Energy transition

April 2023

CONEXIONES QUE INSPIRAN


Basic concepts
• Climate change
• Energy transition

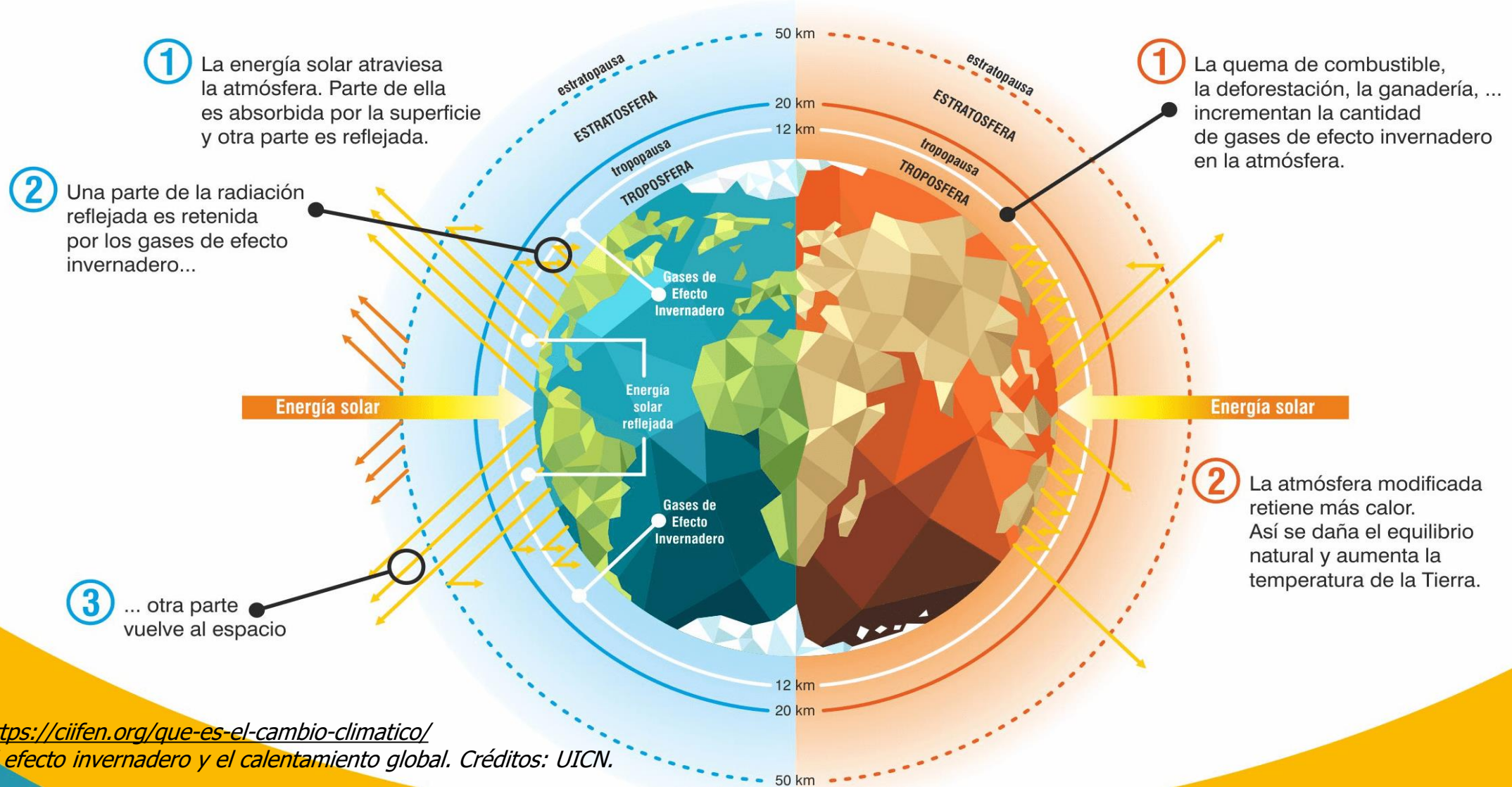
What is climate change?

EL EFECTO INVERNADERO

Es el calentamiento natural de la Tierra. Los gases de efecto invernadero, presentes en la atmósfera, retienen parte del calor del Sol y mantienen una temperatura apta para la vida

EL CALENTAMIENTO GLOBAL

Es el incremento a largo plazo en la temperatura promedio de la atmósfera. Se debe a la emisión de gases de efecto invernadero que se desprenden por actividades del hombre.



https://ciifen.org/que-es-el-cambio-climatico/

El efecto invernadero y el calentamiento global. Créditos: UICN.

Climate change and energy transition

MITIGATION
Deep decarbonization

ADAPTATION
Impact management

Energy transition

Process of transformation of the energy matrix prioritizing the use of new, efficient technologies, introducing new energy generation methods, and promoting sustainable consumption habits.

