

### Indonesia's Net Zero Emissions Journey:

## The Impact of Clean Energy Targets on the Oil & Gas Industry

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# Executive Summary

# **Executive Summary**

### **Fueling Innovation:**

### A Dynamic Overview of Clean Energy in the Oil & Gas Industry

- In the past 10 years, the oil & gas sector has been Indonesia's most significant energy supplier; however, it has declined in recent years.
- Over the past decade, the contribution of the oil & gas sector to Indonesia's gross domestic product (GDP) declined by 2.6%, in contrast to a 4.2% growth observed in other sectors.
- Indonesia's oil & gas production landscape is still largely shaped by local players, who churn out an average of 658,540 barrels
  of oil per day (BOPD), underscoring their crucial role in any Net Zero Emissions (NZE) initiatives. Oil & gas production has
  significant negative implications as a contributor to fossil fuel CO<sub>2</sub> emissions, which continue to increase from year to year.
- Upstream activities contribute up to 59% of oil & gas companies' high carbon emissions.
- Oil & gas companies must implement NZE initiatives to reduce carbon emissions from upstream, midstream, and downstream activities.

### **Breaking Barriers:**

### Challenges in the Indonesian Oil & Gas Industry's Transition

- Oil & gas companies may be hesitant to allocate resources to carbon trading initiatives due to high investment costs, especially if they perceive the financial returns to be uncertain or insufficient compared to their traditional business activities.
- The lack of knowledge on carbon trading and its benefits impacts the knowledge gap between the resources/ working team and the target that has been set.
- Uncertainty surrounding the regulation of carbon trading emissions, coupled together with the absence of incentives to shift towards NZE results in the loss of oil & gas investment opportunities in clean energy and reputational risk on a global scale.



### **Shifting Perspectives:**

### **Evaluating Gaps in Oil & Gas Initiatives for Indonesia**

- Indonesia: Based on Indonesia's Nationally Determined Contribution (NDC), its emission reduction target is 29% unconditionally and 41% conditionally by 2030. Meanwhile, oil & gas energy transition investment is predicted to be around USD 8 billion, which is higher than the business-as-usual scenario. In terms of resource readiness, BAPPENAS, the Indonesian Ministry of National Development Planning, has led the initiatives to increase worker readiness towards a green economy.
- England: The UK government has set a highly ambitious climate change target. It aims to reduce its overall emissions by at least 68% by 2030, with a reduction target of 10% by 2025 and 25% by 2027 for oil & gas companies. Oil & gas revenues are projected to allocate 50% of their capital budget by 2030 to achieve their target. In terms of resource readiness, the UK plans to add 500,000 or over 80% of new roles for energy transition by 2030.



- The United States: The United States' NDC aims to reduce greenhouse gas (GHG) emissions by 50-52% by 2030. To achieve this target, the US government has invested USD 104 million in clean energy projects and plans to generate 2.3 million net jobs by 2035.
- Malaysia: Malaysia aims to cut 45% of its carbon intensity against its GDP by 2030 and has developed a National Energy Transition Roadmap (NETR) to shape these comprehensive initiatives. The government has allotted a RM 1.2 – 1.3 trillion budget until 2050 to support the initiative and prepare talent readiness through education and green job opportunities.
- Thailand: Based on Thailand's NDC, the power sector aims to decrease the share of renewables for natural gas electricity from 64% in 2015 to 37% in 2036 in order to reduce dependency on natural gas and rely more on renewables. To achieve this target, Thailand's oil & gas players have invested approximately USD 55.7 million in greenhouse gas and environmental management. Although the general public favors the energy transition ideas, Thailand will require support from more stakeholders to achieve the target, at the national level, regarding green jobs and skills.
- Shell and Chevron, two of the most competitive oil and gas players globally, have been working towards achieving their NZE target, which includes Scopes 1, 2, and 3 of the 2001 GHG Protocol. Chevron has collaborated with its stakeholders and invested in research and development that will work to reduce 30 million tons of carbon dioxide equivalents (CO<sub>2</sub>eq) by 2028, while Shell's plans involve building an integrated power business incorporating renewable power.
- Oil & gas players in Indonesia, Malaysia, and Thailand have established specific goals to achieve their national mission reduction targets. However, they are still focusing on their first step, engaging with Scopes 1 and 2 of of the GHG Protocol from 2001. They are mainly investing and implementing in carbon capture and storage (CCS), carbon capture, utilization and storage (CCUS), waste generation, flare gas recovery and utilization, and infrastructure development.



