



IGTIC

## DECARBONISATION OF THE ENERGY SECTOR

# MODULE 3

Material for group work





IGTIC

## GOALS OF SECTORAL GROUP WORK

- Identify the main sources of greenhouse gas emissions in your sector.
- Familiarize yourself with the target indicators and quantitative measures of decarbonization in the industry.
- Learn which climate risks companies in this sector consider most significant.
- Assess the activities and technological solutions that are most common and acceptable in the short and long term for sector decarbonization

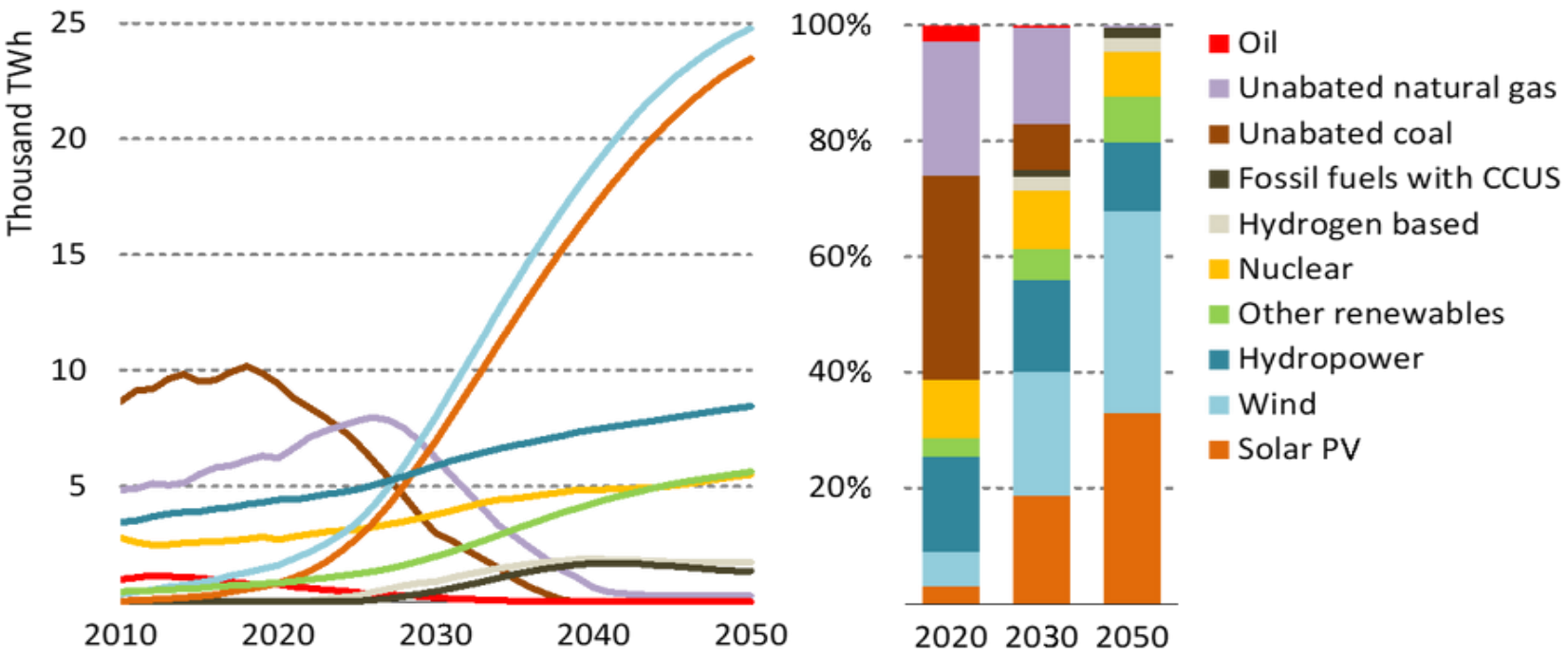