International Renewable Energy Agency, 2022

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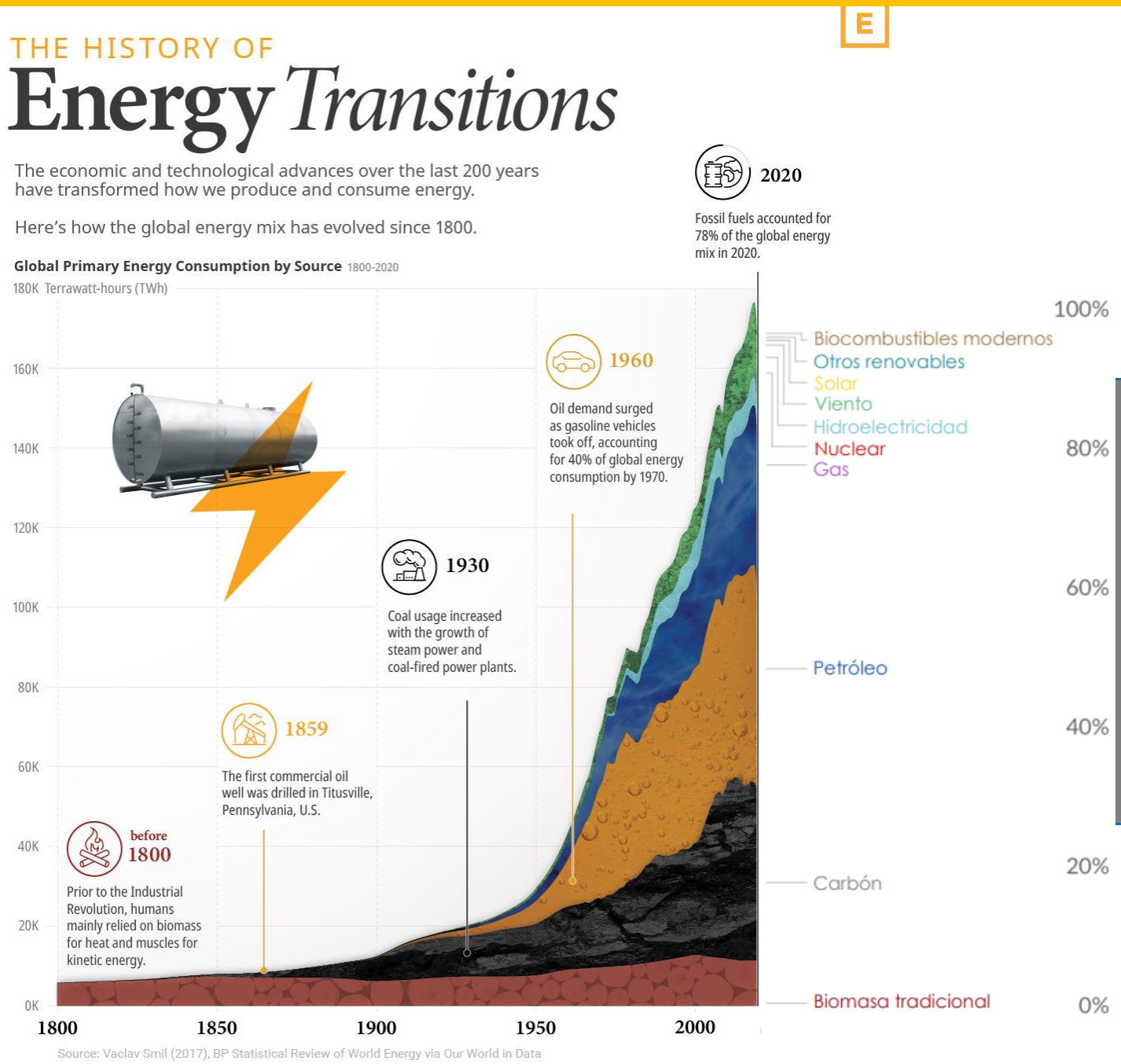
This is not the first transition faced by humanity

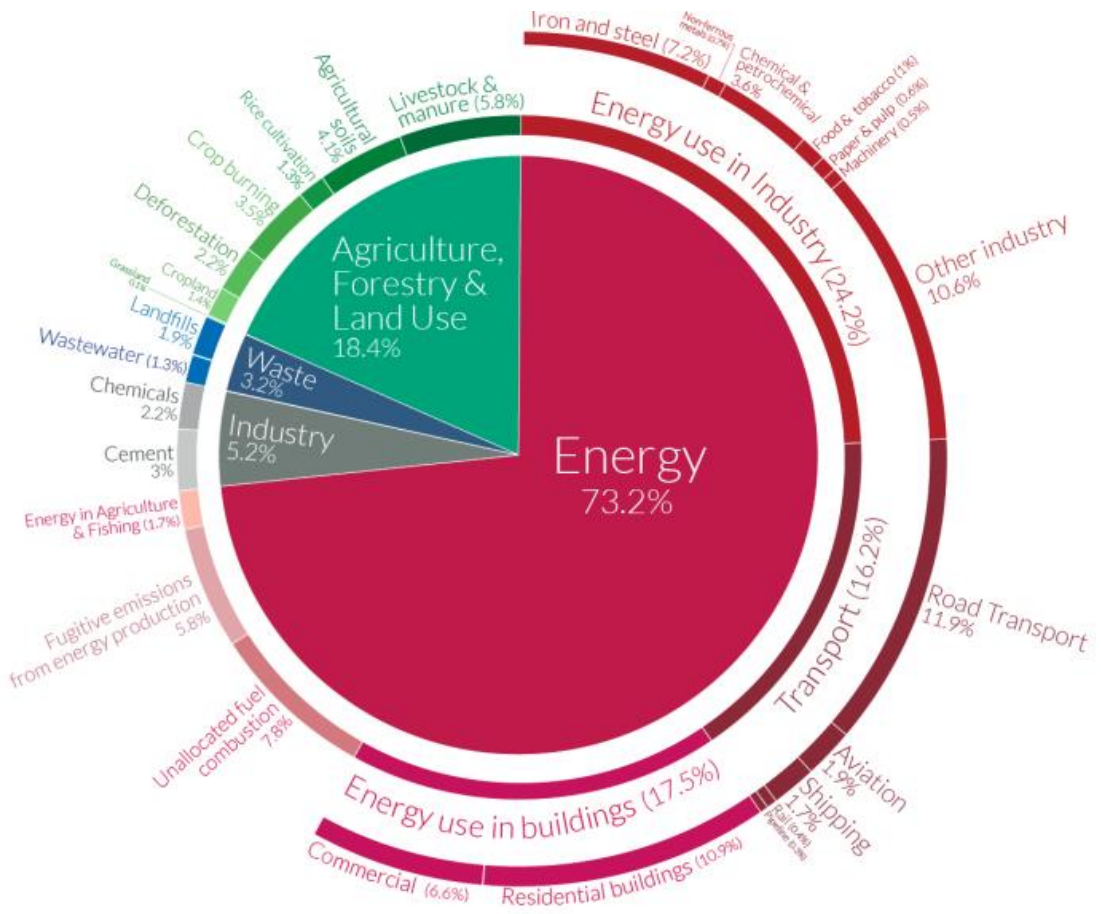
The history of energy consumption by mankind is one of progress but also of technological change.

In the last 200 years, mankind has changed the way of producing and consuming energy several times.

