How can the Energy Sector undergo a Green Transition?

- Part 1: Approaches and Tools
- Part II: Strategic and Programmatic Guidance

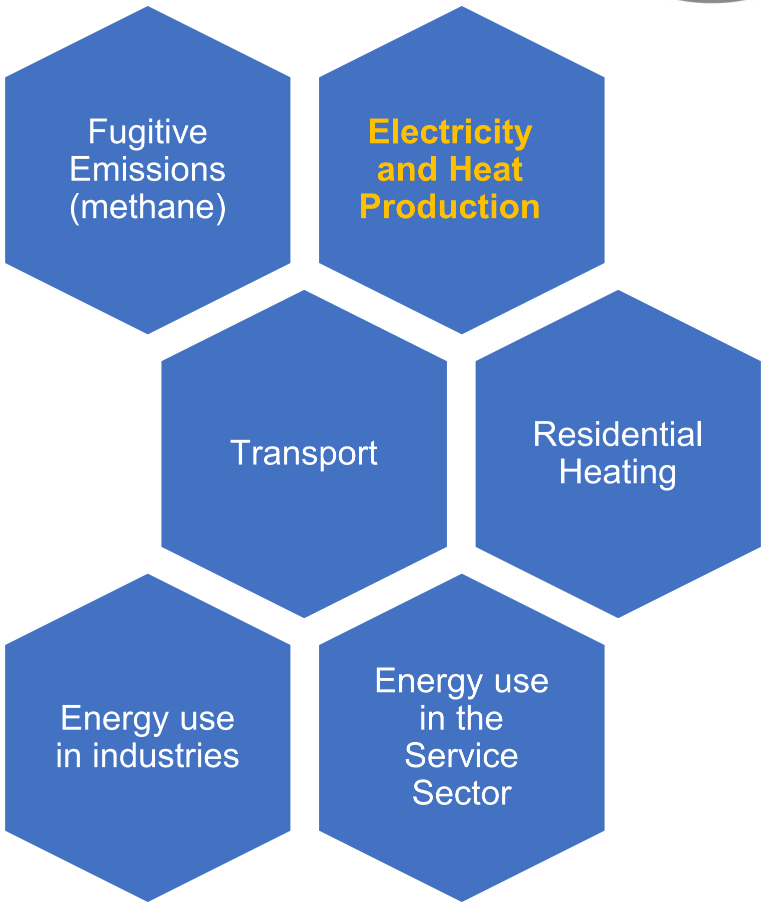
Overview of Issues to be Covered

- How is the needed Energy Transition addressed at global, regional and national level?
- How can the energy crisis be dealt with?
- What tools and databases can help to design and guide the transition?
- What are possible interventions?
- What are our benefits?

Role of Energy in Green Transitions

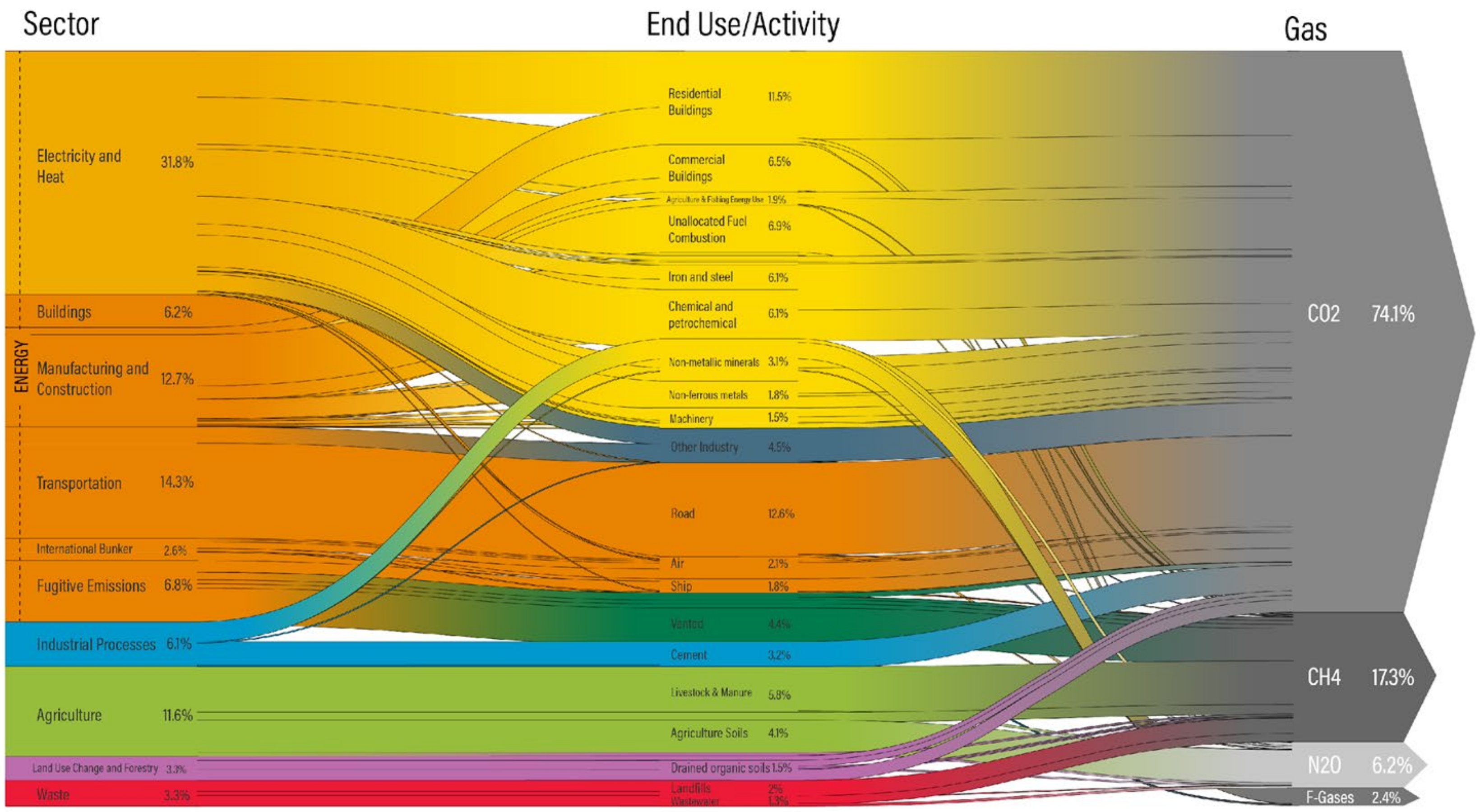
- The energy sector is THE sector to be addressed
- There is more than electricity production!
- There is more than natural gas, oil and coal!

- There is a range of intervention opportunities!



World Greenhouse Gas Emissions in 2019 (Sector | End Use | Gas)

Total: 49.8 GtCO2e



Source: Climate Watch, based on raw data from IEA (2021), GHG Emissions from Fuel Combustion, www.iea.org/statistics; modified by WRI.

WORLD RESOURCES INSTITUTE

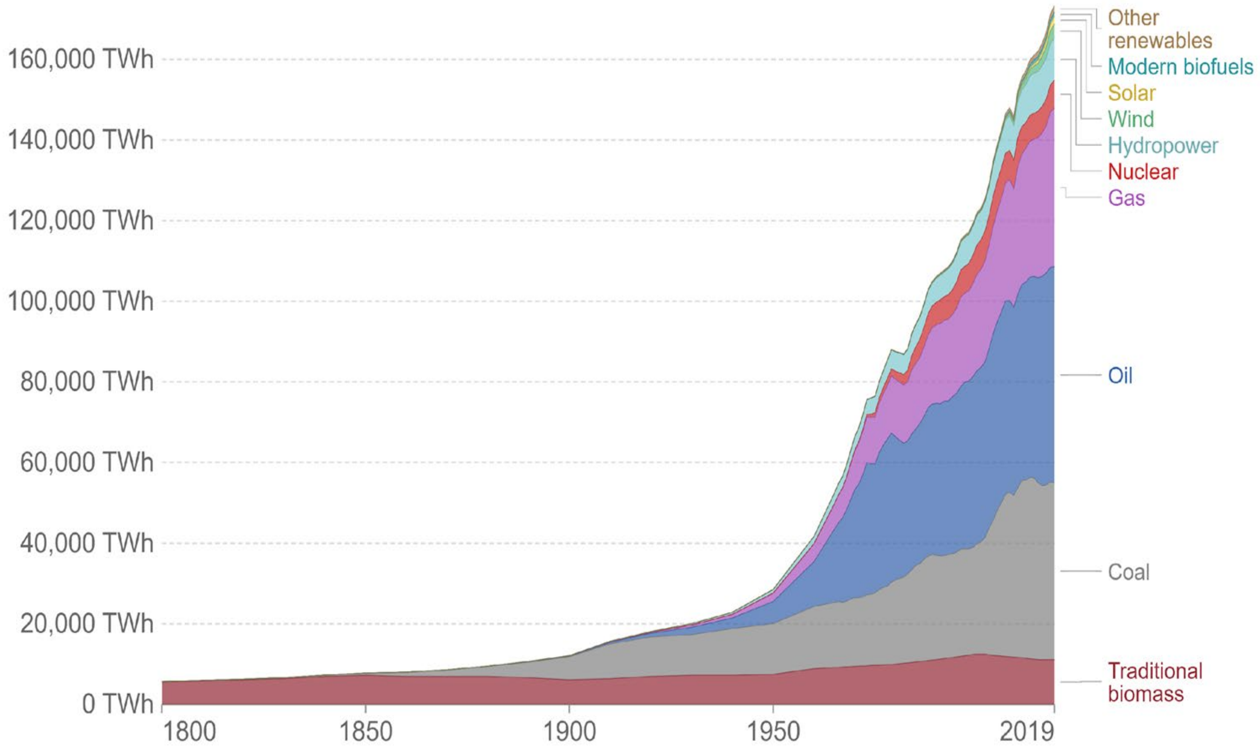
Target the energy supply AND the consumption

Energy Transition in History

Global primary energy consumption by source

Our World in Data

Primary energy is calculated based on the 'substitution method' which takes account of the inefficiencies in fossil fuel production by converting non-fossil energy into the energy inputs required if they had the same conversion losses as fossil fuels.



Source: Vaclav Smil (2017) & BP Statistical Review of World Energy

This is not the first energy transition!

But this one does not simply happen!

Part I

Approaches and Tools for a Green Transition in the Energy Sector

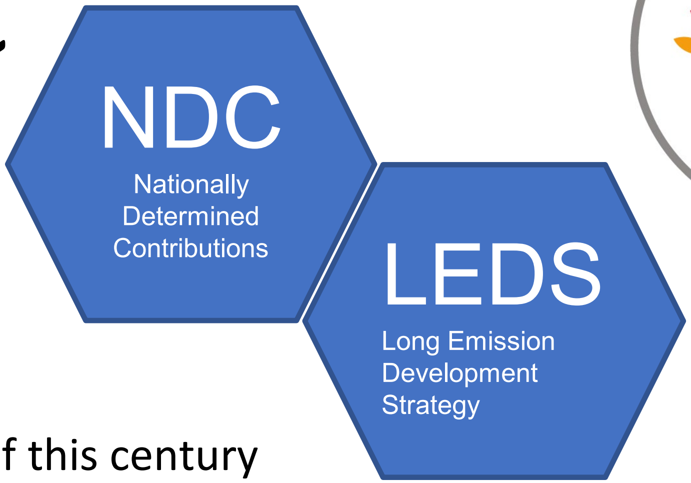
Subtopic 1: Global, Regional & National Approaches

What is the global ambition?

How does the European Union go climate-neutral?

What are country-approaches?

Global Approach - UNFCCC



Paris Agreement (2015), Article 4:

… reach global peaking of GHG emissions as soon as possible ….

