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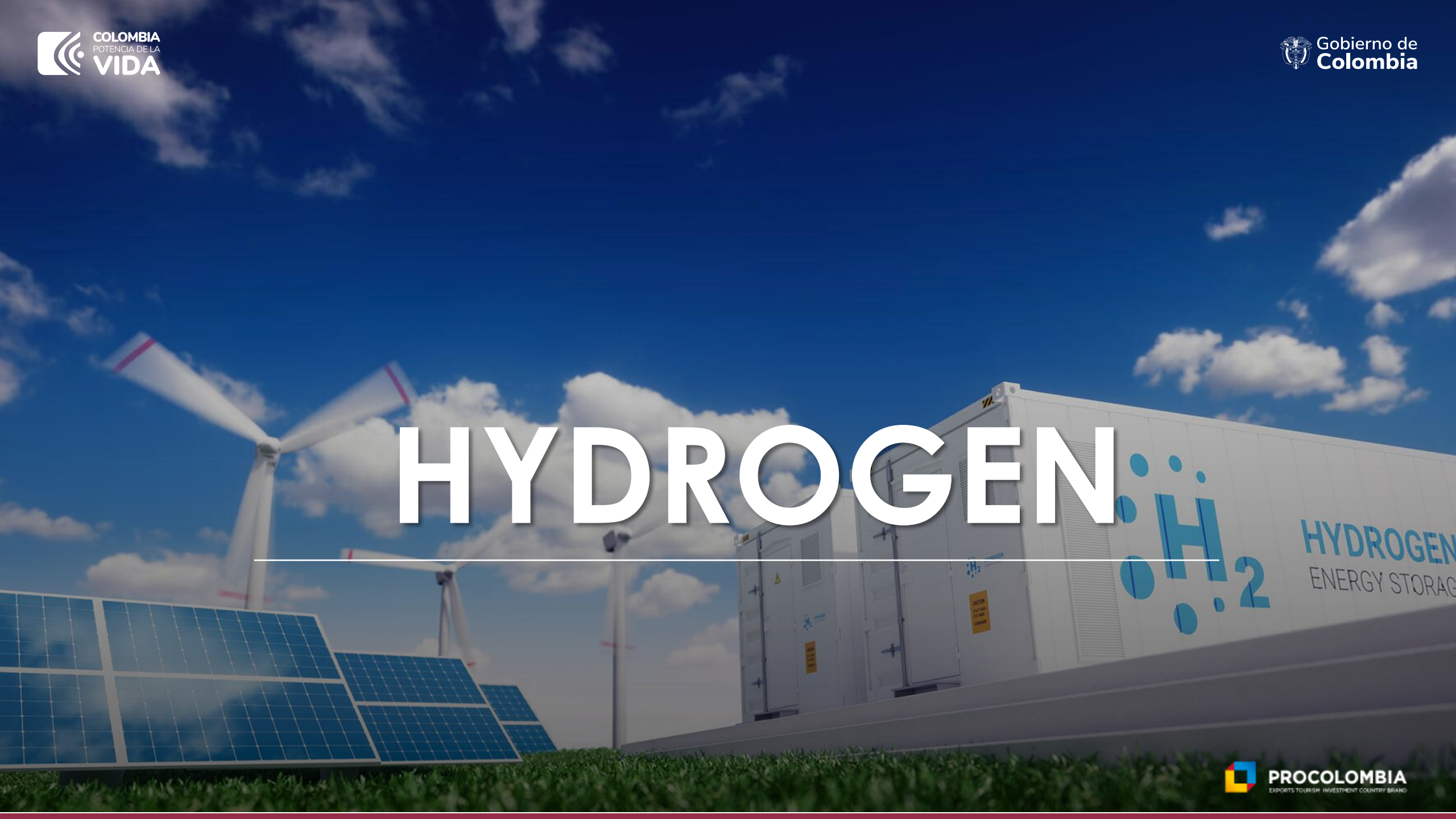
HYDROGEN



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HYDROGEN FOR A JUST AND SUSTAINABLE ENERGY TRANSITION

5 REASONS TO INVEST IN HYDROGEN

1 **Colombia has a green energy matrix** mainly with renewable resources and a competitive energy mix with high availability of sources, allowing the development of large-scale of low-emission hydrogen projects.

2 **Colombia will provide the world's fourth - lowest hydrogen production** cost and the second lowest in Latin America by 2050*.

*IRENA, 2022

3 The National Hydrogen Strategy sets by 2030, there will be an electrolysis capacity of 1-3 GW, with **estimated investment of USD 5.5 billion** in hydrogen production and demand projects for mobility and refineries.

