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LOW ENERGY INCLUSIVE APPLIANCES PROGRAMME

Impact Evaluation

October 2026



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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. The full methodology can be found in the ↘ annex.

- 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



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List of acronyms

BGFA	Beyond the Grid Fund for Africa
EESL	Energy Efficiency Services Limited
FCDO	UK Foreign, Commonwealth and Development Office
GAIN	Global Alliance for Improved Nutrition
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH
GWP	Global warming potential
HFC	Hydrofluorocarbon
H-PURE	Humanitarian Productive Uses of Renewable Energy
IEC	International Electrotechnical Commission
IRENA	International Renewable Energy Agency
KCCA	Kenya Cold Chain Accelerator
KOSAP	Kenya Off-Grid Solar Access Project
LEIA	Low Energy Inclusive Appliances
MECS	Modern Energy Cooking Services
NFP	Netherlands Food Partnership
PAYGo	Pay-as-you-go
PREO	Powering Renewable Energy Opportunities
PURE	Productive use of renewable energy
QA	Quality assurance
R&D	Research and development
RD&D	Research, development, and demonstration
REEEP	Renewable Energy and Energy Efficiency Partnership
SPIS	Solar-powered irrigation system
TEA	Transforming Energy Access
UNEP	United Nations Environment Programme
UNICEF	United Nations Children's Fund

INTRODUCTION

Off-grid and weak-grid electrification has expanded across sub-Saharan Africa and South Asia. But access to the appliances that make that power useful has not kept pace due to three specific constraints.

- Energy access policy and financing have focused overwhelmingly on supply, not demand.
- Low-income consumers face affordability, quality, and availability barriers.
- Supply chains remain fragmented, import-dependent, and under-resourced.

Programme context

The Low Energy Inclusive Appliances programme (LEIA) launched in 2017 to address these constraints, with a founding goal to double the efficiency and halve the cost of high-priority off-grid appliances. Its founding Theory of Change identified five integrated activities (market stimulation, quality assurance (QA), market intelligence, R&D co-investment, and sector coordination), across two technology tiers (near-to-market appliances ready for immediate scale, and horizon technologies requiring early-stage innovation support).

LEIA is funded by the UK Foreign, Commonwealth and Development Office (FCDO) and the IKEA Foundation, and co-delivered by Energy Saving Trust and CLASP. It sits within FCDO's Transforming Energy Access (TEA) platform and contributes to the outputs of the UK government's Ayrton Fund.

From the outset, the programme identified the tensions it would need to manage: cost reduction versus efficiency gains, market growth versus consumer protection, and programme-level action versus external forces that LEIA does not control, including macroeconomic conditions, policy shifts, and large-manufacturer behaviour.



Solar-powered irrigation technology helping support agricultural productivity through Simusolar's R&D Fund-supported project in Tanzania.
Photo credit: Energy Saving Trust

Eight years into the programme, LEIA's work spans R&D and business model innovation; testing and QA; research and market intelligence; stakeholder convening; capacity building; strategic communications; and mainstreaming gender equity, affordability, and circularity across the energy access sector. It operates across off-grid and weak-grid markets in sub-Saharan Africa and South Asia, primarily through the enterprises and institutions that shape appliance availability, affordability, and performance, rather than through direct end-user engagement.

LEIA's Theory of Change

LEIA's Theory of Change is based on the premise that addressing technology and market barriers will increase the availability, affordability, and performance of appliances suited to off-grid and weak-grid settings. ↘ Figure 1 presents the current version of the Theory of Change, which was revised in 2024.

Over the long term, LEIA aims to contribute to robust, inclusive appliance markets and wider adoption among people whom commercial appliance markets have little incentive to serve. Beyond those markets, LEIA expects wider adoption to improve livelihoods and climate resilience for off-grid and weak-grid communities, smallholder farmers, and refugees, and expects solar-powered appliances to avoid greenhouse gas emissions. These impacts are expected to emerge through sustained ecosystem change rather than through any single intervention.

Figure 1

LEIA's Theory of Change



Efficiency for Access context

LEIA operates under the Efficiency for Access brand. However, Efficiency for Access as an active brand and Efficiency for Access as a dormant coalition are distinct, a difference that matters.

Efficiency for Access as a *brand* is active. Energy Saving Trust and CLASP maintain the website, send the newsletter, and publish LEIA's research and data platforms under the Efficiency for Access name rather than LEIA's own.

The Efficiency for Access *Coalition* comprises a donor roundtable, investor network, and programme partnerships. The donor roundtable has not met in over a year and the investor network is no longer active. The programme partnerships remain active, including research partnerships and working groups. ↗ **Evaluation question 1** traces how and why the Coalition has evolved.

Energy Saving Trust and CLASP serve as co-secretariat of Efficiency for Access. LEIA is Efficiency for Access's flagship programme, funded through the UK government's TEA platform and the IKEA Foundation. LEIA's positioning is deliberately brand-low: its work is published and promoted under the name Efficiency for Access, not under LEIA.

Interviewees and survey respondents used Efficiency for Access and LEIA interchangeably. Unless otherwise noted, this evaluation treats references to either name as references to LEIA. CLASP and VeraSol are distinct organisations that carry out LEIA-funded activities; references to their work in this report refer to those LEIA-funded activities.

Ecosystem context

LEIA works almost entirely through other organisations. It funds, researches, and convenes; it does not manufacture, distribute, or sell. Everything it seeks to change in the appliance market reaches end users through companies, distributors, and last-mile channels that LEIA does not control.

Companies are where most of the programme converges. The Efficiency for Access Research and Development Fund (R&D Fund) grants funding to them, research is integrated into funded projects, and VeraSol and the test labs test their products and run the product competition behind the Global LEAP Awards. Workforce and skills development is the exception, reaching university students through the Design Challenge and the Accelerator Programme rather than through companies directly. Some R&D Fund grantees return to the Design Challenge as mentors, and LEIA research and insights serve as guiding resources for university students.

Beyond the companies it funds, LEIA reaches the sector through convening. Energy Saving Trust and CLASP coordinate a set of donor, investor, and implementer groups. Several are now dormant. Those that remain active run through the CROWD platform, the Agri-Energy Coalition, and Ayrton Challenge: Sustainable Cooling for All (led by Energy Saving Trust) and Ayrton Challenge: Energy Efficiency (led by CLASP).

Evaluation context

Energy Saving Trust and CLASP commissioned Caribou to conduct an impact evaluation of LEIA. The evaluation assesses impact over eight years of implementation, generates learning to inform the next phase, and supports accountability to funders and stakeholders.

The evaluation's three questions structure this report:

1. How and why has LEIA evolved over eight years, and what does this show about how it has come to operate within the current ecosystem?
2. How has LEIA contributed to change in the ecosystem, and why has its contribution been catalytic in some areas and more marginal in others?
3. What are the strategic implications for the next phase of LEIA, and what does the evidence suggest for how other ecosystem actors can best support inclusive access to low-energy appliances?

The analysis focuses on the following cross-cutting themes:

- **Evidence-based, research-led RD&D programming.** LEIA's use of research to shape its own design choices, including technology roadmaps that guide product development and sector-level studies that inform coordination efforts across the ecosystem.
- **Technology and business model innovation.** LEIA's direct support for improving appliances and the businesses selling them: R&D funding, lab and field testing, and the test methods and standards that let public funders and buyers identify high-performing products.
- **Sector awareness, convening, coordination, and collaboration.** LEIA's role in building shared understanding across the sector and aligning the actors within it, from communications that build awareness of market barriers to coordination work linking grant funders, technical assistance providers, and private investors around a common pipeline of investable companies.
- **Market stewardship promoting inclusivity and circularity.** LEIA's efforts to shape how appliance markets develop, including who is served, and whether inclusion and circularity become embedded in market practice.

This report uses four related terms in specific ways:

- **Outcome:** A specific, observed change, for example, a company securing capital, a standard adopted, or a market opening.
- **Impact:** Longer-term change to which outcomes contribute, such as more inclusive appliance markets and wider adoption among hard-to-reach populations.
- **Contribution:** LEIA's role in producing an outcome, rated on the scale set out in the contribution rubric.
- **Catalytic contribution:** The top of the contribution scale: no other actor was positioned to produce the outcome without LEIA. Marginal contribution sits at the other end: the outcome would likely have happened regardless of LEIA's contribution.

Methodologically, the evaluation uses a theory-based, mixed-methods design drawing on four complementary sources of evidence: a structured document and evidence review, key informant interviews, a targeted survey of LEIA partners and grantees, and a structured contribution rubric to support transparent synthesis and judgement. For more information on the methodology, please see the ↘ annex.

EVALUATION QUESTION ONE

How and why has LEIA evolved over eight years, and what does this show about how it has come to operate within the current ecosystem?

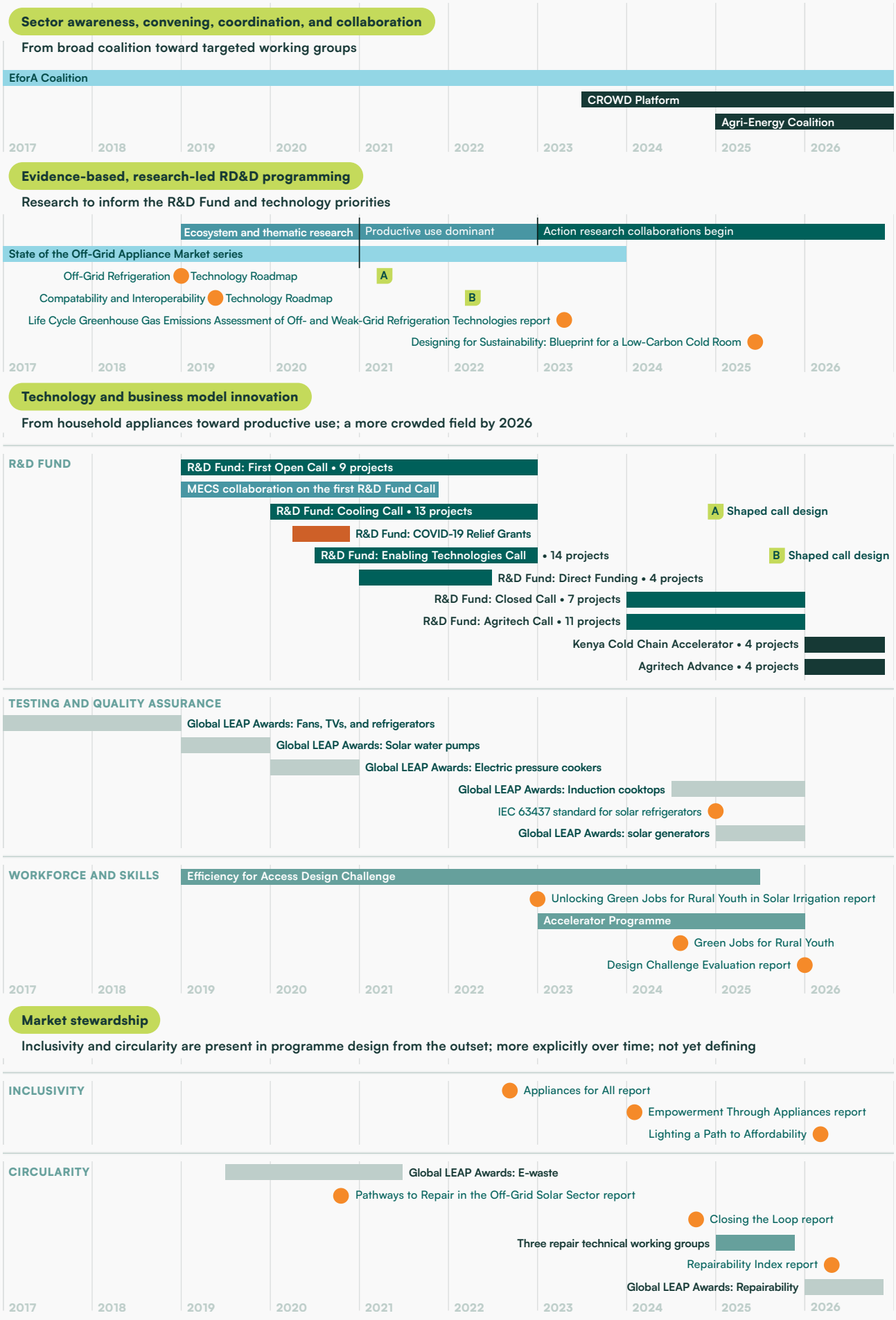
LEIA evolved over eight years through a combination of funder influence, implementation learning, and ecosystem change. The result is a programme that is broader and more strategically self-aware than at its start, one whose evolution has expanded its reach even as it has made LEIA's distinct niche harder to define.

