

# Latin America Energy Outlook

Overview: Colombia

International  
Energy Agency

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World Energy Outlook Special Report

# INTERNATIONAL ENERGY AGENCY

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The IEA examines the full spectrum of energy issues including oil, gas and coal supply and demand, renewable energy technologies, electricity markets, energy efficiency, access to energy, demand side management and much more. Through its work, the IEA advocates policies that will enhance the reliability, affordability and sustainability of energy in its 31 member countries, 13 association countries and beyond.

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# Colombia



**6TH**

largest city (Bogota) in Latin America and the Caribbean

**8TH**

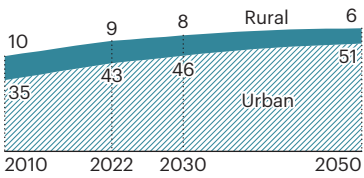
largest e-bus fleet in the world

**6TH**

largest coal exporter in the world

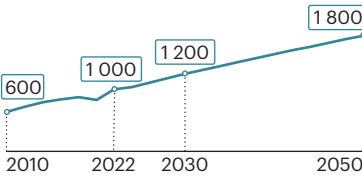
## Population

Million people



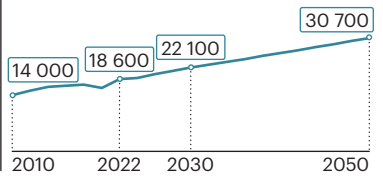
## GDP

Billion USD (2022, PPP)



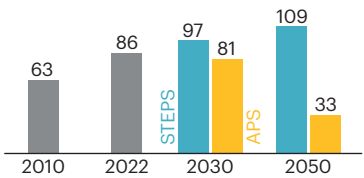
## GDP per capita

USD per capita (2022, PPP)



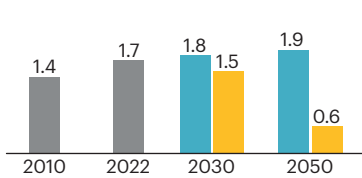
## CO<sub>2</sub> emissions

Mt CO<sub>2</sub>



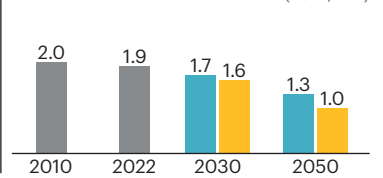
## CO<sub>2</sub> emissions per capita

t CO<sub>2</sub>/capita



## Energy intensity

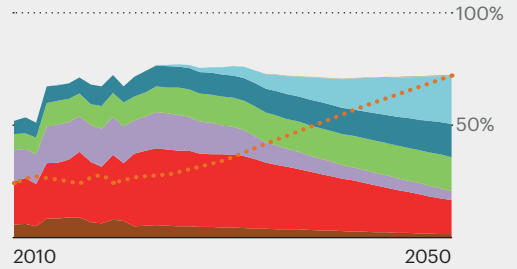
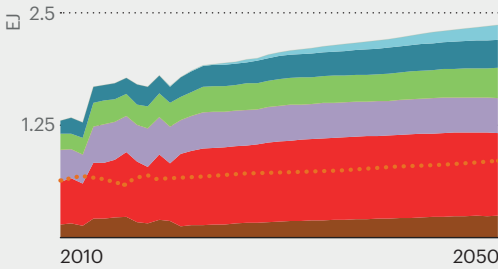
GJ per thousand USD (2022, PPP)



## Primary energy supply and share of low-emissions sources

STEPS

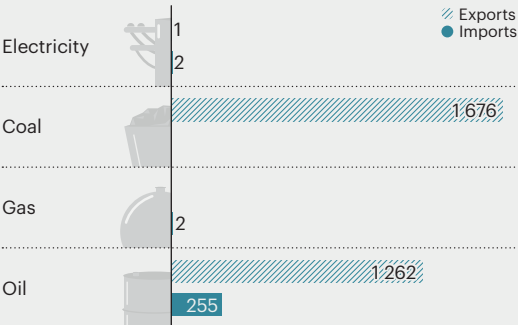
APS



● Coal ● Oil ● Natural gas ● Nuclear ● Bioenergy ● Hydro ● Wind and solar ● Other ● Share of low-emissions (right axis)