….balance between emissions and removals in the second half of this century

… on the basis of equity and in the context of sustainable development and efforts to eradicate poverty

Glasgow Climate Pact (2021) – 1/CMA.3,

36. Calls upon Parties to accelerate the development, deployment and dissemination of technologies, and the adoption of policies, to transition towards low-emission energy systems, including by rapidly scaling up the deployment of clean power generation and energy efficiency measures, including accelerating efforts towards the phasedown of unabated coal power and phase-out of inefficient fossil fuel subsidies, while providing targeted support to the poorest and most vulnerable in line with national circumstances and recognizing the need for support towards a just transition;

European Approach – EU Green Deal

The European Green Deal:

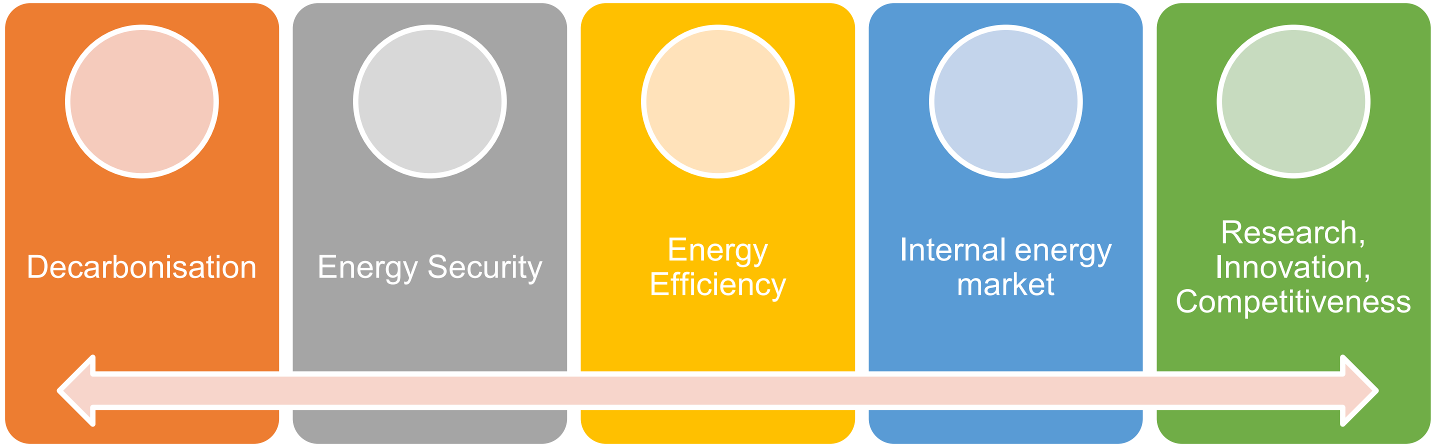
- climate neutrality by 2050
- reduction of net GHG emission by 55% by 2030

Clean Energy Transition – Principles:

- ensuring a <u>secure</u> and <u>affordable EU energy supply</u>
- developing a <u>fully integrated, interconnected</u> and <u>digitalised EU energy market</u>
- prioritising <u>energy efficiency</u>, improving the <u>energy performance of our buildings</u> and developing a power sector based largely on <u>renewable sources</u>

EU Governance Mechanism

- To help the EU reaching its 2030 climate and energy targets
- common rules for planning, reporting and monitoring
- Harmonised with ambition cycles of Paris Agreement



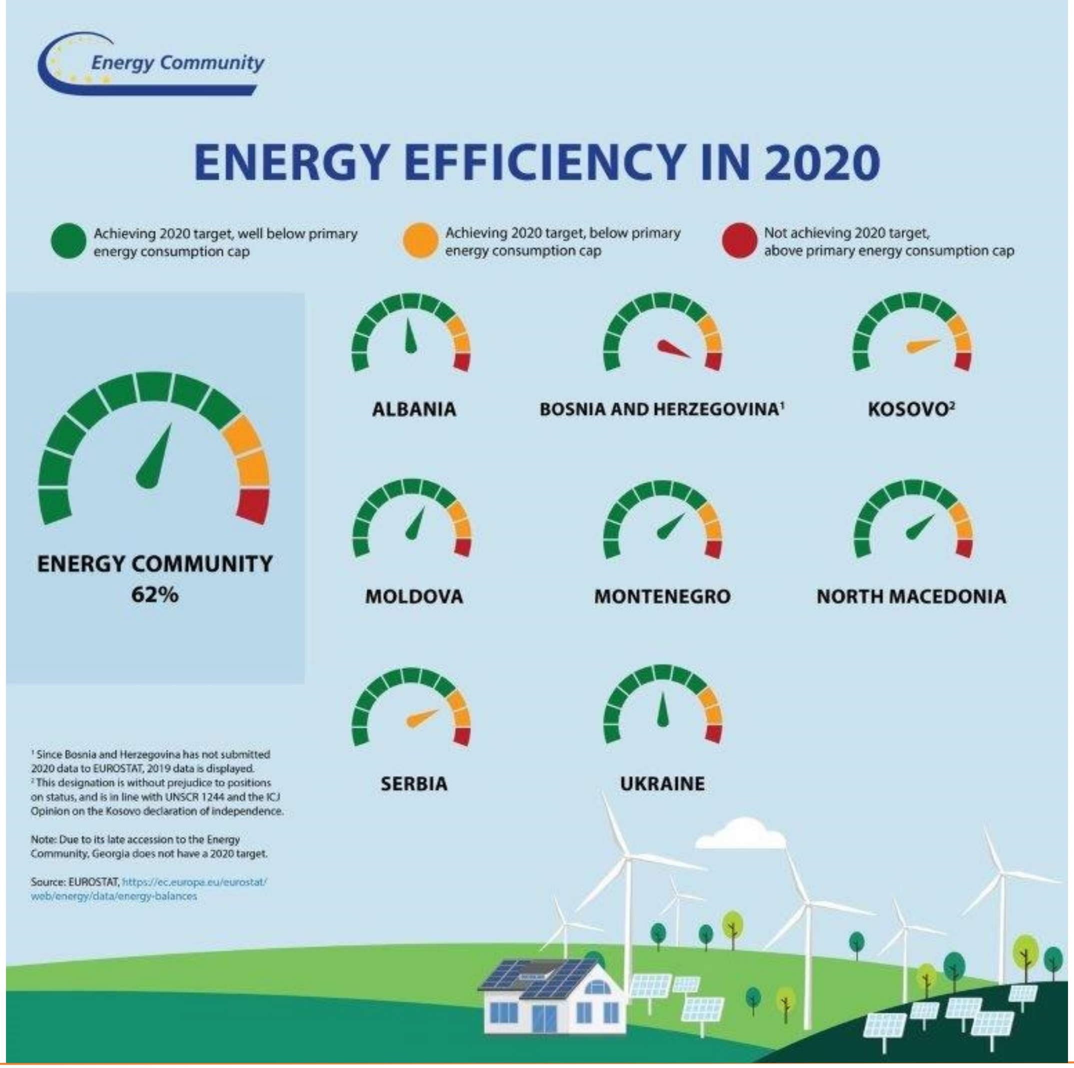
Regulation (EU) 2018/1999

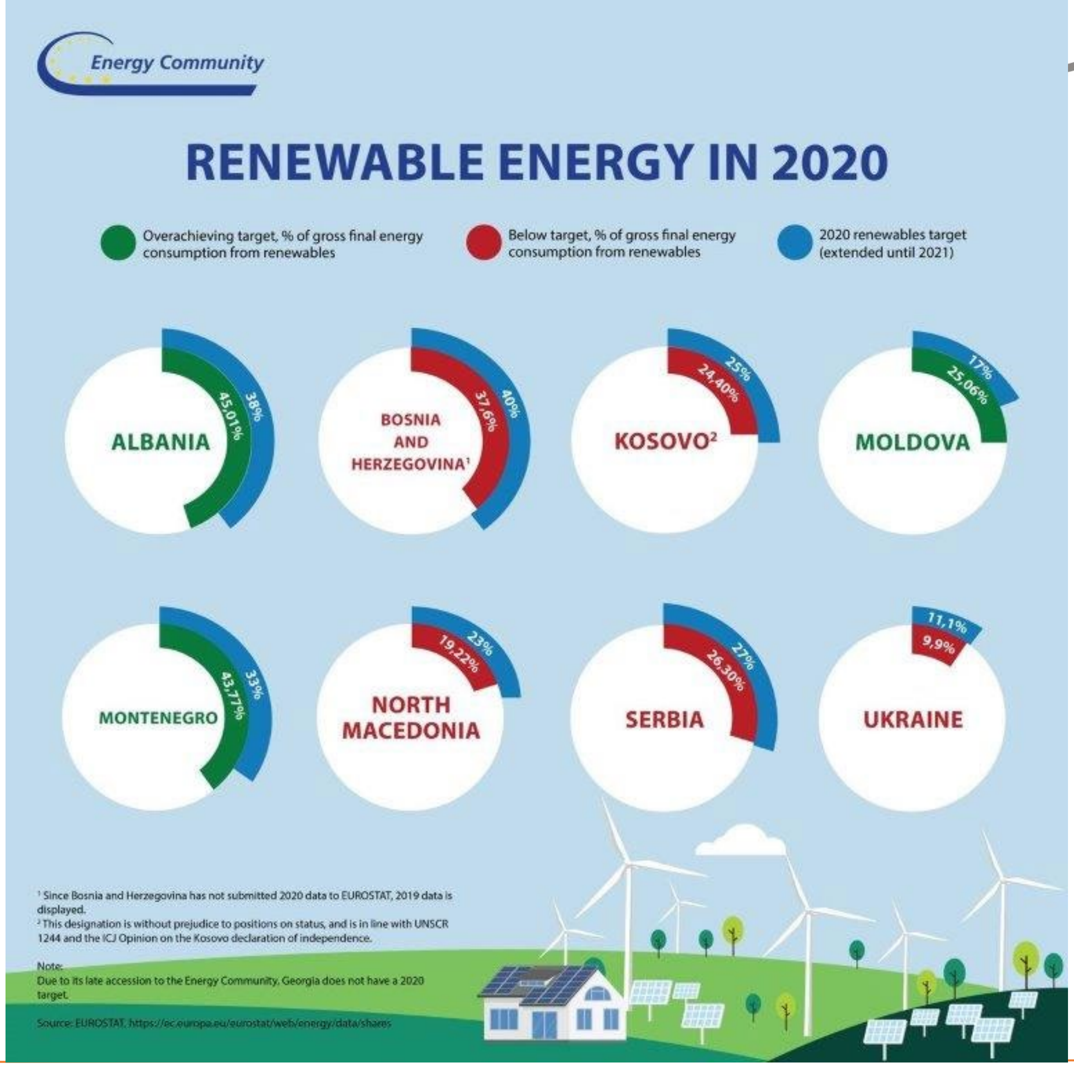
2030: EU renewable target 32% (40%?)

2030: EU EE target 32,5% (39% PEC, 36% FEC?)

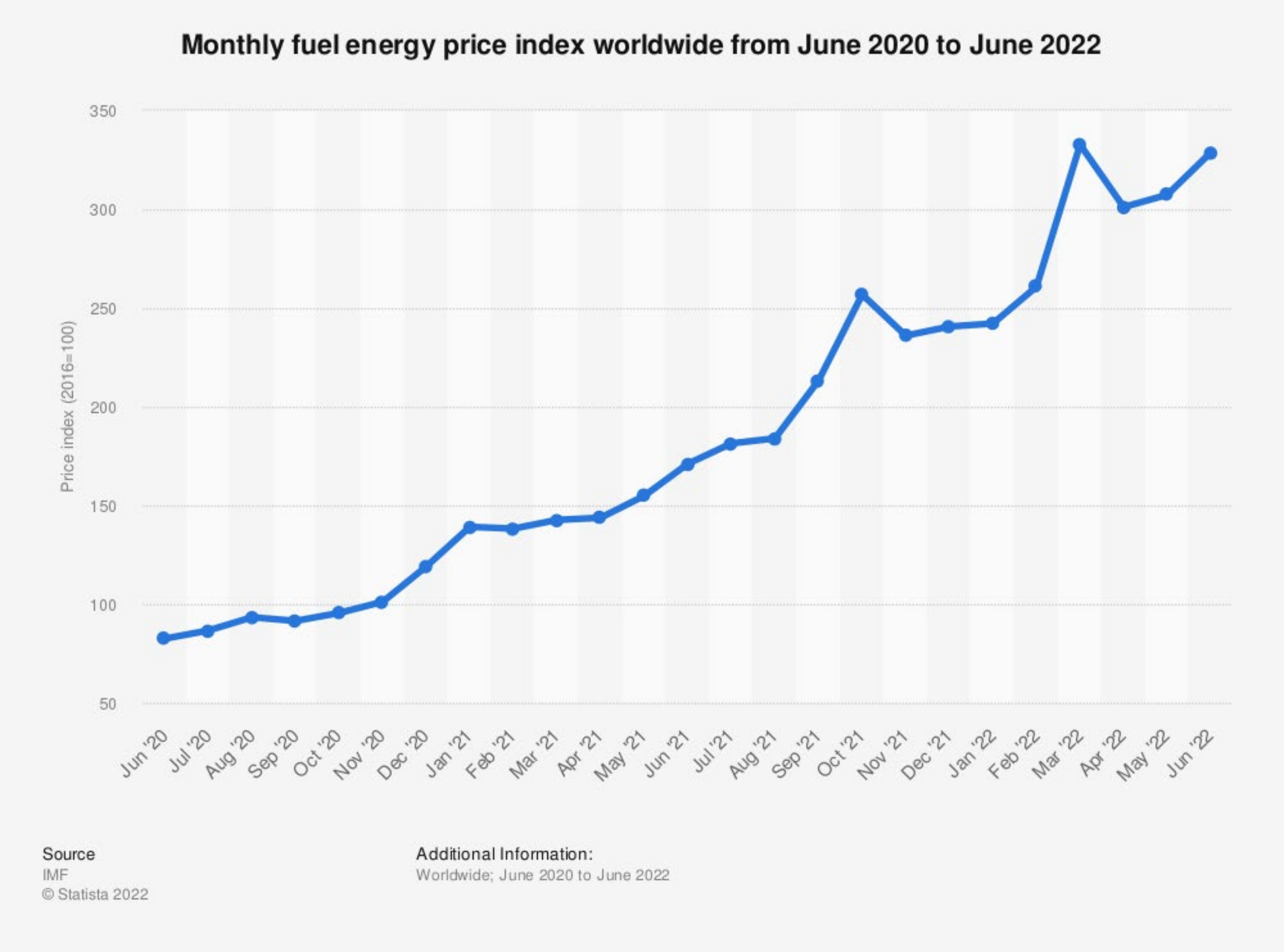
Targets will be increased □ REPowerEU plan

National Approaches – Energy targets





Subtopic 2: Energy Crisis



Energy Crisis & its Impacts

Covid Pandemic

War in Ukraine

Reduced supply of gas & oil

Changed investment patterns

High energy demand

Increasing energy prices

Higher production costs

Economic Downturn & Inflation

Financial windfalls for oil and gas sector

Additional Investment needs

Increased energy poverty

Increased living costs

Social discontent

REACTIONS

Switch to other existing energy sources:
- LNG
- Shale gas
- Postpone closure of coal fired power plants
- Increased use of nuclear energy

Switch to renewable energy sources & systems, e.g.
- wind, solar, bioenergy
- Heat pumps
- Electrification

Implement energy saving measures, e.g.
- Insulation of buildings
- Heating control

IEA: 10-Point-Plan

- Gas: diversify supply, storage capacities, no more Russian gas
- Power sector: wind, solar, bioenergy, nuclear, manage electricity prices
- End-use sectors: replace gas boilers with heat pumps, energy efficiency measures, heating control
- Cross-cutting: increase flexibility of power system

Study accessible at: https://www.iea.org/reports/a-10-point-plan-to-reduce-the-european-unions-reliance-on-russian-natural-gas

A 10-Point Plan to Reduce the European Union's Reliance on Russian Natural Gas

Measures implemented this year could **bring down gas imports from Russia by over one-third,** with additional temporary options to deepen these cuts to **well over half while still lowering emissions.**

Action 1

No new gas supply contracts with Russia

Impact: Taking advantage of expiring long-term contracts with Russia will reduce the contractual minimum take-or-pay levels for Russian imports and enable greater diversity of supply.