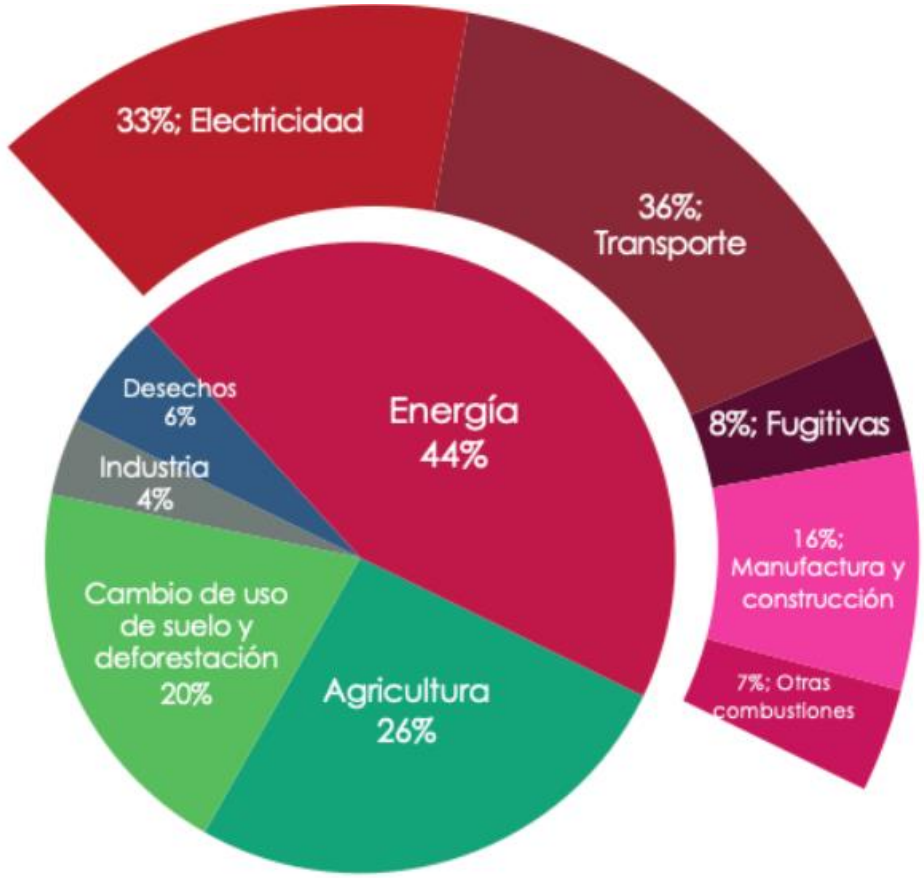


The transition agenda must be tailored to the region's particularities

Global emissions (2020)



Latin America emissions (2018)



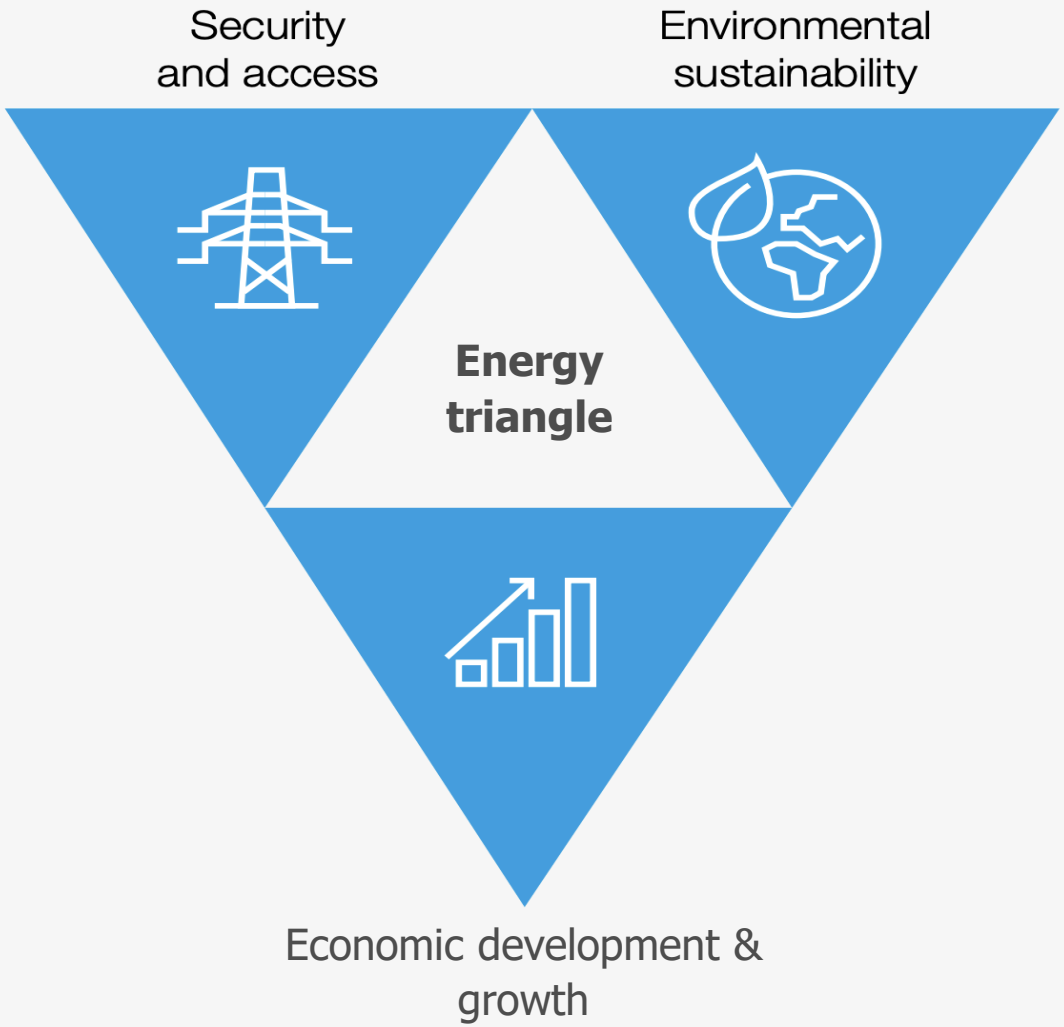
Fuente: Our World in Data; BID, elaboración propia

Characteristics of the energy transition

Effective

An effective energy transition can be defined as a timely transition towards a more inclusive, sustainable, affordable, and secure energy system that provides solutions to global energy-related challenges, while creating value for business and society.