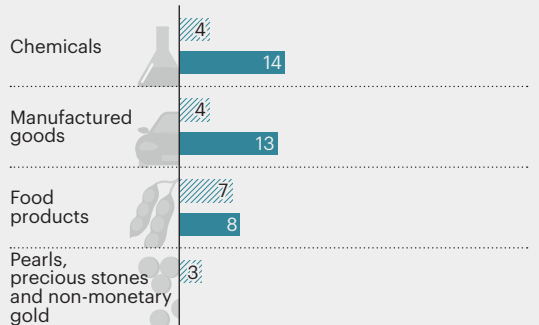
## Trade of main energy products (2021)

PJ



## Trade of non-energy products (2021)

Billion USD



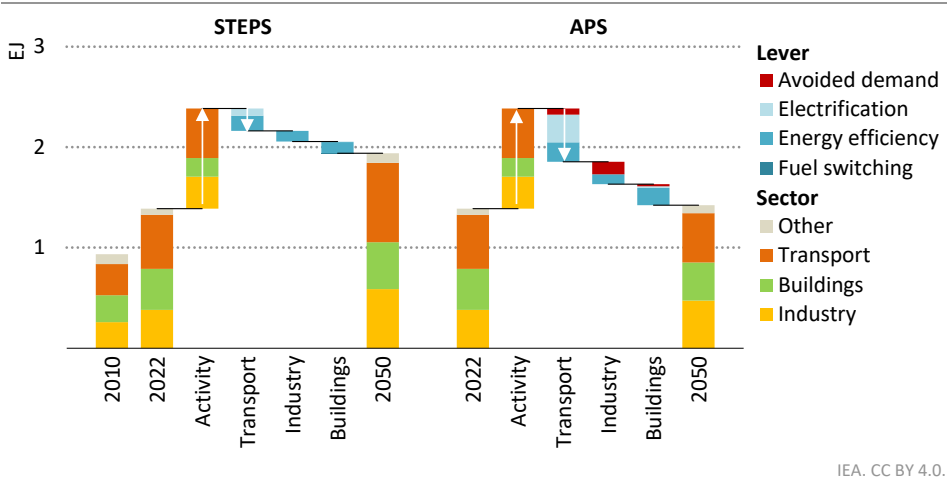
**Table 1** ▶ Recent policy developments in Colombia

	Policy	Publication year
<b>Economy-wide measures</b>	• Climate Action Law: Net Zero GHG emissions by 2050.	2021
	• NDC: Unconditional target to reduce GHG emissions 51% below business-as-usual by 2030.	2021
	• Carbon tax for petroleum derivatives and gas used for combustion (USD 5/t CO <sub>2</sub> -eq). Carbon tax for coal will be increased gradually to reach USD 12/t CO <sub>2</sub> -eq by 2028.	2016
	• New National Energy Plan which will include the Just Energy Transition roadmap by 2050 (announced).	2023
<b>Just transition policies</b>	• Law 2056 to regulate the organisation and functioning of the general system of royalties.	2020
<b>AFOLU</b>	• Climate Action Law: Reduction of deforestation to 50 000 ha/year and zero deforestation by 2030.	2021
<b>Oil and gas production</b>	• Legislation to ban fracking (announced).	2022
	• Halt on new fossil fuel exploration licences (announced).	2023
<b>Hydrogen</b>	• National Hydrogen Strategy: 40% low-emissions hydrogen in total consumption in industry sector by 2030.	2021
<b>Power</b>	• Promotion of renewables integration through long-term auctions.	2021
	• E2050 strategy: Quantitative targets for clean electricity generation (10 GW offshore wind by 2050).	2021
<b>Transport</b>	• National Electric Mobility Strategy: 600 000 EV stock (excluding two/three-wheelers) by 2030.	2019
<b>Energy efficiency</b>	• Product Efficiency Call to Action at COP-26: Double the efficiency of air conditioners, refrigerators, lighting and industrial electric motors by 2030.	2021