Action 2

Replace Russian supplies with gas from alternative sources

Impact: Around 30 bcm in additional gas supply from non-Russian sources.

Action 3

Introduce minimum gas storage obligations to enhance market resilience

Impact: Enhances the resilience of the gas system, although higher injection requirements to refill storage in 2022 will add to gas demand and prop up gas prices.

Action 4

Accelerate the deployment of new wind and solar projects

Impact: An additional 35 TWh of generation from new renewable projects over the next year, over and above the already anticipated growth from these sources, bringing down gas use by 6 bcm.

Action 5

Maximise generation from existing dispatchable low-emissions sources: bioenergy and nuclear

Impact: An additional 70 TWh of power generation from existing dispatchable low emissions sources, reducing gas use for electricity by 13 bcm.

Action 6

Enact short-term measures to shelter vulnerable electricity consumers from high prices

Impact: Brings down energy bills for consumers even when natural gas prices remain high, making available up to EUR 200 billion to cushion impacts on vulnerable groups.

Action 7

Speed up the replacement of gas boilers with heat pumps

Impact: Reduces gas use for heating by an additional 2 bcm in one year.

Action 8

Accelerate energy efficiency improvements in buildings and industry

Impact: Reduces gas consumption for heat by close to an additional 2 bcm within a year, lowering energy bills, enhancing comfort and boosting industrial competitiveness.

Action 9

Encourage a temporary thermostat adjustment by consumers

Impact: Turning down the thermostat for buildings' heating by 1°C would reduce gas demand by some 10 bcm a year.

Action 10

Step up efforts to diversify and decarbonise sources of power system flexibility

Impact: A major near-term push on innovation can, over time, loosen the strong links between natural gas supply and Europe's electricity security. Real-time electricity price signals can unlock more flexible demand, in turn reducing expensive and gas-intensive peak supply needs.

Subtopic 3: Tools & Databases

There is a lot of material available …

- Energy Transition toolkit - World Energy Council
- Carbon Neutrality toolkit - UNECE
- Fossil Fuel Subsidy simulator – UNDP
- Net zero by 2050 – Report by International Energy Agency
- De-risking renewable energy investment – Framework by UNDP
- IRENA Flextool - International Renewable Energy Agency
- …

Energy Transition Toolkit (1/3)

- Developed by World Energy Council
- Designed for energy stakeholders
- Tools available:
  - Issues monitor
  - Energy Trilemma Index
  - World Energy Scenarios: 3 scenarios until 2040
  - World Energy Pulse (study)
  - Innovation Insights: hydrogen, blockchain, sector coupling, etc. (studies)
  - World Energy Transition Radar

https://www.worldenergy.org/transition-toolkit#fullpage1

Energy Transition Tool (2/3)- Monitor

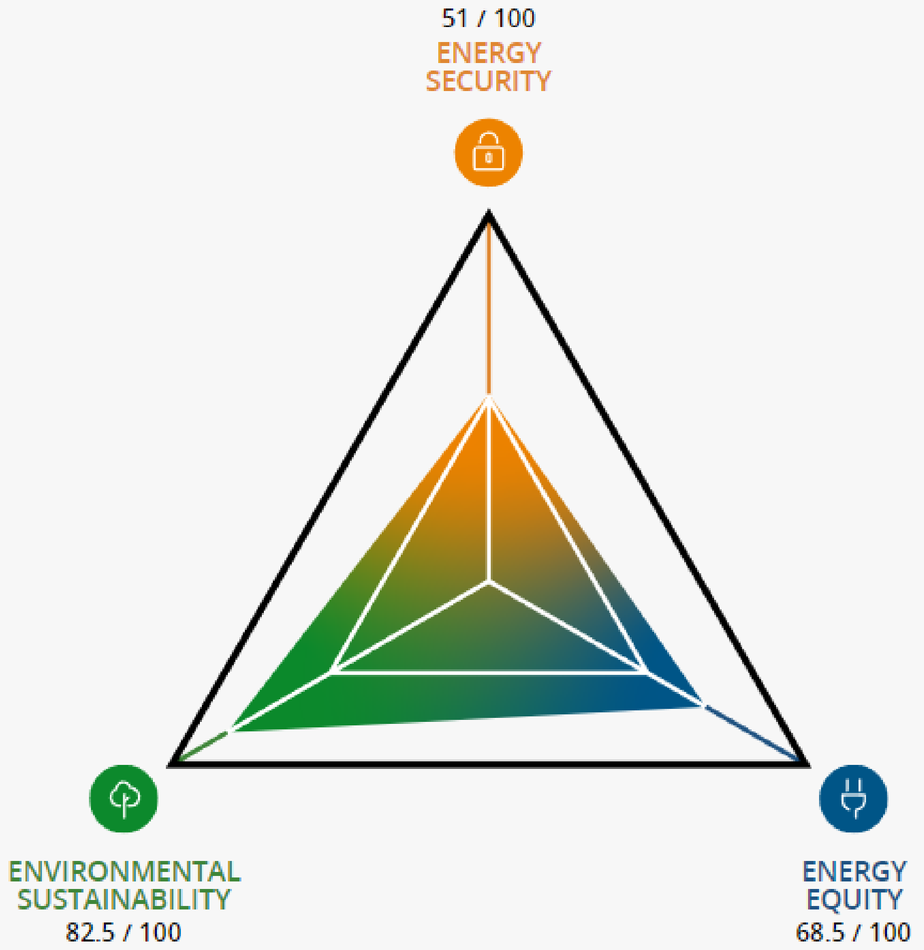
To understand the complex environment in which energy leader must operate

Critical Uncertainties
Action Priorities

Accessible at: https://www.im.worldenergy.org/

Energy Transition Tool (3/3) - Trilemma

Balance



Albania

Trilemma Rank
47

Trilemma Score
65.6

Balance Grade
CCA

Albania gets a high score for Environmental Sustainability due to the low carbon electricity generation and CO2 emissions per capita. The Energy Equity index is backed by high rates of access to electricity and affordable electricity prices, and there is room for improvement in access to clean cooking. Energy security is the least scoring indicator due to the low diversity of electricity generation and limited storage capacity. The country's global ranking has slipped from 43 in 2020 to 47 in 2021. The 2021 Trilemma grade for Albania is CCA.

Accessible at: https://trilemma.worldenergy.org/

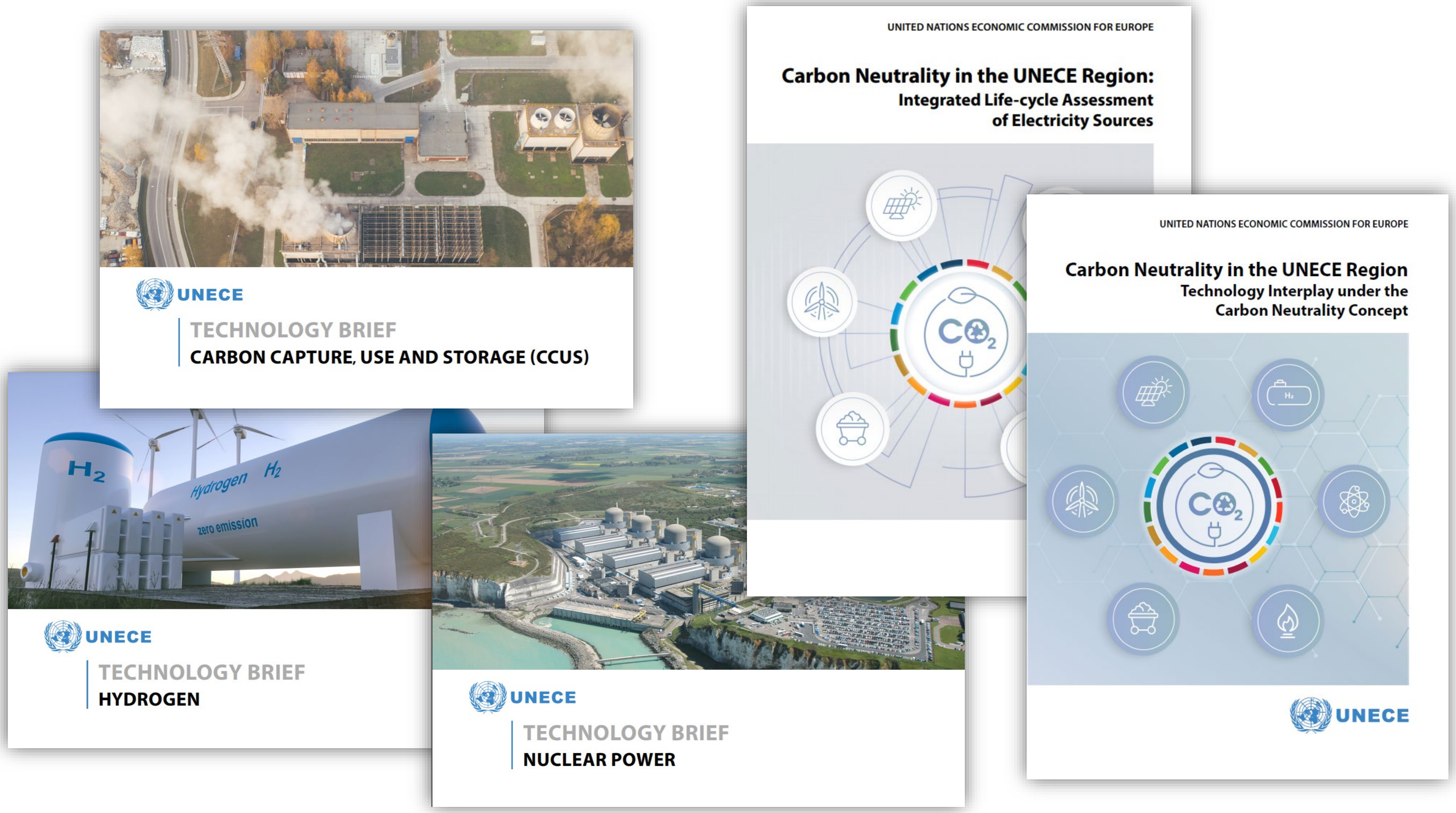
UNECE Carbon Neutrality Toolkit

Carbon Neutrality Toolkit

Supporting policymakers to make informed decisions towards the implementation of the 2030 Agenda for Sustainable Development and the Paris Agreement.

