

# Private Sector Engagement

## The Key to Efficient, Effective Energy Access for Refugees

A toolkit for the Moving Energy Initiative

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# Introduction | Private sector engagement

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Currently, energy interventions in refugee settings are largely developed and executed by humanitarian actors, though many have limited in-house expertise regarding the development and management of cost-efficient and effective energy solutions. Private sector actors could thus play a role in alleviating challenges associated with scaling or optimizing energy access in refugee settings, given their value-additive experience and expertise providing appropriate, market-tested energy products and services, sometimes in high-conflict, base-of-the-pyramid communities.

# Introduction | Identified challenges

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- Limited private sector access to key humanitarian decision-makers and to refugee camps;
- Limited access to energy-related data in refugee settings, 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 supplemental services (i.e. maintenance, warranties);
- Issues associated with energy asset optimization given that assets are often owned and operated by non-energy experts;
- Challenges associated with developing cost-efficient, effective supply chains in remote, insecure locations.

# Introduction | Identified opportunities

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- Leverage rental and lease-to-own payment terms, alleviating financing risks for large-scale energy solutions;
- Procure portable energy infrastructure (i.e. mini-grids, solar farms) that can be repurposed by humanitarian or private sector actors;
- Develop local capacity such that refugees and community members can conduct customer sensitization and basic technical services in a cost-efficient and effective manner;
- Utilize remote monitoring infrastructure, allowing companies to manage assets and pre-empt operations and maintenance issues;
- Set up in-camp manufacturing facilities alleviating costs associated with transporting products to remote, insecure locations.



# Introduction | Site-specific information needed

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- Current energy access situation (i.e. grid connected, generator access, none);
- Geographic location (i.e. urban, peri-urban, remote);
- Energy input availability (i.e. solar, wind accessibility);
- Anticipated longevity of operations (i.e. temporary, long-term site);
- Political climate (i.e. stability, prevalence of corruption);
- Payment risk (i.e. buyer capital availability, projected payment terms);
- Consumer needs and preferences (i.e. cooking preferences, power needs);
- Supply chain requirements (i.e. distribution, sensitization logistics).





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# Identified challenges

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## Infrastructure Management

Currently, large-scale energy assets are primarily purchased and owned by humanitarian actors, which presents a number of challenges, including:

- Humanitarian actors rarely have in-house energy experts, limiting their ability to efficiently operate and service energy assets;
- Private sector actors have limited access to refugee camps and limited incentives to maintain assets given negligible stake in asset ownership;
- Humanitarian actors have a limited ability to invest in efficient, large-scale assets given longer-term repayment periods.

## Limited Data Availability

- Limited information regarding in-camp energy consumption and expenditure, impeding the development of accurate cost-benefit analyses;
- Limited data regarding end-user preferences, impeding the development of end-user friendly solutions;
- Limited data regarding consumer cash availability and purchasing preferences, impeding the development of viable payment mechanisms.

## Decision-making Challenges

- Difficulties accessing humanitarian actors who have the authority to sign off on project implementation;
- Extensive bureaucracy, limiting efficient decision-making in humanitarian settings.

## Procurement

- Lack of mechanisms for widely publicizing energy product requests for proposals;
- Strict procurement processes impeding bid submission by a broad range of potential suppliers;
- Issues with contract acquisition based on personal interactions with humanitarian actors;
- Issues with pitching solutions to targeted humanitarian actors, given a perception of favoritism if solutions are selected;
- Limited transparency regarding the decision-making process for energy solution selection.

## Transportation

- High transportation costs given the remote locations of targeted refugee communities;
- Challenges associated with safe, cost-efficient transport given insecurity in targeted refugee settings.

# Identified challenges

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## Financing

- Limited capital availability for energy interventions and solutions given lacking programmatic prioritization by humanitarian agencies.
- Limited humanitarian ability to invest in longer-term energy solutions given short-term funding cycles;
- Limited alignment between fuel purchaser (i.e. camp managers) and consumer (i.e. implementing NGOs) reducing incentive to cut fuel costs.
- Limited incentive to save money on administrative fuel consumption, as unused funding cannot be reallocated to other budget lines;
- Issues associated with “facilitation fee” payment when working with program implementers or local communities in refugee settings.