# MAIN SOURCES OF GREENHOUSE GAS EMISSIONS IN THE ENERGY SECTOR



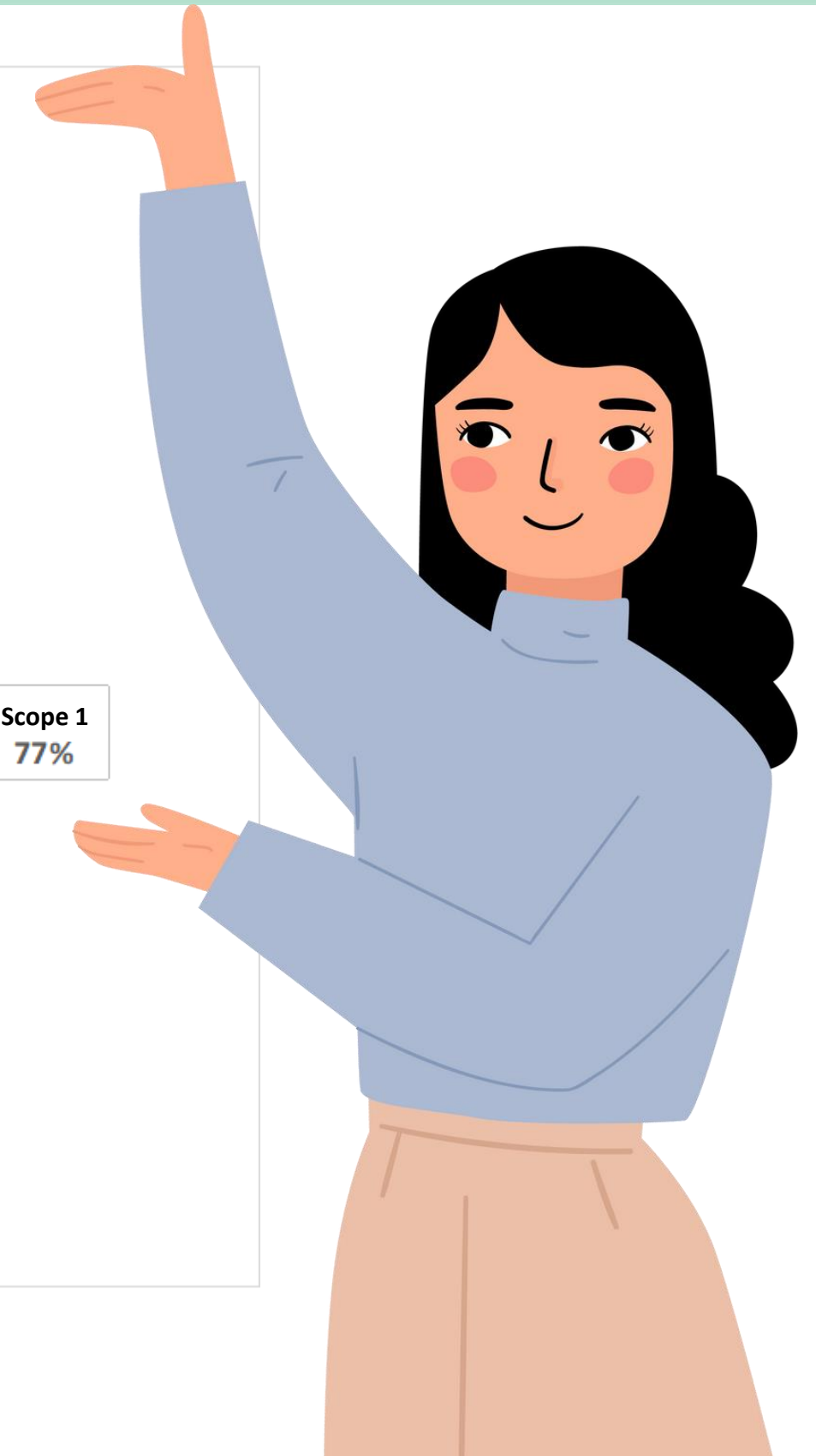
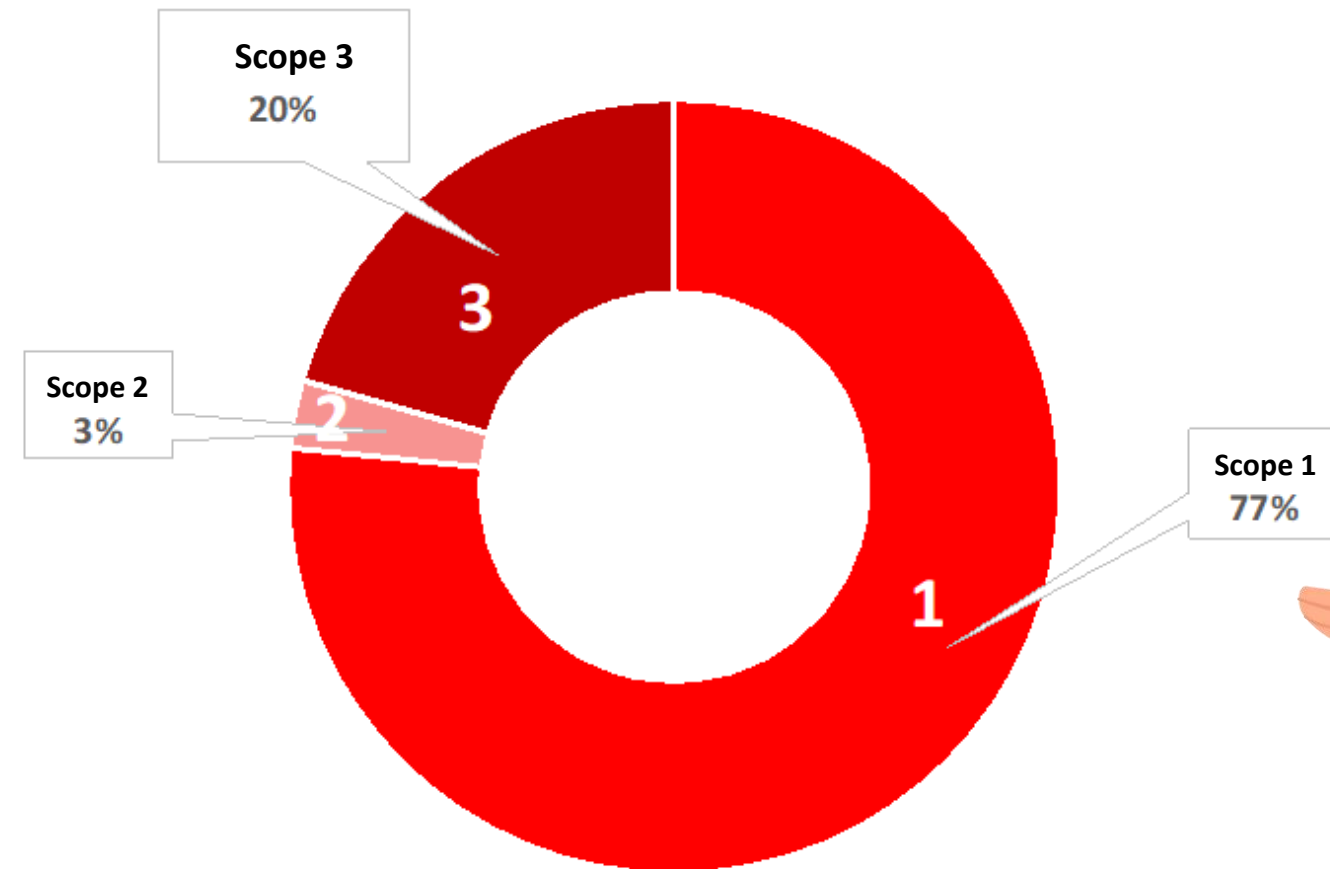
Combustion of fossil fuels for electricity and heat generation (Scope 1):

- Coal: Generating electricity and heat from coal leads to significant CO2 emissions due to its high carbon content.
- Oil: Burning oil products like gasoline and diesel in vehicles, aircraft, and industrial installations also results in CO2 emissions.
- Natural gas: While natural gas is considered cleaner compared to coal and oil, burning it also results in CO2 emissions.