The evaluation groups LEIA's activities into four dimensions: technology and business model innovation, research and market intelligence, sector convening and coordination, and market stewardship. Funder pressure, implementation learning, and sector change reshaped all four dimensions, though at different speeds. Technology and business model innovation moved fastest; market stewardship moved steadiest, though interviews continued to identify LEIA with the R&D Fund and testing and QA work.

↘ Figure 2 plots the four dimensions of LEIA's evolution against an eight-year timeline. 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. LEIA used research to inform the R&D Fund and technology priorities, moving from household appliances to productive-use appliances. Technology and business model innovation followed three separate paths across R&D, testing and QA, and workforce and skills development. Market stewardship grew along two tracks: inclusivity from the outset, and circularity from 2019.

Figure 2

Evolution of LEIA across four dimensions



LEIA moved from broad donor and investor convening to smaller functional coordination structures

LEIA's approach to convening moved from an ambitious donor and investor coalition to smaller, more functional working groups. Though the Efficiency for Access Coalition grew quickly in its early years, its Donor Roundtable has not met in over a year and its Investor Network is no longer active. The coalition's programme partnerships remain active and are the current mechanism through which LEIA runs convening, particularly the CROWD platform and the Agri-Energy Coalition.

Interviewees describe the original coalition ambition as genuinely optimistic and ultimately unrealised. Almost no donor was willing to subordinate its own brand to Efficiency for Access; the IKEA Foundation was the one exception. Interviewees point to the same causes for the decline in the coalition's donor and investor convening: meeting fatigue, bandwidth constraints, and the rise of other fora like Mission 300 that reduced the need for a dedicated secretariat.

The CROWD platform, established in 2023 with 23 members, emerged directly from donor feedback that smaller, locally led companies were underserved. This is a more targeted response to a specific gap than the broad donor coalition model. A research partner appreciated LEIA's adaptive model, sensing what the sector needs and adjusting, rather than holding to a fixed design. As these working groups are still relatively new, the evaluation cannot determine if they are more effective or efficient than the Efficiency for Access Donor Roundtable and Investor Network.

LEIA used research to inform the R&D Fund and technology priorities

Technology roadmaps shaped R&D Fund decisions from early on. Interviewees describe the *Off-Grid Refrigeration Technology Roadmap* as underpinning the cooling calls that became the fund's flagship portfolio. The *Compatibility and Interoperability Technology Roadmap* informed the enabling technologies call. Gender, disability, and inclusivity research was built into funding criteria from the design stage. That direct dependency has narrowed as the sector's core technical questions have been answered, though interviewees are clear that research still needs to underpin LEIA's funding decisions.

Broader ecosystem research connected to the R&D Fund later, through action research collaborations with grantees on topics like the life-cycle assessment of off-grid and weak-grid refrigeration technologies and low-carbon cold room blueprint, deepening further with the Kenya Cold Chain Accelerator. Interviewees cite the State of Off-Grid Appliance Market report series as a resource the sector relies on. Research on repairability and interoperability fed into the Solar Appliance Repairability Index Series, and a consumer research partnership continues to collect field-level user feedback.

The shift towards productive use

Productive use became a priority following research and early consultations with the sector, later confirmed by external market data showing that by 2021 75% of venture grant capital in the sector had concentrated on productive use. LEIA used this evidence to validate the shift rather than originate it. Interviewees describe productive-use technologies as effectively nonexistent as a category when LEIA started; LEIA's own market-sizing research gave the sector a shared reference point. However, interviewees are candid that they can't fully disentangle whether LEIA's research drove a major funder's strategic pivot toward productive use or followed that pivot.

Productive-use technologies are those that support income-generating activity. Examples include irrigation, refrigeration, drying, milling, and cold storage.

Interviewees also warn that LEIA's broadened shift to productive use has cost it a distinct identity. Its early household appliance work had a clearer value proposition. Productive use is now a more crowded field, and some interviewees worry basic household access loses attention in the shift.

Cost and efficiency

Interviewees also raise a challenge to the programme's founding logic. LEIA's founding target assumed efficiency gains and cost reduction would move together: double the efficiency, halve the cost. Two different costs sit behind that target. The first is the price of the appliance itself. The second is the cost of powering it. LEIA's initial target was set on the first.

The price of an appliance and its efficiency often move in opposite directions.[4] Market data from 2023 to 2025 shows that pattern holding for some categories but not others. Refrigerators improved efficiency by 53% while price per litre fell 17%. Fans improved efficiency by 62% but rose 39% in price per inch.

The efficiency case rests on the second cost. A more efficient appliance runs on a smaller solar and battery system, so the total cost of owning and powering it can fall even when the appliance itself costs more. This is the mechanism that made LED lighting viable off-grid. LEIA's outcome indicators measure appliance efficiency and average retail price per unit of size. Neither tracks system cost. This evaluation does not maintain that LEIA should have driven down the price of solar panels and batteries, which are global commodities well outside the programme's influence. The important conclusion is that the indicator set cannot show whether the total cost to the buyer fell, which is the claim the founding target rests on.

LEIA's methodology for measuring appliance cost and efficiency improved over eight years; since 2023, efficiency and cost have been tracked using units surveyed directly from national markets, representative of what consumers can actually buy, rather than the smaller sample of tested, best-in-class units used in the programme's earlier years. The figures above fall entirely within that later method. Thus cost and efficiency trends cannot be compared on a like-for-like basis across the full eight years of the programme.

4 Interviewees consistently identified this as a design tension: higher-efficiency components (e.g., better compressors, better insulation) cost more to build. See Efficiency for Access Coalition, *2021 Appliance Data Trends: Insights on Energy Efficiency, Performance and Pricing for Off-Grid and Weak-Grid Appropriate Appliances* (January 2021), 34.

Technology and business model innovation followed three separate paths across R&D, QA, and workforce development

Research & Development Fund

LEIA's R&D Fund evolved from grants alone into broader ecosystem support. Informed by R&D company feedback, examples from other programmes, and research, it added technical assistance, testing, matchmaking, and business model support. Technology scope broadened in step, moving from household appliances into a widening set of productive-use categories with their own test methods and QA frameworks.

Programme documentation traces this shift. Grants gave way to a technical assistance facility, lab testing, and field testing. Matchmaking was present early on, connecting grantees to each other, and in one case to a PAYGo provider to integrate connectivity into refrigerators. Later-stage grantees now benefit from a conscious shift towards business model development, evidenced by four later-stage companies supported through the Kenya Cold Chain Accelerator (KCCA). Interviewees describe the shift from what used to be reported uniformly as "open calls" to a tiered structure including closed calls and the more targeted KCCA, operating alongside testing, QA, and workforce and skills work.

Testing and quality assurance

The testing and QA work that LEIA funds originally launched in 2009 as Lighting Africa Quality Assurance and ran under the World Bank Group as Lighting Global, only covering solar energy kits. A competitive process in 2016 and 2017 moved it out of the World Bank and selected CLASP as the partner, at which point appliances entered scope. Test methods for televisions and fans were published in August 2016, before LEIA began. The team renamed the operation VeraSol in 2020, and the product database, launched as Equip Data in 2019, took the same name.

New appliance categories entered LEIA's testing work through the Global LEAP Awards, a competition run for one appliance type at a time. Manufacturers submit products, the products are tested against a common method, and the results are published as a buyer's guide. Refrigerators, fans, and televisions had test methods and buyer's guides by late 2017. Solar water pumps (2019) and electric pressure cookers (2020) followed. Running a Global LEAP competition required a test method, so each round produced or revised one. The refrigerator method published in 2018 was revised in 2019 and again in 2021; this method became IEC 63437 in 2025.

The Global LEAP Awards also supplied the programme's own indicator data. Until 2023, LEIA reported efficiency and cost against a sample of tested, best-in-class units, and competitions brought those units in for testing.

The approach changed as categories matured at different rates. In 2022, LEIA's testing and QA team built the Rapid Product Assessment, a faster and cheaper route for productive-use technologies that had not yet reached market viability, on the reasoning that a full test method costs more than an unproven category can justify. Assessments followed for egg incubators, solar milling machines, and agricultural sprayers.

A test method sets out how to measure a product. A quality standard sets out what a product has to achieve, and certification is only possible once one exists.

Eight years of testing and QA work has produced test methods across the appliance categories LEIA covers, and quality standards for solar energy kits alone. Solar energy kits are the only products VeraSol certifies. Every other appliance is tested, and performance, safety, and durability results are published on the VeraSol database. Appliance testing is voluntary, and the volume of products tested varies depending on whether a Global LEAP competition is running for that category, LEIA is sampling products from national markets, or a development programme requires testing as a condition of support. Testing subsidy has varied across the programme's eight years, including periods with none, and now LEIA largely does not subsidise appliance testing.

Workforce and skills development

Workforce and skills development changed more than any other part of LEIA's technology and business model innovation work. When the budget came in below expectation, grant-making, testing, and QA continued. Within workforce and skills, the Design Challenge also continued, but the planned growth beyond it was scaled back. One interviewee attributes that decision to limited funder appetite for expanding into work the programme had not delivered before.

