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Taking the Pulse

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FOREWORD

Achieving universal access to clean, affordable energy, as called for by Sustainable Development Goal 7 (SDG7), is not possible without significant investment in electricity access and clean cooking solutions. The estimated amount for achieving universal access is over USD 45 billion per year (2019-2030).

Providing countries the finance they need for universal energy access requires a detailed understanding of national contexts. Specifically, the scale of their energy access gaps, current levels of finance, existing energy infrastructure, expected population trends, and much more.

Now in its third edition, the biennial *Energizing Finance: Taking the Pulse 2021* report provides crucial insights into how national contexts shape finance flows for electricity and clean cooking access. It drills down into these contexts to assess each country's finance needs to achieve universal energy access through mini-grids, stand-alone solar and various tiers of clean cooking solutions. It also considers the costs of overcoming energy affordability gaps, which, if left unfilled, will leave many people behind.

This year's report offers deep-dives into what it will take to achieve SDG7 targets in Ghana, Mozambique and Vietnam, using universal access scenarios to forecast the volume and type of capital needed by enterprises and households.

The report finds that achieving universal access to electricity and to clean fuels and technologies will cost at least USD 38 billion across Ghana, Mozambique and Vietnam cumulatively from 2021 to 2030. A more incremental pathway of achieving access to electricity and improved cookstoves, will be considerably less costly at USD 2.1 billion.

By comparing these finance needs to current levels of committed finance identified for these countries in *Energizing Finance: Understanding the Landscape 2021*, we gain a clear picture of how far we need to go. For example, Understanding the Landscape tracked only USD 32.3 million for clean cooking in the three countries over a six-year period, or an annual average of USD 1.7 million per country. With the cost of universal Tier 4 clean cooking access being at least USD 37 billion over the next 9 years, there is a huge finance gap to fill.

Meanwhile, although universal Tier 1 electricity access is an important target to hit, the development of the studied countries' economies and critical services like health facilities will require access at higher tiers, demanding much greater finance than what is identified in this report.

Importantly, *Energizing Finance: Taking the Pulse 2021* provides a set of country-specific recommendations to help fill current finance gaps. Many of these solutions are ones Sustainable Energy for All (SEforALL) advocates for and works with countries to implement, including providing results-based finance for energy project developers and adjusting policies around demand-side subsidies and taxes on solar equipment.

Through this report, SEforALL and Dalberg Advisors have provided a clear view of the potential pathways to SDG7 in Ghana, Mozambique and Vietnam so that stakeholders have the evidence they need to act. Yet the value of this work extends far beyond these countries' borders. The lessons and recommendations found in *Energizing Finance: Taking the Pulse 2021* can be applied in many other countries facing energy access deficits.

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ABBREVIATIONS

AfDB	African Development Bank
AMER	Mozambican Renewable Energy Association
BAU	Business-as-usual
CAGR	Compound annual growth rate
CDC	UK development finance institution
CDM	Clean development mechanism
DHS	Demographic Health Survey
EDM	Electricidade de Moçambique
EIA	Energy Information Administration
EnDev	Energising Development
ESMAP	Energy Sector Management Assistance Program
EU	European Union
FUNAE	Fundo de Energia
GIZ	German Corporation for International Cooperation
GLPGP	Global LPG Partnership
GOGLA	Global Off-Grid Lighting Association
ICS	Improved cookstove
IEA	International Energy Agency
IMF	International Monetary Fund
ISSER	Institute of Statistical, Social and Economic Research, Ghana
kW	Kilowatt
LPG	Liquefied petroleum gas
MECS	Modern Energy Cooking Services
MICS	Multiple Indicator Cluster Survey
MTF	Multi-Tier Framework
MW	Megawatt
NGO	Non-governmental organization
PAOP	Power Africa Off-grid Project
PAYG	Pay-as-you-go
RBF	Results-based financing
REEEP	Renewable Energy and Energy Efficiency Partnership
REMP	Renewable Energy Mitigation Programme (Ghana)
RISE	Regulatory Indicators for Sustainable Energy
SDG	Sustainable Development Goal
SEforALL	Sustainable Energy for All
SHS	Solar home system
SNV	Netherlands Development Organization
UNDP	United Nations Development Programme
USAID	United States Agency for International Development
VAT	Value-added tax
WHO	World Health Organization

EXECUTIVE SUMMARY

Despite recent progress made on the path to Sustainable Development Goal 7 (SDG7)[1] — affordable, reliable, sustainable and modern energy for all by 2030 — current prospects of reaching that goal appear dim. In the past decade, over 812 million people around the world have gained access to electricity and 443 million have gained access to clean cooking fuels and technologies (*Tracking SDG7: The Energy Progress Report 2021*). However, about 760 million people remain without access to electricity, and nearly 2.6 billion are without access to clean cooking fuels and technologies, with Covid-19 only exacerbating these inequities. Based on the current, business-as-usual (BAU) trajectory, SDG7 will not be achieved.

A transformation of the energy sector is desperately needed. This will require an integrated approach that combines centralized and decentralized energy solutions, national energy planning and market based-opportunities, substantial commercial and non-commercial finance, and targeted non-financial support. *Energizing Finance: Taking the Pulse 2021* focuses primarily on decentralized energy solutions – in particular, it suggests that demand-side and supply-side subsidies will be key to unlocking access.

This report updates and extends the biennial Taking the Pulse report, first published in 2017 by Sustainable Energy for All (SEforALL) as part of its Energizing Finance research series.[2] It seeks to (i) estimate the total volume and type of finance needed by decentralized energy (clean cooking and electricity) enterprises, (ii) estimate unmet finance needs (the affordability gap) for end-use customers, (iii) provide high-level recommendations on the use of funding to unlock private sector capacity and deliver energy access solutions at scale, and (iv) suggest enabling policies and regulations for governments.

***Energizing Finance: Taking the Pulse 2021* focuses primarily on decentralized energy solutions – in particular, it suggests that demand-side and supply-side subsidies will be key to unlocking access.**

Like previous editions, *Energizing Finance: Taking the Pulse 2021* relies heavily on an empirically based model to estimate future finance needed in three countries: this year, Ghana, Mozambique and Vietnam, which represent three distinct levels of electricity and clean cooking access and market maturity. The report uses the World Bank's widely recognized Multi-Tier Framework (MTF) to classify different levels of electricity and clean cooking access for households. For electricity, it measures the gap to achieving universal Tier 1 access[3] and examines past trends with respect to grid, mini-grid, and standalone solar home system (SHS)

[1] The first target of SDG7 is Target 7.1: "By 2030, ensure universal access to affordable, reliable and modern energy services". This target has two indicators: Indicator 7.1.1: Proportion of population with access to electricity. Indicator 7.1.2: Proportion of population with primary reliance on clean fuels and technology. "Clean fuel" in this context is defined by the emission rate targets and specific fuel recommendations (i.e., against unprocessed coal and kerosene) included in the normative guidance by the WHO for indoor air quality.)

