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WEBINAR SERIES



## Renewables for refugee settlements:

Sustainable energy access in humanitarian situations

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**TUESDAY, 28 APRIL 2020 • 10:00AM – 10:30AM CET**

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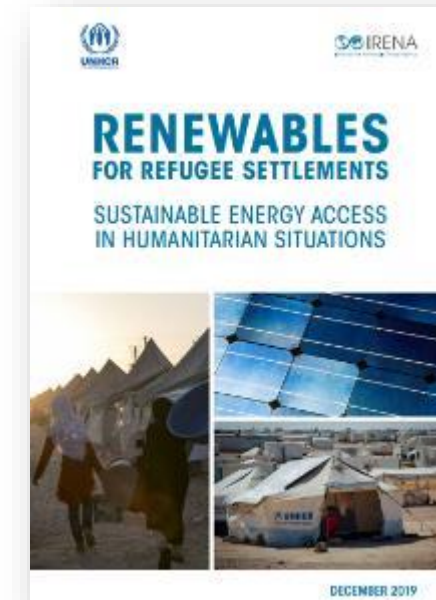
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# Introduction and background

- UNHCR's latest Global Trends Report: 70.8 million displaced people (25.9 million refugees and over half < 18 years of age)
- Most refugees depend on unsustainable energy resources that pose risks to their security and safety or lack access to basic modern energy services
- Access to clean and sustainable energy can deliver quick returns in humanitarian settings and significantly contribute to SDGs
- IRENA and UNHCR entered into an MoU to cooperate towards promoting the use, increased uptake and replicability of renewable energy solutions, as cost effective and environmentally sound options, in situations of displacement and other humanitarian settings.
- Under this framework, IRENA – jointly with UNHCR – released a study at the Global Refugee Forum in December 2019 to assess energy usage in four refugee camps in Iraq and Ethiopia and devise a blueprint for a more reliable and affordable energy supply through renewables
- Missions to the camps in Ethiopia and Iraq took place in September 2019



# Technology options considered for electricity

- **Solar lighting kits**

- Generally composed of solar PV panel, LED lamp, charge controller and battery



Solar lanterns charging at a school in Chuuk, Federated States of Micronesia

- **Standalone solutions /SHS**

- Typically consist of solar PV modules, batteries, charge controller and possibly inverter



School in Chuuk using standalone solar PV with battery storage

- **Solar water pumping**

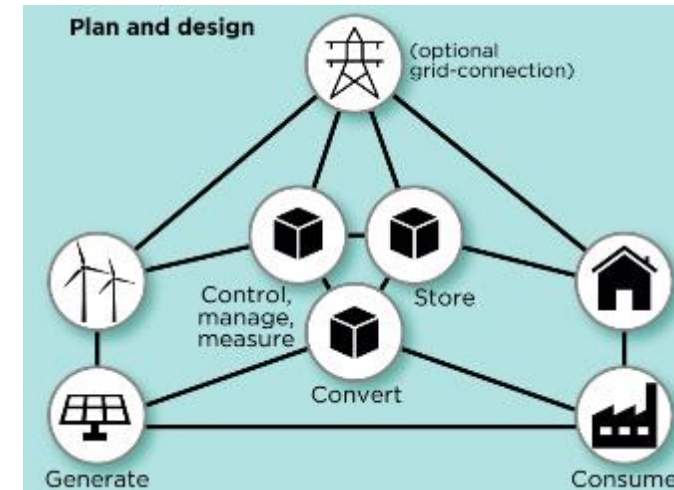
- Can provide reliable water supply, irrigation (if sufficient water is available), improved crop yields, increased income, reduction of fuel usage and improved food security. If combined with special pumps, batteries are not necessary



A solar plant installed at a borehole in Darashakran refugee camp (Iraq)

- **Mini-grids**

- One of the main options considered for the four settlements



Source: Based on IRENA (2016) Innovation Outlook: Renewable Mini-Grids

- **Grid connected renewables**

- Renewable generation can be combined with grid connection to offset electricity demand without having to invest in significant storage, where the grid is reliable

# Technology options considered for cooking

## ■ Ethanol

- Produced from crops with high starch and sugar content (e.g. sugar cane, corn and other sources of biomass)
- More efficient and less polluting as opposed to solid biomass when combusted for cooking
- Ethanol-fuelled stoves provide faster cooking and do not produce smoke or soot



Household kitchen in the Sherkole refugee settlement (Ethiopia)