The Efficiency for Access Design Challenge, launched in 2019 and delivered with Engineers Without Borders UK, reached 691 students across 42 universities over six years. UK universities made up a larger share of early rounds; that share fell as more universities from sub-Saharan Africa and South Asia took part. The Accelerator Programme followed in 2023, built to close a gap the Challenge itself had created: engineering students held the technical knowledge to design an appliance but lacked the business knowledge to take it further.

The Challenge paused in July 2025 for two stated reasons. A stakeholder consultation identified a gap between university curricula and industry skills needs. Separately, funding for a full year had not been committed when the decision was required. Programme staff describe commissioning the independent evaluation as making use of the pause rather than causing it; the reasoning was not well understood outside the delivery team, including by one of LEIA's funders. As Accelerator entry depended on the Challenge, the pause also closed its recruitment route.

Other workforce activity continued during the pause. Through the TEA Learning Partnerships, LEIA developed a masters-level course on off-grid appliances and market research that eleven universities across sub-Saharan Africa, Southeast Asia, and Oceania adopted into their degree programmes. The *Green Jobs for Rural Youth* report, published in August 2024, identified outdated curricula, underqualified trainers, and minimal private sector engagement in technical and vocational institutions, and *Unlocking Green Jobs for Rural Youth in Solar Irrigation* mapped those institutions against the jobs emerging in solar irrigation. The Kenya solar powered irrigation system (SPIS) workforce training pilot evolved out of those two reports, launching in 2026 with five rural technical and vocational institutions to train 50 solar irrigation technicians.

Throughout, the workforce and skills development activities ran as a self-contained pathway. LEIA attempted to connect the workstream to its innovation work by recruiting R&D Fund companies as Design Challenge mentors, but this was not always successful. Programme staff describe the curriculum for the Kenya SPIS workforce training pilot as related to the Global LEAP Awards for Repairability and Repairability Index, though the evaluation did not find documentation of how that connection works in practice.

Market stewardship grew along two tracks: inclusivity from the outset, and circularity from 2019

Market stewardship advanced with a steadier cadence than LEIA's other three dimensions of evolution, without a single sharp pivot. It runs along two distinct threads: inclusivity, present in the programme's design from the outset, and circularity, which entered two years after LEIA's launch through the Global LEAP Awards.

Inclusivity

Inclusivity featured in LEIA's initial design and became more explicit over time, visible in the 2020 R&D call on inclusivity and interoperability, the 2022 *Appliances for All* report, and the 2024 *Empowerment Through Appliances* report. Programme documents trace a shift from inclusivity as a monitoring requirement to inclusivity as a design principle, with gender criteria embedded in test lab procurement and R&D Fund call design.

Even so, interviewees rarely foreground inclusivity unprompted; it isn't a defining characteristic of how the sector perceives LEIA. Survey data shows real variation in how much partnerships prioritise it: central to some, irrelevant to others. The LEIA team acknowledges difficulty securing private sector buy-in on the issue. Programme documents state intentions on inclusivity more consistently than they verify actual behaviour change.



Workers watering crops in Kenya.
Photo credit: Energy Saving Trust

Circularity

Circularity entered the programme through the Global LEAP Awards Solar E-Waste Challenge in 2019. Research followed in 2020 with the publication of *Pathways to Repair*, which set out the circularity agenda that LEIA still follows. The report's first recommendation was to develop an objective method for rating the repairability of off-grid products using the European Standards Framework (EN 45554), delivered by a working group of off-grid specialists. LEIA convened three working groups in 2025, one each for solar fans, pumps, and refrigerators, contributing to the publication of the Repairability Index in April 2026. *Closing the Loop*, published in October 2024, supplied the intervening evidence, documenting that solar appliance repair remains informal and uncoordinated. The Repairability Index faces its first commercial test with the 2026 Global LEAP Awards for Repairability.

Alongside e-waste and repairability, *Lifecycle Greenhouse Gas Emissions Assessment of Off- and Weak-Grid Refrigeration Technologies* (April 2023) set out carbon impact, thermal storage, and low-GWP refrigerants as explicit design recommendations. The *Blueprint for a Low-Carbon Cold Room* (June 2025) pushed further, treating life-cycle assessment as a real-time design tool.

Circularity shows the same variation inclusivity does. It's central for some grantees, Solar Cooling Engineering's modular, biogenic-material cold rooms among them. For others, circularity is constrained by supply chain and market immaturity, as in Kenya, where dependence on imported units and the absence of a functioning secondary-battery market limit possibilities.

Unlike inclusivity, externally circularity is raised unprompted by interviewees as a future ambition or an emerging shift rather than a description of what LEIA already is.

Together, these four dimensions trace a programme that grew broader, more self-critical, and more ecosystem-aware over eight years. What they cannot resolve is whether that evolution translated into catalytic change. The next section takes up that question directly.



Women farmers harvesting and cleaning a watermelon grown using a solar-powered water pump and drip irrigation system in Kenya.
Photo credit: CLASP

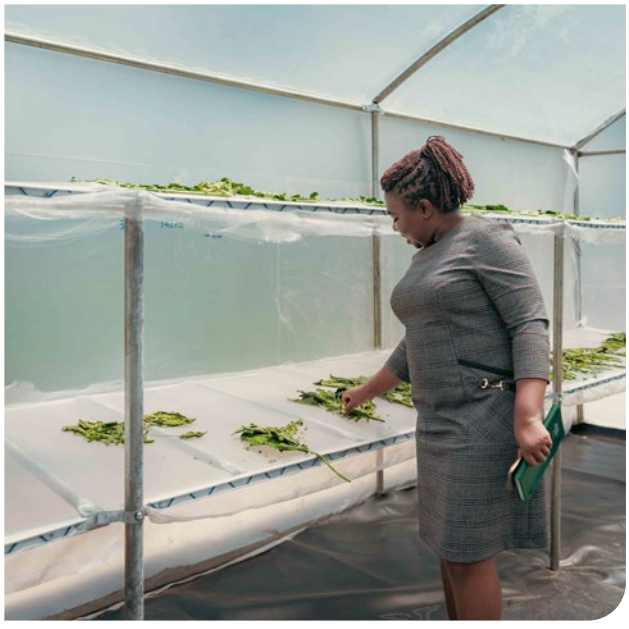
EVALUATION QUESTION TWO

How has LEIA contributed to change in the ecosystem, and why has its contribution been catalytic in some areas and more marginal in others?

LEIA's contribution was catalytic where it was the only actor positioned to act. Across all four areas of work, the same pattern holds: LEIA funded the single technical pivot that turned a company into an investable business, supplied an off-grid lens to institutions whose own frameworks did not carry one, bridged actors who would not otherwise have met, and extended appliance markets to populations the commercial market has no reason to serve. Other outcomes required several organisations working together. In those cases, the question is not how much of the outcome belongs to LEIA, but what LEIA specifically brought to those collaborations and partnerships.

Methodology note

The examples in this section are not exhaustive. They are selected from the contribution rubric's 56 outcomes as they highlight LEIA's contribution, rated on significance, contribution, and evidence, where no other actor was positioned to do what LEIA did. The full rubric holds the complete picture, including outcomes where the evidence was weaker or LEIA's role was more marginal. What follows illustrates the pattern of catalytic contribution. It is not a catalogue of every outcome LEIA touched.



A farmer inspecting crops dried using a solar-powered dryer in Kenya.
Photo credit: CLASP

LEIA supported the technical step that made companies investable and turned test methods into testing capacity close to the markets that use the products

Early-stage support

LEIA occupies a funding niche no other actor in the ecosystem fills: between early-stage technical risk, too far from market for commercial investors, and existing grant support, too shallow for the pivot a company actually needs. In that gap, LEIA's funding buys one specific, decisive pivot per company: not the business itself, not the market opportunity, but the exact move that turns an existing idea into something investable.

These outcomes sit on the Theory of Change's "new technologies and business models developed and tested" pathway, feeding its outcome statement on improved affordability, performance, inclusivity, and circularity.

Devidayal, GOGLA, and Angaza

INDIA



Devidayal built India's first PAYGo-enabled solar refrigerator and holds a Government of India patent on its payment technology. The remote lock-out feature gave Indian banks the security they had been missing, cutting interest rates for customers who repay on time from around 18% to 12%—14%. The product has since reached Tanzania, Somalia, and Uganda, with planned expansion to Kenya and Rwanda. LEIA's R&D grant paid for developing and patenting the chip, at a cost of £98,000. LEIA then connected Devidayal with Angaza, a PAYGo technology provider, and with GOGLA, so the chip could work with payment systems already used across the sector.[5]

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. Equity for productive-use companies in India was scarce at that point, and the founder 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.

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

Synnefa Green's Smart Solar Dryer

KENYA



Synnefa Green's Smart Solar Dryer cut the energy needed to dry coffee from 96 Wh/kg to 16 Wh/kg, an 83% reduction; lowered post-harvest losses by up to 50%, and doubled throughput for the cooperatives using it. Revenue grew 126% between 2024 and 2025, with a further doubling projected for the following year. A majority (65%) of customers are farmer cooperatives in deep rural areas. The dryer now runs in Uganda, where AB InBev is an anchor customer supplying barley farmers, and in Ghana, where a pilot with Complete Farmer reaches an offtaker network of 1.2 million farmers. LEIA's R&D grant funded the pivot that moved Synnefa out of greenhouse production support and into post-harvest drying.[6]

Synnefa was a working business with a product concept prior to the grant, and demand for post-harvest solutions in Kenya grew during their LEIA R&D grant period. The company would probably have grown without LEIA, but it would not have had this dryer. Synnefa's founder traces the move out of greenhouses and into drying to the grant specifically, and the expansion into Uganda and Ghana rests on performance credentials that came from the funded development work.

Where LEIA's programme design pushes results into the open market, a single grant reaches past the company that received it.

Solar Cooling Engineering

SUB-SAHARAN AFRICA



Solar Cooling Engineering tested cold rooms assembled from recycled and locally sourced materials, cutting assembly cost by half with no loss of efficiency. It published the method as an open-source step-by-step guide.

The guide then travelled further than the company did: Ecotech Mali used the published materials and training to install five SelfChill cold rooms, without any involvement from Solar Cooling Engineering. Victor Torres-Toledo, Solar Cooling Engineering's founder, is clear about the distance: "We have never been to Mali and have never directly installed a cold room there ourselves. Instead, through the training and knowledge transfer we provided, Ecotech Mali acquired the expertise to apply the SelfChill approach locally. Using locally sourced materials together with SelfChill components, Ecotech Mali successfully built and operated five cold rooms in Mali." LEIA funded the testing and is the reason the results were published.

