



## **WEO 2022 – From the fossil fuel age to the clean energy era**

**Author: Paul Schreiber, Reclaim Finance**

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### **Abstract:**

On October 27<sup>th</sup>, the International Energy Agency (IEA) published its *World Energy Outlook 2022* (WEO 2022). This landmark report charts a path to exit the energy crisis by transforming the energy system to limit global warming to 1.5°C. To follow it, the age of fossil fuels must swiftly end and be replaced by a clean energy and efficiency era, thus requiring a total transformation of the energy investment landscape. For financial institutions, this notably means following two key complementary rules: (1) ending all financial services to fossil fuel development, and; (2) massively ramping up clean energy and efficiency investment, thus investing nine times more in it than in fossil fuels by 2030.

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## **Introduction**

The WEO 2022 is published in an energy crisis, where states are struggling to balance energy supply and demand while households and companies are facing surging energy bills. In this context, the flagship report of the global energy watchdog takes on an even bigger role than usual. The fact that it focuses on providing clean solutions to the energy crisis is not only a sign of the urgency of climate action ahead of COP27, but also a logical response to a crisis caused by an unsustainable power system.

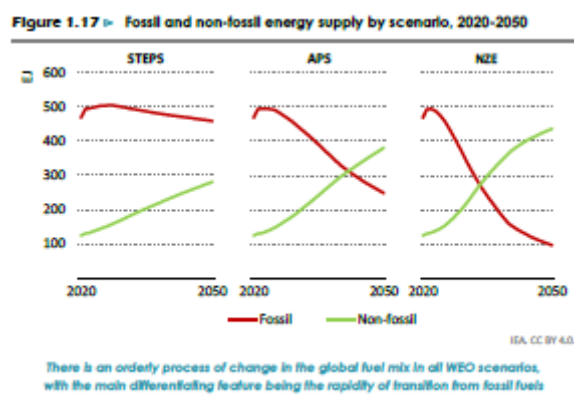
The crisis enables the “alignment of economic, climate and security priorities”. On one hand, renewables are correlated with lower electricity prices, and efficient homes and electrified heating provide a buffer for consumers. On the other hand, polluting fossil fuels are the cause of the rise in the cost of electricity generation. As IEA Director Fatih Birol summarizes: *“The world is struggling with too little clean energy, not too much. Faster clean energy transitions would have helped to moderate the impact of this crisis, and they represent the best way out of it.”* In other words, **limiting global warming to 1.5°C by transforming the energy sector is also the “best way” to ensure energy security and protect energy consumers.**

In this note, we explore the new energy landscape painted by the IEA in its WEO 2022, highlighting the changing role of fossil fuels and clean energy in the global energy mix. By looking deeper into WEO’s central scenario of “Net-Zero by 2050” (NZE), we uncover two key complementary rules for financial institutions that pledge to support the 1.5°C goal and energy transition.

## I/ The end of the fossil fuel age

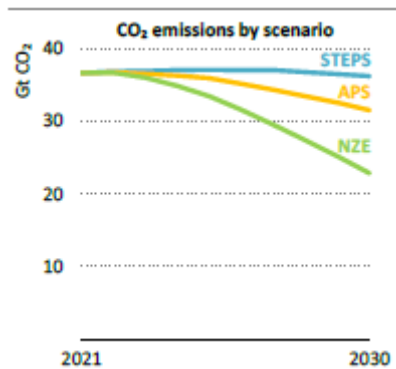
### **1. The age of fossil fuels is coming to an end...**

The WEO 2022 shows that the age of growing fossil fuel demand is over. For the first time, “a WEO scenario based on prevailing policy settings has global demand for each of the fossil fuels exhibiting a peak or plateau”. In other words, fossil fuel demand and production will decline even if the world goes on with “business as usual” - the Stated Policies Scenario (STEPS). Merely **upholding current climate pledges** - as in the **Announced Pledges Scenario (APS)** - significantly accelerates this movement, sending the demand for all and each fossil fuels into decline by 2030.



Of course, **the end of the fossil fuel era starts with coal**. In the APS, it drops by 80% to 2030 and is phased out by 2040 in advanced economies. But, **beyond coal, IEA underlines that “one of the effects of Russia’s actions is that the era of rapid growth in natural gas demand draws to a close”** and that “increased climate ambition in some emerging market and developing countries in Asia implies that natural gas now faces existential questions about its long-term future”. To say it differently, **the crisis ended the “transition fuel” narrative that the gas industry spent so long to advertise**. Sustained high gas prices bring a “relatively barren period for large new gas export projects” in both APS and STEPS. In this situation, switching from coal to gas is much less attractive and renewables are becoming the default replacement for coal power.

