



أديبك
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ENERGY IN CONTEXT SERIES

FINANCING A JUST, ORDERLY AND EQUITABLE TRANSITION



CASE STUDY

How NOCs can pave
the way for a just
energy transition

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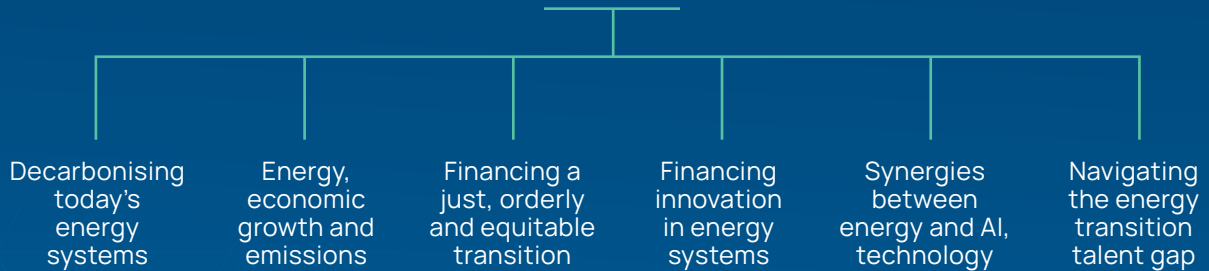
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The transformation of the world's energy system offers a unique opportunity for economic growth, with the energy sector driving global advancement.

ADIPEC's **Energy in Context** series presents high-value briefs and case studies that showcase progress, foster dialogue and fast-track innovation to accelerate the energy transition.

The series explores key pillars driving the industry's transformative journey towards a secure, equitable, and sustainable energy future.

KEY PILLARS OF ADIPEC



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How NOCs can pave the way for a just energy transition

CONTEXT

National oil companies (NOCs) are pivotal in the global energy landscape. They hold nearly 60% of the world's oil and gas reserves and are responsible for more than half of the oil and gas production. This underscores the significant role NOCs can play in the energy transition and their potential impact on achieving net-zero targets¹.

Among forward-thinking NOCs, Ecopetrol stands out for its substantial investment in green energy. The Colombian oil and gas giant is committing US\$1.23 billion to accelerate its transition efforts. This investment aims to enhance its exploration of renewables and hydrogen, improve energy efficiency, and develop carbon capture technologies. Ecopetrol is also channelling funds into Interconexión Eléctrica (ISA), the Colombian power transmission company.

These strategic plans align with Colombia's climate objectives and reflect the pathways being explored by some Latin American countries. The continent is emerging as a significant player in the renewable energy sector and has the potential to be a key contributor to the global shift towards low-carbon hydrogen—an essential component in the pursuit of net-zero emissions worldwide.

ADVANCING COLOMBIA'S ENERGY TRANSITION

Ecopetrol, Colombia's leading petroleum enterprise, plays a critical role in steering the nation towards its climate objectives. The oil and gas behemoth has pledged to invest US\$1.23 billion in energy transition projects, with a focus on a self-consumption scheme for renewable

50kt

Amount of green hydrogen Ecopetrol aims to generate by 2025²

40

Number of countries exploring natural hydrogen deposits in 2023⁵

US\$277bn

Projected value of hydrogen generation market by 2032⁴

380Mt

Amount of low-carbon hydrogen and its derivatives required per year to limit global warming to 2°C³

