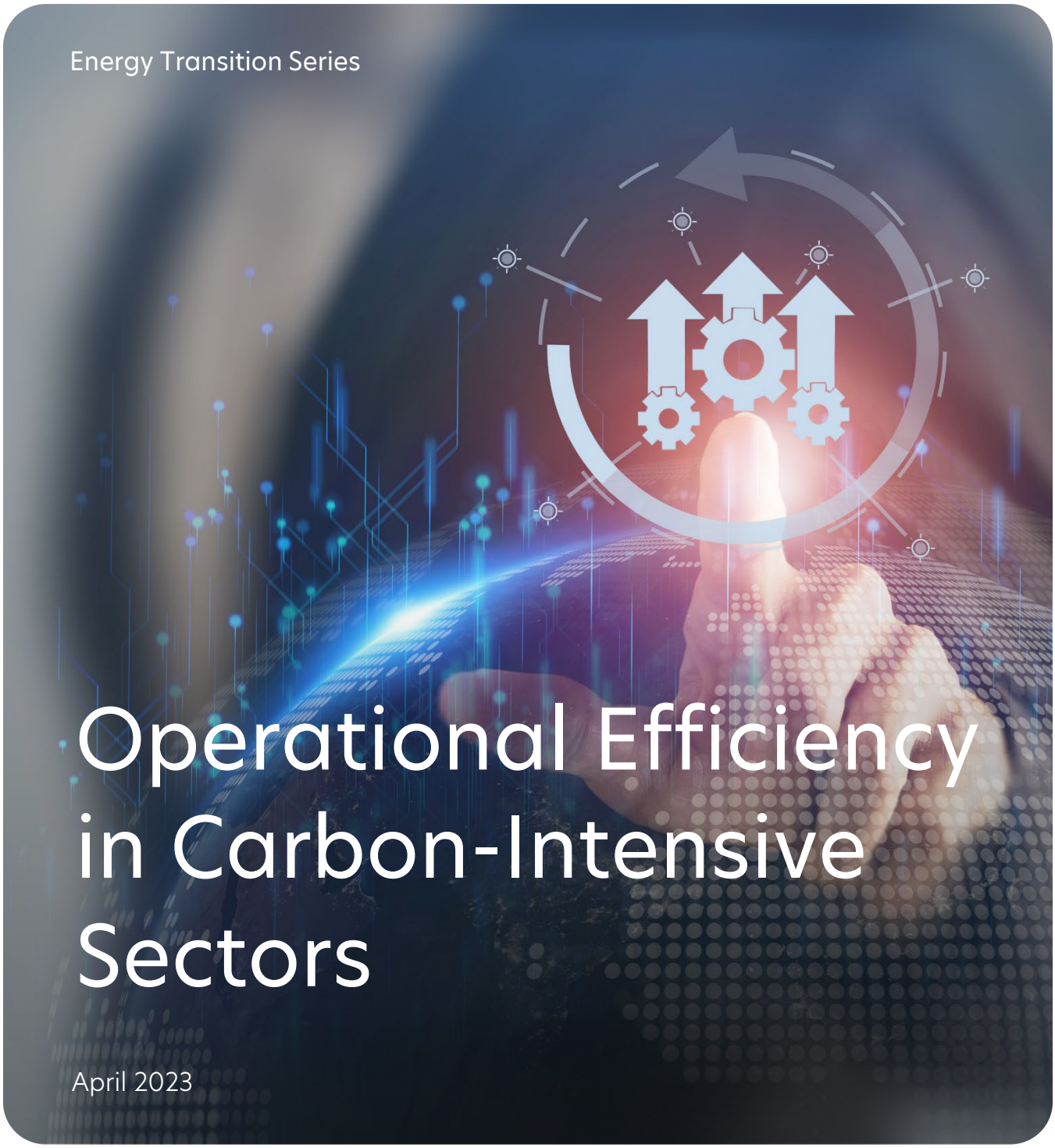
Oil, Gas & Chemicals

UOB

Energy Transition Series



Operational Efficiency in Carbon-Intensive Sectors

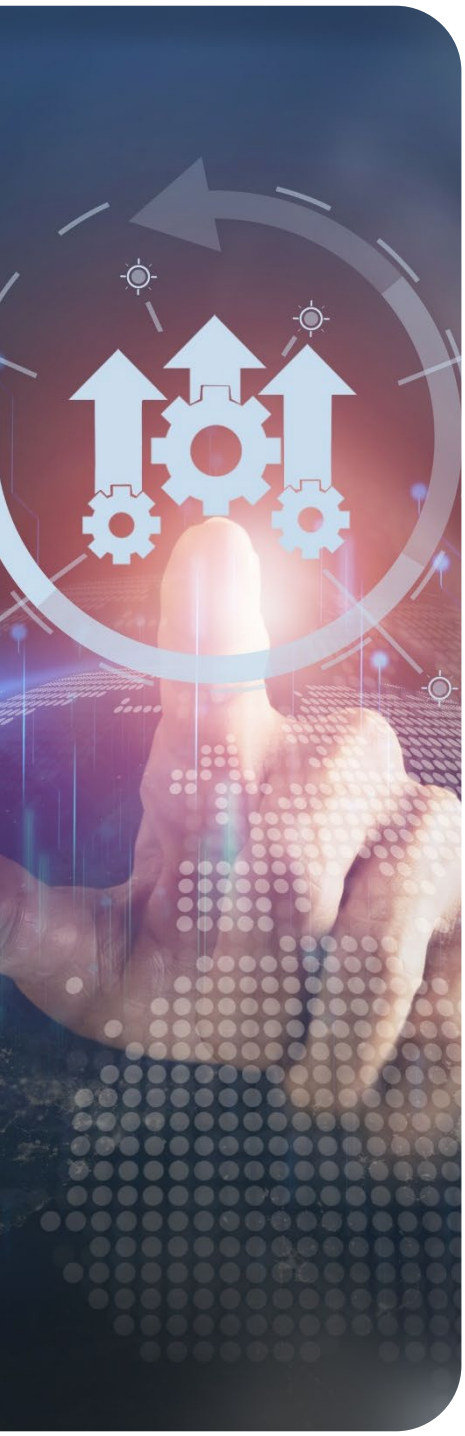
April 2023

Right By You

Industry Perspective

Content

April 2023



Executive Summary

Carbon-intensive, high emitting and "hard-to-abate" sectors such as Oil, Gas & Chemicals, Metals & Mining, Fossil Fuels Power Generation and Transportation & Logistics are heavily reliant on fossil fuels and account for more than 50% of greenhouse gas (GHG) globally. In South-east Asia, these four major industries account for more than 80% of total GHG emissions.

These industries are facing growing environmental concerns over their emission levels and stricter regulations to reduce their carbon footprint. Improving operational efficiency, which results in the reduction of energy use, is one of the first steps that companies can take to effectively and efficiently reduce their overall GHG emissions. Further, operational efficiency has the benefit of long-term energy cost-savings and reduction of operating costs.

This report describes some commonly adopted technologies that help companies in carbon-intensive sectors to achieve improved operational efficiency. They are:

- Common energy efficiency solutions, such as waste heat recovery system and co-generation/ combined heat and power system;
- Emissions reduction solutions, such as flare gas and vapour recovery systems; and
- Digitalisation to enhance energy efficiency.

To address our climate challenge, UOB has developed a Transition Finance Framework to assist carbon-intensive, high-emitting and "hard-to-abate" companies in their energy transition journey. To complement this framework, UOB has rolled out a financing solution that is curated to support "operational efficiency". This solution targets companies' investments and upgrades to improve their operational efficiency. With short and longer-term financing available, carbon-intensive companies can improve their cashflows when undertaking such projects. Transition enablers, such as equipment suppliers and contractors, who undertake such projects can also tap on UOB's trade financing.

