

# Toolkit for the Moving Energy Initiative

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## Private-Sector Engagement The Key to Efficient, Effective Energy Access for Refugees



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# Contents

	Preface	2
	Summary	3
1	Introduction	5
2	Challenges Associated with Executing Energy Projects in Humanitarian Settings	6
3	Approaches for Managing the Challenges	8
4	Proposed Energy Delivery Models	20
5	Conclusions and Action Points	28
	About the Author	30
	Acknowledgments	31

## Preface

The Moving Energy Initiative (MEI) is a collaboration between GVEP International, Chatham House, Practical Action Consulting, the Norwegian Refugee Council (NRC) and the Office of the United Nations High Commissioner for Refugees (UNHCR). The initiative is supported by the UK Department for International Development (DFID). MEI seeks to meet the energy needs of the forcibly displaced in a manner that reduces costs; is safe, healthy and respectful; benefits host countries and communities; and also, where possible, creates opportunities for income generation and knowledge transfer to reduce energy poverty and improve sustainability.

This paper is one of a series of ‘toolkits’ developed by MEI partners. It has been written by Lindsay Van Landeghem of GVEP International, with copy-editing and production support from Chatham House. It offers guidance on the effective and efficient involvement of private-sector actors in providing energy solutions in forced displacement settings. It is aimed at implementers of energy interventions, and at policy decision-makers who identify priority needs and develop humanitarian budgets.

Many of the insights in this paper were generated via discussions with companies scaling up energy access in ‘base-of-the-pyramid’ communities. A list of companies engaged is included in the acknowledgments. This paper should be read in conjunction with other publications in the MEI series – *A Review of Cooking Systems for Humanitarian Settings* (Practical Action); *The Energy Situation in the Dadaab Refugee Camps, Kenya* (GVEP International); *The Energy Situation in Goudoubo Refugee Camp, Burkina Faso* (Practical Action Consulting); and the main report from the first phase of the project, *Heat, Light and Power for Refugees: Saving Lives, Reducing Costs* (Chatham House).

## Summary

Currently, energy interventions in forced displacement settings are largely developed and executed by humanitarian actors, though many of them have limited expertise in the development and management of cost-efficient and effective energy solutions. Private-sector actors that operate with the intention of generating profits could play a role in alleviating challenges associated with scaling up or optimizing energy access in refugee and internally displaced person (IDP) settings. Given their experience providing market-tested energy products and services – often in high-conflict, base-of-the-pyramid communities<sup>1</sup> – private-sector actors could add significant value in humanitarian settings.

To date, however, companies cite numerous issues associated with operating in refugee and IDP settings, including the following:

- Limited private-sector access to key humanitarian decision-makers and to refugee contexts;
- Limited access to energy-related data, impeding the development of reliable cost–benefit analyses;
- Risks associated with asset financing, given limited capital availability and short-term funding cycles within humanitarian organizations;
- Inconsistent procurement of the highest-quality energy solutions, including complementary services (e.g. maintenance, warranties);
- Issues associated with energy-asset optimization, given that assets are often owned and operated by non-energy experts; and
- Challenges associated with developing cost-efficient, effective supply chains in remote, insecure locations.

Private-sector actors also cite a number of innovations that could meet these challenges. Many of these strategies have been leveraged in base-of-the-pyramid communities, and are listed below:

- Employing rental and lease-to-own payment terms, thus reducing financing risks for large-scale energy solutions;
- Procuring portable energy infrastructure (e.g. mini-grids, solar farms) that can be repurposed by humanitarian or private-sector actors;
- Procuring energy as a service rather than purchasing a critical mass of products with limited supportive infrastructure (e.g. distribution/payment infrastructure, after-sales service);
- Developing local capacity that allows refugees and community members to perform customer sensitization and basic technical services in a cost-efficient manner;
- Utilizing remote-monitoring infrastructure, thus allowing companies to manage assets and pre-empt operational and maintenance issues;

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<sup>1</sup> The term ‘base-of-the-pyramid communities’ refers to the largest but poorest socio-economic group (numbering about 3 billion–4 billion people). The annual per capita earnings for this group are below the minimum considered necessary to maintain a decent life, i.e. less than \$1,500.

- Collecting energy data, perhaps via independent experts, thus allowing the private sector to develop business and financial models demonstrating the benefits of alternative technologies; and
- Setting up in-camp manufacturing facilities to reduce the costs associated with transporting products to remote, insecure locations.

Companies are interested in serving refugee and IDP populations despite the associated challenges, as they recognize a significant need and opportunity. In order to adequately assess the relevance of technology solutions in specific locations, however, private-sector actors require site-specific information, including:

- Current energy-access situation (e.g. grid-connected, generator access, no power source)
- Geographic location (e.g. urban, peri-urban, rural, remote)
- Energy-input availability (e.g. solar, wind accessibility)
- Anticipated longevity of operations (e.g. temporary, long-term site)<sup>2</sup>
- Political climate (e.g. stability, prevalence of corruption)
- Payment risk (e.g. buyer-capital availability, projected payment terms)
- Consumer needs and preferences (e.g. cooking preferences, power requirements)
- Supply-chain requirements (e.g. distribution, sensitization logistics)

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<sup>2</sup> Amare Egziabher, senior environmental coordinator at the UNHCR, notes that the longevity of operations will remain a challenge, as the length of refugees' stay in the host country depends on the political stability in their country of origin. Given that refugees currently remain displaced for an average of 17 years, he notes that one could comfortably assume a time frame of over 10 years for any potential investment in camps.

# 1. Introduction

Humanitarian and private-sector actors have noted that the private sector is well positioned to accelerate and improve energy access in refugee and internally displaced person (IDP) settings. Indeed, humanitarian actors have cited the need to move away from free handouts towards the development of sustainable business models, as well as a significant opportunity to reduce the overwhelming cost of diesel in refugee settings.<sup>3</sup>

Private-sector companies agree that they could play a critical role in this space, as they have the expertise and incentive to improve access to energy products and services, particularly within base-of-the-pyramid communities. They also note that significant cost and operational efficiencies could be achieved in such settings by shifting to alternative technologies and by optimizing energy-access supply chains.<sup>4</sup>

Though companies have been involved in large procurements within the humanitarian sector, they assert that they should be involved to a greater extent in on-the-ground implementation, so that energy solutions are effective and efficient. Larger companies could also facilitate the access of local entrepreneurs to cleaner, cheaper energy solutions. They could thereby support the growth of local, sustainable, clean-energy markets within refugee and host communities.

The private sector notes that the UNHCR and implementing NGOs also play a critical role in facilitating in-camp energy access, being well positioned to facilitate on-the-ground logistics, provide capital for large-scale infrastructure and subsidize products for capital-constrained households.<sup>5</sup>

Though private-sector and humanitarian actors note that public–private partnerships could be mutually beneficial, they agree that there are currently significant gaps in communication and collaboration between programme implementers and technical experts. They assert that the involvement of and collaboration between both parties is critical to the execution of a successful intervention.<sup>6</sup>

Section 2 of this paper outlines the numerous issues impeding the development and scaling up of energy interventions in refugee and IDP settings, including those associated with infrastructure management, data availability, decision-making, supply-chain risks, transportation costs, financing risks, sensitization and distribution, after-sales service, and risk management. The analysis systematically proposes solutions (Section 3), and provides case studies illustrating best practices. The analysis then delves into challenges and proposed solutions on a ‘per-technology’ basis (Section 4). This approach illustrates that numerous challenges must first be addressed at a macro level, while individual technologies should be considered on a ‘per-site’ basis.

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<sup>3</sup> Egziabher, A. (2015), remarks at the ‘Safe Access to Fuel and Energy (SAFE) Humanitarian Workshop’, Uganda, 27 July 2015.

<sup>4</sup> Telephone interview with Sam Dargan, founder and CEO, Great Lakes Energy, 11 March 2015.

<sup>5</sup> Telephone interview with David Small, managing director, East Africa, Envirofit, 16 March 2015.

<sup>6</sup> Jahangiri, V. (2015), remarks at the ‘Safe Access to Fuel and Energy (SAFE) Humanitarian Workshop’, Uganda, 27 July 2015. Jahangiri is deputy director of the International Lifeline Fund.

## 2. Challenges Associated with Executing Energy Projects in Humanitarian Settings

Several issues impede the execution of optimized energy interventions and the potential for private-sector engagement in refugee settings. They are listed in Table 1. This paper proposes solutions and best-practice case studies addressing some of these issues.