## ■ Briquettes

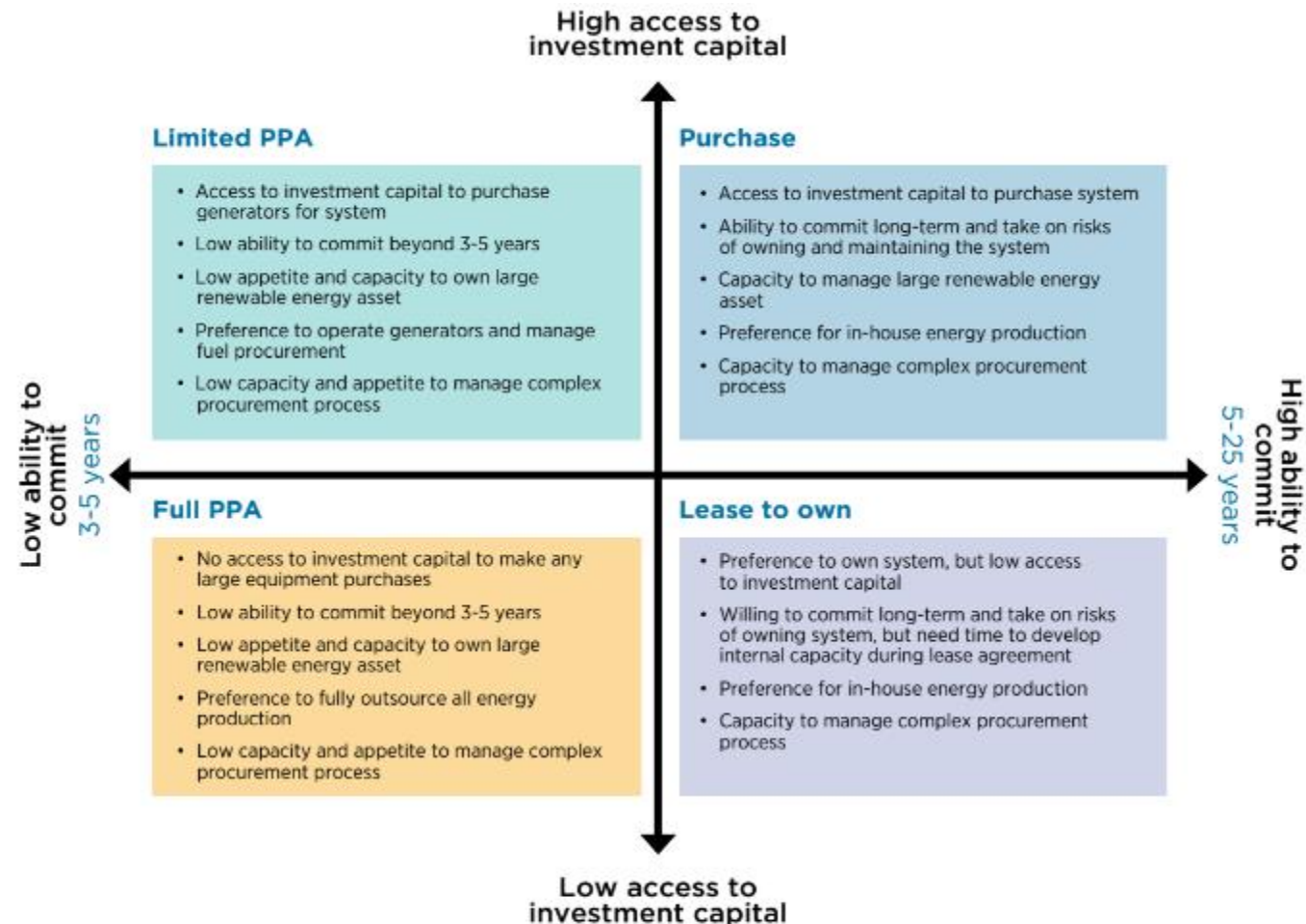
- Made by compressing dried woody biomass
- Briquettes are efficient to burn due to their low moisture content and to their high energy density
- They burn for a longer time and due to the low moisture they significantly reduce smoke
- Considered a renewable fuel source when produced from sustainable biomass resources



Traditional cook stove in the Sherkole refugee settlement (Ethiopia)

# Business models

- New business models increasingly becoming available for humanitarian organisations:
  - Leasing (organisations pay monthly fee for PV equipment)
  - PPA (organisations only pay for electricity produced)
  - PAYG (RE developer/company rents a SHS/solar kit to the user, providing basic energy services)
- Pay as you go (PAYG) models can be useful to provide refugees without access to electricity with SHS or lighting kits, in combination with cash-based assistance
- Other options that UNHCR may explore:
  - Mini-grids where excess power is sold to the grid
  - Public-private partnerships where UNHCR can be bulk buyer of electricity from RE installations that supply electricity to local settlement grid