**The above-mentioned elements send clear signals that fossil fuels are the past – not the future – of energy and no longer a sound investment for the sector**. However, under no circumstances should they be understood as a sign that the energy and climate transition will happen at a pace sufficient to address the climate crisis and that we are getting on track to limit global warming to humanly tolerable levels. Indeed, the Scenario (STEPS) brings temperatures to 2 °C around 2060, temperatures continue to rise after that and there is a 10% chance they go above 3.2 °C in 2100, an increase that “would pose a severe threat to the wellbeing of humans and global ecosystems”. The gap between the STEPS, the APS and what needs to be done to keep global warming to 1.5°C - the Net Zero Emission by 2050 (NZE) scenario – remains huge.

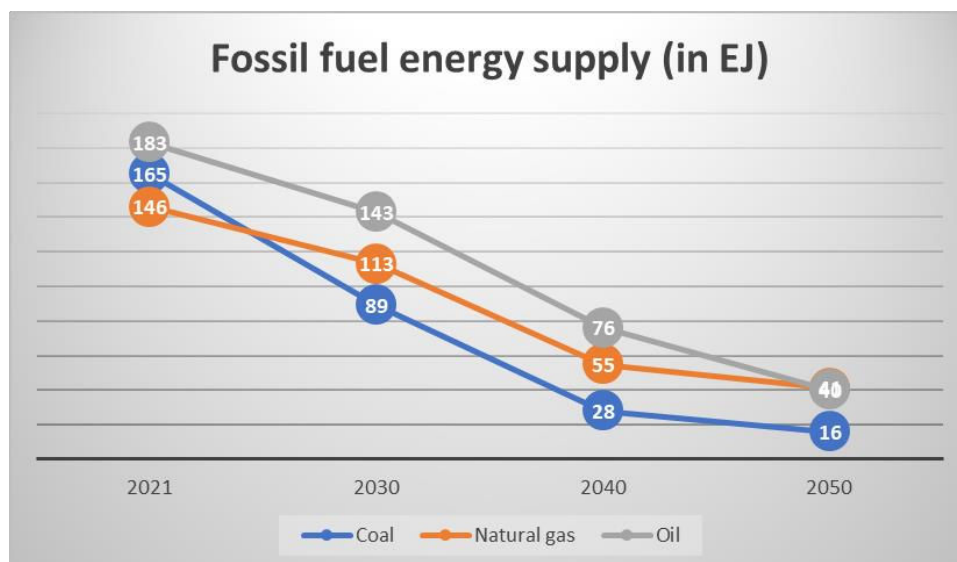


## 2. ...And we must end it much faster if we are to avoid catastrophic global warming

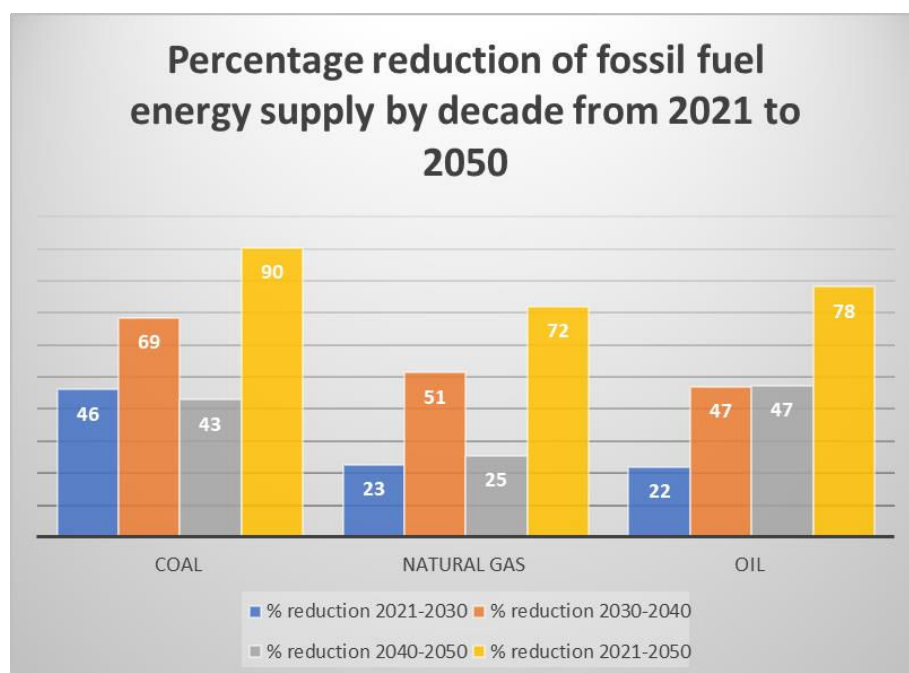
As - among others - the IPCC, the UN, the scientific community and human rights experts underline, it is essential to limit global warming to 1.5°C to avoid catastrophic consequences on nature and human life. For the IEA, this notably means following the pathway charted by the NZE that also delivers massive improvements on sustainable development goals (SDGs) and job creation. And, for the second year in a row, **the NZE is the “normative” scenario in the WEO**. It is the go-to scenario for policymakers, companies and financial institutions that are looking to reshape the energy sector in a way that is compatible with urgent GHG emission reduction cuts.