6 Synnefa, "Smart Solar Dryer," accessed 13 August 2026.

Solar Cooling Engineering was not working on this project alone. The Nigerian Food Stored Products Research Institute was independently exploring local manufacturing of cold rooms, and cheap battery-based systems arriving from China were pushing cold-room costs down over the same period. Some of the 50% reduction is the market moving rather than Solar Cooling Engineering's testing.[7] Yet, Solar Cooling Engineering had no commercial reason to hand its method to competitors. That decision came from how LEIA designed the grant, and the five cold rooms in Mali are the result.

Securing commercial support

Whether early-stage public support produces investable businesses or a population of companies dependent on concessional funding is the central diagnostic question for the productive-use sector. The 2026 *Scaling Potential* report found that of 127 companies supported by CROWD platform 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 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 that LEIA did not support, the rate was 17%. Both figures use the report's own classification and dataset.

It's possible the R&D Fund builds companies, or it may select companies already positioned to attract investment. If it picks well, those companies would have raised capital anyway. Eleven companies is also a small group, and nearly 70% of disclosed commercial capital across the wider sector sits with three companies, so the rate may reflect a few strong performers. LEIA-supported companies receive support from other sources too, so a later raise may belong to that combination rather than to LEIA.

Founders report that the R&D grant: paid for product development and field trials no 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 that companies pass through before a commercial raise. On that basis, the evaluation treats LEIA's role as associated with later capital-raising rather than as its cause.

Ownership across LEIA's PURE portfolio

Among LEIA's 26 PURE R&D companies, 46% are locally owned and 19% are women-owned, against CROWD-wide rates of 51% and 14%, respectively. LEIA does not track disability-led ownership among funded companies.

Among the 11 LEIA-supported PURE companies that raised commercial capital, 45% are locally owned and 18% are women-owned, nearly identical to their 46% and 19% share of the full 26-company portfolio. Within this small portfolio, local ownership and women's ownership do not appear to correspond with lower capital-raising rates, though the sample is too small to support a firm conclusion.

7 Nigerian Stored Products Research Institute, *2023–2028 Strategic Plan* (2023).

Testing and QA

The second level of LEIA's technology work runs through institutions rather than a single company's pivot. Three cases follow. In the first two, LEIA was doing work no other actor was positioned to do. In the third, several organisations were already setting solar water pump standards, and LEIA supplied the off-grid evidence none of them held.

Energy Efficiency Services Limited (EESL)

INDIA



As the Indian government's energy services agency, EESL issued a tender for 150 solar-powered walk-in cold rooms across at least six states, mobilising over $3.2 million in public and private financing, between 35% and 50% of its government subsidy. That tender grew from a six-unit pilot.[8] CLASP began providing technical assistance to EESL two years earlier in 2023, work that helped catalyse Asian Development Bank grant support for three pilot projects to test the business case. In 2025 LEIA supported six walk-in cold room demonstrators across three states. EESL's own account places CLASP at every stage of the pilot, from convening the first stakeholders and developing specifications through site selection and quality protocols to the tender itself. LEIA then built the first field test method for walk-in cold rooms in the Global South, designed to assure quality on the 150 units as are installed. Because these rooms are modular and assembled on site, the method covers components, design, installation, and in-field performance rather than laboratory conditions alone.

EESL is a large, established agency, and the Asian Development Bank is a major infrastructure financier. Both had the political will and the capital pipeline to expand cold storage without LEIA support, and the pilot may have been a convenient reference point that happened to be running at the right moment. EESL's own account argues against this reading, describing the technical assistance as continuous rather than a single input at the start, and the scale-up as not plausibly achievable without it. The test method is the weaker of the two claims. LEIA developed it and then put its validation out to competitive tender, which Wageningen University won, testing a walk-in cold room in its own facilities and publishing the results. Wageningen's long-standing expertise in cold-room performance is what that tender bought, which places LEIA's contribution to the method in the funding, convening, and structuring of the work rather than in its technical content. Yet, India's decentralised cold chain deficit runs to tens of thousands of units. One hundred and fifty across six states proves a government-backed procurement can be built from a small pilot, but it doesn't close the cold chain deficit.[9]

8 Sipra Singh, "In India, Solar-Powered Crop Storage Helps Farmers and the Economy," CLASP, 26 May 2026.

9 Press Information Bureau, Government of India, "In Future Development Focus Needs to Be More on Modern Pack-Houses and Refrigerated Transport: Dr. Balyan," 4 September 2015.

University of Nairobi Lighting Laboratory

KENYA

Previously, the lab could only test products up to about 15 watts, nothing larger. It is now installing capacity to test solar water pumps, a category once entirely outside its reach. LEIA's Testing and QA team partnered with the Schatz Energy Research Center to build training materials specific to pump testing, then identified the World Bank's Kenya Off-Grid Solar Access Project (KOSAP) as an aligned source of funding and brokered the connection between that project, Kenya's Ministry of Energy, and the laboratory.[10] In the final quarter of 2022, the Ministry approved $200,000 for the test bench and equipment, and procurement is still underway. Staff at the laboratory describe the support as covering the bench, the equipment, and the technical training together, and say the approach came to them because the lab had worked with VeraSol before.

Both the World Bank and Kenya's Ministry of Energy hold independent mandates to strengthen energy access infrastructure, and KOSAP had priorities of its own to fund. Some investment in the laboratory's testing capacity would plausibly have happened without LEIA, and the lab would have continued to operate and grow regardless. Yet, no other actor was building solar water pump training materials for the lab, and no other actor brokered the arrangement that pointed KOSAP funding at pump testing specifically. Additionally, testing is a cost that companies distributing solar water pumps into African markets have absorbed themselves, because no laboratory on the continent could test VeraSol's pump method, and VeraSol results are what companies need to access results-based financing and the subsidies that bring product prices down. Laboratory staff make the same point from their own side, describing local testing capacity as a direct reduction in cost for manufacturers.

10 World Bank, "Kenya Off-Grid Solar Access Project for Underserved Counties," Project P160009, accessed 13 August 2026.



The lab in Nairobi

"The quality [assurance] infrastructure is not always visible, but it is foundational. It underpins trust and performance in the energy systems that are deployed."

Dr. Lindah Karea leads the Off-Grid Energy Testing Laboratory at the University of Nairobi. Her team tests solar and off-grid products for performance, safety, and reliability, work supported through the VeraSol QA programme. Testing capacity in Nairobi means products can be verified close to the markets that use them, rather than only in Europe.

Efficiency for Access, LinkedIn, March 2026



At the University of Nairobi, Dr. Lindah Karea leads the Off-Grid Energy Testing Laboratory, supported through the VeraSol QA programme. Photo credit: CLASP

Solar water pump test method

GLOBAL



Solar water pumps are the most commercially mature productive-use appliance across sub-Saharan Africa and Asia, and a pump that fails is a direct livelihood loss for the smallholder farmer who bought it. There is now a unified test method covering off- and weak-grid conditions, including solar direct drive systems, and it is feeding into proposed revisions to IEC standards for photovoltaic pumping systems. VeraSol built it. The Global LEAP Solar Water Pump Test Method was first published in 2019 and updated in 2021 and 2025, grounded in LEIA's own field testing programme, which found that nearly half of the users who ran into problems with their pumps said those problems were never resolved. That evidence came from actual operating conditions rather than from laboratory assumptions, and it shaped both the method and the standards work that followed.

LEIA was not alone in this space. The World Health Organization sets standards for pumps in health facilities, the Food and Agriculture Organization publishes guidance on solar irrigation, and several bilateral programmes carry their own procurement standards. None of them covered the off-grid productive-use case: a single method spanning off- and weak-grid conditions and solar direct drive systems, built on documented user experience rather than assumption. LEIA's field testing carried that evidence into the revisions, and LEIA describes the value of its involvement as making the standard fit the markets where these pumps are used, in Africa and India, rather than the markets where they are made.

A farmer preparing a solar water pump for work in Kenya. Photo credit: Energy Saving Trust



LEIA's research mattered most when it made overlooked markets measurable and actionable

LEIA's research had the most effect where it brought an off-grid perspective into institutions already positioned to act on it. UNEP's flagship cooling report now carries a framework for measuring off- and weak-grid access. GOGLA's sales tracking now covers televisions, fans, refrigerators, and solar water pumps alongside lighting. UNEP's Kigali formula now extends to off-grid refrigerators under 600 litres. In each case the framework, the reporting system, and the method already existed; what LEIA added was coverage of markets they had not reached.

Global Cooling Watch 2025

GLOBAL

The *Global Cooling Watch 2025* report proposes a definition of access to cooling for the first time, sets out an initial framework for measuring residential cooling access, and presents off- and weak-grid cooling technologies and business models suited to low-income countries. UNEP's flagship cooling publication had previously concentrated on urban settings in high- and middle-income countries. The framework now informs how governments implement their Nationally Determined Contributions, and how the 72 signatories to the Global Cooling Pledge build their National Cooling Action Plans. LEIA established a cross-sector partnership with the UNEP Cool Coalition and formed a technical taskforce of Energy Saving Trust and SEforALL cooling experts to strengthen the report's greenhouse gas emissions modelling with rural, off-grid perspectives.[11] That taskforce developed the access-tracking framework the report now carries. UNEP credits Energy Saving Trust and SEforALL staff as lead topical authors for the sections on access to cooling and off-grid solutions.

These examples trace to the Theory of Change's "performance data guides policy and financing eligibility" pathway, feeding the outcome on integrating efficient inclusive appliances into energy access policies and financing. They sit on the research side of LEIA's work specifically.

The obvious alternative explanation is SEforALL, which holds cooling access expertise of its own and was already involved. Yet, SEforALL describes itself as lacking the bandwidth to drive the work and credits LEIA with taking the lead organisationally and carrying the taskforce through to publication. The evaluation identified no other actor positioned to bring an off-grid lens to a report that had not previously carried one. What makes the contribution clear rather than merely plausible is that the acknowledgement is part of UNEP's own publication rather than in LEIA's self-reporting.

11 Efficiency for Access, "Reflections from COP30," 2025.

Phasing Down HFCs in Off- and Weak-Grid Refrigeration: An Opportunity to Reduce Greenhouse Gas Emissions

GLOBAL



In 2019, more than half of off-grid refrigerator manufacturers were still using R134a, a refrigerant with 1,430 times the warming potential of carbon dioxide. The sector lacked a standard method to measure these effects. Emissions that cannot be measured do not appear in impact reporting, and emissions that do not appear in impact reporting give manufacturers no reason to switch. LEIA commissioned research across more than 50 companies and 66 refrigerator models, drawing on manufacturers, formal e-waste recyclers, and refrigerant specialists, and adapted UNEP's OzonAction Kigali formula to the specific characteristics of off-grid direct current refrigerators under 600 litres. The resulting metric put a number on the problem: if the obtainable market of 11 million refrigerators[12] were sold running hydrofluorocarbon (HFC), the sector would emit close to half a million tonnes of CO_2 equivalent. That metric now feeds LEIA's own impact assessment framework, and the report proposed adding refrigerant type and charge mass to GOGLA's bi-annual sales surveys so the sector could collect the data at scale.

