Energy Security, Affordability and Sustainability: The Grand Alliance

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Introduction: Pursuing Climate Change Goals While Ensuring Energy Security

Since the 2021 United Nations Climate Change Conference (COP26), the UN has repeatedly warned that the international community is falling far short of the Paris Agreement goal of limiting global warming to 1.5°C this century.[1] Specifically, the organization believes "only an urgent system-wide transformation can avoid climate disaster." One UN study has even accused governments of procrastinating in their efforts. At COP26, all countries agreed to revisit and strengthen their climate plans to provide more aggressive climate targets; however, only 24 new or updated plans have since been submitted.[2]

That is surely disappointing. While it is true that governments' response has not been commensurate with the calls for concrete and immediate actions to save the planet from an imminent climate crisis, "procrastinating" may not be an accurate depiction.

In the last three years, the world has experienced a series of crises—from the Covid 19 pandemic to the war in Ukraine, among others—that crippled world economies, left many governments hugely indebted, contributed to record high inflation and further fueled higher energy prices and greater energy poverty. For the first time in decades, the number of people around the world without access to electricity increased in 2022, reaching 760 million people.[3]

Top Concerns Among Gen Zs and Millennials

	Cost of living	Unemployment	Climate change	Mental health of my generation	Crime/personal safety
Gen Zs	35%	22%	21%	19%	17%
Millennials	42%	23%	20%	19%	18%

Table 1. Deloitte survey of more than 22,000 people across 44 countries
Source: World Economic Forum, May 2023[5]

The cost of living has become the top concern for many, overtaking climate change (Table 1). The World Bank warned: "A lost decade could be in the making for the global economy... Nearly all the economic forces that powered progress and prosperity over the last three decades are fading."[4]

People want a green future with the world saved from violent climate extremes. They also want secure and reliable energy supplies, at reasonable cost, to guarantee uninterrupted light and warmth, to sustain their industries and to lift billions out of poverty as quickly as possible. Many have put those aims on a collision course, arguing that a choice has to be made. Other demands are also being voiced about what the energy transition ought to achieve, including equity and justice. All these legitimate goals and aspirations should not be seen as "either-or." On the contrary, they can and should be pursued in parallel, in order for the complex and challenging global energy transition to accelerate.

A Massive Transformation Is Needed to Achieve Climate Goals

To meet the Paris Agreement goals, the world needs to reduce greenhouse gases (GHG) by unprecedented volumes and at unparalleled speed, which is achievable only through a large-scale, rapid and systemic transformation. To hold global warming to 1.5°C, emissions must fall by 45% from those forecast under current policies by 2030; even to reach the 2°C target, a 30% cut is needed.[6]

The largest share and growth in gross GHG emissions occur in CO_2 from fossil fuels combustion and industrial processes, followed by methane, according to the Intergovernmental Panel on Climate Change (IPCC).[7] Lowering GHG emissions will therefore require a significant curtailing of the demand for fossil fuels—that is, oil, natural gas and coal. However, this has proved to be easier said than done.

The world's primary energy mix continues to be dominated by fossil fuels, which provide 82% of global energy used, with 7%, 4% and 7% coming respectively from hydropower, nuclear and modern renewable energy (primarily solar and wind). Oil continues to be the most-used fuel, and consumption of all fossil fuels continues to grow (Figure 1).

Even in the power sector, where all fuels can compete against each other most easily, the share of fossil fuels has declined only marginally over the last few decades. In this fast-growing sector, inter-fuel substitution has happened mostly within non-fossil energy (where renewable energy crowded out nuclear) and within fossil fuels (where natural gas crowded out oil and, to a lesser extent, coal). The substitution between green and conventional fuels has been much less pronounced (Figure 2).