### **Unlocking Tomorrow's Energy:**

### The Power of Implementing Clean Energy in the Oil & Gas Industry

- Recommendations for oil & gas NZE initiatives will be reflected in a roadmap and divided into three phases: reducing highemission business operational activities, increasing low-emission corporation strategic initiatives, and adapting a lowemission value chain resilience strategy.
- As the energy transition leads to a higher demand for renewable and clean energy projects globally, oil & gas players must navigate the transition through human capital development initiatives.

### Fueling Innovation:

# A Dynamic Overview of Clean Energy in Indonesia's Oil & Gas Industry

## **Oil & Gas Industry Overview**

Over the last decade, the Oil & Gas sector has been the largest energy supplier in Indonesia; however, it has exhibited a decline in recent years.



Energy Supply in Indonesia, by Sector in million terajoule (TJ)

- The oil & gas sector has contributed 33.4% of Indonesia's total energy supply in the last 10 years. However, it decreased by 2.1% in 2010.
- The sector with the second-largest energy supply is coal at 22.4%, with a growth rate of 5.9%.
- In the future, environmentally friendly energy sources such as wind and solar will experience an increase in supply, having experienced a growth trend of 4.5% over the last 10 years.

Source: IEA, Carbon Credits, Ministry of Energy & Mineral Resources, YCP Research & Analysis

The contribution of the Oil & Gas sector to Indonesia's GDP decreased by 2.6%, while other industries grew by 4.2% over the last 10 years.



The Oil & Gas Sector's Contribution to Indonesia's GDP (in IDR trillion)

- Over the past 10 years, the oil & gas sector's contribution to Indonesia's GDP has decreased by 2.6% from IDR 313 trillion to IDR 247 trillion.
- The sectoral decline is attributed to the reduction in energy supplies from Indonesia's oil & gas sector, which is expected to be replaced by other sectors in the years to come.

## Up to this point, the production of Oil & Gas in Indonesia is still dominated by local players, who produce an average of 658,540 barrels of oil per day (BOPD).



### Indonesia's Oil & Gas Players, by production capacity (BOPD)

- According to the Ministry of Energy and Mineral Resources, the average oil & gas production in Indonesia was 658,540 barrels of oil per day (BOPD) throughout 2021.
- Currently, Indonesia's top 10 companies in terms of oil & gas production are still local players.

Source: IEA, Carbon Credits, Ministry of Energy & Mineral Resources, YCP Research & Analysis

Indonesia's Oil & Gas Sector:

## **A Major Contributor to High Emissions**

Oil & Gas production significantly contributes to fossil fuel CO<sub>2</sub> emissions, which continue to increase yearly.

### Fossil Fuel CO<sub>2</sub> Emission in Indonesia, by Energy Source



- Almost every energy source, including oil, gas, coal, and others, contributes to carbon emissions and climate change.
- As per the Global Carbon Project's findings, CO<sub>2</sub>eq emissions from Indonesia's fossil fuel combustion are projected to surge, with greenhouse gas emissions increasing by over 20%.
- The Oil & Gas sector is witnessing a substantial 13.2% rise in fossil fuel emissions, reaching nearly 330.5 million metric tons.

## Upstream activities make up to 59% of the total carbon emissions generated by Oil & Gas companies.



### GHG Emission, by supply chain (% Kt CO<sub>2</sub> eq)

- Based on the value chain of oil & gas production, the largest carbon emissions come from upstream activities, accounting for 59% or equivalent to 3,292 metric tons of carbon dioxide equivalent (MtCO<sub>2</sub>e). Meanwhile downstream activities contribute 27% or approximately to 766 MtCO<sub>2</sub>e. Lastly, midstream activities contribute 14% or equivalent to 1,526 MtCO<sub>2</sub>e.
- According to the value chain, upstream methane contributes the highest emission, followed by energy for extraction, and hydrotreating in downstream activities.