**Table 1: Overview of energy intervention challenges in refugee settings**

<p><b>Infrastructure management</b></p>	<p>Currently, large-scale energy assets are primarily purchased and owned by humanitarian actors. These agencies rarely have in-house energy experts, which limits their ability to operate and service energy assets efficiently.</p> <p>Private-sector actors have limited access to refugee camps, and limited incentive to maintain assets. At present, their stakes in asset ownership and management in displaced person settings are negligible.</p> <p>Year-long funding cycles limit the ability of humanitarian actors to invest in efficient, large-scale assets.</p>
<p><b>Limited data/information availability</b></p>	<p>Limited information regarding in-camp energy consumption and expenditure can impede the development of cost–benefit analyses.</p> <p>Limited data regarding end-user preferences can impede the development of end-user-friendly solutions.</p> <p>Limited data regarding consumer cash availability and purchasing preferences can impede the development of viable payment mechanisms.</p>
<p><b>Decision-making challenges</b></p>	<p>Private-sector actors have difficulties accessing humanitarian agencies with the authority to sign off on project implementation.</p> <p>Humanitarian agencies often have cumbersome decision-making processes, limiting efficient project implementation.</p> <p>High staff turnover in humanitarian agencies impedes the continuity of relationships with reliable product suppliers.</p> <p>Decision-making in humanitarian agencies can be ‘siloed’ (e.g. health; water, sanitation and hygiene; shelter), which limits private-sector engagement on a strategic level.</p>
<p><b>Procurement</b></p>	<p>There are few mechanisms for widely publicizing requests for proposals for energy products and solutions.</p> <p>Strict procurement processes limit the submission of bids from a broad range of potential suppliers.</p> <p>Pitching solutions to targeted humanitarian agencies can lead to a perception of favouritism when the solutions are selected.</p> <p>There is limited external clarity regarding the decision-making process for the selection of energy solutions.</p> <p>Procurement practices often favour low prices over other parameters, resulting in procurement of low-quality products.</p>
<p><b>Transportation</b></p>	<p>The remote locations of refugee/IDP communities can lead to high transportation costs.</p> <p>Insecurity in some refugee/IDP settings can lead to challenges associated with safe and cost-efficient transport.</p>

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<b>Financing</b>	<p>A lack of recognition of energy issues in the humanitarian system can lead to limited funding for interventions.</p> <p>Short-term funding cycles limit the ability of humanitarian agencies to invest in longer-term energy solutions.</p> <p>The limited alignment between those who bear the costs of fuel (i.e. in the case of UNHCR-run camps) and those who purchase and/or use it (i.e. implementing NGOs) reduces the incentive to cut fuel costs.</p> <p>Perceived difficulties with reallocating funding to other budget lines can limit incentives for camp administrators to save money on fuel consumption – especially consumption related to serving administrative needs, such as powering administration blocks etc.</p> <p>Humanitarian agencies and private-sector providers can have issues paying the ‘facilitation fees’ that are often requested when working with programme implementers or local communities in refugee/IDP settings.</p>
<b>Sensitization and distribution</b>	<p>Limited energy expertise in humanitarian agencies can lead to the procurement of ineffective technologies and the execution of inefficient supply chains.</p> <p>A limited baseline understanding of end-user needs and a lack of sensitization efforts can lead to problems in transitioning end-users to new solutions.</p> <p>The tradition of free distribution of products and services can lead to distorted market dynamics.</p> <p>The procurement of context-inappropriate products can lead to product breakage, abandonment or resale.</p> <p>Insecurity can limit on-the-ground distribution and sensitization efforts.</p> <p>Inadequate understanding of the energy access situation in host communities can lead to unintended consequences of product distribution (e.g. superior energy access for refugees/IDPs relative to local communities).</p>
<b>After-sales service</b>	<p>The procurement of inexpensive, poorly designed products can lead to product breakage.</p> <p>Limited in-camp technical expertise means there is little capacity to provide repair solutions.</p> <p>Products may be procured without warranties, or companies may lack capitalization to fulfil the warranties provided.</p> <p>After-sale service provision can be limited given the lack of an in-camp point person.</p>
<b>Risk management</b>	<p>Security risks can lead to financial and physical threats to programme implementers, impeding on-the-ground operations.</p> <p>There is a risk of asset damage or theft, given limited oversight by humanitarian agencies and limited buy-in from host communities.</p> <p>Investments in large-scale assets with longer repayment periods could be at risk if refugee camps are closed.</p>

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### 3. Approaches for Managing the Challenges

This section proposes ways in which the challenges impeding successful collaboration between humanitarian and private-sector actors – and thus the scaling up of energy access in refugee and IDP settings – might be addressed.

#### Introducing solutions at scale

Considering the global magnitude of population displacement, the actors responsible for facilitating energy access for refugees and IDPs should prioritize quickly scalable, context-relevant solutions. Companies can achieve cost and operational efficiencies only by operating at scale. They could justify an investment in on-the-ground distribution, sensitization and after-sales services, or in infrastructure supporting intervention success, if a viable business case exists. Technologies and supply-chain models should thus be tested, proven and scaled up in targeted locations so that the private sector can operate in refugee and IDP settings in an effective, profitable and sustainable manner. Differing local contexts and end-user needs also necessitate the implementation of varied solutions across camps.

#### Managing energy infrastructure

Improving energy access in displacement settings may entail reassigning responsibility for large-scale asset performance, optimization and efficiency to expert teams with the qualifications and incentives to operate and maintain energy solutions effectively. Large-scale assets include those providing energy to administrative or community centres, which are often powered by diesel generators. This approach could also remove the responsibility for purchasing and installing new equipment from humanitarian agencies. Different possible infrastructure management contracts could be tested to promote effective and efficient management of energy infrastructure in displacement settings. For most public-sector infrastructure, the most common allocation of responsibilities is as listed below:<sup>7</sup>

- Designing and building (D&B) – private
- Financing and owning (F&O) – public
- Operating and maintaining (O&M) – public

This structure works best when a public agency has the financial capacity to purchase and own the asset, as well as the technical expertise to operate and maintain it. Where the public agency does not have this financial capacity, the asset may not be built, which is a common explanation for underinvestment in public infrastructure. Where the public agency does not have relevant technical expertise, it can be at the mercy of private companies that have specified and supplied assets. For these reasons, alternative contract structures are sometimes used, and risks are allocated to the party best able to manage them. Such contract structures are as follows:

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<sup>7</sup>Personal correspondence with Ben Good, CEO, GVEP International, 11 August 2015.

- Design, Build, Operate (DBO) contracts: the public agency funds construction while design, operation and maintenance are contracted to the private sector.
- Build, Own, Operate (BOO) contracts: the D&B and O&M phases are contracted to the private sector, which also finances the asset.
- Build, Own, Operate, Transfer (BOOT) contracts: similar to the BOO contract, but ownership of the asset transfers to the public agency at the end of the contract.

Arrangements also exist wherein the private sector takes over existing assets, with or without the responsibility to repay the upfront investment. When the private sector takes on financing obligations, implicated costs can be recovered through fees earned over the life of the contract. If the private sector collects revenue, it typically does so via a tariff structure or a concession, usually agreed with a public agency. To incentivize the operator to optimize asset performance, contracts are often on the basis of fees for service, which may reward high service quality or high volumes of produced energy. Such mechanisms sometimes integrate a share in efficiency gains between operator and client. They also force all parties to evaluate carefully potential risks before signing a contract, which can be complex and may give reasons not to proceed. However, as risks always exist, it is often argued that time should be spent understanding associated risks. Issues that may feature in the contract discussions include:

- Longevity of operations
- Asset condition
- Volume/demand uncertainty
- Acts of God
- Acts of war or conflict
- Input costs (e.g. fuel)
- Currency risks
- Mechanisms for services, performance fees and cost-sharing
- Demand forecasting/operational planning arrangements
- Client obligations (provision of resources, facilities, etc.)
- Payment arrangements
- Contract oversight, governance and reporting arrangements
- Disputes and dispute resolution
- Breach and termination events, and consequences thereof
- Sustainability and emissions requirements
- Obligations for decommissioning and waste management

These issues become more or less significant depending on the extent to which contractors are required to finance assets, and on the extent to which compensation terms account for associated risks.

### Box 1: AFD and Sunref – managing infrastructure in Jordan

The French Development Agency (AFD) developed the Sustainable Use of Natural Resources and Energy Finance (Sunref) initiative, which loaned two Jordanian banks (CairoAmman Bank and Capital Bank) \$53 million for onward lending towards green investments.<sup>a</sup> Under the scheme, two schools received \$350,000 to install 67 kWp of solar photovoltaic (PV) power, and thereby reduced their energy consumption by 30.6 per cent and 33 per cent respectively. The schools saved almost \$55,000 in the first year of the programme. Furthermore, because the European Union returns 5 per cent of the amount loaned under Sunref investments, the schools will receive \$17,500 back on the investment. The payback period for the investment is estimated to be about 7.9 years.<sup>b</sup>

<sup>a</sup> Ghazal, M. (2014), 'French initiative to facilitate loans for green energy projects', *Jordan Times*, <http://www.jordantimes.com/news/local/french-initiative-facilitate-loans-green-energy-projects#sthash.zgNgSSYH.dpuf> (accessed 11 Mar. 2016).

<sup>b</sup> Sunref Jordan (undated), 'Two Amman Schools Save Almost a Third of Their Electricity Bills', Sunref Jordan, <http://sunrefjordan.com/en/two-amman-schools-save-almost-third-their-electricity-bills>, (accessed 11 Mar. 2016).