# EXAMPLE: EMISSIONS INVENTORY OF RWE(GERMANY)

GHG Scopes and Categories	2020
	in million mt CO <sub>2e</sub>
<b>Scope 1</b>	<b>70.4</b>
<b>Scope 2</b>	<b>2.6</b>
<b>Scope 3</b>	<b>18.9</b>
Cat. 1 Purchased Goods and Services	0.7
Cat. 2 Capital Goods	0.6
Cat. 3 Fuel and energy-related activities	5.5
Cat. 4 Upstream transportation and distribution	0.3
Cat. 5 Waste generated in operations	0.1
Cat. 6 Business travel	< 0.1
Cat. 7 Employee commuting	< 0.1
Cat. 8 Upstream leased assets <sup>2</sup>	n. a.
Cat. 9 Downstream transportation and distribution	< 0.1
Cat. 10 Processing of sold products	0.1
Cat. 11 Use of sold products	11.7

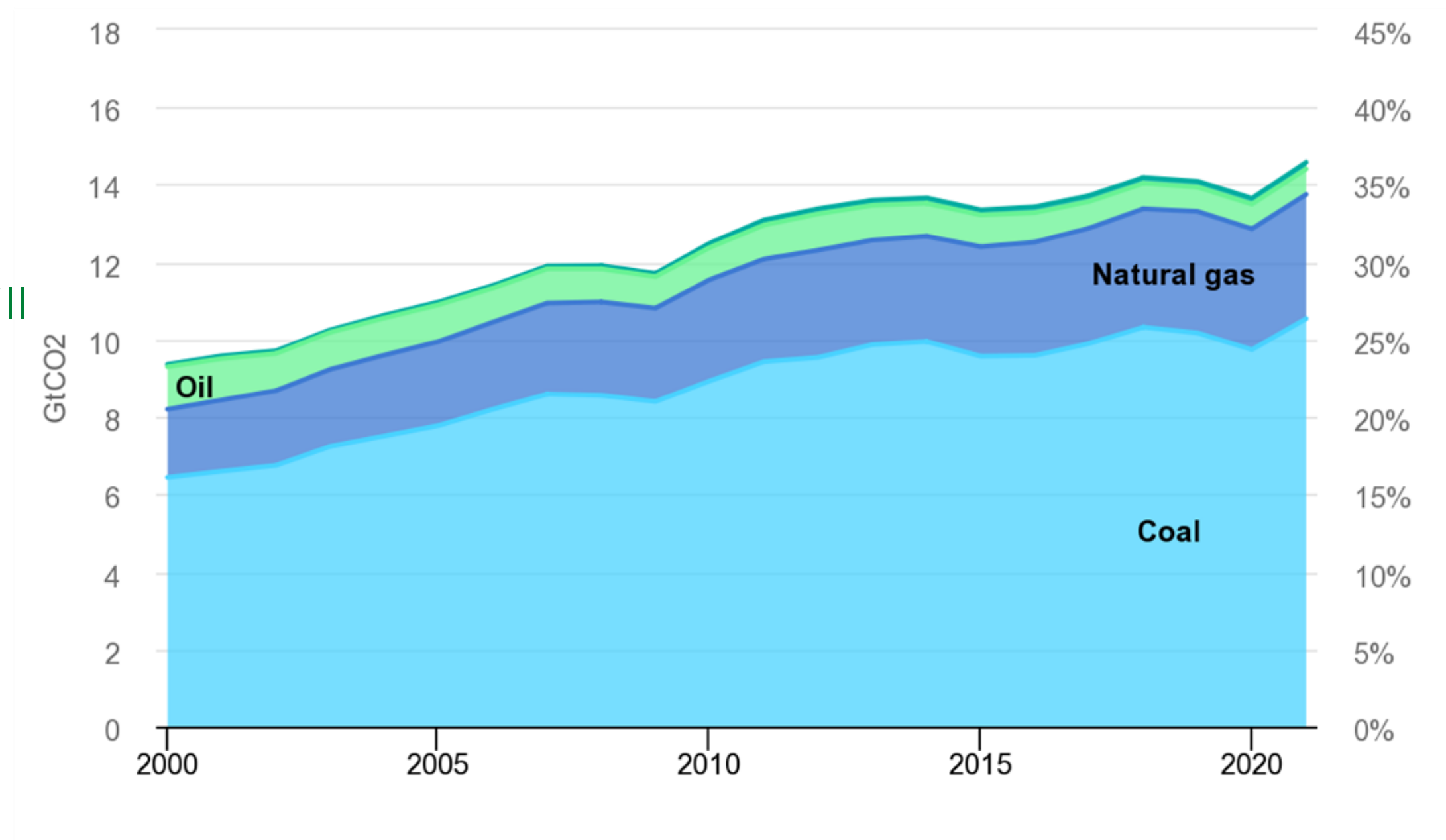


# HEAT GENERATION

- Almost half of the energy consumption in buildings is used for heating spaces and water.
- 40% of households worldwide require heating.
- Nearly two-thirds of heat energy is still based on fossil fuels (mostly coal and natural gas).

CO2 emissions from electricity and heat production by fuel type and their share by fuel type, 2000-2021.

Source: IEA



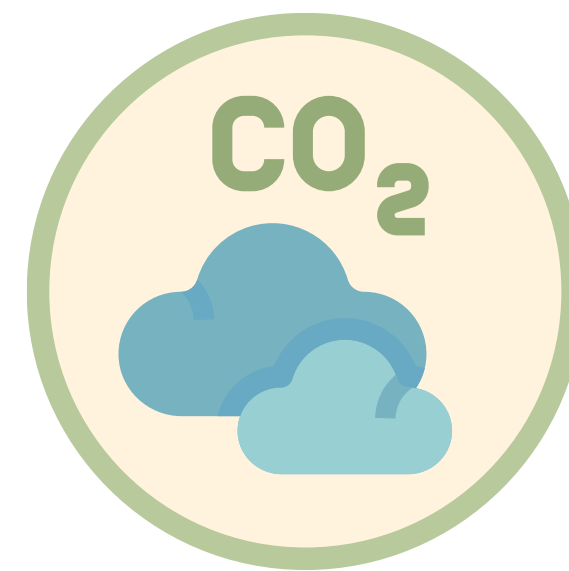
# CO2 EMISSIONS FROM ELECTRICITY AND HEAT PRODUCTION BY FUEL TYPE AND THEIR SHARE, 2000–2021. SOURCE: IEA