Following this scenario requires a complete and rapid transformation of the energy supply and demand, with a drastic drop in fossil fuel production and consumption. While oil, natural gas and coal accounted for around four fifths of total energy supply in 2021, this falls to around two thirds in 2030 and less than one fifth in 2050 in the NZE. **The use of each fossil fuel drops significantly by 2030 and drastically by 2050** (see graph below):

- **Coal use declines from 5 600 million tonnes of coal equivalent (Mtce) in 2021 to 3 000 Mtce in 2030 and to less than 600 Mtce in 2050.**
- **Natural gas demand drops from around 4 200 bcm in 2021 to 3 300 bcm in 2030, and 1 200 bcm in 2050.** Gas production diminish in all geographical areas except the Middle East by 2030. Gas use falls by 7% per year on average in the 2030s and by around 3% in the 2040's. Power sector gas demand falls faster, by 25% of 2021 levels by 2030 and 93% by 2040.
- **Oil demand never returns to its 2019 level and declines from 95 million barrels per day (mb/d) in 2021 to 75 mb/d in 2030, and to less than 25 mb/d in 2050,** with an annual decline rate of 6% on average from 2030 onwards. Oil production declines in all geographical areas by 2030.

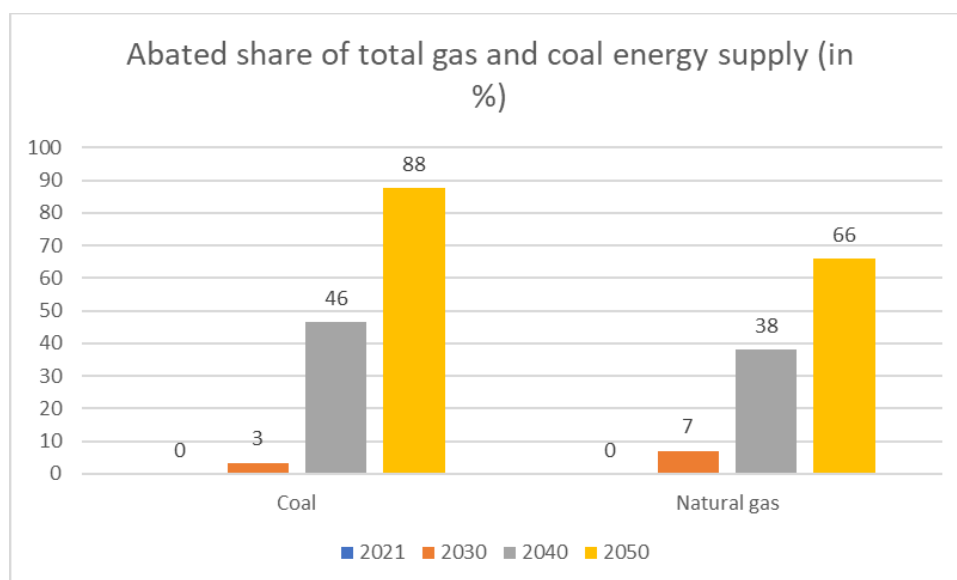


Beyond coal, gas and oil energy supply decline respectively by 23 and 22% by 2030 already and by as much as 51 and 47% from 2030 to 2040 (see graph below). The significant and rapid decline in demand and production for all fossil fuels fossil fuel demand means that no new coal, oil and gas production projects are approved in the NZE. The immediate shortfall in Russian gas supply does not change this key feature of the NZE that made headlines in the *WEO 2021*, highlighting the incompatibility of projects that had not reached the final investment decision by the end of 2021 with climate commitments. Any new project “would make the later stages of the transition even more challenging, and creates the clear risk that [the 1.5°C] target moves out of reach”. The IEA warns that new conventional oil and gas fields would not help to meet immediate needs, could jeopardize the 1.5°C objective and would generate major commercial risks if this objective were to be pursued. To quote the IEA: “No one should imagine that Russia’s invasion can justify a wave of new oil and gas infrastructure in a world that wants to reach net zero emissions by 2050.”