## Addressing the information gap

The private sector typically takes a market-based approach to providing products and services to end-users, which increases the likelihood that solutions will meet consumer needs and that supply-chain mechanisms will be optimized. Achieving this outcome requires a deep understanding of end-user requirements and market dynamics, which often entails conducting extensive on-the-ground assessments. In order to facilitate this market-based approach in displacement settings, the following mechanisms could be instituted:

- Executing sensitization sessions targeting humanitarian actors to promote awareness of technology and business model options, as well as of the pitfalls of selecting context-inappropriate solutions.
- Partnering with independent experts to conduct subject-specific analyses (e.g. market research, energy consumption and/or technology analytics), and sharing relevant data with potential product suppliers. Implicated costs could be covered by an external fund or shared with private-sector actors.
- Hiring long-term on-site staff or training national staff to provide institutional knowledge regarding the successes and failures of past projects.
- Developing a centralized database containing lessons learned from past energy interventions, so that best practices and potential pitfalls can be integrated or avoided in future energy projects.
- Developing case studies of bankable solutions from a technology, environmental and financial standpoint, and leveraging lessons generated to develop guidelines or tools informing future energy interventions.

### Box 2: Prakti's field-testing methodology

Prakti, a cookstove manufacturing company, recommends that enterprises conduct field tests in refugee camps to ensure that quality stoves are deployed. This process would entail the following steps:

- Submitting enterprise's profile (e.g. historical and proposed stove designs, manufacturing and distribution proposal);
- Conducting an in-camp design workshop facilitating multiple prototyping iterations;
- Developing two stoves and conducting a four-day 'controlled cooking test';
- Building 12 stoves and placing them in homes for testing;
- Evaluating stove performance, acceptability and durability over one month, meanwhile making needed design changes to stoves;
- Finalizing the stove design, conducting a final 'controlled cooking test' and submitting the stove for official testing and certification;
- Conducting a commercial pilot in collaboration with local distribution partner; and
- Selecting and training a final local distribution partner.

Prakti recommends that the test be conducted by the cookstove enterprise, though it should be monitored and reviewed by an independent third party to ensure that the relevant expertise is employed throughout the testing and iteration process.<sup>a</sup>

<sup>a</sup> Personal correspondence with Mouhsine Serrar, founder and CEO, Prakti, 2015.

## Improving procurement processes

Procurement within humanitarian agencies is often complex, and though the process is well documented in reports and guidelines, various issues can impede the efficient procurement of high-quality goods and services. For example, audits of UNHCR country operations indicate a wide variety of issues pertaining to how the procurement process is interpreted and applied, including the following:

- Lack of training and supervision of procurement staff (Democratic Republic of the Congo (DRC) 2013,<sup>8</sup> Kenya 2011,<sup>9</sup> Burkina Faso 2015);
- Inadequate monitoring of procurement by implementation partners (Kenya 2011, Kenya – Dadaab 2013<sup>10</sup>);
- Issues with vendor vetting and selection (Kenya 2011, South Sudan 2008,<sup>11</sup> Nigeria 2013,<sup>12</sup> DRC 2013, Tanzania 2013<sup>13</sup>);

<sup>8</sup> Office of Internal Oversight Services (2013), *Audit Report 2013/086: Audit of United Nations High Commissioner for Refugees (UNHCR) operations in the Democratic Republic of Congo*, New York, NY: Office of Internal Oversight Services, <https://oios.un.org/page/download/id/36>.

<sup>9</sup> Office of Internal Oversight Services (2011), *Audit Report: UNHCR local procurement activities in Kenya*, New York, NY: Office of Internal Oversight Services, [http://usun.state.gov/sites/default/files/organization\\_pdf/179499.pdf](http://usun.state.gov/sites/default/files/organization_pdf/179499.pdf).

<sup>10</sup> Office of Internal Oversight Services (2013), *Report 2013/139: Audit of security, asset management and procurement activities in the United Nations High Commissioner for Refugees sub office Dadaab in Kenya*, New York, NY: Office of Internal Oversight Services, <https://oios.un.org/page/download/id/88>.

<sup>11</sup> Office of Internal Oversight Services (2008), *Audit Report: UNHCR operations in South Sudan*, New York, NY: Office of Internal Oversight Services, [http://download.cabledrum.net/wikileaks\\_archive/file/un-oios/OIOS-20080925-01.pdf](http://download.cabledrum.net/wikileaks_archive/file/un-oios/OIOS-20080925-01.pdf).

<sup>12</sup> Office of Internal Oversight Services (2013), *Audit Report 2013/065 (Redacted): Audit of United Nations High Commissioner for Refugees operations in Nigeria*, New York, NY: Office of Internal Oversight Services, <https://oios.un.org/page/download/id/15>.

<sup>13</sup> Office of Internal Oversight Services (2013), *Audit Report 2013/128: Audit of financial, procurement and asset management in the United Nations High Commissioner for Refugees operations in Tanzania*, New York, NY: Office of Internal Oversight Services, <https://oios.un.org/page/download/id/81>.

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- Inconsistent application of procurement policy and guidelines (Kenya 2011, South Africa 2008,<sup>14</sup> Burkina Faso 2015,<sup>15</sup> Jordan 2015<sup>16</sup>);
  - Bypassing of competitive selection for suppliers (Jordan 2015);
  - Improper asset management (South Africa 2008, South Sudan 2008, Nigeria 2013, Tanzania 2013, Burkina Faso 2015); and
  - Lack of procurement strategy or plans (Jordan 2015).

The following opportunities thus exist to ensure that high-quality goods are procured in a more competitive fashion:

- Employing procurement solutions wherein tenders are widely available and competitive (all tenders could, for example, be listed on the UN Global Marketplace or on an alternative open-source procurement platform);
- Choosing appropriate procurement methods (invitation to bid, request for proposals, request for quotations); carefully selecting services, equipment, materials or a combination thereof; deciding on international, regional or local procurement options best suited for the specific energy requirement;
- Developing procurement guidelines that prioritize not only low prices, but also ensure the procurement of high-quality products, the provision of relevant services and a warranty;
- Ensuring that items are pre-tested and pre-approved by technical and supply-chain experts within UNHCR headquarters, and that individuals involved in the procurement of energy products liaise with energy staff to ensure the selection of high-quality solutions;
- Ensuring that all products are sanctioned by a pre-approved, local quality assurance agency to promote decentralized decision-making and the procurement of high-quality, local products;
- Ensuring that all lighting and cooking products, for example, are pre-approved by sector experts such as Lighting Global or the Global Alliance for Clean Cookstoves; and
- Mandating that all products undergo field-testing to prove the relevance of solutions in-context before large product batches are procured.

### Box 3: The SAFE Humanitarian Working Group

The Safe Access to Fuel and Energy (SAFE) Humanitarian Working Group, the Global Alliance for Clean Cookstoves (GACC), the United Nations Sustainable Energy 4 All (UN SE4All) initiative and Lighting Global are working with the UNHCR to develop procurement processes and technical specifications that will promote the procurement of reliable energy products.

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<sup>14</sup> Office of Internal Oversight Services (2008), *Audit Report: UNHCR operations in South Africa*, New York, NY: Office of Internal Oversight Services, [http://download.cabledrum.net/wikileaks\\_archive/file/un-oios/OIOS-20080714-01.pdf](http://download.cabledrum.net/wikileaks_archive/file/un-oios/OIOS-20080714-01.pdf).

<sup>15</sup> Office of Internal Oversight Services (2015), *Report 2015/008: Audit of the operation in Burkina Faso for the Office of the United Nations High Commissioner for Refugees*, New York, NY: Office of Internal Oversight Services, <https://oios.un.org/page/download/id/268>.

<sup>16</sup> Office of Internal Oversight Services (2015), *Report 2015/049: Audit of the operations in Jordan for the Office of the United Nations High Commissioner for Refugees*, New York, NY: Office of Internal Oversight Services, <https://oios.un.org/page/download/id/310>.

## Minimizing transportation costs

Given the remote location and insecurity of some displacement settings, product transportation can be cost-intensive and, at times, prohibitive. Mechanisms that may address this issue are as follows:

- Developing supply chains in which local inputs are predominantly or exclusively utilized (e.g. with a fuel supply chain, use locally available feedstock and production facilities);
  - Piggybacking off existing transportation infrastructure facilitated via local entrepreneurs, or via commercial or humanitarian actors;
- Taking into account in tendering the landed costs of delivered materials and fuel; and
- Coordinating where possible with UN convoys travelling to refugee camps to mitigate costs and to ensure safe transport.

The Dadaab-based PowerGen mini-grid was, for example, transported to its final location via UN convoys, ensuring the cost-efficiency and security of asset transportation.

## Developing appropriate payment mechanisms

The development of appropriate payment mechanisms is a major issue identified in refugee settings, as administrators often have one-year funding cycles that limit their ability to invest in large-scale, cost-efficient energy solutions. Additionally, there is a perception that displaced persons have limited access to income-generating activities, even though this may not be the reality, especially in longer-term settlements. Technology and financing innovations could lower barriers to procuring efficient, effective energy solutions in administrative, community-based and household settings.