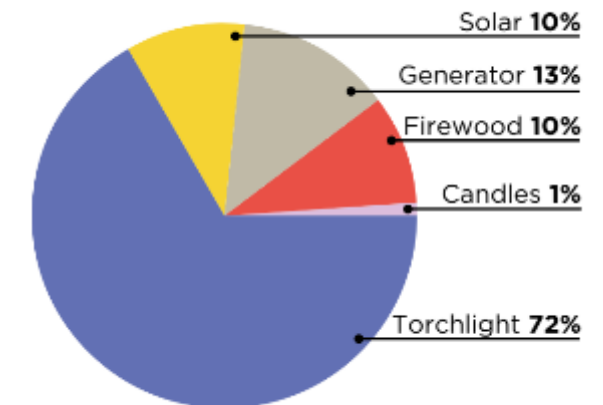
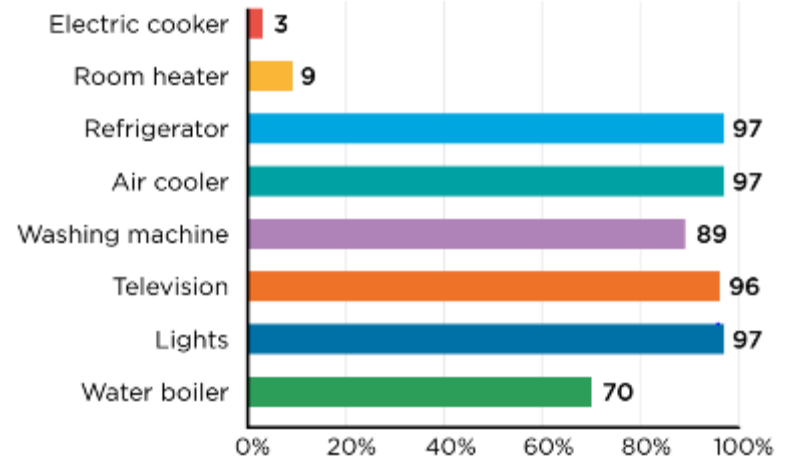
PPA= Power purchase agreement

Note: For the limited PPA, organisations will need access to investment capital to procure generators

Source: Kube Energy

# Key findings

- 1. The energy situation for refugees reflects the development level of the host community**
- 2. Brownouts and blackouts lead to over-reliance on expensive backup diesel generators in Iraq**
- 3. The lack of access to energy for cooking for refugees poses a risk for conflict with host community in Ethiopia**
- 4. Large potential benefits arise from increasing the use of renewable energy in refugee settings**
- 5. The lack of data limits the efficiency of electricity supply and is a barrier for moving to renewables**



Distribution of appliances in Domiz, Iraq (top) and main lighting source in Sherkole, Ethiopia (bottom)