World Economic Forum - WEF



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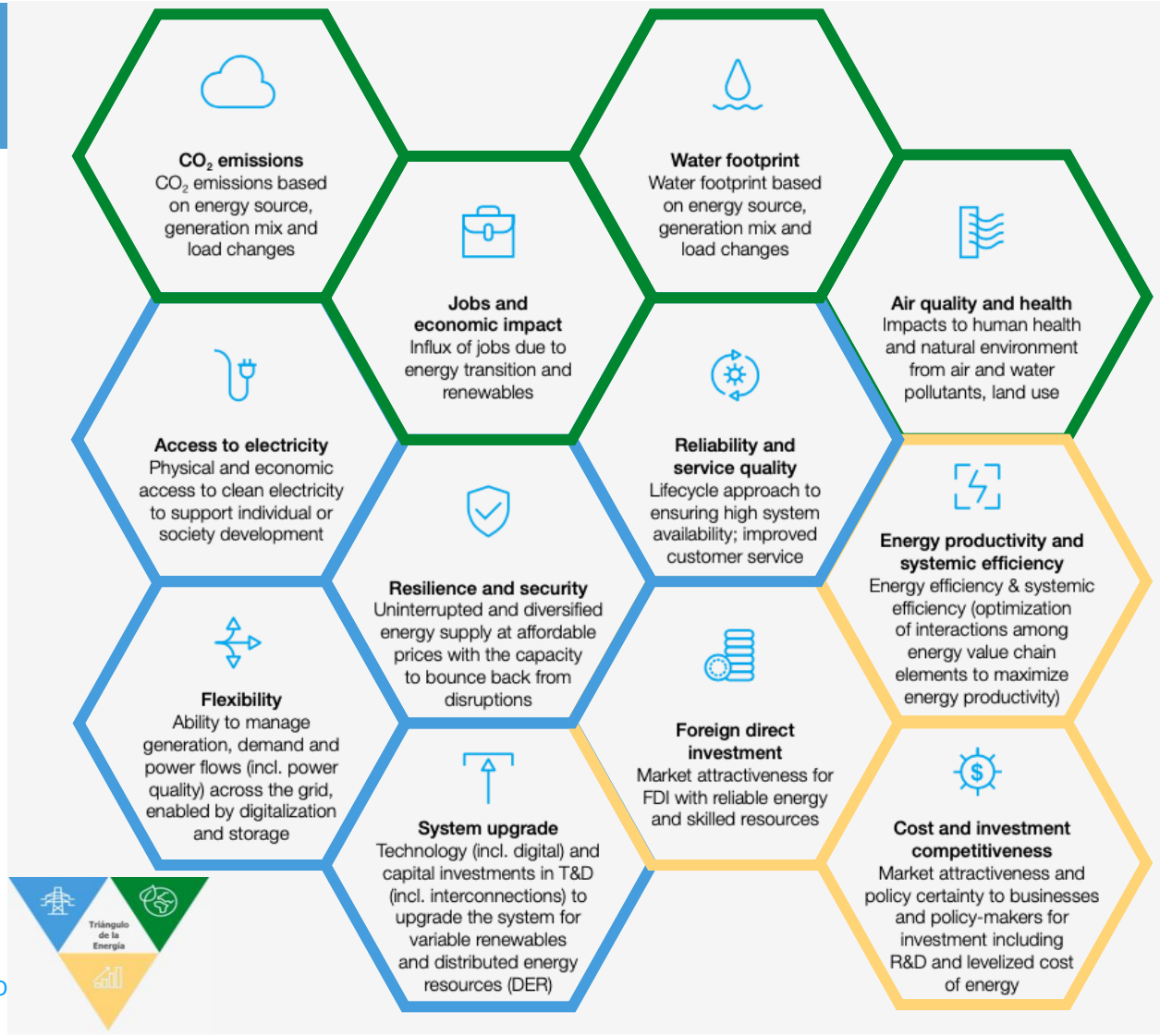
Characteristics of the energy transition

Resilient

A resilient energy transition has the capacity to absorb, recover and adapt to disruptions while continuing on a path to deliver a secure, sustainable, affordable and inclusive low-carbon future.

Fostering Effective Energy Transition
World Economic Forum – WEF
2021



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Contribution of
Transmission to the
energy transition

Climate change

To ensure that the global temperature does not rise more than 2ºC above pre-industrial levels

Energy transition

We need to reduce global carbon emissions
Deep decarbonization
MITIGATION

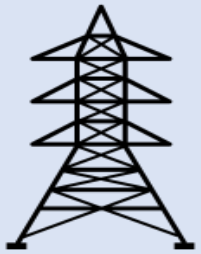
1. Applying **energy efficiency**
2. **Electrifying** sectors requiring energy
3. **Energía**
4. Using **clean fuels** in non-electrifiable sectors
5. **Reducing, capturing, storing and utilizing** carbon

We need to adapt to extreme climate events
Impact management
ADAPTATION

Reducing / eliminating emissions in the energy sector

Our priorities in Electric Power

Transmission



- **A** Grid Expansion Renovation / Modernization (increased use of existing grid)
- **B** Connection of new renewable generation
- **C** Regional electrical integration

New technologies

- **D** Distributed energy solutions

Energy

- Safe and reliable
- Clean and sustainable
- Accessible and affordable

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Reducing / eliminating emissions in the energy sector

We need to adapt to extreme climate events
Impact management
ADAPTATION

Our priorities in Roads

Roads

New technologies

- **A** Sustainable, efficient asphalt mixes
- **B** Exploration of new alternative materials
- **C** Infrastructure for transportation electrification
- **D** Dynamic tariffs
- **E** Free-flow electronic fee collection