### Administrative payment mechanisms

Currently, administrative energy consumption in refugee settings is largely served by generator sets, which consume significant amounts of diesel.<sup>17</sup> In the Dadaab refugee camps in Kenya, for example, approximately \$2.3 million is spent on diesel for camp administrators and operations each year.<sup>18</sup> There is thus a significant opportunity to acquire solutions that could produce energy in a cleaner, more cost-efficient fashion. However, the one-year funding cycles common within humanitarian agencies make it difficult for organizations to invest in large-scale, expensive assets with relatively long payback periods. Additionally, an investment in permanent energy assets may be problematic from a political perspective, given that many refugee camps are intended to be temporary. The following solutions could alleviate this issue:

- Introducing mobile assets (e.g. mobile farms) offered on a rental basis (e.g. weekly or monthly) to mitigate administrative payment risks.<sup>19</sup>
- Initiating power-purchase agreements with in-country energy providers to provide longer-term solutions, taking into account the fact that the average length of time spent as a refugee is 17 years.

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<sup>17</sup> Egziabher (2015), remarks.

<sup>18</sup> Lahn, G. and Grafham, O. (2015), *Heat, Light and Power for Refugees: Saving Lives, Reducing Costs*, Chatham House Report for the Moving Energy Initiative, London: Royal Institute of International Affairs, <https://www.chathamhouse.org/sites/files/chathamhouse/publications/research/20151117HeatLightPowerRefugeesMEILahnGrafham.pdf>.

<sup>19</sup> Telephone interview with Erwin Spolders, CEO, Redavia, 7 May 2015.

- Introducing revenue or rental guarantees that could be backed by a reliable counterparty, and considering instituting minimal and maximum load requirements and a six-month removal notice allowing owners to repurpose the asset efficiently.<sup>20</sup>
- Providing initial concessionary funding through donor capital, as it may be difficult to source private investment for a solution lacking a track record in refugee/IDP settings. Following proof of concept, solutions could be partially or entirely privately financed, and perhaps guaranteed via public funding.
- Financing of assets serving community centres (utilized by displaced persons and local communities) by local governments, international governments or humanitarian agencies.

### Box 4: Aggreko and Redavia – a potential larger-scale energy solution

Aggreko, a temporary power-generation company operating in more than 45 countries, could provide a centralized hybrid energy source in collaboration with a renewable-energy provider such as Redavia of Germany. The companies would own and install a movable asset that they would rent out to a camp's administration. The rental charge would include a standing charge for the equipment, as well as a fixed or consumption-based charge for metered energy consumption. Company staff could manage, maintain and insure the asset, optimizing its performance and minimizing payment risks for humanitarian actors.

## Local entrepreneur payment mechanisms

Community-based assets such as diesel generators, solar kiosks and biogas digesters could be owned and maintained by local entrepreneurs to promote local revenue generation and to ensure that local communities have the incentive to maintain community-based solutions. Given that the upfront costs of such solutions may be significant, different payment solutions could be used to facilitate local entrepreneur access to assets. Examples are listed below:

- Humanitarian actors could purchase the solution and employ community members to operate and maintain the asset.
- Private-sector actors could own and maintain a critical mass of community-based solutions, which they would be incentivized to operate and maintain.
- Private-sector or humanitarian actors could facilitate entrepreneur access to large-scale assets via rental, lease-purchase or franchise models.
- Local entrepreneurs could purchase the asset, perhaps facilitated by a local financial institution or humanitarian actors, and maintain and operate it.

### Box 5: Franchise modelling by African Renewable Energy Distributor, Rwanda

African Renewable Energy Distributor (ARED) has facilitated access to solar kiosks in refugee settings via a franchise model. Typically, entrepreneurs pay a franchise fee of \$700 over a 12-month period for a package that includes a solar kiosk, start-up capital for the sale of services, training, maintenance support and insurance. ARED maintains ownership of the kiosk, as entrepreneurs cannot afford to purchase the asset. ARED recovers the investment via alternative revenue streams, such as commissions from companies selling products via the entrepreneurs and monthly revenue generated via selling advertising space on the kiosk.

<sup>20</sup> Interview with Kennedy Omutanyi, general manager, Kenya, Aggreko, 24 July 2015.



### Household payment mechanisms

The humanitarian sector has historically distributed goods and services free of charge. This can disrupt markets within refugee and local communities. For example, refugees may resell products into local communities at prices below market value, thus undermining the development or viability of local enterprises. Additionally, if end-users are accustomed to receiving goods free of charge, they will be less likely to pay for products in the future, which undermines the entry of more cost-effective, sustainable distribution and financing mechanisms. Though the free dissemination of life-saving products may be critical in an emergency situation and to particularly vulnerable persons and families, the introduction of alternative payment mechanisms is generally preferable in a protracted displacement scenario. Examples of such mechanisms are as follows:

- Cash aid/vouchers: These facilitate access to capital for refugees/displaced persons, promoting freedom of investment selection. This mechanism assumes that individuals would be willing to pay for energy products when given the choice between a variety of levels of expenditure, meaning that products must fit consumer needs. Products should be priced so that they are competitive in-context.<sup>21</sup>
- In-kind payments: End-users can perform services (e.g. voluntary work) to access goods, which can be used to increase a sense of end-user ownership.<sup>22</sup>
- Community-based saving/lending: In some camps, refugees are able to generate income, though savings may be limited. Mechanisms can be put in place to facilitate savings so that community groups can purchase energy assets.<sup>23</sup>

In considering relevant payment mechanisms, implementers must abide by local labour standards. These can be prohibitively restrictive, especially if interventions depend on income-generating activities. Suggestions for alleviating such challenges are discussed in Box 6.

#### Box 6: Payment mechanisms in displacement settings in Jordan and Kenya

In 2014, the World Food Programme ended food distributions and introduced cash grants for refugees in Mole, in the Democratic Republic of the Congo. The UNHCR reports that these grants have helped create new economies, noting that ‘many refugees have been busy cultivating extra crops around the camp for sale in the market, while others have become traders’.<sup>a</sup>

In Zaatari, Jordan, refugees use pre-loaded UN-issued debit cards provided gratis by a Jordanian bank.<sup>b</sup> These allow refugees to access and participate in the growing Zaatari economy, and facilitate private-sector engagement in this setting. For example, the first private supermarket chain (Safeway) opened in January 2014.<sup>c</sup>

In an IDP camp near Nakuru, Kenya, individuals earning minimal wages allocate a certain amount of money to a savings pool on a monthly basis. When sufficient capital is aggregated, individuals are selected to receive goods (e.g. cookstoves). If selected individuals accrue personal savings as a result of this investment, as would be the case with a cookstove, they allocate more money to the pool on a monthly basis thereafter.<sup>d</sup>

<sup>a</sup> Schmitt, C. (2014), ‘Cash grants transform life in Congo camp for Central African Republic refugees’, UNHCR, <http://www.unhcr.org.uk/news-and-views/news-list/news-detail/article/cash-grants-transform-life-in-congo-camp-for-central-african-republic-refugees.html>.

<sup>b</sup> Gavlak, D. (2014), ‘Zaatari Syrian refugee camp fertile ground for small businesses’, BBC, <http://www.bbc.co.uk/news/world-middle-east-28541909>.

<sup>c</sup> Knell, Y. (2014), ‘Camp for Syrian refugees starts to look more like home’, BBC, <http://www.bbc.co.uk/news/world-middle-east-26565060>.

<sup>d</sup> Interview with David Small, 16 March 2015.

<sup>21</sup> Schmitt, C. (2014), ‘Cash Grants Transform Life in Congo Camp for Central African Republic Refugees’, UNHCR, 3 October 2014, <http://www.unhcr.org/542eb0ab9.html> (accessed 3 Aug. 2015).

<sup>22</sup> Interview with Sam Dargan, 11 March 2015.

<sup>23</sup> Interview with David Small, 16 March 2015.



## Navigating demand generation and distribution

The execution of effective demand generation and distribution mechanisms is essential for ensuring that end-users value products and understand how they are used. The following points could be taken into consideration when developing the relevant mechanisms:

- Free distribution to end-users should be minimized, except in emergency situations, as it can thereafter be prohibitively difficult to transition to more sustainable alternatives.
- Consumer willingness and ability to pay for products should be adequately understood before product prices or subsidies are introduced.
- If end-users do not generate income, in-kind payment mechanisms (e.g. vouchers, cash programming) could be introduced.
- Private-sector actors with the expertise and incentive to ensure effective product utilization may be best positioned to launch and manage marketing and distribution efforts.

