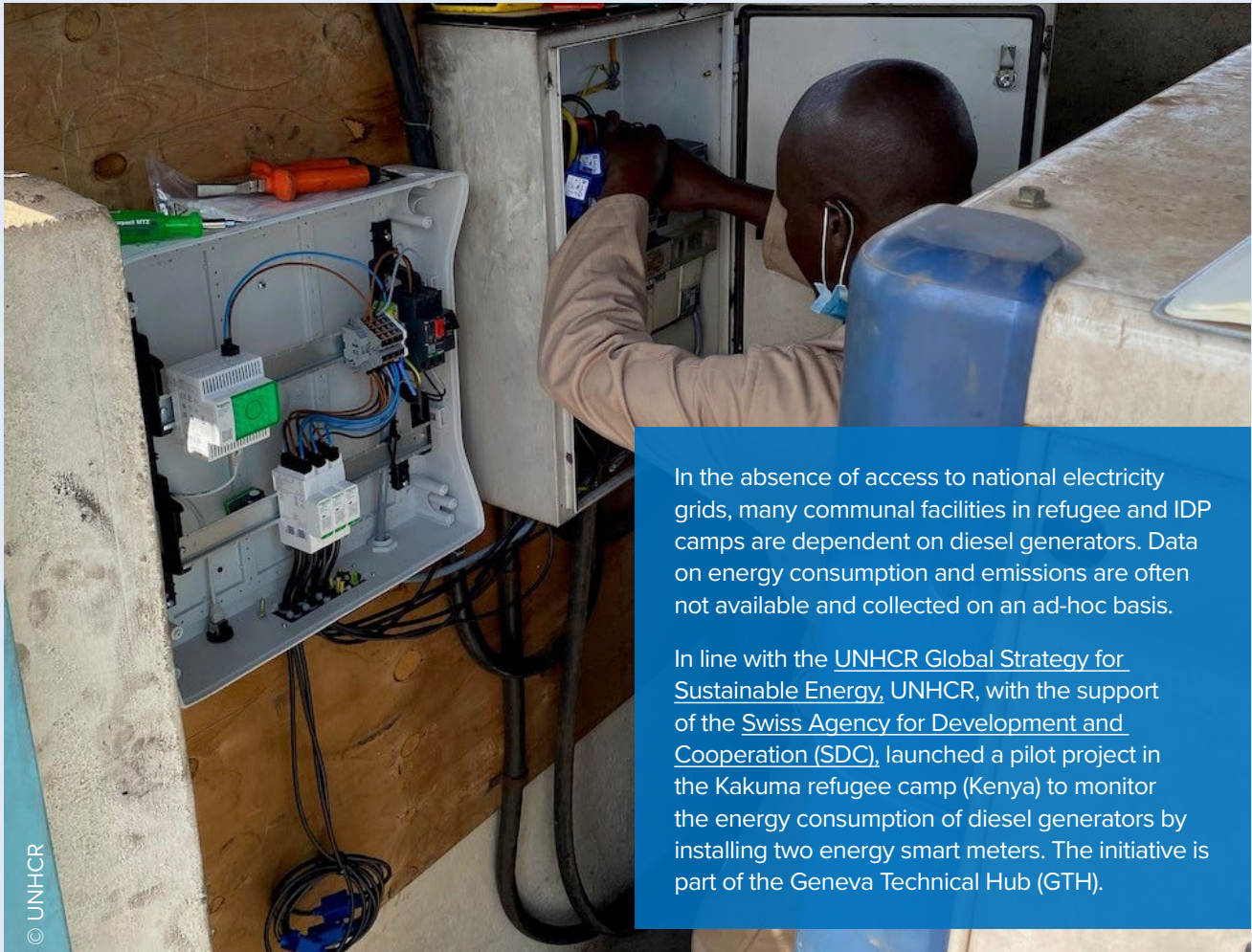


# SMART ENERGY METERS FOR REFUGEES' COMMUNITY FACILITIES



In the absence of access to national electricity grids, many communal facilities in refugee and IDP camps are dependent on diesel generators. Data on energy consumption and emissions are often not available and collected on an ad-hoc basis.

In line with the [UNHCR Global Strategy for Sustainable Energy](#), UNHCR, with the support of the [Swiss Agency for Development and Cooperation \(SDC\)](#), launched a pilot project in the Kakuma refugee camp (Kenya) to monitor the energy consumption of diesel generators by installing two energy smart meters. The initiative is part of the Geneva Technical Hub (GTH).