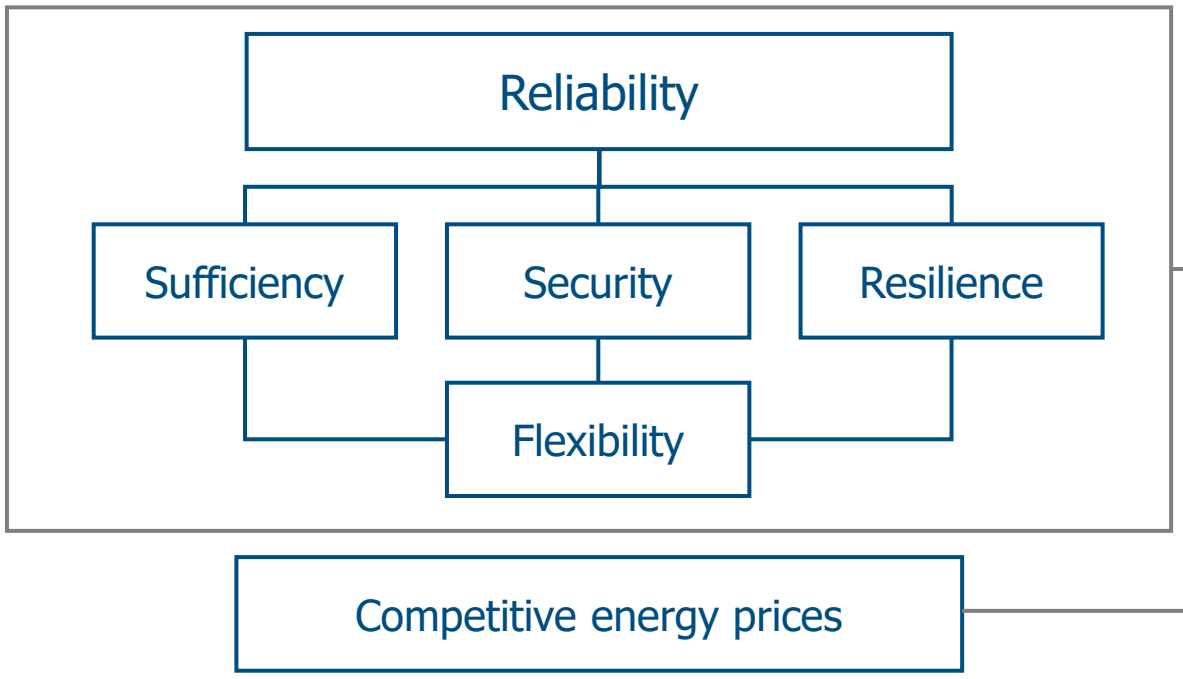
Exploration of road infrastructure adaptation alternatives for transition

Energy

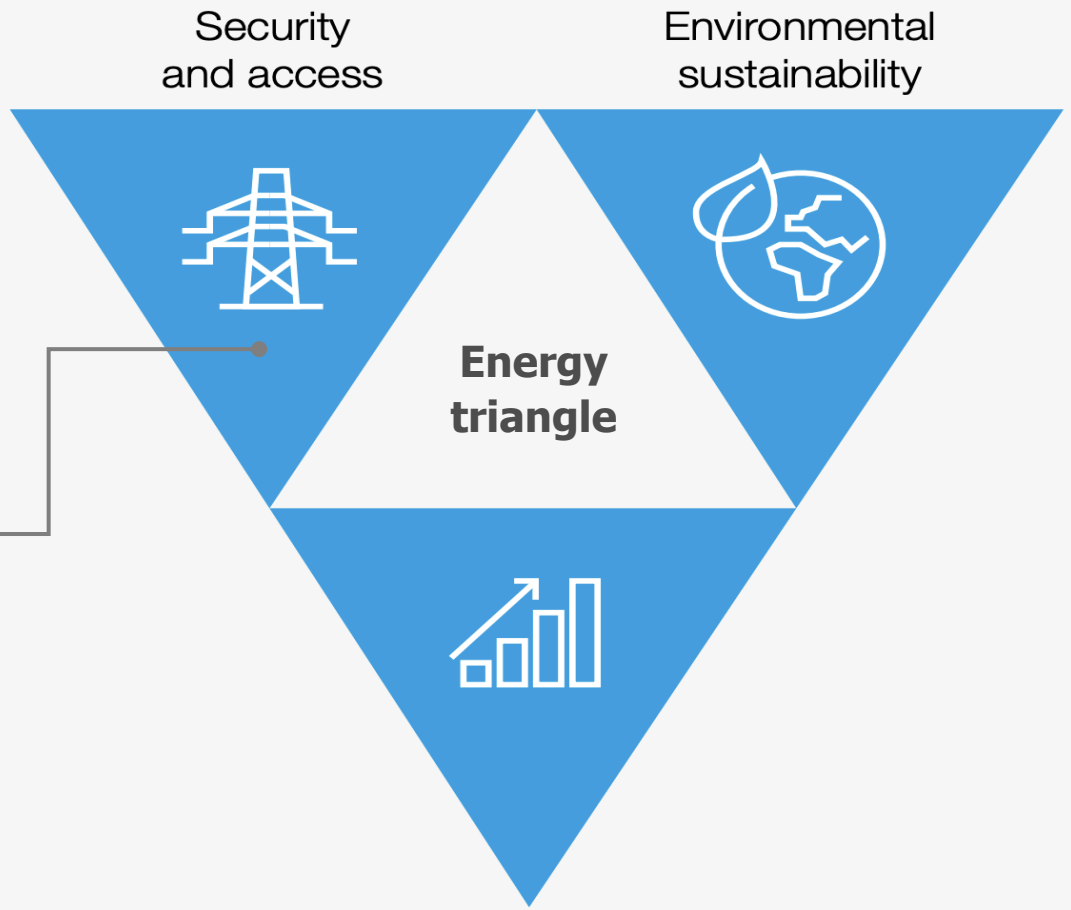
- Safe and reliable
- Clean and sustainable
- Accessible and affordable

Contribution of Transmission from Energy Security

Energy Security measures the capacity to meet the current and future energy demand in a reliable manner, and withstand and recover quickly from system shocks with minimal disruption to supplies.