### Box 7: Alternative payment mechanisms by Great Lakes Energy, Rwanda

For the Global BrightLight project in Kiziba refugee camp in Rwanda, Great Lakes Energy distributed Greenlight Planet solar lanterns to over 3,700 households. The UN would not allow refugees to pay for lanterns given the limited cash available to them, though it agreed that the lanterns should not be distributed for free. In order to receive the lanterns, therefore, refugees used a token demonstrating that they had contributed to the planting of 20,000 trees in the surrounding area. They then received a lantern, and the serial number for each one was registered to monitor theft or loss. Great Lakes Energy provided training for local leaders, addressing how and why to use the lanterns. Camp management expected a 30 per cent sell-on rate, i.e. that camp residents would receive and then resell the product, yet there was only a 0.6 per cent disappearance rate, indicating that consumers valued the solution.

## Executing operations, maintenance and after-sales services

After-sales service support is essential for ensuring the continued operation of energy solutions. The following options could be considered when accounting for this need:

- Ensuring the procurement and distribution of easily maintained and repairable solutions so that after-sales needs are minimal;
- Integrating remote monitoring or a tracking system that could monitor energy utilization, fuel consumption and system functionality for large-scale solutions, so that energy usage can be tracked and repairs can be executed proactively;
- Hiring and training camp residents to manage and maintain solutions in order to reduce the cost of transporting remotely based staff and to facilitate community buy-in, thus mitigating security risks;
- Linking remotely based companies with distributors, within the local or displaced persons' communities, that are prepared to service the warranty;
- Encouraging private-sector actors' investment in on-the-ground staff by ensuring the asset purchased or procurement/service contract is large enough; and
- Outsourcing the operations and management of energy assets to private-sector actors with the expertise and incentive to ensure asset functionality.

### Box 8: Maximizing energy savings with Giertsen in the Dadaab camps, Kenya

Giertsen, a Norwegian supplier of hybrid solutions in the Dadaab camps, noted that its solar water-pumping solution could generate savings of up to 50 per cent relative to existing diesel solutions. According to a Giertsen representative, however, the UNHCR is not maximizing the potential savings.<sup>a</sup> The UNHCR operates the pumps from 6 am to 8 am, when the energy from the sun is not at its maximum. Thus diesel consumption is being reduced by 40 per cent instead of 60 per cent. Private-sector management of such assets could optimize their performance.

<sup>a</sup> Interview with Bart van Ouytsel, VP Sales and BD Energy Solutions, Giertsen, 11 May 2015.

## Managing risks

Large-scale solutions are often expensive and are at risk of theft or damage. Thus, private-sector actors require the relevant insurance and/or indemnities.<sup>24</sup> Security measures should also be put in place to ensure the maintenance of energy solutions in refugee/IDP settings.

For small-scale solutions, mechanisms should be put in place allowing companies to manage the risks associated with product breakage. There should thus be on-the-ground contact persons in refugee camps, with whom product suppliers can liaise to determine whether there is a need for support services. Product suppliers should thereafter be able to provide relevant after-sales services in person, via trained local staff or via a customer service line.

### Box 9: d.light's warranty system in Nepal

Following the 2015 earthquake in Nepal, d.light worked with a local distributor to insert local warranty cards into solar lamps provided to internally displaced people. Local distributors then serviced the warranties for all recipients, allowing a remotely based solar-product company to ensure that malfunctioning products were effectively serviced and replaced.<sup>a</sup>

<sup>a</sup> Email correspondence with Kate Montgomery, director of global partnerships, d.light, 28 October 2015.

## Improving the regulatory environment

Whether a country has a regulatory climate that impedes or enables the success of energy interventions in displacement settings can make a significant difference to the success of an intervention. The following factors should be considered when assessing the regulatory landscape:

- Technology considerations: tax and tariff regimes, available subsidies and incentives.
- Operational infrastructure: employment regulations, land rights, capital/credit access, access to education.
- Regulatory environment: transparency and coordination among programmes and agencies.
- Political situation: host-country attitude towards displaced persons.

<sup>24</sup> Interview with Kennedy Omutanyi, 24 July 2015.

## Characteristics of restrictive environments

Limited capacity within host governments can lead to the inadequate development or implementation of enabling regulations and policies. This issue is particularly prevalent in developing countries, where a large proportion of the world's displaced populations are hosted and where governments are already struggling with policy and governance issues.

An example of this is highlighted in a study conducted by the Women's Refugee Commission in North Kivu, DRC. In this setting, the organization noted, access to alternative modern forms of energy was limited primarily by the government's struggles to 'implement appropriate sector regulation, promote and engage public and private investments to improve energy access, and establish an enabling environment for doing business that would encourage new initiatives'.<sup>25</sup>

Restrictive policies and regulations for refugees may also contribute to an adverse regulatory climate for private-sector engagement, as demonstrated by the example of Kenya's Refugee Act of 2006. This law restricts wage-earning employment for refugees, and also restricts refugees' movement outside the camps – especially when they do not have movement passes.

Such policies limit the extent to which displaced persons can take part in local economies, and they affect the private sector's ability to include displaced people in their business models as, for example, distributors or franchise owners.

## Characteristics of enabling environments

The policies of the host-country government are huge determinants of the regulatory climate, and may influence or skew the market in favour of or against particular energy technologies.

The relaxation of taxes and import duties and the introduction of feed-in tariffs may help to create an enabling environment for renewable energy. In Kenya, for example, the feed-in tariff policy specifically promotes the introduction or increased use of privately owned renewable-energy power plants or hybrid systems. Additional incentives include a waiver on the duty for imported power-generation equipment and tax breaks for investors. Two recent laws provide clear legal frameworks for the solar energy sector. All these measures, in addition to the existing tax incentives exempting solar products and other renewable-energy equipment from import duties and valued-added tax, create a favourable environment for solar solutions in Kenya.<sup>26</sup>

In Sudan, a government decree in 2000 subsidized liquefied petroleum gas (LPG) supply by 50 per cent and exempted LPG appliances from import duty taxes. LPG consumption thereafter went from less than 50,000 tons pre-2000 to over 250,000 tons in 2006.<sup>27</sup>

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<sup>25</sup> Women's Refugee Commission (2014), *Cooking in the Congo: Technical assessment of cooking fuel and stoves for displaced communities in North Kivu, Democratic Republic of Congo*, New York, NY: Women's Refugee Commission, <https://www.womensrefugeecommission.org/images/zdocs/Cooking-in-the-Congo-North-Kivu-Tech-Assess.pdf> (accessed 14 Jul. 2015).

<sup>26</sup> Owiro, D., Poquillon, G., Sivi Njonjo, K. and Oduor, C. (2015), *Situational Analysis of Energy Industry, Policy and Strategy for Kenya*, Nairobi: Institute of Economic Affairs.

<sup>27</sup> ProAct Network (2012), *Alternative Domestic Energy Options for Darfur – A Review*, report for the United Nations Environment Programme, Nyon: ProAct Network, [http://postconflict.unep.ch/publications/UNEP\\_Sudan\\_DAEP.pdf](http://postconflict.unep.ch/publications/UNEP_Sudan_DAEP.pdf) (accessed 20 Jul. 2015).

Facilitative regulations on refugees and their rights in host countries may also lead to dramatic gains, for example giving them access to private-sector business models. In Uganda, the Refugee Act of 2006 allows refugees to own and dispose of property, practise a profession, take up employment and move freely. Researchers have found that refugees have often made a positive contribution to Uganda's economy through trade, job creation for Ugandan nationals and the development of new technologies.<sup>28</sup>

In essence, in order to scale up access to energy solutions in refugee and IDP settings effectively, one must first understand and address potential challenges in the regulatory environment.

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<sup>28</sup> Betts, A., Bloom, L., Kaplan, J. and Omata, N. (2014), *Refugee Economies: Rethinking Popular Assumptions*, Oxford: Humanitarian Innovation Project, Refugee Studies Centre, University of Oxford, <http://www.rsc.ox.ac.uk/files/publications/other/refugee-economies-2014.pdf> (accessed 20 Jul. 2015).

## 4. Proposed Energy Delivery Models

Technologies that could scale up or optimize energy access in refugee and IDP settings have specific supply-chain requirements that must be considered when assessing the feasibility of solutions in-context. Examples of complications and potential solutions associated with various technologies can be considered within three categories: large-scale solutions, community-based solutions and household solutions.

The analysis demonstrates the importance of accounting for factors such as camp context, supply-chain mechanisms and risk mitigation before deciding on the relevant technologies and supply-chain mechanisms in specific locations. Solutions should therefore be pitched on a ‘per-camp’ or ‘per-context’ basis. Numerous proposals should be competitively sourced and assessed by technology and supply-chain experts, taking into account considerations such as those listed below.

### Large-scale solutions

Camp administrators primarily consume power produced by disaggregated diesel generators that are managed, maintained and fuelled by humanitarian actors. Assets may power administrative units or, in some cases, community centres. The problems with this arrangement include inefficient asset management and high diesel consumption, which could be addressed by introducing solutions such as those listed in Table 2.