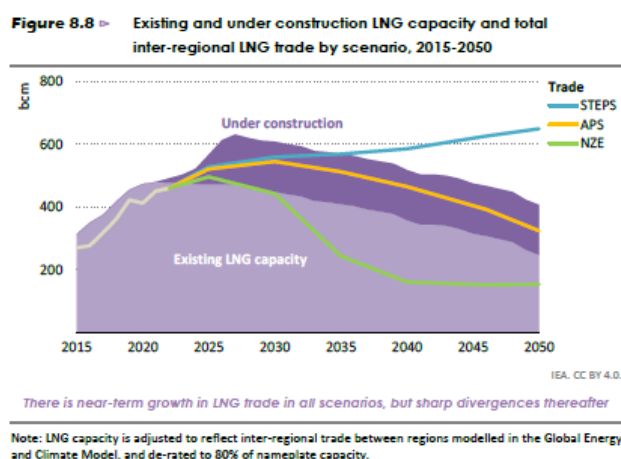


The decline in fossil fuel use becomes even starker when looking only at the fuels used for energy uses and without any abatement. Indeed, the share of total final consumption for energy directly

provided by unabated fossil fuels falls from nearly 60% of in 2021, to around 45% in 2030, and only 5% by 2050. Of the 100 EJ of fossil fuels still consumed in 2050 in the NZE: 40% is consumed in facilities equipped with CCUS; 40% is consumed in “applications where the carbon is embodied in the product and there are no direct CO<sub>2</sub> emissions”; 20% is used in sectors where clean energy technologies are “least feasible and cost effective”. Concretely, this means **about 90% of the remaining coal and 65% of the remaining gas is used with CCUS, while 70% of the remaining oil is used products where the carbon is embodied** – such as petrochemicals.



Unsurprisingly given the above elements, even the demand and exports of fashionable liquified natural gas (LNG) rapidly decreases. **Global LNG trade peaks in the mid-2020s** and returns to 2021 levels by 2030, before declining sharply to 150 bcm by 2050. **There is no further need for additional LNG capacity beyond what exists or is under construction.** Here, the IEA wording – identical to the one used on upstream projects - means that LNG projects that have not reached their final investment decision by the end of 2022 are incompatible with limiting global warming to 1.5°C. **On the contrary, existing and under construction capacity largely exceeds LNG needs in the NZE.**



## **II/ The clean energy and power generation era**

### ***1. The new era is the one of renewable power generation and clean energy...***

In the NZE, electricity “becomes the new linchpin of the global energy system” and play a key role in replacing fossil fuels, providing more than half of total final consumption and two-thirds of useful energy by 2050. For this increased electricity use to be compatible with climate mitigation, electricity sectors reach net zero emissions by 2035 in advanced economies, and by 2040 globally in the NZE.

These milestones are achieved thanks to massive renewable energy deployment. **Annual renewable capacity additions quadruple from 290 GW in 2021 to nearly 1 200 GW in 2030, and averages above 1 050 GW from 2031 to 2050. These additions bring the share of renewables in electricity generation from 28% in 2021 to over 60% in 2030, and nearly 90% in 2050.** More precisely:

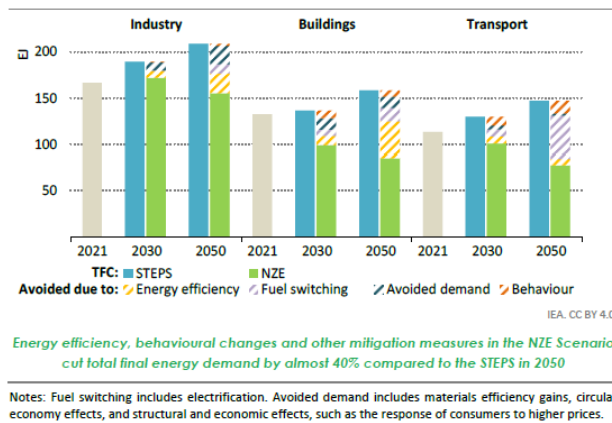
- Solar PV and wind take the lion’s share of renewable energy growth. **The share of electricity generation coming from solar PV and wind alone increases from 10% in 2021 to 40% by 2030, and 70% by 2050.** Solar PV additions expand more than fourfold to 650 GW by 2030, and wind additions to over 400 GW.
- **Capacity additions of hydropower and other dispatchable renewables triple by 2030 to over 125 GW**, providing an important contribution to integrating solar and wind production.
- **Renewable energy integration is facilitated by the addition of battery capacity: by 2030, global battery capacity reaches 780 GW in the NZE Scenario** (15% of all dispatchable power capacity).