UNECE

UNECE Carbon Neutrality Toolkit



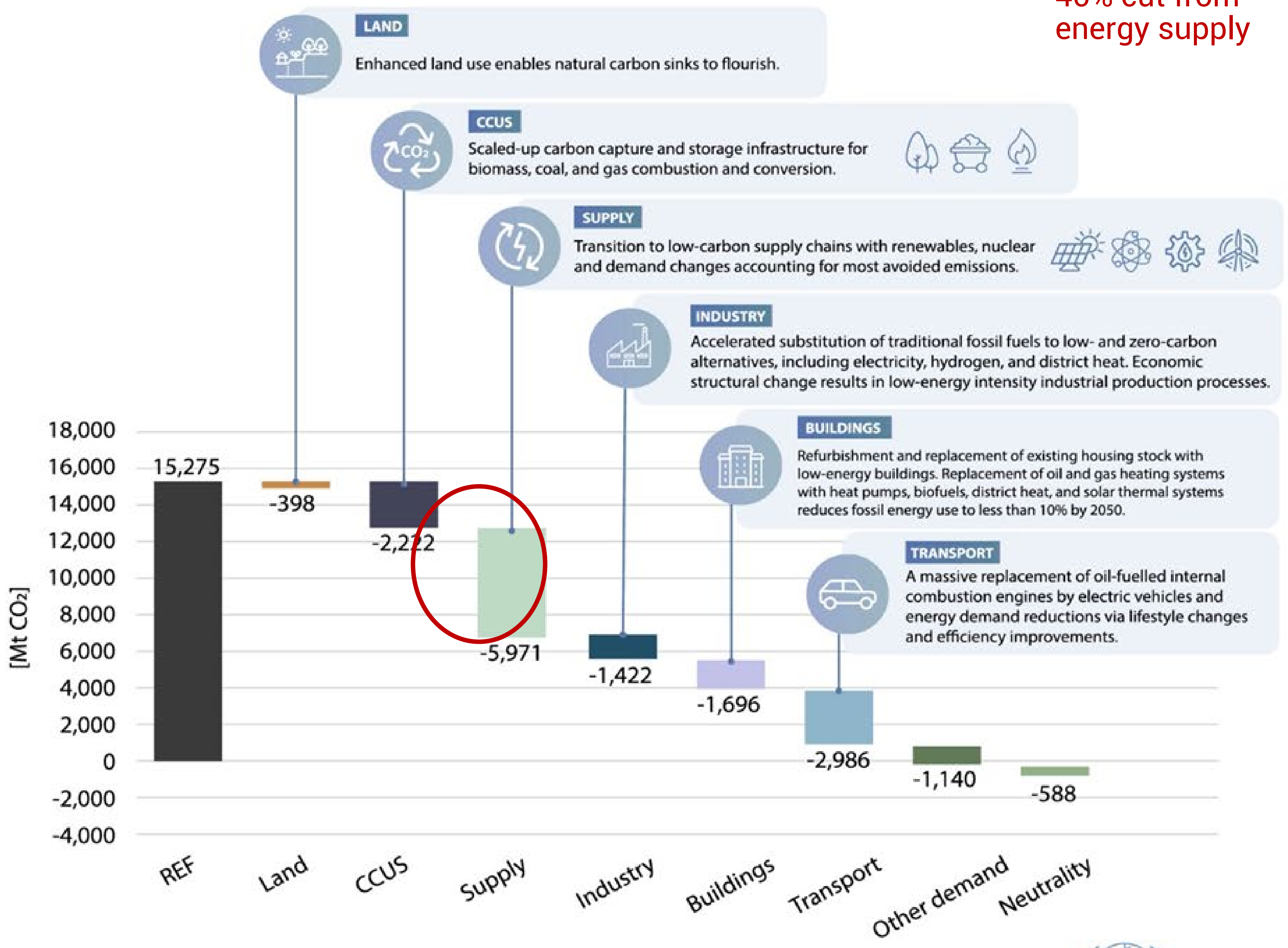
Carbon Neutral Energy System of the Future

Actions are needed across sectors

How can different energy sectors be decarbonized?

CO_2 mitigation [$MtCO_2$/yr.]
in UNECE,
Neutrality vs. Reference Scenarios

40% cut from energy supply



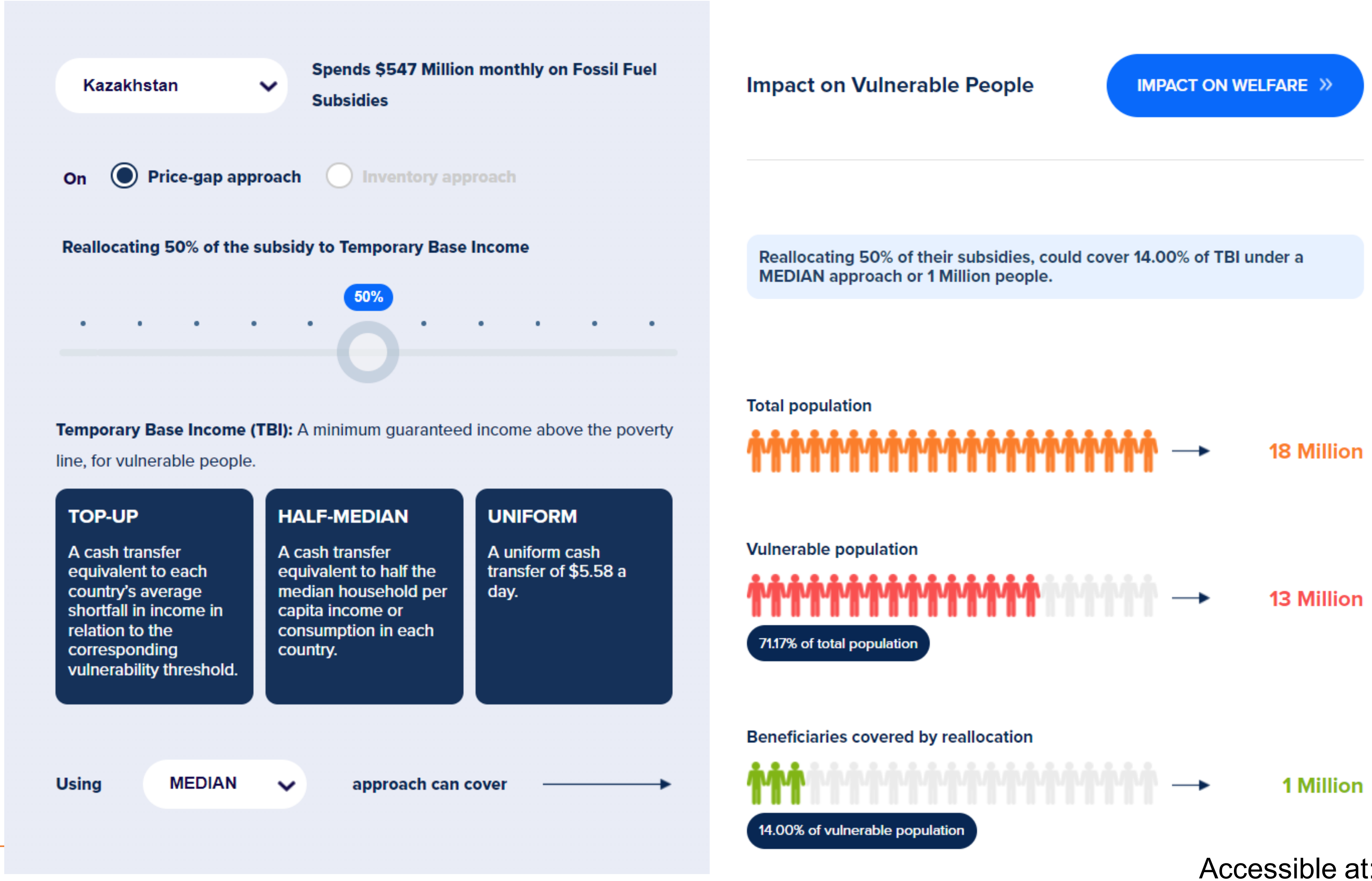
UNECE

Fossil Fuel Subsidy Simulator (1/2)

- Developed by UNDP
- interactive simulator to explore different scenarios of fossil fuel subsidy reforms and their impacts.
- Analysis of the consequences in reallocating a specific share of subsidies
    - Impact on vulnerable people
    - Impact on welfare
- Interactive tool: select country, reallocation rate and approach
- Country specific information

Accessible at: https://data.undp.org/fossil-fuel/

Fossil fuel subsidy simulator (2/2)



Example: Kazakhstan

Accessible at: https://data.undp.org/fossil-fuel/

Net Zero by 2050 (IEA)

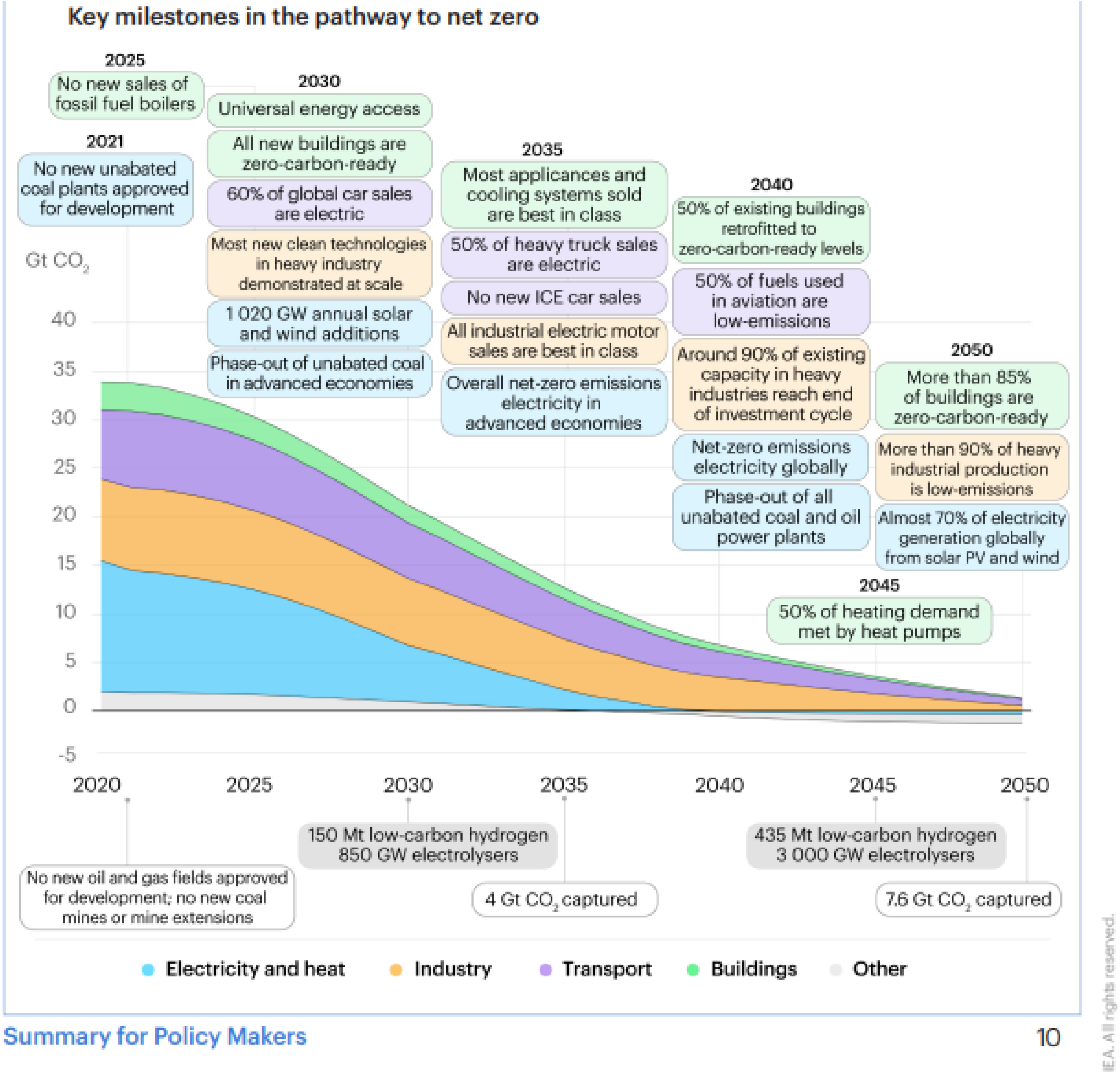
Scenario built on

- uptake of all the available technologies and emissions reduction options is dictated by costs, technology maturity, policy preferences, and market and country conditions.
- All countries co-operate towards achieving net zero emissions worldwide. (just transition)
- An orderly transition across the energy sector.

Worldwide scenario

Net Zero by 2050

- A Roadmap for the Global Energy Sector
- World's first comprehensive study of how to transition to a net zero energy system by 2050 while ensuring stable and affordable energy supplies, providing universal energy access, and enabling robust economic growth.