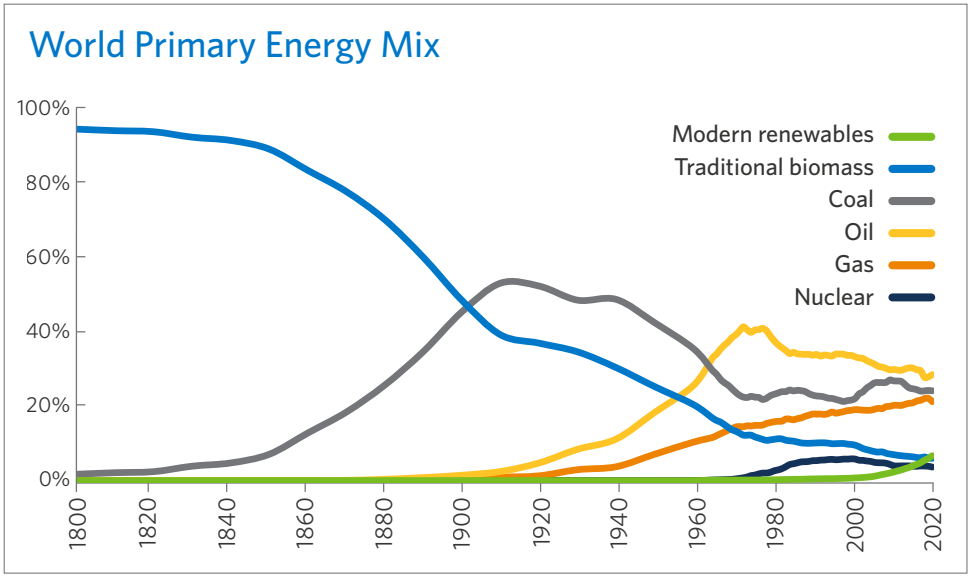


Figure 1. World Primary Energy Mix | **Source:** Energy Institute (2023)[8]; Vaclav Smil (2017)[9]

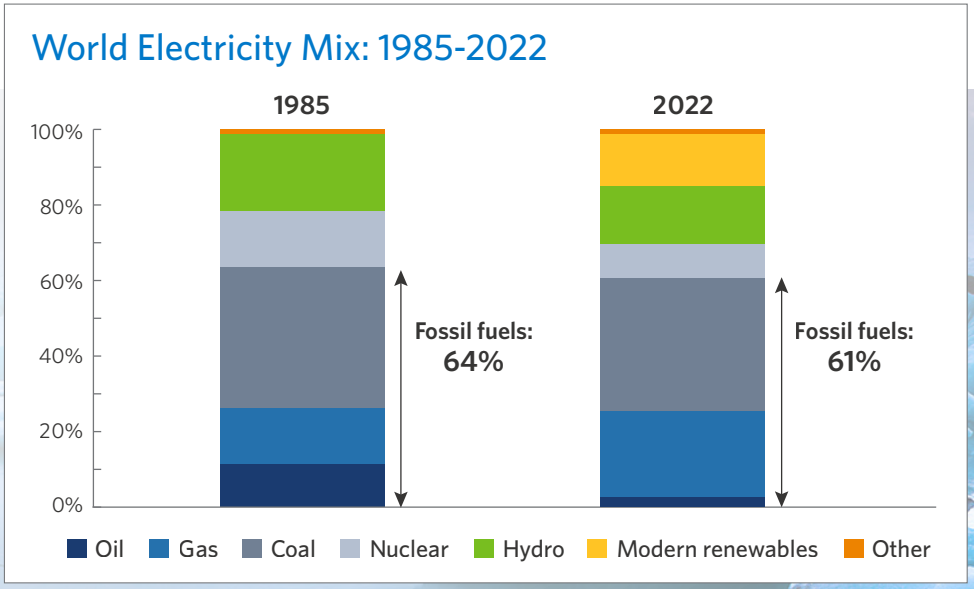


Figure 2. World Electricity Mix | **Source:** Energy Institute (2023)[10]

Substitution Has Been Limited

Substitution is driven by a whole host of factors, most importantly the relative price of competing fuels. Other realities, such as regulations or technology that affect the scalability of certain fuels, or changes in preferences (e.g., electric vehicles vs. gasoline-powered cars), also factor into substitution decisions. In the recent past, the substantial increase in fossil fuel prices triggered by the war in Ukraine in 2022 (Figure 3) might have been expected to provide a boost for green energy—at least in Europe, where these consequences have had the greatest impact.

However, two factors prohibited the market from adjusting instantaneously. First, energy prices are socially and politically sensitive. Energy enables people to meet basic needs, and its cost represents a large share of the expenditures of many households. High fuel prices may therefore trigger undesirable political reactions, such as diluting a leader's popularity, fueling social unrest or even toppling governments.

This is why policymakers typically feel compelled to act to ease the burden of high energy prices on households and businesses. Second, inter-fuel substitution cannot happen immediately if the technology and infrastructure for the reliable use of renewable energy is not readily available.