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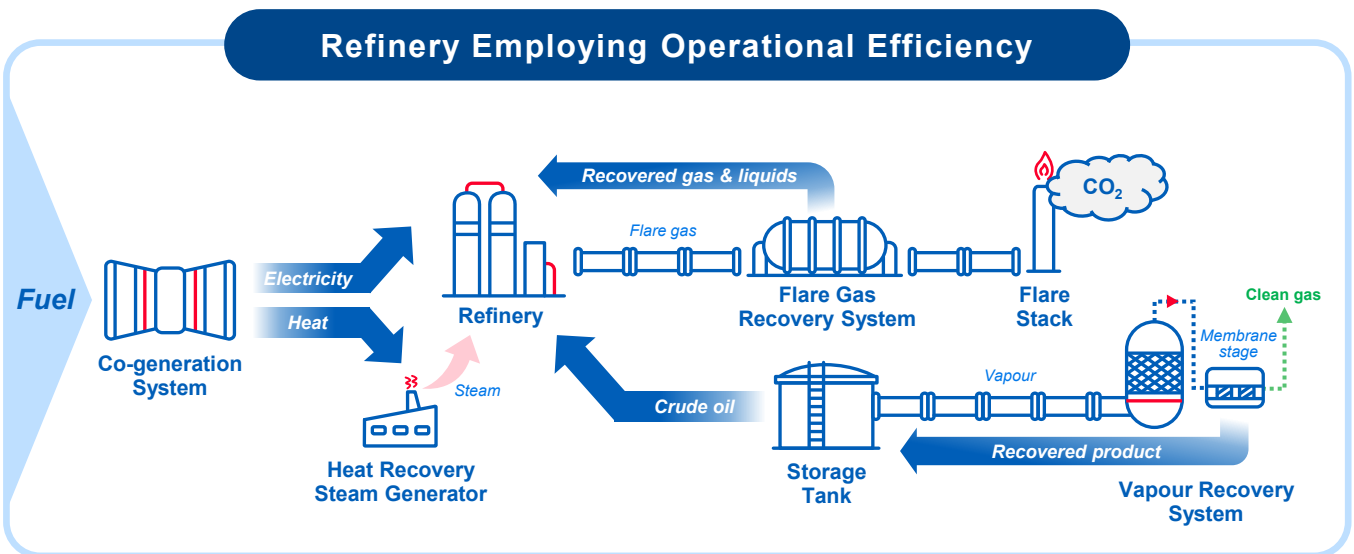
Operational efficiency improves profitability and the environment in the long run

When looking to reduce greenhouse gas (GHG) emissions, focusing on the energy efficiency (the use of less energy to perform the same task or produce the same output) opportunities that are easily within reach is often the most effective and efficient way for companies in carbon-intensive, high-emitting and "hard-to-abate" sectors to reduce their overall Scope 1 and Scope 2 emissions.

Operational efficiency improvements enable emissions reduction, enhance cost competitiveness and improve productivity simultaneously

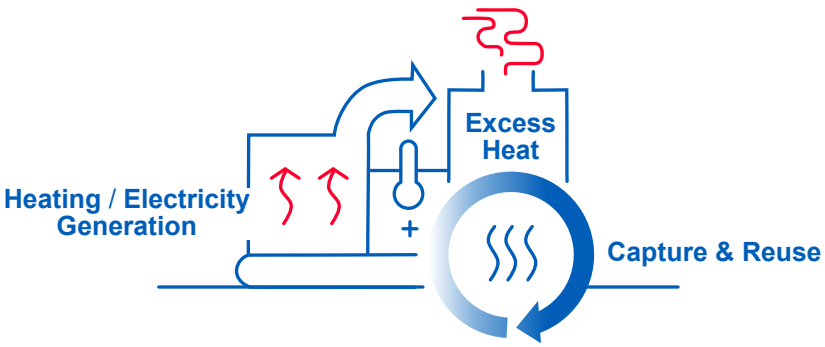
A typical industrial plant spends 30 – 50% of its operating budget on energy, hence it is critical to focus on industrial energy efficiency to minimise energy loss and energy spend. According to the International Energy Agency (IEA), increased energy efficiency will help to reduce energy spend, hence supporting the world economy to grow by 40% by 2030 while using 7% less energy than today.

In certain sectors such as Oil, Gas & Chemicals, there are other streams of GHG emissions such as carbon dioxide (CO_2) from the flaring of waste gases generated during production processes and volatile organic compounds (VOCs) from petroleum fuels. Increasingly stringent environmental regulations on GHG emissions for the sector is a key driver for operators to adopt measures such as flare gas and vapor recovery systems which can help to significantly reduce emissions, enhance cost competitiveness and improve productivity simultaneously.



Common energy efficiency solutions

Waste Heat Recovery System (WHRS)



A WHRS is an energy recovery heat exchanger that captures and reuses the excess heat generated from existing processes for other purposes such as heating or electricity generation. Industrial waste heat recovery is prevalent in various energy intensive industries, including refineries, chemical plants, cement plants and general manufacturing. The average cost of a WHRS is cir. US$2 million per megawatt of electricity and waste-heat recovery projects can yield annual energy cost savings of 10% to 20% for industrial facilities.

