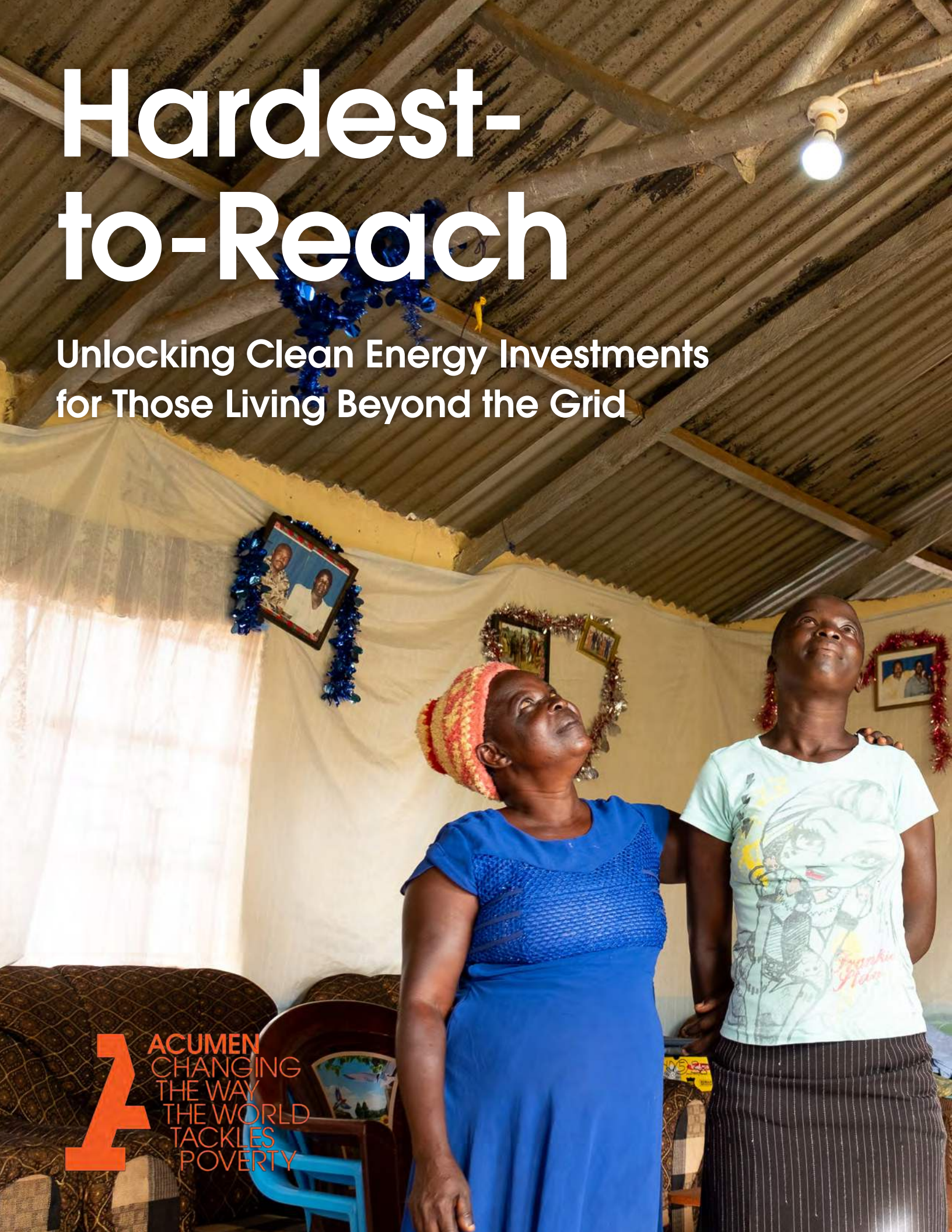
Hardest-to-Reach

Unlocking Clean Energy Investments for Those Living Beyond the Grid



ACUMEN
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Hardest-to-Reach: Unlocking Clean Energy Investments for Those Living Beyond the Grid

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Executive Summary

The Problem: People Without a Path to Clean Energy

Of the approximately 789 million people in the world who currently live without electricity, many will gain access through grid extension and off-grid solar by 2030. However, estimates suggest that roughly 215 million people will be left behind because they live in risky or remote, rural areas where investors have been unable or unwilling to go. In the last decade, there has been a steady increase in financing available for clean, renewable energy, but that money is largely directed towards wealthier nations while millions in the Global South, in places like sub-Saharan Africa and Southeast Asia, still lack basic energy access.

This is a result of a too-narrow global energy strategy that focuses almost exclusively on the problem of carbon emissions while neglecting the real and urgent needs of unelectrified and excluded populations. Furthermore, data shows that developing economies (excluding China) now account for roughly 45% of carbon emissions and will propel almost all emissions growth going forward.[1] Without significant energy access investments in these high-risk, low-income markets, entire countries will be left behind in the clean energy transition.

