Sharjah Humanitarian Campus UAE

IES partnered with the UAE Ministry of Energy and Infrastructure to explore the use of its innovative Intelligent Communities Lifecycle (ICL) digital twin technology to help create a net-zero or positive energy block (PEB) for a new development proposed by the UAE government.

SHARJAH HUMANITARIAN CAMPUS
UAE

SECTOR: ICL
DATE: September 2020
COUNTRY: UAE

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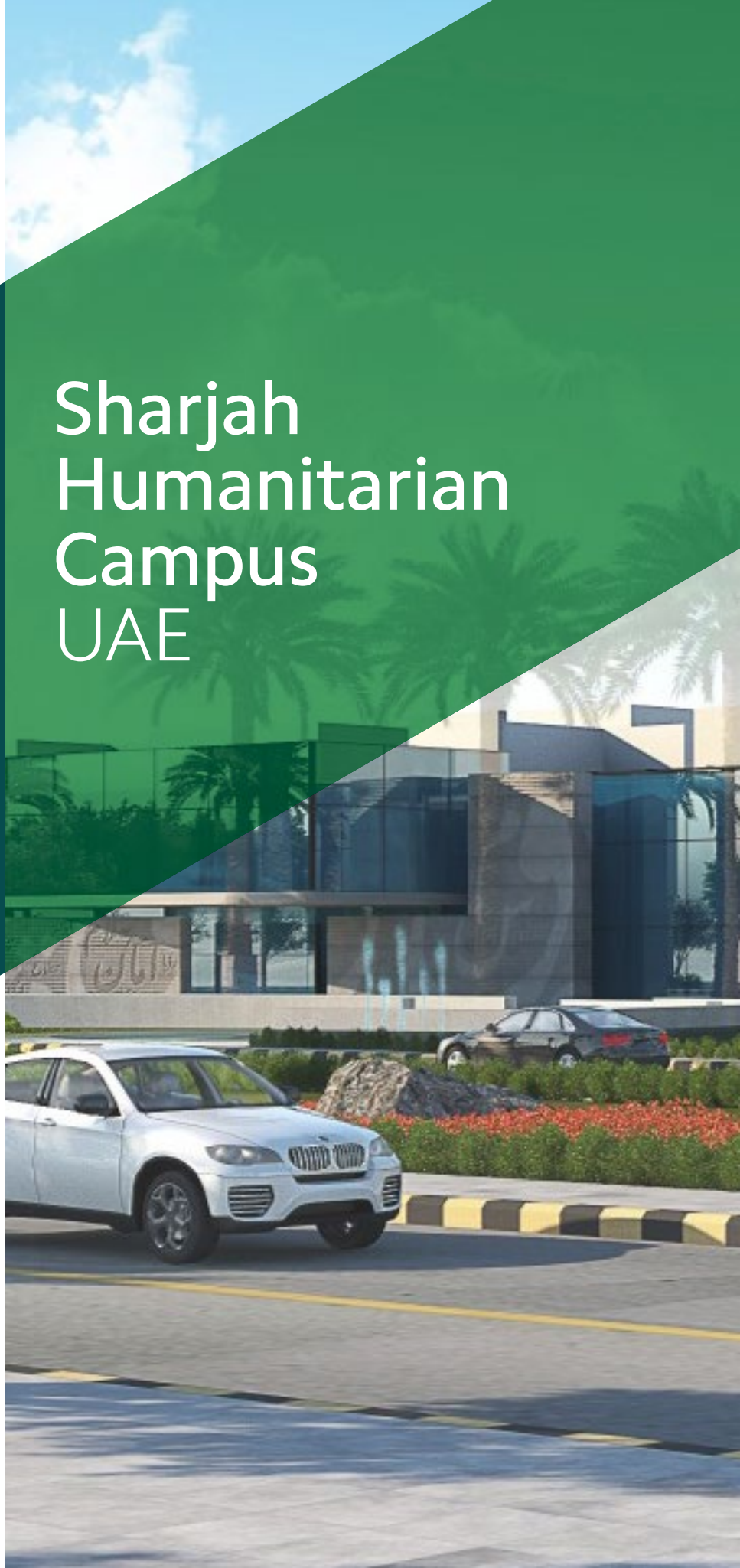
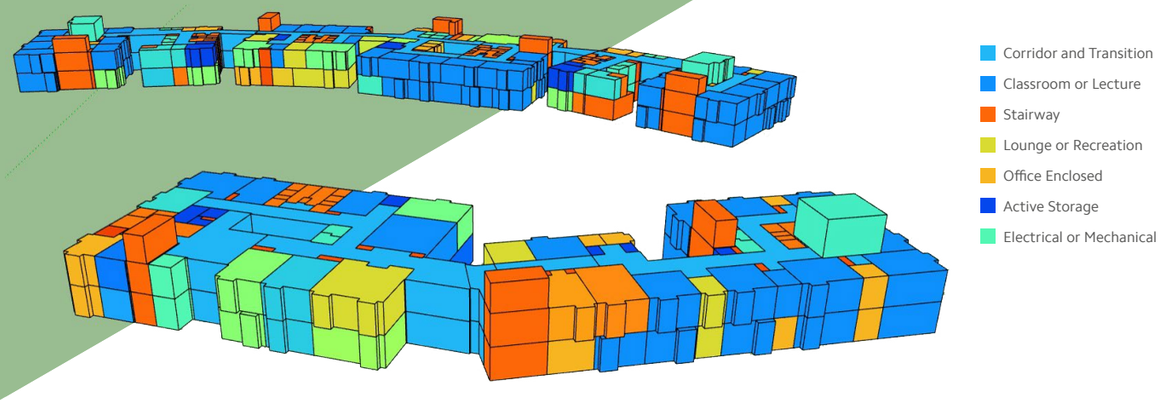