Most sub-Saharan African countries froze HFC consumption in 2024 and face their first reduction step in 2029; India's freeze will occur in 2028. GIZ Proklima, UNEP OzonAction, and the Cool Coalition were working on refrigerant transition in developing countries over the same period. LEIA's own report concedes as much, observing that the off-grid market's natural refrigerant share will improve to some extent without intervention. The formula is adapted rather than original; the underlying methodology was created by UNEP. What LEIA supplied was the off-grid specificity, applying an existing method to a product category nobody had measured and making visible an externality the sector had been reporting around. Refrigerant management sits alongside repairability and battery end-of-life as one of the few structural environmental levers available in off-grid appliances, which is why a measurement gap here mattered. The metric is a proposal, and whether manufacturers or sector reporting change in response has not yet been demonstrated.

12 Efficiency for Access Coalition, *The State of the Off-Grid Appliance Market* (October 2019), 13.

GOGLA's sales and impact reporting

GLOBAL



Historically, GOGLA's bi-annual sales reports tracked basic solar lighting and energy kits and nothing else. They now cover televisions, fans, refrigerators, and solar water pumps, household and productive use alike. GOGLA also reports on what those appliances deliver rather than only how many units sold, covering health, livelihood, and climate adaptation benefits. LEIA contributed to both changes, through two separate pieces of work. It funded the expansion of GOGLA's sales data collection to cover appliances from 2018 onwards, which took the reports beyond lighting and energy kits. It also built an impact assessment framework for off-grid appliances, covering health, livelihood, and climate adaptation metrics, which GOGLA integrated into its bi-annual reporting. Over 90 appliance companies now report sales data into the expanded system. GOGLA describes the collaboration as substantive rather than nominal, involving joint work on reviewing reports and checking data quality directly with companies.

GOGLA's bi-annual sales reports are produced in collaboration with the World Bank and the International Finance Corporation. Both institutions control access to development finance, so company participation may reflect their gravity as much as LEIA's coordination. The World Bank Energy Sector Management Assistance Program confirms that LEIA brought the funding that expanded sales data collection into appliances specifically. GOGLA's reporting machinery, its relationships with the companies that submit data, and its standing in the sector all existed before LEIA arrived; what LEIA funded and designed was the extension of that system to appliances, not the system itself. Reporting also dropped during COVID, when companies facing supply chain disruption and inflation deprioritised voluntary data submission, which shows it depends on a stable market.

LEIA shaped the sector by connecting unconnected actors, building infrastructure others adopted on their own terms, and running joint efforts with other programmes

Convening

These examples trace to the Theory of Change's "strategy, policy, and partnerships" pathway, using partnerships and sector coordination to integrate efficient, inclusive appliances into policy and financing.

Agri-Energy Coalition SUB-SAHARAN AFRICA

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. The Coalition formally bridged long-standing silos between the energy, agriculture, water, and nutrition sectors. LEIA co-developed the *Beyond Silos* report with seven partners: GOGLA, SNV, Wageningen University, GAIN, AGRA, IRENA, and GIZ. The report set out the ways off-grid solar appliances can decarbonise agriculture in sub-Saharan Africa while raising productivity and strengthening food security. It presented the findings to government representatives at a closed-door interministerial event at the Africa Food Systems Forum, where the Coalition launched. LEIA is part of the Coalition's 11-member steering committee, which also includes Energy Saving Trust, REEEP, Netherlands Food Partnership, and the other organisations mentioned above. LEIA helped build the governance structure and strategy, and co-leads two of the Coalition's action areas: development approaches targeted at donors, and business models and technology innovation. The coalition has already moved capital thinking: one investor shared that it has shaped how the firm approaches investing in the agriculture-energy space.

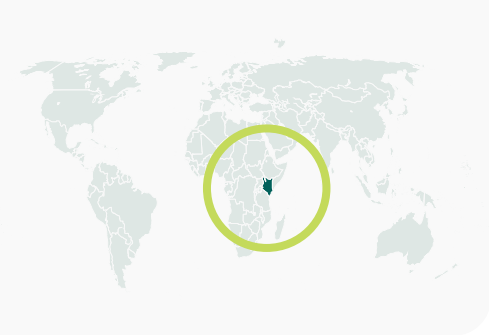


Beyond Silos was co-authored with seven organisations, the NFP facilitated the governance work, and the launch ran on pre-existing platforms (the Africa Food Systems Forum and COP30) rather than an audience LEIA had to build. A sector already motivated to collaborate would arguably have found its way to something similar. Two factors distinguish LEIA's role. Wageningen and GOGLA both trace the Coalition directly back to *Beyond Silos* and place LEIA at the centre of producing it. GOGLA describes the Coalition as the merger of two previously separate groups, its own market and policy network and the more technical group around LEIA and Wageningen. Building on existing platforms rather than new ones is also a cheaper way to convene, not a weaker one. What the Coalition has not yet done is change how its members design and run programmes. One member organisation is candid that the Coalition remains at pilot level, and that its value will depend on whether members build joint work rather than attend the same meetings.



Technician installing a solar fan and lights on a farm in Kenya. Photo credit: CLASP

National Energy Policy & Finance Bill 2025 KENYA



Kenya reversed a proposed tax on solar-powered appliances in the Finance Bill 2025, and in the same year incorporated renewable appliances into its National Energy Policy for the first time, opening a path to dedicated off-grid appliance standards under the new Productive Use of Renewable Energy Strategy. Both came out of one campaign. CLASP, through the Efficiency for Access Coalition, formalised a partnership with the Kenya Renewable Energy Association (KEREA) to engage the Kenyan government on the policy revision, the tax proposal, and the PURE Strategy as a single package, and programme documents credit that partnership with the policy inclusion.

The organisations that ran the campaign placed LEIA elsewhere. 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, and reports that it has not seen LEIA active in policy advocacy independently. Programme documentation concedes the underlying point, noting that direct advocacy from international organisations would not achieve this alone. What the evidence supports is a role building sector awareness and convening the relationships KEREA and GOGLA later drew on. The proximate work belonged to them: the modelling, the relationships inside government, and the pressure that moved the outcome. Kenya also revisits the tax treatment of this sector in most budget cycles, and the PURE standards the policy inclusion points toward have not yet materialised.

Energy access sector-shaping infrastructure

LEIA also shapes the sector by building infrastructure that becomes how the market operates. VeraSol's QA requirements and the IEC 63437 refrigerator test standard are the clearest cases. Both rest on years of LEIA-funded technical work, though in the case of VeraSol it was building upon the inherited Lighting Global framework. Once these quality and efficiency standards existed, funders and standards bodies used them as the basis for determining funding eligibility and writing import regulations.

VeraSol quality assurance requirements

GLOBAL



By 2021, several financing initiatives had written VeraSol QA requirements into their funding eligibility rules, among them the Beyond the Grid Fund for Africa (BGFA), GIZ's Green People's Energy results-based financing programme, and the World Bank's Sindh Solar Energy Project. For appliances, that means testing against a Global LEAP test method and a listing on the VeraSol Product database. LEIA established the Global LEAP Awards and integrated the testing data they generated into the VeraSol platform. The World Bank had been funding VeraSol's QA work under Lighting Global, and its own energy programme describes LEIA as the funder that extended that work into appliances, the first time anyone other than the World Bank had done so.

The off-grid and weak-grid appliance market was expanding quickly without LEIA. Sub-Saharan Africa alone represented a total addressable market of $11.3 billion as of 2018, and at that point dominated by products that were either grid-powered or low-quality off-grid. LEIA's contribution was to establish a quality threshold that contributed to growing interest from funders. BGFA describes VeraSol as the first reference point it consults when setting product eligibility, and as instrumental to results-based financing across the sector. One investor reports using VeraSol and Global LEAP to set performance requirements for the companies it backs; another describes the Awards as having de-risked the market enough to make investment making possible.

IEC 63437

GLOBAL



IEC 63437, the first international test standard for off-grid and weak-grid refrigerators, was published in November 2025. It covers conditions no other refrigerator standard addressed: fluctuating voltage and varying solar irradiance. Its practical effect is to give governments something to regulate against. Until this standard, there has been no mechanism for governments to condition subsidy eligibility or procurement criteria on a specific refrigerator efficiency level. This means that until now, a whole class of policy and financing instruments was out of reach. This is a major win for consumer protection; off-grid refrigerators are among the most expensive productive-use appliances a smallholder farmer or small business owner can buy, and a unit that underperforms is a serious financial loss. Re:genT and CLASP built the original Global LEAP Off-Grid Refrigerator Test Method from scratch, iterated it over several years, and carried it into the IEC committee process. LEIA's R&D grantees supplied the product data and technical inputs that shaped its specifications, among them SureChill, SelfChill, and ColdHubs. LEIA also convened an informal working group so that smaller industry participants, who are not included in international-level IEC discussions, could submit recommendations.

Several other drivers besides LEIA were moving markets toward efficiency standards. The World Health Organization and UNICEF, which both set procurement requirements for vaccine refrigerators, might have driven some form of off-grid refrigerator standardisation eventually. Additionally, a surge of capital into cooling over the same period, including $157 million the Green Climate Fund approved for sustainable cooling and cold chain projects, created sector-wide pressure for standardisation.[13]

But the evidence still points to LEIA's impact. Off-grid refrigeration is a niche that conventional standards bodies would not have prioritised without outside catalysis, and the technical depth that makes IEC 63437 specific to off-grid conditions traces directly to LEIA's testing data. One participant in the committee process puts it plainly: without LEIA's funding, there was a very good chance the standard would never have been developed at all. The claim stops at publication, though. Whether national governments and international bodies regulate to the standard over the next two to three years is not something LEIA controls.

13 Green Climate Fund, "FP177: Cooling Facility," accessed 13 August 2026.

Collaboration

LEIA also shapes outcomes through sustained relationships with other programmes, sometimes as a co-funder joining a joint effort, sometimes as the pipeline through which another donor's money reaches companies. Carbon Trust describes LEIA and the Modern Energy Cooking Services (MECS) programme as having grown closer over time, on the observation that appliances and cooking appliances are difficult to separate, and confirms that companies are referred between LEIA and other TEA programmes in practice. The MECS relationship runs in both directions.