**COAL CONSUMPTION:** \_\_\_\_\_

**OIL CONSUMPTION:** \_\_\_\_\_

**NATURAL GAS CONSUMPTION:** \_\_\_\_\_

**OTHER SOURCES:**





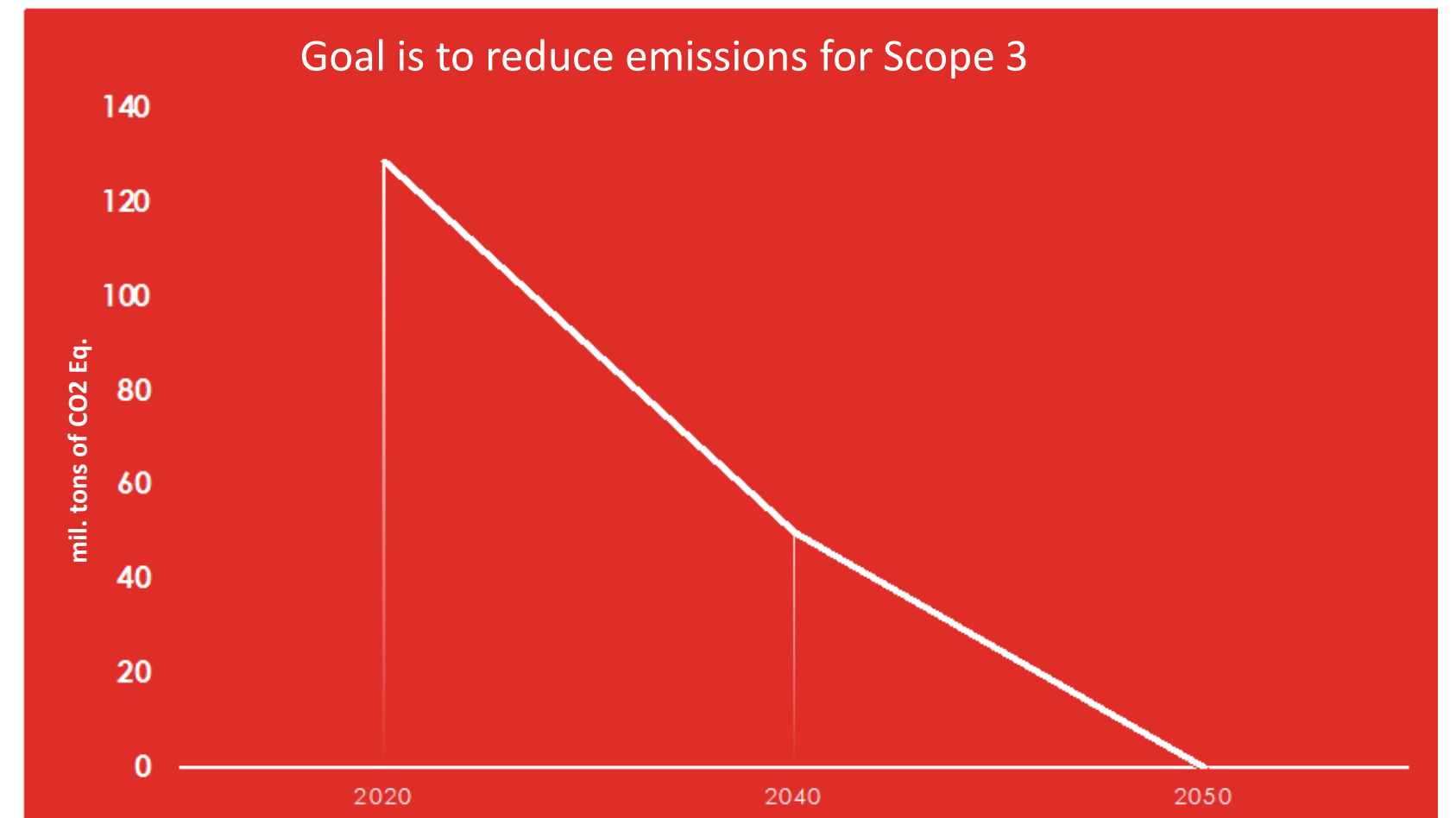
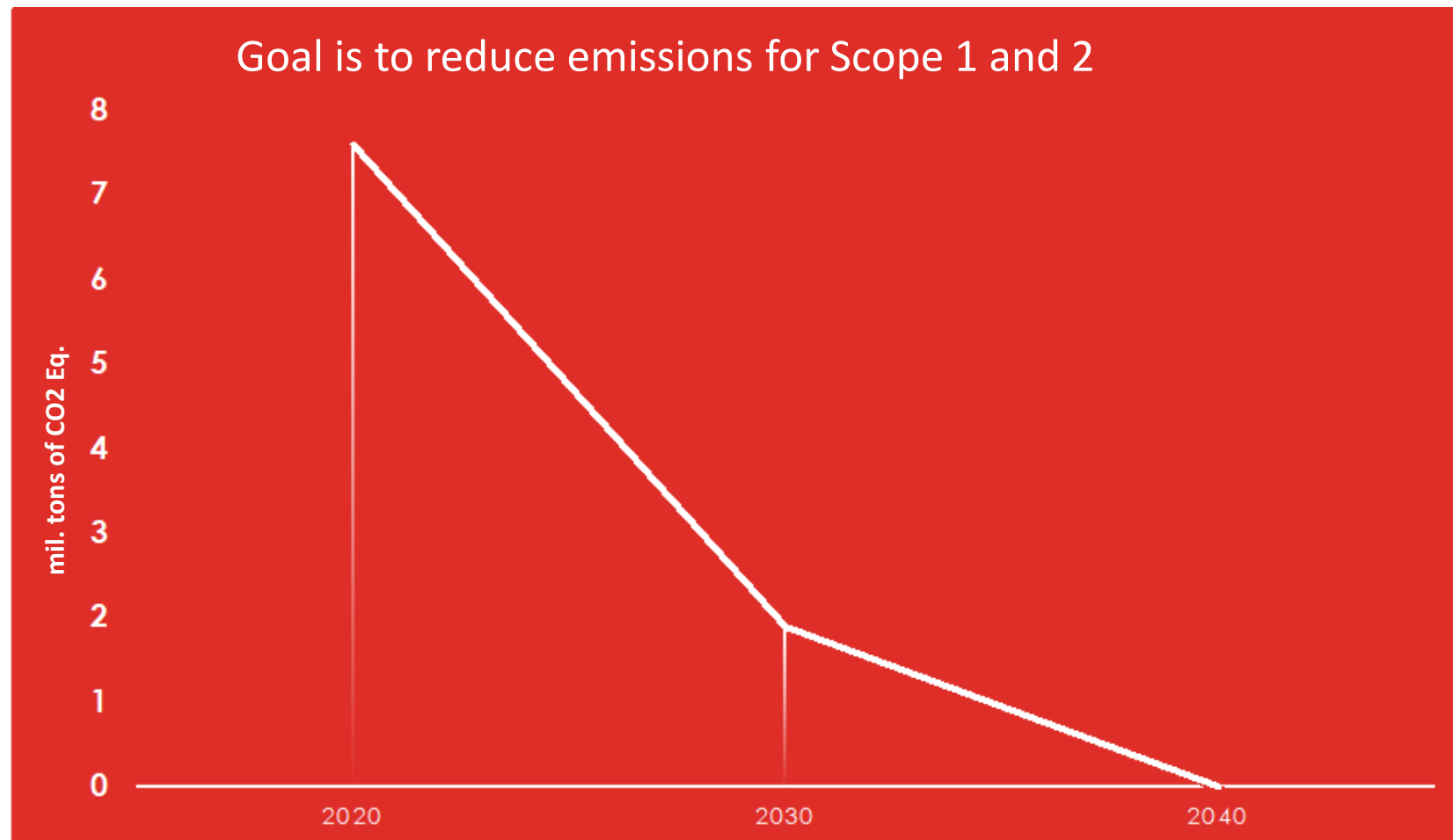
# EXAMPLES OF CORPORATE GOALS\*\*



