

ENOC RETAIL LLC

ENOC Retail futuristic station opened with smart energy efficient technologies in Expo 2020 Dubai, complying with the ISO 50001 standard and certified by LEED Platinum certification in January 2021



ENOC Futuristic Station Expo 2020

Case Study Snapshot

Industry	Oil & Gas
Product/Service	Fuel Filling Stations
Location	Dubai, UAE
Energy performance improvement percentage (over the improvement period)	27% improvement over 03 years
Total energy cost savings (over the improvement period)	USD 1,146,220
Cost to implement Energy Management System (EnMS)	USD 593,933
Total energy savings (over the improvement period)	33,681 GJ
Total CO₂-e emission reduction (over the improvement period)	4,866 Metric Tons

Organization Profile / Business Case

Emirate National Oil Company (ENOC) unveiled the innovatively designed Service Station of the Future at the Expo 2020 Dubai site. The station will support the logistical needs of the global event.

The forecourt canopy design is inspired by the resilient Ghaf, the UAE's native tree which resembles resilience and co-existence. For canopy structure, first-time carbon fibre is used, formed with leaf shaped ETFE cushions, integrated with LED and transparent solar panels. The station has digital displays, wayfinding navigation system, interactive dispenser, wind turbine, EV charger, VRS, occupancy sensors and other innovative features.

This is the world's first LEED Platinum service station.

ENOC Retail is constantly pushing to innovate in design and construction of its fuel stations to meet the growing demand of its customers. ENOC also manages and operates 176 ENOC service stations in the UAE in which there are 35 certified sites with ISO 50001.

The Retail station facilities include forecourt for vehicle fueling, convenient store, automotive services consist of oil change, maintenance, and car wash facility. Building smart station is one of the strategic initiatives of ENOC Retail and implementation of Energy Management System plays a vital pillar to achieve the ENOC Group Vision and Mission.

Vision: To be an innovative energy partner, delivery sustainable value and industry-leading performance.

Mission: Deliver world class sustainable and integrated energy solutions, striving for excellence in operations, innovation and happiness of employees, customers, and partners.

“ISO 50001 is a system that helps ENOC better manage energy use, thus improving productivity by implementing energy policies, setting energy savings target, and designing action plans to monitor and measure progress.”

— H.E. Saif Humaid Al Falasi, Group Chief Executive Officer ENOC

On Dubai, UAE; 22 February, 2021 ENOC Group, the Official Integrated Energy Partner of Expo 2020 Dubai, unveiled the innovatively designed Service Station of the Future, located at the Expo 2020 site (www.enocstationofthefuture.com) .

The station will support the logistical needs of Expo 2020's fleet ahead of the global event and will serve the general public at District 2020, the smart human-centric community and curated innovation system that will become Expo's physical legacy after its doors close on 31 March 2022.

The service station received the LEED platinum certification, an internationally recognised building certification system from the US Green Building Council. LEED verifies that designs and buildings have been built considering factors that improve performance based on metrics such as energy savings, water efficiency, CO2 emissions, etc. making it the world's first platinum certified station. ENOC exceeded the requirements; securing 93 points, making it the first service station in the world to obtain a LEED platinum certification.

The service station's design is inspired by the rich heritage of the UAE's traditions in the form of its national tree, the ghaf. Marking a true innovation in fuel retail, it is also the first station in the region to incorporate an on-grid wind turbine for power generation and carbon fibre in the construction of its canopy.

More than 43,000m²/37 tonnes of carbon fibre – a light, eco-friendly material that is three times stronger and five times lighter than steel – has been used to build the 133 multi-layer canopy frame. The frame structure houses a clear, innovative leaf-shaped ethylene tetrafluoroethylene (ETFE) cushion canopy, which is 100 per cent UV ray-protected and corrosion-proof, and illuminated with more than 3,800 LED light modules. The nine tree designs that support the station were built from another 22,500m² of carbon fibre.