Competitive energy prices



Economic development & growth

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On this basis, the new Transmission priorities are confirmed

- To contribute to the transition, there are new priorities in transmission:
  1) Grid expansion, upgrading and modernization of infrastructure (increased use of existing grid)
  2) Connecting renewable energy sources to transmission networks
  3) Developing interconnections to make regional integration feasible

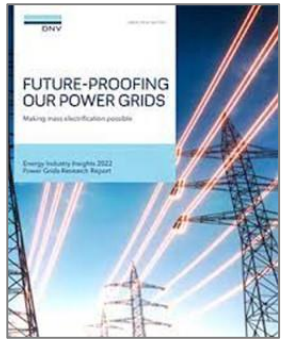
  The above, understanding that it is essential to invest in networks.

DNV

FUTURE-PROOFING OUR POWER GRIDS

Making mass electrification possible

Energy Industry Insights 2022
Power Grids Research Report



Power grids need urgent investment

Total

The below data shows the total respondents broken down by the industry they work in, either power grids or renewables. The regional splits are the total respondent base not split by industry. Percentages reflect net agreement with the statement.

There is an urgent need for greater investment in the power grid

Power grid infrastructure cannot yet adequately connect sources of renewable energy to areas of high demand

Power grid expansion and upgrading is critical to meeting climate targets

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Transmission, the platform for the energy transition

"The electric grid is about to be transformed"

....grids will also have to grow in capacity at a rate the developed world has not seen for many decades

The Economist, April 2023

"If you care about climate change, you should care about transmission"

The surprising key to a clean energy future
Bill Gates. On the grid – January 2023

- We need to **upgrade our grid, build more high-voltage transmission lines**...
- **We'll also need more lines**, because our country's demand will only go up in the years ahead as **we electrify more things**

"The world power line length and capacity **is expected to grow by 2.5x**, with a substantial amount of grid growth **in the emerging markets**..."

Actis- The Street View. Grid Modernisation: A Key Enabler For Energy Transition – 2021
https://www.act.is/

"Power grids need urgent investment"

Future-proofing Our Power Grids
DNV Energy Industry Insights 2022
Power Grids Research Report

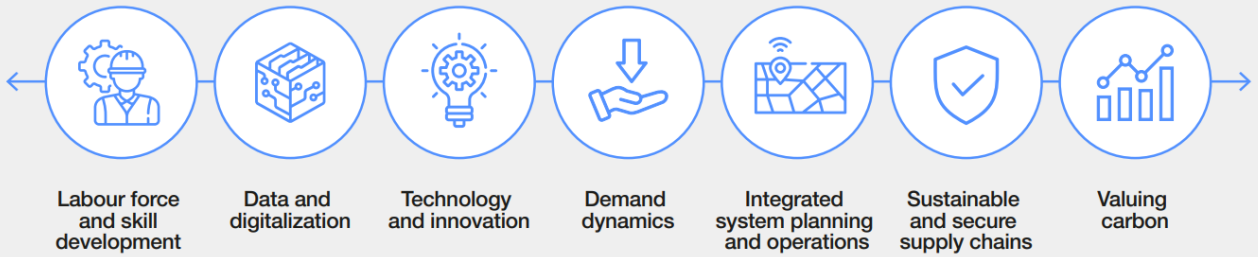
- Power grid infrastructure cannot yet **adequately connect sources of renewable energy...**

Other factors relevant to the role of transmission during the transition

- To ensure success in this process, it is important to enable other critical elements to allow the energy systems of the future to have flexible, reliable and resilient electricity as their backbone, for which grids and infrastructure play a fundamental role.

Electricity+:
Electricity as the Backbone of an Integrated Energy System
World Economic Forum, January 2023

- On the other hand, there are major risk factors that jeopardize the transmission development goal and the fulfillment of the new performance attributes, which must be addressed:
  - age of the grid
  - increased grid complexity
  - delays in project development
  - extreme climate change events
  - failures or disruptions in the supply chain
  - cybersecurity



Source: World Economic Forum

World Energy Outlook 2022

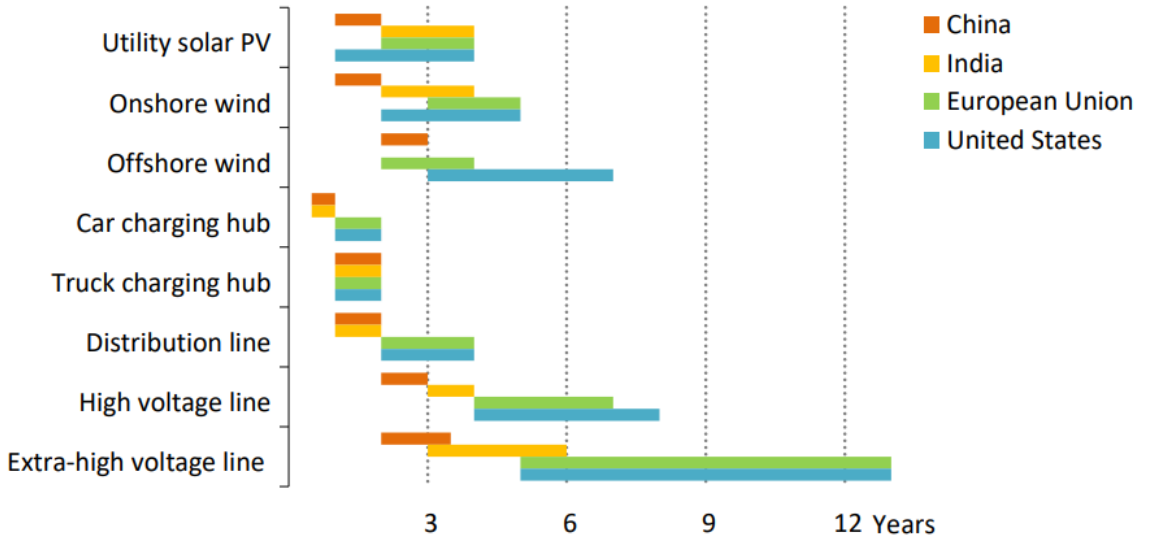
Grids support secure energy transitions

Successful clean energy transitions depend on modern electricity networks, and their development requires long-term vision and planning. For example, large projects involving transmission systems can often take a decade or longer to complete. Such long lead times put a premium on strategic thinking and accurate estimates of future supply and demand so that tomorrow's networks are ready to meet the requirements placed on them and do not act as a bottleneck in clean energy transitions.