**Table 2: Different types of energy solutions**

Alternative energy installations		
Proposed model	Complication	Potential solution
Hybrid diesel/ alternative energy (e.g. wind and solar) powering administrative blocks	<ul style="list-style-type: none"> <li>• High upfront costs.</li> <li>• Long repayment periods (often greater than two years) at odds with funding cycles (often one year).</li> <li>• Difficult to maintain when managed by non-energy experts.</li> <li>• High impact of theft/ damage due to value of infrastructure.</li> <li>• Regulatory restrictions on renewables in some jurisdictions.</li> <li>• Waste disposal can be challenging.</li> </ul>	<ul style="list-style-type: none"> <li>• Encourage shift to better technology with cost-benefit analyses drawing on diesel and energy expenditure data.</li> <li>• Use flexible solutions that can be removed or repurposed if camps close.</li> <li>• Reduce financial risks through hire-purchase or rental agreements that incentivize proper maintenance.</li> <li>• Ensure solutions are easy to clean and repair.</li> <li>• Adopt remote monitoring, using private-sector contractors, to pre-empt operational and maintenance problems.</li> <li>• Develop incentive structures and/or contracts to ensure that technical support is provided by administrative staff, locally trained technicians or the private sector.</li> <li>• If installation/revenue potential is large enough (e.g. 300 KW), provide on-site staff to maintain and repair solutions.</li> <li>• Introduce solutions in jurisdictions with lenient policies on targeted solutions.</li> <li>• Ensure costs related to battery recycling and other waste management are clearly calculated and integrated into system-management costs.</li> </ul>

Centralized diesel generators		
Proposed model	Complication	Potential solution
Large-scale, centralized diesel generators managed by energy experts	<ul style="list-style-type: none"> <li>• Diesel solutions are less effective than renewable-energy solutions for reducing energy costs and environmental impacts.</li> <li>• Centralized solutions may entail high infrastructure and distribution costs.</li> </ul>	<ul style="list-style-type: none"> <li>• Use hybrid diesel generators (solar or wind) to reduce fuel consumption and provide more consistent power supply.</li> <li>• Introduce clear fuel and oil containment and management protocols.</li> <li>• Optimize asset performance through private-sector management of the solution.</li> <li>• Conduct on-site assessments, using private-sector actors, to demonstrate advantages of alternative solution.</li> <li>• Hire experts to conduct side-by-side analysis of numerous large-scale asset proposals to ensure procurement of the best solution.</li> </ul>
Grid extension		
Proposed model	Complication	Potential solution
Grid extension to non-connected refugee communities	<ul style="list-style-type: none"> <li>• Grid distribution infrastructure is unwieldy and expensive.</li> <li>• Gives the appearance of longevity to a refugee population, creating political sensitivities.</li> <li>• Political issues may arise from favouring grid extension over local off-grid solutions.</li> <li>• Time-intensive, given the extensive political and resource mobilization required to execute grid-related projects.</li> <li>• May be more expensive than developing large-scale, stand-alone solutions.</li> </ul>	<ul style="list-style-type: none"> <li>• Use grid connections initially to power institutional and administrative units, to minimize the distribution infrastructure required.</li> <li>• Ensure that refugee and local communities gain access to grid.</li> <li>• Recruit humanitarian donors to subsidize grid extension or guarantee investment, in order to promote local and national government buy-in.</li> <li>• Develop timeline for grid extension alongside an assessment of the potential longevity of the refugee settlement.</li> <li>• Conduct cost-benefit analysis to ascertain the benefits of expanding the grid versus developing stand-alone solutions.</li> </ul>

## Community-based solutions

In refugee settings such as Dadaab in Kenya, community members and refugees sell products and services within the community. Business models include facilitating connections to diesel generators and selling solar lamps and cookstoves. Generators also often power community institutions such as schools, health clinics and boreholes. Solutions such as those shown in Tables 3 and 4 could thus be introduced to supplement or optimize existing energy assets.

**Table 3: Community-based lighting and power solutions**

Alternative energy installations			
Issue	Proposed model	Complication	Proposed solution
Diesel generators – an inefficient, expensive and environmentally harmful energy source – are predominately used to power camp infrastructure (e.g. schools and health centres) and local businesses.	Alternative energy solutions replace or supplement diesel generators at the administrative level, reducing diesel consumption and facilitating access to cleaner energy solutions (e.g. solar-powered water pumping, mini-grid and stand-alone charging solutions).	<ul style="list-style-type: none"> <li>Community-based solutions, such as mini-grids, often have a payback period of more than 1.5 years, exceeding the typical one-year humanitarian funding cycle.</li> <li>Distribution of infrastructure to disparate locations may be logistically and/or financially prohibitive.</li> <li>Solar-powered mini-grids may not provide power equivalent to that of a generator and thus may not meet end-user needs.</li> <li>Likelihood of theft or breakage can be particularly problematic for expensive infrastructure.</li> <li>End-users may overload the solution, causing the asset to malfunction.</li> <li>Camp administrators who manage solutions (e.g. solar-powered water pumps in Dadaab) may lack the expertise required to optimize energy-asset performance.</li> </ul>	<ul style="list-style-type: none"> <li>Introduce rental solutions to minimize payment risks for administrators and address mobility concerns.</li> <li>Develop the solution in a location with multiple energy assets to ensure cost-efficient distribution.</li> <li>Ensure the asset is in a location with adequate access to needed energy input (e.g. sun, wind).</li> <li>Ensure that the asset is tightly secured via locked infrastructure, protected by a reliable security team, or that other preventative measures are taken to secure it (e.g. locate solar panels on high masts).</li> <li>Hire/train community members to provide maintenance and security services, in order to manage costs and promote community buy-in.</li> <li>Integrate the asset in central, secure locations, such as administrative blocks.</li> <li>Engage private-sector actors to remotely monitor assets, which would improve operations and maintenance, save money for on-the-ground staff, and mitigate issues of non-expert operations and maintenance.</li> <li>If sufficient assets are procured, consider private-sector investment in locally based team.</li> </ul>
Local entrepreneurship (e.g. solar kiosks)			
Issue	Proposed model	Complication	Proposed solution
Household energy products (e.g. solar lamps, cookstoves) are often distributed via humanitarian agencies that provide limited consumer sensitization and after-sales support, reducing longevity of solution.	Local distribution (by refugees/local communities), allowing for local sensitization, provision of repair services and follow-up with product manufacturers.	<ul style="list-style-type: none"> <li>Working capital for products may not be available to entrepreneurs.</li> <li>If energy products and/or kiosks are offered on a pay-as-you-go, rental or franchise basis, entrepreneurs may need to be managed.</li> <li>Operational and financial difficulties may arise in relation to off-site management by private-sector actors.</li> </ul>	<ul style="list-style-type: none"> <li>Local NGOs/development financial institutions (DFIs) to provide working capital for products and/or kiosk infrastructure.</li> <li>Private-sector actors to provide favourable payment terms to entrepreneurs (e.g. by paying for products post-sale).</li> <li>Trained, incentivized humanitarian staff to manage kiosk payment and operational infrastructure.</li> <li>Kiosks to be introduced initially in locations accessible by kiosk managers (e.g. private-sector or administrative actors).</li> <li>Large number of assets to be procured, so that companies can justify investment in on-the-ground staff.</li> </ul>

**Table 4: Community-based cooking solutions**

Institutional cookstoves			
Issue	Proposed model	Complication	Proposed solution
High consumption of firewood may lead to local political tensions, violence against women who collect firewood, and degradation of the environment.	Institutional clean cookstoves (e.g. in school feeding programmes, health and community centres, refugee intake centres).	<ul style="list-style-type: none"> <li>• Maintenance issues (replacement parts may not be locally available and repairs may require a specialist).</li> <li>• Low adoption if the stove does not meet local cooking needs (e.g. inability to cook local dishes).</li> <li>• Cultural and societal issues related to shift from household to communal cooking.</li> <li>• Potential incompatibility of stoves with alternative fuels (resulting in continued high consumption of firewood).</li> </ul>	<ul style="list-style-type: none"> <li>• Keep replacement parts on site and train local technicians to conduct basic repairs.</li> <li>• Invest in on-site staff (which producer may justify if critical mass of stoves is procured).</li> <li>• Train and incentivize community members to operate and maintain the solution.</li> <li>• Conduct studies on local cooking habits to ensure that developed/procured stoves are an appropriate fit.</li> <li>• Introduce an initiative only in situations where communities are already cooking/eating communally.</li> <li>• Introduce stoves that use alternative fuels if production or import of such fuels is practical.</li> </ul>
Biogas			
Issue	Proposed model	Complication	Proposed solution
Centralized power for cooking, phone charging and lighting may be lacking. Existing diesel-powered solutions are expensive and relatively unclean.	Power small generators or cookstoves with biogas produced via a central repository of human waste.	<p>Past initiatives leveraging biogas in discrete refugee settings have been unsuccessful given the following factors:</p> <ul style="list-style-type: none"> <li>• Waste aggregation must be closely managed (mismanagement could have negative health implications) and requires significant operational infrastructure.</li> <li>• Significant maintenance services are required to prevent system failure.</li> <li>• In many cultures there is an aversion to cooking with fuel produced via human waste or to defecation in communal latrines.</li> <li>• Biogas requires water inputs, which may not be readily/sufficiently available in refugee settings.</li> <li>• Developing the piping necessary to facilitate gas access in households may be costly, and the development and maintenance of the infrastructure may require additional technical support.</li> </ul>	<ul style="list-style-type: none"> <li>• Ensure the private sector provides technical support or trains/manages local technicians.</li> <li>• Implement biogas solutions where there is no cultural aversion to human-waste-powered solutions or defecation in communal latrines.</li> <li>• Conduct sensitization sessions to mitigate aversion to the solution in some/all refugee camp communities.</li> <li>• Develop a closed-loop system wherein waste is transferred via piping.</li> <li>• Assess water availability in refugee scenarios, as well as the cost/operational implications of setting up the water-transfer value chain.</li> <li>• Introduce biogas solutions in situations in which communities cook food communally, and where minimal biogas piping is required.</li> <li>• Distribute biogas via bottles/low-pressure packaging.</li> </ul>