In a bold move to incorporate renewable energy to generate power and enable the station to be energy efficient, 283 solar photovoltaic (PV) panels have been installed to generate 143 MWh of solar power every year, and a 25-metre wind turbine will generate 12.7 MWh of wind energy annually. This follows ENOC Group's decision to incorporate solar PV panels to power its service-station network and is aligned with the Dubai Integrated Energy Strategy 2030 and Dubai Clean Energy Strategy 2050 goals.

Highlighting the group's aspirations to 'Reimagine Energy', His Excellency Saif Humaid Al Falasi, Group CEO, ENOC, said: "ENOC is proud and honoured to be the Official Integrated Energy Partner for Expo 2020 Dubai. We recognise this unique opportunity to represent our industry and our country on the global stage.

"Our presence at Expo 2020 is also underpinned by the unveiling of the Service Station of the Future, a fully functioning, futuristic service station that incorporates multiple sources of energy. We've always taken pride in our ability to make bold decisions, and the unveiling of this first-of-its-kind service station in the world, which harnesses the power of renewables, is a stepping stone in a new era for the future of fuel retail."

“Using next-generation technology, ENOC’s Service Station of the Future will directly contribute to two of Expo 2020’s subthemes: Mobility and Sustainability. We see these areas, alongside our third subtheme of Opportunity, as fundamental to collectively addressing the world’s most pressing challenges.

we aim to be one of the most sustainable World Expos in history and to support the UAE’s strong emphasis on sustainable development and innovation. We have integrated sustainability and innovation into all aspects of our journey to create a meaningful impact that reaches far beyond the Expo site and the six months of the event.

The new iconic service station’s systems have been deployed to enhance energy conservation, such as the use of carbon filtration technologies to recycle and reuse grey water for irrigation, significantly reducing outdoor water consumption. In addition, the station is equipped with drinkable air units that use ozonation techniques to convert water molecules from humidity in the air into drinkable water for staff onsite.

The service station also includes several applications of advance machine learning, artificial intelligence and data analytics technologies that play a role in customising services and retail offerings for customers, managing queue and waiting times at the forecourt, and improving the overall customer journey.

Vehicle mapping surface lighting is deployed to mark traffic flow to direct vehicles to the fuelling area, as well as entry and exits to the station. Occupation sensors and signals at fuelling positions will also manage traffic flow, redirecting vehicles to empty spaces at dispensers. Digital signage in the station consists of 12 million LED chips to illuminate the digital screens onsite.

Other prominent features include electric-vehicle chargers and multi-media interactive advanced dispensers.

For enhanced safety, the station uses advanced fuel management and gauging systems that continuously monitor the integrity of the tanks, providing 24-hour leak detection coupled with turbine pump interface monitoring systems.

Construction work on the service station began in early August 2019. ENOC recorded 400,000 manhours during the build process, with zero lost time injury (LTI), demonstrating ENOC Group’s commitment in adhering to the best health, safety and environment (HSE) practices.

Business Benefits

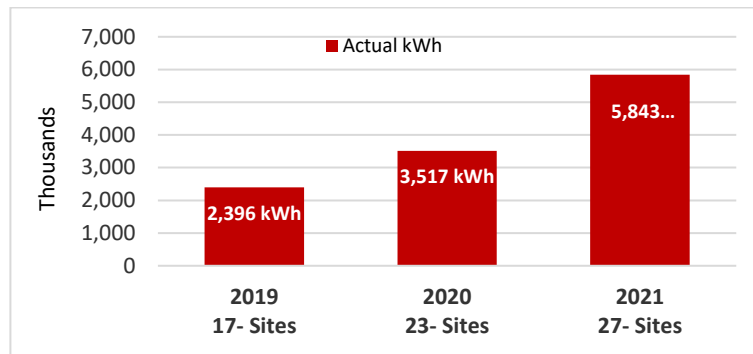
The Service Station of the Future canopy holds 283,296 solar photovoltaic (PV) panels capable of generating 143MWh of solar power annually. The station is also the first in the region to incorporate an on-grid wind turbine for power generation, which will produce 12.7 MWh of wind energy every year.

The ENOC project has made very sincere efforts to drastically reduce the overall energy consumption in the building, as compared to similar standard Fueling stations. In comparisons with the ASHRAE 90.1-2016 Base case, the Project has achieved more than 55 % Energy Savings.