[2] Other reports published by SEforALL as part of the Energizing Finance series include Understanding the Landscape, which focuses on finance commitments for energy access in twenty countries with large energy access deficits, and Missing the Mark, which examines gaps and lags in disbursement of development finance for energy access.

[3] This corresponds to a minimum 12 watt-hour of electrical energy per person per day and lighting performance of 1,000 lumen-hours per person per day, which provides enough power to illuminate three to four

growth and penetration, based on a review of policy documents and wide-ranging stakeholder interviews in each focus country. The report then develops two scenarios: (i) a business-as-usual (BAU) scenario that determines a realistic view of the universal energy access gap in 2030; and (ii) a forecast scenario that models the expected contributions grid, mini-grid, and standalone solar solutions would make to achieve universal access. For clean cooking, this report estimates the deficit to both universal Tier 2/Tier 3 levels through industrially manufactured improved cookstoves (ICS) (which rely on traditional biofuels but are cleaner and more efficient than artisanal cookstoves)[4] and Tier 4 modern energy cooking services (MECS) (through liquefied petroleum gas (LPG), ethanol and electricity).[5] It then models forecast scenarios for the uptake of Tier 2/Tier 3 solutions and Tier 4 solutions to achieve universal access. Finally, the report uses the electricity and clean cooking universal access scenarios to forecast the volume and type of capital needed by enterprises and households.[6] *Energizing Finance:: Taking the Pulse 2021* breaks down the cost of universal access between private finance needs (in grant, debt and equity) as well as the affordability gap for Tier 1 electricity and Tier 2/Tier 3 clean cooking. Tier 4 clean cooking costs are split by fuel and stove costs, infrastructure investments, and required behavioural change campaigns to convince households to switch to "clean" fuels.

The cost of achieving universal energy access in Ghana, Mozambique and Vietnam

Achieving universal Tier 1 electricity and Tier 4 clean cooking access will cost USD 38-48 billion across Ghana, Mozambique and Vietnam. A more incremental pathway of Tier 1 electricity and Tier 2 / Tier 3 clean cooking access will be considerably less costly at USD 2.1 billion (Figure 1).

Achieving universal **Tier 4 cooking access** across all three countries will cost about USD 37-47 billion, depending on the technology used (Figure 2).[7] Current utilization levels of Tier 4 solutions are low across all three countries and not expected to rise significantly, other than in Vietnam. Transitioning with LPG will cost about USD 38 billion (in all three focus countries) and will require substantial fuel subsidies and infrastructure investment as well as funding for large-scale awareness and marketing activities to change consumer behaviour. Transitioning with ethanol is expected to cost about the same,[8] with comparatively lower infrastructure costs offset by higher fuel costs (relative to LPG). Transitioning with electric cooking solutions would be expensive for consumers — even with current subsidized electricity tariffs — and would require additional grid- or mini-grid-based electricity generation, costs that are not included here.[9] Other solutions exist but are currently limited in scale. For example, pellets (biofuels made from compressed organic matter or biomass), while not examined in detail in this report, could be a lower-cost solution in urban areas.

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[4] The report discusses a particularly efficient improved cookstove (ICS) option which can provide access up to Tier 2/ Tier 3, as opposed to improved cookstoves in general, which only provide Tier 1/Tier 2 access. Yet Tier 2/Tier 3 cookstoves, although less carbon intensive than traditional biomass alternatives, are not zero-carbon and have negative health implications for users.

[5] Tier 4 access is a composite metric that incorporates higher levels of air quality, efficiency, convenience, and health and safety of the cookstove and greater affordability and availability of clean and high-quality fuel. Tier 4 access is typically only achieved by widespread use of "clean" fuels like electricity, LPG, ethanol, gas pellets, and biogas, most of which are not used at scale in most developing countries. It should be noted that access to a "clean" fuel is a necessary, but insufficient condition of Tier 4 access.

[6] Further details on the methodology are provided in Section V Introduction and under Methodology in Section IX of the Appendix.

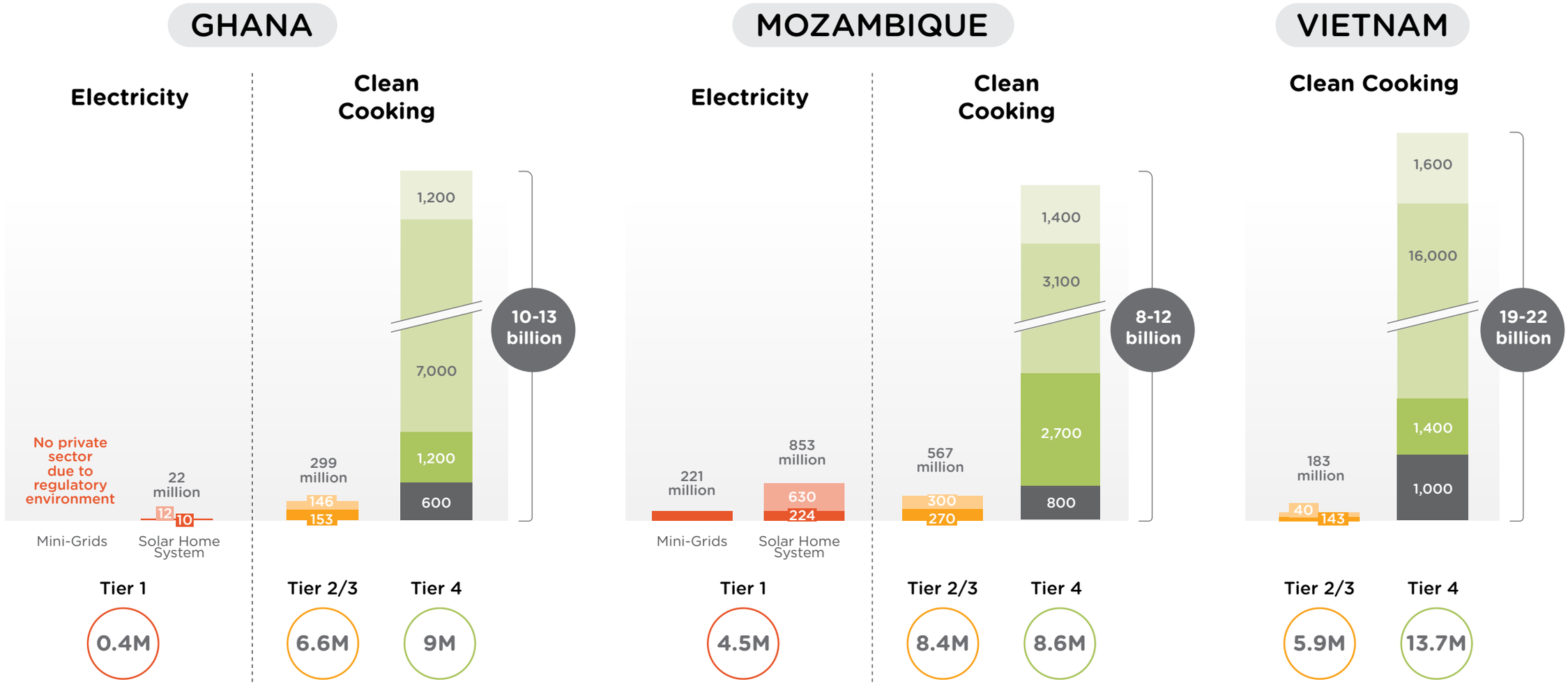
[7] This report assumes that 10 years are required to achieve full displacement of basic cooking technologies and practices.