*Hydrogen Roadmap, 2021

4 **An ideal export platform** to the main hydrogen and derivatives importers in Asia, Europe and North America.

5 **Robust institutions and a sector-specific regulatory framework** that includes incentives to promote long-term investments to achieve the decarbonization and reindustrialization targets.

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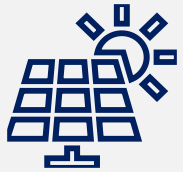
RICH POTENTIAL THANKS TO A DIVERSE GEOGRAPHY AND FAVORABLE CLIMATE CONDITIONS

SOLAR



Colombia surpasses the world average solar radiation by 60%, reaching **4.5 kWh/m2.**

WIND

Potential of **50 GW Onshore** and **50 GW Offshore**. In La Guajira, wind speeds are **9 – 12 m/s,** double the world average.

HYDRO

More than 740,000 watersheds and a multiannual flow of 52 m3/s. **65 GW** hydropower potential capacity.
67% of the energy is produced by hydroelectric power.

BIOMASS

Potential of more than **500,000 TJ** of biomass per year.

GEOTHERMAL

Potential of more than **1.5 GW.**

Source: Ministry of Mines and Energy

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THE WORLD'S FOURTH-LOWEST PRODUCTION COST OF GREEN HYDROGEN BY 2050

LEVELISED COST OF HYDROGEN RANGE IN 2050 DERIVED FROM SUPPLY-DEMAND ANALYSIS (USD/KgH2)

1. China
2. Chile
3. Morocco
4. **Colombia** → Ranging between USD 0.8/ kgH2 and USD 1.1/kgH2
5. Australia
6. Mexico

Source: *International Renewable Energy Agency (IRENA)*

**LCOH: The levelised cost of hydrogen. Notes: Levelised cost of hydrogen derived from supply-cost curves of individual countries and regions based on their estimated hydrogen demand for 2050. Water availability for electrolysis is considered in the hydrogen supply-cost curves*

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USD 5.5 BILLION OF INVESTMENT IN H2 PRODUCTION AND DEMAND PROJECTS BY 2030

GOALS 2030

PRODUCTION

1-3 GW*
Electrolysis capacity between 1.5 - 4 GW of NCRE

1.7 USD/kg LCOH* green

50 kt* H2 – 2.4 USD/kg
Blue hydrogen production

DEMAND

1,500 – 2,000
Light-duty fuel cell vehicles

1,000 – 1,500
Heavy-duty fuel cell vehicles

50 – 100
Public access hydrogen fueling stations

40% low carbon H2 (Green and blue)
of total industry consumption

Demand 2030: 120 kt per year
Demand 2050: 1,850 kt per year

CROSS-SECTORIAL

Between **7,000 -15,000 direct and indirect jobs**

0.7 Mton CO2
avoided annually

The main trade destinations will be **South Korea, China, Japan, and the United States.**

30-YEARS ROADMAP

Scan to download

- With the support of the Interamerican Development Bank – IDB and the UK Government the Colombia´s hydrogen roadmap, launched in 2021.
- **Colombia is updating its strategy** in alliance with GIZ – German Cooperation.

Source: Ministry of Mines and Energy
*NCRE: Non-Conventional Renewable Energy *LCOH: The levelized cost of hydrogen. Kt: kilotons, a unit of energy*