Whereas a conventional fuel station will use 1,492 MWh of electricity in a year, the ENOC Futuristic station is expected to consume as little as 672 MWh of Electricity only in a year.

This drastic reduction in power consumption is achieved because of various Green Measures which are detailed here.

Solar and Wind power is proposed to offset the Carbon Emissions and Electricity consumption.



PV Solar kWh Savings

High Efficiency Building Envelope which includes:

1. Insulated wall which has a U-value of only 0.2 W/m²K.
2. Insulated Roof with High Solar Reflective Index coating which cuts down the high temperatures from directly affecting the building having a U value of 1.5 W/m²K.
3. Very high Efficiency Glass Solar Heat Gain Co-efficient 0.57 and Visible light transmittance of more than 76% which lets in large amounts of Natural daylight but cuts down drastically on the heat which is transmitted inside.
4. Shading: The Fueling Canopy acts as a shading device which protects the building from getting direct heat while allowing air movement to cool the building.
5. Use of Efficient LED lighting systems with task lights and Individual controls enable the building to save on the Lighting Power consumption. Good Daylighting also contributes to reducing Light usage during the daytime. The baseline allows up to 11.3 W/sqm while our design has provided a maximum of only 8.46 W/sqm High Efficiency Air Conditioning System with Variable Refrigerant flow. This reduces the power consumed for cooling the spaces by more than 30%. Additionally, controls are provided for different zones to turn off the AC when not in use.
6. Fresh Air is Essential for the healthy functioning of a building and our project is equipped with 30% more Fresh air than ASHRAE 62.7 requirements. Additionally, since outside fresh air will be considerably warmer, Treated Fresh air system with Heat Recovery has been provided to pre-cool the Fresh air, prior to supply and provide additional savings



Energy Conservation initiatives at ENOC Futuristic Station at Expo 2020

- ENOC Retail 36 EnMS sites which is the scope of this case study has achieved 27% energy performance improvement over 5 years improvement period. And resulted to energy cost savings of USD 1,146,220

Other business intangible benefits are:

- Reduce and optimize growing energy demand
- Refined energy objectives and targets
- Improve overall energy performance
- Set energy baseline and benchmarking data
- Addition of smart metering and sub- metering
- Improve understanding of significant energy users
- Green procurement policy
- Increase employee’s awareness in energy and resource management
- Alignment to UAE national green agenda
- Contribute to Dubai Carbon Reduction Initiatives
- In preparation to Carbon credits scheme and programs

Plan

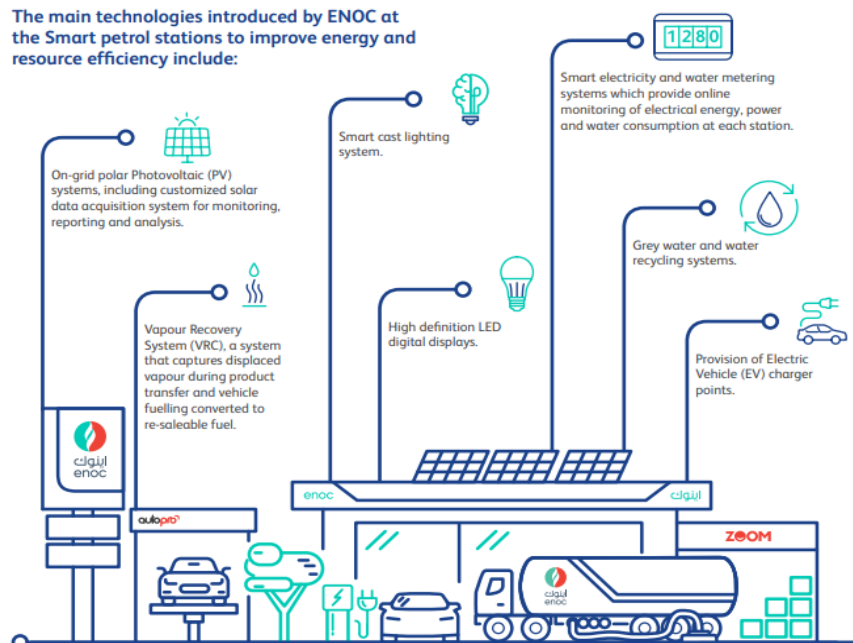
At ENOC, management commitment and support in energy management implementation is secured through ENOC Energy & Resource Steering Committee where all Directors from different Business Units are members and periodic meetings are conducted.