## Sensitization & Distribution

- Limited humanitarian energy expertise, leading to the procurement of ineffective technologies and the execution of inefficient supply chains;
- Issues transitioning end-users to introduced solutions, given limited baseline understanding of end-user needs and limited sensitization efforts;
- Distorted market dynamics given the historical free distribution of products and services;
- Issues pertaining to product breakage, abandonment, or resale when inappropriate products are procured (i.e. unreliable or expensive looking);
- Issues associated with insecurity, limiting on-the-ground distribution and sensitization efforts.

## After-Sales Service

- Issues with the procurement of inexpensive, poorly designed products, leading to product breakage;
- Limited in-camp technical expertise or capacity to repair solutions;
- Lacking in-camp point person to contact regarding after-sale service provision.

## Risk Management

- Security risks posing financial and physical threats to implementers, impeding on-the-ground operations.
- Risks associated with asset damage or theft given limited oversight by humanitarian actors / community buy-in;
- Risks associated with refugee camps closure, leading to payment risks for large-scale assets with longer repayment periods.

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# Introducing solutions at scale

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Considering the global magnitude of displacement, actors responsible for facilitating energy access for displaced populations should prioritize proven, quickly scalable solutions.

Indeed, companies can achieve cost and operational efficiencies only by operating at scale, and could justify an investment in on-the-ground distribution, sensitization, and after-sales teams, or infrastructure supporting intervention success, only in the case that sufficient products were procured.

Technologies and supply chain models should thus be tested, proven, and scaled up such that the private sector can operate in refugee settings in an effective, profitable, and sustainable manner.



# Infrastructure outsourcing

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Develop and test infrastructure management contracts mitigating humanitarian long-term financing responsibility and ensuring expert management of energy assets.

Examples include:

- Design, Build, Operate (DBO) Contracts: Public agency funds construction; design, operation & maintenance is 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: Like the BOO contract, though asset ownership transfers to the public agency at the end of the contract.

To incentivize operator to optimize asset performance, contracts may reward high quality service, or efficiency gains may be shared. Contractual terms would also account for potential risks (i.e. demand uncertainty, insecurity, breach of contract).



# Addressing the information gap

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The private sector typically takes a market-based approach to providing products and service to end-users, which requires understanding end-user requirements and market dynamics and thus conducting extensive on-the-ground assessments. In order to facilitate this market-based approach in refugee settings, the following mechanisms could be instituted:

- Execute sensitization sessions targeting humanitarian actors to promote awareness regarding technology and business model options, as well as the pitfalls of selecting a solution that is not context appropriate;
- Allow technology and business model experts to visit refugee settings and to pitch relevant in-context solutions, which could be vetted and selected by external experts;
- Hire experts into the humanitarian system that could conduct subject-specific analyses (i.e. market research, energy consumption, and / or technology analytics), and share relevant data with potential product suppliers.

# Improving procurement processes

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- Utilize transparent and competitive procurement processes, wherein tenders are widely available. All tenders could, for example, be listed on UNGM or on an alternative open-source procurement platform;
- Ensure that items are pre-tested and pre-approved by technical and supply chain experts within UNHCR headquarters;
- Ensure 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;
- Mandate that all individuals involved in procurement read a manual and/or attend a workshop addressing best practices and failures, citing existing energy interventions.





# Minimizing transportation costs

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- Initially launch energy interventions requiring continuous transport in less remote, relatively secure locations to develop a proof of concept for proposed supply chain;
- Develop supply chain wherein local inputs are predominantly or exclusively utilized (i.e. with a fuel supply chain, use locally-available feedstock and production facilities);
- Piggyback off of existing transportation infrastructure, facilitated via local entrepreneurs, commercial, or humanitarian actors;
- Coordinate with UN convoys travelling to refugee camps to mitigate costs and to ensure safe transport.

# Developing payment mechanisms | Administrative

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- Introducing mobile assets (i.e. mobile farms) offered on a rental basis (i.e. weekly or monthly) could mitigate administrative payment risks. Additionally, revenue or rental guarantees could be backed by a reliable counter-party, minimal and maximum load requirements may be instituted, and a 6-month removal notice could be instituted allowing owners to efficiently repurpose the asset;
- Donor capital may initially provide concessionary funding, as it may be difficult to source private investment for a solution lacking a track record in refugee settings. Following the proof of concept, solutions could be partially or entirely privately financed, and perhaps guaranteed via public funding;
- Assets serving local community centers utilized by refugees and local communities could be financed by local governments, international governments, or humanitarian agencies.