[8] These costs are based on July 2021 LPG retail costs obtained from stakeholder interviews and national reporting statistics. LPG prices have moved in the past along with oil prices and can be volatile. Current LPG prices are not reflective of long-term average prices and do not represent a forecast of 2030 fuel prices. Unlike LPG, which is an established fuel, there are also multiple variables of uncertainty around ethanol prices because the technology is not used at scale. Therefore, this report relied on industry experts' expectations to determine a range of potential ethanol cost of USD 0.6 to 0.8 per liter – without any carbon finance subsidies.

[9] Universal Tier 4 clean cooking is achievable in Vietnam where the entire population could be equipped with induction stoves, since most of the country is grid-electrified. In Ghana and especially in Mozambique, electricity would not provide universal access, given that 10 percent and 62 percent of households, respectively, have electricity access through SHSs and mini-grids, which are not powerful enough for induction stoves.

FIGURE 1

Cost of universal access to electricity and clean cooking in focus countries (USD millions)



LEGEND

TIER 1 ELECTRICITY
- Affordability Gap
- Private sector finance needs

TIER 2/3 CLEAN COOKING
- Affordability Gap
- Private sector finance needs

TIER 4 CLEAN COOKING
- Stove cost
- Fuel cost
- Infrastructure
- Behavioural change

Number of 2030 households without access (million)

FIGURE 2

Estimated cost of universal Tier 4 access by cooking fuel and technology in Ghana, Mozambique and Vietnam (USD billion)[10]

	LPG				Ethanol				Electricity			
USD Billion	GH	MZ	VT	**Total**	GH	MZ	VT	**Total**	GH	MZ	VT	**Total**
Stove costs	1.2	1.4	1.6	**4**	0.7	0.8	0.9	**2**	0.9	0.6	1.5	**3**
Fuel costs	11.3	14.6	17.3	**43**	13.0-14.8	18.7-21.4	17.7-20.5	**49-57**	12.0	4.4	17.0	**33**
Infrastructure	1.2	2.7	1.4	**5**	0.4	0.5	0.5	**1**	27% Additional grid generation need (vs. 2030 generation)	10%	2%	**N/A**
Behavioural change	0.6	0.8	1	**2**	0.6	0.8	1	**2**	0.6	0.8	1	**2**
Sub-Total	14.3	19.5	21.3	**55**	15-17	21-24	20-23	**56-64**	13.5	5.8	19.5	**39**
Avg. Cost per household (USD)	1,600	2,150	1,570	**N/A**	1,760	2,460	1,580	**N/A**	1,720	1830	1,440	**N/A**
Cost of fuel saved	(4.4)	(11.6)	(0.9)	**(17)**	(4.4)	(11.6)	(0.9)	**(17)**	(4.0)	(3.0)	(0.9)	**(8)**
Total Cost	10	8	20	**38**	11-13	9-12	19-22	**39-47**	9	3	19	**31**
% of Households with Tier 4 Access	100%	100%	100%	**N/A**	100%	100%	100%	**N/A**	90%	38%	100%	**N/A**

Achieving universal **Tier 2/Tier 3 cooking access** by 2030 — which only requires households to upgrade to cleaner, more efficient cookstoves, with no changes in fuel and infrastructure — will cost about USD 1 billion. The need is highest in Mozambique (54 percent of total Tier 2/Tier 3 transition costs), followed by Ghana (about 28 percent) and Vietnam (18 percent).

Achieving universal **Tier 1 electricity access** by 2030 in Ghana and Mozambique will require about USD 1.1 billion in additional capital. This report's model forecasts that the grid will service about 90 percent of households in Ghana, 50 percent in Mozambique, and 100 percent of households in Vietnam in 2030. Mozambique — which has the highest forecast electricity access deficit — will require nearly all (about 98 percent) of the USD 1.1 billion, with Ghana requiring just USD 22 million to close the gap to universal Tier 1 access. It should be noted that this report does not factor in finance needs requirements related to grid expansion, which was beyond its scope.

[10] Cost of fuel saved is calculated by multiplying total charcoal/wood consumed annually by the average coal/wood price and forecasting it for the next 10 years. Assuming households transition to LPG, ethanol, or electricity by 2030, these are the fuel savings from no longer using charcoal/wood.