## Household solutions

Refugee households often have limited access to energy solutions, particularly those used for cooking, lighting and heating. This leads to sub-optimal cooking conditions, especially the utilization of the traditional three-stone fire, which compromises food quality, health and safety, and introduces issues associated with fuel consumption and collection. Compromised access to lighting limits the ability of children to complete schoolwork at night and of adults to continue employment and household activities after dark. Inefficient heating solutions can lead to energy overconsumption, resulting in increased pressure on grid connections and unnecessary utilization of fossil fuels. Therefore, several alternative household cooking, heating and lighting solutions are proposed in Tables 5–7.

**Table 5: Alternative household cooking, heating and lighting solutions**

Energy-efficient appliances			
Issue	Proposed model	Complication	Proposed solution
Displaced persons use a variety of appliances requiring electricity, and an influx of refugees can put significant pressure on energy infrastructure.	Introduce energy-efficient appliances to reduce pressure on energy infrastructure.	Many refugees already own appliances that are not energy-efficient and would likely be unwilling to switch, especially where alternatives have lower functionality and/or if individuals are required to purchase them.	<ul style="list-style-type: none"> <li>• Sensitize end-users regarding the benefits of using energy-efficient appliances, with a focus on incurred cost savings.</li> <li>• Include energy-efficiency appliances in an alternative energy provision package (e.g. in conjunction with solar home systems – via closed-loop infrastructure).</li> </ul>

**Table 6: Household lighting and power solutions**

Solar lamps			
Issue	Proposed model	Complication	Proposed solution
Limited access to lighting in households prevents adults from working and children from completing homework. The use of kerosene lanterns can be expensive and hazardous.	Distribute solar lamps using payment mechanisms such as vouchers and cash programming.	<ul style="list-style-type: none"> <li>• Procurement of cheap solutions results in distribution of low-quality lamps.</li> <li>• Limited technical expertise to fix solutions and limited capitalization on existing warranties, even for high-quality products, lead to a relatively high rate of breakage for lighting solutions.</li> <li>• If products are distributed free of charge, end-users may not value them, leading to misuse or resale.</li> <li>• Lamps can generate waste at the end of their product life.</li> </ul>	<ul style="list-style-type: none"> <li>• Ensure procurement of high-quality products.</li> <li>• Elect an in-camp individual as liaison between community members with broken products and companies that provide warranties.</li> <li>• Hire and train entrepreneurs to liaise between end-users and product suppliers.</li> <li>• Ensure community leaders and/or household heads are sensitized regarding why and how to use the lamps versus alternatives (e.g. kerosene lanterns).</li> <li>• Distribute products via payment mechanisms such as vouchers and cash programming to ensure that end-users value them.</li> <li>• Bundle products (e.g. solar lamps, cookstoves, non-energy products) to achieve supply-chain efficiencies.</li> <li>• Incentivize the handover of broken products for recycling or disposal.</li> </ul>

Solar home systems (SHS)			
Issue	Proposed model	Complication	Proposed solution
Households and entrepreneurs in displacement settings may require a significant amount of power (e.g. for refrigerators, televisions, space heaters).	Solar home systems (SHS) offer the potential for providing more extensive services.	<ul style="list-style-type: none"> <li>• SHS can be relatively expensive and pay-as-you-go mechanisms are often used, requiring end-users to pay for the solution on an incremental basis over time (e.g. every month for two years).</li> <li>• Infrastructure could prove problematic; camps may not exist for a significant period of time and/or refugees may not have access to sufficient capital on a continuous basis.</li> <li>• SHS customers must often be registered for mobile money platforms, which may not be readily available in refugee settings.</li> <li>• Requires on-the-ground staff to collect payments and provide maintenance services.</li> <li>• Is financially sustainable for private-sector actors only if a significant number of solutions are procured.</li> <li>• Humanitarian actors may not be best positioned to develop and manage the infrastructure needed to ensure success.</li> <li>• SHS may generate waste at the end of their product life.</li> </ul>	<ul style="list-style-type: none"> <li>• Conduct a grant-funded pilot to test the solution. Once proven, the solution could be scaled up.</li> <li>• Use private-sector actors to invest in on-the-ground staff to service solutions and manage payment infrastructure (depends on a significant number of solutions being procured).</li> <li>• Use humanitarian actors to purchase asset up front and manage payment and operational infrastructure.</li> <li>• Encourage humanitarian actors to communicate with remotely based private-sector actors to address technical issues, and/or to train on-the-ground staff in maintenance and repair.</li> <li>• Introduce alternative payment mechanisms in refugee settings, or advocate refugee admission to mobile money platforms.</li> <li>• Ensure systems are remotely monitored and shut off/taken back by private-sector or humanitarian actors if buyer ceases payment.</li> <li>• Enable private-sector actors to lease systems to administrators for the duration of the refugee camp, and later to take back and restore systems so that they can be repurposed.</li> <li>• Incentivize the handover of broken products for recycling or disposal.</li> </ul>

**Table 7: Household cooking solutions**

Energy-efficient cookstoves			
Issue	Proposed model	Complication	Proposed solution
Overconsumption of unclean fuels, especially firewood in limited supply, may lead to deforestation, local tensions over fuel access, violence against women collecting fuel, and respiratory illnesses from household air pollution.	Reduce firewood consumption through fuel-efficient cookstoves.	<ul style="list-style-type: none"> <li>• No one cookstove fits all cooking needs; designs need to be adjusted after in-camp testing.</li> <li>• Humanitarian actors often order relatively small batches on an infrequent basis, making it difficult for producers to justify high research and development costs for cookstoves.</li> <li>• Once ordered, stoves must be transported and stored appropriately to ensure functionality.</li> <li>• Stoves must be serviced properly to ensure short- and long-term functionality.</li> <li>• Low adoption of stoves and/or fuel stacking may not lead to reduced firewood consumption.</li> </ul>	<ul style="list-style-type: none"> <li>• Allow cookstove producers to conduct in-camp assessments of cooking solutions and supply-chain mechanisms.</li> <li>• Encourage humanitarian actors to select relevant cookstove providers on a competitive, transparent basis (after which a significant number of stoves are procured and distributed).</li> <li>• Involve private-sector actors in supply-chain development and execution to ensure high-quality dissemination.</li> <li>• Keep replacement parts on location and train local staff, members of local communities and/or refugees to conduct basic maintenance services.</li> <li>• Allow companies to invest in on-the-ground maintenance staff if enough stoves are procured.</li> </ul>
Alternative fuels			
Issue	Proposed model	Complication	Proposed solution
Overconsumption of unclean fuels, especially firewood in limited supply, may lead to deforestation, local tensions over fuel access, violence against women collecting fuel, and respiratory illnesses resulting from household air pollution.	Introduce alternative fuels (e.g. ethanol, LPG, briquettes) to reduce reliance on unclean fuels with limited availability.	<ul style="list-style-type: none"> <li>• Inputs needed to produce alternative fuels (e.g. charcoal dust, agricultural/human waste, sugar cane) may not be readily or consistently available, and transporting them from centralized locations may be expensive.</li> <li>• Some alternative fuels are compatible only with certain cookstoves. Compatible cookstoves must first be developed and sourced, and achieve uptake, before alternative fuels are introduced.</li> <li>• Developing a pricing strategy for alternative fuels may be difficult, especially if refugees/IDPs are paying little to nothing for fuel.</li> <li>• Ensuring a reliable supply chain for alternative fuels, especially in remote locations, may be financially and operationally challenging.</li> <li>• Shifting consumers from current fuels (e.g. wood) requires extensive sensitization.</li> </ul>	<ul style="list-style-type: none"> <li>• Determine which cookstoves are already being used and introduce an alternative fuel that is compatible with them.</li> <li>• Assess the type and amount of fuel input to be sourced within refugee camps, then work with the private sector to ascertain the potential supply chain.</li> <li>• Ascertain the cost of importing alternative fuels from an existing production location.</li> <li>• Distribute free or highly subsidized alternative fuel-compatible cookstoves; base fuel prices on prices of existing alternatives.</li> <li>• Publicize tenders to alternative-fuel producers. Tenders would be evaluated on feedstock reliability, technical capabilities, distribution infrastructure, marketing schema and pricing strategy.</li> </ul>

