

About IRENA

Established in 2011.

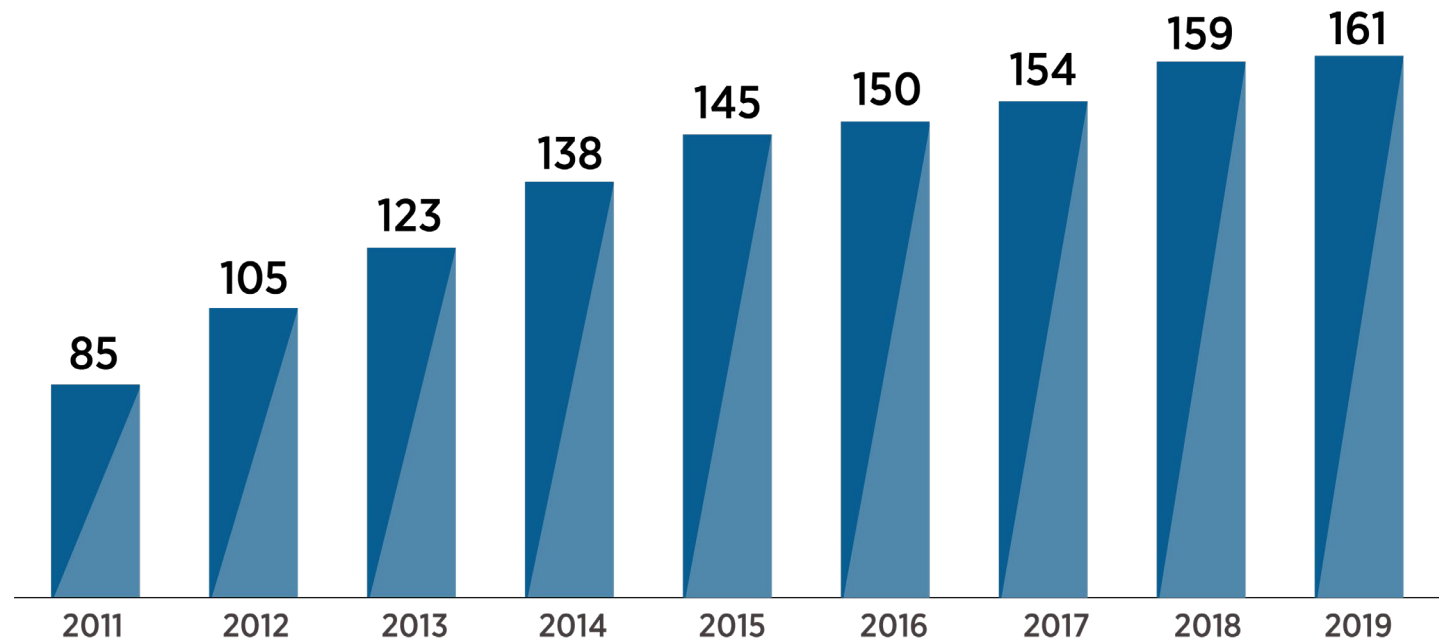
161 Members; 22 States in accession.

Mandate: to promote the **widespread adoption and sustainable use of all forms of renewable energy**

Scope: All renewable energy sources produced in a **sustainable manner**

IRENA serves as:

- Centre of excellence for knowledge and innovation
- Global voice of renewables
- Network hub
- Source of advice and support



IRENA Offices



IRENA Headquarters
Masdar City



IRENA Innovation and Technology
Center



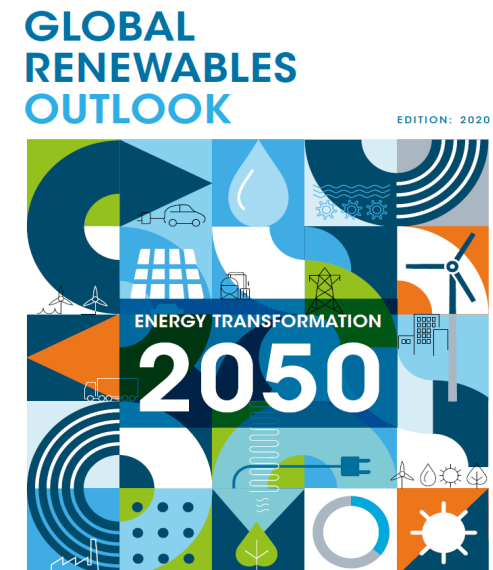
IRENA - Office of the Permanent
Observer to the United Nations

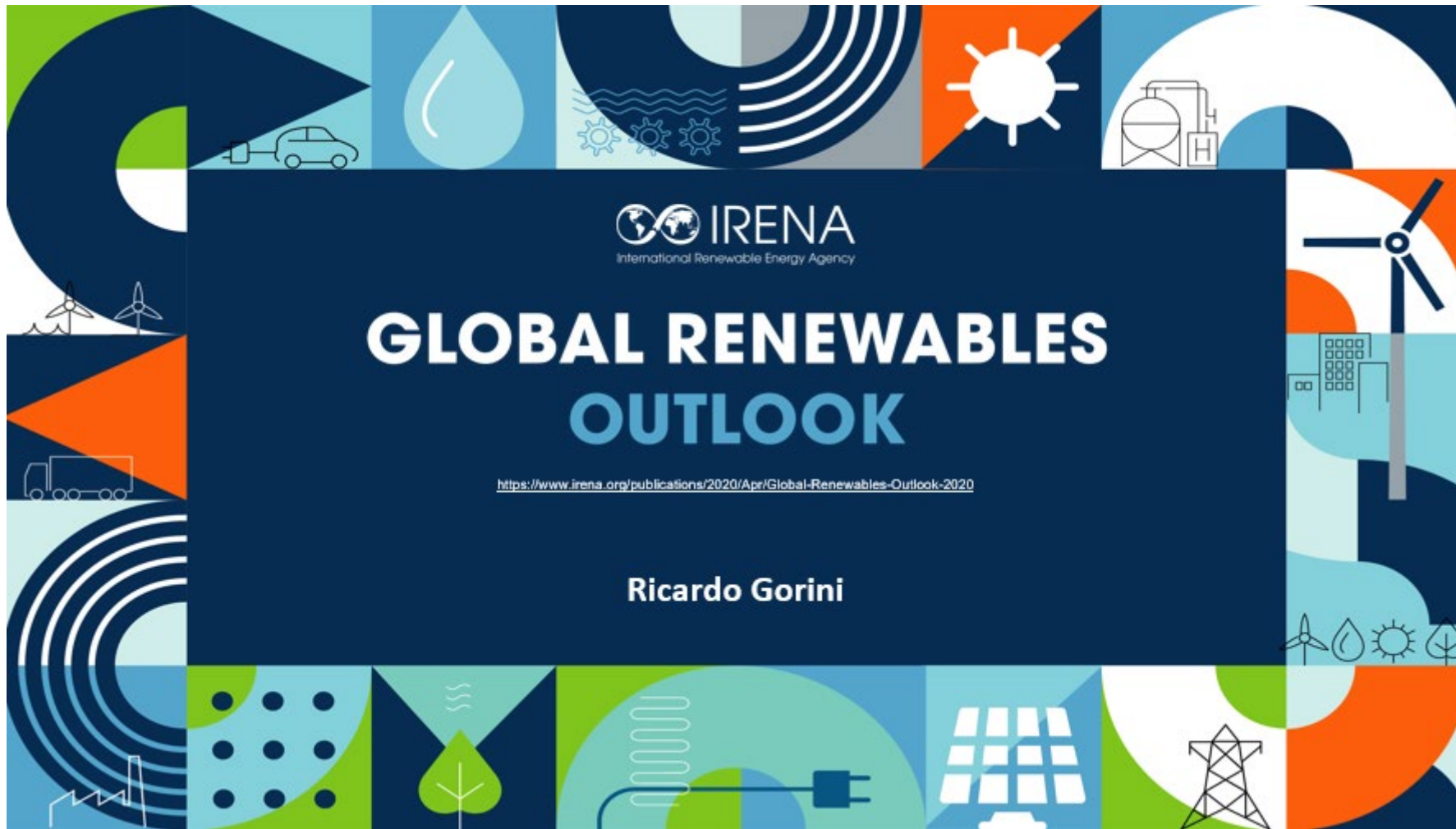
This presentation has been prepared based on the report:

IRENA (2020), *Global Renewables Outlook: Energy transformation 2050*

(Edition: 2020), International Renewable Energy Agency, Abu Dhabi.