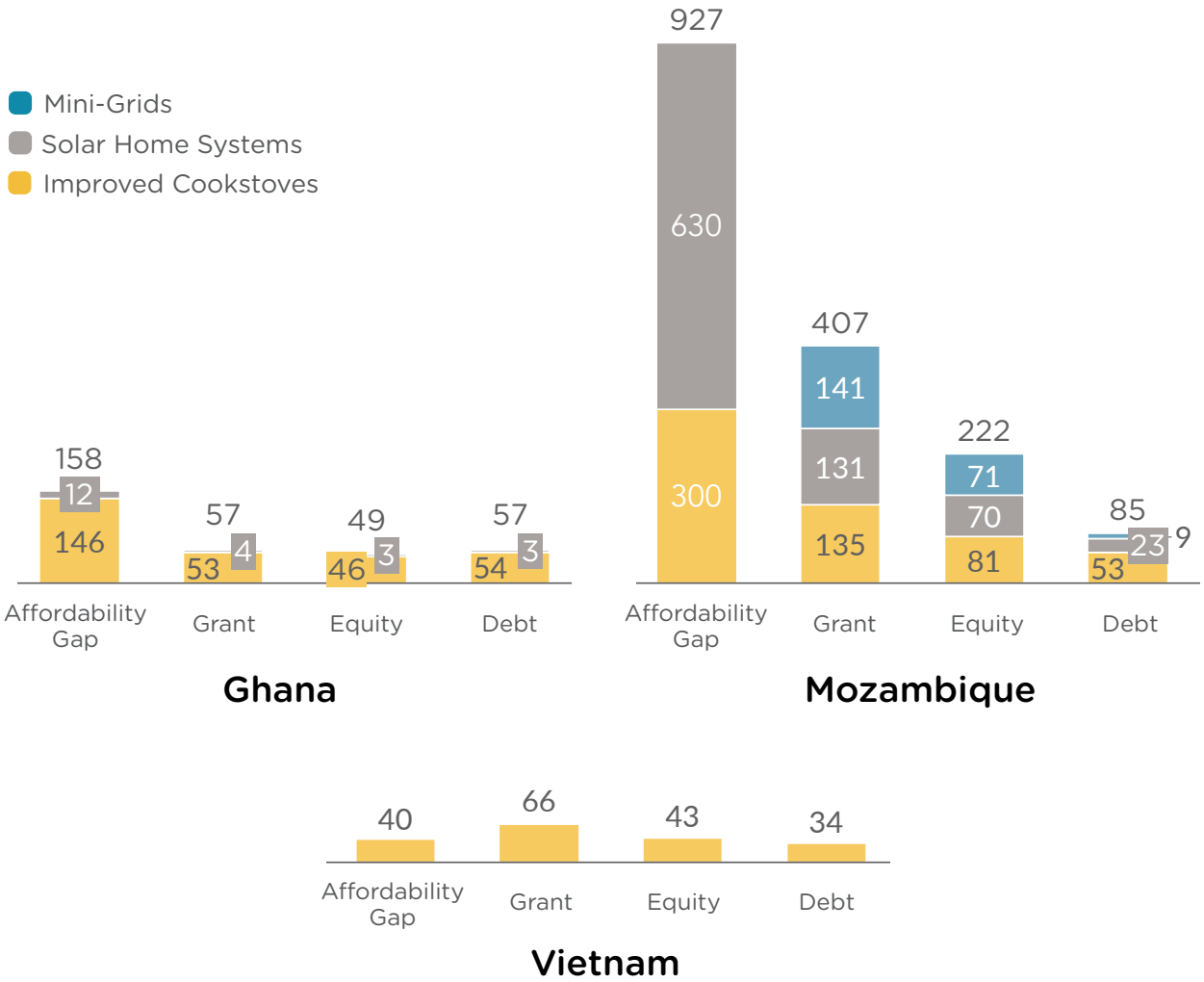
Private sector finance needs for Tier 1 electricity and Tier 2/Tier 3 cooking access[11]

Of the USD 2.1 billion in total costs to transition households to universal access by 2030, about 47 percent (USD 1 billion) will be needed in finance to support enterprises, both in ICS (USD 568 million) and decentralized standalone solar (USD 455 million). In comparison, the *Energizing Finance: Understanding the Landscape 2021* report identifies total commitments of just USD 32 million for clean cooking in Ghana, Mozambique and Vietnam from 2013 to 2019, and USD 118 million in Mozambique for mini-grid and SHSs across the same seven-year time period (SEforALL 2021).

Approximately USD 530 million (52 percent of the total enterprise finance need) will be in the form of grants to electricity and clean cooking enterprises (Figure 3). Most of this grant funding will be needed in Mozambique as its private sector is the least mature and established. A further USD 314 million (31 percent of the total) will be needed in the form of equity and the remainder, USD 176 million (17 percent), will take the form of debt. The high ratio of equity to debt largely reflects the energy sector's early stage of development, especially regarding clean cooking fuels and technology. Debt is likely to make up a larger proportion of the finance mix in Ghana (relative to Mozambique and Vietnam), reflecting a more mature energy enterprise landscape.

FIGURE 3

Private sector finance needs split across debt, equity, and grants for Tier 1 electricity access and Tier 2/Tier 3 clean cooking access (USD million) as well as affordability gap funding



[11] Note that private sector finance needs are only examined for electricity access and Tier 2/Tier 3 clean cooking access. The overall cost of Tier 4 clean cooking access corresponds to a combination of public, private, and household investments, and this report does not take a position on how the cost of universal access should be split between these stakeholders.

The relative proportions of grants, equity and debt finance needed in the three focus countries reflect the overall nascency of private enterprise in these sectors. Smaller businesses are typically unable to secure affordable commercial finance on reasonable terms, which leads to the relatively high proportion of grant funding required. Stakeholders from the three countries confirmed this dynamic in interviews. In more mature markets, early-stage enterprises can typically rely on equity to finance growth. However, this type of capital is difficult to come by in the focus countries given the limited number of equity providers and the perceived risk of energy access enterprises. These companies have therefore relied on grants to enable them to operate and grow their businesses and reach customers.

Affordability gap for Tier 1 electricity and Tier 2/Tier 3 cooking access

About USD 1.1 billion will be needed in affordability gap finance across Ghana, Mozambique and Vietnam. Unsurprisingly, given its high poverty levels (46 percent compared with 23 percent in Ghana and 7 percent in Vietnam) (World Bank)), Mozambique will account for the overwhelming share (82 percent) of the need across the three focus countries, mostly to drive standalone solar uptake in poor, rural households. Most of Ghana's affordability gap finance (92 percent) will be needed in the service of household ICS purchases, with only USD 12 million needed to support standalone solar purchases. Vietnam will require about USD 40 million to support household purchases of ICS solutions. The use of targeted end-user subsidies through, for example, vouchers and results-based financing (RBF) instruments, will be an important tool in addressing the affordability gap in all three countries.