Source: Global Carbon Project, Skolkovo Foundation, YCP Research & Analysis

## Therefore, Oil & Gas companies must implement more initiatives to achieve the NZE goal of reducing carbon emissions.



Net Zero Emission Scopes Across Value Chain

The Greenhouse Gas Protocol from 2001 marked a significant step forward in standardizing how businesses and organizations measure and report greenhouse gas emissions. It established a foundational framework, including the value chain-based emission scopes.

#### Scope 1:

Covers direct emissions from sources that are controlled or owned by the company. This includes emissions from fuel combustion in things like boilers, generators, burning fuels from company vehicles, as well as leaks from equipment.

#### Scope 2:

Covers indirect emissions from the generation of purchased electricity, heat, or steam that the company uses. In other words, it refers to the emissions released when creating the electricity that oil & gas companies consume.

#### Scope 3:

Encompasses all other indirect emissions that are a consequence of the company's activities but occur from sources not owned or controlled by the company. This includes emissions from the production of goods and services purchased by the company, transportation of purchased materials, employee business travel, waste disposal, and sold gas (used by customers).

Salamuddin Daeng, an energy observer and researcher at the Indonesian Economic and Political Association (AEPI), said that only 10 large global oil & gas companies have committed to the Scope 3 net zero emissions. In Indonesia itself, **the Scope 3 targets and implementations have not yet been implemented and are not running optimally due to challenges.** 

Source: EPA, National Grid, YCP Research & Analysis

# Breaking Barriers: Challenges in the Indonesian Oil & Gas Industry's Transition

# High investment costs associated with emission reduction

### Barriers



# Lack of resource readiness between O&G companies, their employees, and stakeholders

### Barriers



### Issue 3:

# Uncertainty and the lack of incentives from the government to encourage the shift to NZE

### **Barriers**



# Shifting Perspectives: Evaluating Gaps in Oil & Gas Initiatives for Indonesia





- As for Indonesia's Nationally Determined Contribution (NDC), the latest submission outlined the main goal to "Reduce GHG Emission target unconditionally to 29%, conditionally to 41% compared to businessas-usual figures of 834 Mt CO<sub>2</sub>e and 1,185 Mt CO<sub>2</sub>e, respectively, by 2030," distributed along five key sectors which are forestry, energy, agriculture, and industrial processes and product use (IPPU).
- Regulation

• To achieve the targets, the government has created a "guidebook" to implement NZE initiatives. However, there is a lack of obligatory policies to support the execution directly.

• Indonesia is predicted to invest around USD 8 billion more per year in the Announced Pledges Scenario (APS) than in a business-as-usual scenario, with investment in renewable energy generation and grids (USD 25 billion) more than the current investment in the entire energy sector by 2030.



Investment

 According to SKK Migas, the Special Task Force for Upstream Oil and Gas Business Activities in Indonesia, the investment in energy, especially in oil & gas industry, will continue to increase by 2050.
 SKK Migas also continues to support the renewable energy demand by increasing the national oil & gas production, especially natural gas as it will play big role during energy transition to achieve the NZE target by 2030.



• The green economy transition will lead to positive impacts to provide more green-job opportunities in Indonesia. This has led to the need for new skills, qualification profiles, and training frameworks.



BAPPENAS has led initiatives to increase worker readiness for a green economy, which includes but
is not limited to conducting green jobs conferences and the development of occupational maps in the
Indonesian National Qualifications Framework (KKNI). They aim to develop resources and skilled human
power to meet the need for environmentally friendly work or green jobs, supporting Indonesia's economic
transformation through the green economy.

Source: IEA, Ministry of National Development Planning/Bappenas, YCP Research & Analysis







### **Global Gap Analysis**





Source: White House Gov., UK Government, YCP Research & Analysis



- Malaysia aims to cut 45% of its carbon intensity relative to its GDP by 2030, compared to the 2005 baseline.
- Malaysia developed the Twelfth Plan, which outlines the nation's aspiration of achieving net zero greenhouse gas emissions by as early as 2050. The plan not only focuses on ensuring energy policies and programs, but also considers the socioeconomic implications.



 The country has also established the National Energy Policy, 2022 – 2040 (DTN), to transform the primary energy supply by moving to cleaner, renewable energy sources.