This pilot project focused on the Sharjah Humanitarian City Campus for people of determination. The campus has an area 87,000m² and is located in an open, non-urbanised area approximately 20km south-east to the city centre of Sharjah on Emirates Road. The project phase 1 consists of three educational buildings: The Administration & Library, the Wafa School, and the Autism Centre.

With many countries declaring a climate emergency, the UAE has set ambitious environmental goals to minimise its impact on climate change.

These include:

- Reach a 40% energy consumption reduction compared to Business-As-Usual projection by 2050 (2050 UAE Energy Strategy),
- Reach 30% of clean energy production by 2030 (UN SDG 7),
- Implement a more integrated national grid (UN SDG7),
- Various measures to improve energy efficiency (UN SDG 7).

This project constitutes a first step in demonstrating how IES's Positive Energy Block (PEB) methodology can help reach these environmental goals, and how the ICL digital twin can efficiently help design a PEB for any project; effectively reducing the demands on existing infrastructure. A PEB is where a group of buildings produce more primary energy on an annual basis than they consume.

The PEB methodology aimed to minimize carbon emissions and to reach as close as possible to net-zero energy, and can be broken down into the following steps:

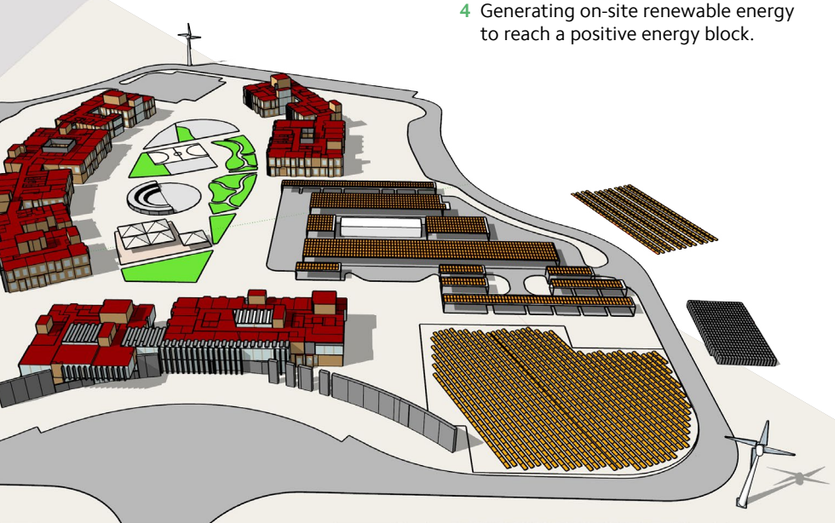
1. Implementing passive measures during the design phase to reduce the energy needs of the site's buildings to a minimum
2. Addressing the remaining energy needs with efficient HVAC systems
3. Optimizing the site's energy supply locally
4. Generating on-site renewable energy to reach a positive energy block.