Achieving universal access to clean cooking

Achieving universal access to clean cooking is the most challenging aspect of meeting SDG7 by 2030, with low rates of access and limited progress in Ghana and Mozambique, and trends of good progress only in Vietnam.

GHANA

Under a BAU scenario, access to clean cooking will fall far short of universal access targets, both in terms of Tier 2/Tier 3 access (40 percent estimated access by 2030) and Tier 4 access (18 percent access by 2030). Universal Tier 4 access will cost USD 10–13 billion. This is largely due to the cost of fuel (USD 7.6 billion) and is driven by the number of households that are not able to afford Tier 4 solutions. Universal Tier 2/Tier 3 access to ICS requires a much smaller investment of USD 299 million. This is driven by a USD 146 million affordability gap for households and private-sector finance needs of USD 153 million. Many ICS companies are small companies with limited scale, no access to low-cost international finance, and limited local commercial funding. As a result, grants will remain a core source of funding for many companies until 2030 to support the expansion of private companies.

MOZAMBIQUE

Under a BAU scenario, access to clean cooking will largely stay at current levels until 2030 both in terms of Tier 2 /Tier 3 access (7 percent estimated access by 2030) and Tier 4 access (4.4 percent access by 2030). Universal Tier 4 clean cooking access will cost USD 8–12 billion, with fuel subsidies accounting for about 90 percent of the total. Universal Tier 2/Tier 3 access to ICS will require USD 570 million, mainly driven by a USD 300 million affordability gap. The remainder, USD 270 million, will be needed for private-sector clean cooking solution providers. Half will be in the form of grants (USD 135 million) as the ICS sector remains small and sub-commercial.

VIETNAM

Vietnam has made significant progress in access to clean cooking, primarily driven by growth in LPG usage and electric cooking. Under a BAU scenario, access to clean cooking will continue to increase until 2030 both in terms of Tier 2/Tier 3 access (79 percent estimated access by 2030) and Tier 4 access (51 percent access by 2030). Despite these increases, the estimated number of

households without access in 2030 will be large (14 million). As a result, transition costs, especially for universal Tier 4 access, USD 19–22 billion, remain substantial. Universal Tier 2/Tier 3 access to clean ICS will require USD 185 million. This is driven by a consumer affordability finance need of USD 40 million and private-sector finance needs of USD 145 million. Donor and private finance have remained low in Vietnam, partially driven by the country having achieved universal electricity access and reaching middle-income status. Stakeholder interviews also suggest that commercial debt is unobtainable by ICS enterprises, due to their small size and perceived risk. As a result, some level of grant finance is required to help the private sector scale by 2030.

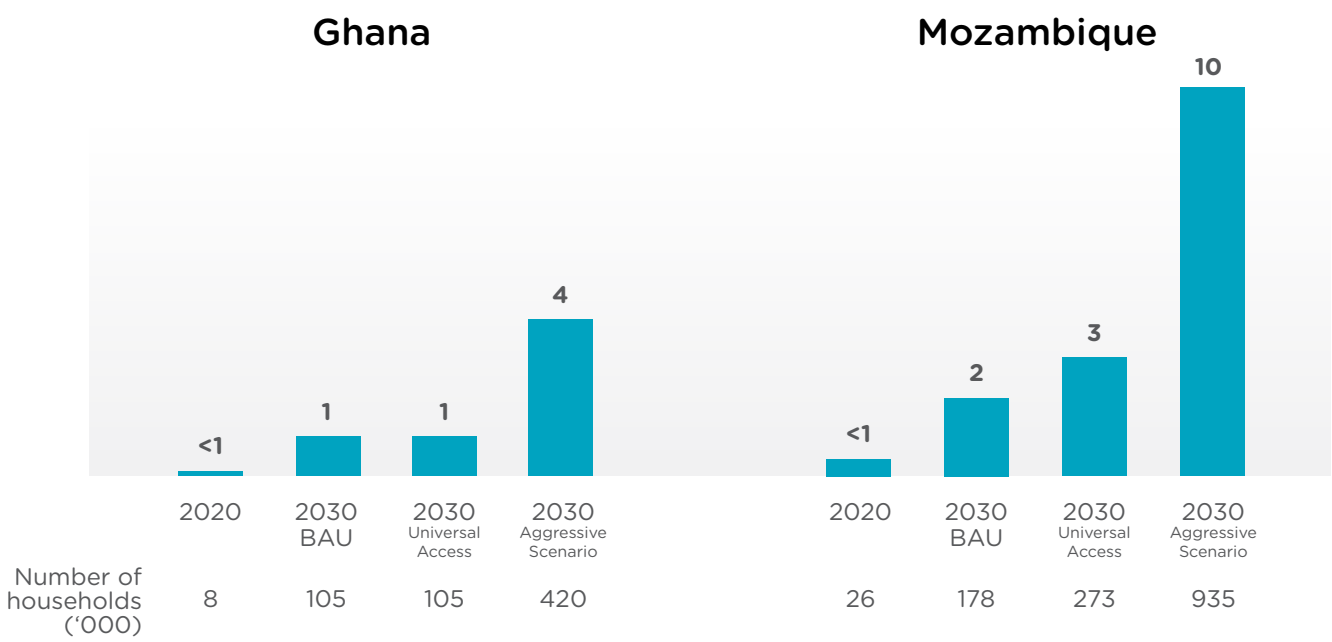
Achieving universal access to electricity: mini-grid contributions

Mini-grids will make a relatively small contribution to universal Tier 1 electricity access in the BAU scenario. They will provide electricity to up to 3 percent of the population in Mozambique and only about 1 percent in Ghana by 2030. High connection costs (relative to SHSs[12]) combined with a lack of policy and regulatory clarity around licensing, land acquisition, concessions, tariffs, and subsidy schemes, limit private participation in mini-grids.[13]

GHANA

Mini-grids in Ghana have been built and operated almost entirely by the government, with funding from donor sponsors, and currently serve only a small proportion of households (less than 1 percent). The government-led rural electrification strategy restricts private-sector mini-grid activity; developers are not allowed to charge cost-reflective tariffs, and private companies are barred from applying for licences to sell electricity. Its renewable energy plan has identified 300 mini-grid sites that are in various stages of development based on financial support from development partners. As a result, the BAU scenario considers

FIGURE 4
Percent of households in Ghana and Mozambique electrified with mini-grid[10]



[12] In Mozambique, mini-grid capital expenditure per connection is USD 700 to USD 1,500, compared to less than USD 100 for SHSs.
[13] It is important to note that mini-grids can provide higher levels of electricity access to households relative to SHSs (i.e., beyond basic Tier 1 access), which explains higher connection costs. While SHSs remain the fastest pathway to basic Tier 1 electricity access, mini-grids could have a bigger role to play in electrification in the long term, but not without improvements in the regulatory landscape. In fact, SHSs can set the stage for mini-grids by increasing household willingness to pay for higher-order electricity applications (including applications for productive use) that are needed to make mini-grids commercially viable.

only these government-led 300 mini-grids and does not project an increase in its universal-access scenario. With no private-sector engagement projected, this report does not estimate any private-sector finance needs for mini-grids.