- Regulation
- They also developed the National Energy Transition Roadmap (NETR), led by the Ministry, to shape the comprehensive initiatives along with the state governments and private sectors.
- In line with the nation's Low-Carbon National Aspiration by 2040, the Malaysian government established tax incentives for carbon capture storages (CSS) to limit CO<sub>2</sub> emissions using technology in 2023. The proposed tax mechanisms include a 100% tax allowance for 10 years, import duty and tax exemptions from 2023 2027, and tax deduction for pre-commencement expenses within five years of operations.



- According to Bank Negara Malaysia (BNM), achieving Malaysia's National Energy Transition Roadmap would require the success of initiatives across infrastructure, technology, and human capital up to 2050, amounting anywhere between RM 1.2 trillion and RM 1.3 trillion in investment.
- The Malaysian government has allotted the budget to support initiatives to achieve the NETR.
- In addition, most banks in Malaysia are committed to supporting the initiatives.



 In 2023, the Malaysian government increased talent readiness efforts through education by establishing a task force to tackle the waning interest in science and technology among children in rural areas and poverty-stricken locations.



- The Malaysian government has also supported the development of the "green collar workforce" through the NETR.
- Through various NETR projects and initiatives, the government expects to generate 23,000 high-impact, high-quality green job opportunities in Malaysia.

Source: Malaysia Gov., YCP Research & Analysis



 According to Thailand's Nationally Determined Contribution (NDC), to achieve a 1.5°C pathway, the power sector would need to see a sharp increase in the share of renewables in electricity generation from 16% in 2020 to 57–67% by 2030.



• In 2008, the government of Thailand introduced the 15-year Renewable Energy Development Plan (REDP 2008-2022), a long-term plan to increase the share of renewable energy in final energy consumption to 20% by 2022.

Regulation

• The plan targets to reduce the electricity generated by natural gas from 64% of total electricity generation in 2015 to 37% in 2036, while also increasing reliance on domestic renewable energy (20%).



- In 2022, PTT, a prominent oil & gas company in Thailand, spent roughly USD 32.9 million on greenhouse gas management, with a breakdown as follows:
  - GHG emissions reduction projects USD 31.3 million and offsetting projects, including blue carbon USD 1.6 million.

Investment

• In addition, PTT also spent USD 1.7 million on ocean health and biodiversity monitoring strategy and USD 21.1 million on environmental management in 2022.



Resource

Readiness

- While the idea of a low-carbon society is a widely and politically accepted ideology, Thailand still lacks an integrated plan or policy at the national level focused on green jobs and green skills.
- During the transition towards a low-carbon economy, line ministries, business establishments, and representatives of private companies have developed green competencies and skills.
- Koh Samui, a small island town and famous tourist destination in south Thailand, provides an excellent example of public-private collaboration to promote energy conservation.

Source: Thailand Gov., YCP Research & Analysis

### Local Players' Initiatives



Company	Scope	Initiatives	Result
MedCo	1	<ul> <li>From 2019 onwards, reduce greenhouse gas emission by 30% in 2025 and 30% in 2030</li> <li>Reduce oil &amp; gas methane emissions by 25% in 2025 and 37% in 2030</li> </ul>	<ul> <li>Reduced 0.4 million tons of CO<sub>2</sub>eq (carbon dioxide equivalents) or +5% YoY in 2022 from oil &amp; gas operations</li> <li>Reduced 0.5 million tons of CO<sub>2</sub>eq or +59% YoY in 2022 from power operations</li> </ul>
	2		<ul> <li>Reduced 50,000 m3 +1% YoY in 2022 from water withdrawal</li> <li>Reduced 48% or 1,958 tons of non-hazardous waste generation</li> <li>Spent USD 2.3 million on sustainable oil &amp; gas and power CSR initiatives (examples are blue carb bank, hydroponic and organic vegetable greenhouse)</li> </ul>
	3	<ul> <li>Disclose Scope 3 greenhouse gas emission targets by 2025</li> </ul>	Progress not mentioned
Pertamina Power Indonesia (PPI)	1	<ul> <li>Add up 20.9 gigawatts (GW) of renewable power generation by 2030</li> </ul>	<ul> <li>Installed 2,471.4 MWp of solar panels through Jawa Satu Power Plant</li> </ul>
	2	<ul> <li>generation by 2030</li> <li>Set an increasing target for the renewable energy mix, aiming to achieve 23% by 2025</li> <li>Reduce the emission burden by at least 0.08% from the 2020 emission baseline</li> </ul>	<ul> <li>Reduced energy consumption to 513,424.80 gigajoules (GJ) or 3.7% from 2021</li> <li>The use of operational electric cards in the PPI environment since 2022</li> <li>Utilization of electrical bus tie system for PLTP 3 &amp; 4 (UBL) Electrification Logyard (LMB)</li> <li>Reduced the emission by 1.06% or 1,295.05 tons of CO<sub>2</sub>eq</li> </ul>
	3	Target not yet mentioned until 2023	
Eni Eni Indonesia	1	Acceleration of     decarbonization programs	<ul> <li>Developed bio-feedstock to produce biofuels, nature-based, and technology-based carbon offsets</li> <li>Carbon capture storage/carbon capture utilization and storage (CCS/CCUS) and energy efficiency</li> </ul>
	2		Target not yet mentioned until 2024
	3		Target not yet mentioned until 2024