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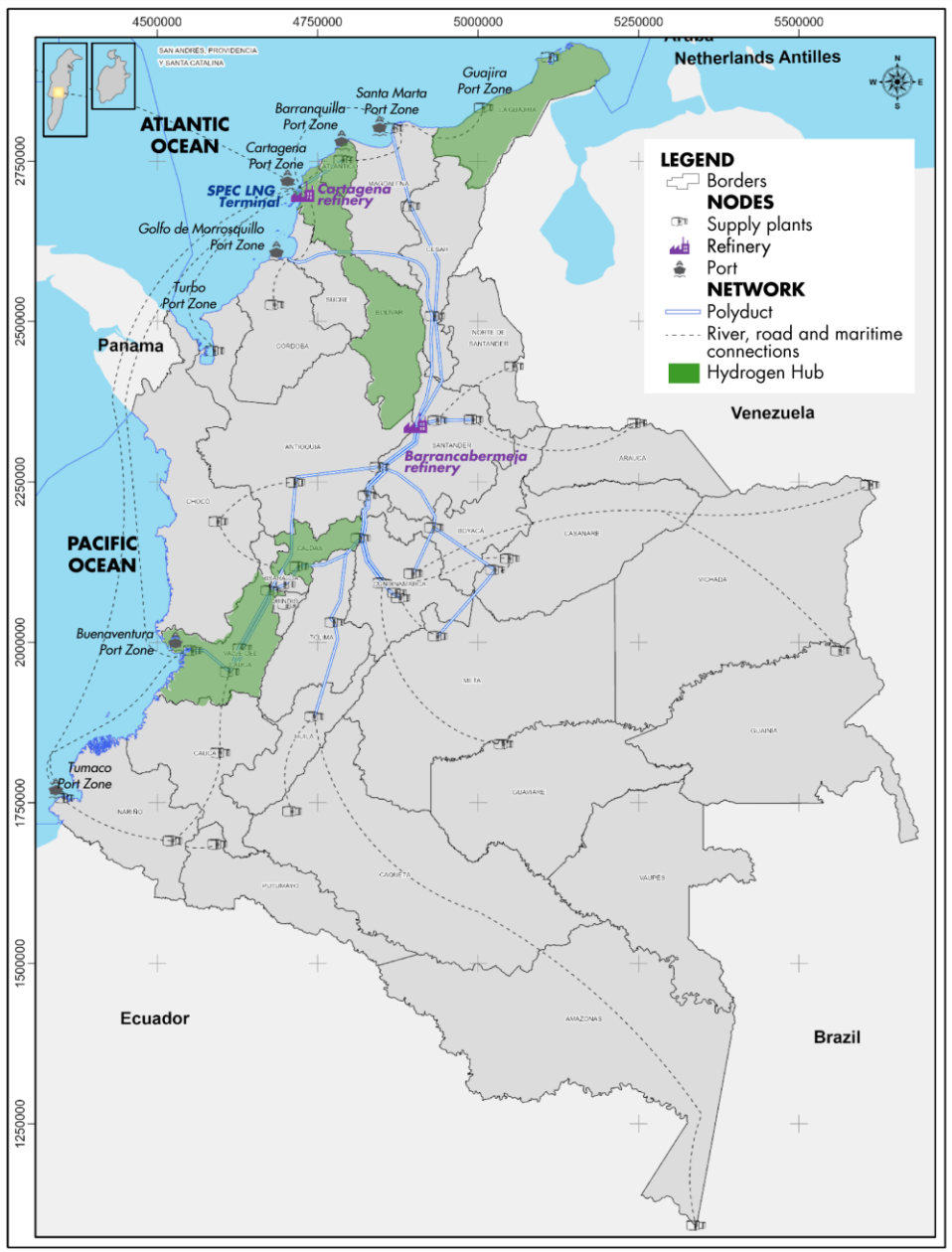
HYDROGEN PERSPECTIVES IN THE JUST ENERGY TRANSITION ROADMAP (DRAFT DOCUMENTS)

2023- 2030		2030	2040	2050
Regulation for hydrogen production, storage and distribution.	**Electrolysis capacity**	2.5 GW	10 GW	25 GW
International cooperation agreements to facilitate the export of green hydrogen.	**Renewables**		120 GW	
Investments in infrastructure and hydrogen production.	**H2 National Demand**			1,569 MT/Y Mobility: 872kt (220,000 Vehicles) Refineries: 412kt (50% Green H2) Industries: 285kt
	H2 Exports	Start of exports to countries with International Agreements		885 KT/Y

MT/Y: Million Tons per Year
KT/Y: Thousand Tons per Year
Source: Ministry of Mines and Energy. Just Energy Transition Roadmap. Draft Documents. (In Spanish)



INFRASTRUCTURE AND EXPERIENCE FOR FUTURE DEVELOPMENTS

5 hubs for the development of hydrogen corridors and valleys to have a network of production, distribution and transportation.

10 Port Zones with access to the Atlantic and Pacific coasts. **The ports of Barranquilla and Cartagena** already have infrastructure for handling ammonia and liquid fuels exports and imports.

2 Refineries and 1 Regasification Terminal.

Skilled workforce and productive capabilities in goods and services for the electric sector.