# Developing payment mechanisms | Entrepreneur

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 up-front costs of such solutions are not insignificant, a number of payment solutions could be utilized to facilitate local entrepreneur access to such assets, including:

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



# Developing payment mechanisms | Household

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- **Mechanism** | Cash Aid / Vouchers
- **Context** | Facilitate refugee access to capital, promoting freedom of investment selection. This mechanism assumes that refugees would be willing to pay for energy products when given the choice of a variety of expenditures, meaning that products must fit consumer needs. Products should also be priced such that they are competitive in context.
- **Mechanism** | In-Kind Payment
- **Context** | End-users can conduct services (i.e. voluntary work) to access goods, which can be used to increase a sense of end-user ownership.
- **Mechanism** | Community-Based Saving / Lending
- **Context** | In some camps, refugees are generating income, though savings may be limited. Mechanisms can be put in place to facilitate savings such that community groups can purchase energy assets.

# Demand generation and distribution

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- Free distribution to end-users should be minimized, 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 have no cash availability, in-kind payment mechanisms (i.e. vouchers, cash programming) could be introduced;
- Private sector actors, who have the expertise and incentives to ensure effective product utilization, may be best positioned to launch and manage marketing and distribution efforts.



# Operations, maintenance, and after-sales services

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- Ensure the procurement and distribution of easily maintained and reparable solutions such that after-sales needs are minimal;
- For large-scale solutions, integrate remotely monitoring such that energy usage can be monitored and repairs can be executed proactively;
- Camp residents could be hired and trained to manage and maintain solutions to reduce the cost of transporting remotely-based staff, and to facilitate community buy-in thus mitigating security risks;
- Private sector actors could justify an investment in on-the-ground staff if the asset purchased or procurement / service contract is large enough;
- Outsource the operations and management of energy assets to private sector actors with the expertise and incentives to ensure asset functionality.



# Managing risks

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Large-scale solutions are often expensive and are at risk of theft or damage. Thus, private sector actors call for the implementation of relevant insurance and / or indemnities. Securities should also be put in place to ensure the maintenance of energy solutions in refugee settings.

For small-scale solutions, mechanisms should be put in place allowing companies to manage risks associated with product breakage. There should thus be on-the-ground contacts 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 on-the-ground staff, or via a customer service line.

# Regulatory environment

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Whether a country has a regulatory climate that impedes or enables the success of energy interventions in refugee settings can make a significant difference in the success of an intervention. Thus, the following aspects should be considered when assessing regulatory climate friendliness:

- **Technology considerations** | Tax & tariff regimes, available subsidies and incentives;
- **Operational infrastructure** | Employment regulations, land rights, capital access;
- **Regulatory environment** | Transparency and coordination among programs and agencies;
- **Political situation** | Host-country attitude towards refugees.





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# Large-scale alternative energy installation | Large-scale solution

## Proposed Model

Hybridize diesel generators powering administrative blocks with alternative energy solutions (i.e. wind, solar), thereby introducing cost and energy efficiencies.

## Complication

- Solutions often have high up-front costs and long repayment periods (often exceeding two years). Refugee camp administrators balk at such financing requirements given that funding cycles are often one year and refugee camps are intended to be temporary.
- Effective asset operation and maintenance is required to ensure the long-term viability of solutions, which can be difficult to ensure when assets are being managed by non energy-experts.
- Large-scale energy infrastructure is valuable and thus the risk of theft or damage could have significant implications.
- Certain geographies may have regulatory restrictions pertaining to the importation and / or operation of renewable solutions.

## Potential Solution

- Aggregate diesel and energy expenditure data to develop cost-benefit analyses denoting the short- and long-term upside of the technology shift.
- Introduce solutions that can be removed or repurposed for local energy consumption in the case of camp closure.
- Introduce assets on a hire-purchase or rental basis so that payment risks are mitigated / operators are incentivized to operate and maintain assets.
- Provide easily cleaned / repairable solutions.
- Contract private sector actors to remotely monitor solutions so that operational and maintenance issues are proactively addressed.
- Introduce solutions in geographies with lenient policies relating to targeted solutions (i.e. Kenya has import duty and tax exemptions for solar PV products and other renewable energy equipment).