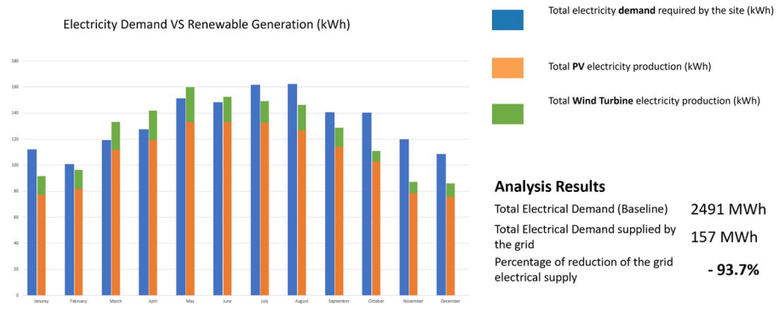
This pilot project was divided into two phases:

In Phase 1, using the iCD (Intelligent Community Design) tool to assess the sites energy needs, it was discovered that by improving the buildings' envelope performance and using a more efficient cooling system it was possible to reduce the site's energy consumption by 25.6% compared to a Business-as-usual case.

As the buildings energy needs were optimized in Phase 1, Phase 2 focuses on how to optimize the energy supply side of the site using the iVN (Intelligent Virtual Network) tool. The goal here was to efficiently address the site's energy demand and investigate how much on-site renewable energy was necessary to make it a PEB.

By using a site-wide central cooling system, rather than individual chillers in buildings and producing on-site renewable energy (4552m² of PV panels, 2 Wind turbines, 136 Batteries, 98m² of solar hot water collectors) it was possible to reduce the total electricity demand by 95.4% compared to a Business-as-usual case and thus reduce its carbon emissions by the same amount.



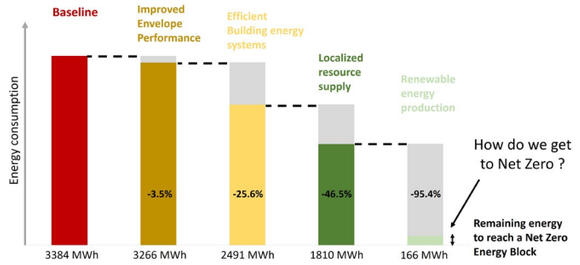


Analysis Results

Total Electrical Demand (Baseline)	2491 MWh
Total Electrical Demand supplied by the grid	157 MWh
Percentage of reduction of the grid electrical supply	**- 93.7%**

This pilot project showed that the PEB methodology can be implemented more widely in the UAE with results that, if extrapolated, exceed the national environmental goals in terms of GHG emission reduction. Compared to the goals set in the 2050 UAE Energy strategy (50% of clean energy production by 2050) or in the UAE Vision 2021 (27% of clean energy production by 2021), this project shows that it is possible to have 93.7% of the Campus's energy consumption coming from on-site clean energy.

Although the project does not reach net-zero energy with on-site generation, the work done in both phases proves that it would be possible to reduce the energy supplied by the grid by 95.1% compared to the Business-as-usual scenario. This corresponds to 3164 tons of CO_2 equivalent of GHG emissions avoided, or 1257 cars yearly emissions.



If off-site generation is included, the project could reach net-zero energy with, for example, a further 620m² of photovoltaic panels.

This study has shown that by using the ICL digital twin and implementing the PEB methodology earlier in the design stage, the design could be optimized to achieve net-zero or a PEB.

"Using IES's ICL technology helped us to understand the feasibility and possibility of near zero or positive energy blocks within our scope of work and region. The idea being that we can then replicate the methodology in more groups of buildings throughout the region to help meet our governments environmental goals."

Naseebah Al Marzouqi
Director of Sustainability and Technical Studies Department, Ministry of Energy and Infrastructure, UAE

KEY FACTS

- Campus area 87,000m²
- Phase 1 - improving buildings' envelope and using a more efficient cooling system it was possible to reduce energy consumption by 25.6% compared to a Business-as-usual case
- Phase 2 - using a site-wide central cooling system and on-site renewables it was possible to reduce total electricity demand by 95.4% compared to Business-as-usual case
- Total possible energy savings equates to 3164 tons of CO_2 equivalent of GHG emissions avoided, or 1257 cars yearly emissions

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