Available for download: www.irena.org/publications





 IRENA
International Renewable Energy Agency

GLOBAL RENEWABLES OUTLOOK

<https://www.irena.org/publications/2020/Apr/Global-Renewables-Outlook-2020>

Ricardo Gorini

REmap products

Global

- Status of the energy transition and perspective for the global energy system to 2050 based on current and planned policies (the Reference Case).
- Detailed REmap transition pathway to 2050 – an energy pathway aligned with the well-below 2oC target of the Paris climate goals.
- 6 global reports ('14, '16, '17, '18, '19, '20)
- **GRO 2020, Post-Covid Recovery report and G20 report**
- **Next GRO 2021**



Regional

- Assessment of technology options and regional disaggregation
- Identification of key technologies and trends, and cross-country opportunities
- 3 regional reports (Africa, ASEAN and EU)
- **3 in preparation (REmap CESEC (SEE), REmap Central America, REmap ASEAN 2.0)**
- **EU 2nd phase** (subject to fund availability)
- **REmap South America** (subject to fund availability)



Country

- Insights for policy and decision makers for areas in which action is needed at a country level
- 14 country reports for major economies
- **Lebanon done, South Africa –launch TBD, Nigeria on going),**
- **2 starting (Malaysia, Indonesia)**
- **NDC (El Salvador, Republica Dominicana, Albania, Lebanon, Belize, write-up)**
- **China (papers)**

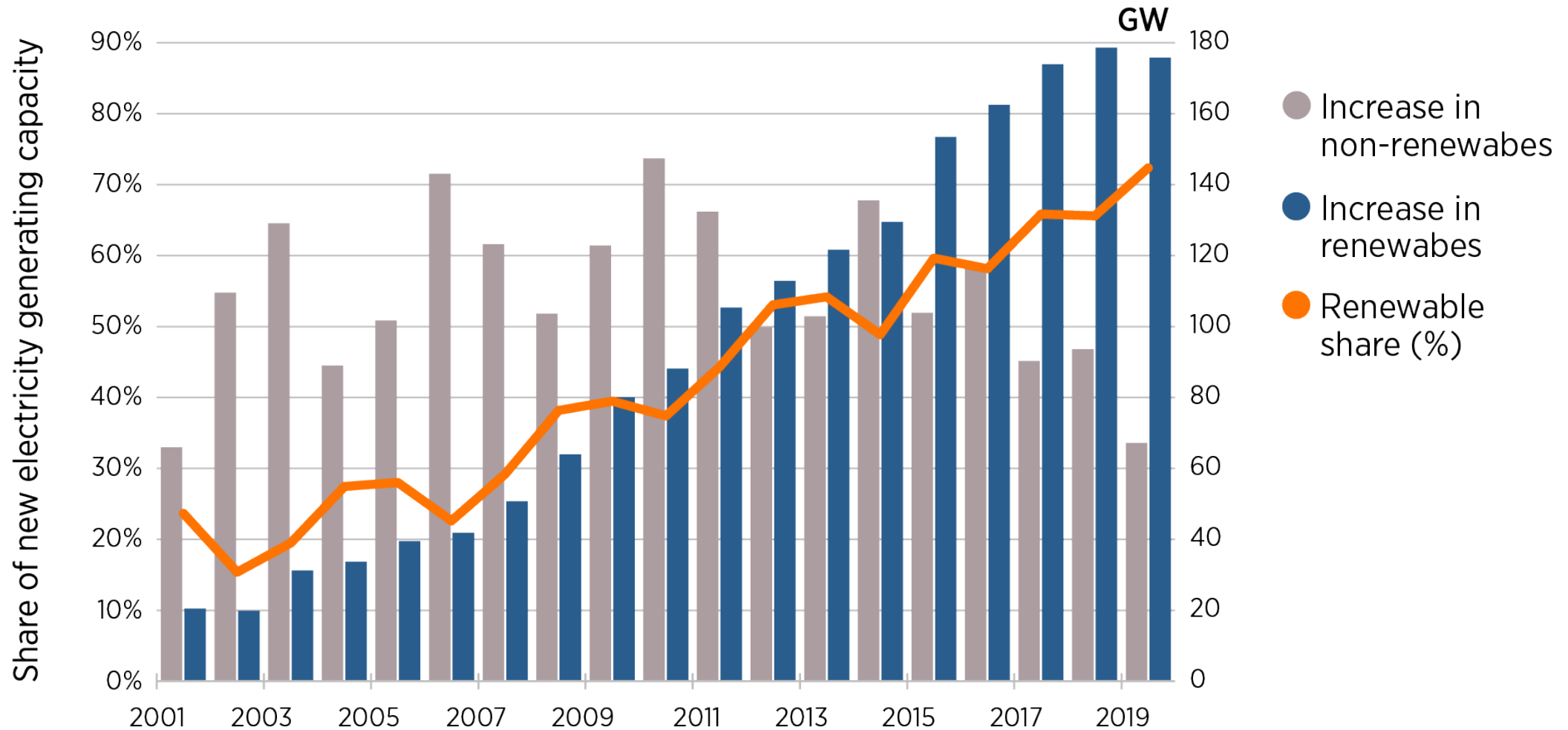


Thematic

- Provide detailed technical and economic analysis on specific topics (i.e. Future of Wind/Solar PV, RE investments, stranded assets, district heating and cooling etc.)
- **Reaching Zero - contribution**
- **Oil & Gas strategy paper**