To ensure security of supply, grid development must be considered at the system level, taking account of increasing electricity demand and rising levels of variable renewables. Energy from utility-scale wind or solar PV installations, which are often located far from densely populated cities and other demand centres, will need to be transferred over long distances through a network that may have been designed for a different type of operation.

Electricity network projects, especially high voltage interconnections, are very complex in terms of both permitting and construction. Line route plans and reports have to be drawn up covering the entire length, conditions and specifications have to be assessed, and stakeholders must be engaged. People living near proposed line routes may oppose their development.

Figure 6.20 ▷ **Typical deployment time for electricity grids, solar PV, wind and EV charging stations**



IEA. CC BY 4.0.

Electricity grid deployment is complex, involves many stakeholders and can take many years, which makes advanced planning critical to support clean energy transitions

Notes: Ranges reflect typical projects commissioned in the last three years. Distribution line = 1-36 kV overhead line; transmission is split between high voltage line = 36-220 kV overhead line and extra-high voltage line = 220-765 kV overhead line. To date, India has not developed offshore wind projects.

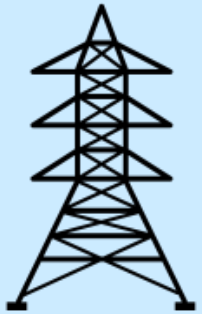
Source: IEA analysis.

DERECHOS RESERVADOS POR INTERCONEXIÓN ELÉCTRICA S.A. E.S.P.


Progress and perspectives of ISA regarding the energy transition

Our outlook to 2030: developing the transmission infrastructure required for the region's energy transition

Transmission



A Grid Expansion
Upgrading / Modernization (increased use of existing grid)

C Regional integration

USD
7,600 million
Current and new geographies

B Connection of new renewable generation

D Distributed energy solutions

USD
1 billion
B2B businesses

New technologies

USD
1 billion
Including storage

ISA consolidates its position in Latin America by building energy transition infrastructure

Projects commissioned
2019-2023 (1Q)

5,100
km of circuit

11,800
MVA of transformation

30 / 60
MW/MWh storage

Projects awarded
2019-2023 (1Q)

6,004
km of circuit

12,785
MVA of transformation

Projects under execution (1Q2023)
In operation 2023-2029

4,671
km of circuit

16,451
MVA of transformation

B

We are making the incorporation of renewable generation feasible through connections and transmission infrastructure reinforcements

Transmission expansion for new generation projects

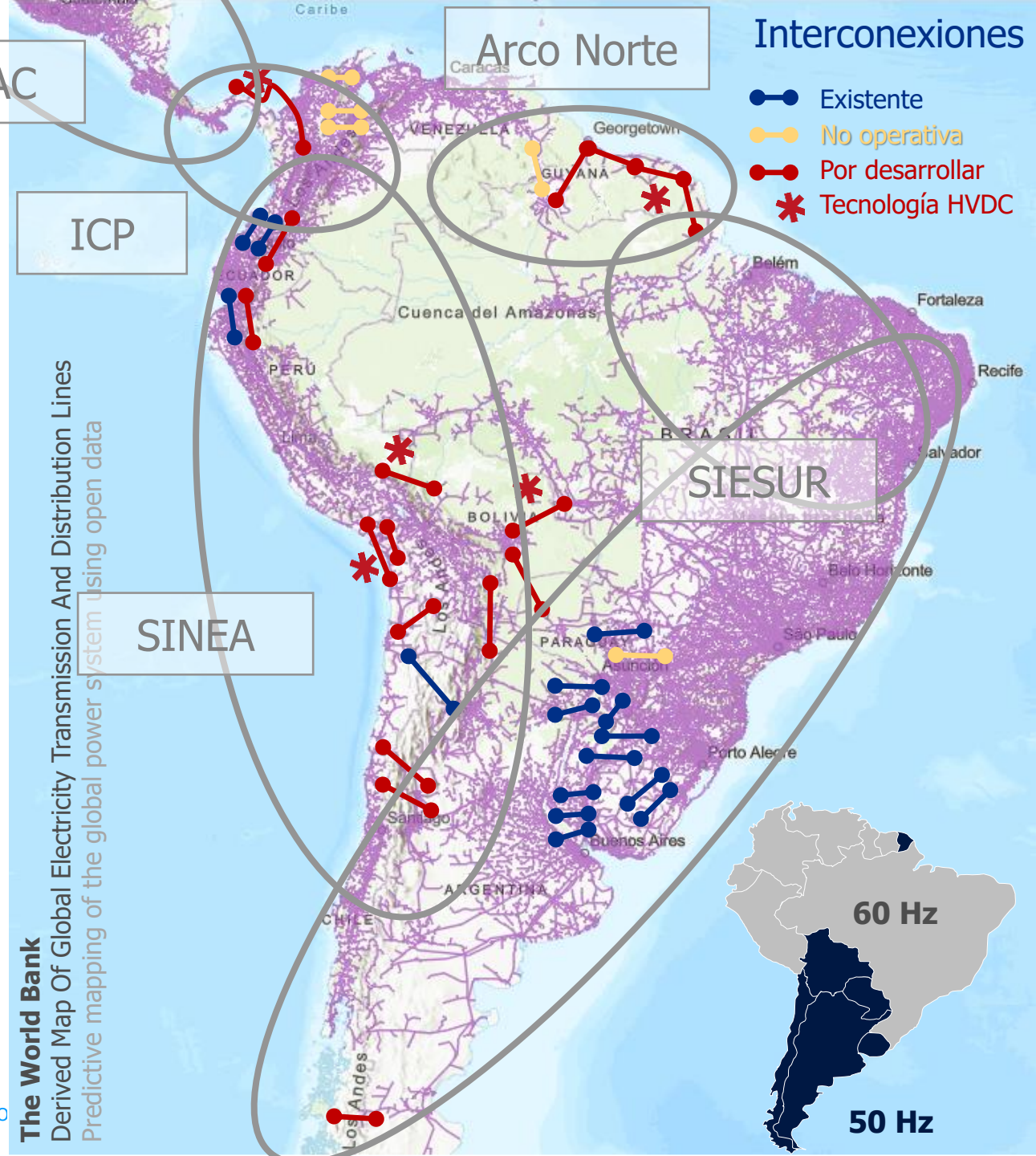
	Proyecto Transmisión	Generación (MW)	Total (MW)
GEB	SE La Loma (STR)	La Loma (150)	150
ISA	LT Copey-Cuestecitas 500 kV	Windpeshi (200) Acacia 2 (80)	280
GEB	LT Colectora-Cuestecitas 500 kV	Irraipa (99) Carrizal (195) Casa eléctrica (180) Apotolorru (75) Ipapure (201) Chemesky (100)	850
GEB	LT Bonda – Río Córdoba 220 kV	Beta (280) Alpha (212) Camelias (250)	742
GEB	LT Cuestecitas – La Loma 500 kV (2c)		
ISA	LT Cuestecitas – Copey 500 kV (2c)		
ISA	LT La Loma – Sogamoso 500 kV		
	Total		**2.022**