Organisations involved

- Ecopetrol
- ISA

Industry

Energy

Location

Colombia

Cost

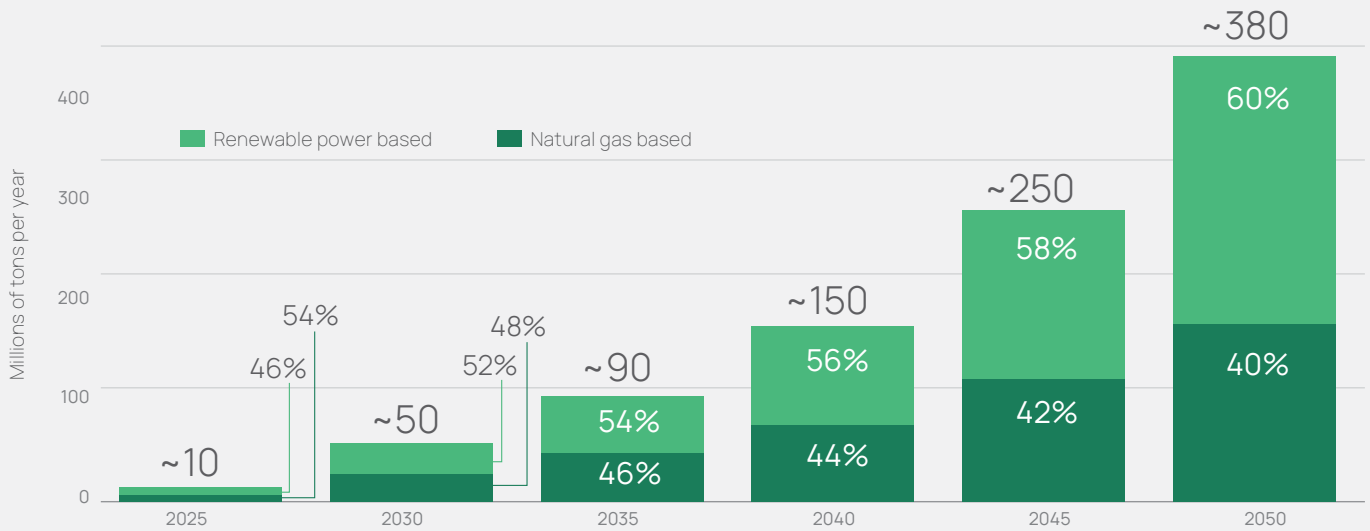
US\$1.23 bn

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Projected low-carbon hydrogen needed to meet demand

By feedstock source (2°C change scenario)¹



¹ These volumes include clean hydrogen derivatives such as 3-ammonia, e-methanol, and kerosene

Source: International Energy Agency; BCG analysis

energy. This initiative will enable the company to both generate and utilise a greater share of renewable energy within its operations.

In addition to this, Ecopetrol is set to advance the development of low-carbon hydrogen, with a goal of producing over 50,000 tonnes by 2025². The company also aims to enhance energy efficiency by implementing strategies to optimise energy use, minimise waste, and conduct research to advance CO2 capture and storage technologies.

The NOC’s investment plans in ISA—Colombia’s power transmission firm—and road infrastructure will further bolster the energy transition. By integrating 900 MW of renewable energy and striving to cut CO2 emissions by nearly 400 kilotonne (Kt), Ecopetrol’s initiatives will significantly advance Colombia’s climate targets.

Yoshinori Kanehana, Co-Chair of the Hydrogen Council, a global initiative focused on developing the hydrogen economy, said: “Making the globally announced 1,400+ clean hydrogen projects a reality with its associated 45 Mt annual supply through 2030 will require ambitious concerted action by both private and public stakeholders.”

The focus on low-carbon hydrogen is in line with both international trends and Colombia’s national ambitions. Hydrogen is increasingly recognised as a vital element in the global energy transition. White hydrogen – which is hydrogen found in nature – in particular, presents distinct benefits due to its zero CO2 emissions and the fact that it requires no water to produce. It also offers a cost advantage over other hydrogen types due to its natural occurrence. While grey hydrogen, derived from fossil fuels, averages less than US\$2 per kg, green hydrogen, which is produced using renewable electricity, is currently more than three times as expensive. Even if the cost of renewable hydrogen decreases with falling electrolyser prices in the future, white hydrogen is likely to remain the more economical option⁶.

Moreover, white hydrogen boasts a low carbon intensity. With a hydrogen content of 85% and minimal methane contamination, its carbon intensity stands at approximately 0.4 kg CO2 equivalent (CO2e) per kg of hydrogen gas, accounting for both embodied and hydrogen-specific emissions. However, when the hydrogen content is 75% and methane content is 22%, the intensity increases to 1.5 kg CO2e per kg of H2⁵.

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The Boston Consulting Group estimates that 380 million tonnes of low-carbon hydrogen and its derivatives will be needed annually to limit global warming to 2°C. This requirement rises to 565 million tonnes per year to meet the Paris Agreement target of a 1.5°C increase³.

As oil and gas companies increasingly seek natural hydrogen deposits to leverage this green fuel, the number of companies exploring these resources has risen to 40 by the end of 2023, up from just 10 in 2020⁵. Exploration activities are underway in Australia, the US, Spain, France, Albania, Colombia, South Korea, and Canada, underscoring the broad scope and significant role of hydrogen in achieving global net-zero emissions.

Given the substantial concentrations of white hydrogen in Colombia's Llanos Basin, Ecopetrol's efforts to tap into this resource could play a pivotal role in meeting the country's energy demands sustainably.

Ecopetrol's proactive investments in renewable energy, hydrogen, and carbon capture are essential to Colombia's transition towards a low-carbon economy. By focusing on innovative technologies and aligning with national policies, Ecopetrol not only advances its own sustainability agenda but also supports Colombia's broader climate goals. The company's strategic initiatives illustrate how major oil and gas players can contribute meaningfully to global energy transitions while addressing local energy needs sustainably.



“ Making the globally announced 1,400+ clean hydrogen projects a reality with its associated 45 Mt annual supply through 2030 will require ambitious concerted action by both private and public stakeholders. ”

Yoshinori Kanehana
Co-Chair, the Hydrogen Council

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