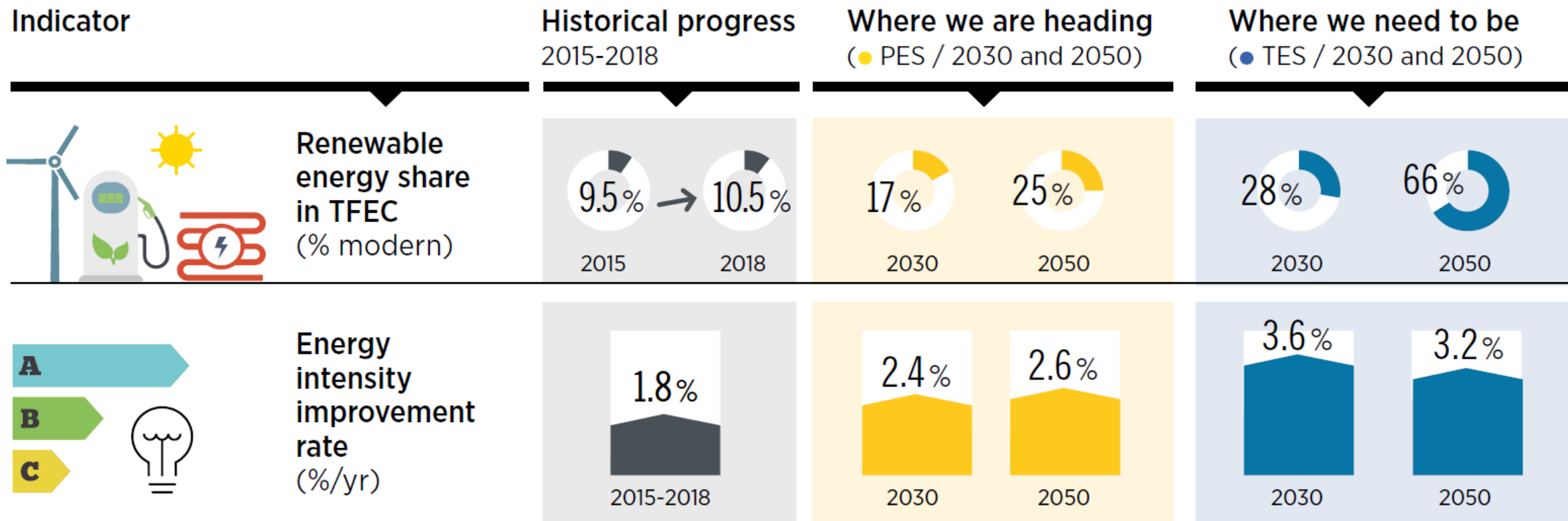


Global: Las energías renovables continúan dominando la expansión de capacidad



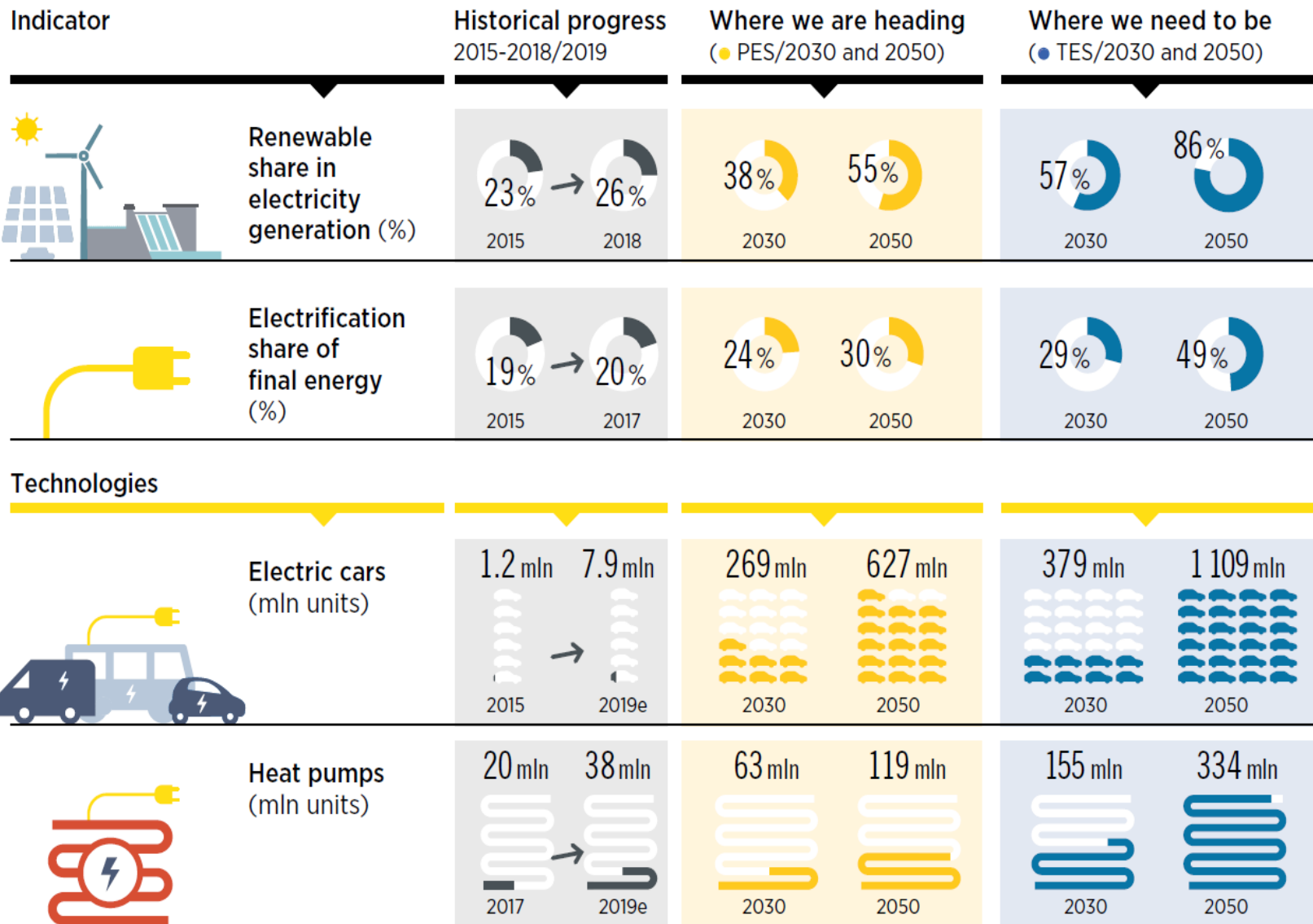
Las energías renovables ahora representan un tercio de la capacidad energética mundial en la actualidad

Global: Las energías renovables - aumento de seis veces



- Las mejoras en la eficiencia energética deben ampliarse rápida y sustancialmente.
- La energía renovable y la eficiencia energética juntas ofrecen más del 90% de las medidas de mitigación necesarias para reducir las emisiones relacionadas con la energía en el escenario de transformación de la energía.

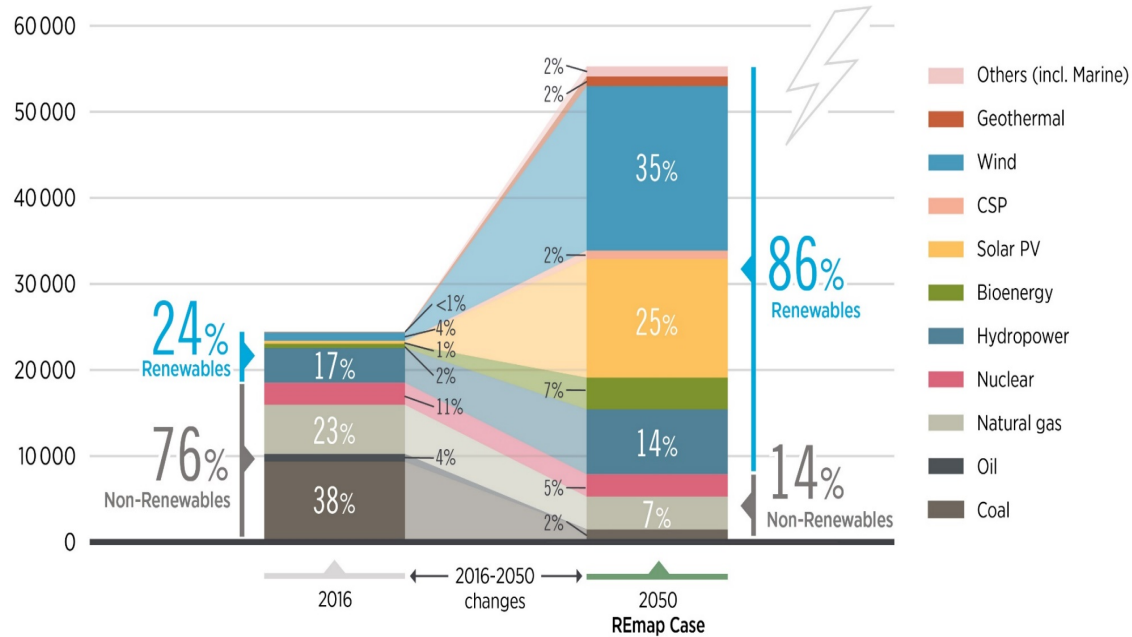
Global: Un sistema energético cada vez más electrificado