The Energy Management objectives specifically the energy efficiency target is part of Business Scorecard where the annual targets are agreed and set at Q4 in preparation for the succeeding year implementation.

Implementing EnMS at multiple sites is challenging at initial stage and later with support of energy sub-metering to establish an effective energy aspect register realized lots of saving opportunities.

To ensure saving opportunities are materialized, securing of resources to put the energy initiatives into action plan is part of annual budget planning for the investment required for energy efficient technologies.

During the ISO 50001 recertification in 2019, the focus was to improve the effectiveness of the EnMS approaches and improving energy saving targets compare to initial certification where meeting efforts were on meeting the minimum requirements.



New technologies introduced at ENOC retail Stations

“For a very long time now, energy and efficiency have been our focus areas but now they have become embedded in our core. We consider efficiency measures in everything we do.”

—Taleb Al Saleh, Director Retail Marketing

Do, Check, and Act

ENOC Retail Energy Management Committee under the sponsorship of the Managing Director has been instituted to establish and champion the implementation of Energy Management System requirements. The team comprises of personnel from different support business departments who will have an impact on energy use, consumption, initiation and monitoring of energy projects and implementation of energy operational controls.

Top management provides continuous motivation and support to the business units and its EnMS team through ENOC Annual Energy Award which covers both business unit and individual employee award category. Continuous EnMS-related training are both provided for management awareness and technical competency development.

ISO 50001 Energy Management System – Case Study

2022

United Arab Emirates

To measure, monitor and analyses energy and resource utilization to reduce consumption, as part of the requirements of our E&RM policy. For the organization to identify relevant saving opportunities, it is critical to have a detailed understanding of the breakdown of energy consumption by different areas of operations.

We have introduced smart monitoring systems at our retail sites and energy monitoring systems at the Autopro and Sharjah Auto Village sites to identify areas of high energy consumption and achieve our annual energy-saving target of 3.5%. This also supports the sites in meeting the requirements for ISO 50001:2011 certification

The energy review process compels substantial planning inputs which will be detailed in the following sections which are critical requirements to carry out an effective and valuable energy review and expected to produce energy planning outputs that are practicable and reasonable measures to the organization activities leading to continual improvement to energy performance

The energy savings reflected in the case study is as per the baseline period of one year (2016) and reporting period is the following three succeeding years (2019-2021). The reporting period selected to start in 2017 since this the year where the newly built petrol station standard design was changed from conventional to smart station.

In monitoring and analyzing the energy performance of SEU's, factors are used to normalize the data like weather, cooling degree days and occupancy in square meters for SEU Air Conditioning, fuel in tones for overall site energy consumption and vapor recovery system.

With the EnMS implementation it pushed the organization to set its green procurement objectives, and this is supported with Green Procurement Procedure and assigned a dedicated Green Procurement Analyst. The green procurement target is set as 30% in 2017, 2018 and revised to 100% in 2019.

Transparency

In ENOC, achievements and accomplishments in Energy Management System including ISO 50001 certification is communicated to employees and society in different venues and communication platforms. ENOC issue Energy Efficiency Annual Report and Sustainability Report where collective efforts across the group and respective business unit energy initiatives are showcase. This report is published in ENOC company website which is open to public, and this book is also distributed in Energy-related conferences sponsored and participated by ENOC.



ENOC Retail ISO 50001 certification announcement also by posting certificate at each retail site. And another public awareness is through application to EnMS related award similar to CEM like UAE Energy Management Insight Award where ENOC Retail received an award in 2017 from Ministry of Energy.

ENOC is member of several external committees where ISO 50001 certification achievement is also highlighted. Some of the key groups include Dubai Supreme council of Energy, Green procurement Committee and Dubai Carbon Abatement Strategy

What We Can Do Differently

During the EnMS implementation period, there are lots of lessons learned in different aspects of energy management and below are some key areas.