Connections provided by ISA companies

Proyecto Generación	Generación (MW)	Tipo	Subestación
EDPR			
Alpha	212	Wind	Cuestecitas 500 kV
Beta	280		
ENEL Green Power			
Windpeshi	200	Wind	Cuestecitas 220 kV
Nabusimake	100	Solar	Fundación 110 kV
Guayepo	400	Solar	Sabanalarga 500 kV
Portón del Sol			
Portón del Sol	102	Solar	Purnio 230 kV
Total	**1.294**		

ISA is committed to regional integration, essential in the energy transition scenario.

- Integration provides flexibility and resilience to the systems, connecting new energy poles; allowing to complement, share and use better the available resources.
- The process is progressing through different regional initiatives; each initiative is at a different stage of development and has a defined roadmap; it is the result of the joint work of authorities, companies, institutions and multilateral banks.



SIEPAC: Electrical Interconnection System of the Central American Countries
SINEA: Andean Electrical Interconnection System
ICP: Colombia-Panama Interconnection
SIESUR: Energy Integration System for Southern Countries

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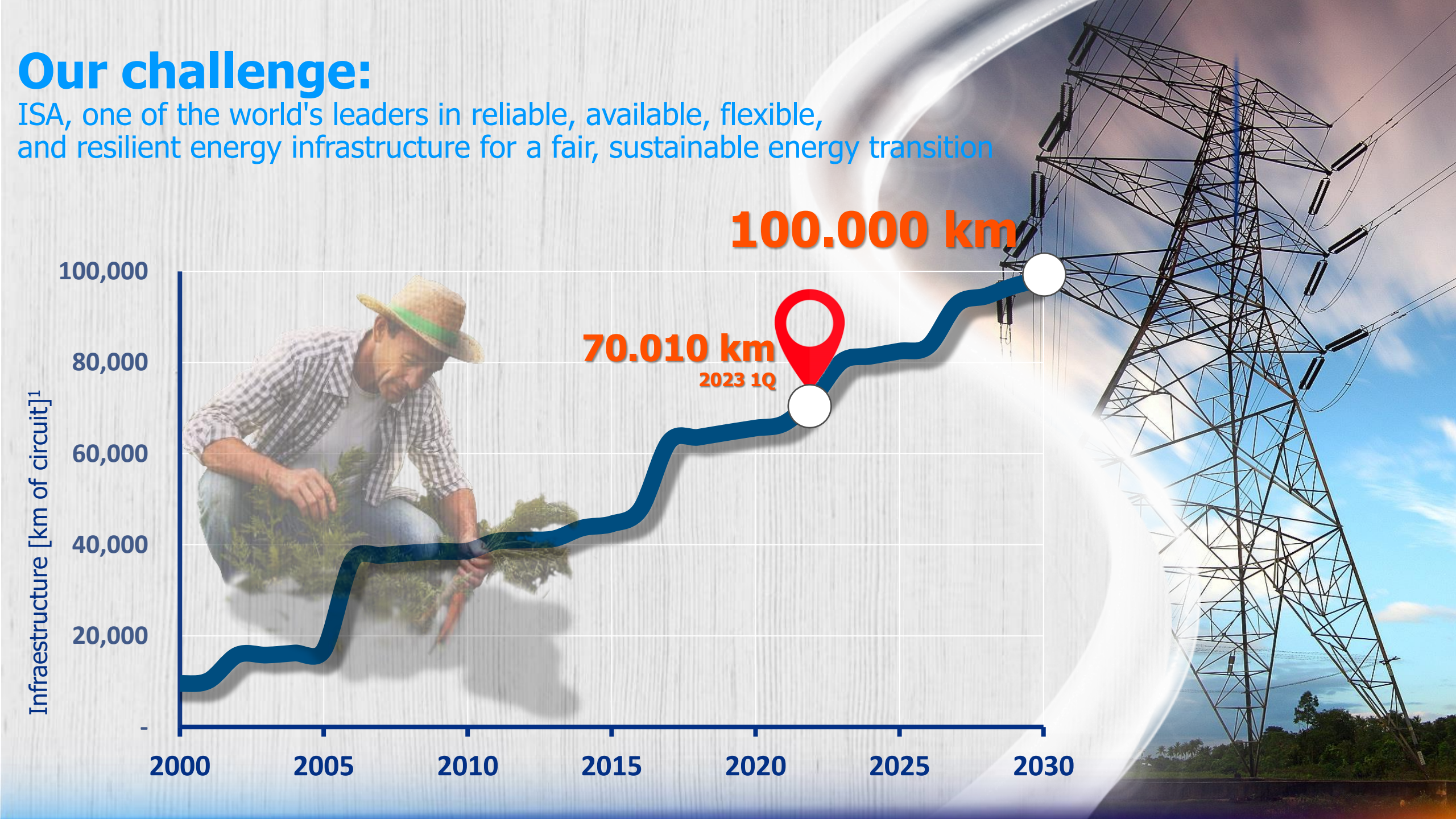
Our challenge:

ISA, one of the world's leaders in reliable, available, flexible,
and resilient energy infrastructure for a fair, sustainable energy transition

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