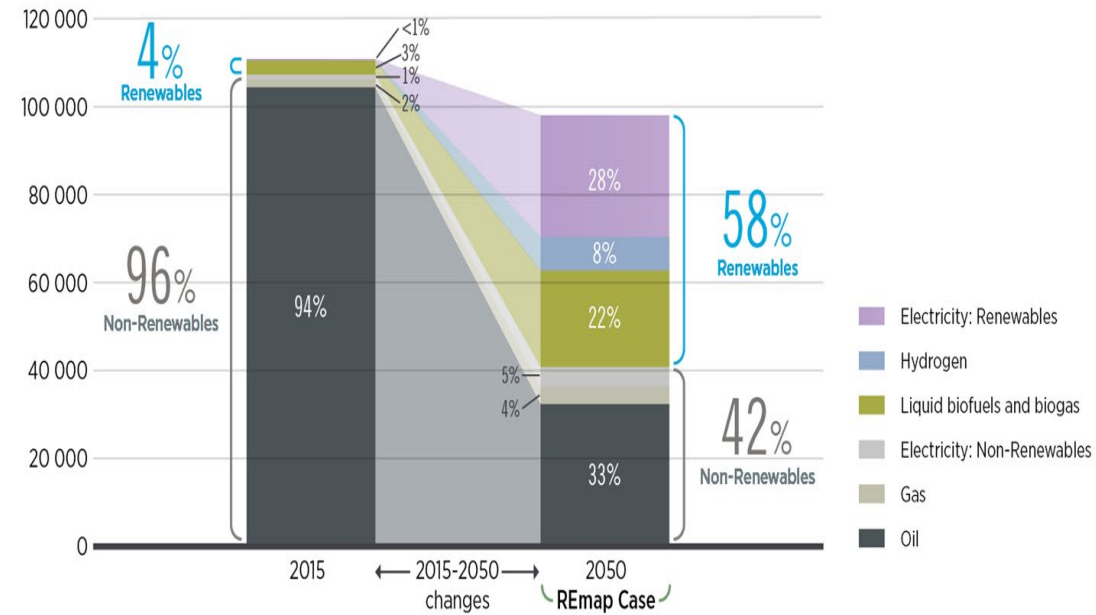
- Las **tecnologías de generación de energía renovable** están estableciendo **récords de bajos costos y nueva capacidad**.
- La tasa de crecimiento en la **participación porcentual de la electricidad** (punto porcentual “ppt”) en la energía final debe **cuadruplicarse**, de un aumento de 0,25 ppt / año a 1,0 ppt / año.
- La **electrificación de los usos finales** impulsará una mayor demanda de energía para satisfacerla con **energías renovables**

Global: El sector transporte con un mix energético diversificado

Breakdown of electricity generation, by source (TWh/yr)



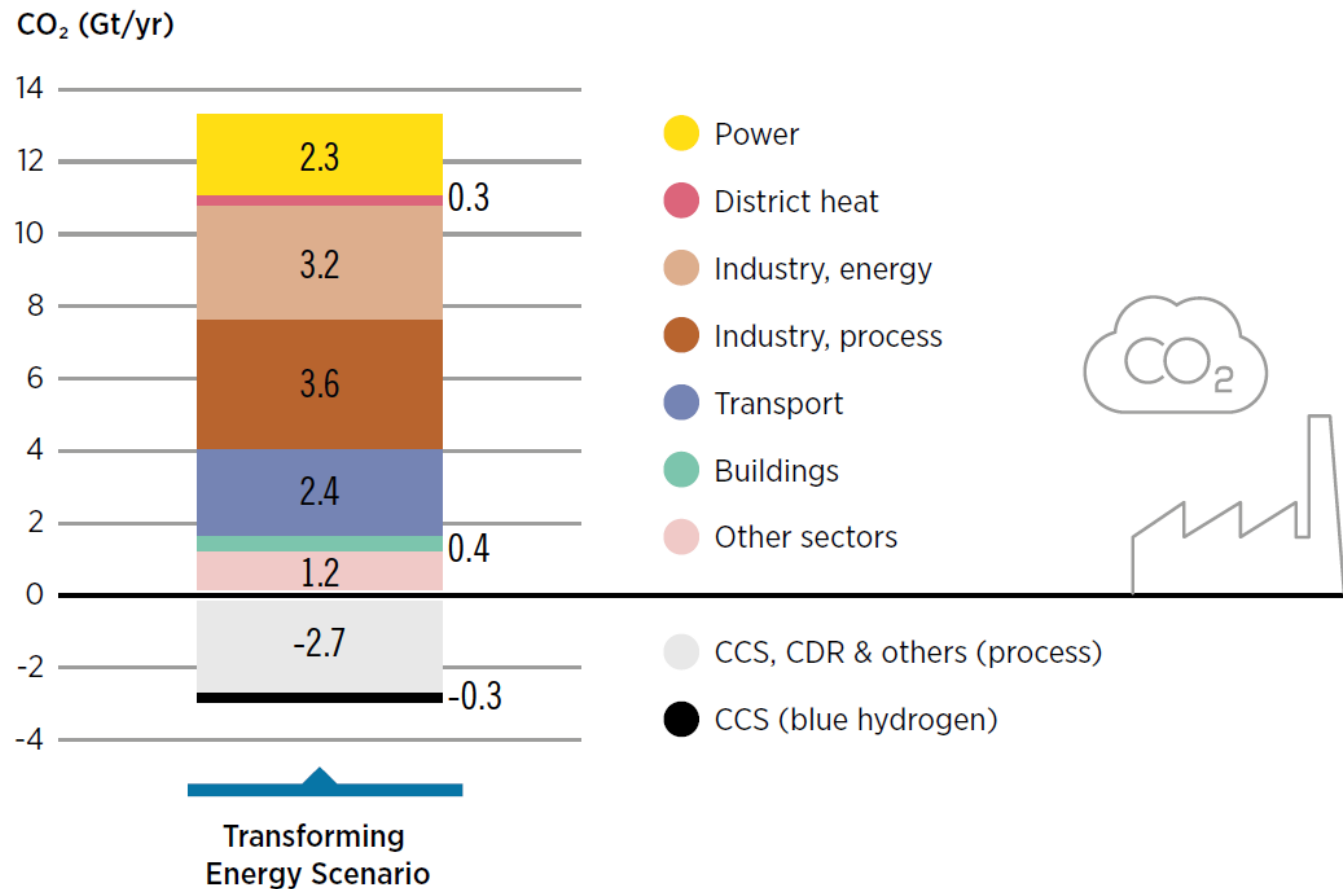
Transport final energy consumption (PJ)



Sector coupling: Complementariedad entre el Sistema de transporte y el Sistema eléctrico