### Global Players' Initiatives



Company	Scope	Initiatives	Result
et al construction de la constru	1	<ul> <li>Reduce the intensity of greenhouse gas emissions from exploration and production activities</li> </ul>	<ul> <li>Exploration and production portfolio management and well-management contributed to reducing total greenhouse gas emissions by approximately 5.9 million tons of CO<sub>2</sub>eq</li> <li>From the total emission reduction, methane leakage control contributed 0.03 million tons of CO<sub>2</sub>eq and flare gas recovery and utilized 1.9 million tons of CO<sub>2</sub>eq</li> </ul>
	2	under operational control by at least 25% by 2030 (from 2012)	<ul> <li>Incorporated various technologies to the production process, which reduced approximately 3 million tons of CO<sub>2</sub>eq</li> <li>From the total emission reduction, energy efficiency contributed 0.6 million tons of CO<sub>2</sub>eq, while product efficiency improvement and renewable energy contributed to reducing 0.3 million tons of CO<sub>2</sub>eq</li> </ul>
	3	Target	not yet mentioned until 2023



### Global Players' Initiatives



Company	Scope	Initiatives	Result
Petronas	1	<ul> <li>Reduce operational emissions to 49.5 million tons in Malaysia by 2024</li> <li>Reduce methane emissions by 50-70% for natural gas and gas value chain</li> </ul>	<ul> <li>Intensified efforts through flaring and venting, energy efficiency, and electrification, which includes digital solutions, operational excellence, and equipment optimization</li> <li>Matured carbon capture storage (CCS) lever for its assets</li> <li>Become a leading hub for CSS in Malaysia</li> <li>Electrified operations through asset modification and infrastructure development</li> </ul>
	2	<ul> <li>Reduce greenhouse gas emissions by 25% through the equity share approach</li> <li>Build 30-40 gigawatts (GW) of renewable energy capacity by 2030, and 1.2 million tons per annum (MTPA) hydrogen by 2030</li> </ul>	<ul> <li>Established a strong presence among specialty chemicals businesses</li> <li>Provide bio-based value chain, captured 10% market share of public electric vehicle charging points across key markets in the Asia Pacific</li> </ul>
	3	Target	not yet mentioned until 2023



### Global Players' Initiatives



Company	Scope	Initiatives	Result
Shell	1	<ul> <li>Reduce operational emissions by 100% by 2030</li> <li>Eliminate routine flaring of natural gas from its upstream operations by 2025</li> <li>Maintain a methane emission intensity below 0.2% and achieve its near-zero emission target by 2030</li> </ul>	<ul> <li>Successfully reduced 22 million tons of emissions per year from 2016 until 2023</li> <li>From 2016 onwards, reduced total methane emissions by 70% through enhanced source level measurement in line with the United Nation's Oil &amp; Gas Methane Partnership 2.0 (OGMP 2.0) reporting requirements</li> <li>In 2023, around 50% of total routine and non-routine flaring in Shell's Integrated Gas and Upstream facilities occurred in assets operated by the SPDC and Shell Nigeria Exploration and Production Company (SNEPCo)</li> </ul>
	2	<ul> <li>Reduce emission from energy they purchase to run their operations by 2030</li> <li>Invest in low-carbon energy solutions</li> </ul>	<ul> <li>Reduced emissions by 4 million tons yearly since 2016</li> <li>Between 2023-2025, invested USD 10-15 billion in low- carbon energy solutions</li> </ul>
	3	<ul> <li>Reduce Net Carbon Intensity (NCI) by 15-20% by 2030</li> <li>Reduce emissions from consumer-use of Shell's oil products by 15-20% by 2030</li> </ul>	<ul> <li>Plans to build an integrated power business to reduce NCI, which will include renewable power and increase the sales and demand for low-carbon energy.</li> </ul>