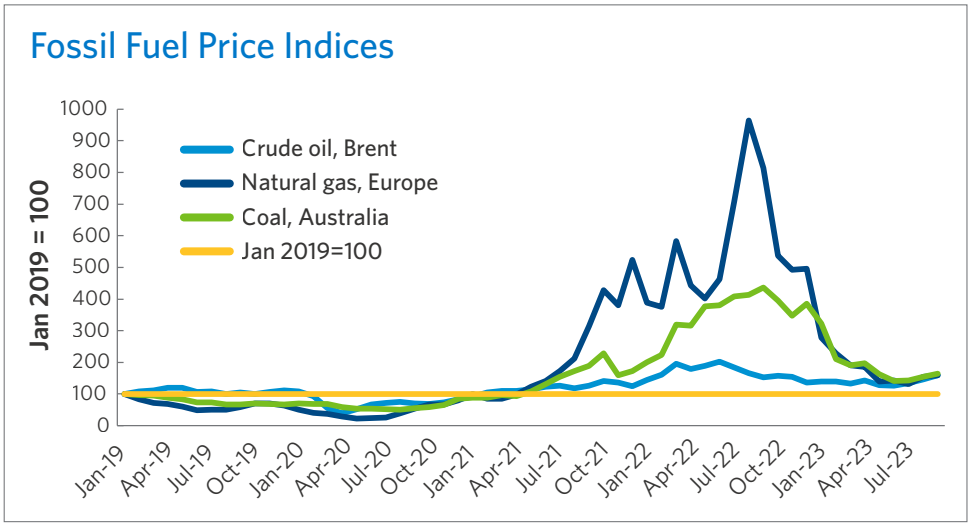


Figure 3. Fossil Fuel Price Indices | **Source:** The World Bank (2023)[11]

Substitution occurred in Europe, but it was largely confined to substitution between suppliers, with Russian gas replaced by gas from other countries, and (Russian) pipeline gas replaced by liquefied natural gas (LNG), including Russian LNG (Figure 4). In the United Kingdom, to reduce dependency on imports, the government awarded hundreds of licenses for North Sea oil and gas extraction in July 2023, and then in September announced it was delaying the ban on the sale of new gasoline and diesel cars to 2035, in addition to other measures that relaxed previous climate commitments.