Source: Net Zero by 2050, A Roadmap for the Global Energy Sector, Summary for Policymakers, IEA 2021

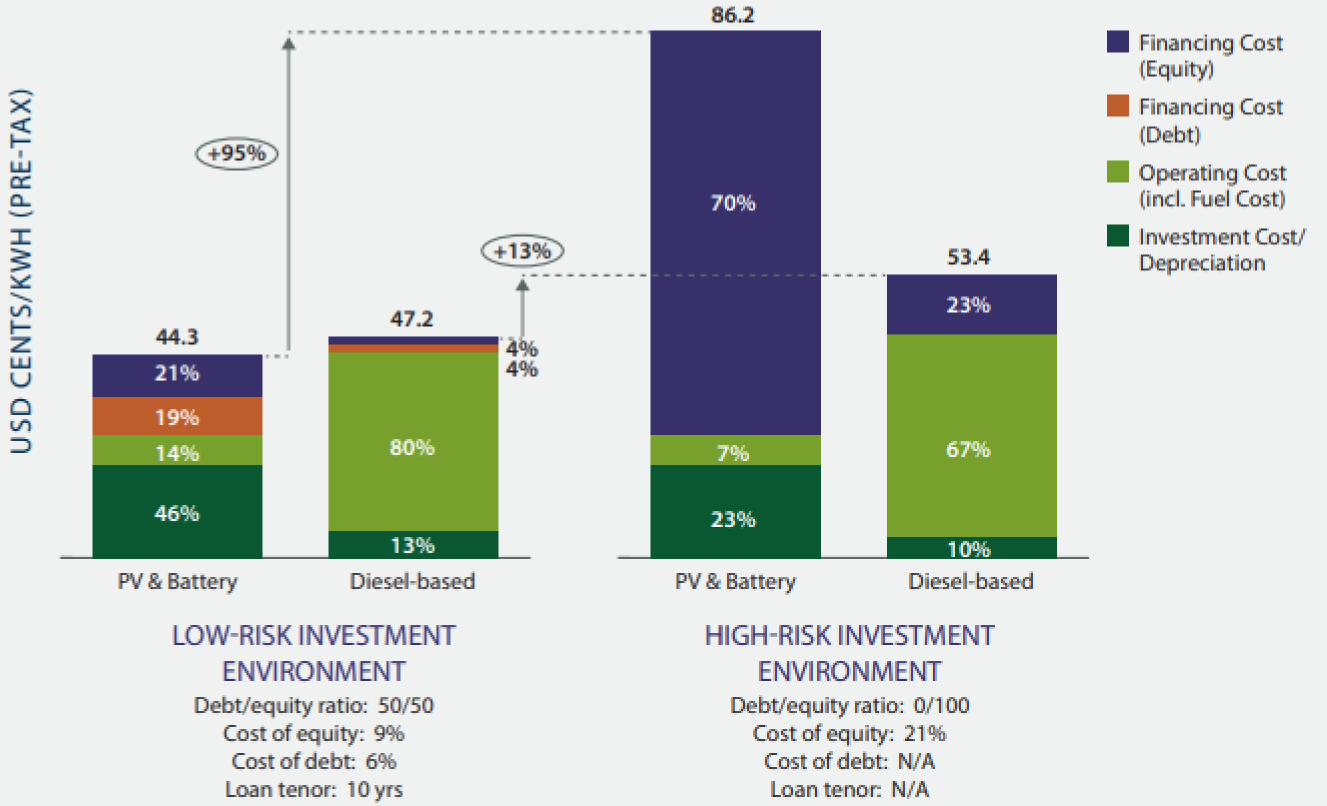
De-risking renewable energy investment - DREI (1/2) by UNDP

- For policy makers to identify cost-effective instruments to promote and scale-up private sector investments
- Identify risks and then intervene by either reducing, transferring or compensating the risks
- DREI framework covers: publicly-available methodologies, financial tools/models and resources
- Sources covered: (i) utility-scale, (ii) on-grid rooftop PV, (iii) off-grid mini-grids, and (iv) solar home systems.

Accessible at: https://www.undp.org/publications/derisking-renewable-energy-investment

DREI- off-grid Electrification (2/2)

Figure E.1: Impact of financing costs on solar PV-battery and diesel-powered mini-grids' generation cost in low and high-risk investment environments[1]



Source: Authors' modelling.

Due to their capital intensity, solar mini-grids are penalized in high financing cost environments.

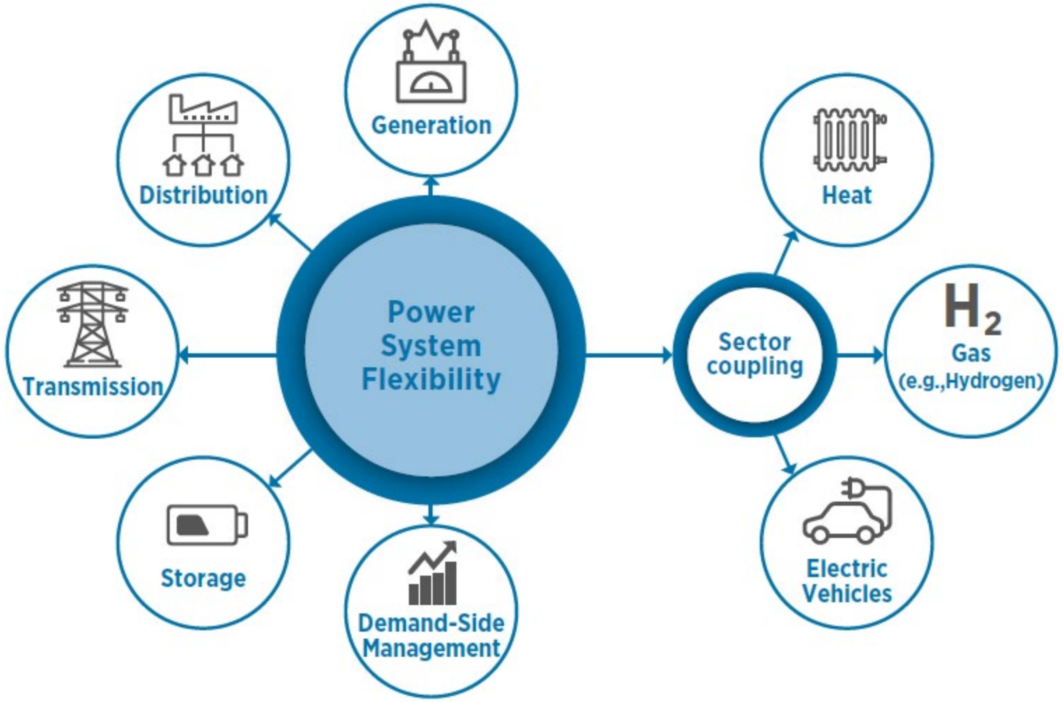
- Reduce risk
- Transfer risk
- Compensate risk

Source: ETH Zürich, Derisking Renewable Energy Investment: Off-Grid Electrification, Executive Summary, UNDP

IRENA Flex tool (1/1)

- By International Renewable Energy Agency
- “Flexibility is the capability of a power system to cope with the variability and uncertainty that solar and wind energy introduce at different time scales, from the very short to the long term, avoiding curtailment of power from these variable renewable energy (VRE) sources and reliably supplying all customer energy demand.” (IRENA, 2019)
- assessment of potential flexibility gaps as well as highlighting the most cost-effective mix of solutions to fill in such gaps
- Input required: demand, generation mix, hydrological data, VRE time series, interconnections and fuel costs.
- publicly and freely available (open-source) tool

Figure 3: Power system flexibility enablers in the energy sector



Accessible at: https://www.irena.org/energytransition/Energy-System-Models-and-Data/IRENA-FlexTool

Part II

Strategic and Programmatic Guidance for a Green Energy Transition

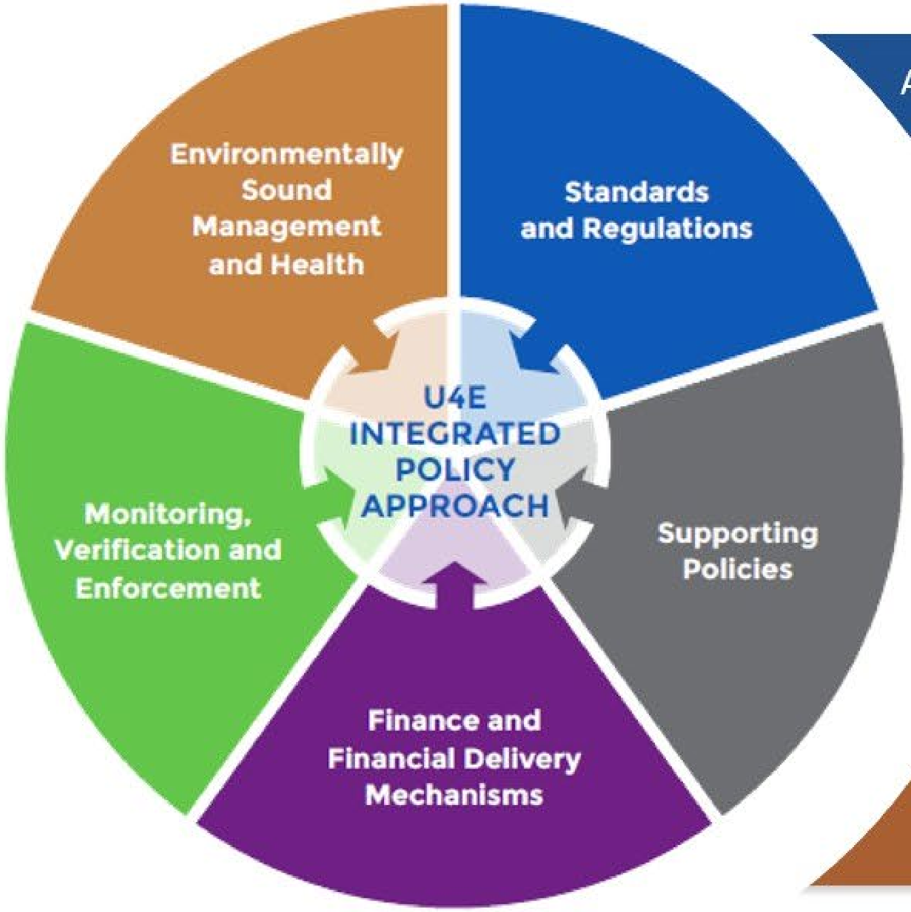
Key interventions:
Decarbonising the Energy Sector

Energy savings	District Heating & Cooling	Sector coupling	Low carbon mobility
Electrification	Renewable energy sources	New technologies: Hydrogen, …	Carbon Capture & Storage
Energy Storage	Smart Grids	Behavioural Change	Carbon pricing
Phase out fossil fuel subsidies	Interconnection	Avoid fugitive emissions	Digitalisation

Move away from Business as Usual

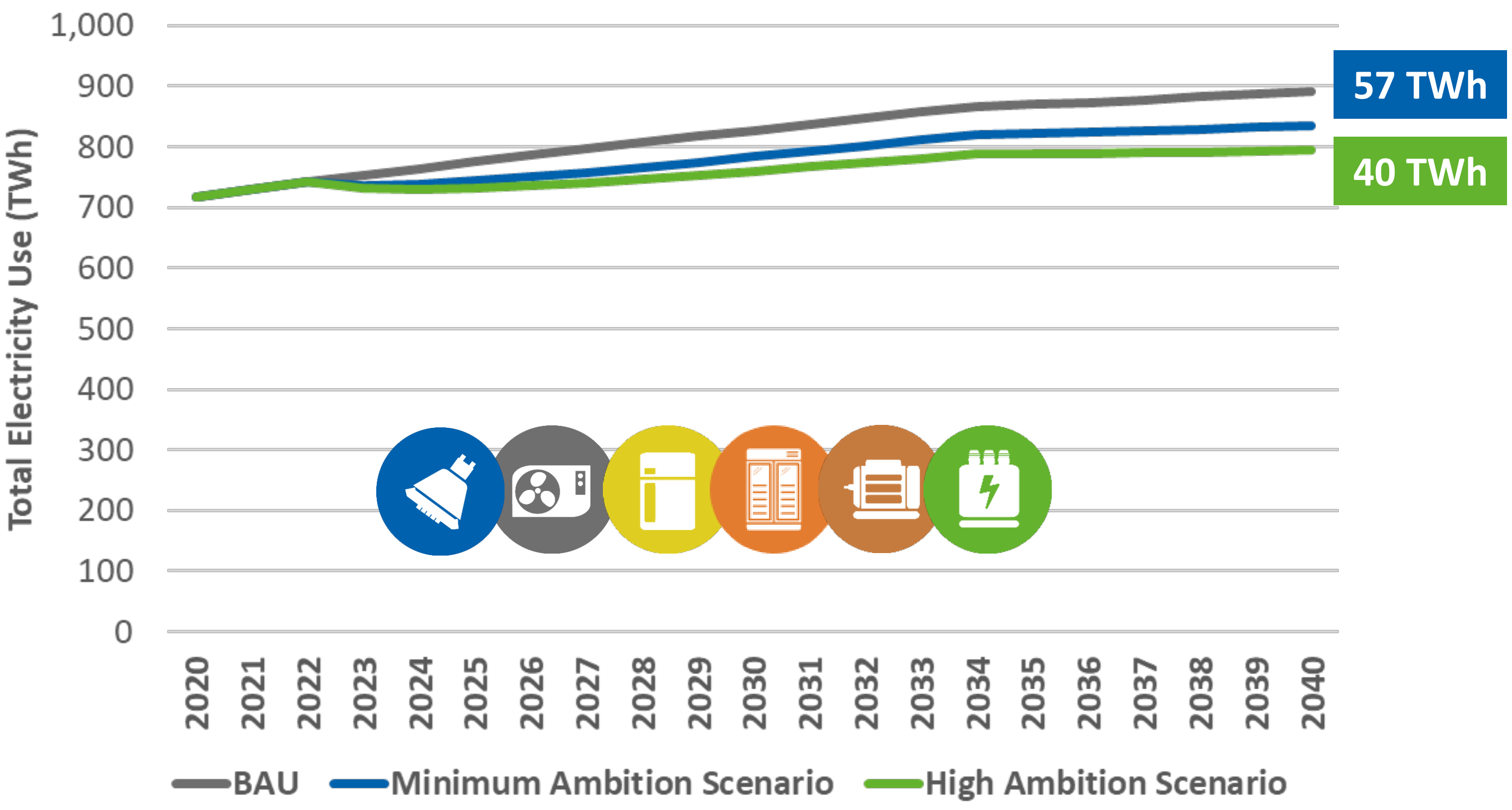
Intervention 1: United for Efficiency (1/5)

U4E supporting emerging and developing economies to accelerate their transition to energy efficient and climate friendly products through an Integrated Policy Approach



- Adopt minimum energy performance and internationally-recognized test standards
- Ensure effective labels are in place and that appropriate consumer information and advice is available
- Consider a blend of financing mechanisms and incentives to help offset the incremental costs of energy-efficient products
- Include legal authority, enforcement powers, capacities and penalties in the national legal and enforcement frameworks;
  Use a product registration system as an initial compliance gateway
- Provide for Materials Recovery (e.g. glass, ferrous and nonferrous metals and phosphors including any mercury in lamps and refrigerant gases).