Modern Energy Cooking Services

KENYA, HAITI, MYANMAR, AND UGANDA

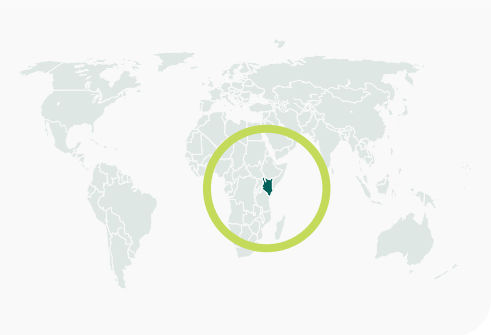


MECS used LEIA's first research and development call as its own sourcing and vetting pipeline. LEIA advertised the call and collected the applications, drawing 152 registrations and 41 eligible submissions. MECS then reviewed the electric cooking proposals and funded six independently, putting roughly £0.75 million into the market alongside the £1.0 million LEIA committed to nine projects of its own. Fifteen projects came out of one call, funded by two programmes. MECS also adapted LEIA's application forms and monitoring frameworks for its own subsequent rounds and describes LEIA's established position as having brought larger and more established organisations into its calls than it could have attracted alone. The arrangement ran again for a second round.

MECS has its own funding and could have built a call of its own. Its own account is that doing so would have taken longer, which places LEIA's contribution in speed and reach rather than in whether the projects happened at all. A harder qualification concerns what flowed through the pipeline. The first call drew only five proposals from Asian-headquartered firms and only three across solar water pumping and agricultural technology, and programme documents found that the funding terms favoured applicants already practised at navigating grant processes. LEIA built a pipeline that worked and another programme used it; what came through that pipeline was shaped by whom its terms attracted.

Kenya's first demonstrator of institutional electric boilers

KENYA



In 2025, Kenya's first demonstrator of institutional electric boilers grew from the initial pilot to nine 300-litre e-cookstoves across nine public schools in six counties, reaching more than 9,500 students and staff. In December 2025, *Making the Switch: The Deployment Handbook for Institutional E-Cookers* was published to show other schools and manufacturers how to equip a school kitchen for electric cooking safely. The boilers are fabricated in Kenya by Ecobora, and the work created eight jobs there, six held by men and two by women. LEIA and MECS co-funded the field research; neither led the other, and each brought its own money to a joint trial. The A2EI joined to provide remote monitoring, which generated the performance data that supported the deployment guide. The demonstrator gave Ecobora the field evidence needed to secure follow-on funding from the Powering Renewable Energy Opportunities (PREO) programme.

This was a co-funded trial rather than an LEIA initiative supported by MECS, and the evaluation cannot separate each programme's contribution. The demonstrator itself is documented rather than corroborated. MECS confirms the wider co-funding relationship with LEIA and describes adopting LEIA's application and monitoring processes for its own use, but its account does not name the boilers or Ecobora. What happened to Ecobora afterwards is independently corroborated. FCDO describes its trajectory as an illustration of how the support continuum is meant to work: early R&D funding from LEIA, business model testing from PREO, then venture-building investment from MECS.

A school kitchen off wood

Ecobora fabricates electric boilers in Kenya and installs them in school kitchens. Cooks who fed hundreds of students a day over wood-burning stoves now work with a 300-litre electric boiler instead. The change is visible in the kitchen itself: no woodpile, no smoke, no fire to tend between meals.

Efficiency for Access, LinkedIn, April 2025



Ruth Mokobi (Lead Product Designer and Fabricator) and Wilberforce Kibog (Stove Fabricator) at Ecobora in Kenya. Ecobora builds solar- and grid-powered electric cookstoves for school and institutional kitchens. Photo credit: CLASP

Market stewardship reached underserved populations directly; embedding circularity into standards is still forthcoming

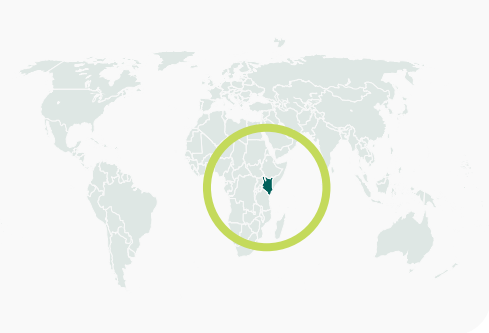
Inclusivity

This theme touches two outcomes of the Theory of Change: access to clean energy services leading to improved livelihood and climate resilience for off- and weak-grid communities, smallholder farmers, and refugees; and improved affordability, performance, inclusivity, and circularity of a range of appliances suited for off- and weak-grid contexts.

Market stewardship's clearest wins come from extending LEIA's R&D funding and programme design to populations the commercial market has no reason to serve: off-grid communities, displaced people, wherever market forces alone leave a gap.

Savanna Circuit

KENYA



Fish traders around Lake Victoria and dairy farmers in Murang'a County now have cooling they can afford, in places where grid access is limited and mobile cooling had not reached them at any scale. More than 70% of users are women. Savanna Circuit sells cooling as a service rather than equipment, through EcoSav bags for fish and Nomad Cans for dairy, supported by automated refuelling stations. These design changes have direct impacts: traders can stay at market longer and keep their goods saleable for longer, which is income rather than convenience. Young people in the area were trained to maintain the units, so the capacity outlasts the grant. LEIA's R&D Fund grant paid for the product development and field testing, and the company attributes both its shift to a cooling-as-a-service model and its expansion into western Kenya to that support.

Savanna Circuit had a product and a business concept before the grant arrived, and interest in agricultural cooling in Kenya grew across the same period, pushed by several donor programmes, including LEIA's own Kenya Cold Chain Accelerator. The company would probably have grown without LEIA. What the grant changed was the pace and the direction of that growth. The company's account places the grant before the business model shift and before the western Kenya expansion, and describes both happening in a shorter period than it could have managed alone. Accelerating an outcome that might otherwise have taken years is a real contribution, and in this case it brought first-time cooling access to a group of users who are predominantly women, in a region the company had not previously served. The scale should be read honestly. This is one company in one country, and the evidence is a company-level outcome rather than a market-level one.

Humanitarian Productive Uses of Renewable Energy (H-PURE)

RWANDA

By March 2026, 282 micro-enterprises were operating across three refugee camps in Rwanda (Mahama, Kiziba, and Nyabiheke), and their surrounding host communities. Just over half are led by women. These are businesses rather than relief recipients, running solar mills, refrigerators, and sewing machines bought through local distributors. LEIA provided an 80% subsidy on cost of goods and cost of sales to those distributors, which made the appliances affordable for micro-enterprises in the camps and host communities. Energy Saving Trust and Practical Action, co-delivered H-PURE, and Practical Action brought the community relationships. H-PURE is LEIA's only project co-funded by an FCDO in-country office, the British High Commission Kigali. Following a site visit in January 2026, the British High Commission Kigali committed a further £150,000 to extend the work and support more businesses: phase two is running through 2026 to 2027.

Practical Action ran the community awareness events and meetings 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 the energy expertise. The Global Platform for Action, which coordinates the Humanitarian Energy Exchange Network, describes the value of this work as introducing genuine energy access sector expertise into humanitarian settings, where energy questions are usually handled by non-specialists, and as a market-systems approach in place of the more common model of procuring products and distributing them. 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.



A cafe in Mahama

"My business is growing, and I am earning more than before. There was a time when I could only buy my boys new shoes once the old ones were finished. Now I can provide for them before it gets to that stage. I am building a future where my children can choose what they want to do in life."

Nadine Umutoni runs a café in Mahama Refugee Camp in Rwanda. She bought a solar-powered fridge from a local distributor through H-PURE. Cold storage means less spoilage and more that she can sell, and more that she can sell means a steadier income for her and her three sons. She is running a business, not receiving relief.

Efficiency for Access, LinkedIn, March 2026



Nadine Umutoni, a café owner in Mahama Refugee Camp in Rwanda, is using a solar-powered fridge supported through the H-PURE initiative, delivered by Energy Saving Trust in partnership with Practical Action, to grow her business. Photo credit: Practical Action

Together these outcomes are the clearest test of the Theory of Change's most end-user-facing impact: access to clean energy services improving livelihood and climate resilience for off- and weak-grid communities, smallholder farmers, and refugees.



Businesswoman milling maize with a solar mill in Kenya. Photo credit: CLASP

Circularity

Repairability Index

GLOBAL



The *Repairability Index*, published in April 2026, gives the sector its first standardised and objective way to assess how repairable a solar appliance is. It expands the definition of quality, from efficiency alone to durability and circularity. The need for this standardisation came out of LEIA's own research into why appliances in Global South markets reach the end of their working lives earlier than they should: spare parts are hard to source, products are not designed to come apart, repair training is thin, and consumer protection is limited. Throughout 2025, LEIA convened and moderated three technical working groups, one each for solar fans, pumps, and refrigerators. Each group brought together manufacturer, distributors, repairers, and researchers, meeting between April and October 2025. The groups defined what repairability would be measured on: the availability of spare parts and tools; the complexity of disassembly; the level of skill a repair demands; and the quality of the repair documentation. Working repairers sat in the groups alongside the manufacturers whose products they repair, so the methodology reflects how appliances are actually repaired rather than how their designers imagined they would be. LEIA kept each group small enough that every participant could shape the result, and bracketed the process with joint sessions at the start and end.

The Index was co-developed by multi-stakeholder working groups, which may mean the sector had already recognised the e-waste problem and was collectively ready to act, with LEIA facilitating a willing industry rather than originating anything. And the market may simply have outgrown basic performance testing, as institutional buyers funding more expensive appliances start demanding life-cycle and durability guarantees to protect what they are financing. Neither accounts for the Index itself. Wanting appliances to last does not produce a method for measuring whether they do; someone has to convene the people who know, moderate the disagreement, and publish the result. Co-development describes how the Index was built, not who would have built it otherwise. However, whether and how the Index changes appliance production remains untested. The Global LEAP Awards for Repairability launched in April 2026 and will evaluate fans, pumps, and refrigerators against the Index for the first time, with results due in October 2026, after this report is finalised. One results-based financing programme with no involvement in the work has noticed the announcement and is waiting for those results, which suggests the financing community may be considering the Index as a procurement criterion rather than treating it as an internal LEIA output.



Farmer loading produce in a walk-in cold room in Kenya.
Photo credit: CLASP

What happens next to these outcomes is largely outside LEIA's control. Governments decide whether to regulate to IEC 63437, and manufacturers decide whether the HFC metric changes what they build. The technical work is done in each case; the constraint has now moved to financing, infrastructure, and workforce. The next steps sets out what interviewees say the energy access sector needs in those areas, and what it implies for ecosystem actors and LEIA.

EVALUATION QUESTION THREE

What are the strategic implications for the next phase of LEIA, and what does the evidence suggest for how other ecosystem actors can best support inclusive access to low-energy appliances?

LEIA launched in 2017, designed to address unreliable, inefficient, and unaffordable appliances in markets no one was investing in. While technological improvements have been made, financing, infrastructure, and the workforce needed to support those technologies remain challenges. The evaluation found five themes in what interviewees shared on where they believe the energy access sector is heading.