**Table 2** ▶ Major infrastructure projects in Colombia

	Project	Size	Date online	Status	Description
<b>Hydrogen/ammonia</b>	Cartagena refinery	9 kt H <sub>2</sub> /year (capacity)	2026	●	Dedicated renewable
	Barrancabermeja refinery	9 kt H <sub>2</sub> /year (capacity)	2026	●	Dedicated renewable
	BEAUTY Ammonia	170 kt H <sub>2</sub> /year (capacity)	2027	●	Grid
<b>Oil and gas</b>	Sebastopol refinery	150 000 b/d	2022	●	Crude oil derivatives Delayed due to COVID
<b>Public transport</b>	Bogota Metro Rail, Line 1	72 000 passengers per hour	2028	●	-
<b>Status</b> ● Feasibility study ● Under construction					

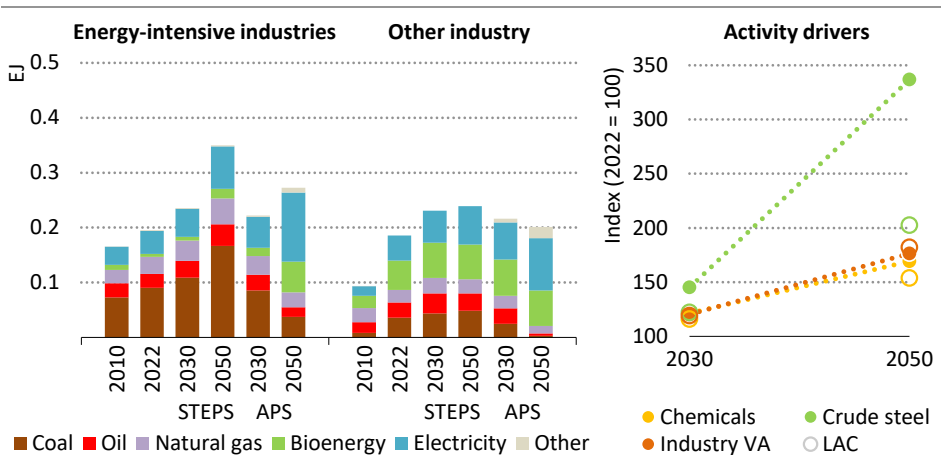
**Figure 1** ▶ Final energy consumption by scenario in Colombia



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- Today, the transport and buildings sectors account for 68% of final energy consumption.
- Total final consumption increases 40% by 2050 in the STEPS, led by transport and industry. In the APS, only the industry sector consumes more energy in 2050 than in 2022.

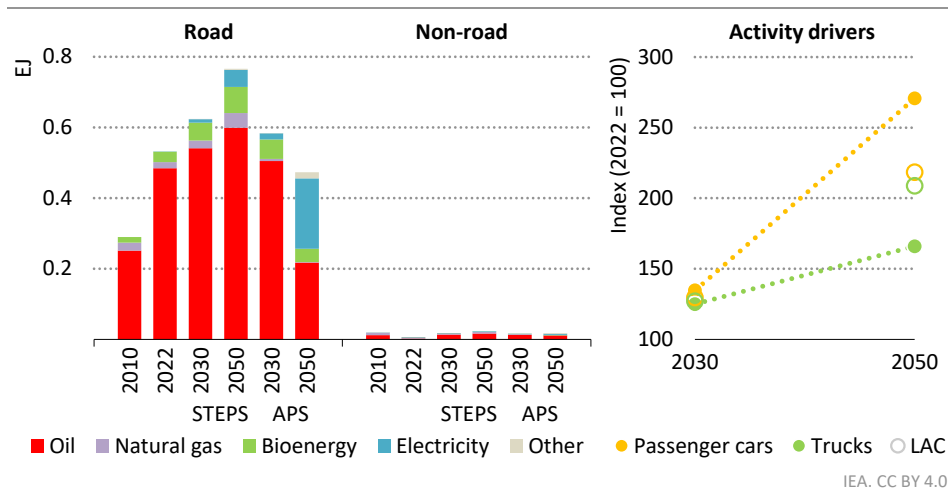
**Figure 2** ▶ Fuel consumption in industry by type and scenario in Colombia