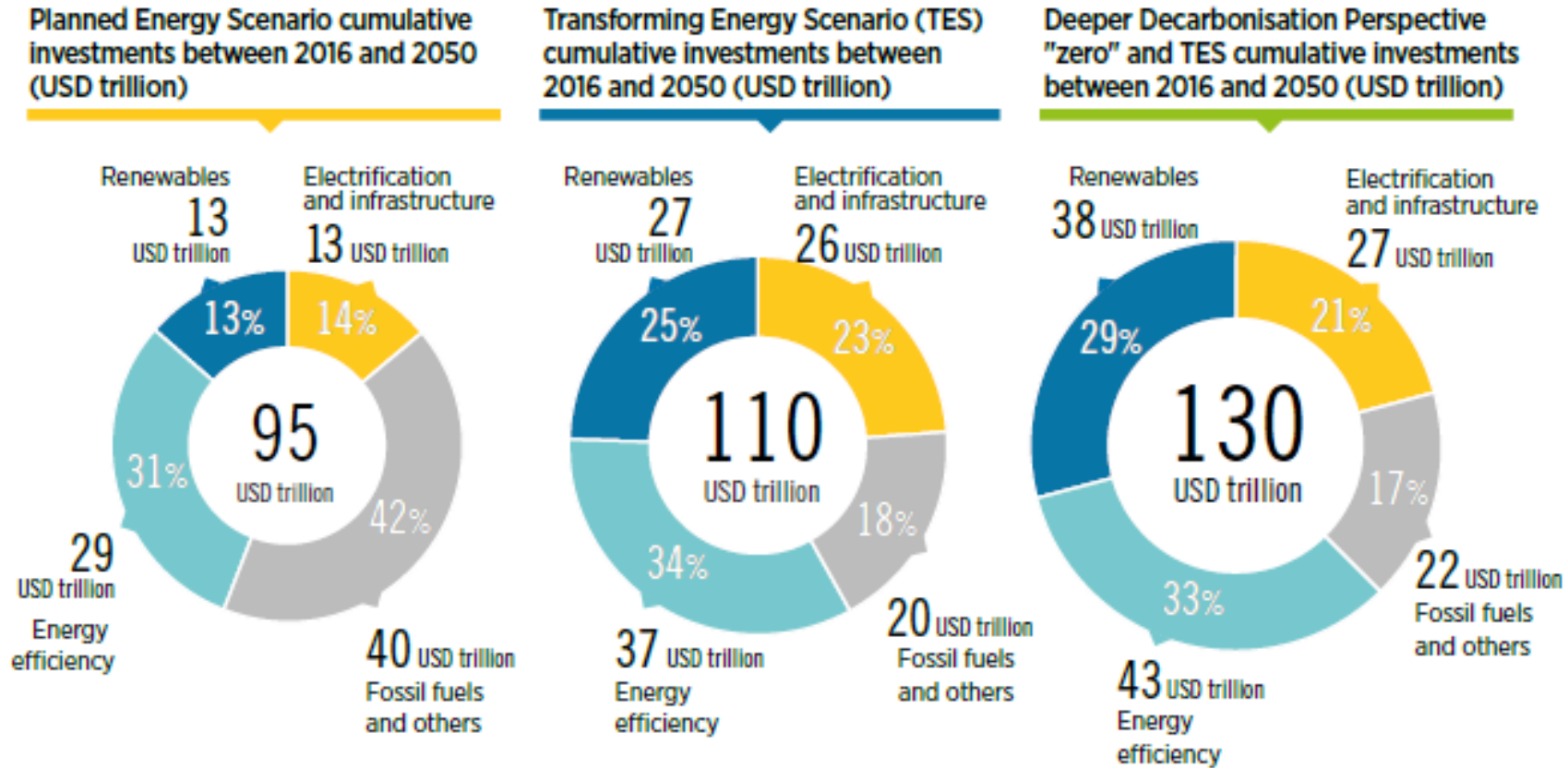
Global: Industry and transport - The bulk of remaining CO2 in 2050

Energy-related and industrial process CO2 emissions in the Transforming Energy Scenario, 2050



- The Transforming Energy Scenario would result in **10.4 Gt** of remaining net CO₂ emissions in 2050. The bulk of these remaining emissions is found in the **transport** and **industry sectors**.
- Two-thirds of the remaining emissions come from challenging sectors, namely:
 - **Heavy industry:** steel and iron, chemicals & petrochemicals, cement making, aluminum
 - **Transport:** aviation and shipping
- The Deeper Decarbonisation Perspective outlines some of the key solutions to reduce emissions in these challenging sectors to net-zero, and eventually zero.

Global: priorities - renewables, efficiency and electrification



- **Total investment in the energy system in the Transforming Energy Scenario would reach USD 110 trillion by 2050, or around 2% of average annual GDP over the period. Of that total, over 80% needs to be invested in renewables, energy efficiency, end-use electrification, and power grids and flexibility.**
- **The Deeper Decarbonisation Perspective would require an additional investment of USD 20 trillion.**

América Latina

A OPORTUNIDADE QUE NÃO PODE SER PERDIDA

Regions - Current status and Planned Energy Scenario

Characteristics

Regions	Population (million)	TFEC per capita (GJ per capita)	Local pollution (based on number of indicated cities)	Energy-related emissions (tCO ₂ per capita)	GDP per capita (PPP, constant 2011 \$) 2018	Energy access (% population with access to Clean Cooking and Electricity)	Renewables Competitiveness (LCOE - price)/price	Fossil fuel dependence	Resource availability (Generation in PES by 2050 over technical potential)
			● Good ● Moderate ● Unhealthy				● Non-competitive ● Competitive		
Sub-Saharan Africa	1041 (2018) / 1947 (2050)	18 (2017) / 6 (2050)	50% (4 Cities)	0.7 (2018) / 0.4 (2050)	3519	16% (2018) / 45% (2050)	Non-competitive	low	0.1% (Solar), 2.0% (Wind), 0.1% (Hydro), 2.4% (Geothermal), 11.8% (Other)
Southeast Asia	642 (2018) / 749 (2050)	28 (2017) / 40 (2050)	0% (35 Cities)	2.3 (2018) / 3.7 (2050)	11 642	60% (2018) / 95% (2050)	Competitive	medium	4.3% (Solar), 32.8% (Wind), 0.2% (Hydro), 11.8% (Geothermal), 44.7% (Other)
Rest of Asia	2070 (2018) / 2601 (2050)	21 (2017) / 35 (2050)	0% (119 Cities)	1.9 (2018) / 2.9 (2050)	7 330	46% (2018) / 91% (2050)	Non-competitive	high	2.3% (Solar), 2.3% (Wind), 2.3% (Hydro), 8.1% (Geothermal), 26.0% (Other)
Latin America	465 (2018) / 536 (2050)	41 (2017) / 56 (2050)	7% (91 Cities)	2.3 (2018) / 2.8 (2050)	13 426	87% (2018) / 98% (2050)	Competitive	low	0.7% (Solar), 1.3% (Wind), 0.7% (Hydro), 4.8% (Geothermal), 44.4% (Other)

key drivers for the transformation of the energy system

- Universalisation of access and infrastructure improvement

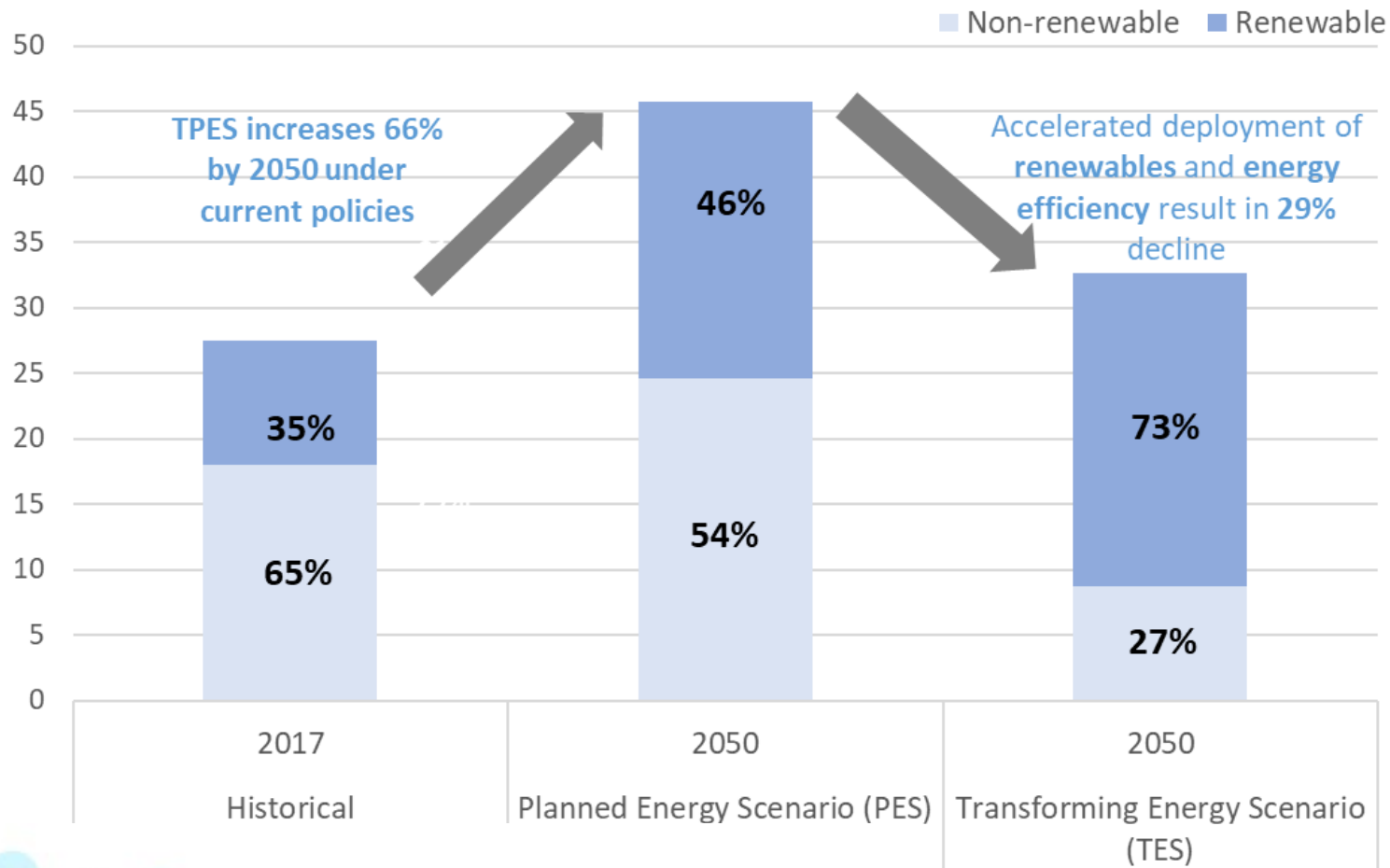
- Economic development and cost-competitiveness of renewables