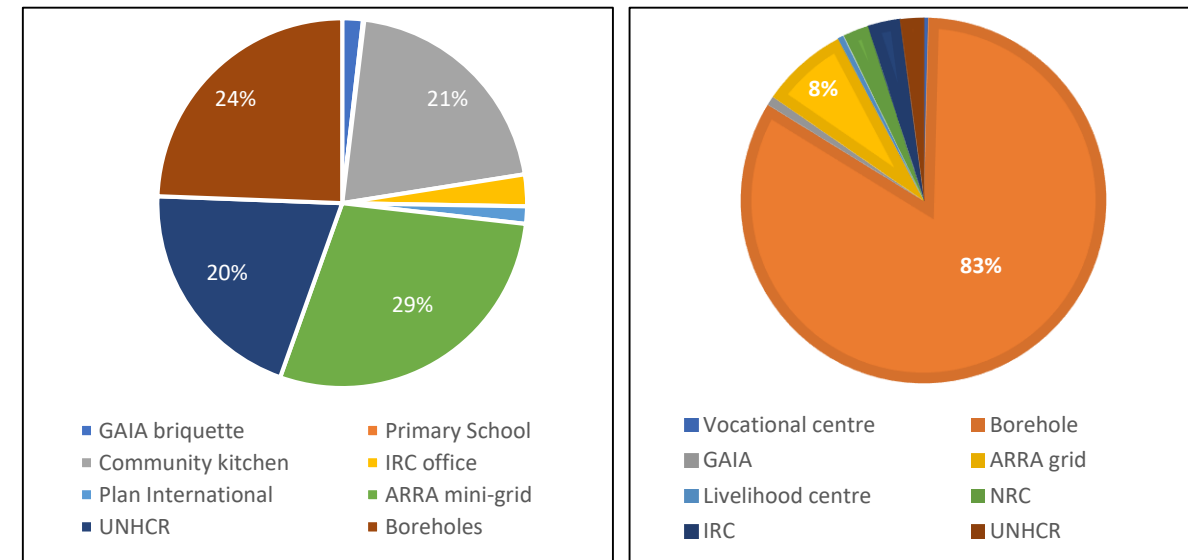


# Overview of refugee settlements

- **Darashakran, Iraq**
  - 40km north of Erbil (Kurdish region of Iraq)
  - Opened in 2013 and currently largest settlement in Erbil region ( $\approx 11,608$ )
- **Domiz 1 & 2, Iraq**
  - Adjacent to each other, 10 km outside Duhok (Kurdish region of Iraq)
  - Opened in 2012, combined population of 44,000 refugees (largest in Iraq)
- **Sherkole, Ethiopia**
  - 42 km north of Assosa on the Ethiopian border with Sudan
  - Established in 1997 and currently hosts  $\approx 10,619$  refugees
- **Tsore, Ethiopia**
  - 20 km north of Assosa on the Ethiopian border with Sudan
  - Established in 2015 and currently hosts  $\approx 14,153$  refugees



UNHCR refugee settlements in Iraq



Pie charts of the electricity use in Sherkole (left) and in Tsore (right)

# Recommendations for settlements in Iraq

1. Improve energy efficiency at the settlements
2. Continue to install renewables at community & support facilities
3. Discuss with local government the possibility of increasing transformer capacity
4. Install renewable power plants on the feeder lines to the settlements to compensate for the lack of electricity supply
5. Facilitate for any investments in infrastructure for the refugee settlement to take place in ways that reduces UNHCR's technical and financial risk
6. Push for meters to be installed at households in the Domiz settlements and for refugees to pay for the electricity similarly to the host community, on a kWh basis



6.6 MW solar PV installation in Domiz 1 (left) and a 2.5 MW solar PV installation in Domiz 2 (right)



Birdseye view of the powerhouse (in red) and available space (in blue)

# Recommendations for settlements in Ethiopia

1. Promote and support the use of fuel-efficient stoves in the settlement, which could reduce fuel use for cooking by around 30%
2. Consider a transition to a market-based approach for providing sustainable biomass for cooking in the settlements – for example, improved cook stoves that use briquettes or ethanol
3. Scale up forest plantations and rehabilitate land near the settlements
4. Establish a mini-grid in the settlements
5. Initiate market-based solar lamps access initiatives in the settlements to provide refugees with access to improved lighting as well as charging for small appliances such as phones and radios
6. Basing on a detailed protection-sensitive lighting needs assessment, increase the use of solar street lights to improve the lighting situation in the settlements
7. Apply for a grid connection for the settlements from Ethiopian Electric Power



A refugee tending a eucalyptus plantation in the Sherkole refugee settlement



Standalone solar system with containerised battery bank

# Conclusions






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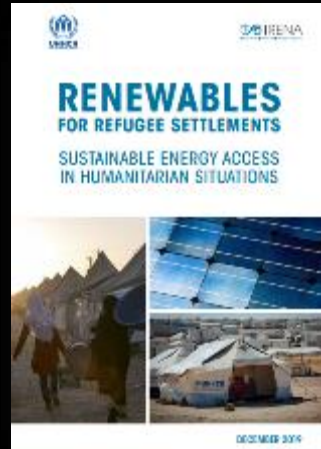
- More data needs to be collected to support decision-making on energy-related questions (this can lead to improvements in planning & operations of energy infrastructure)
- Energy loggers are crucial for humanitarian agencies and actors to properly measure and size appropriate renewable energy systems to provide the refugees with clean, reliable and cost-effective energy
- In Iraq, transitioning to a meter-based payment system for HH in the settlements could improve the availability and quality of electricity supply
- In Ethiopia, collecting data on HH income would be central in moving towards market-based cash assistance as a way to scale up the supply of energy for refugees
- The study has illustrated that there are considerable synergies to be gained from the collaboration between humanitarian organisations as UNHCR and specialised RE agencies as IRENA, in improving access to sustainable energy for refugees

Renewables are key  
for affordable, reliable,  
climate-safe access to  
modern energy services

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