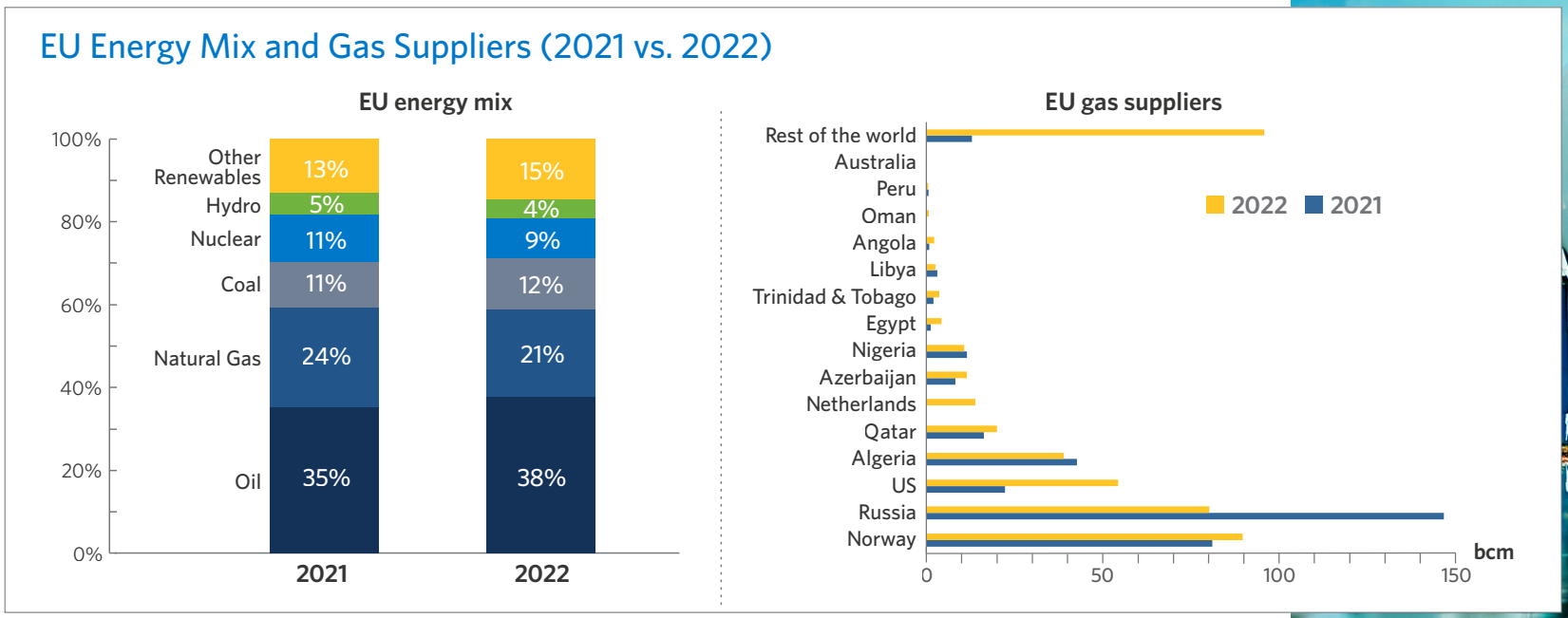


Figure 4. EU Energy Mix and Gas Suppliers (2021 vs. 2022) | **Source:** Energy Institute (2023)[12]

Affordability and Reliability Are Key Considerations

Energy security has always been an important pillar of energy policy among net importers, but in reality it is an issue that receives differing levels of attention depending on current conditions. In times of scarcity (even if only perceived), energy security becomes a topic of great urgency, only to fade into the background when supplies are plentiful and prices are low. Today, the issue is taking center stage once again.

Ensuring uninterrupted, reliable and affordable "access to all fuels and energy sources," as stated by the International Energy Agency (IEA),[13] has long been at the heart of energy security from the perspective of consumers.

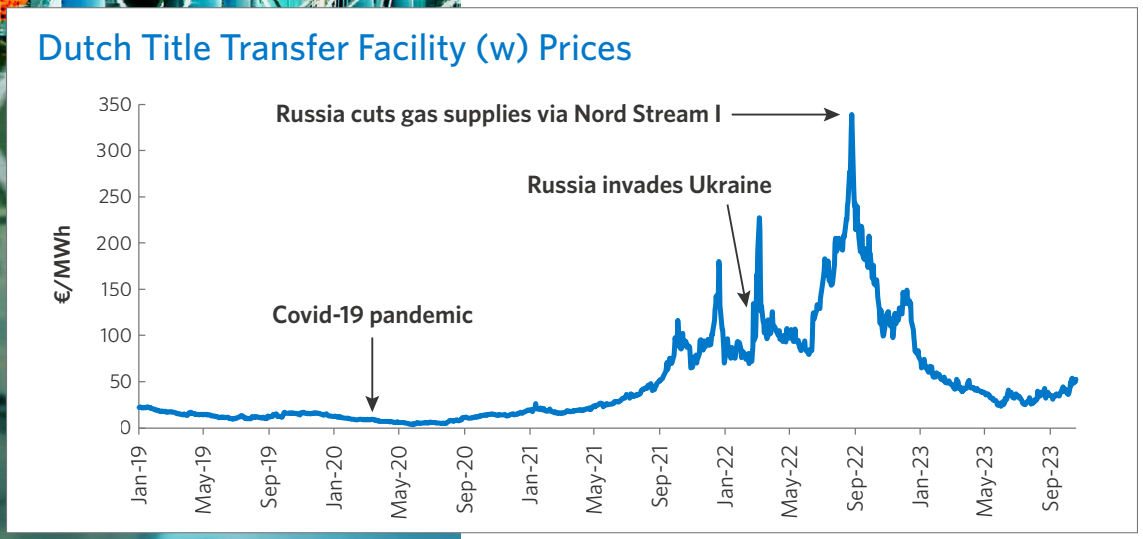


Figure 5. Dutch Title Transfer Facility (TTF) Prices | **Source:** Investing (2023)[14]

The agency notes that energy security has two main aspects:

- Long-term energy security, which mainly concerns timely investments to supply energy in line with economic developments and environmental needs
- Short-term energy security, which focuses on the ability of the energy system to react promptly to sudden changes in the supply-demand balance

In this respect, maintaining investment in all sources of energy to meet existing demand remains key to ensuring future reliable supplies. Furthermore, while volatility in prices has always been a feature of fossil fuel markets, the energy crisis of 2022 has also shown that fossil fuels can respond to that volatility rather swiftly. This is a key capability that is not currently available with green energy, where the output of the sun or the wind is not in our control. What happened in Europe in 2022 provides a good illustration. Only a few months after the war in Ukraine had started, causing serious disruptions to gas supplies and skyrocketing prices, LNG tankers were queuing at European terminals, which subsequently put downward pressure on prices (Figure 5).