Saving Opportunities in MENA from Energy-Efficient Lighting, Appliances and Equipment (2/5)



Annual Savings in 2040*:

57 TWh of electricity consumption, which is equivalent to:

- **26+ Power stations** [500 MW each]
- **33** Million tonnes of **CO_2**
- **5.2** Billion **USD on electricity bills**

Country Savings Assessments (3/5)

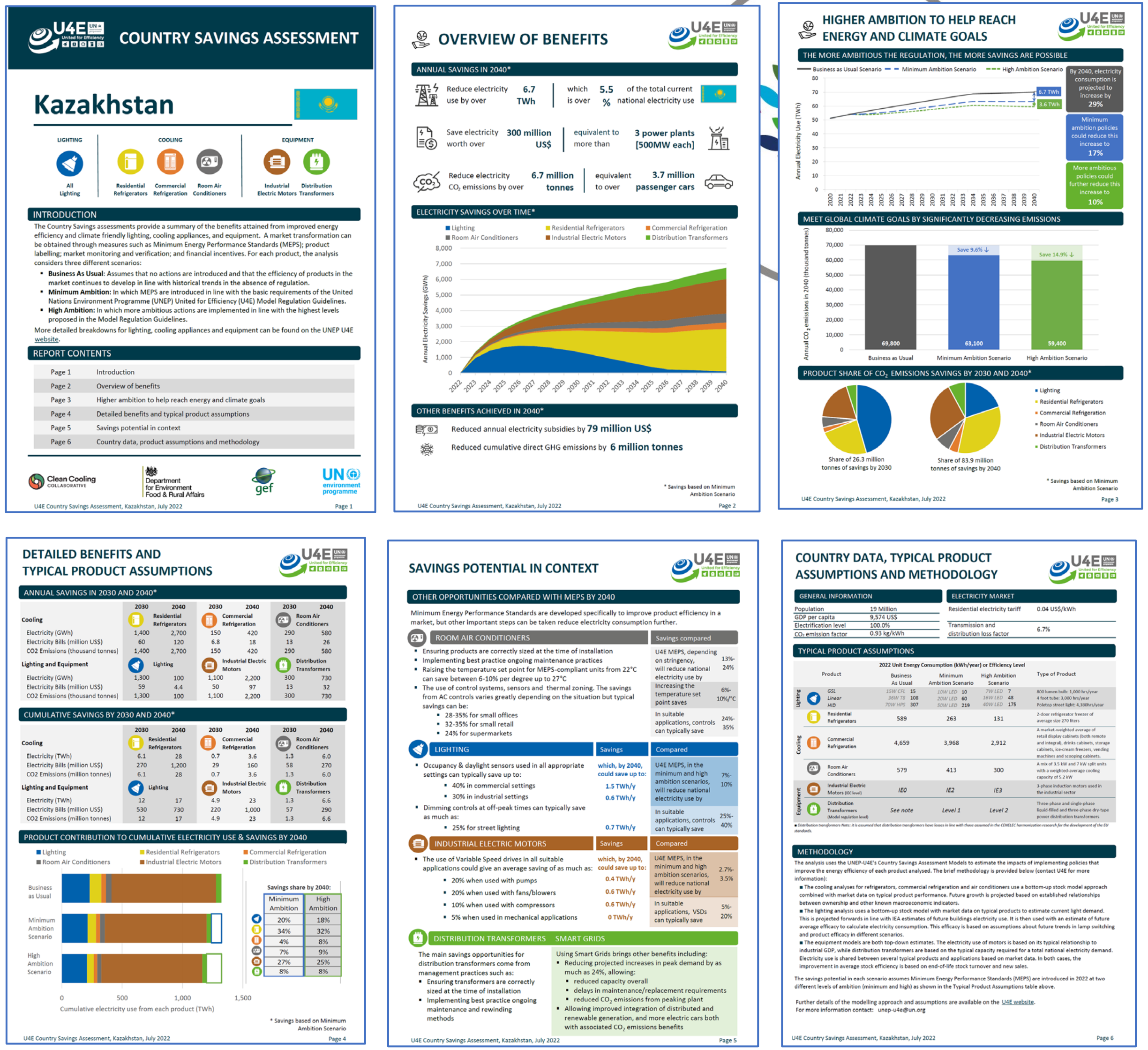
Objective

Analysis on **potential impact** of adopting Model Regulation guidelines for **lighting, room air conditioners, residential refrigerators, commercial refrigeration equipment, industrial electric motors and distribution transformers.**

These product categories are responsible for **>50% of electricity usage** today.

Overview

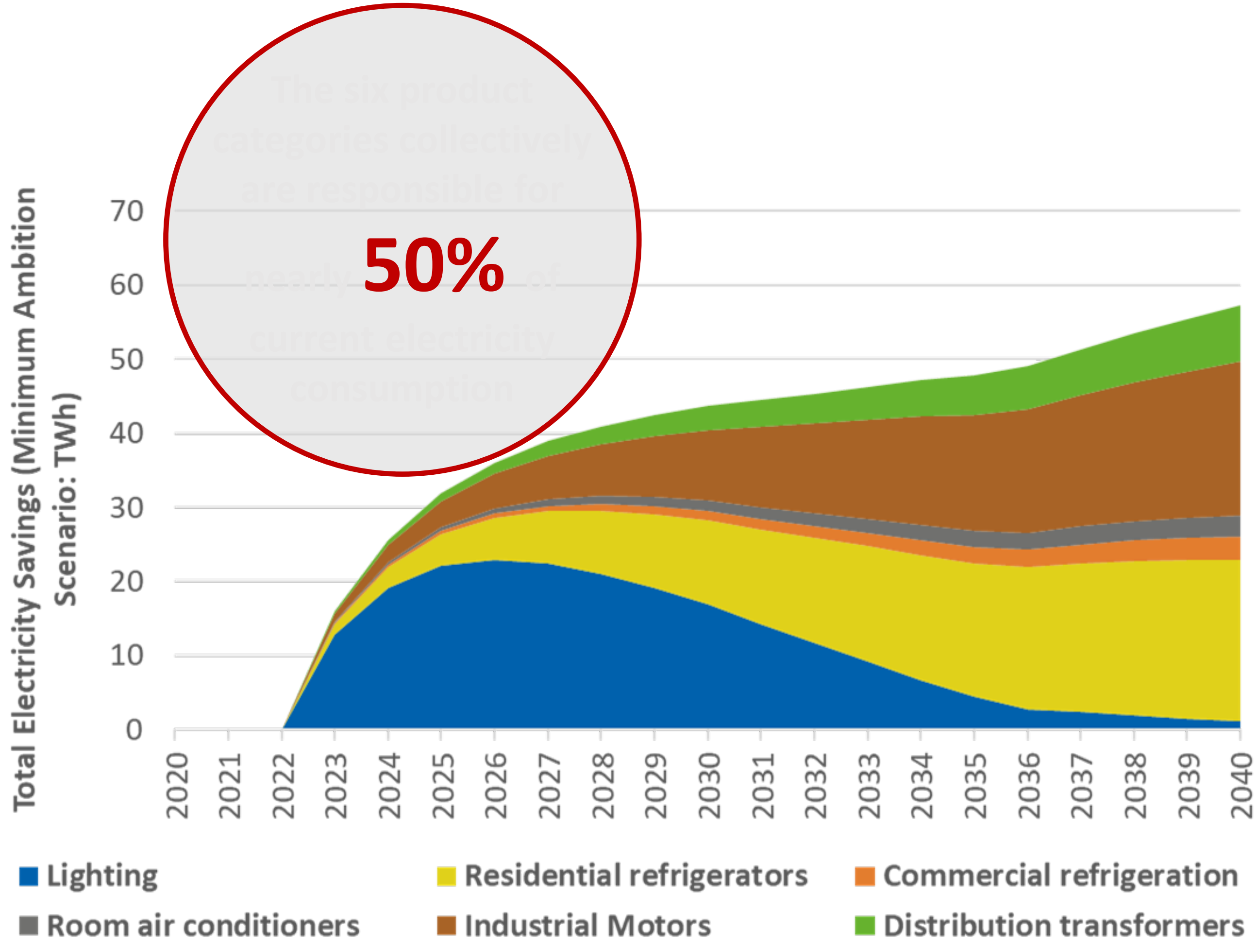
- The assessment provides three scenarios: **Business As Usual Scenario (BAU)**– No policy intervention; **Minimum Ambition Scenario** – assumes Minimum Energy Performance Standards (MEPS) implemented; **High Ambition Scenario** – Assumes MEPS are implemented at a higher level of ambition for six products.
- The **energy savings potential** is calculated till 2040 and is computed based on the difference between total energy consumption in the ambition scenarios and that of the BAU scenario and is expressed in terms of **GHG emissions mitigated, Capacity (Power plants) avoidance and Financial savings.**



*Available in English for all 156 developing and emerging economies.
French and Spanish translations are available for select countries

Individual country CSA reports can be downloaded from https://united4efficiency.org/countries/country-assessments/

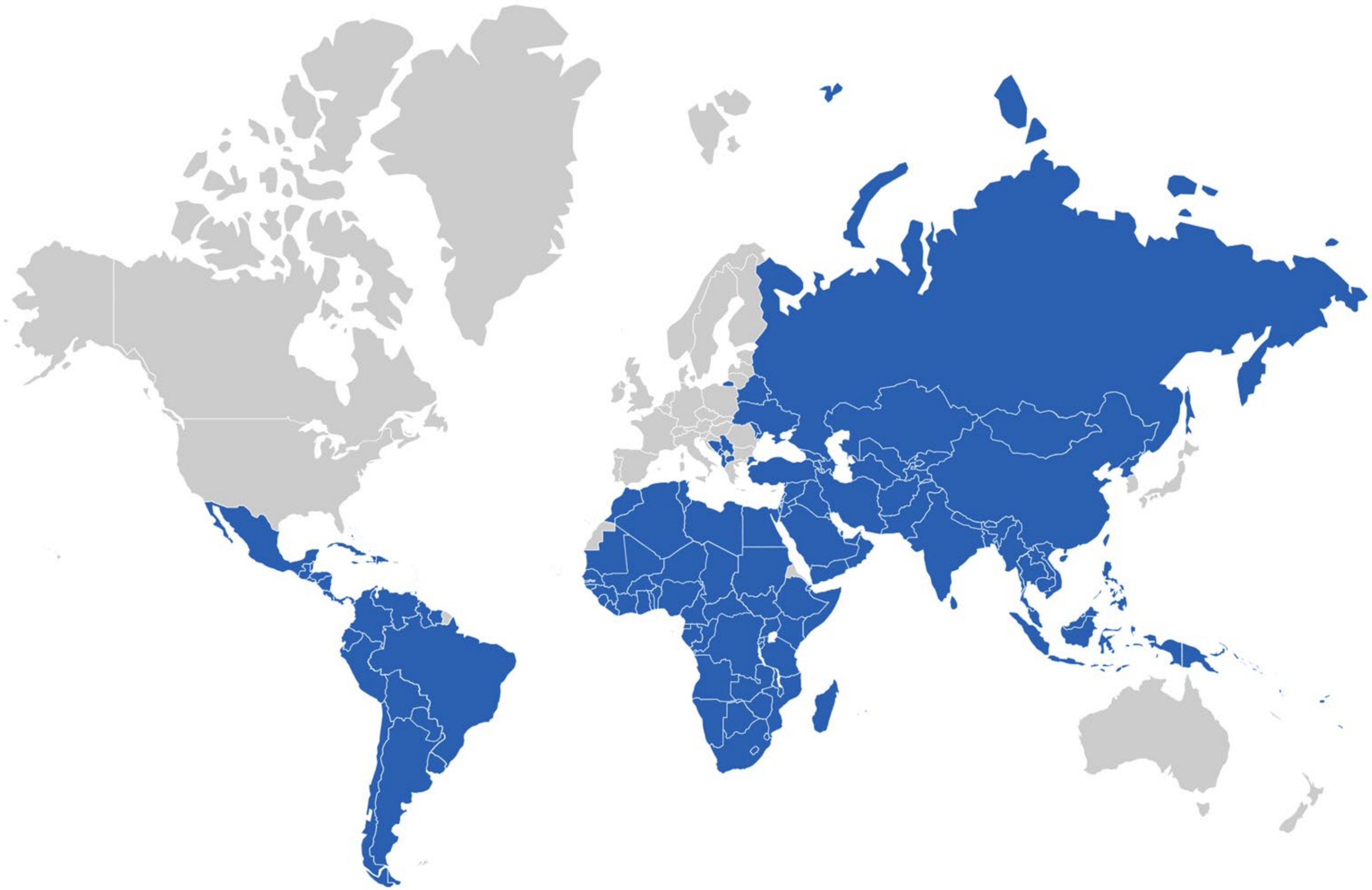
Saving Opportunities in Central Asia and Eastern Europe from Energy-Efficient Products (4/5)



Savings in 2040 with the Minimum Ambition Scenario	TWh	MtCO2e
Lighting	1	1
Residential refrigerators	22	13
Commercial refrigeration	3	2
Room air conditioners (RACs)	3	2
Industrial motors	21	12
Distribution transformers	8	4
Total	**57**	**33**

*Savings of all six products with Minimum Ambition Scenario in 2040

U4E Country Savings Assessment- Updated July 2022 (5/5)



- 156 developing countries and emerging economies have been assessed under the U4E Country Saving Assessments
- Explore for each country on: https://united4efficiency.org/countries/country-assessments/

Intervention 2: Sustainable and efficient cooling

- Cooling accounts for 10% of global electricity consumption [1]
- 7% of the GHG emissions are from cooling and expected to double by 2050 [2]
- Cooling energy use expected to triple by 2050 [3]
- Sustainable and efficient cooling solution can reduce this demand

[1] Futre of Cooling, IEA
[2] Clean Cooling Corroborative
[3] Future of Cooling, IEA

Sustainable cooling framework (1/4)

The **2016 Kigali Amendment** to the **Montreal Protocol** encourages sustainable cooling by progressively reducing the reliance on high-GWP Hydrofluorocarbons (HFCs) and offers opportunities for energy efficiency gains.