The Solution: Innovative Investments in Established Solar Companies

The energy access sector has grown, reducing the number of people without access to clean, affordable energy by nearly half in the last decade.[2] It is possible to electrify the 215 million people who live in risky and remote areas, considered some of the hardest-to-reach markets in the world. Reaching them will require all of the following:

- Off-grid solar systems paired with pay-as-you-go (PAYGO) financing, which are more affordable and more easily distributed to households removed from the grid[3]
- Established solar companies that have proven track records of success in hard-to-reach markets
- An investing approach that uses innovative, flexible financial solutions that blend grant, equity, and debt capital to de-risk and incentivize companies while also allowing for returns

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1 www.cgdev.org/media/developing-countries-are-responsible-63-percent-current-carbon-emissions

2 The energy access sector includes the companies, investors, and practitioners working to provide clean, affordable, renewable energy to low-income households that couldn't access it otherwise.

3 IRENA provides an overview of the pay-as-you-go (PAYGO) model, a financing technology that allows end-users to pay for solar energy, usually via SMS, in weekly installments or whenever they are financially liquid.

The Opportunity: Pathways Out of Poverty

Distributed renewable solutions like off-grid solar have proven their ability to deliver energy while also averting long-term climate change and creating economic growth. In roughly a decade, the energy access sector has created over 400,000 jobs, more than 30% of which are held by women.[4] Off-grid solar's unmatched affordability leads to improved incomes, security, education, and health and well-being. If climate investors are willing to expand their priorities to address inequality in renewable energy access and direct investments to hard-to-reach markets, universal energy access by 2030 could be within reach (United Nations Sustainable Development Goal 7).[5] This will allow low-income communities in risky markets to transition to clean energy today, avoiding dependence on diesel and kerosene, carbon emissions, and costly energy transitions down the road.

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[4] GOGLA (2019). Off-Grid Solar. A Growth Engine for Jobs.

[5] Climate finance is defined by the UN Framework for Climate Change as "local, national, or transnational financing—drawn from public, private, and alternative sources of financing—that seeks to support mitigation and adaptation actions that will address climate change."

Introduction

The climate crisis is no longer something that will occur one day in the future; it is a very real and present danger to people the world over. To mitigate and adapt to an increasingly warming planet, it is critical that countries transition to renewable energy. Investments in renewable energy have increased in developed countries in the last decade, helping them transition away from fossil fuel dependence and curb carbon emissions. The same is not true for countries in the Global South, who historically have contributed little to climate change yet are disproportionately harmed by it.

Widening the Lens: Climate Justice and Poverty

Global commitments that prioritize net zero carbon emission targets have inevitably raised questions about the impact on these countries' populations.[6] Restricting their use of fossil fuels as part of a global push to net zero will greatly hinder their ability to grow their economies, keeping hundreds of millions in poverty and deepening inequality between developing and developed countries. At the same time, despite pledges that suggest otherwise, recent data demonstrates that climate finance dollars are increasingly directed away from the markets that need them the most in the Global South.[7]

What's more, there is a customer base in these countries that is not only interested in, but also able to pay for, energy access. Without clean, renewable energy solutions, they will find themselves trapped: People need energy access to climb out of poverty, but renewable energy and climate-focused investors won't invest in volatile or untested markets. That is neither good for the planet nor just for the people affected.

"On-Ramps" to Clean Energy: A New Role for Philanthropy

A lack of investment in renewable energy access in low-income countries now will lead to harmful emissions in the future. Without strategic climate investments, many households will meet their energy needs by using kerosene, diesel, and other unhealthy and expensive fossil fuels. In sub-Saharan Africa, where most of the unelectrified reside, the population is expected to double by 2050, meaning energy demand will only continue to grow.[8] Providing an on-ramp to clean energy access will make it possible to avoid future carbon emissions.

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[6] https://www.nature.com/articles/d41586-021-02843-6

[7] BloombergNEF (2021). *Climatescope 2021 Energy Transition Factbook*.

[8] https://population.un.org/wpp/Graphs/Probabilistic/POP/TOT/947

Patient capital, a form of philanthropic, risk-tolerant investment capital, presents a promising solution. Patient capital prioritizes impact on poverty over financial returns, allowing investment dollars to flow to companies operating where markets do not yet exist or are nascent. A 20-year analysis of Acumen's patient capital investing has demonstrated that in sectors like energy access, fragile markets can rebound and new markets can develop.[9] With the right products, the right companies, and the right mix of capital, it is possible to provide clean, renewable energy to the approximately 215 million potential customers who otherwise would have no green and affordable pathway out of energy poverty.