# Centralized diesel generators | Large-scale solution

## Proposed Model

Install large-scale, centralized diesel generators managed by energy experts to centralize operations, optimize asset performance, and reduce diesel consumption.

## Complication

- The continued utilization of diesel solutions may not reduce energy costs and negative environmental impacts to the extent that renewable energy solutions would.
- Refugee camps spread over large areas may require disaggregated solutions, as centralized solutions may require high infrastructure and distribution costs.

## Potential Solution

- Hybridize the diesel generators with solar or wind solutions to reduce fuel consumption. A renewable solution backed by diesel generator(s) could also ensure a more consistent power supply.
- Private sector management of the solution could ensure that the expertise and incentive is in place to optimize asset performance.
- Allow relevant private sector actors to conduct on-site assessments to demonstrate upside of introducing alternative solution.
- Hire experts to conduct side-by-side analyses of numerous large-scale asset proposals to ensure procurement of the best solution.

# Grid extension | Large-scale solution

## Proposed Model

Advocate for the extension of the grid to non-grid connected refugee communities.

## Complication

- Refugee camps can be spread over large areas, making grid distribution infrastructure unwieldy and expensive.
- Grid extension may be politically sensitive given that it gives an appearance of longevity of a refugee population.
- Political issues may arise regarding favoring grid extension for refugee populations over local, off-grid communities.
- Grid extension may be prohibitively time intensive, given the extensive political and resource mobilization required to execute grid-related projects.
- Extending the grid would likely be more expensive than developing large-scale, stand-alone solutions.

## Potential Solution

- Initially use grid connections to power institutional and administrative units to minimize the distribution infrastructure required.
- Ensure that both refugee and local communities gain access to grid.
- Humanitarian aid donors could subsidize the expansion of the grid or could guarantee the investment to promote local and national government buy-in.
- Develop potential timeline for grid extension alongside an assessment of the potential longevity of the refugee settlement.
- Conduct cost-benefit analysis to ascertain the benefits of expanding the grid versus developing stand-alone solutions.

# Alternative energy installation | Community-based solution

Issue	Proposed Model	Complication	Proposed Solution
<p>Boreholes, schools, and health centers in locations like Dadaab are powered predominately by diesel generators; local entrepreneurs also use generators to provide household connections and phone charging services. Diesel generators are, however, inefficient, expensive, and continued utilization can be harmful to the environment.</p>	<p>Alternative energy solutions could thus replace or supplement diesel generators used by boreholes / health centers / schools, or by entrepreneurs. Such solutions (i.e. solar-powered water pumping, mini-grid, and stand-alone charging solutions) could decrease administrative diesel consumption and could facilitate community access to cleaner solutions.</p>	<ul style="list-style-type: none"> <li>• Community-based solutions such as mini-grids often have a payback period of 1.5 or more years, which could pose issues given the typical one-year humanitarian funding cycle.</li> <li>• Distribution infrastructure to disparate locations can 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 be sufficient to meet end-user needs.</li> <li>• Locating a large-scale asset within the local community may increase the likelihood of theft or breakage.</li> <li>• End-users may overload the solutions, which could cause the asset to malfunction.</li> </ul>	<ul style="list-style-type: none"> <li>• Introduce rental solutions to minimize payment risks;</li> <li>• Develop solution in a location with multiple energy assets to ensure cost-efficient distribution.</li> <li>• Ensure that asset is in a location with adequate access to needed energy input (i.e. sun, wind).</li> <li>• Ensure asset is tightly secured, protected by a reliable security team, or that other preventative measures are taken to secure the asset (i.e. locate solar panels on high masts).</li> <li>• Private sector actors could remotely monitor asset and thereby preempt issues associated with operations and maintenance, save money on on-the-ground staff, and could mitigate issues associated with non-expert operations and maintenance.</li> <li>• If sufficient assets are procured, private sector actors may be able to justify an investment in a locally based team.</li> </ul>