MOZAMBIQUE

Mini-grid development in Mozambique is mostly led by the government and funded by international donors. Successful completion of priority mini-grid projects planned by the government and Fundo de Energia (FUNAE), the government entity in charge of rural electrification, could provide access to 2 percent of households. The absence of a clear regulatory framework and tariff limitations (benchmarked to the rate charged by the national utility) has discouraged private-sector interest in the country. Thus, in a BAU scenario, only the donor-sponsored mini-grid projects stand to be completed by 2030. For similar reasons, the universal-access scenario estimated in this report sees a minor role for mini-grids. In a BAU scenario, this report estimates the cost of private-sector led mini-grid expansion at about USD 221 million, accounting for 3 percent of overall access. However, if regulatory reforms currently tabled are adopted by FUNAE, the sector could grow to cover up to 10 percent of households by 2030 and require about USD 1.8 billion[14] in private financing.

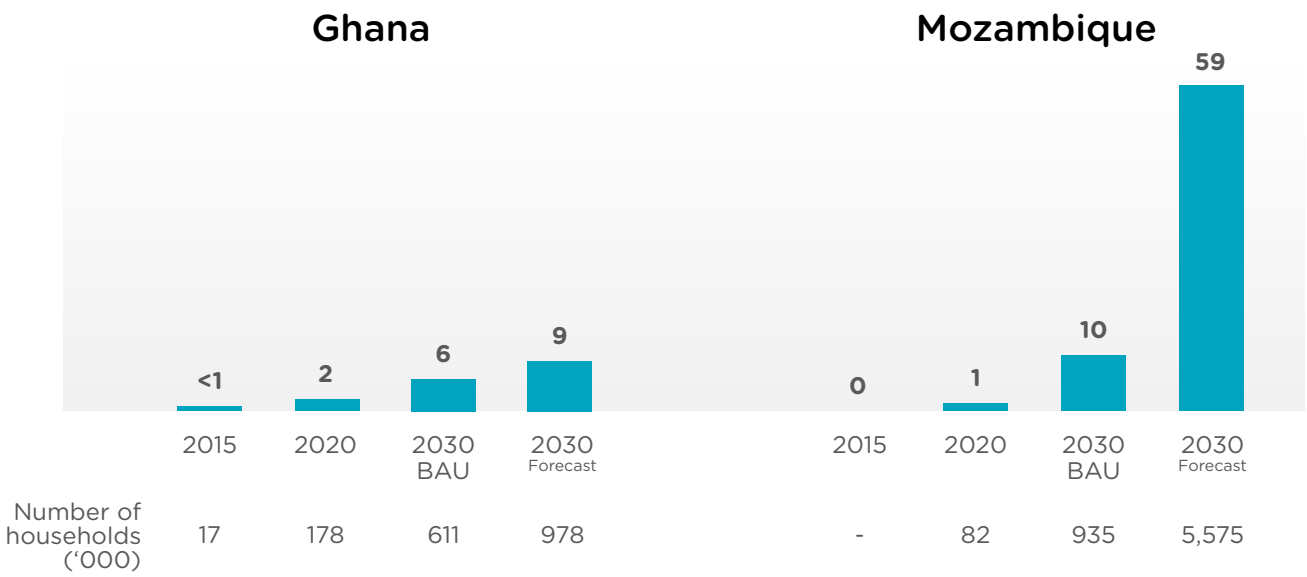
Achieving universal access to electricity: standalone solar contributions

Standalone solar solutions will deliver access to all transition households not served by the grid or mini-grids. Achieving this will require a substantial increase in public and private financing above current levels, especially in Mozambique.

GHANA

Under a BAU scenario, about 6 percent of Ghana's households receive Tier 1 access through standalone solar, a figure that rises to about 9 percent in the universal-access scenario (Figure 5). These households are primarily located in rural areas and are not covered under the government's grid electrification plan or by its mini-grid projects. With several mature companies and high pay-as-

FIGURE 5
Percent of households in Ghana and Mozambique electrified with solar home systems



[14] This estimate is based on third party reports including ESMAP's least-cost analysis and stakeholder interviews in Mozambique. (World Bank 2019). Mozambique geospatial option analysis towards universal electrification.

you-go (PAYG) penetration, the private sector in Ghana has the capacity to service a significant share of non-electrified households by 2030. About USD 22 million is needed in total finance, with about USD 10 million reserved for companies and the remainder, USD 12 million, required to address the consumer affordability gap.

MOZAMBIQUE

Under BAU, access to electricity is expected to increase to 50 percent by 2030, with standalone solar systems accounting for about 10 percent of households. In the universal-access scenarios, standalone solar is expected to play a primary role, with nearly 59 percent of households receiving first-time Tier 1 access through SHSs (Figure 5). 70 percent of the population lives in low-density, rural areas that are complex and costly to serve through the grid and mini-grids and favouring SHS distribution. To reach almost two-thirds of Mozambique's population, the domestic SHS sector will require USD 854 million in total finance, of which USD 630 million (74 percent) would be needed to address the large consumer affordability gap. 46 percent of Mozambique's population currently lives below the poverty line and 80 percent of households are not able to purchase SHSs on a PAYG basis over 24 months.

Eight cross-cutting challenges that impede universal access

While Ghana, Mozambique and Vietnam are all unique in their context and solution set to achieve universal energy access, there are important cross-cutting challenges.

Consumer affordability. This is the costliest and most important challenge. Many consumers are unable to afford the one-time cost of solutions such as an SHS, much less pay for the cooking technologies and ongoing fuel costs necessary to reach universal energy access. This challenge is exacerbated by seasonal variability of incomes, the limited reach of consumer finance options such as PAYG, and lower awareness and willingness to pay for clean energy solutions (especially clean cooking) due to the availability of cheaper traditional alternatives.