"Energy is the golden thread that connects economic growth, social equity, and environmental sustainability."

–Ban Ki Moon

Bridging the Clean Energy Gap

While many in wealthier nations take electricity for granted, it is a coveted resource for those in markets where the majority of people do not have access to a power grid. This renders them unable to cook, light their homes, or regulate indoor temperature in harsh climates without relying on wood, kerosene, or diesel. However, constructing large-scale electric grids is costly, time-intensive, and requires political stability and dense populations, making them next-to-impossible to establish in risky or remote, rural areas.

Distributed Renewable Energy Solutions Work

The energy access sector was created to address this gap. Since 2007, the cost for solar panels has steadily decreased from around $4 per watt to less than $1 per watt, making solar the least costly, most effective source of power for those living in poverty compared to other renewable energy solutions like hydropower, wind, or biomass. The sector encompasses solar off-grid solutions that are designed to provide energy access for those not connected to a grid. Products and services range from off-grid solar appliances like clean cookstoves and solar home systems to mini-grids that can service entire communities and small businesses. In regions where there are limited options for clean energy, the companies serve many functions: They provide clean energy products designed for low-income customers, create distribution models that reach remote or hard-to-reach households, and develop asset financing systems such as PAYGO that make the products affordable and accessible for poor households.

[9] Report forthcoming on Acumen's patient capital investing over a 20-year history.

Energy Access Sector Growth and Impact

Incredible gains have been made toward universal energy access over the last 10 years, driven by a combination of national electrification initiatives across the Global South and a revolution in the private off-grid solar market; the latter has been spurred by PAYGO financing, made possible in part by the rapid growth in mobile money adoption in sub-Saharan Africa.[10] Annual public investments in clean energy directed toward developing countries increased from $10.6 billion in 2010 to its peak of $21.9 billion in 2017.[11] Products and services improved, too: Whereas first-generation solar lanterns had reputations for being poorly constructed and unreliable, newer solar home systems introduced to the market come with warranties and can reliably power computers, phones, and televisions.

Energy Access Improves Lives

All of this progress has led to a rise in clean energy adoption among customers in low-income countries. For many, clean and affordable energy solutions offer more than environmental benefits: With PAYGO financing, they are cheaper than kerosene and other fossil fuels, freeing up household resources for other needs. Energy access is also directly linked to improvements in quality of life.[12] With electricity, students can use computers to do their homework and small businesses can use technology to improve efficiency and stay open later. Clean energy is safer than kerosene, reducing risks of fire or damage. When used for water filtration, cooling and refrigeration, or clean cooking, health and hygiene improve.[13] In fact, in a report drawn from 35,000 interviews with energy access customers, 88% said that the product they purchased had improved their quality of life and 86% reported feeling safer because they had reliable, clean energy access. Importantly, 18% of customers reported using their newfound energy access to increase their incomes to better provide for their families' needs.[14]

Zeroing In on Hard-to-Reach Markets

Even when investment dollars are directed to low-income regions, they are not always directed where the need is greatest. Most investors only operate in markets that are proven to yield financial returns. For this reason, progress has been contained to a few investor-ready countries (Bangladesh, India, Pakistan, and Kenya) with high mobile phone adoption and relative stability in their currencies and political and regulatory environments. Troublingly, only 18% of energy access financing committed to high-impact countries (HICs)—countries that offer the most potential to make rapid progress towards energy access—was directed to the 15 countries in sub-Saharan Africa with the lowest

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[10] UNCDF (2017). *The Fight for Light: Improving Energy Access through Digital Payments.*

[11] SEforAll (2021). *Tracking SDG7: Energy Progress Report 2021.*

[12] https://www.un.org/sustainabledevelopment/energy/

[13] Clean cooking is cooking that uses clean fuel sources instead of pollutive biomass, kerosene, or coal, which cause respiratory illnesses, heart problems, and premature death.

[14] 60 Decibels (2020). Why Off-Grid Energy Matters.

electrification rates.[15] Within this group of countries, higher investments have gone to countries where the total population without energy access is comparatively low. It's clear that the nature of a private market, where investment capital flows to firms and markets that are safe or are perceived to be, is working against the hundreds of millions of people living in extremely poor countries.