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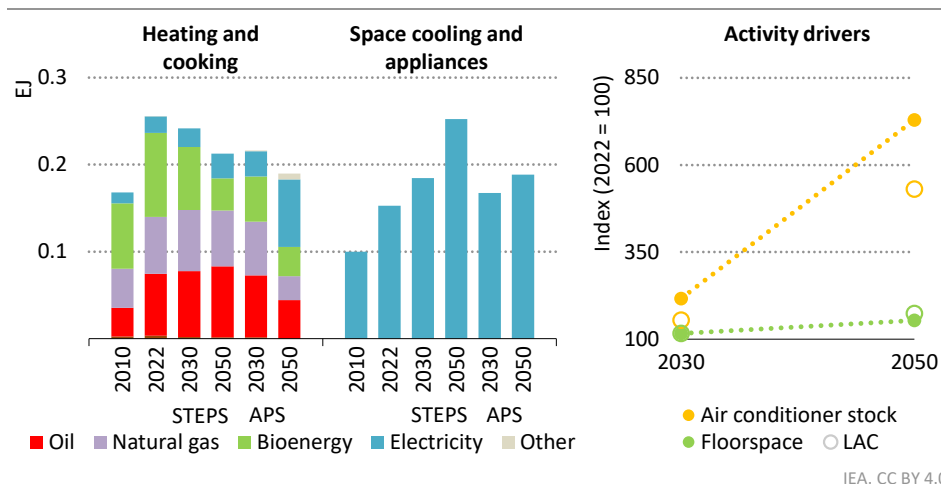
- Coal currently meets a third of energy consumption in industry, and it remains the main fuel in the STEPS for energy-intensive industries as steel production more than triples by 2050.
- In the APS, the roll-out of heat pumps and processes based on electrolytic hydrogen lead to electricity demand displacing coal in most industrial sectors.

**Figure 3 ▶ Fuel consumption in transport by type and scenario in Colombia**



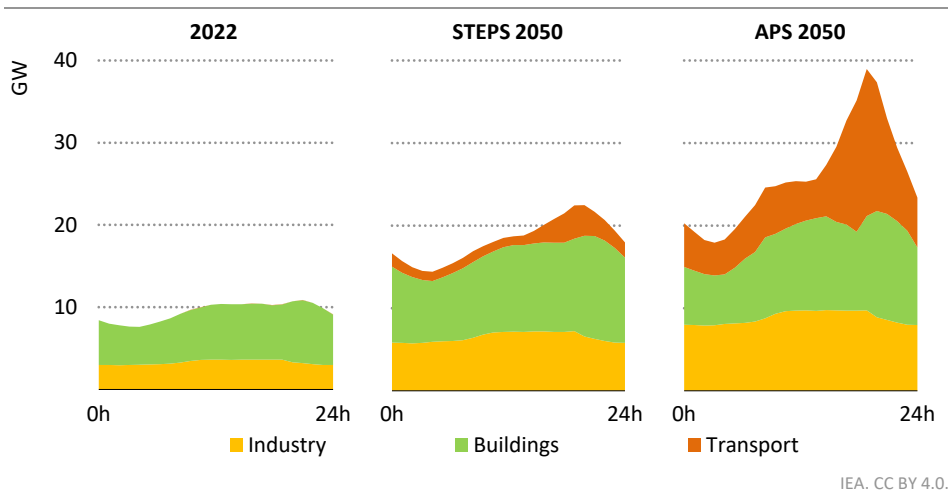
- Colombia has the world's eighth-largest electric bus fleet today. In the APS, nearly 80% of the bus fleet is electric by 2050.
- In the APS, passenger activity increases by 170% from 2022 levels by 2050, but oil use in road transport falls by 55% as the share of electricity in consumption rises to over 40%.