- Have a good online data management system is key for timely monitoring and effective data analysis of significant energy users (SEU)
- Improve verification methodology of SEU performance results
- Convert manual sheet of energy aspect register to software or online register
- Improve internal benchmarking approach and select appropriate external benchmarking
- To consider renewable projects implemented in new built smart site for refurbishing old sites
- More focus on to improve the effectiveness of the EnMS for an additional Retail site within the region by understanding the benefits of energy management system

THE WORLD'S FIRST LEED PLATINUM SERVICE STATION

First service station in the world to achieve a LEED platinum certification. Breaking world records is not a first for us at ENOC.



ENERGY SAVING LED LIGHTS

High efficiency LED lights save 60 % more energy compared to conventional lighting and 20-30 % energy compared to regular LED.



STURDY CARBON-FIBER CANOPY

The first-time carbon fibre (3X stronger and 5X lighter than steel) is used to construct the entire canopy structure. The structure is made of 43,000 m2 of eco-friendly carbon fibre.



EV-CHARGING TREE TO REPRESENT THE 7 EMIRATES OF THE UAE

4 EV charging units located in an EV charging Ghaf tree that is shaded by 7 ETFE leaves, each representing an emirate of the United Arab Emirates help power electric vehicles.



133 ETFE CUSHIONS

Designed to have high corrosion resistance and strength over a wide temperature range, the canopy is formed by 133 leaf-shaped Ethylene Tetrafluoroethylene (ETFE) cushions that are transparent and illuminated with more than 3,800 LED light modules.



WIND TURBINE SYSTEM

For the first time in the UAE, a 25 metre wind turbine which generates 12.7MWh output capacity per year converts energy from the wind to power the station with its own on-grid metering facility.



INTEGRATED TRANSPARENT SOLAR PANELS

283 integrated transparent solar panels installed on the canopy at the service station. They allow natural lighting during the day while providing 100 % UV protection.



SMART ENERGY MONITORING

A dedicated building management system efficiently monitors and controls HVAC and lighting systems, as well as water and electrical consumption.



SOLAR PV ON-GRID SYSTEM

Solar PV panels with an energy yield of 143 MWh every year are installed on top of the canopy and boundary walls and are linked to an on-grid system to generate energy to power the station.



INTERACTIVE FUEL DISPENSER

Advanced multimedia electronic dispensers with safe and cashless payment features reduce waiting time and improve customer journey.



DIGITAL DISPLAYS

Digital communication on the façade of the station as well as ZOOM store's sliding doors and internal pelmets totalling 15 million LED chips enhance the futuristic style and eliminate the need for printing traditional paper posters.



VRF AIR CONDITIONING

High-efficiency VRF systems reduce energy consumption by at least 35%.



WAYFINDING NAVIGATION SYSTEM

Smart Vehicle Mapping surface lighting system on the ground marks traffic flow to ensure smoother traffic navigation throughout the station.



ADVANCED VAPOUR RECOVERY SYSTEM

Using refrigeration condensation principle, the unit recovers gasoline vapour while controlling Volatile Organic Compounds emissions and converts 70% of fumes back to fuel.



FUELLING INDICATOR SENSORS

Drivers in the queue are notified by green lights if there's an empty dispensing area, so queues move forward quicker and cars get their fuelling done swiftly.



STORM & GREY WATER TREATMENT

First station in the region to use carbon filtration technology to treat waste water, so it is converted for irrigation purposes to feed landscaping, therefore reducing outdoor water consumption.



DRINKABLE AIR

Using the same principle as condensation, humidity from the surrounding air is ozonised to eliminate harmful bacteria; air is converted to water molecules to become safe, drinkable water for staff working at our station.



ADVANCED MACHINE LEARNING

Harnessing the power of data analytics, AI technology enhances services and improves customer experience by communicating hyper-relevant messages and products.



MOTION / OCCUPANCY SENSORS

Light-dimming motion sensors on the canopy and the back of the house dim lights when minimal or no motion is detected, thereby saving 10-15% of energy and extending fixture life.



Reimagine Energy™