# Local entrepreneurship | Community-based solution

Issue	Proposed Model	Complication	Proposed Solution
<p>Household energy products (i.e. cookstoves, lanterns) are often distributed via humanitarian actors, who often provide limited consumer sensitization and follow-on sales support. This reality limits the effectiveness and longevity of solutions.</p>	<p>Refugees and local community members could serve as distributors, could provide services such as phone charging, could sensitize local communities on solution utility, could provide repair services, and could liaise with product manufacturers to ensure that solutions are repaired / replaced.</p>	<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. This could pose difficulties from an operational and financing standpoint, as the private sector actors who often manage franchisees may not be located near refugee camps.</li></ul>	<ul style="list-style-type: none"><li>• Local NGOs / DFIs could provide working capital support for products and / or for the kiosk infrastructure.</li><li>• Private sector actors could provide favorable payment terms to entrepreneurs (i.e. entrepreneurs could pay for products post-sale).</li><li>• Trained, incentivized humanitarian staff could manage kiosk payment and operational infrastructure.</li><li>• Kiosks could initially be introduced only in locations accessible by kiosk managers (i.e. by private sector or administrative actors).</li><li>• A large number of assets could be procured such that companies could justify an investment in on-the-ground staff.</li></ul>

# Institutional cookstoves | Community-based solution

Issue	Proposed Model	Complication	Proposed Solution
<p>In locations such as Dadaab, the overconsumption of firewood causes major issues, such as political tensions between the local and refugee communities, violence against the women who collect firewood, and the degradation of the environment.</p>	<p>Provide institutional clean cookstoves to school feeding programs, community centers, health centers, refugee intake centers, or to any location in which food is consumed communally.</p>	<ul style="list-style-type: none"><li>• Potential issues associated with maintenance exist, as replacement parts may not be locally available and repairs may require a specialist.</li><li>• Populations typically use new cooking solutions only if solutions cook local dishes, which may require the development of specialized cookstoves.</li><li>• Cultural and societal issues associated with shifting from household to communal cooking may exist.</li><li>• Institutional cookstoves may not be compatible with alternative fuels, and thus may not reduce firewood consumption to the extent possible.</li></ul>	<ul style="list-style-type: none"><li>• Keep replacement parts on-site and train local technicians to conduct basic repairs.</li><li>• If a critical mass of institutional stoves is procured, the producer could potentially justify an investment in on-site staff.</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 fit local cooking needs.</li><li>• Introduce initiative only in situations in which communities are already cooking and eating communally.</li><li>• Introduce cookstoves that utilize alternative fuels.</li></ul>

# Biogas | Community-based solution

Issue	Proposed Model	Complication	Proposed Solution
<p>Communities often lack centralized power sources for cooking, phone charging, and lighting. Additionally, diesel powering existing solutions is often expensive and is a relatively unclean power source. .</p>	<p>Power small generators or cookstoves with biogas produced via central repository of human waste.</p>	<ul style="list-style-type: none"> <li>• Past initiatives leveraging biogas in discrete refugee settings have been unsuccessful given:               <ul style="list-style-type: none"> <li>• Waste aggregation must be closely managed, as it can require significant operational infrastructure to be carried out safely;</li> <li>• Significant maintenance services are required to prevent system failure;</li> <li>• Cultural aversion to cooking with fuel produced via human waste;</li> </ul> </li> <li>• Biogas requires water inputs, which may not be sufficiently available in refugee settings.</li> <li>• Developing the piping necessary to facilitate gas access in households may be cost intensive, and the development and maintenance of the implicated infrastructure could require additional technical support.</li> </ul>	<ul style="list-style-type: none"> <li>• Mitigate cultural aversion by identifying cultures / geographies that do not have an aversion to human waste-powered solutions, and implement biogas solutions only in those locations.</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 and operational implications of setting up the water transfer value chain.</li> <li>• Introduce biogas solutions in refugee situations in which communities cook food communally, and in which the biogas piping required is thus minimal.</li> <li>• Distribute biogas via bottles / low-pressure packaging.</li> </ul>