Agro-forestry			
Issue	Proposed model	Complication	Proposed solution
Overconsumption of unclean fuels, especially firewood in limited supply, may lead to deforestation, local tensions over fuel access, violence against women collecting fuel, and respiratory illnesses resulting from household air pollution.	Plant fast-growing, coppicing trees or plants to replace/supplement firewood or to produce charcoal.	<ul style="list-style-type: none"> <li>• Outputs may not be immediately available; trees/plants may require months or years to grow.</li> <li>• Certain trees may absorb a significant amount of water and could reduce the fertility of the land.</li> <li>• Land may be privately owned or infertile, thus limiting the potential for planting trees.</li> <li>• It may not be possible to meet demand, due to limited space, private ownership of some land, and operational or financial issues.</li> <li>• Premature and/or unsustainable harvesting of trees may occur given significant and immediate fuel needs.</li> </ul>	<ul style="list-style-type: none"> <li>• Invest in research to identify locally appropriate (and, ideally, indigenous) plants.</li> <li>• Conduct environmental assessment of affected areas and introduce context-appropriate crops.</li> <li>• Favour fast-growing plants that have proven potential as fuel inputs.</li> <li>• Ascertain ownership and fertility of land around refugee camps to determine the amount of land that could be used, at what cost and with what chance of success.</li> <li>• Develop favourable rental terms with local landowners to facilitate community buy-in.</li> <li>• Capitalize on incentives for conservation and fuel reduction (e.g. carbon credits) to promote stakeholder buy-in and financial sustainability.</li> </ul>

## 5. Conclusions and Action Points

Private-sector engagement models could be utilized to scale up energy access in displacement settings effectively and efficiently. The potential to operate in these settings constitutes a major opportunity for the private sector, as the number of refugees and IDPs forced from their homes by conflict is now approaching 60 million.<sup>29</sup> Local communities adjacent to refugee/IDP settings may also benefit from energy interventions there. Many private-sector actors, particularly those that already provide products and services to base-of-the-pyramid customers in emerging markets, recognize the opportunity and are eager to provide solutions in such settings despite the associated risks. They also assert that while the opportunity is of great interest, appropriate supply chains and safeguards must be implemented to protect them and camp administrators, as well as to ensure the quality and longevity of in-camp energy solutions.

The development of relevant energy access business models is technology-specific and site-specific, and thus relevant private-sector engagement and technology options should be considered on a case-by-case basis. In order to fully assess the relevance of targeted energy solutions in refugee contexts, private-sector actors must first have access to much more extensive information on in-camp realities, including energy consumption and expenditure habits, consumer behaviours and preferences, existing energy infrastructure logistics, and in-camp operational dynamics and risks. This approach is relevant whenever private-sector actors consider expansion into new markets.

Table 8 outlines general points that should be addressed in order to facilitate private-sector engagement and/or the development of efficient supply chains facilitating energy access in displacement settings.

**Table 8: Action points to ensure effective engagement of the private sector**

<b>Infrastructure management</b>	<p>Develop contracts that provide for the appropriate allocation of development, ownership, financing and operating obligations between humanitarian and private-sector actors, so that asset performance is optimized.</p> <p>Allow technology product and service providers to access refugee camps to conduct operational and service tasks to sustain and optimize energy-asset performance.</p> <p>Introduce payment mechanisms and technology services that mitigate payment risks for private-sector and humanitarian actors.</p>
<b>Limited data/information availability</b>	<p>Allow independent experts to conduct in-camp analyses to ascertain energy consumption and expenditure patterns, end-user preferences and consumer capital availability.</p> <p>Provide product suppliers with relevant data for the development of context-specific solutions.</p>

<sup>29</sup> UNHCR (2014), *UNHCR Global Trends, Forced Displacement in 2014*, Geneva: UNHCR, <http://unhcr.org/556725e69.html>.

<b>Decision-making challenges</b>	<p>Facilitate conversations between humanitarian and private-sector actors in order to catalyse potential opportunities for private-sector engagement in humanitarian settings.</p> <p>Streamline decision-making within humanitarian organizations so that high-impact solutions can be considered and implemented in a transparent and efficient manner – in particular, so that energy-related decision-making goes beyond a narrow, silo-based approach.</p> <p>Hire long-term energy staff in refugee settings, or remotely based staff who have oversight over energy projects across multiple camps, to develop institutional knowledge around best practices and potential pitfalls for energy interventions.</p>
<b>Procurement</b>	<p>Ensure that requisitions are optimally aligned with holistic requirements (e.g. to account for equipment, installation and after-sales requirements) and that energy solutions are sourced from appropriate markets (e.g. internationally, regionally or locally).</p> <p>Implement transparent, efficient procurement processes in which tenders are widely available, all procured products are quality assured, and decisions regarding products procured are defensible.</p> <p>Use mechanisms for widely publicizing energy-product requests for proposals.</p> <p>Expand energy expertise in humanitarian organizations so that context-appropriate technologies and supply-chain mechanisms can be appropriately vetted and implemented in refugee settings.</p>
<b>Transportation</b>	<p>Procure solutions at scale from vetted, proven suppliers to minimize transportation costs on a per-product basis.</p> <p>Produce or operate solutions locally, minimizing transportation costs for goods and services.</p> <p>Ensure that convoys transporting energy-related products and staff are protected by UN security forces to mitigate safety risks.</p>
<b>Financing</b>	<p>Continue advocacy on energy within the global cluster system under the Inter-Agency Standing Committee or the inter-agency coordinating body for humanitarian assistance.</p> <p>Introduce large-scale assets via rental terms and/or procure permanent assets, anticipating potentially repurposing them for the use of local communities.</p> <p>Align cost and savings incentives between the UNHCR and implementing NGOs so that expenditure on and consumption of fuel can be reduced.</p> <p>Introduce energy interventions in locations where ‘facilitation fees’ are negligible so that operations may be profitable.</p> <p>Facilitate administrative access to capital facilities (e.g. in the form of loan guarantees) to mitigate risks associated with investing in large-scale energy assets.</p>
<b>Sensitization and distribution</b>	<p>Outsource energy interventions to private-sector actors with the in-house expertise and incentive to ensure their optimization.</p> <p>Develop technical and business expertise within humanitarian organizations so that high-quality energy products are procured and efficient supply chains developed and maintained.</p> <p>Require proof that energy interventions are demand-driven and context-appropriate (e.g. via pilot results) before projects are implemented and/or scaled up.</p> <p>Reduce free distribution to the greatest extent possible (e.g. except in emergencies) and introduce innovative payment mechanisms for energy interventions (e.g. via cash programming, vouchers), so that consumers value the products received and sustainable supply chains are instituted.</p> <p>Ensure procurement of high-quality, context-appropriate energy goods and services.</p>
<b>After-sales service</b>	<p>Ensure procurement of high-quality goods.</p> <p>Develop in-camp technical expertise/capacity to repair solutions.</p> <p>Assign in-camp individuals to ensure the quality of energy products/services and waste management, and to serve as liaisons between end-users and private-sector actors providing relevant technical services and replacing/recycling defunct products.</p>
<b>Risk management</b>	<p>Ensure all energy solutions are protected by reliable security infrastructure and/or forces.</p> <p>Develop large-scale energy infrastructure in relatively protected parts of refugee camps (e.g. in administrative compounds).</p> <p>Ensure that solutions are insured and that revenue guarantees are in place to mitigate the risks associated with camp closure and lack of payment for energy assets.</p>

## About the Author

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## Acknowledgments

The author would like to thank Makena Ireri for her contribution to the research, and Divyesh Thakkar, Erwin Spolders, Kate Montgomery, Mouhsine Serrar and the UNHCR team in the Kenya office as well as Geneva for reviewing and providing feedback on this paper.

Many private-sector companies operating primarily – and in some cases exclusively – in base-of-the-pyramid communities in developing markets also offered valuable perspectives from their experiences in refugee and IDP settings. These include representatives from d.light, Sunlite, Greenlight planet, Great Lakes Energy, Illumination, Bboxx, Fenix International, Off-Grid Electric, Prakti, Burn, Envirofit, Ecozoom, UpEnergy, Potential Energy, InStove, BioLite, Firefly, Azimuth, Redavia, PowerGen, MGP, ARED, Sanivation, Green Bio Energy, GreenChar, Project Gaia, Global Supply Solutions Limited and Milio. These companies contributed significantly to this paper’s content by elaborating on their experiences operating in humanitarian settings, proposing solutions to challenges, and providing insight into supply-chain optimization mechanisms.



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Cover image: A Rohingya man operating a mobile phone and electric-battery charging business, in Sittwe, Rakhine State, Myanmar on 18 July 2015

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ISBN 978 1 78413 125 8

This publication is printed on recycled paper.

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