Signs of Progress on Climate Goals

Despite the recent setbacks, progress has been made on the climate front. Almost everywhere, climate change is accepted as an existential threat for humankind. Investment in renewable energy continues. Governments are not canceling climate targets. Companies the world over, small and large, private and state-owned alike, are adopting measures to reduce their carbon footprints. More than 1,000 big companies to date have committed to setting emissions-reduction targets, and more than 340 have set net-zero targets across their operations and value chains.

Furthermore, while emissions grew globally, many countries have already seen their own plateau or the start of a decrease. US emissions peaked in 2005 and have declined by over 10% since then. Russia, Japan and the EU have also seen their emissions plateau, according to one report in MIT Technology Review.[15] Although global energy-related CO_2 emissions grew by 0.9% (321 million metric tons) in 2022, reaching a new high of over 36.8 billion metric tons, the growth was lower than feared, despite gas-to-coal switching in many countries.[16] Under the stated policy scenario (STEPS), the IEA expects a high point for global energy-related CO_2 emissions to be reached in 2025, at 37 billion metric tons per year, then fall to 32 billion metric tons by 2050.[17]

Technology has played a central role in accelerating the energy transition, as it improves the efficiency of operations and reduces the carbon footprint of conventional fuels while supporting the deployment of green energy. According to the UN, readily available technological solutions already exist for more than 70% of today's emissions.[18] Digital technologies—the Internet of Things (IoT), mobility and cloud technologies, machine learning and artificial intelligence (AI) in particular—are transforming the way the world produces and consumes energy.

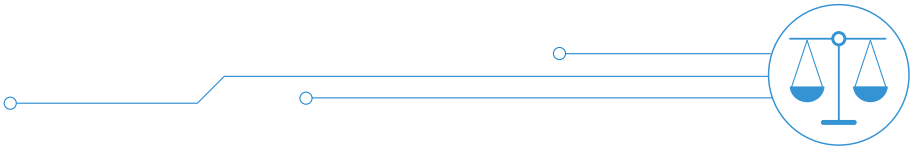
In a 2022 report, the IPCC argues that such technologies can contribute to the mitigation of climate change and the achievement of several sustainable development goals (SDGs).[19] The report cites AI as improving energy management in all sectors, increasing energy efficiency and promoting the adoption of many low-emission technologies, including decentralized renewable energy. Digital technologies to support decarbonization are now reaching the phase of industrial scaling, which will require partnerships for further development. However, what has been done is clearly not enough.

How Do We Ensure a Just Transition?

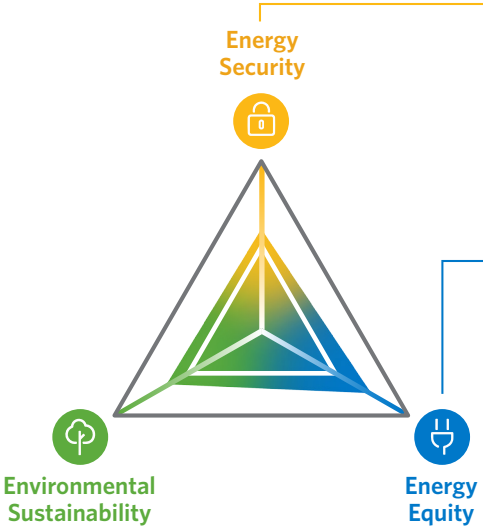
Technologies require the right regulatory and market framework, as well as the necessary funding, to flourish. In this respect, the government's role in providing an enabling environment is essential—and there are dangerous consequences that can come from the enactment of certain policies.

The excessive use of subsidies for green energy technologies, for example, has raised several concerns. On one hand, relying on spending measures to achieve net zero carbon emissions by 2050 is fiscally unsustainable, as it could cause a surge in public debt in some countries by up to 50% of gross domestic product, the International Monetary Fund (IMF) recently warned.[20]

On the other hand, poorer countries don't have the funds to subsidize green technology. The drain on their capital reserves raises another important aspect of the energy transformation, that of a just energy transition. According to the International Renewable Energy Agency (IRENA), "a just transition—where no one is left behind—is critical to meet justice and equity demands and ensure broad social acceptance of the profound changes the energy transition entails."[21]



WEC's Energy Trilemma Index



58/100 Countries
Reflects a nation's capacity to meet current and future energy demand reliably, withstand and bounce back swiftly from system shocks with minimal disruption to supplies.