- Reducing emissions and improving air quality

Ruta del escenario de transformación energética de IRENA para América Latina y el Caribe

Total primary energy supply (EJ/yr)

Latin America and Caribbean (excl. Mexico)

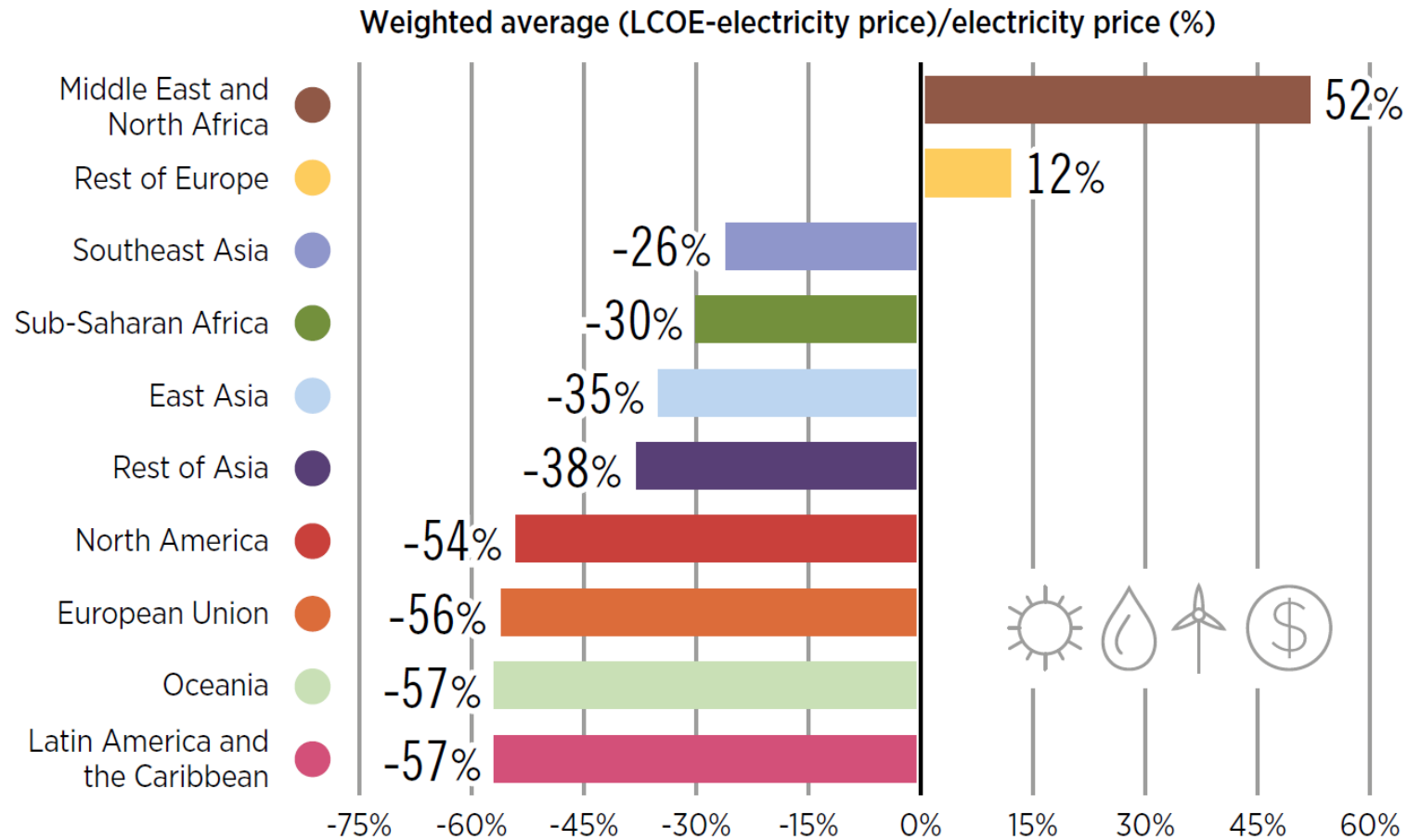


PES 2050: si bien se incluye a México, 2017 tendría un TPES de ~ 35 EJ / año y la participación total de **energía renovable** aumentaría del **29% en 2017 a cerca del 35% para 2050** (57 EJ / año).

TES 2050: al agregar México, la participación aumentaría a alrededor del **72%** (45 EJ / año).



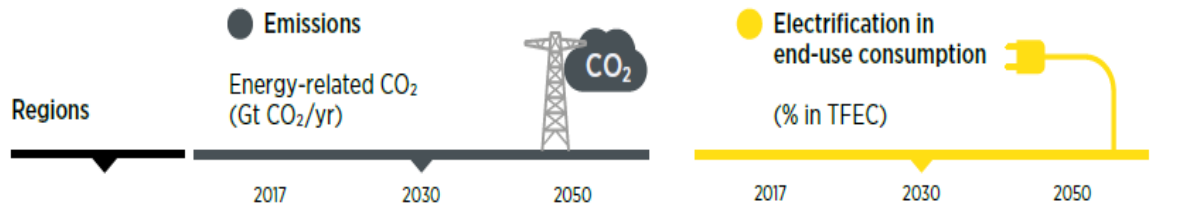
Lat.Am. Renewable electricity: Cheaper than most regions



- In Latinoamerica **renewable costs** are at least **57% lower** than global.