**Displaced by renewables, the share of fossil fuels in power generation falls even faster than in the total energy supply:**

- Unabated coal in global electricity generation falls rapidly from 36% in 2021 to 12% in 2030, and to zero percent by 2040 and beyond. **“No new unabated coal fired plants are needed” in the NZE.**
- **Natural gas-fired generation peaks by 2025 before starting a long-term decline.** By the time the global electricity sector reaches net zero emissions in 2040, the unabated use of natural gas is 97% lower than it was in 2021.
- So-called “low-carbon” power generation with fossil fuels develops but remains rare, making up for 3-5% of global electricity generation in 2050 (2-3% from ammonia and hydrogen and 1-2% from CCUS).

Energy efficiency improvements combined with more robust materials efficiency and behaviour change are fundamental in the NZE to facilitate a much faster rise in the share of clean electricity supply. **In 2030, energy savings from efficiency as well as behavioral changes amount to around 110 EJ compared to the STEPS**, equivalent to total final energy consumption of China today. **This enables total energy supply to decline by 10% over the coming decade (compared to a 2% and 10% increase in the APS and STEPS) in the NZE Scenario** even as the global economy grows by nearly a third.

**Figure 3.18** ▶ Total final consumption in the STEPS and demand avoided by measure in the NZE Scenario



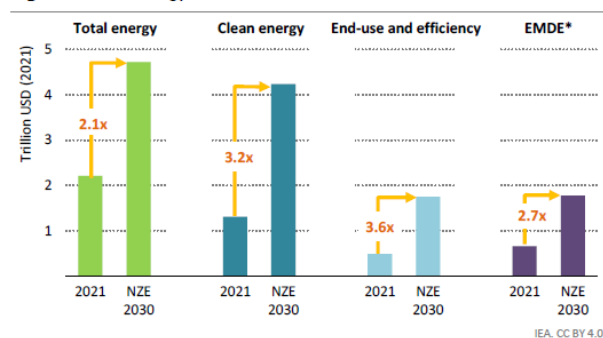
On top of renewable electricity and energy efficiency development the NZE also relatively marginally relies on so-called “low-carbon” solid or gaseous alternatives:

- **Hydrogen and hydrogen-based fuels reach around 10% of total final in 2050.** The supply of “low-emissions” hydrogen increases from 0.3 Mt (45 petajoules) today to 90 Mt in 2030 and 450 Mt in 2050. In 2050, a little less than ¾ of hydrogen is produced via water electrolysis, and a bit more than 1/2 is produced from fossil fuels with CCUS.
- **Bioenergy use reach 75 EJ in 2030 and 100 E in 2050 (compared to 41 EJ today), around 15% of total final consumption.** The traditional use of biomass (24 EJ today) falls to zero by 2030 with full access to modern cooking solutions and is replaced by modern biomass. However, only around 1/3 of total biomass in 2050 is used in the power sector, and more than 1/3 in industry and buildings.

## 2. ... And it requires financial institutions to set a new investment landscape

Going from the fossil fuel age to the clean energy one requires the growth and transformation of energy investment. **Energy investment accounted for just over 2% of global GDP annually between 2017 and 2021, and this rises to nearly 4% by 2030 in the NZE Scenario.**

**Figure 1.18** ▶ Energy investment in the NZE Scenario, 2021 and 2030



There are multiple imbalances in current investment flows that need to be addressed in order to meet rising demand for energy services while reducing emissions

\* Excludes China.

Note: EMDE = emerging market and developing economies; NZE = NZE Scenario.