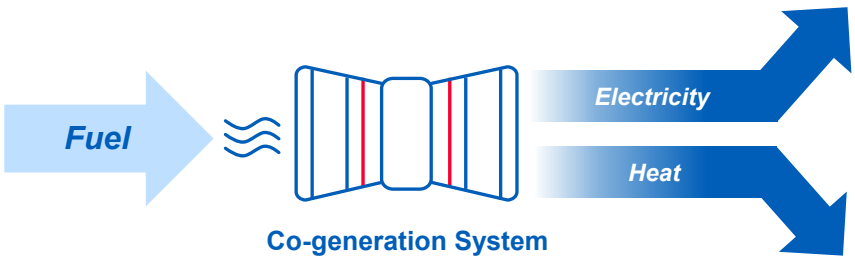
A regional national oil company invested cir. US$83 million to install a gas turbine generator and heat recovery system to enhance the overall efficiency in electricity generation of its utilities plant within its refinery. This energy conservation project helped the company reduce energy consumption by 1.1 million GJ per annum, reduce GHG emissions by 80,280 tons CO_2 equivalent per annum and reduce energy cost of cir. US$9 million per annum.

Co-generation/ Combined Heat and Power (CHP) System ▸

Source: European Council for an Energy Efficient Economy, UOB Analysis

Common energy efficiency solutions

Co-generation/ Combined Heat and Power (CHP) System



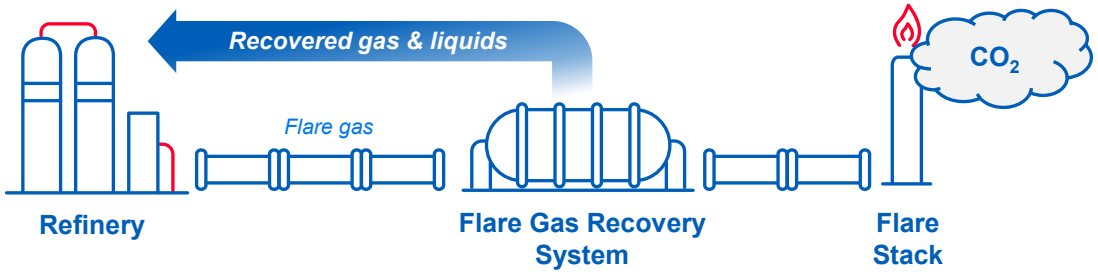
A CHP system simultaneously produces electricity and heat from a single fuel source. While conventional energy production just treats waste heat as an inevitable loss, the CHP system treats heat from energy production as thermal energy which can be recycled in the energy production process. Energy efficiency is thus improved by combining the production of useful heat and electric energy by a single generator.

A CHP system significantly reduces GHG emissions as it requires less fuel to produce a given energy output - resulting in up to 60% higher energy efficiency. An onsite CHP to power industrial processes costs an average of US$1.5 to 2.0 million per megawatt of electricity. Such a system can provide electricity cost savings of up to 40% and typically has an investment payback period of 3 to 5 years.

Flare Gas Recovery System (FGRS) ▶

Emission reduction solutions

Flare Gas Recovery System (FGRS)



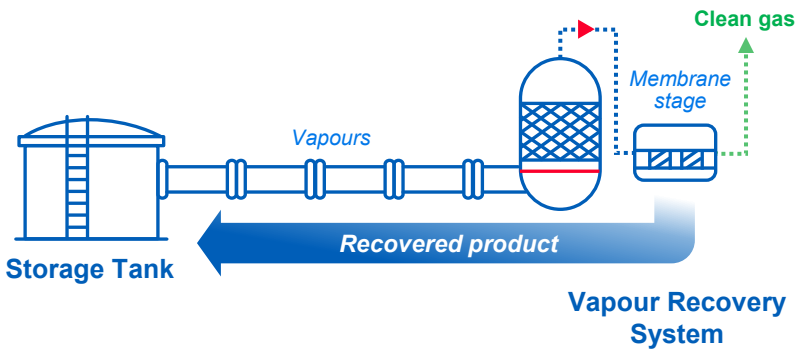
Gas flaring is a process used to burn-off associated gases generated during industrial processes such as crude oil refining and petrochemical production. A FGRS recovers and repurposes gases and emissions, such as methane, liquified petroleum gas (LPG) and sulfur dioxide, that would normally be burned during the flaring process. Burning these gases is a key source of GHG emissions. It is crucial to operate the refineries and petrochemical facilities safely by capturing the gases from the flare knock-out vessels and compressing them using liquid ring compressors. The recovered gases can then be reused within the facility's fuel gas system, as a refinery feedstock or for re-injection.

Emissions can be reduced by up to 80% for refineries installed with FGRS and recovered gases can be reused, resulting in reductions in fuel costs for the facilities. The average investment payback period for a FGRS is 3 years.

Vapour Recovery System (VRS) ▶

Emission reduction solutions

Vapour Recovery System (VRS)



A VRS aims to lower emissions from the vapour of gasoline or other fuels while recovering hydrocarbons (which would otherwise have been flared) to be sold or reused as fuel onsite. A mechanical vapour recovery unit is used to recover storage tank vapour-gas that is formed at the top of the tank. A carbon bed vapour recovery unit is used to handle vapour that is off-set during liquid loading of trucks, vessels or tanks.