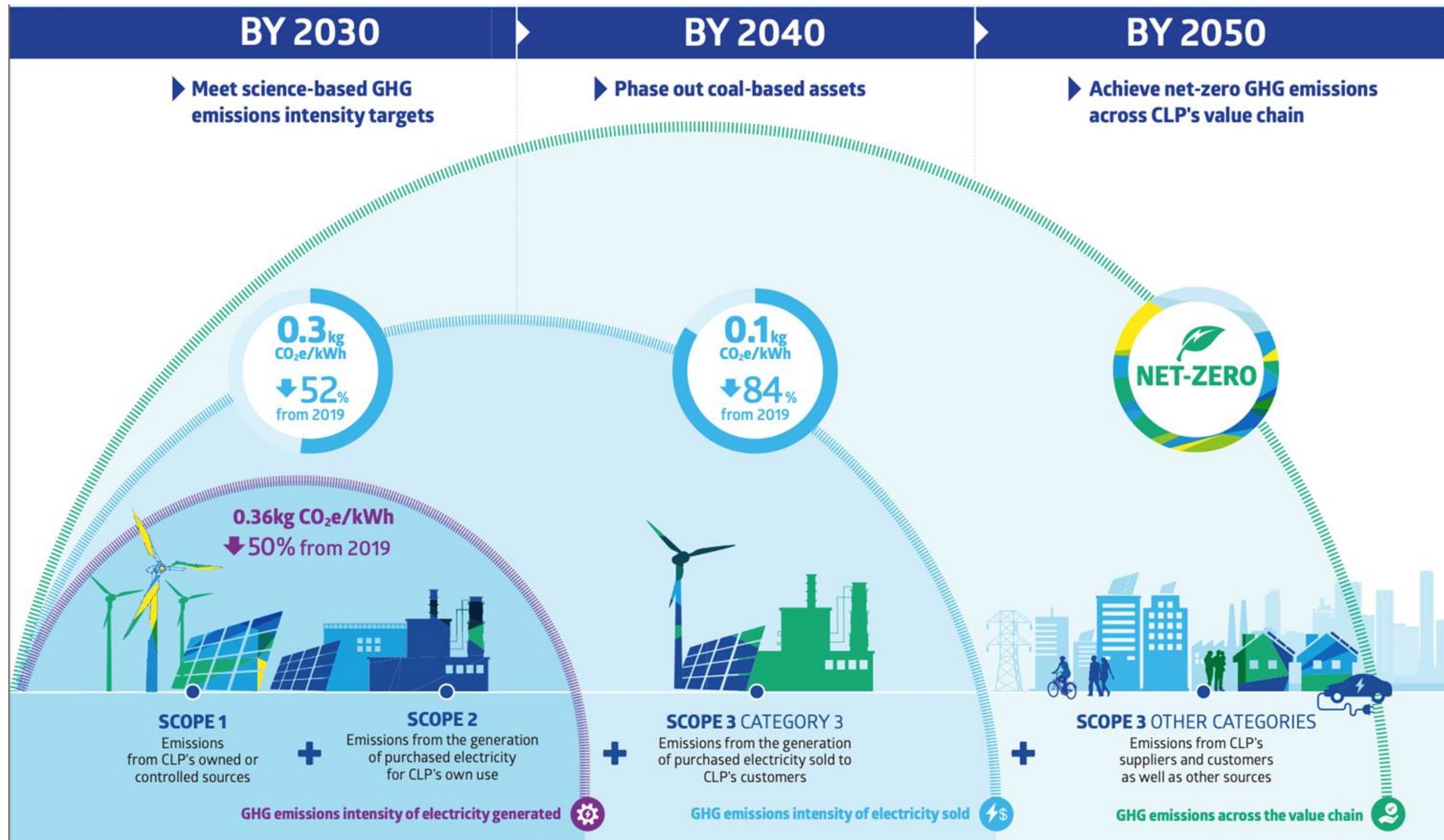
One of Europe's largest energy companies: supplier of electricity to 50 million customers.

Reduce Scope 1 and 2 emissions by 75% by 2030 and by 100% by 2040.