Fossil fuel investment progressively drops, replaced by a clean energy investment surge:

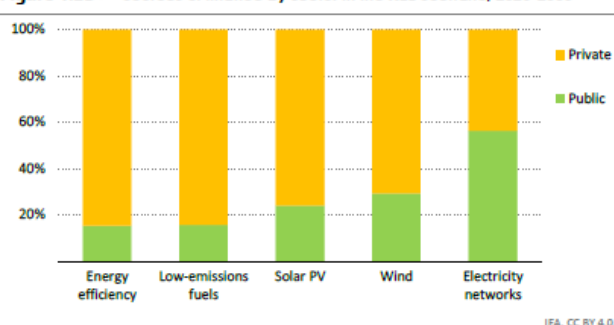
- On one hand, **annual spending on the fossil fuel supply falls from its current level of around USD 830 billion to around USD 455 billion in 2030 (from 35% to 10% of total energy investment and about half of the levels seen over the past five years).** These lasting fossil

fuel investments are used to ensure that supply from existing fossil fuel projects does not fall faster than the decline in demand and to reduce emissions from the fossil fuel supply chain<sup>20</sup>. Therefore, much of these investments go to reducing the global average emissions intensity of oil and gas production (about - 50% to 2030) and methane emissions (to reach - 75% by 2030).

- On the other, **clean energy investment reach USD 4.2 trillion in 2030, more three times their 2021 level<sup>21</sup>** (see Figure 1.18), compared to a mild 25% increase in 2022 compared to the 2017-2021 average. They are the primary driver of the global energy investment increase and require investment beyond the level of previous fossil fuel investment.

The huge growth of clean energy investment requires an increased mobilization of both private and public finance. However, **private sources are the main contributor with around USD 3 trillion in 2030, around 70% of the total**.

**Figure 4.22** ▶ Sources of finance by sector in the NZE Scenario, 2026-2030

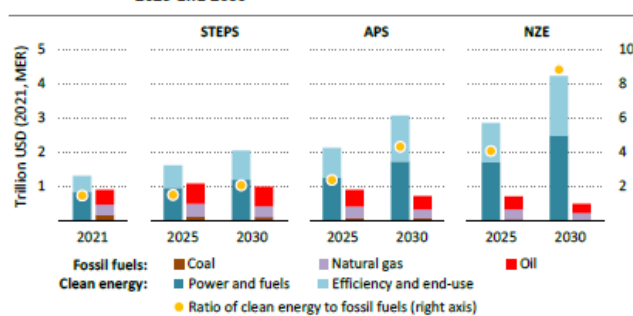


IEA, CC BY 4.0.

*Public finance, though its role varies by sector, cannot cover more than a fraction of total investment requirements, yet it needs to act as a catalyst for private capital*

Concretely, **for every USD 1 spent globally on fossil fuels in 2030, more than USD 9 is spent on clean energy in the NZE** (see Figure 4.2). The IEA underlines that this ratio “provides a useful guideline for understanding the alignment of financial flows of investor and company portfolios with achieving net zero emissions globally by 2050”.

**Figure 4.2** ▶ Investment in clean energy and fossil fuels by scenario, 2025 and 2030



IEA, CC BY 4.0.

*Around USD 9 is invested in clean energy for every USD 1 invested in fossil fuels in 2030 in the NZE Scenario*

Note: MER = market exchange rate.

The IEA points out that **scaling down fossil fuel investment and scaling-up investment in clean energy technologies must be jointly considered**. Ending investment in new fossil fuel production and LNG projects and reducing fossil fuel investments frees up capital that must be invested in clean energy. At the same time, massive clean energy and efficiency investment enables the world to progressively

replace fossil fuels. In a word: **financial institutions and governments must at the same time end fossil fuel development and implement the “9 for 1” rule for clean investment.**

### **Conclusion: The “no expansion” and “9 for 1” rules for financial institutions**

For financial institutions worldwide, the new energy landscape that appears in the WEO 2022 can be boiled down to two complementary key rules:

- 1) Ending all financial services to new fossil fuel production and LNG projects and the companies that develop them;**
- 2) Immediately ramping up clean energy investment – prioritizing wind, solar, energy efficiency and energy grid investment – to reach a ratio of USD 9 invested in it for every USD 1 spent on fossil fuels.**

These rules are essential to meet carbon neutrality and climate alignment pledges, deliver on the UN Sustainable Development Goals (SDGs) linked to energy, improve health worldwide and generate massive clean energy jobs. They are also in line with [the expectations of the UN High-Level Expert Group \(HLEG\)](#) published at COP27.

**While not sufficient to ensure the alignment of a financial institution with climate goals, following these rules testifies real commitment and responsibility. However, disregarding them means failing yet another litmus test for climate credibility and responsibility.**