1. **Overall international framework: Kigali Amendment** - Ten countries in the region have committed to a phase-down of the HFC consumption and production, as 137 countries have done so worldwide.
2. **Practical example:** Sustainable technology transition in **Moldova** - The financial support provided to the private sector (cooling equipment in supermarkets) by the Multilateral Fund helped introduce energy efficient equipment that work on natural refrigerants such as carbon dioxide. The gains in energy efficiency reached the very high level of 40% through this project.
3. **All countries** in the region **eligible** to receive financial support to ensure compliance with the Montreal Protocol, through either the Multilateral Fund of the Global Environment Facility.

National Cooling Plans – ECIS (2/4)

National Cooling Action Plans (NCAPs): a global policy best practice to address the cross-cutting nature of cooling, to bring stakeholders from government, industry and academia to the table, discuss needs and possible solutions, and translate this into a document that provides a roadmap for action. Currently, over 30 NCAPs are at various stages of development.

<u>Objective: </u>Proposes an overarching comprehensive approach to cooling, from direct to indirect GHG emissions.

Allow to identify interventions and projects with highest potential impact at national level.

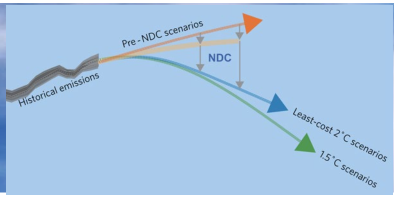
Results can be integrated in **Nationally Determined Contributions (NDCs)**

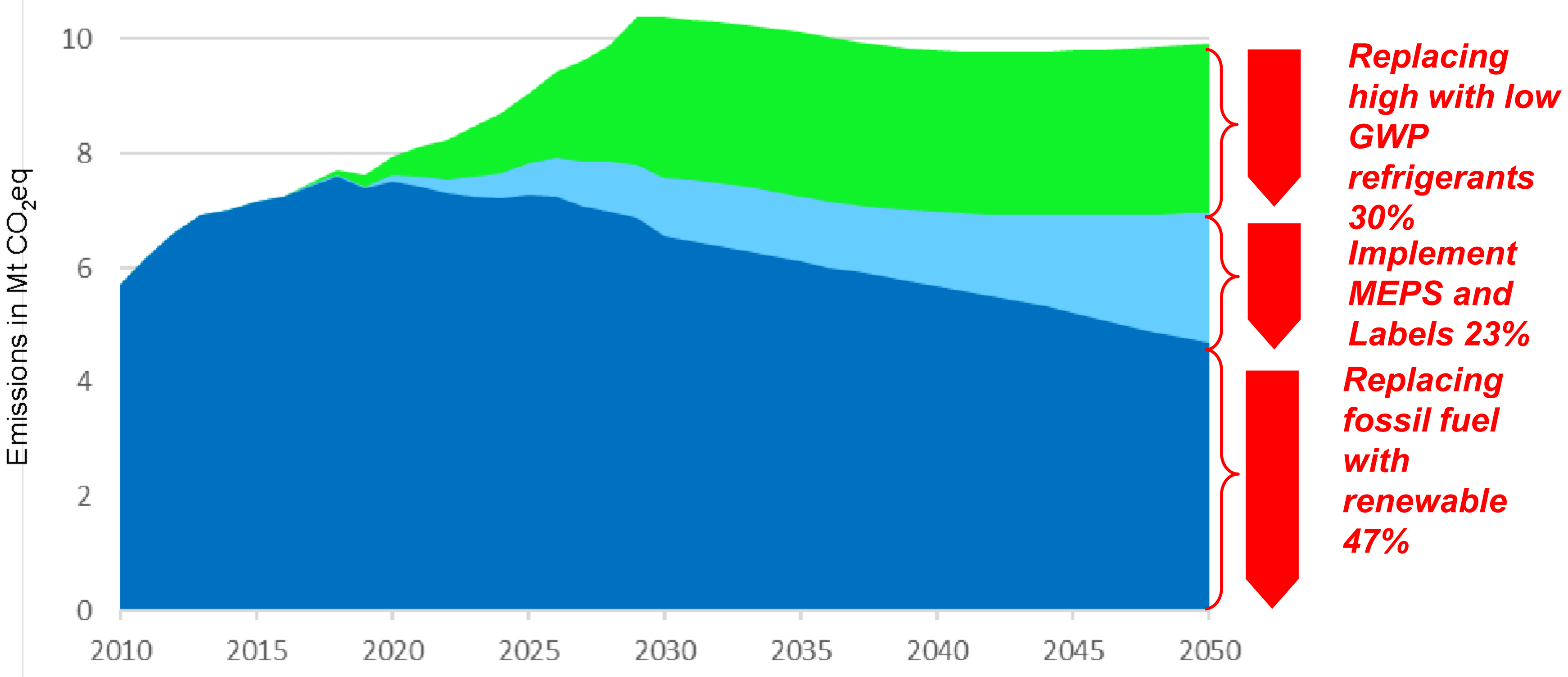
Sectors covered (for example): unitary air conditioning, chiller, mobile air conditioning, domestic, commercial and transport refrigeration.

No NCAP completed yet in ECIS region

2 NCAP preparation are ongoing in 2022 with support of UNDP: in **Kazakhstan** and **Uzbekistan**.

3/4 - Example of Lebanon: Impact of energy efficiency and low GWP





Useful tools for sustainable cooling (4/4)

1. Cool calculator - This Cool Calculator, developed by Cool Coalition is a 2050 scenario tool that allows stakeholders to run simple but open calculations on key aspects of cooling decarbonisation, empowering them to identify a set of solutions that works best for particular regions and/or sectors.

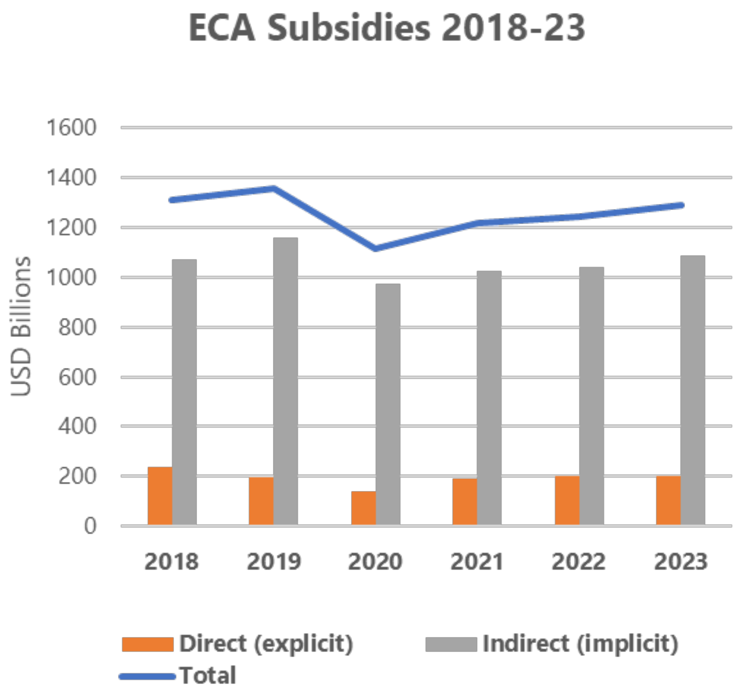
2. MEPSy - MEPSy is a policy tool developed by CLASP to determine the impact of appliance performance standards (like air conditioners) to determine national side metrics like reduced energy usage, emissions mitigated, and consumer side metrics like payback period and life cycle cost savings.

3. Factsheets and final reports for demonstration projects on low-global-warming-potential alternatives to HCFC technologies on the web site of the Multilateral Fund for the implementation of the Montreal Protocol and Sustainable Cooling solutions from the Clean Cooling Collaborative

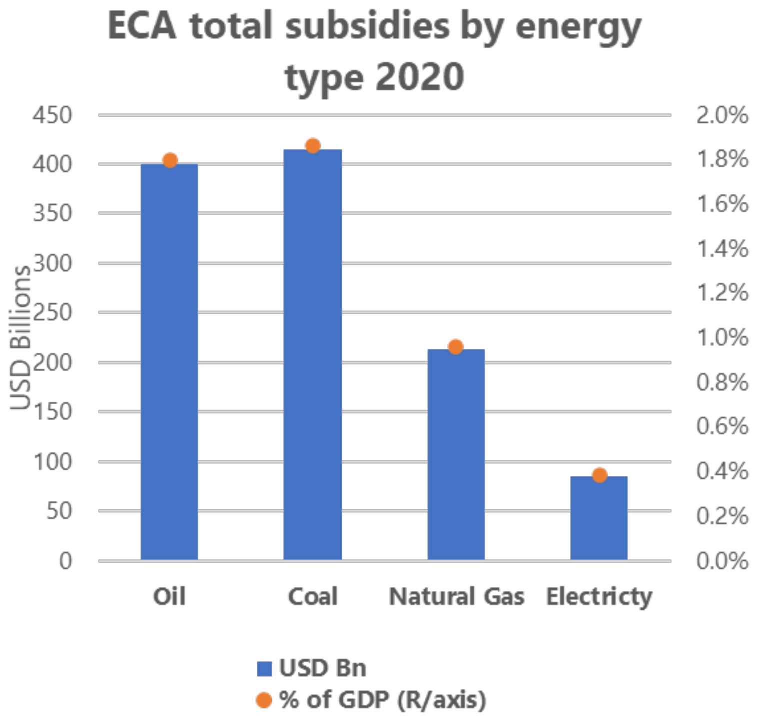
Intervention 3– Fossil fuel subsidies (1/3)

- **Globally colossal amounts are spent on fuel subsidies**
- According to IMF: Overall FFS globally amounted to USD 5.9 trillion in 2020 (or 6.8 percent of global GDP) and are expected to rise to 7.4 percent of GDP by 2025.
- Less than 10 percent of fossil fuel subsidies globally reflect lack of cost recovery (i.e. prices set below supply costs or direct subsidies) while over 90 percent reflect vast negative externalities stemming from excessive consumption of fossil fuels spurred by subsidies (i.e. indirect subsidies).
- In the ECA region fossil fuel subsides amounted to USD 1.1 trillion in 2020. Expected to have increased to USD 1.2 trillion in 2021 but below pre-pandemic level.
- **However, FFS is expected to have increased considerably in 2022 owing to the global energy crisis.**

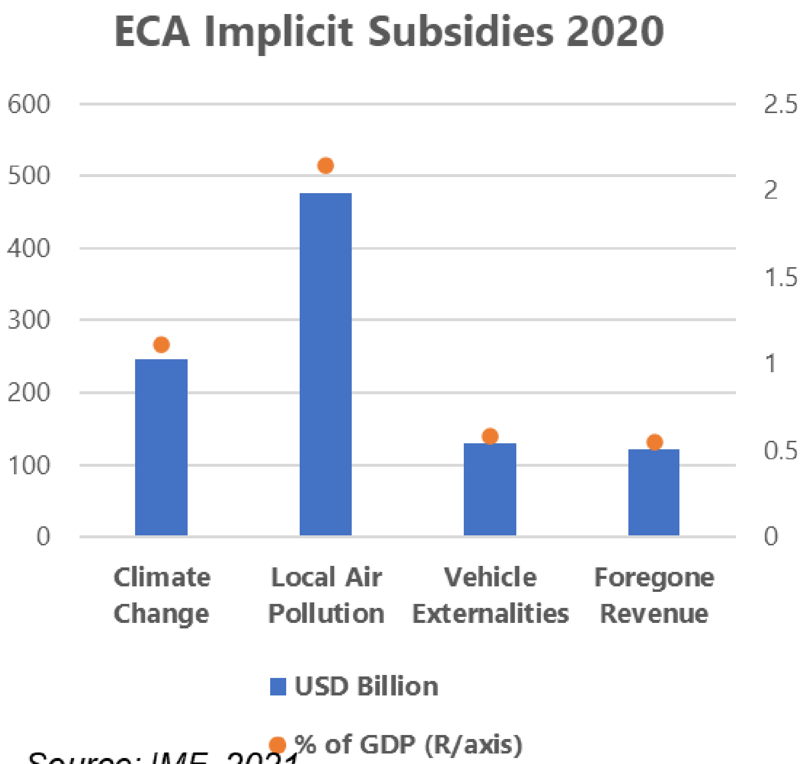
FFS-Global and Regional context (2/3)