Reduce Scope 3 emissions by 50% by 2030 and by 100% by 2050.



# CLP GROUP IS ONE OF THE LARGEST ENERGY COMPANIES IN THE ASIA PACIFIC REGION.



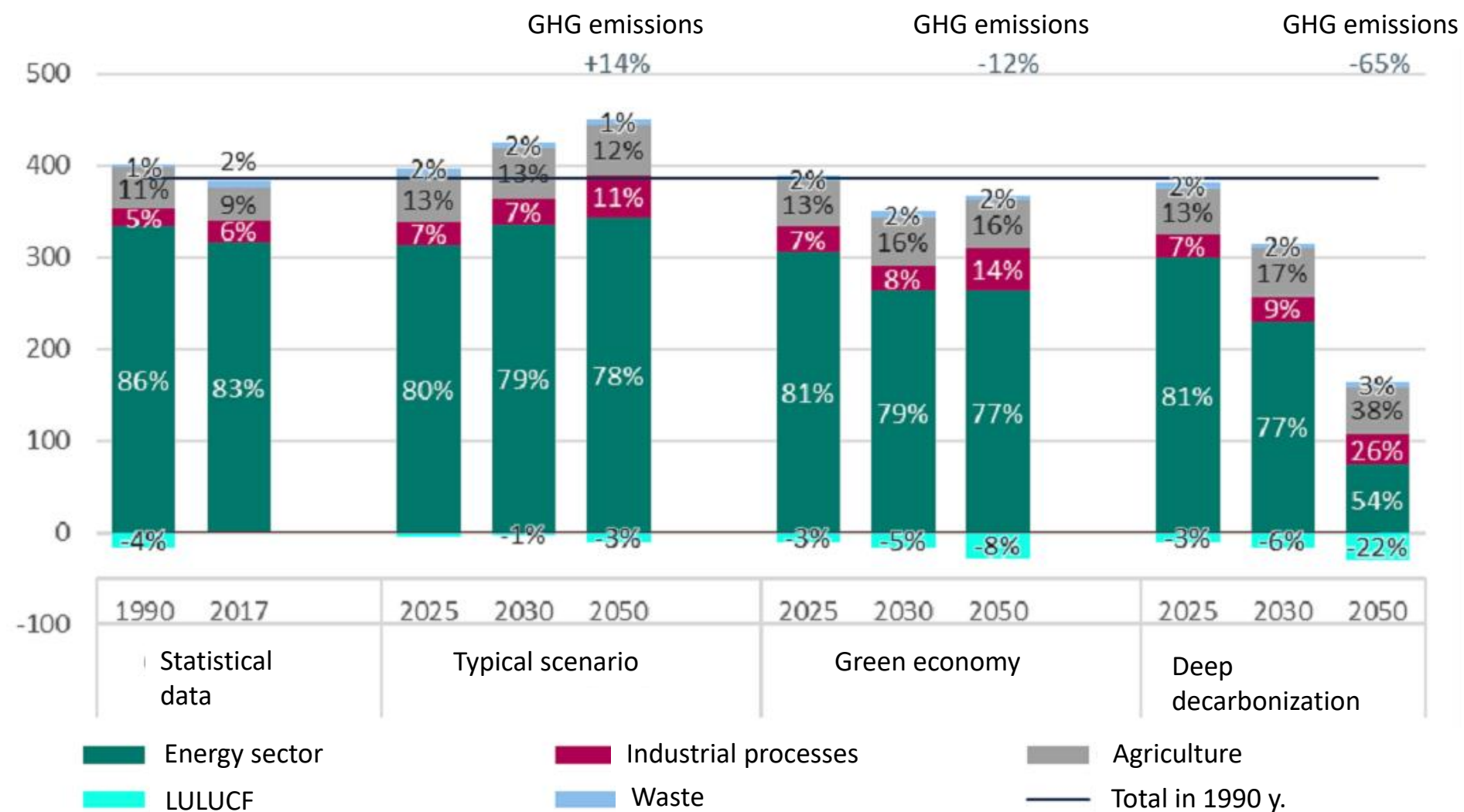


# COMPARISON OF CORPORATIVE GOALS

Company	Goals	Comments
<b>CLP Group (Singapore)</b>	Reduce the emission intensity to <b>0.3 tCO<sub>2</sub>e/MWh</b> , by 50% reduction, by 2030	One of the largest coal-fired power plants in the Asia-Pacific region reduced its emission intensity to energy transition bonds issued in 2021 amounting to \$300 million USD
<b>SSE (UK)</b>	Reduce the emission intensity (EI) from 0.6 to <b>0.3 tCO<sub>2</sub>e/MWh</b> , by 50% reduction, from 2009 to 2020, and achieve 120 kgCO <sub>2</sub> e/kWh by 2030	Sustainability Linked Bond Framework 2021
<b>CEZ Group (Czech Republic)</b>	Reduce the emission intensity (EI) in heat and electricity generation by <b>57.4% - from 0.38 kgCO<sub>2</sub>e/kWh (in 2019) to 0.16 kgCO<sub>2</sub>e/kWh by (2030)</b> for Scope 1	CEZ Group Sustainability-Linked Financing Framework: Release of bonds totalling 600 million euros in 2022.