Customers who are unable to afford energy services are often the hardest to reach. In most markets, companies naturally focus on serving the lowest hanging fruit in terms of potential customers. These tend to be those who live in urban and peri-urban areas. Meanwhile, those who lack reliable energy access often reside in regions where distribution is more costly due to limited existing infrastructure. According to stakeholder interviews, without incentives, private companies tend to focus on more profitable customers, often selling higher-tiered systems to households that already enjoy some level of energy access, and not organically pushing into areas with households needing first-time electricity access.

Gender disparities related to energy access that are common to many developing countries also affect the three focus countries, albeit to different degrees. Interviews in all three countries indicated that, on average, women have a lower ability to pay and less agency than men in household purchasing decisions, including those concerning energy services. Women's participation in modern energy supply chains (including for SHSs, mini-grids, and clean cooking) is almost universally lacking. They are largely missing in the energy sector workforce (as technical and sales agents, for example) and women-owned energy enterprises are rare. Overall, gender disparities are highest in Mozambique and are more pronounced in the clean cooking sector.

Energy companies remain mostly small and lack access to the suite of financial solutions and capital (debt, equity and grants) required to reach all potential consumers across countries and technology segments. Across technologies, only a few energy solution providers are mature and large enough to obtain commercial finance from local financial institutions or international funding from investors. As a result, the private sector will continue to rely, at least in part, on grants and concessional finance. Addressing these issues requires a combination of industry capacity building and funding companies' supply chain activities.

The absence of clear, enabling regulatory frameworks has hampered energy access, particularly for mini-grids. In both Ghana and Mozambique, this has resulted in a lack of private mini-grid development. Meanwhile, in countries where tariff subsidies allow private companies to recoup their investments, the number of mini-grids has expanded (AMDA 2020). Additionally, in Mozambique, the lack of fiscal incentives, including import duty exemptions and value-added tax (VAT) on SHSs makes them up to 45 percent more expensive than in Ghana. The lack of clarity around long-term government priorities, willingness to support the sector, and technology preferences also contributes to an uncertain business environment, which disincentivizes the private sector from entering the market.

A lack of government commitment and leadership on clean cooking is negatively impacting energy access. Stakeholder interviews suggest that government commitment to clean cooking in the three focus countries is limited; no universal access strategies have been outlined, no clear commitments have been made, and leadership on the issue has been missing. These interviews also suggest that government support for regulatory standards, clear energy access goals, and access to carbon finance would enable greater further private-sector growth.

A lack of coordination between electricity, clean cooking, and climate efforts is slowing energy access. National and development partner strategies often view electricity, clean cooking and climate in silos, despite common challenges and solutions. Energy access through decentralized renewable energy technologies can significantly contribute to national emission reduction targets, yet few countries have clear strategies that incorporate these into electricity and climate plans. In this regard, the advantages of Integrated Energy Planning (IEP)[15] should be emphasized further to simultaneously address these challenges in a cost-effective manner by creating multiple benefits in these areas.

The Covid-19 pandemic has negatively impacted energy access in all three focus countries, but the sector is expected to bounce back. Overall, the impact has been uneven, influenced in part by variations in local policy responses. In Ghana and Mozambique, Covid-19 has not caused a significant slowdown in energy access. In large part this is because the government in Ghana and development partners in Mozambique provided subsidies to support customers' continued access to grid and off-grid energy. Overall, stakeholders are optimistic that the sector will return to pre-pandemic growth levels as early as 2022, particularly in energy access where SHS sales increased in 2020.

Country-specific financing recommendations

In each country, the private sector's finance requirements and the affordability gap will need to be addressed with solutions appropriate to the local context.

GHANA

The finance required to cover the consumer affordability gap for universal electricity access is USD 12 million (mainly for SHSs) and the private-sector finance need is USD 10 million. This could feasibly be managed through a single energy access programme, which could be structured in several ways. For example, a competitive bidding process could identify companies that are willing to cover the remaining population at the lowest cost and are able to apply an upfront grant toward establishing the supply chain to cover these areas. Another option could be an RBF payment that companies are able to realize for each verified sale.

For Tier 4 universal cooking access, the execution of the national LPG strategy would increase access to "clean" fuels. Developing a strategy incorporating other pathways for access, as well as developing a national scheme for carbon finance would also increase Tier 4 access. For Tier 2 /Tier 3 universal

[15] Universal integrated energy planning is a 'power tool' that helps direct resources effectively and efficiently to where they are needed the most. Integrated energy planning is required to ensure that current and future energy service needs can be met in the most cost effective, efficient, and socially beneficial manner while also considering environmental impacts and policy development to shape the future energy landscape of the country.

cooking access, the development of a national clean cooking strategy — with clear guidelines and measures for private sector development — could go a long way toward addressing constraints related to lack of government planning and minimal access to enterprise funding. Development partners could explore demand-side and supply-side subsidies to increase uptake of ICS stoves as well as consumer consumer finance to address severe affordability constraints.[16]

MOZAMBIQUE

Efforts should focus on reducing the estimated USD 927 million affordability gap for SHSs and ICS. The Government of Mozambique should coordinate with development partners to determine a set of solutions and instruments to address this challenge. Lifting import duties on SHS products and introducing a VAT exemption would make an immediate and significant contribution to reducing the affordability gap; at least part of the fiscal loss could be balanced by increased economic activity and associated revenues downstream for the resultant enterprise activities. Programmes that address affordability gaps by providing direct subsidies to consumers are being implemented in other countries including the CIZO programme in Togo (GSMA 2021) and could offer lessons for Mozambique. In addition, development partners could explore scaling up existing RBF programmes to incentivize private-sector expansion in harder-to-reach areas – for example, by adapting an approach piloted in the Kenyan KOSAP programme, which provides grants to offset high distribution costs in remote areas.

VIETNAM

The private sector for ICS remains small and lacks access to finance. Supply-side support, including grants, RBF mechanisms that encourage firms to expand into harder-to-reach areas[17] and working capital facilities are necessary. To address consumer affordability challenges (which are less severe than in Ghana and Mozambique), development partners should consider supporting the rollout of more PAYG models for clean fuels and investigate developing consumer finance options for ICS users. There is also a need to expand access to carbon credits by supporting small manufacturers through technical assistance. The ICS affordability issue in Vietnam could be addressed with a single USD 40 million facility, which could be dispensed in the form of targeted demand-side subsidies for the 5 percent of the population unable to afford ICSs and RBF to companies, as noted above.