The number of people living without electricity has roughly halved since 2010, from 1.2 billion to approximately 789 million in 2021.[16] Still, access to affordable and clean energy remains one of the greatest development challenges for many countries—especially in sub-Saharan Africa, where 75% of the unelectrified are located.[17] These are some of the hardest-to-reach markets in the world. In fact, the overall electrification rate in sub-Saharan Africa is just 45%.[18] Furthermore, 58% of the customers in these regions live in fragile or conflict-affected settings, and 84% live in rural areas.[19]

An Overlooked Climate Finance Opportunity

According to research supported by the Rockefeller Foundation and Shell Foundation, climate investors have a $200 billion opportunity to avoid the emission of 626 million metric tons of carbon by investing in energy access. Investors can deliver on the United Nations' Sustainable Development Goal (SDG) 7, universal energy access by 2030, while also helping to achieve several other SDGs by 2030 and global net-zero emissions by 2050.[20] If this $200 billion market opportunity is leveraged, it is expected to create 132 million new energy connections from off-grid technologies to deliver 100% household electricity in Africa and replace 9.2 million fossil-fuel-powered backup generator sets with solar alternatives. A $200 billion estimate to achieve universal energy access in low-income countries pales in comparison to the approximately $110 trillion in climate investments needed by 2050 for a global energy transition.[21]

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15 SEforAll (2021). *Energizing Finance: Understanding the Landscape 2021.*

16 www.iea.org/articles/the-covid-19-crisis-is-reversing-progress-on-energy-access-in-africa

17 IEA (2020). *SDG7: Data and Projections.*

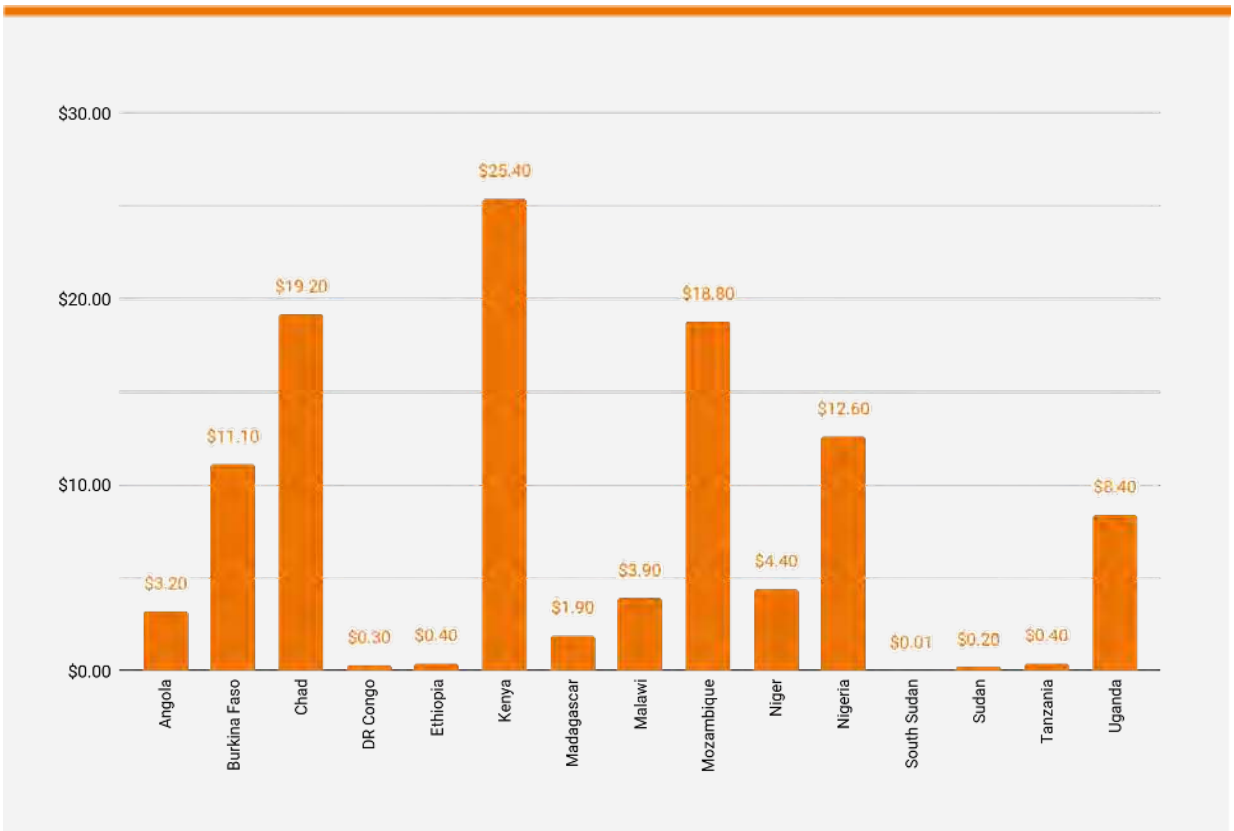
18 IEA (2019). *Africa Energy Outlook 2019.*

19 IRENA (2021). *Tracking SDG 7: The Energy Progress Report 2021.*

20 Shell Foundation and Rockefeller Foundation (2021). *Unlocking Climate Finance to Accelerate a Green Energy Future in Africa.*