**Figure 4 ▶ Fuel consumption in buildings by type and scenario in Colombia**



- Most heating and cooking needs in Colombia are met by bioenergy, oil and natural gas. In the APS, the share of oil declines as electrification increases.
- Increased use of household appliances and space cooling drives electricity demand growth in buildings. In the APS, more stringent MEPS cut the growth by nearly 15% compared to STEPS.

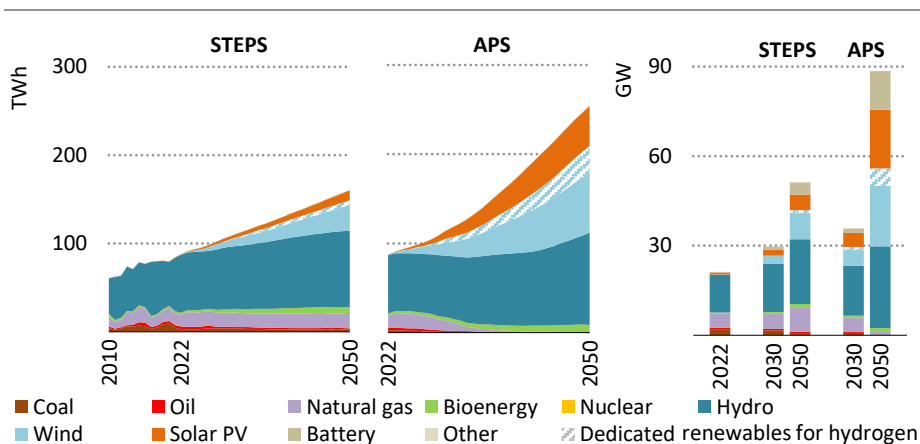
**Figure 5** ▶ Average electricity daily load profile by scenario in Colombia



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- By 2050, peak electricity demand doubles in the STEPS and more than triples in the APS, outpacing growth in average electricity demand.
- In the APS, smart charging of EVs could smooth the evening peak in demand.

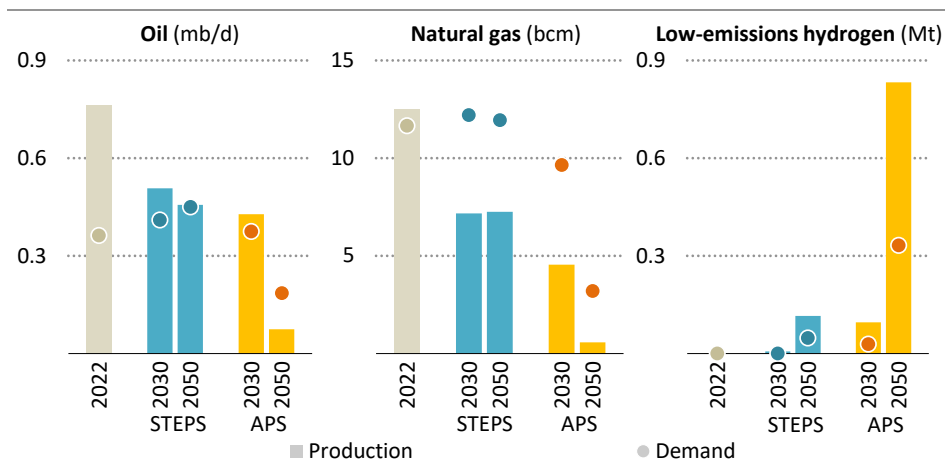
**Figure 6** ▶ Electricity generation and capacity by fuel and scenario in Colombia



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- Today's power mix is dominated by hydropower (75%), with natural gas and oil accounting for most of the rest.
- Rising demand for electricity is met primarily by wind and solar PV generation. In the APS, solar PV and wind generation increases from 1% today to almost 60% in 2050.