*Installation of a smart meter in Kalobeyei (Thomas Gross, UNHCR)*

## Project context: Kakuma, Kenya – energy access situation

Kakuma and Kalobeyei hold the second-largest in-formal settlement of Refugees in Kenya. Kakuma refugee camp is in the North-western region of Kenya. As of 18th March 2022, Kakuma camp and Kalobeyei Integrated Settlement had a population of 226,737 registered refugees and asylum-seekers.

Despite the robust economy in Kakuma and Kalobeyei, there is a lack of access to sustainable energy amongst the refugees: 93% of the households in Kakuma Refugee Camp and Kalobeyei Settlement do not have access to reliable electricity. Communal facilities, including schools,

health centers, registration centers and other support facilities are either powered by off-grid diesel generators or completely lack access to energy.

As of 2021, around 10% of communal facilities have access to sustainable energy in Kakuma and Kalobeyei. UNHCR started a programme to scale up renewable energy systems with the potential to provide 31 schools and 7 health facilities with improved access to electricity for around 69,000 students and over 150,000 patients respectively. The installed energy smart meters will support this project by providing reliable monitoring data on the facilities powered with diesel generators and informing the design of renewable energy systems.

## Results from pilot installation

With contributions and support from SDC, UNHCR installed two energy smart meters in two field posts in the Kakuma Camp and Kalobeyei Settlement.

For this pilot, two field posts were selected (Fieldpost 4 in Kakuma and Reception Centre in Kalobeyei). These facilities have a standalone diesel generator as the only source of energy. UNHCR is looking into the conversion of the two power systems to renewable energy for 2022 to reduce the environmental footprint and reduce the operating costs. The smart meters provide realtime monitoring and collect useful data on diesel fuel consumption.



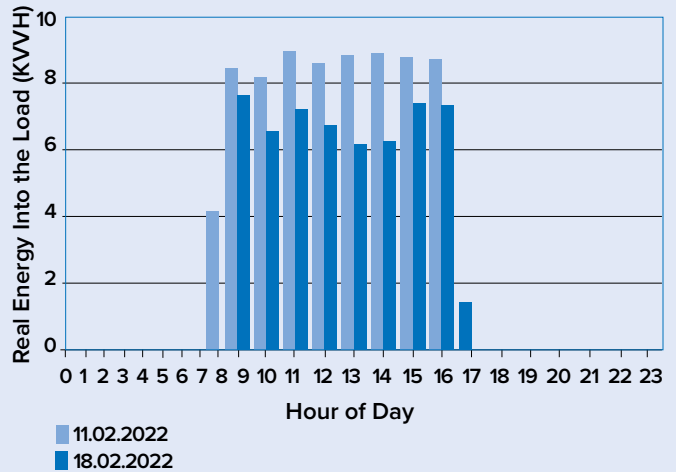
Diesel generator powering the field post in Kakuma camp

## The power of data

Smart meters allow real-time electrical measurements. Data are then analysed to get additional in-formation from the power production unit.

The sensors allow current, voltage and frequency per phase to be measured. Processed available data are, for example, power and energy. This data enables the operator to monitor the “health” status of the power generation system. The power and energy data are relevant – e.g. peak loads and the daily consumption patterns - to allow energy experts to input to the design of a future renewable energy system. As shown in the example below, the field-post requires energy supply only during working hours (8 am to 5 pm), and it requires between 8-10 kW of power (with a peak load of up to 14 kW), with an energy consumption of up to 100 kWh per day.

Daily power profile (kW)



## Smart Meter sensor technical concept

The installed smart meters are commercial-of-the-shelf products. They can be installed in a non-intrusive way.

The metering measuring device is based on the so-called Rogowski Coil. It is a toroid of wires measuring an alternating current through a cable encircled by the toroid. In a three-phase system, each phase is measured separately. Each coil is also directly connected to the respective phase to get the accurate sine curve from the measured phase. The three coils provide the measurements to a central data processing unit. This unit serves as short-term data storage and for communication with a server for remote access.

## Outlook

During the first phase, the project will verify the feasibility of the energy meters use in refugee settings, with the potential to scale-up to additional communal facilities in Kenya and in other refugees hosting countries. The long-term project objective is to equip UNHCR’s technical support to operations with a powerful tool to remotely track energy consumption and support the conversion of diesel generators to sustainable energy systems in line with UNHCR [Operational Strategy for Climate resilience and environmental sustainability](#).

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