21 IRENA (2019). *Global Energy Transformation: A Roadmap to 2050.*

In High-Impact Countries, Electricity Investments Per Person Without Electricity Demonstrates Unequal Capital Flows[22]

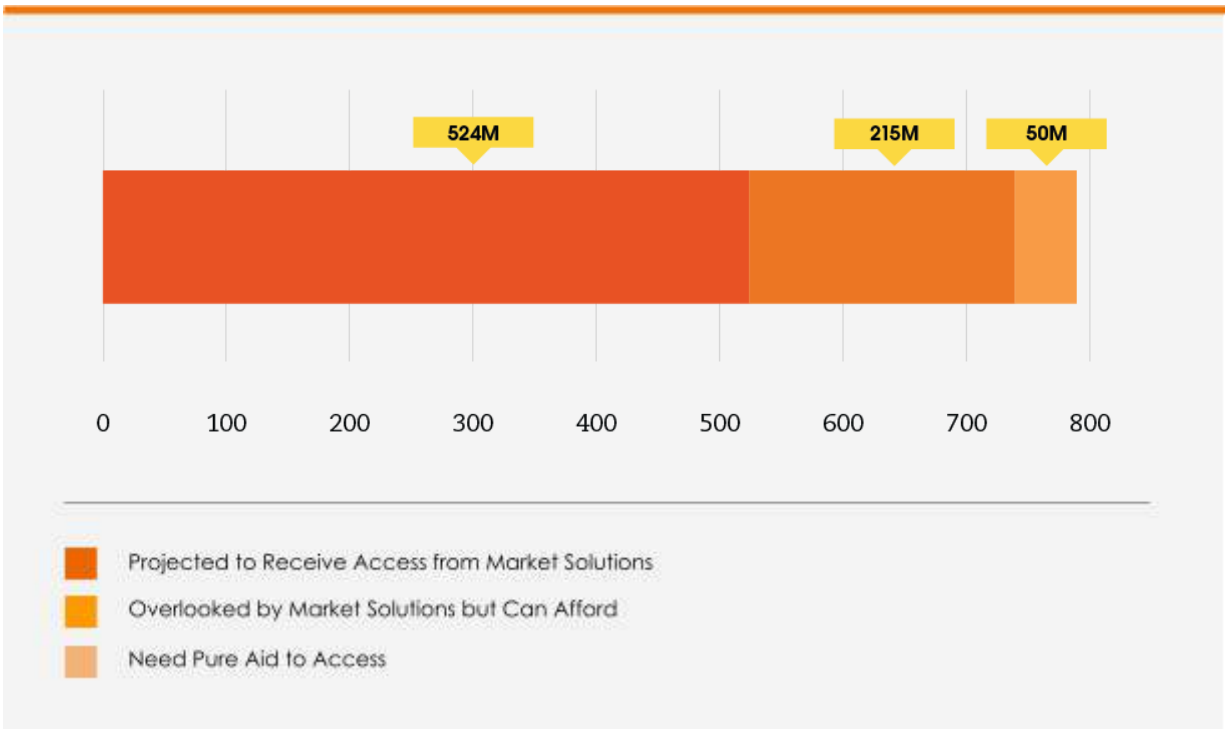


Achieving Universal Energy Access

Forecasting models for achieving universal energy access project that, under business-as-usual conditions, traditional grid extension and market-based solutions will reach 524 million people currently without access, who account for approximately 66% of the 789 million unelectrified globally. Most of these customers are located in favorable markets or near-urban areas where access is less of a barrier. A further 50 million households do not earn enough income to afford even the most basic solar energy solution; they are considered "ultra-poor" and will only achieve access with subsidies from aid or government intervention. That leaves roughly 215 million people (27%) who could afford energy access but live in countries deemed too risky or too remote for market-rate returnable investments—some of the hardest-to-reach people in the world. They will be left behind in a business-as-usual investment environment.

[22] SEforAll (2021). *Energizing Finance: Understanding the Landscape 2021*.

Roughly 215 Million People Could Be Left Behind in the Bid to Achieve SDG 7[23]



This group of people who can afford basic energy products and services, but who live in countries that are not investor-ready, can and should be served if we unlock the investment capital needed to stimulate a market. For a mere fraction of the total climate investments needed for the global clean energy transition, climate financiers could help the world avoid carbon emissions, offer developing markets affordable energy solutions that meet their needs, and provide low-income people with a pathway out of poverty. But with all of the challenges outlined so far, it's abundantly clear that a traditional investment approach is insufficient.

[23] Our model indicates 524 million people in sub-Saharan Africa and Asia-Pacific are likely to access electricity in a business-as-usual scenario. Based on methods used in the 2020 Off-Grid Solar Market Trends Report, we estimate that number could increase by 40% when factoring in the use of consumer finance business models like PAYGO. Our model also takes into account the number of people who fell back into poverty as a result of COVID-19, based on IEA's estimates.