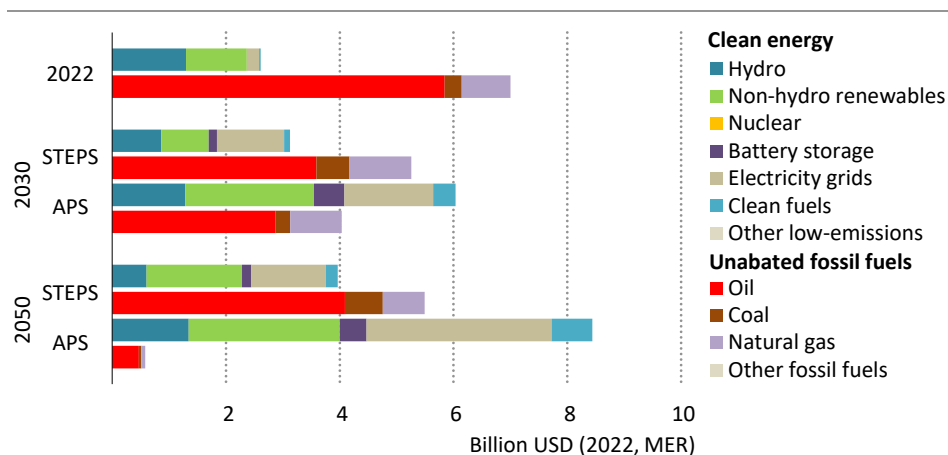
**Figure 7 ▶ Fuel demand and production by scenario in Colombia**



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- Oil and gas production decline in both scenarios, but the decline is much starker in the APS as Colombia delivers on its pledge of no new oil and gas exploration contracts.
- In the STEPS, low-emissions hydrogen production rises to 0.1 Mt by 2050. In the APS, it increases to almost 1 Mt.

**Figure 8 ▶ Annual investment in energy supply by type and scenario in Colombia**



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- Investment in clean energy supply accounts for 0.6% of GDP in Colombia in the STEPS by 2050 and 1.4% in the APS.
- More than a third of overall investment for clean energy supply supports grid development in both scenarios in 2050.



## Notes

### Units

<b>Area</b>	ha	hectares
<b>Distance</b>	km	kilometre
<b>Emissions</b>	Gt CO <sub>2</sub>	gigatonnes of carbon dioxide
	Mt CO <sub>2</sub>	million tonnes of carbon dioxide
	Mt CO <sub>2</sub> -eq	million tonnes of carbon-dioxide equivalent (using 100-year global warming potentials for different greenhouse gases)
	t CO <sub>2</sub> -eq	tonnes of carbon-dioxide equivalent
<b>Energy</b>	EJ	exajoule (1 joule x 10 <sup>18</sup> )
	PJ	petajoule (1 joule x 10 <sup>15</sup> )
	TWh	terawatt-hour
	Tcal	teracalorie (1 calorie x 10 <sup>12</sup> )
<b>Gas</b>	bcm	billion cubic metres
	bcm/d	billion cubic metres per day
	mcm/d	million cubic metres per day
<b>Mass</b>	kg	kilogramme
	kt	kilotonnes (1 tonne = 1 000 kg)
<b>Monetary</b>	USD million	1 US dollar x 10 <sup>6</sup>
	USD billion	1 US dollar x 10 <sup>9</sup>
<b>Oil</b>	mb/d	million barrels per day
	b/d	barrels per day
<b>Power</b>	GW	gigawatt
	MW	megawatt
	kV	kilovolt

### Terms

**Activity** drivers for industry include production levels (Mt) and value added (USD 2022, PPP); for transport, vehicle-kilometres (km) for passenger cars and tonne-km for trucks; for buildings, air conditioning (million units) and floorspace (million square metres). The activity numbers presented correspond to the Stated Policies Scenario (STEPS) indexed on the 2022 value.