# Solar lanterns | Household solution

Issue	Proposed Model	Complication	Proposed Solution
<p>Households have limited access to lighting, which prohibits adults from working and children from completing homework after dark. Even households that have access to lighting often use kerosene lanterns, for which fuel is expensive and which can pose a fire hazard.</p>	<p>Distribute solar lanterns using payment mechanisms such as vouchers and cash programming.</p>	<ul style="list-style-type: none"><li>• The procurement of cheap solutions results in the distribution of low-quality lanterns.</li><li>• Limited technical expertise to fix solutions and limited capitalization on existing warranties, even for high quality products, leads to a relatively high rate of breakage for lighting solutions.</li><li>• In the case that products are distributed free of charge, end-users may not value products, leading to product mal-use or resale.</li></ul>	<ul style="list-style-type: none"><li>• Ensure procurement of high quality products.</li><li>• Elect in-camp individual (refugee or humanitarian staff) to serve as a point person between community members with broken products and companies that provide warranties.</li><li>• Alternatively, hire and train entrepreneurs to serve as liaisons between end-users and product suppliers.</li><li>• Ensure that community leaders and/or households heads are sensitized regarding how and why to use the lanterns, as opposed to alternatives (i.e. kerosene lanterns).</li><li>• Distribute products via payment mechanisms such as vouchers and cash programming to ensure that end-users value products.</li></ul>

# Efficient appliances | Household solution

Issue	Proposed Model	Complication	Proposed Solution
<p>Displaced persons may use a variety of appliances requiring electricity. The gradual increase in the number of appliances resulting from an influx of refugees in locations like Jordan can lead to significant pressure on energy infrastructure. .</p>	<p>Introduce energy efficient appliances to reduce pressure on energy generation infrastructure.</p>	<ul style="list-style-type: none"><li>• Many refugees already own appliances that may not be energy efficient and would likely be unwilling to switch, especially in the case that alternative appliances have lesser functionality and / or if individuals would be required to purchase new appliances.</li></ul>	<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, for example in conjunction with solar home systems (perhaps via closed loop infrastructure).</li></ul>

# Solar home systems | Household solution

Issue	Proposed Model	Complication	Proposed Solution
<p>Households and entrepreneurs may own assets that require large amounts of power (i.e. refrigerators, televisions, space heaters). In locations like Daadaab, such households are connected to diesel generators. In Jordan, households are connected to the grid; the influx of refugees has thus put significant pressure on the grid.</p>	<p>Existing solutions could be replaced or supplemented by cleaner, more efficient solutions, such as solar home systems. These solutions provide more extensive services than solar lanterns; larger solutions, for example, can power products as large as televisions, refrigerators, and heaters. Such solutions could also provide space heating in locations like Jordan.</p>	<ul style="list-style-type: none"> <li>• Solar home solutions can be relatively expensive and thus PAYG mechanisms are often utilized, requiring end-users to pay for the solution on an incremental basis over a certain period of time (i.e. every month for two years). Such infrastructure could prove problematic in a refugee setting, as 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>• Currently SHS customers often must be registered for mobile money, a service that may not be readily available in refugee settings.</li> <li>• The solution often requires on-the-ground staff to collect payments and to provide maintenance services. This provision would, however, only be a financially sustainable for a private sector actor in the case that a significant number of solutions were procured.</li> <li>• Humanitarian actors may not be best positioned to develop and manage the infrastructure necessary to ensure the success of this initiative.</li> </ul>	<ul style="list-style-type: none"> <li>• Conduct grant-funded pilot to test the solution; thereafter, scale up solution.</li> <li>• If a significant number of solutions were procured, private sector actors could justify an investment in on-the-ground staff to manage payment infrastructure.</li> <li>• Humanitarian actors could purchase the asset up front and could manage the payment and operational infrastructure. They could also reach out to remotely-based private sector actors to address technical issues and / or on-the-ground staff could be trained to maintain and repair the solutions.</li> <li>• Introduce alternative payment mechanism in refugee settings or advocate for refugee admission to mobile money platforms.</li> <li>• Systems could be remotely monitored and shut off / recollected by private sector or humanitarian actors if the buyer ceases payment.</li> <li>• Private sector actors could lease the systems to administrators for the duration of the refugee camp, and could thereafter recollect and restore systems such that they can be repurposed for other uses.</li> </ul>