Lessons From Patient Capital Investments

Patient capital investments tend to fall under the umbrella of "impact investing," but they prioritize impact in ways that traditional impact investing does not. Acumen, which launched in 2001, developed patient capital as a third way between pure philanthropy and commercial market solutions, bridging the rigor and accountability of the markets with the patience and flexibility of philanthropy. It supports innovations to problems of poverty that customers truly value, and therefore are willing to pay for. For this report, we define patient capital as investment capital (debt or equity) that: prioritizes impact above financial returns, though not at the exclusion of them; is highly risk-tolerant, unrelated to financial rewards; and maintains a more flexible time horizon to return capital than closed funds. From a financial returns perspective, patient capital earns between zero and market rates. At Acumen, patient capital is almost always backed by some form of philanthropy, because the investment risks are too great, markets are too nascent, timelines are too long, and costs are too high to attract commercial investors.

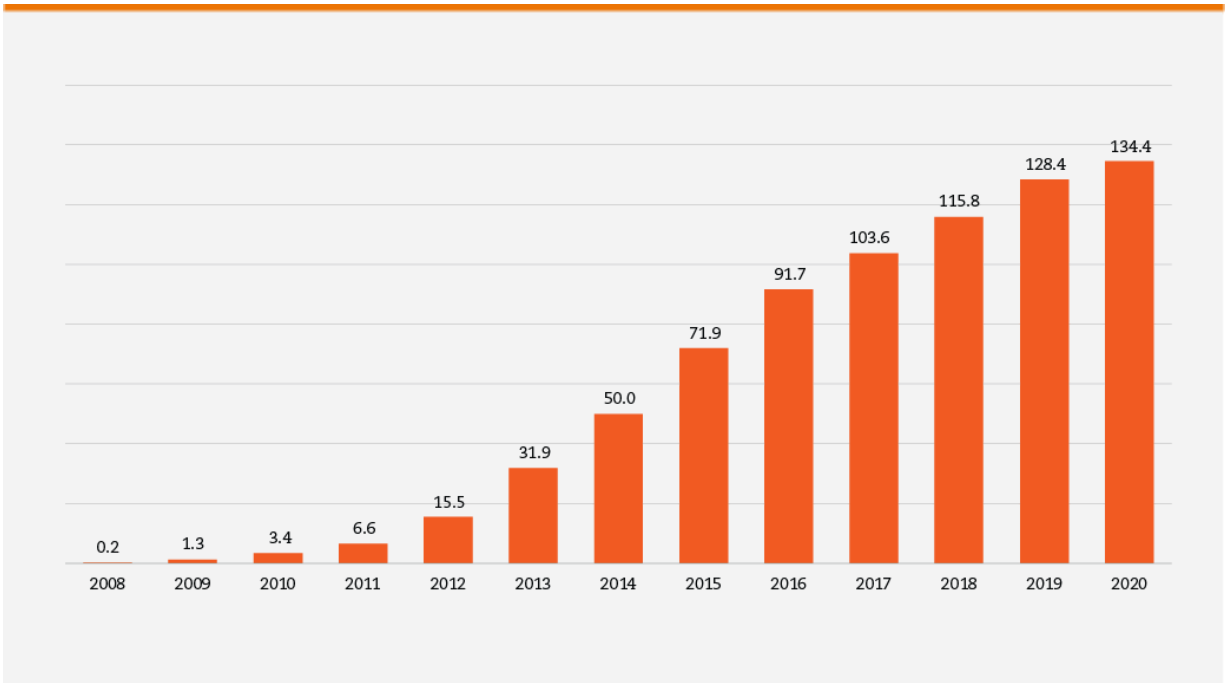
Acumen's Patient Capital Approach Starts With Philanthropic Funds

15 Years Tackling Energy Poverty

Acumen began investing in energy access in 2007, with a company called d.light. Since then, Acumen's energy access portfolio has grown into the largest in the world that serves the poor. To date, Acumen has invested over $30 million in 30 energy access companies as a part of its nonprofit, philanthropically-funded investing. In many of these instances, Acumen was the company's first investor and played a significant role in helping the company test their business model and attract other investors. Combined with its for-profit, returnable energy fund, KawiSafi Ventures, Acumen's total portfolio includes over $100 million invested in 38 companies operating across 60 countries. In total, Acumen's

investees have prevented 65 million metric tons of carbon emissions, provided clean energy access to over 150 million people, and raised over 6.8x in follow-on investments.