Affordability has overtaken technology as the binding constraint. Interviewees increasingly frame the problem as one of financing rather than engineering: long-term and affordable consumer credit, subsidies at the point of sale, and support for distributors testing viable price points, not further gains in appliance efficiency. Subsidy needs exist across the value chain (at the manufacturer, importer, distributor, and consumer level alike). Commercial financiers stay wary of markets that depend on uncertain subsidies. Blended finance poses an opportunity for appliance companies that are too small and fragile for commercial lenders to underwrite directly.

Testing and QA infrastructure remains fragile, even where the technology has matured. A global fridge standard needed eight years to develop. The only VeraSol-approved test lab for the standard is in the Netherlands, far from most of the markets it serves. Interviewees see this pattern repeating for other technologies: a product can be ready for market and backed by an international standard, but local test capacity and the enforcement needed to make that standard stick (at customs, at point of sale) lag years behind.

Early-stage R&D funding is at risk just as 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. A company's next pivot, newest product category, or first working prototype all still need funding before they are proven.

Workforce training and repair capacity remain underfunded, though not unrecognised. Trained technicians and spare-parts supply chains are standing elements of any appliance market. In early-stage markets, companies are too resource constrained to build them alone, so they remain dependent on public or donor investment. Interviewees describe this gap as one of resourcing rather than understanding.

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. Interviewees describe energy practitioners increasingly recognising that the people they call "end users" are, in agriculture's own terms, producers. That recognition points toward cross-sector partnerships and a wider set of policy audiences in agriculture, finance, and humanitarian sectors.

Community members in Kenya with Agsol's R&D Fund-supported project, a highly efficient solar-powered mill. Photo credit: Energy Saving Trust



Recommendations for the wider ecosystem

Affordability and testing infrastructure both rest on decisions made by commercial investors, national policymakers, regulators, and test-lab operators. Affordability depends on end-user financing and demand-side policy: tax and duty treatment, consumer subsidies, and results-based financing that lower a buyer cost at the point of purchase. End-user financing and commercial investment reinforce each other. Affordable consumer credit lifts sales volumes, and sales volumes are what make a company legible to a commercial investor; commercial capital in turn funds the working capital needed for a PAYGo offer. Testing and certification infrastructure needs sustained investment and regulatory reach that extends past the labs to the customs officials and revenue authorities who decide what enters a market at all.

The recommendations below address these wider ecosystem challenges; the following section looks at recommendations for LEIA's own programming. There are two important conditions that bound these recommendations' potential achievements. First, sales volumes in most productive-use categories are small, which limits the role a test facility or a financing instrument sized for larger markets can play. Second, for some appliance categories or customer segments, concessional finance is likely to be a permanent arrangement rather than a transitive step on the way to commercial capital.

Increase funding for testing and quality assurance as sector infrastructure

For Donors and funders investing in off grid and weak-grid appliance markets

A product reaches results-based financing, subsidy, and procurement money through a VeraSol test result. Since LEIA launched in 2017, over 50 development programmes have made VeraSol QA requirements a condition of funding. The laboratories producing those results cannot cover their costs from test fees alone. Their customers are early-stage manufacturers with little to spend, and no single market buys productive-use appliances in the volumes a laboratory needs. Testing capacity therefore exists where a funder has paid to build it: for example, off-grid and weak-grid refrigerators in the Netherlands and solar water pumps in California.

Two laboratories show the requirements for building capacity elsewhere:

- → At Kijani Testing in Kisumu, LEIA funded equipment purchasing, ISO 17025 accreditation, and test method development. The facility now tests electric pressure cookers, egg incubators, and solar milling equipment, and receives requests directly from companies that find it listed as a VeraSol test partner.
- → At the University of Nairobi, LEIA developed solar water pump training materials with the Schatz Energy Research Center, then brokered $200,000 from the World Bank's Kenya Off-Grid Solar Access Project, approved by Kenya's Ministry of Energy in 2022, to equip the laboratory.

The recommendation is for funders to pay for equipment, accreditation, and training at laboratories that can serve regional markets.

Fund the capital rungs between R&D grants and commercial investment

For Donors and blended finance providers · Local banks · Insurers and pension funds · Development finance institutions · Governments running national electrification programmes

Companies that finish an R&D grant face a gap before any commercial investor will consider them, and the patient, blended, and impact capital that should fill it is thinly available. A typical funding sequence runs from R&D grant to matching grant or another donor instrument, then to angel and pre-seed investment, and only later to commercial capital; the middle rungs are missing. Scale is also 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. Financing instruments built for rapid growth do not fit companies whose realistic path is a durable business at modest volume.

Different actors can take up this recommendation in distinct ways.

- → Donors and national governments can expand end-user financing: local currency finance, carbon credits, consumer subsidies, and tax and duty treatment that lower prices at the point of purchase.
- → Blended finance providers and programme conveners can bring local banks, insurers, and pension funds into working groups as lenders and risk-holders, distinguishing the two roles that matter once grant funding ends: offtakers who commit to buying, such as government procurement programmes, utilities, and large agribusinesses, and de-riskers who absorb or guarantee losses, such as guarantee facilities and first-loss providers.
- → Donors and development finance institutions can pursue the Mission 300 opening to connect early-stage grant funders with the governments and financing facilities behind national electrification programmes, the large-scale public financing that pays for grid extension, mini-grids, and household connections.

Design appliance investment around the system the appliance sits in

For Investors and financing institutions setting due-diligence criteria; programme designers in the wider sector

Appliance investments that stop at deployment underperform for the people they are meant to reach. This applies to productive-use assets expected to generate income for the people using them, whether those assets are bought outright, financed on credit, held by a cooperative, or reached through a service or rental model. The financing form that works is the one that fits the local ecosystem rather than a default carried in from elsewhere. Synnefa Green's Smart Solar Dryer illustrates this point: 65% of its customers are farmer cooperatives in deep rural areas, and the company reaches them through a rent-to-own and drying-as-a-service model priced at a level a smallholder can meet, with a single unit serving as many as 15,000 farmers.

Productive-use appliances only deliver if:

1. The people using it capture enough of the value the appliance creates
2. The terms leave room to benefit rather than only to service a debt or a fee
3. Users have the skills to turn the appliance into income
4. Repair and spare parts are available

Investors and programme designers should assess these four conditions during due diligence, alongside financial and technical viability. Where one is absent, rather than declining the investment, funders can support the missing condition alongside the appliance, whether that is technician training, a spare parts channel, or different repayment terms.

Use tax, duty, and procurement policy to make tested off-grid and weak-grid appliances affordable

For National policymakers and regulators | Donors funding standards development | Standards bodies

Policy shapes whether a tested off-grid and weak-grid appliance is affordable and available, and the levers that lower cost work better than those that restrict supply. Limited policy attention to demand-side solutions is one of three founding barriers named in LEIA's Theory of Change. The evaluation team judges mandatory national performance standards to be a poorer fit than they first appear, on four grounds: most productive-use appliance standards do not yet exist, even in voluntary form; no funder currently pays for their development; regulators asked to build compliance regimes for small volumes often experience the request as externally imposed; and restricting market entry while a market is still forming risks closing off innovation the sector still needs.

The recommendation involves three aspects:

- Governments that want appliance standards can adopt an international test method as their own (such as IEC 63437, for example), then set the performance threshold that products must meet when measured against it. That second step is easier than building a standards regime from scratch, and makes conformity assessment at the point of import possible.
- Donors can fund the development of voluntary productive-use standards where none exist.
- Policymakers can extend tax exemption and import duty treatment for off-grid and weak-grid appliances beyond Kenya to other priority markets, alongside consumer awareness work that builds demand for quality products.

Technician training farmers on solar fan and lights on a farm in Kenya. Photo credit: CLASP



Recommendations for LEIA

The four recommendations above depend on investors, national policymakers, and test lab operators. The four recommendations in this section fall under LEIA's own decisions: the R&D Fund, building testing laboratory capacity, committments in its next theory of change, and how it reaches the people meant to act on its evidence.

Protect early-stage R&D funding as the core of the next phase

For LEIA programme leadership · FCDO · the IKEA Foundation · Prospective co-funders

LEIA's clearest contribution occurs at the point where technical risk is too early for other programmes or investors. When currency and freight costs moved against early-stage appliance companies in 2022 and 2023, LEIA brokered rescue capital. Several companies survived that would otherwise have folded; the evaluation identified no other actor positioned to do this. This pattern holds across the R&D Fund's strongest outcomes, with manufacturers commercialising cooling and cooking appliances years ahead of where the market would have taken them alone. As funders shift toward blended finance and near-market scaling, early-stage R&D funding is at risk. The recommendation is for LEIA programme leadership to treat early-stage R&D as the core of the next-phase proposition rather than one workstream among several, and to open funder conversations beyond FCDO and the IKEA Foundation on that basis.

Use the solar energy kit laboratory policy as a template for appliances

For VeraSol team · LEIA programme leadership

VeraSol has already published what a laboratory must demonstrate to test solar energy kits. The Product Testing and Laboratory Eligibility Policy, revised in October 2025, names the accreditation required, the round robin testing framework, documented knowledge transfer, minimum equipment capacity, and two practice tests within six months of training. It gives an application route, commits VeraSol to explaining a rejection in writing, and allows a laboratory to reapply once it has closed the gaps. Five laboratories now hold approval for solar energy kit testing, in California, Shenzhen, Hong Kong, Nairobi, and Addis Ababa.

Appliance testing has no published equivalent. Six laboratories test appliances and productive use equipment, listed by product category alone. Refrigerators can be tested at one, in the Netherlands; solar water pumps at one, in California. BGFA identifies the cost and logistics of reaching them as a substantial barrier for manufacturers in Africa and Asia, and staff at the University of Nairobi laboratory describe local capacity as lowering cost for the manufacturers who use it.

The recommendation is to publish eligibility criteria for appliance and productive use testing on the model of the solar energy kit policy, set by product category rather than as a single policy, and starting with the categories where testing flow is most consistent. Qualifying laboratories may not appear for some time, but the published criteria give laboratories, and the funders who pay for their equipment and training, a defined target to work toward.

Anchor the next theory of change in what the evidence shows worked

For LEIA programme leadership · LEIA monitoring, evaluation, and learning team

The evaluation's strongest evidence clusters in two places: QA infrastructure that funders and governments have adopted as a purchasing requirement, and R&D Fund support that moves companies toward commercial investability. These are the areas where the evaluation found no substitute actor, and they are a defensible starting point for the next theory of change alongside the systems mapping and stakeholder consultation LEIA already runs.

An important indicator gap accompanies this evidence. LEIA tracks public and private finance mobilised under International Climate Finance KPIs 11 and 12, which capture co-funding into programme activity rather than commercial capital raised by supported companies. Neither would register the capital-raising pattern this evaluation identified among R&D Fund grantees. The recommendation is to add a commercial capital indicator.