# Household cooking solutions | Household solution

Issue	Proposed Model	Complication	Proposed Solution
<p>The overutilization of unclean fuels (especially firewood) can cause a number of major issues, including deforestation, tensions with the local community regarding fuel access, violence against the women collecting fuel, and an increase in respiratory illnesses resulting from indoor air pollution.</p>	<p>Reduce firewood consumption in locations like Dadaab by facilitating access to fuel-efficient cookstoves.</p>	<ul style="list-style-type: none"><li>• Not one stove fits all cooking needs; cookstoves may thus need to be tested and adjusted by designers after in-camp testing;</li><li>• NGOs / the UN 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 properly serviced in order to ensure long and short-term functionality.</li></ul>	<ul style="list-style-type: none"><li>• Allow multiple cookstove producers to conduct in-camp assessments, after which point they can pitch the supply or development of relevant cooking solutions.</li><li>• Humanitarian actors select relevant cookstove provider(s) on a competitive, transparent basis, after which point a significant number of stoves is procured;</li><li>• Involve private sector actors in the development of the supply chain to ensure high quality dissemination.</li><li>• House replacement parts on-location and train local staff, members of local communities, and / or refugees to conduct basic maintenance services.</li><li>• In the case that sufficient stoves are procured, companies may be able to justify an investment in on-the-ground maintenance staff.</li></ul>

# Alternative fuels | Household solution

Issue	Proposed Model	Complication	Proposed Solution
<p>The overutilization of unclean fuels (especially firewood) that is in limited supply can cause a number of major issues, including deforestation, tensions with the local community regarding fuel access, violence against the women collecting fuel, and an increase in respiratory illnesses resulting from indoor air pollution.</p>	<p>Introduce alternative fuels (i.e. ethanol, LPG, briquettes) to reduce reliance on unclean fuels in limited availability.</p>	<ul style="list-style-type: none"> <li>• The inputs needed to produce alternative fuels (i.e. 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 fuels are compatible only with certain cookstoves; fuel-compatible cookstoves must first be developed / sourced and achieve uptake before alternative fuels are introduced.</li> <li>• Developing a pricing strategy for alternative fuels may be difficult, especially if refugees are paying little to nothing for fuel.</li> <li>• Ensuring a reliable supply chain for alternative fuels, especially in a remote location, could be financially and operationally intensive.</li> <li>• Shifting consumers from current fuels (i.e. 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 existing solutions.</li> <li>• Assess type and amount of fuel input that could be sourced within refugee camp; thereafter work with private sector to ascertain potential supply chain.</li> <li>• Alternatively, ascertain cost of importing alternative fuels from an existing production location.</li> <li>• Distribute free / highly subsidized alternative fuel-compatible cookstoves; base fuel prices on prices being charged by illegal firewood traders (which accounts for a vast majority of the current firewood supply in Dadaab, for example).</li> <li>• Publicize tender to alternative fuel producers; tenders would be evaluated based on feedstock reliability, technical capabilities, distribution infrastructure, marketing schema, and pricing strategy.</li> </ul>

# Agro-forestry | Household solution

Issue	Proposed Model	Complication	Proposed Solution
<p>The overutilization of unclean fuels (especially firewood) that is in limited supply can cause a number of major issues, including deforestation, tensions with the local community regarding fuel access, violence against the women collecting fuel, and an increase in respiratory illnesses resulting from indoor air pollution.</p>	<p>Plant fast-growing, coppicing trees or plants that could replace or supplement firewood as a cooking fuel. This solution could reduce pressure on nearby forestry resources, ensuring more sustainable resource management. Private sector actors could invest in agro-forestry initiatives to contribute to the development of a fuel supply chain for fuel / cookstoves.</p>	<ul style="list-style-type: none"> <li>• Trees or plants may require months or years to grow; therefore, outputs may not be immediately available.</li> <li>• Certain trees could absorb a significant amount of water and could reduce the fertility of the land.</li> <li>• Land may be privately owned or infertile, limiting the potential of planting trees.</li> <li>• Because in-camp fuel needs are enormous, growing sufficient trees and plants to meet demand may be prohibitive from a space, operational, and / or financial perspective.</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>• Import grown or quickly growing plants that have proven potential as fuel inputs.</li> <li>• Conduct an environmental assessment in affected areas and introduce context-appropriate crops.</li> <li>• Couple reforestation with solar irrigation efforts in arid areas to improve plant output; this solution could also create an additional avenue for private sector involvement.</li> <li>• Ascertain the ownership and fertile nature of land surrounding refugee camps to determine the amount of land that could be used, at what cost, and with what chance of success.</li> <li>• Develop favorable rental terms with local landowners to facilitate community buy-in.</li> <li>• Capitalize on incentives for conservation and fuel reduction (i.e. carbon credits) to promote stakeholder buy-in and financial sustainability.</li> </ul>