Cumulative Lives Reached through Acumen's Energy Investments (in millions)



The Pioneer Gap in Energy Access

In 2017, Acumen launched the Pioneer Energy Investment Initiative (PEII), a $22 million, five-year patient capital portfolio funded by philanthropy. It addressed the sector's "Pioneer Gap," the early stage of growth where companies have the most difficulty attracting Seed and Series A equity financing. At the time, over one billion people did not have energy access, and three billion people cooked with dirty fuels.[24] Prior to PEII's launch, Acumen had invested $20 million in 19 energy access companies, including d.light, BioLite, and BURN Manufacturing.

From its prior investment lessons, Acumen believed that equity investments, unlike grants, would be critical to creating markets. Equity could help create financially sustainable companies with robust governance structures, validating approaches that other companies entering the space could replicate. Equity could also encourage future lenders to provide the debt these companies would need to scale up.

[24] blogs.worldbank.org/opendata/chart-over-1-billion-people-had-no-access-electricity-2014; www.seforall.org/data-stories/clean-cooking

Acumen's PEII patient capital investments targeted specific energy products and services that were tailored for low-income households, including: off-grid solar home systems; mini-grids; and productive use of energy (PUE), characterized as energy products and services like solar-powered appliances that enable income generation. Lastly, because the customer base of PEII was predominantly low-income and decentralized, successful solutions required the right mix of innovative products, accessible payment models, and efficient distribution methods. Sixty-three percent of PEII company customers surveyed received first-time access to solar home products. An analysis of PEII, paired with a complete retrospective analysis of Acumen's entire patient capital portfolio, has yielded a number of relevant lessons.

Case Study: Taking a Chance on Off-Grid Solar in Sierra Leone

In 2017, Sierra Leone—a country many consider hard-to-reach—ranked in the bottom quartile of doing business indices, with a currency devaluation of 29% the previous year. Easy Solar, an off-grid energy company that sells lanterns and PAYGO solar home systems in the country, had only been operating for 18 months, and had sold several thousand products but raised no equity. Investors believed that Sierra Leone was too small, or too poor, or that a cash-based financing model would not work.

But to Acumen, Easy Solar presented an incredible opportunity for impact: 87% of the country had no electricity, and 71% lived under $3.10 per day. This, paired with the Easy Solar team's impressive understanding of the market, led Acumen to invest $2 million in preferred equity over a four-year period. Easy Solar was Acumen's first-ever investment in Sierra Leone.

Acumen's investment, along with the company's impact, piqued the interest of FMO, a European Development Finance Institution with no previous experience investing in Sierra Leone. Easy Solar raised a Series A round with FMO, unlocking opportunities to scale. Since Acumen's investment, Easy Solar's annual revenues have grown at a 137% compound annual growth rate. This has enabled them to expand into Liberia and, most importantly, reach over 850,000 people in a market where very few thought this possible.

What It Will Take to Reach the Unelectrified

Reaching these people who represent the gap between market-based solutions and pure aid will require a different approach that uses both investment and philanthropic capital to accomplish this audacious goal. To do so will require a focus on speed and scale. Any hope of a clean energy transition that leaves no one behind must include three components: the right products, the right companies, and the right capital.

A Proven Business Model

Off-grid PAYGO solar is the on-ramp for hard-to-reach customers unlikely to ever be served by a power grid. Off-grid solar solutions have proven the most effective and immediately available option for low-income and rural populations. PEII analysis found that mini-grids, while promising, require high upfront costs, and though PUE provides income-generating benefits to low-income customers, the market has not yet developed enough for accessibility and scale. For companies serving low-income consumers, innovative products are just one component of the solution: These companies must also be competent in financial services in order to ensure affordability and accessibility. PAYGO removes barriers for low-income, off-grid customers by offering payment solutions that allow customers to pay for products over time.

For hard-to-reach markets, the entry point for energy access should focus on products like the Tier 1 off-grid solar home system (SHS): an entry-level, off-grid solar-powered system that provides basic household energy service, such as lighting and cell phone charging, through monthly installments.[25] Analysis suggests that PAYGO can help make the Tier 1 SHS more affordable for low-income households, bringing energy access within reach for these hard-to-reach customers.[26] (Note: Solar lanterns are not considered Tier 1, as they only provide basic lighting and therefore do not meet the minimum requirement for a home "system.")

The Right Companies for the Job

One efficient way to expand energy access in hard-to-reach markets is to focus on established companies that have a proven track record of penetrating such markets. These companies have already been through the due diligence process, built up enough equity to demonstrate their stability, and tested their models in countries where the market was latent or non-existent. Early-stage companies are by nature riskier, having not had the chance yet to prove their business models, so preparing for investment tends to make the due diligence process longer and significantly more costly.

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[25] mtfenergyaccess.esmap.org/methodology/electricity

[26] Lighting Global (2020). *Off-Grid Solar Market Trends Report 2020.*

At the outset of a nascent energy market, established companies that have the experience and expertise require less capital to do the job.[27] However, these companies will not be able to succeed on their own. They need bespoke, innovative, and sometimes concessionary investments and grants to expand to hard-to-reach markets. PEII demonstrated the role of equity investments in helping off-grid solar companies grow and improve. Where these companies have proven their models, they need capital to expand and scale.