### Global Players' Initiatives \_\_\_\_\_



Company	Scope	Initiatives	Result
Chevron	1	<ul> <li>Upstream methane-intensity target 2.0 kg CO<sub>2</sub>e/boe by 2028</li> <li>24 kg CO<sub>2</sub>e/boe for oil by 2028 (global industry average is 46)</li> <li>24 kg CO<sub>2</sub>e/boe for gas by 2028 (global industry average is 71)</li> <li>2 kg CO<sub>2</sub>e/boe for methane and a global methane-detection campaign</li> <li>0 routine flaring by 2030 and 3 kg CO<sub>2</sub>e/boe</li> </ul>	<ul> <li>Reduced the methane intensity of oil &amp; gas operations by more than 50% since 2016</li> <li>Reduced oil operations emissions by 40% from 2016</li> <li>Reduced gas operations emissions by 26% since 2016</li> <li>Reduced methane and global methane emissions by 53% since 2016</li> <li>Reduced routine flaring emissions by 66% since 2016</li> </ul>
	2	<ul> <li>Improve energy management by investing in wind and solar projects that can reduce carbon emissions cost-efficiently</li> </ul>	<ul> <li>Sourced electricity from renewable sources, such 65 megawatts (MW) wind-power purchase agreement in the Permian Basin</li> <li>Negotiated an agreement with SunPower to provide more than 1.4 billion kilowatthours (kWh) of solar energy over 20 years</li> <li>Partnered with Algonquin Power &amp; Utilities to source 500 megawatts (MW) by 2025</li> </ul>
	3	<ul> <li>Portfolio carbon intensity to reduce 30 million tons of CO<sub>2</sub>e by 2028 through a diversified product called New Energies</li> <li>Utilize liquefied natural gas (LNG) carbon footprinting to deliver a cargo-specific greenhouse gas emissions profile based on the carbon footprint of the supply chain from the wellhead to the delivery point</li> </ul>	<ul> <li>Invested in hydrogen research and development for decades and acquired over 75 patents from early commercial ventures that align with the company's future development strategies.</li> <li>Produced around 1 million tons of hydrogen per year</li> <li>Partnered with Qatar Energy and Pavilion Energy to collaborate on the development of a greenhouse gas quantification and reporting methodology for LNG shipments</li> </ul>

# Building a Sustainable Future: A Roadmap for Oil & Gas Companies in the Energy Transition

### Pathway for the Oil & Gas Industry to Achieve **Net Zero Emissions**

### **Net Zero Emission Pathway**



Indirect

Code	Initiatives for Oil & Gas Companies
1A	Oil & gas companies can capture carbon emissions through carbon capture, utilization & storage (CCUS) and carbon trading by allocating investments to CCUS technology, integrating CCUS technologies into their existing operations, or participating in carbon trading markets.
1B	Oil & gas companies can undertake decarbonization efforts within their business divisions by reducing operational emissions, particularly by mitigating methane emissions.
2A	Oil & gas companies can take corporate action in clean-energy and low-carbon solutions by allocating investments to purchase or develop contractual agreements with relevant companies.
2B	Oil & gas companies can collaborate with renewable energy companies to provide corporation electricity for buildings, vehicles, and other infrastructures or assets.
<b>3A</b>	Oil & gas companies can develop green partnerships by enhancing business investments and partnerships with suppliers and customers who support greenhouse gas emission reduction.
3B	Oil & gas companies can develop new business models to reduce emissions in upstream and downstream activities.