COMMON RECOMMENDATIONS

Across countries and technology solutions, achieving universal electricity and clean cooking access will require interventions through the finance value chain that are customized to local needs. Enterprise finance solutions will need to effectively combine the funding capacity, time horizons, risk tolerance, and capabilities of different types of funders or investors and map these clearly to private-sector needs and capacity. In all three countries, there remains a significant requirement for debt and equity to support the growth of firms and the associated expansion of energy access, alongside appropriately targeted grants as outlined above. Various combinations of grants, concessional capital, and risk-mitigation instruments, such as guarantees, will be needed for energy access investments that commercial investors consider risky. Carbon finance could play an important role in addressing Tier 4 clean cooking finance needs, as part of a portfolio of finance solutions, especially for transition with ethanol.[18] The feasibility of carbon finance mechanisms, which are nascent globally, is critically dependent on carbon prices that have thus far been variable and difficult to predict. These mechanisms also require complex and stringent monitoring and reporting to ensure proceeds are effectively deployed. Technical assistance to government and companies will be critical to the expansion of carbon finance.

[16] Ghana has leveraged demand-side subsidies in the past to increase access to the grid and to subsidize electricity tariffs; such mechanisms could be explored to address the SHS and clean cooking affordability challenges.
[17] Ethnic minorities who often speak different languages and live in isolated, hard-to-reach communities require additional investments including in translation, awareness campaigns, etc.

FIGURE 6
Key finance instruments and policy recommendations by country

	Country	Main recommendations
1	**Ghana**	**Electricity** • **Explore RBF programmes** to incentivize the private sector to reach lowest income households in harder-to-reach areas while addressing affordability. **Clean cooking** • **Execute on LPG strategy and incorporate into national clean cooking strategy** a pathway for "clean" fuels beyond LPG, support ICS sector with clear guidelines. • **Provide demand-side subsidies** (e.g., voucher programmes) to improve customer affordability – potentially with carbon finance proceeds. • **Support PAYG model expansion** for clean fuels and consumer finance options to improve customer affordability, including through R&D
2	**Mozambique**	• **Explore demand-side subsidies** programmes to address the USD 930 million affordability gap in electricity and clean cooking. • **Expand supply-side finance**, including catalytic grants to encourage market entrance and RBF to incentivize expansion in last-mile areas. • **Remove import duty and VAT** for SHS products to improve affordability.
3	**Vietnam**	• **Build on prior results-based mechanisms** to encourage the private sector to expand in harder-to-reach areas and to serve ethnic minorities. • **Explore targeted demand-side subsidies** programme for households unable to afford ICS. • **Expand PAYG access and consumer finance options to improve customer affordability.**
4	**Cross-cutting**	• **Expand local debt and concessional finance** to the private sector – invest directly and in partnership with **local financial institution**s. • **Expand access to carbon credits through government carbon schemes** that capture carbon proceeds and apply them to expand "clean" fuels. • **Develop coordinated electricity access, cooking access and climate change strategies.**[19] • **Explore financial instruments and policies** specifically targeting women that recognize the additional (and often unique) **legal and cultural barriers women face** in accessing finance; provide training and capacity-building support to incorporate gender lens in programme planning and design.

[18] Clean fuel costs amount to USD 32-40 billion in the three focus countries (USD 49–57 net of USD 17 billion in savings on charcoal fuel spending). This corresponds to USD 3.5–4.5 billion annually until 2030. Assuming a carbon credit price of USD 30 this represents 120 to 150 million carbon credits a year. Assuming each household can generate five credits per year, this requires transitioning 25 to 30 million households to clean fuels and providing them with a fuel subsidy. This corresponds to the 75 to 95 percent of households that will need support to transition to Tier 4 in the three focus countries by 2030.

[19] This coordination should be present across all actors (government, development partners and investors) and all dimensions including planning, financing, and private sector engagement.

Stakeholder-Specific Recommendations

FIGURE 7
Key recommendations for energy access stakeholders

Stakeholder	Recommendations	Country
Governments	**Address barriers that limit private sector participation:** For mini-grids, universal tariff, licenses; for SHS cost of doing business, duties and tariffs.	GH, MZ
	Define a national clean cooking strategy to address adoption and awareness with clear guidelines and measures. Coordinate across ministries and governing bodies to ensure that energy access is fully integrated within the wider development priorities.	MZ
	Define clear policy or regulatory environments where these are lacking, particularly with respect to mini-grids and LPG.	GH, MZ
	Consider demand-side and/or supply-side subsidy support and risk mitigation to address affordability and financing challenges, in coordination with development partners.	
Development partners	Collaborate with governments and other development partners in HICs to **allocate enough funds to ensure universal access**.	GH
	Pilot financing mechanisms including demand-side subsidies, carbon finance, impact bonds, etc. in specific contexts where existing tools may be insufficient.	GH, MZ, VT
	Support private-sector development through **additional finance**, including **RBF** to incentivize distribution in last-mile areas, and mechanisms to **support access to carbon finance**.	
	Expand **technical assistance efforts** to include private companies, particularly distributors and local financing institutions.	
	Support awareness campaigns to increase demand and adoption of clean cooking technologies.	
	Increase the number of 'scaling mini-grid' initiatives, where development partners support the implementation of the full set of required legal, regulatory and institutional improvements to enable the mini-grid sector to take off.	GH, MZ
	Support a national clean cooking strategy development process that leverages carbon finance as a tool for financing access to clean cooking.	GH, MZ, VT
Investors	Explore **risk-sharing mechanisms** with the local financial sector to provide affordable local currency funding.	GH, MZ, VT
	Assess how financial products could evolve to meet the needs of smaller, local companies.	
	Support smaller local companies with a combination of **seed funding and concessional debt.**	
	Explore aggregation modalities that can combine multiple smaller companies or projects with similar characteristics into a single, larger financing mechanism.	

Civil society organizations (CSOs)	**Advocate for the needs** of communities with governments, development partners, and investors; monitor energy access progress.	GH, MZ, VT
	Engage with communities to increase awareness, education, and information on clean cooking and electricity benefits to allow people to make informed choices.	
	Advise governments and stakeholders on gender-responsive energy sector planning and financing.	
All	**Explore financial instruments and policies** specifically targeting women that recognise the specific **barriers they face** in accessing finance for energy services.	GH, MZ, VT