Ruta del escenario de transformación energética de IRENA para América Latina y el Caribe

Transforming Energy Scenario (TES)

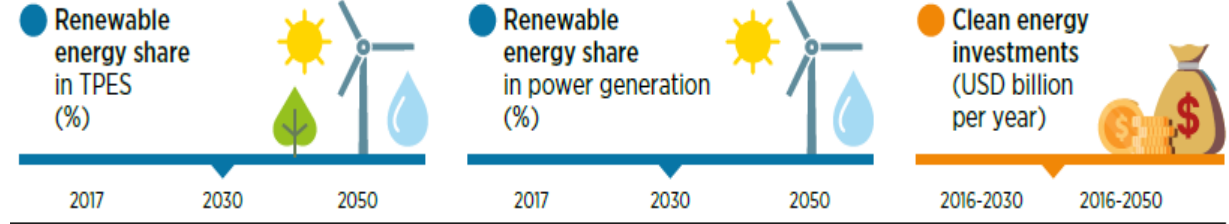


Latin America and the Caribbean

1.2
Gt CO₂/yr

1.0
Gt CO₂/yr

0.6
Gt CO₂/yr

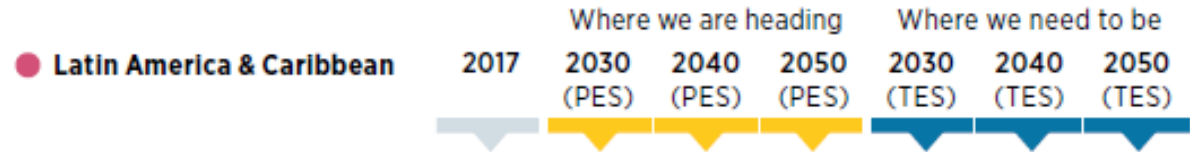


154 USD bln

118 USD bln

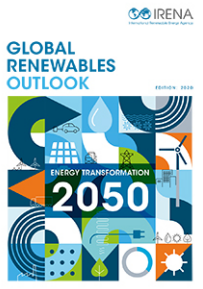


Improved energy efficiency leading to lower energy supply and consumption



Energy (EJ)	2017	2030 (PES)	2040 (PES)	2050 (PES)	2030 (TES)	2040 (TES)	2050 (TES)
Supply (TPES)	27	35	42	46	30	32	33
Consumption (TFEC)	21	27	31	34	22	22	21

* Not including Mexico



Latin America and The Caribbean

Latin America & Caribbean

Where we are heading
Planned Energy Scenario 2016-2050 (PES)

Where we need to be
Transforming Energy Scenario 2016-2050 (TES)

Energy system investments (average annual, 2016-50) USD billion/year

	2016-2050 (PES)	2016-2050 (TES)
Power	39	45
– Renewable	21	28
– Non-renewable	5	3
– Power grids and system flexibility	13	15
Industry (RE + EE)	7	11
Transport (electrification + EE)	10	19
Buildings (RE + EE)	29	42
Biofuel supply	2.4	2.5
Renewable hydrogen – electrolyzers	0.03	0.5

Note: RE – renewable energy; EE – energy efficiency

The findings in this report consider targets and developments as of April 2019. The wind and solar PV capacities in the Transforming Energy Scenario in 2030 in this report are slightly higher than the estimates presented in IRENA's reports (IRENA, 2019c; 2019d) which consider developments as of the third quarter of 2019.

SOCIO-ECONOMIC OUTLOOK TO 2050

Latin America & Caribbean

2019e 2030 2050

	2019e	2030	2050
Population (thousands) region-wide	474 076	505 546	535 802

GDP (USD 2015)

	2019e	2030	2050
GDP (million): PES	3 679 104	5 158 950	13 240 587
GDP (million): TES	3 700 954	5 194 779	13 563 681
GDP changes (million): TES vs. PES	21 850	35 828	323 093
GDP changes (%): TES vs. PES	0.6	0.7	2.4
Per capita GDP (thousand): PES	7.8	10.2	24.7
Per capita GDP (thousand): TES	7.8	10.3	25.3

Employment

Economy-wide employment (thousands)

	2019e	2030	2050
Employment: PES	272 097	282 324	251 102
Employment: TES	272 239	281 399	250 700
Employment changes: TES vs. PES	143	-925	-402
Employment changes (%): TES vs. PES	0.05	-0.33	-0.16

Latin America & Caribbean

2017 2030 (PES) 2040 (PES) 2050 (PES) 2030 (TES) 2040 (TES) 2050 (TES)

Energy (EJ)

	2017	2030 (PES)	2040 (PES)	2050 (PES)	2030 (TES)	2040 (TES)	2050 (TES)
Supply (TPES)	27	35	42	46	29	31	31
Consumption (TFEC)	21	27	31	34	22	22	21

Renewables shares (modern)

	2017	2030 (PES)	2040 (PES)	2050 (PES)	2030 (TES)	2040 (TES)	2050 (TES)
Supply (TPES)	30%	40%	42%	46%	53%	63%	73%
Consumption (TFEC)	30%	36%	37%	40%	47%	57%	67%
Power generation	65%	73%	75%	79%	85%	90%	93%

Electricity share in final energy consumption

	2017	2030 (PES)	2040 (PES)	2050 (PES)	2030 (TES)	2040 (TES)	2050 (TES)
End-use consumption	18%	22%	24%	26%	26%	31%	39%
Industry	21%	24%	24%	25%	27%	29%	33%
Transport	0.2%	1%	1%	2%	9%	14%	24%
Buildings	45%	58%	63%	67%	61%	70%	78%

Renewable installed capacity (GW)

	2017	2030 (PES)	2040 (PES)	2050 (PES)	2030 (TES)	2040 (TES)	2050 (TES)
Bioenergy	19	45	61	79	50	72	94
Hydropower	173	181	201	226	186	211	240
Solar PV	5	76	128	177	108	196	281
Wind	17	74	111	148	93	141	188

Biofuels

	2017	2030 (PES)	2040 (PES)	2050 (PES)	2030 (TES)	2040 (TES)	2050 (TES)
Liquid biofuels (billions of litres per year)	31	61	74	79	61	75	73

Energy consumption per capita (GJ/capita)

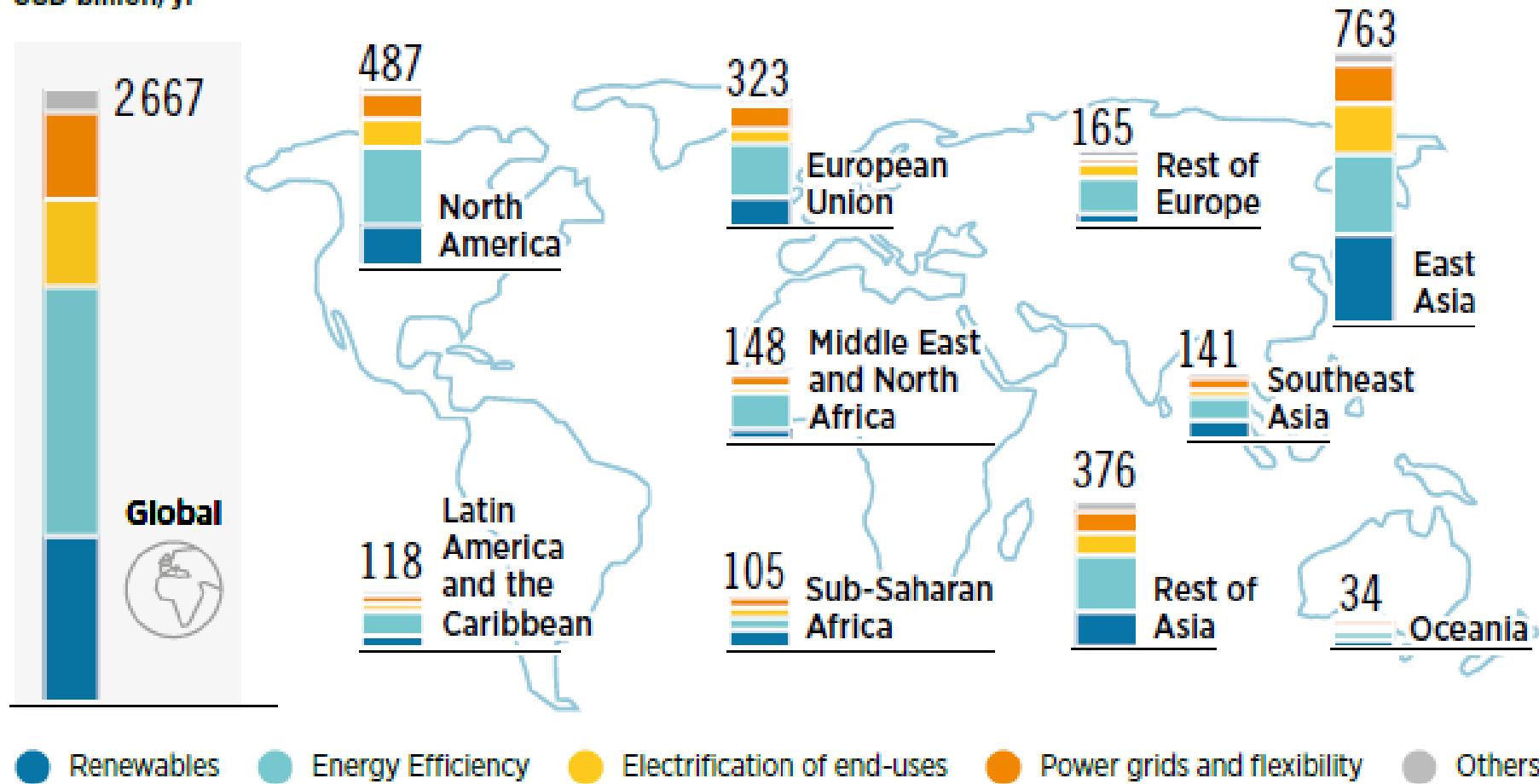
	2017	2030 (PES)	2040 (PES)	2050 (PES)	2030 (TES)	2040 (TES)	2050 (TES)
Consumption (TFEC) per capita	41	47	53	56	38	38	35