Financing Solutions to Meet the Moment

Financial instruments and solutions may vary, but what's clear is that blended grant and debt capital will be crucial to achieve scale. Without grant capital, companies will shoulder too much risk in smaller or less-developed markets and will be less incentivized to expand. Without blended finance structures, many investors will be unable to invest in these markets. This also provides an opportunity to develop working models for governments to partner with private sector companies to deliver essential services to those most in need. Acumen has implemented a number of different financial solutions that could offer models for hard-to-reach markets, including instruments that use a first-loss layer comprised of grant capital and guarantees or concessionary debt based on impact metrics.

What's also clear is that financing will need to be flexible, giving companies latitude over how to use it when entering a new geography. Examples of the types of activities that companies may need to fund include: building up staff and other operating expenses, financing PAYGO receivables, building distribution infrastructure, and paying third-party distributors or partners. Because these off-grid enterprises operate in some of the world's toughest geographies serving low-income customers, financial growth is not guaranteed. Companies will need to take outsized risks to deliver off-grid solar units. In return, lives will be changed and the lessons learned will be substantial.

[27] GOGLA (2019). *Investing in the Off-Grid Solar Sector: What You Need to Know.*

Conclusion: No One Left Behind

For people in developing nations to move out of poverty—and to adapt to the hostile realities of a warming planet—they need clean, affordable energy. Communities in some of the hardest-to-reach markets in sub-Saharan Africa, in particular, could begin to leapfrog traditional fossil fuel-based technologies just as they did with mobile phone technology.

Off-grid solar energy is quick, green, affordable, and inclusive. With the right products, the right companies, and the right mix of capital, it can help solve this global inequity. By decarbonizing electrification in the Global South, we can end energy poverty, achieve universal energy access, and avoid hundreds of millions of metric tons of carbon emissions.

The connection between energy access and climate action is as evident as it is urgent. These hard-to-reach customers should not be left behind in the global energy transition, either stuck in poverty or dependent on harmful fossil fuels. It will take a concerted effort by investors, donors, and companies to include them; achieving universal energy access will only be possible through creative capital structures that de-risk and incentivize companies to expand into new, risky markets. The financial solutions exist; what remains to be seen is if investors are up to the task.

Appendix: Acumen's Patient Capital Energy Investments

Company	Location(s)	Energy Solution	Investment Type
d.light (2007)	Global	Solar Home System	Convertible Note, Equity Loan, Warrant
SHREY (2008)	India	Solar Home System	Equity
Husk Power Systems (2010)	India, Tanzania	Mini-Grid	Equity, Loan
M-KOPA (2012)	India	Solar Home System	Equity, Loan
Avani Bio Energy (2013)	India	Mini-Grid	Equity, Loan
SRE Solutions (2013)	Pakistan	Solar Home System	Equity
Aga Khan Rural Support Program (2013)	Pakistan	Mini-Grid	Loan
SolarNow (2014)	Kenya, Uganda	Solar Home System	Equity
Devergy (2015)	Tanzania	Solar Home System	Equity
Nizam Energy (2015)	Pakistan	Solar Home System	Equity
BioLite (2015)	Kenya	Solar Home System, Cooking	Convertible Note, Equity
BURN Manufacturing (2015)	Kenya	Cooking	Convertible Note, Equity
Frontier Markets (2015)	India	Solar Home System, Cooking	Convertible Note, Equity
Greenway Grameen (2015)	India	Cooking	Equity
Green Energy Biofuels (2016)	Nigeria	Cooking	Equity
Easy Solar (2017)	Sierra Leone	Solar Home System	Convertible Note, Equity, Loan
PEG (2017)	Côte d'Ivoire, Ghana, Mali, Senegal	Solar Home System	Convertible Note, Equity, Loan
KopaGas (2018)	Tanzania	Cooking	Equity
Simusolar (2018)	Tanzania	Productive Use	Convertible Debt
PowerGen (2019)	Kenya, Nigeria, Sierra Leone, Tanzania	Mini-Grid	Convertible Debt
RVE.SOL (2019)	Kenya	Mini-Grid	Equity, Convertible Debt
Promethean (2019)	India	Productive Use	Equity
Solaris Offgrid (2020)	Tanzania	Solar Home System	Convertible Debt
S4S Technologies (2020)	India	Productive Use	Equity
Winock Solar (2020)	Nigeria	Productive Use	Convertible Debt, Loan
Soluna Energia (2020)	Colombia	Solar Home System	Convertible Debt
KoolBoks (2021)	Nigeria	Productive Use	Equity

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