## Potential benefits of a Net Zero Transition for O&G Companies



Demand

- The Net Zero Emission transition leads to the higher demand of renewable and clean energy projects globally. This also implies the need to extend workforce requirements within the industry players to fulfill the demands.
- Oil & gas players need to consider the workforce requirement transition from emissionintensive jobs, including white and blue-collar workers, to growing demand jobs, with additional green-collar workers, resulting from the NZE transition.
- Oil & gas players must navigate the transition through human capital development initiatives for existing workers and their upcoming workers to fulfill future job demands, which are upskilling and retraining.



Cost

- The levelized cost of energy (LCOE), which calculates the price of a plant producing a megawatt hour of electricity throughout its lifespan, determines the comparison between multiple energy sources.
- The formula of LCOE encompasses the total initial investment, operations and maintenance, and fuel cost, divided by the total of electricity generated within the same time frame. Companies should strive for a lower LCOE.
- When projected between the years 2040 and 2050, solar PV and wind energy will produce the
  most competitive LCOE across different power stations. This outcome is due to technological
  advancements, improved economies of scale, and manufacturing practices. Meanwhile, the
  upward trajectory of coal plants' LCOE is mainly due to declining capacity over the years.

# Authors



### Dara Risczka Rosdianty

Dara is based in YCP Solidiance's Indonesia office. She has gained exposure to diverse industries, including technology, agriculture, and healthcare. Dara has also been involved in several projects, including feasibility studies, route-to-market strategies, growth strategies, and digital transformation.



### Humaira Syifa

Syifa works from YCP Solidiance's Indonesia office. Before joining the firm, she worked as a supply chain specialist at a pharmaceutical company, focusing on planning and logistics. Syifa was involved in various industries before venturing into consulting, including public transportation, oil & gas, marketing, and the agribusiness sectors.



### Dylan Sastilaya

Dylan is based in YCP Solidiance's Indonesia office. While at YCP Solidiance, Dylan has gained valuable experience in construction market research, restructuring the mining business, holding survey services, and lubricant distributor audits.



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Nabila works from YCP Solidiance's Indonesia office. She has gained experience in market assessment from her previous experiences in various sectors, delving into lubricants, machinery, and MNC toys. Prior to joining YCP Solidiance, she was an Analyst at a local boutique management consulting firm, where she worked on projects related to M&A, commercial due diligence, and the PMO office.



### Kara Carolluna

Luna is based in YCP Solidiance's Indonesia office. At YCP Solidiance, Luna has been involved in corporate strategy and market research, providing survey services. Prior to joining YCP Solidiance, she gained experience at a local management consulting firm working on feasibility studies, and working within the environment, local businesses, and mining sectors.

### For Business Development Inquiries



#### Septian Waluyan Partner, YCP Solidiance

Septian is a Partner in our Indonesia office. He built his expertise in consulting through a focus on FMCG and consumer-related sectors, as well as manufacturing. He has managed and worked on various projects for the firm, including go-to-market strategy, M&A, commercial due diligence, marketing strategy, and channel management. Before YCP Solidiance, he was a product manager for several multinational companies in Singapore and The Netherlands.

Education:

- · Bachelor Degree, B.Sc., from Nanyang Technological University, Singapore
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### Dhendy Fadhillah

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Dhendy is a Director based in our Jakarta Office. He has gained experience in various sectors, such as energy and utilities, mining, manufacturing, supply chain and logistics, and telecommunications. His expertise also includes enterprise take-off programs, accurate strategy & execution discipline, corporate excellence, and end-to-end digital transformation.

Before he joined YCP Solidiance, Dhendy led major projects in well-known consulting firms focused on business transformation, operations, technology, organization, and business management.

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# About Us

### What We Do

YCP Solidiance is an Asia-focused strategy consulting firm with offices across 21 key locations globally. Asia-focused with global presence, we define new business models and help clients drive their business growth through strategic solutions. We deliver highimpact advisory services by tailoring our services to suit different business needs. To learn more about our services visit: https://ycpsolidiance.com

### **Our Locations**

We are present in Singapore (global headquarters), Japan, China, Hong Kong, Taiwan, Indonesia, Malaysia, the Philippines, Thailand, Vietnam, India, United Arab Emirates, North America, and Europe.

### What We Focus On

We focus on advising our large client base across a wide spectrum of strategic consultancy areas, identify breakthrough growth opportunities and develop execution-ready strategies and roadmaps. Our Asia-focused market entry and growth strategy services provide the required insights to capture a profitable market share in the region.

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