IMF, 2021 (Projections from 2021 does not include effects of global energy crisis)



Source: IMF, 2021



Source: IMF, 2021

FFS in face of the energy crisis (3/3)

- Will contribute to **growing fiscal and external pressures**

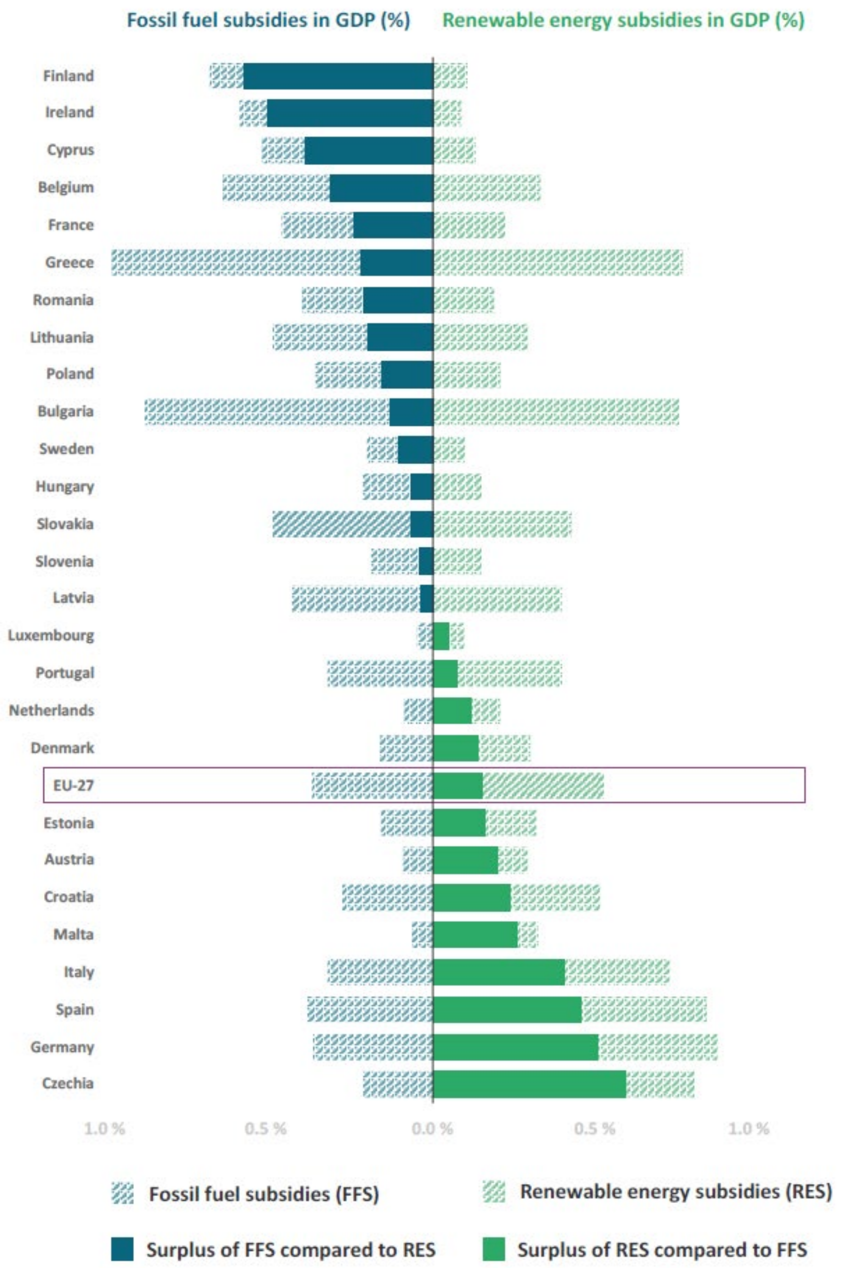
  Even among **stronger economies**, blanket subsidies incur **significant opportunity cost:** money that could be better used for strengthening social protection, provide impactful economic stimulus and countering climate change**.**

- Would stand to delay net-zero transition and **commitments under Paris Agreement**.

- Developed country subsidies would **dent fiscal space that would have otherwise supported ODA** –very much needed by developing countries facing considerable adversities**.**

Subsidies to renewable energ

- EU subsidies for renewable energy (RES) has increased nearly four-fold from 2008.
- The growth in renewable energy subsidies has contributed to the increase in the share of renewable energy in the EU energy mix, rising from 12.6 % in 2008 to 19.7 % in 2019.
- In general, throughout EU, RES exceeds FFS. However, in several states the opposite is witnessed: FFS exceeds RES



Source: ECA based on Trinomics, *Study on Energy costs, taxes and the impact of government interventions on investments*, October 2020.

Source: ECA 2021; European Court of Auditors 2022

Intervention 4: Carbon pricing (1/3)

- The use of **Carbon Taxes** as an explicit means of controlling emissions and thereby lowering indirect subsidies have grown in the EU. [8 states in 2008
- currently 14 states]
- However, these carbon taxes vary significantly across nations:
  - Poland lowest at €0.1/Ton CO2
  - Sweden highest at €100/Ton CO2
- The highest share of emissions captured under the carbon tax regime is in Ireland (49%) whilst the lowest are in Estonia and Spain (3% each)

Carbon prices (2/3)

- The OECD in May 2021 published its effective carbon rates which serves as valuable benchmark:

  - €30/tonne of CO2 – a historic low-end of the benchmark. **CO2 prices below this benchmark do not trigger meaningful abatement.**

  - €60/tonne of CO2: a mid-range estimate of carbon costs in 2020 **commensurate with a slow rate of decarbonization.**

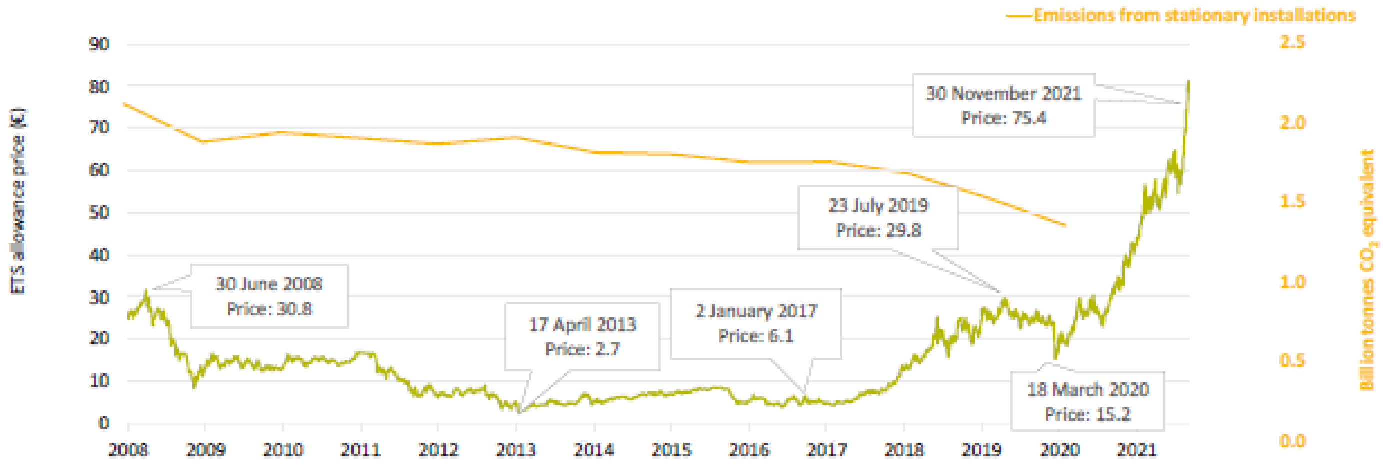
  - €120/tonne of CO2 – an estimate of the carbon price needed in 2030 to **effectively decarbonise by mid-century (2050).**

Carbon pricing (3/3)

- To capture external costs to the environment and the planet
- Polluter pays principle
- National Carbon taxes initiatives are individually designed (different scope & coverages)
- Difference ETS & carbon tax:
  - ETS emission reduction is pre-defined
  - Carbon tax: price is set, but not reduction

Some price examples in USD/ t CO2 eq:
EU-ETS: 86,53
Kazakhstan – ETS: 1,08
Latvia – Carbon tax: 16,58
Ukraine – Carbon tax: 1,03
Liechtenstein – Carbon tax: 129,86

Source: Worldbank, Carbon Pricing Dashboard
Note: Nominal prices on April, 01 2022

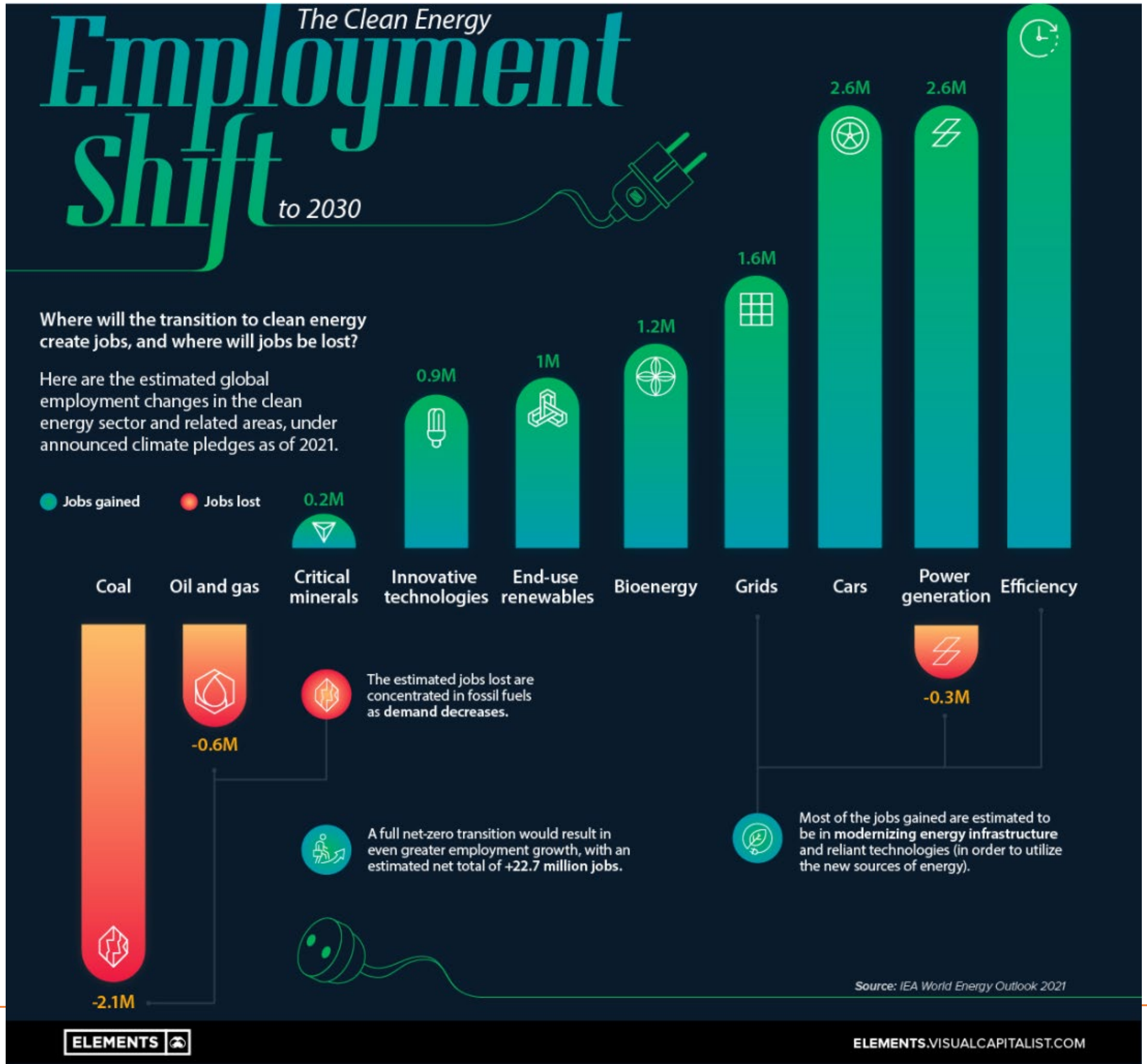


Source: ECA, based on Sandbag carbon price viewer and EU ETS data viewer.

Benefits of a Green Energy Transition

- Less dependency from fossil fuel imports
- Less air pollution better health
- Green jobs (EU + 884000 jobs, all skills required)
- Chance of whole-of-society development, respecting gender equity and vulnerable groups
- Local development options
- More resilient energy sector
- A chance for a better future!

Green jobs



- Globally millions of net new jobs
  - IEA: 10.3 Mio by 2030
  - ILO: 18 Mio by 2030
- Mostly in modernising energy infrastructure

Closing Remarks

Make use of the momentum:

- Energy prices of renewables become competitive
- Countries want to reduce their dependency on energy imports
- Citizens care more and more about energy and climate
- Turn fossil fuel subsidies into green subsidies

Thank you for your attention!

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