Translate evidence into the forms each audience can act on

For LEIA programme leadership · LEIA communications and research staff · Policy-facing staff

LEIA's research reaches people. It is presented at sector convenings and conferences and distributed through the Efficiency for Access website and channels. The evaluation found no evidence of a distribution problem. Yet, one funder was direct that LEIA does not tell the story of its own impact well, a judgement that carries weight because that organisation's continued support depends on understanding the programme's achievements. Funders, policymakers, and investors do not read the way researchers do; they skim, search, and return to material when a specific question arises. The evaluation also found limited evidence that producing more research has, by itself, increased policy influence, though influence of this kind is difficult to observe and the absence of evidence is not evidence of absence.

This recommendation includes two aspects: First, produce a small number of standing outputs aimed at decision-makers, built for readers who skim, search, and return to material, and maintain them rather than publishing them once alongside a report. An impact dashboard kept current is worth more to a funder than a suite of explainers released and left. Second, directly engage policymakers in agriculture, finance, and planning, rather than relying on published evidence to reach them.

ANNEX

METHODOLOGY

The evaluation drew on three main sources of evidence: programme documentation, key informant interviews, and a targeted partner and grantee survey. These evidence streams were brought together through a structured contribution analysis process to assess the extent and nature of LEIA's contribution to priority outcomes.

Evidence base

Document review

First, the team conducted a structured review of more than 130 sources of programme documentation and wider sector evidence provided by Energy Saving Trust. Documents were categorised according to their anticipated relevance to the evaluation as "must read/watch," "good to read," or "additional reading," ensuring that the review focused on the most significant sources while maintaining coverage across all LEIA workstreams and thematic areas.

All documents were catalogued in a relational database, which served as the central evidence library for the evaluation. Documents were reviewed by members of the evaluation team using a structured evidence extraction template that captured summaries, key findings, workstream, geography, stakeholder group, evaluation question, Theory of Change pathway, contribution area, and cross-cutting themes. The relational structure enabled documents

to be tagged and linked across multiple analytical dimensions, allowing evidence to be systematically retrieved, compared, and synthesised throughout the evaluation.

As additional evidence emerged through interviews and surveys, the document library was updated iteratively to ensure that the evidence base remained comprehensive and reflected the evolving analysis.

Interviews

Second, the team conducted key informant interviews with a purposive sample of stakeholders, including Energy Saving Trust and CLASP leadership, LEIA workstream leads, partners, funders, programme implementers, companies supported by LEIA, and wider ecosystem actors. Interviews were conducted in five sequential waves, allowing emerging findings from earlier interviews to inform subsequent sampling and lines of enquiry.

The interview sequence began with system-level observers to provide an overarching view of the sector, followed by funders and investors, programme implementers, workstream leads, and finally companies and other critical sector voices to deepen understanding of programme implementation and outcomes. Interviews explored perceived results, causal mechanisms, LEIA's role and influence, interactions with other initiatives, and contextual factors shaping outcomes.

Interview data was analysed using a structured thematic coding approach. An initial coding framework was developed prior to qualitative data collection, drawing on the evaluation questions, and LEIA's Theory of Change. This deductive frame was applied abductively; the codebook anchored coding to these established categories while remaining open to new codes emerging from the data. The codebook organised evidence across several analytical domains, including programme evolution, ecosystem and market context, LEIA's contribution mechanisms, outcomes and significance, cross-cutting themes, and strategic implications.

This ensured that interview data could be systematically linked to the evaluation questions while also distinguishing between LEIA's activities, observed outcomes, and wider contextual factors and alternative explanations. Coding was undertaken by multiple members of the evaluation team, with cross-checks to ensure consistency and completeness across the dataset.

Table 1

Interview participants by stakeholder group

Stakeholder Group	Contacted	Completed	Response Rate
Companies	12	8	67%
Government agency	1	1	100%
Donors	6	5	83%
Industry associations	4	3	75%
Internal (Energy Saving Trust/CLASP)	16	13	76%
Investor	1	1	100%
Programme implementers	18	13	72%
University	1	1	100%
Total	**58**	**44**	76%

Survey

Third, three targeted online surveys were administered using KoboToolbox to gather structured, comparable evidence from a broader group of stakeholders than could be reached through interviews. Separate questionnaires were developed for (1) companies supported through LEIA, (2) funders and investors, and (3) programme implementers and industry associations, enabling questions to be tailored to each group's relationship with the programme while maintaining consistency around the core evaluation themes. Respondents were identified by Energy Saving Trust and CLASP based on their involvement with LEIA. The surveys combined Likert-scale questions, multiple-choice and ranking questions, and open-ended responses, and comprised between eight and ten questions depending on the respondent group.

The surveys were designed as perception surveys rather than broad outcomes or impact surveys. Questions explored respondents' experiences of LEIA's support, perceived contribution to programme and sector-level outcomes, additionality, collaboration, and future priorities. The company survey focused on the influence of LEIA's support on technology development, business growth, partnerships, and investment readiness. The funder and investor survey examined LEIA's influence on strategic thinking, programme delivery, sector coordination, and perceived additionality within the inclusive appliances ecosystem. The programme implementer and industry association survey explored how collaboration with LEIA had shaped organisations' activities, the significance of LEIA's contribution relative to other actors, and the programme's role in strengthening wider market, policy, and financing linkages.

Survey invitations were distributed via e-mail by the evaluation team, with relevant Energy Saving Trust workstream leads included in the initial communications.

Quantitative responses were analysed using descriptive statistics and cross-tabulations to identify patterns across stakeholder groups, while open-ended responses were analysed alongside the qualitative interview data to provide additional explanatory context. Rather than being treated as standalone evidence of programme outcomes or impact, survey findings were used to corroborate and challenge emerging contribution claims, helping to assess the consistency of stakeholder perceptions across respondent groups and to triangulate findings from the document review and key informant interviews. Given that respondents were largely organisations that had directly engaged with LEIA, findings were interpreted with appropriate caution to account for the potential for positive response bias.

Table 2

Survey administration and response rates by stakeholder group

Survey respondent group	Contacted	Completed	Response Rate
Companies	12	8	60%
Funders and investors	8	4	50%
Programme implementers and industry associations	31	8	26%
Total	**49**	**18**	37%

Note: Three stakeholder-specific surveys were administered using KoboToolbox. Surveys were distributed electronically, followed by reminder emails two weeks after launch. Energy Saving Trust workstream leads also undertook targeted follow-up with selected organisations to encourage participation.

Contribution rubric

A structured contribution rubric was used as the primary analytical framework for synthesising evidence and developing evaluative judgements. Rather than assessing LEIA at the level of individual activities or outputs, the rubric was organised around a set of prioritised outcome areas identified through the document review and refined throughout the evaluation. Each outcome was assessed using a rubric with definitions and decision rules that captured the significance of the outcome, LEIA's contribution, the causal pathway through which change occurred, supporting documentary and stakeholder evidence, the role of other actors, alternative explanations, and an assessment of the strength of the available evidence. Both the significance of each outcome and the strength of LEIA's contribution were assessed using a standard rating scale (high, medium, low), enabling consistent comparison across outcomes while recognising differences in context and evidence.

The contribution rubric served as the central analytical framework through which evidence from all data collection streams was synthesised. Findings from the document review, key informant interviews, and stakeholder surveys were systematically triangulated and mapped against individual outcome areas. Coded excerpts were linked directly to individual contribution claims and triangulated with documentary and survey evidence to develop and test contribution narratives, identify areas of convergence and divergence across stakeholder perspectives, and assess the strength of evidence underpinning each contribution claim. As new evidence emerged, the rubric was iteratively updated to strengthen contribution claims, address evidence gaps, and test competing explanations for observed changes.

The structured approach enabled the evaluation team to assess not only whether outcomes had occurred, but also the extent to which they could plausibly be attributed to LEIA's activities. Explicit consideration was given to the influence of external contextual factors and the contributions of other organisations, recognising that many observed outcomes resulted from collective action rather than LEIA acting alone. This helped distinguish LEIA's contribution from broader ecosystem dynamics and ensured that conclusions reflected the balance of available evidence rather than individual stakeholder perceptions.

Limitations

The evaluation looked back across eight years, and evidence is thinner for the early period than for recent years. Several of the people who designed and ran LEIA's first phase have since left Energy Saving Trust, CLASP, and the partner organisations involved. Therefore, for the period from 2018 to 2021 the evaluation relied more on programme documentation than on firsthand accounts. Interviewees who were present throughout were asked to recall decisions taken up to eight years earlier, and recall over that span is stronger on *what* happened than on *why* it happened. Explanations offered in hindsight were treated with corresponding caution. Where documentation and recollection diverged, both are reported.

Energy Saving Trust and CLASP staff form the largest single group in the interview sample, at 13 of 44 completed interviews. This reflects a deliberate choice, since understanding how the programme evolved required the accounts of the people who ran it. It also means a substantial share of the evidence comes from sources

with an interest in the findings. The evaluation addressed this by distinguishing between findings confirmed by documentation or independent parties and accounts given by those delivering the programme. Statements from programme staff and implementing partners are treated as descriptions of intent and practice rather than as evidence of outcome.

Survey findings are subject to non-response and self-selection bias. Eighteen of 49 invited stakeholders completed a survey, with response rates varying substantially across groups and falling to 26% among programme implementers and industry associations. Those with stronger relationships with LEIA, greater familiarity with its work, or more positive experiences may have been more likely to respond. Respondents were also identified partly through Energy Saving Trust and CLASP's stakeholder networks. Survey findings are therefore used to identify patterns and triangulate other evidence rather than to estimate the prevalence of views across the wider stakeholder population.

The company evidence comes from companies LEIA funded, including one that has since ceased trading. Unsuccessful LEIA R&D grant applicants were not interviewed. The evaluation can therefore describe what LEIA's support meant for companies that received it, but it has no comparison against companies that applied and were turned down. Where the evaluation reports that a grant was decisive for a company, that judgement rests on the account of the company that received it.

Several stakeholder groups are represented by one or two interviewees, among them government, investors, and universities. Findings drawn from those groups are reported as individual accounts rather than as the position of a category. The interview sample was purposive rather than representative, selected to cover the range of positions across the ecosystem rather than to support generalisation from any one group.

Impact and outcome figures in this report come from LEIA's own monitoring data, VeraSol records, and partner reporting. The evaluation did not independently verify these figures. They are presented as reported and footnoted on that basis.

Several of the strongest outcomes are recent, documented at the point of publication, launch, or adoption. What follows from them has not yet happened, so the evaluation records the outcome and stops short of assessing its downstream effects.

Contribution analysis establishes whether a programme plausibly contributed to an outcome, and how much weight that contribution carries against competing explanations. It does not establish attribution and it does not rest on a comparison group. Where this evaluation concludes that no other organisation was positioned to do the work, that judgement rests on the accounts of people working in the sector and on documentary evidence of who else was active, not on a counterfactual test.

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