Source: Ministry of Mines and Energy. Just Energy Transition Roadmap. Draft Documents. (In Spanish)

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WE CONNECT TO MORE THAN 750 PORTS IN 140 COUNTRIES AROUND THE WORLD

Source: ProColombia

3,500 MARITIME EXPORT ROUTES THROUGH 30 SHIPPING LINES

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HYDROGEN AND PTX INITIATIVES AND PERSPECTIVES

FIRST PILOT PROJECTS

Industrial feedstock (Refinery)

Injection into the natural gas network

Sustainable Mobility

First Hydrogen Hub
(Launched in July 2023)

NEXT STEPS

Refineries (large-scale Green H2)
60 MW each
(COD: 4Q 2025 – 1Q 2026)

Cartagena	Barrancabermeja
$137-155 MUSD	$135-152 MUSD
MITSUI&CO. TotalEnergies SIEMENS energy	EDF NORTHLAND POWER SIEMENS energy

PTX Production Pilots
Ammonia, methanol a efuels (2025)

Blue Hydrogen
Residue Gasification
(2030)

Barrancabermeja
$1.4-3 BUSD

195 Kton/Year
55% Refinery Consumption
45% Derivatives Production

2.3 Mton/Year
CO2 Captured, available for long-term sequestration
93% CO2 Capture rate

- **Distributed H2**
- **Centralized H2**
- **LOHC**
- **Ammonia**
- **E-fuels**

Waste to Energy:
- **H2**
- **SynGas**
- **Liquid Fuels**

Source: ProColombia, National press release.

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INVESTMENT OPPORTUNITIES

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COLOMBIA IS YOUR NEXT INVESTMENT DESTINATION FOR

Greenfield low-emission hydrogen projects.

Greenfield Power-to-X projects.

Domestic and international market applications: Fertilizers, sustainable mobility, refineries, e-fuels.

International private equity funds and cooperation.

Potential for new manufacturing/assembly of electrolysers: a hub for the region.

Strategic alliances with key local and international players.

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REGULATORY FRAMEWORK AND INCENTIVES

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THE COUNTRY HAS A WELL-ESTABLISHED INSTITUTIONAL FRAMEWORK

GOVERNMENT ENTITIES

- Energía
- UPME
- CREG – Comisión de Regulación de Energía y Gas
- Industria y Comercio – Superintendencia
- Superservicios – Superintendencia de Servicios Públicos Domiciliarios
- XM
- Interior
- ANLA – Autoridad Nacional de Licencias Ambientales
- ANH – Agencia Nacional de Hidrocarburos
- ipse
- Departamento Nacional de Planeación - DNP

H2 ASSOCIATIONS

- SerColombia – Asociación Energías Renovables
- hidrógeno COLOMBIA
- acolgen
- ANDI | MÁS PAÍS | NATURGAS – CÁMARA DE HIDRÓGENO ANDI - NATURGAS

PRIVATE AND SERVICE PARTNERS*

- Legal services
- Human resources
- Communications
- Engineering & construction
- Environmental and social consultancy

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ENERGY TRANSITION POLICY AND LEGAL FRAMEWORK

Law 2099 of 2021 establishes public policy guidelines for the country's energy transition and strengthens the incentives of **Law 1715 of 2014**.

Green, blue and white hydrogen and geothermal are considered as Non-Conventional Sources of Energy (NCSE). *(Law 2099, 2021 and Law 2294, 2023)*

The **Reindustrialization Policy** (2023) included among its main commitments the Energy Transition, which encourages decarbonization and the reduction of economic dependence on oil and coal.

Energy Transition policy was approved through **CONPES 4075 of March 29, 2022**.

The policy creates the energy transition path to develop new technologies such as wind energy, geothermal energy, and **hydrogen production**.

Source: National Planning Department and ProColombia

AN ATTRACTIVE FRAMEWORK FOR HYDROGEN INVESTMENTS

Incentives for investments in Non-Con Efficient Energy Management Sources of Energy (NCSE) and Efficient Energy Management (GEE)

INCOME TAX DEDUCTION

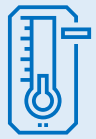
Deduction from income tax, in a 15-year period, 50% of investments in research, development, production of electricity with Non-Conventional Sources; and / measures for Efficient Energy Management; including smart metering.

VAT EXEMPTION

VAT exemption for elements, machinery, services for production and use of energy from renewable sources; actions/measures for energy efficiency, including smart metering. Automatically excluded: energy inverters, solar panels, charge controllers, for solar energy systems with panels.

CUSTOM DUTIES EXEMPTION

Custom duties exemption for machinery, equipment, smart metering, materials, supplies, for generation with renewable sources, and actions/measures for energy efficiency. Only for machinery, equipment, materials, and supplies without national production.



ACCELERATED DEPRECIATION

Accelerated depreciation, up to 33.33% annually for machinery, equipment, civil works for generation with renewable energies, energy efficiency actions/measures. This incentive can be obtained simultaneously with the 50% income tax deduction for the same investments.

**GEE: Efficient Energy Management.*
Source: Ministry of Mines and Energy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