# COMPARISON WITH SCENARIOS TO ACHIEVE KAZAKHSTAN'S GOALS UNDER THE PARIS AGREEMENT

Contribution of the IPCC sectors to total reduction of greenhouse gas emissions historically and under scenarios, Mt CO<sub>2</sub>-eq



Required level of greenhouse gas emissions reduction in the electricity sector to achieve Kazakhstan's approved national goals

- Green Economy Scenario (unconditional goals): 12% reduction between 2025 and 2030.
- Deep Decarbonization Scenario (conditional goals): 20% reduction between 2025 and 2030

# DO YOU HAVE DECARBONIZATION GOALS SET AT YOUR COMPANY?

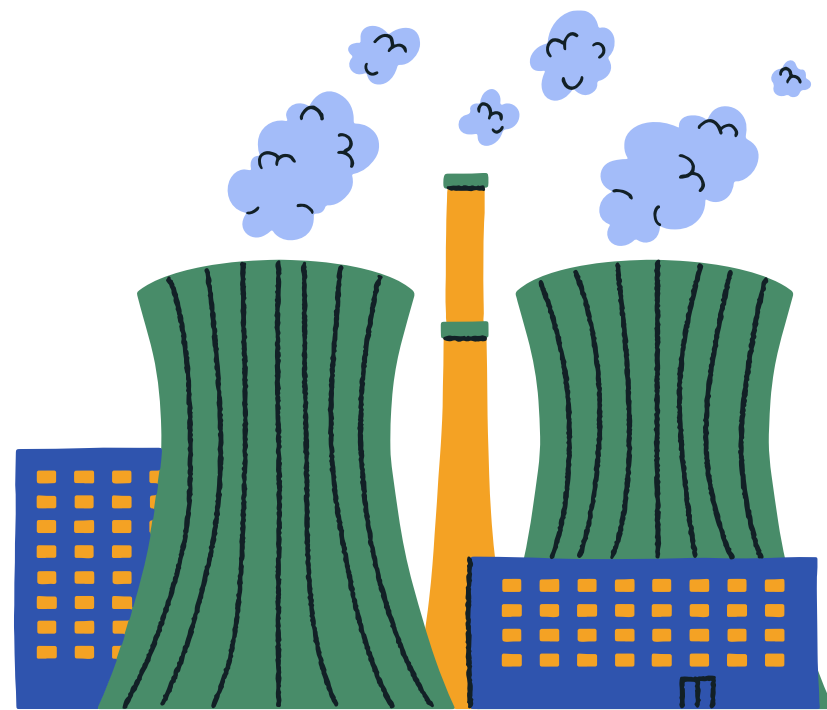
Scope 1 and 2: \_\_\_\_\_

Scope 3 : \_\_\_\_\_

Improving energy efficiency: \_\_\_\_\_

Utilization of RES: \_\_\_\_\_

Other goals: \_\_\_\_\_



# PRINCIPLES OF DECARBONISATION OF ENERGY COMPANIES

- Presence of a strategy with medium-term and long-term goals (2030 and 2050) and effective communication to investors, partners, governments, and customers:
  - Medium-term:
    - Improving efficiency
    - Transitioning to natural gas
    - Demand-side management with consumers
  - Long-term:
    - Transitioning to renewable energy sources (RES)
    - Phasing out coal-fired stations gradually
    - Implementing new technologies
  - Current initiatives:
    - Piloting and R&D of new technologies (with government support)
    - Carbon capture and storage
    - Energy storage solutions
    - Green hydrogen



# "PRODUCTION OF RENEWABLE ELECTRICITY

Renewable energy sources currently takes 39% of electricity generation.

Future growth will increase their share, aiming to achieve 60% of electricity generation from renewable sources by 2030, with the goal of reaching net-zero emissions by 2050.

Share of electricity from low-carbon sources

Low-carbon electricity is the sum of electricity from nuclear and renewable sources (including solar, wind, hydropower, biomass and waste, geothermal and wave and tidal).

Our World  
in Data



Source: Ember's Yearly Electricity Data; Ember's European Electricity Review; Energy Institute Statistical Review of World Energy  
OurWorldInData.org/low-carbon-electricity-by-country • CC BY

## ENERGY AUSTRALIA – AUSTRALIA'S LARGEST ENERGY COMPANY

The first company in Australia with scientifically-based goals to reduce direct emissions by 50% by 2032 and indirect emissions by 25%:

- - Providing customers with cleaner and smarter energy solutions (demand management).
- - Using a strong gas position as a transitional fuel with low emissions.
- - Significantly increasing the share of renewable energy (+70 MW per year).
- - Phasing out coal-fired power generation by 2032, decommissioning 2,880 MW of thermal power plants.
- - Investment in storage + green hydrogen production.

