



# High-efficiency solar-powered containerized oil refineries price reduction





## Overview

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Crude oil distillation is one of the most energy-intensive processes in petroleum refining, consuming up to 20% of total refinery energy. Improving the energy efficiency of crude distillation units (CDUs) is essential for reducing costs, lowering emissions, and achieving sustainable refining.

This study describes techno-economic analysis of opportunities for distributed energy resources that could be integrated to support oil and gas companies' economic, environmental, and energy resiliency goals. Specifically, the analysis evaluates solar photovoltaics, wind turbines, battery energy.

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The purpose of a solar refinery is to enable an energy transition from today's 'fossil fuel economy' with its associated risks of climate change caused by CO<sub>2</sub> emissions, to a new and sustainable 'carbon dioxide economy' that instead uses the CO<sub>2</sub> as a C1 feedstock, together with H<sub>2</sub>O and.

Built on the Solar Reactive Utilization framework, this study presents an innovative concept called the Solar Oil Refinery, applying solar energy in the energy-demanding oil refining. Herein, a solar multi-energies-driven hybrid chemical oil refining system, exemplified by residual oil cracking.

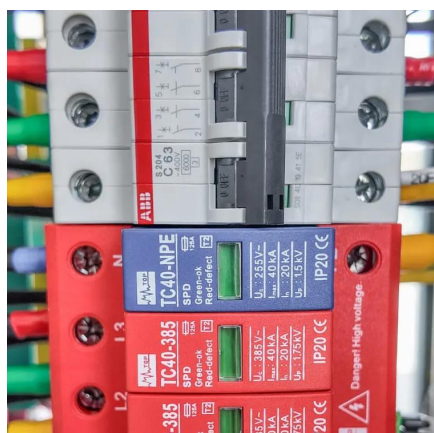
Steam generation alone accounts for up to 33% of the total energy consumed in oil refining, powering turbines, heating, and acting as a process medium. Traditionally, this steam is produced using boilers that burn fossil fuels such as



refinery gas, natural gas, fuel oil, or coal, which in turn.



## High-efficiency solar-powered containerized oil refineries price reduction



### Frontiers , Distributed clean energy opportunities for US oil refinery

Due to lower natural gas prices and a poorer solar resource profile, solar steam is more expensive to integrate in Louisiana, increasing the refinery's total life-cycle cost over a ...

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### Solar-assisted hybrid oil heating system for heavy refinery ...

The purpose of this study is to investigate the potential use of solar energy within an oil refinery to reduce its fossil fuel consumption and greenhouse gas emissions.

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### Distributed clean energy opportunities for US oil refinery

Section 3.1 describes how electricity generation technologies--solar PV, wind, and battery energy storage, which were co-optimized due to the temporal nature of solar and wind resource--can ...

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### Analysis of a Solar-Assisted Crude Oil Refinery System

This paper proposes a solar-assisted method for a petrochemical refinery, considering hydrogen production deployed in Yanbu, Saudi Arabia, as a case study to ...



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### Concentrated Solar Thermal: a solution for oil decarbonisation?

Concentrated Solar Thermal offers a pathway to decarbonising oil refining by replacing fossil-fuelled steam with solar-powered alternatives.

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### Sustainable refining: integrating renewable energy and advanced

By incorporating solar power into preheating systems, utilizing concentrating solar power (CSP) plants, and exploring the potential of fuel cells and green hydrogen, these ...

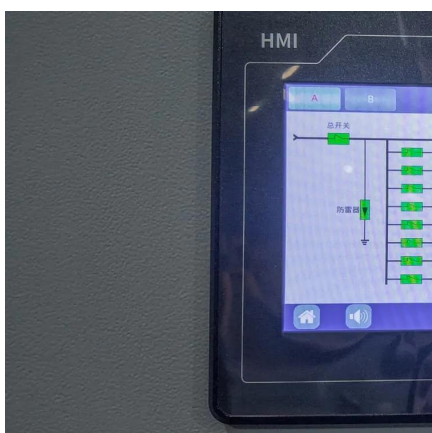
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### Solar Refinery

However, significant reductions in CO<sub>2</sub> capture costs and significant improvements in the efficiency with which solar energy is used to drive chemical conversions ...

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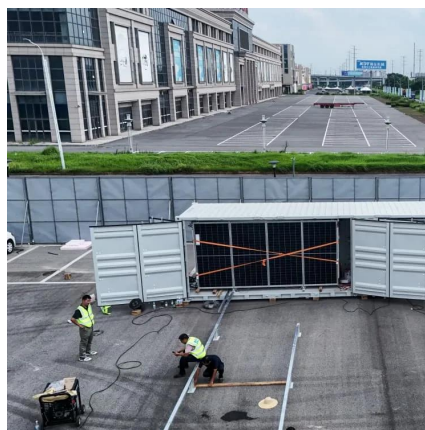
### [How Solar Energy is Revolutionizing Oil](#)



## and Gas Production

Between 2010 and 2019, solar energy costs plummeted by 85%, with the cost per megawatt-hour dropping from \$378 to just \$68. This dramatic decrease continues, driven by ...

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## **Solar Refinery**

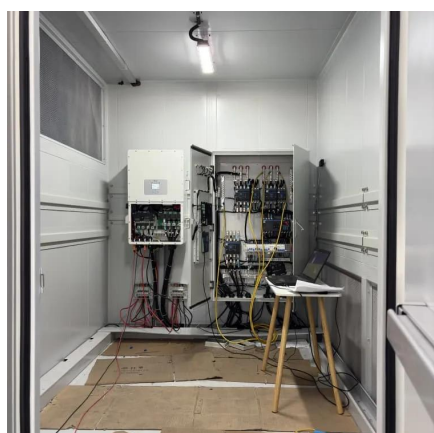
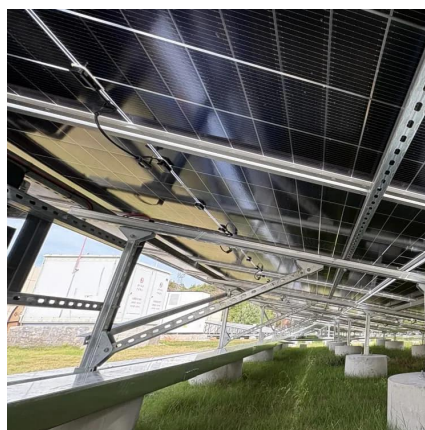
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## Published at Energy Conversion and management

Herein, a solar multi-energies-driven hybrid chemical oil refining system, exemplified by residual oil cracking, has been successfully developed and formulated in solar ...

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## **Using concentrated solar power for**



## **crude oil distillation: a step**

A recent study from ENEA and the University of Palermo has estimated that applying CSP to crude oil distillation might decrease CO2 emissions by more than 10% (about ...

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