Private sector actors consulted

Introduction

Identified challenges

Proposed approaches to challenge management

Proposed energy delivery models

Identified opportunities

# Identified opportunities

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## Infrastructure Management

- Develop contracts wherein development, ownership, financing, and operating obligations are allocated appropriately between humanitarian and private sector actors such that asset performance is optimized.
- Allow technology product and service providers to access refugee camps to conduct the operational and service tasks necessary to sustain and optimize energy asset performance.
- Introduce payment mechanisms and technology services that mitigate payment risks for private sector and humanitarian actors.

## Limited Data Availability

- Allow private sector actors to conduct in-camp analyses in order to ascertain energy consumption and expenditure patterns, end-user preferences, and consumer capital availability. Allowing actors to assess these factors in the targeted setting is critical to the development of a high-impact, sustainable energy intervention.

## Decision-Making Challenges

- Facilitate conversations between humanitarian and private sector actors in order to catalyze potential opportunities for private sector engagement in refugee settings.
- Streamline decision-making processes within humanitarian organizations such that high-impact solutions can be considered and implemented in a transparent and efficient fashion.

## Procurement

- Introduce mechanisms for widely publicizing energy product requests for proposals.
- Develop transparent, efficient procurement processes wherein RFPs are widely available, all procured products are quality assured, and decisions regarding products procured are defensible.
- Build out the energy expertise within humanitarian organizations such that context-appropriate technologies and supply chain mechanisms can be appropriately vetted and implemented in refugee settings.

## Transportation

- Procure large amounts of goods from vetted, proven suppliers to minimize transportation costs on a per-product basis.
- Produce or operate solutions locally, thus minimizing the transportation costs for goods or services.
- Ensure that convoys transporting energy-related products and staff are protected by UN security forces to mitigate safety risks.



# Identified opportunities

## Financing

- Introduce large-scale assets via rental terms and / or procure permanent assets, anticipating potentially repurposing them for the use of local communities.
- Align incentives between fuel purchasers (i.e. UNHCR) and end-users (i.e. implementing NGOs) such that expenditure on and consumption of fuel could be reduced.
- Introduce energy interventions in locations wherein “facilitation fees” are negligible, such that operations may be profitable.
- Facilitate administrative access to capital facilities, perhaps in the form of loan guarantees, to mitigate the risks associated with investing in large-scale energy assets.

## Sensitization & Distribution

- Outsource energy interventions to private sector actors with the in-house expertise and incentive to ensure the optimization of energy interventions.
- Develop technical and business expertise within humanitarian organizations, such that high quality energy products are procured and efficient supply chains are developed and maintained.
- Require proof that energy interventions are demand driven and context appropriate (i.e. via pilot results) before projects are implemented and / or scaled up.
- Ban free distribution except for when deemed absolutely necessary (i.e. post Nepal earthquake), and introduce innovative payment mechanisms for all energy interventions (i.e. via cash programming, vouchers) such that consumers value products received and that sustainable supply chains are instituted.
- Ensure the procurement of high-quality, context appropriate energy goods and services.
- Execute interventions in locations where implementing partners are able to operate effectively on the ground.

## After-Sales Service

- Ensure the procurement of high quality goods.
- Develop in-camp technical expertise / capacity to repair solutions.
- Assign in-camp point person to ensure the quality of energy products and services and to serve as a liaison between end-users and private sector actors that can provide relevant technical services and replace defunct products.

## Risk Management

- Implement energy interventions in locations in which security risks would not impede intervention success.
- Ensure that all energy solutions are protected by reliable security infrastructure and / or forces.
- Develop large-scale energy infrastructure in relatively protected parts of refugee camps;
- Ensure that solutions are insured and that revenue guarantees are in place to mitigate risks associated with camp closure and lacking payment for energy assets.

# Thank you

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