# EXAMPLE OF DIVERSIFICATION AND GREENING OF FEC



## 2009: The largest Danish energy company

- 5.6 GW of coal and gas generation (85%)
- Revenue of 7,5 billion USD

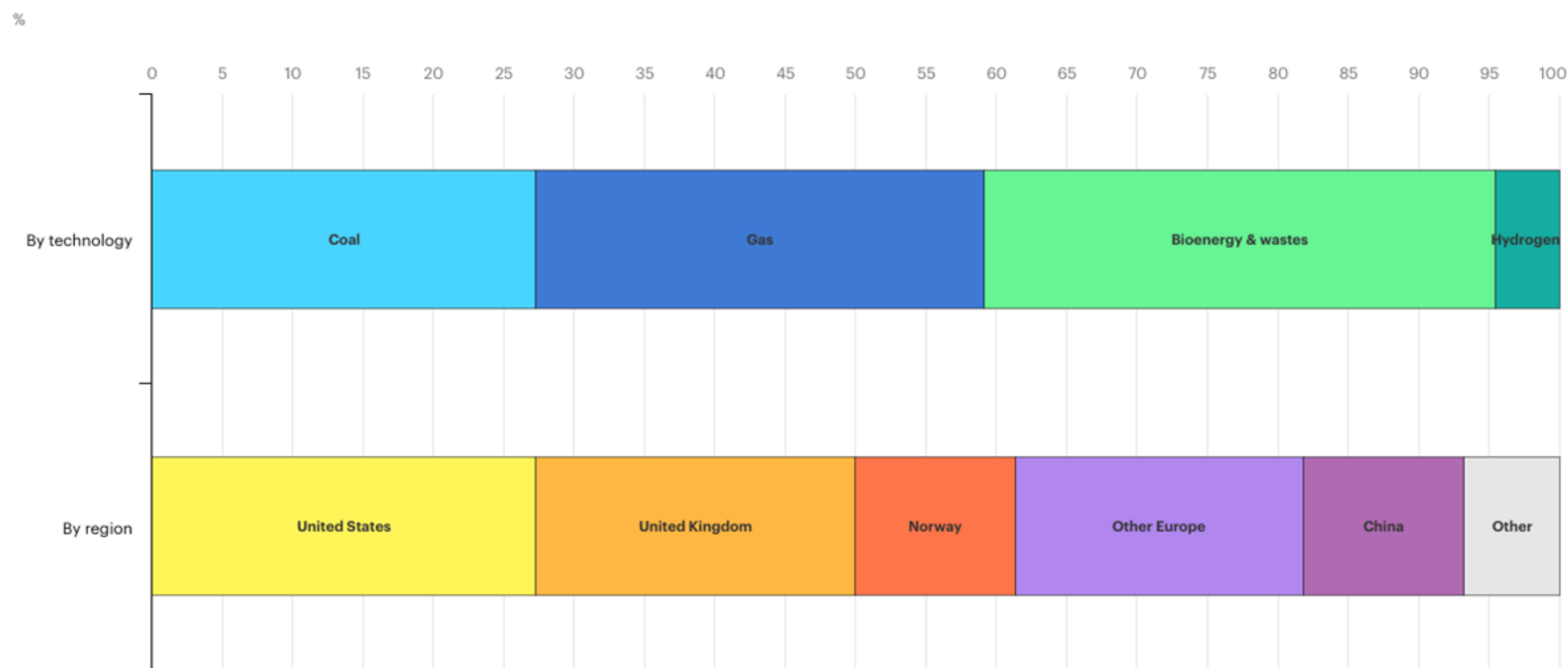
## 2020: Ørsted

- Share of RES in Generation – 86%
- The largest world company with pure generation of 9.9 GW
- 8,5 billion of USD of revenue
- Goals:
  - Completely phase out the coal by 2023
  - Share of RES – 99% in 2025
  - Carbon neutrality in 2040
  - New 20 GW of RES by 2030

# "CARBON CAPTURE AND STORAGE)SYSTEMS"

From January 2020 to August 2021, plans were announced to equip around 30 power plants with CCS systems (total capture capacity slightly exceeding 30 million tons of CO2 per year), at a total cost of \$18 billion USD.

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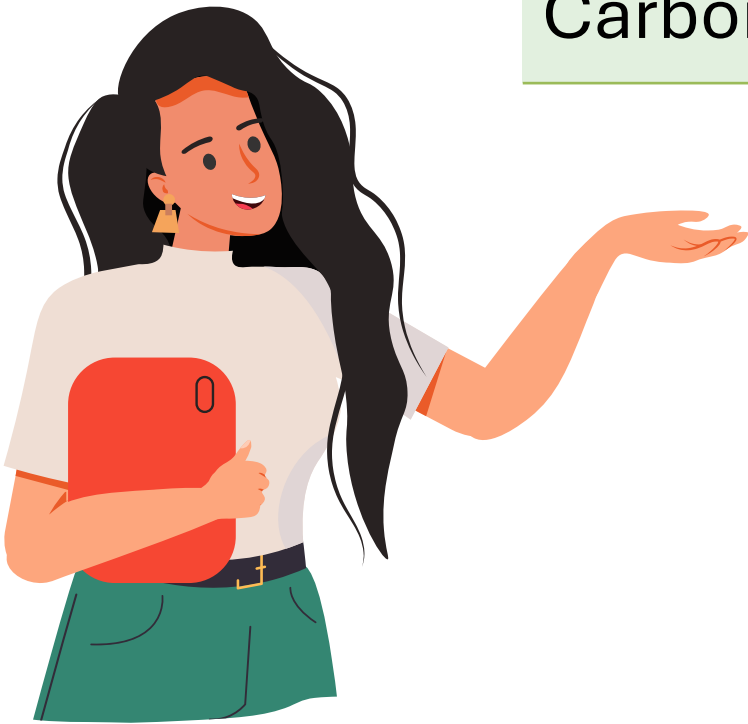


# COMPARISON OF ACTIONS

Summary of the action	Energy efficiency and modernization	Investments into RES	Carbon capture and storage
Emission reduction potential in %	-25%	-100%	-100%
Technological readiness (from 1 to 3)	3	2	1
Investments	Low	Average	High

# ASSESS THE TECHNICAL AND ECONOMIC FEASIBILITY OF IMPLEMENTING DECARBONIZATION MEASURES AT YOUR COMPANY

Actions	Technologically possible	Economically justified
Energy efficiency and modernization		
Investments in new RES objects		
Carbon capture and storage		



## WHAT MEASURES HAVE ALREADY BEEN IMPLEMENTED AT YOUR ENTERPRISE?

Utilization of RES : \_\_\_\_\_

Improving energy efficiency : \_\_\_\_\_

Other measures: \_\_\_\_\_



# CLIMATE RISK ASSESSMENT

## Risks associated with the global transition to low-carbon development

**Credit Risk** Associated with ESG (Environmental, Social, and Governance): Risk of facing higher interest rates and difficulties in accessing financing due to strict ESG compliance requirements.

**Regulatory Risk:** Risk of potential changes in national climate-related legislation, including greenhouse gas taxation, carbon footprint reduction targets, and potential litigation for non-compliance with regulatory requirements.

**Market risk:** Risk exposure to carbon taxation in importing countries of production.

**Customer Risk:** Risk of losing customers due to failure to meet their decarbonization targets as a supplier.



## CLIMATE RISK ASSESSMENT

Risks related to the negative impact of climate change on operations

Operational risk for metallurgy due to changes in precipitation levels

Operational risk due to extreme temperatures

Operational risk due to extreme weather conditions

Operational risk due to water scarcity

Rate from 1 (low) to 5 (high)

## ASSESS THE IMPACT THAT THE RISK MAY HAVE ON YOUR ENTERPRISE AND THE PROBABILITY THAT THE RISK WILL MATERIALISE

Risk	Impact	Probability
Credit risk: Access to capital		
Regulatory risk: Stricter legislation		
Market risk: Taxation of imports		
Customer risk: Loss of markets		
Operational Risk: Changes in precipitation levels		
Operational Risk: Extreme temperatures		
Operational Risk: Extreme weather conditions		
Operational risk: Water scarcity		

## RESULTS OF GROUP WORK

What are the main sources of GHG emissions in your industry?  
What goals do your companies set for themselves?  
Which decarbonization measures do you consider most realistic?  
Which measures have already been implemented?  
What are the main climate risks for your company?