83/100 Countries
Assesses a country's ability to provide universal access to affordable, fairly priced and abundant energy for domestic and commercial use.

69/100 Countries
Represents the transition of a country's energy system toward mitigation and avoiding potential environmental harm and climate change impacts.

Figure 6. WEC's Energy Trilemma Index
Source: World Energy Council (2022)[23]

Top & Worst Performers on WEC's Energy Trilemma Index

Top Performers		Bottom Performers	
Sweden	1	Tanzania	79
Switzerland	2	Madagascar	81
Denmark	2	Zambia	80
Finland	3	Pakiston	82
United Kingdom	4	Senegal	83
Canada	4	Nigeria	84
Austria	5	Nepal	84
France	6	Zimbabwe	85
Norway	6	Mozambique	86
Germany	7	Malawi	87
New Zealand	8	Chad	88
Slovenia	9	D.R. Congo	89
Estonia	9	Benin	90
United States	10	Niger	91

Table 2. WEC's Energy Trilemma Index
Source: World Energy Council (2022)[24]

The exploitation of the metals and minerals needed to produce solar panels, wind turbines and batteries for electric vehicles (among other key components), and which are largely concentrated in the developing countries, provide a good illustration of the justice dimension. The Democratic Republic of the Congo (DRC) accounts for more than 70% of global production of cobalt, which is an essential component of the rechargeable lithium-ion batteries used in EVs.[22] The DRC is also among the five poorest nations in the world. In 2022, nearly 62% of Congolese, around 60 million people, lived on less than $2.15 USD a day, according to the World Bank. Surely, EVs won't find a market there anytime soon.

The World Energy Council (WEC) publishes the energy trilemma index, which ranks countries in terms of progress on three competing demands: energy security, equity and environmental sustainability (Figure 6). Interestingly, the countries that have achieved the best performance on those three criteria are rich countries, whereas the worst performers are among the poorest (Table 2). The latter countries are also rich in hydrocarbon resources, as well as various metals and minerals, including those that are needed for the energy transition. In those countries, people have complained about what they described as "climate colonialism," which can negatively affect support for and the speed of the global energy transition.

A Grand Alliance Is Needed

Given the complexity, scale and desired speed of today's energy transition—three attributes that differentiate it from previous transitions (traditional biofuels to coal, then coal to oil)—it is unrealistic to expect a sudden end to conventional fuels. The oil and gas industry has an important role to play in enhancing energy security by ensuring reliable supplies as well as accelerating the energy transition.

Much has been done, and more can be done to improve efficiency and reduce emissions. With technology, there is always a new and better way of doing things. The infrastructure used for oil and gas activities can play an important role in the deployment of green technologies such as carbon capture and storage (CCS) and offshore wind power. The industry also has the capital to fund green projects.

Saudi Arabia, the world's largest oil exporter, is building the world's largest plant to produce green hydrogen at scale. Norwegian oil company Equinor is the world's leading floating offshore wind developer and operator, becoming the first company in the world with a running commercial park. The industry also has skills that can be deployed to support a rapidly growing green sector. According to one study, over 90% of the UK's oil and gas workforce have medium to high skills transferability and are well positioned to work in adjacent energy sectors.[25] The world's largest national oil companies are diverting substantial revenues from their traditional business to fund green projects. And the list goes on.

It is hard to imagine meaningful progress without collaboration and cooperation between various stakeholders everywhere in the world. The collaboration between American ExxonMobil, a global leader on CCS; Japanese Mitsubishi Heavy Industries, a leader in engineering; and American AspenTech®, a key digital player, is just one example. Mitsubishi Heavy Industries has used AspenTech's engineering software (Aspen Plus® modeling) to invent and improve their proprietary carbon capture technology, which has been adopted by ExxonMobil.

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Former British Prime Minister Winston Churchill once described the alliance between Great Britain, the United States and the Soviet Union as the "Grand Alliance," which was key to victory in World War II. In that particular case, a central objective aligned even the most diverging interests among the alliance.

Today, the climate crisis has far-reaching consequences that will affect generations to come. Averting it requires another Grand Alliance between various stakeholders around the world. Above all, it requires a unity of purpose between security, affordability and sustainability.

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