**Bioenergy** refers to bioenergy and waste.

**Clean fuels** refers to biofuels, hydrogen and hydrogen-related fuels.

**Daily average electricity load profiles** do not factor in electricity demand generated by dedicated renewable sources connected to electrolysers, and they also do not consider the influence of demand-response mechanisms.

**Energy-intensive industries** include chemicals, iron and steel, non-metallic minerals (cement and other), non-ferrous metals (aluminium and other) and pulp, paper and printing.

**Heating and cooking** in buildings refers to energy demand for space and water heating, and cooking.

**Hydrogen demand** excludes both hydrogen exports and the hydrogen used for producing hydrogen-based fuels which are exported.

**Investment** data are presented in real terms in year-2022 US dollars.

**Large-scale CCUS projects** refer only to facilities with a planned capture capacity higher than 100 000 tonnes of CO<sub>2</sub> per year.

**Low-emissions hydrogen projects** considered are those with an announced capacity for 2030.

**Non-road transport** includes rail, domestic navigation, domestic aviation, pipeline and other non-specified transport.

**Other** for power generation and capacity refers to geothermal, concentrated solar power, marine, non-renewable waste and other non-specified sources.

**Other** for final consumption in sectors refers to non-renewable waste, hydrogen, solar thermal and geothermal.

**Other** in a sector category refers to agriculture and other non-energy uses.

**Other fossil fuels** in energy supply investment refer to non-renewable waste and other supply sources.

**Other fuel shifts** include bioenergy, nuclear, solar thermal, geothermal and natural gas.

**Other industry** refers to the construction, food and tobacco, machinery, mining and quarrying, textile and leather, transport equipment, wood industry branches and remaining industry.

**Other low-emissions** in energy supply investment include heat pumps, CCUS, electricity generation from hydrogen, electricity generation from ammonia and direct air capture.

**Road transport** includes six vehicle categories (passenger cars, buses, two/three-wheelers, light-duty vans and trucks, and medium and heavy trucks).

**SDG 7** refers to Sustainable Development Goal (SDG) 7: “ensure access to affordable, reliable, sustainable and modern energy for all”, adopted by the United Nations in 2015.

**Solar potential** data is calculated based on the average potential at national level assessed in kilowatt-hour per kilowatt peak per day (2020).

**Total final consumption** includes consumption by the various end-use sectors (industry, transport, buildings, agriculture, and other non- energy use). It excludes international marine and aviation bunkers, except at world level where it is included in the transport sector.

### Acronyms

Scenarios: **STEPS** = Stated Policies Scenario; **APS** = Announced Pledges Scenario.

<b>AFOLU</b>	agriculture, forestry and other land use
<b>BECCS</b>	bioenergy with carbon capture and storage
<b>CCUS</b>	carbon capture, utilisation and storage
<b>CNG</b>	compressed natural gas
<b>EV</b>	electric vehicle
<b>GDP</b>	gross domestic product
<b>GHG</b>	greenhouse gases
<b>H<sub>2</sub></b>	hydrogen
<b>HVDC</b>	high voltage direct current
<b>ICE</b>	internal combustion engine
<b>MEPS</b>	minimum energy performance standards
<b>MER</b>	market exchange rate
<b>NDC</b>	Nationally Determined Contribution
<b>PPP</b>	purchasing power parity
<b>PV</b>	photovoltaics
<b>SDG</b>	Sustainable Development Goals
<b>VA</b>	value added
<b>ZEV</b>	zero emissions vehicle

The policy tables include existing policies and announcements as of the end of September 2023. The same applies to the tables of existing and announced projects.

The IEA does not use colours to refer to the various hydrogen production routes. However, when referring to specific policy announcements, programmes, regulations and projects where an authority uses colour to define a hydrogen production route, e.g. green hydrogen, we use that terminology to report developments in this review.

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