CO₂ emissions (energy-related)

	2017	2030 (PES)	2040 (PES)	2050 (PES)	2030 (TES)	2040 (TES)	2050 (TES)
Annual level (Gt CO ₂ /yr)	1.2	1.4	1.6	1.7	1	0.8	0.6
Reduction vs. today	NA	19%	35%	38%	-21%	-35%	-54%

Regions - Investment needs by region to 2050

USD billion/yr



- Annual investments in energy transformation amount to **USD 2.6 trillion per year globally.**
- **Latinoamerica will require the largest 118 USD bi/year.**

Descarbonización: acciones urgentes en todos los sectores

Power



ACCELERATE RENEWABLE CAPACITY ADDITIONS TO GENERATE ADEQUATE POWER WITH LOW-CARBON TECHNOLOGIES

- 1) Identify and map renewable energy resources and develop a portfolio of financeable projects for the medium to long term.
- 2) Construct no new coal power plants and plan and implement an end-of-life phase-out of coal capacities.

UPDATE GRID PLANNING TO ACCOMMODATE RISING SHARES OF VARIABLE RENEWABLE ENERGY (SOLAR AND WIND)

- 1) Develop a flexible power system (with flexible supply, storage, demand response, power-to-X, electric vehicles, digital and ICT technologies, etc).
- 2) Update grid codes.
- 3) Deploy micro-grids to improve resilience and expand energy access with renewable sources.
- 4) Deploy super-grids to interconnect regions.
- 5) Deploy cost-reflective tariff structures by properly readjusting the balance between volumetric charges (USD/kWh), fixed charges (e.g. USD/meter-month) and, where applicable, demand charges (USD/kW).

SUPPORT DISTRIBUTED ENERGY RESOURCE DEPLOYMENT

- 1) Incentivise energy consumers to become prosumers.
- 2) Support regulatory and pricing policies, including rights to generate and sell electricity, tariff regulation and grid-arrival policies.
- 3) Enable energy aggregators to foster use of distributed energy resources.

Transport



REDUCE TRANSPORT VOLUME AND CONGESTION

- 1) Adopt advanced digital communication technologies to improve urban transport planning and services (e.g. re-routing to reduce traffic congestion).
- 2) Promote mobility services (e.g. autonomous driving, vehicle-sharing).
- 3) Accelerate the shift from passenger cars to public transport (electric railways, trams or buses).
- 4) Deploy low-emissions city trucks.

ACCELERATE THE SHIFT TO ELECTRIC MOBILITY

- 1) Set minimum standards for vehicle emissions.
- 2) Give electric vehicles (EVs) priority in city access.
- 3) Incentivise the development of charging infrastructure.
- 4) Strengthen links between the power and transport sectors with integrated planning and policy designs (vehicle-to-grid services).

PRIORITISE BIOFUELS IN ROAD FREIGHT, AVIATION AND SHIPPING

- 1) Introduce specific mandates for advanced biofuels, accompanied by direct financial incentives and financial de-risking measures.
- 2) Adopt supporting policies to scale up sustainable production of first- and second-generation biofuels.
- 3) Eliminate fossil-fuel subsidies and implement carbon and energy taxes to increase the competitiveness of renewable-fuelled shipping and aviation.

Industry



REDUCE ENERGY CONSUMPTION IN INDUSTRIES

- 1) Promote circular economy (material recycling, waste management, improvements in materials efficiency, and structural changes such as reuse and recycling).
- 2) Establish energy efficiency standards and ramp up actual efficiency levels.

ENABLE CORPORATE SOURCING OF RENEWABLES

- 1) Support a credible and transparent certification and tracking system for corporate renewable energy use.
- 2) Consider an energy market structure that allows for direct trade between companies of all sizes and renewable energy developers, e.g. through power purchase agreements (PPAs).
- 3) Work with utilities and other electricity suppliers to provide green corporate procurement options.
- 4) Empower companies to invest directly in self-generation.

ACCELERATE LOW-CARBON TECHNOLOGY DEPLOYMENT FOR INDUSTRIAL PROCESS HEATING

- 1) Remove existing barriers and incentivise low-carbon heating methods (e.g. solar thermal heating, modern bioenergy and heat pumps).
- 2) Support emerging biomass and hydrogen technologies. Replace fossil fuel-based with renewable-based feedstocks and process heat (e.g. in iron and steel subsectors, ammonia production).

Buildings



REDUCE ENERGY CONSUMPTION IN BUILDINGS

- 1) Establish or enhance energy-efficient building codes and standards (including for appliances and equipment).
- 2) Adopt retrofitting and renovation programmes, including financing schemes.
- 3) Incentivise retrofits and adjust construction codes in cities and states.
- 4) Combine energy efficiency and renewable energy measures (e.g. public policies to integrate these technologies in renovations of public buildings).

SUPPORT AND FOSTER DER DEPLOYMENT

- 1) Remove barriers that prevent prosumers from actively helping to transform the energy system.
- 2) Promote community ownership models and innovative financing schemes.
- 3) Accelerate the roll-out of smart meters.
- 4) Capitalise on smart-home and digitalisation schemes to allow demand management and strengthen grid services.

SCALE UP THE RENEWABLE SHARE IN THE BUILDINGS SECTOR

- 1) Promote low-carbon heating technologies (e.g. heat pumps, solar heating, modern bioenergy for heating and cooling).
- 2) Apply these renewable energy technologies through district heating.
- 3) Phase out traditional biomass as a cooking fuel and replace it with clean and efficient cookstoves (biogas, modern solid biomass, electricity).

Latin America y Caribe: Acciones necesarias



Los **esfuerzos en los sectores de uso final deben expandirse significativamente** y constituir una parte importante del potencial a largo plazo necesario para transformar el sistema energético de la región en las próximas décadas.



Debe garantizarse la **flexibilidad del sistema eléctrico y fortalecer la capacidad de la red de transmisión para la integración de las energías renovables**. La **electrificación de los usos finales** también es una solución clave que desempeñará un papel más importante en el futuro y requiere una red resistente y robusta.



Deben crearse **mercados de bioenergía** facilitando el suministro sostenible, asequible y fiable de materias primas para bioenergía y un uso más amplio y eficiente de la bioenergía moderna en todas las aplicaciones.



Alinear las políticas y planes energéticos y climáticos y utilizar como un pilar central para la recuperación posterior al COVID. Los países deben alinear los objetivos climáticos y de sostenibilidad con los planes energéticos nacionales.

RGorini@irena.org

OBRIGADO