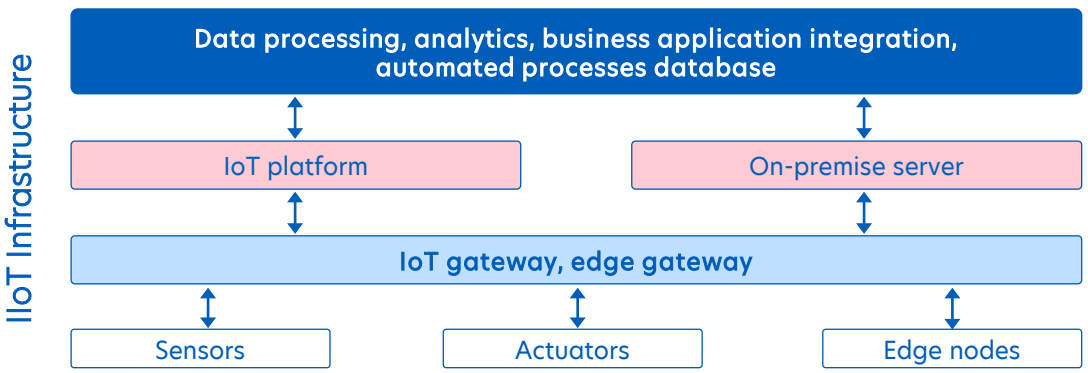
VRS eliminates venting and emissions of pollutants by 95%. Further, the recovered hydrocarbons can be sold or reused as fuel onsite to improve the overall economics of the facility. The average investment payback period for a VRS is 1-2 years.

Digitalisation to enhance energy efficiency for carbon-intensive sectors

Digitalisation can help manufacturing and industry become smarter and more sustainable through better capture and use of data, leading to more efficient energy use and tighter resource management. Digitalisation enables real-time collection of data to identify problems that cause wastage or unnecessary energy loss.

Historically, production plants have reviewed monthly energy consumption data over time to monitor energy loss. Energy management information systems (EMIS) provide up-to-the-minute information about a site's energy consumption to better identify inefficiencies and irregularities, providing real-time data and analytics for decision making.

Such EMIS typically involves the Industrial internet of things (IIoT) , which uses a network of connected smart sensors and actuators to monitor, collect, exchange and analyse data real-time. The global IIoT market size is expected to grow from US$76.7 billion in 2021 to US$106.1 billion by 2026, (CAGR of 6.7%), driven by factors such as technological advancements in semiconductor and electronic devices, increased use of cloud computing platforms and support from governments of different countries for research & development activities related to IIoT.



In the oil and gas industry, IIoT sensors installed on machines provide companies with predictive maintenance data and let companies know in advance what needs to be fixed, replaced or shut down. Such increased visibility of operations performance at certain refineries helped a middle eastern national oil company to significantly reduce problem-to-resolution timelines and identify the best values and set points – resulting in energy savings of US$22 million per year.

For the automotive industry, cloud-based applications collect data every one or two seconds from plant machinery at individual production plants located around the world. This gives automotive manufacturers access to real time data on electricity and gas consumption. Such a move to digitalisation allowed a multinational automotive manufacturer to save 55 gigawatt-hours and lower its CO_2 emissions by 15%.

UOB's Transition Finance Framework also supports the adoption and integration of digital technologies which will further aid companies in their efforts to improve operational efficiency.

Start planning for operational efficiency today

For companies in the carbon-intensive, high emitting and "hard-to-abate" sectors, energy transition is not just a trend to watch out, but a fundamental shift to the industries' development. UOB has developed a Transition Finance Framework to assist carbon-intensive, high-emitting and "hard-to-abate" companies in your energy transition journey.

To complement the Transition Finance Framework, UOB has also rolled out a financing solution that is curated to address "operational efficiency". This solution targets companies' investments and upgrades to improve their operational efficiency. With short and longer-term financing available, carbon-intensive companies can improve their cashflows when undertaking such operational efficiency projects. Transition enablers, such as equipment suppliers and contractors, who undertake such projects can also tap on UOB's trade financing.

For more information on the Transition Finance Framework and banking solutions, please visit our website www.UOBgroup.com/sustainable-financing or email: EnergyTransition@UOBGroup.com to find out more.

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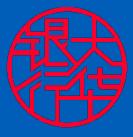

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