May 2022
McKinsey Quarterly

# The net-zero transition in the wake of the war in Ukraine: A detour, a derailment, or a different path?

**The invasion of Ukraine will, at least initially, complicate the transition path to a net-zero economy, but this tragic development could still prove to be a turning point in accelerating progress in the medium run.**

*by Hamid Samandari, Dickon Pinner, Harry Bowcott, and Olivia White*

**The Russian invasion** of Ukraine[1] has ushered in a humanitarian crisis of a scale not seen on European soil since the Second World War, a level of geopolitical tension not experienced since the Cuban Missile Crisis, and a set of rapidly evolving political, economic, and societal responses and counterresponses whose ramifications can scarcely be estimated at this point. Nor are there signs of an imminent resolution on the horizon.

As Russia is one of the world's largest producers of oil, gas, and commodities, one can naturally expect that the massive and universal effort required to address the world's looming climate crisis would also be swept up in the maelstrom. This raises the question of whether the war and its aftermath will prove to be a limited detour from the previous path of net-zero transition, or a true fork in the road and a far more consequential redirection.

It seems clear at this point the war will complicate the transition's path in the short term. In the longer term, however, the logic of energy security and economics could converge to kick net-zero transition efforts into higher gear. Bold moves would be needed at unprecedented speed to boost energy-efficiency measures and adopt renewable-energy alternatives to fossil fuels. If adopted, such actions could drive net-zero technologies down their respective cost curves and build a pathway to faster decarbonization in other regions.

[1] Russia's invasion of Ukraine in February 2022 is having deep human, social, and economic impact across countries and sectors. The implications of the invasion are rapidly evolving and are inherently uncertain. As a result, this article, and the data and analysis it sets out, should be treated as a best-efforts perspective at a specific point in time, which seeks to help inform discussion and decisions taken by leaders of relevant organizations. This article does not set out economic or geopolitical forecasts and should not be treated as doing so. It also does not provide legal analysis, including but not limited to legal advice on sanctions or export control issues.

Such outcomes would not be surprising in light of history; conflict has often accelerated energy transitions. The 19th century's naval wars accelerated a shift from wind- to coal-powered vessels. World War I brought about a shift from coal to oil. World War II introduced nuclear energy as a major power source. In each of these cases, wartime innovations flowed directly to the civilian economy and ushered in a new era.[2] The war in Ukraine is different in that it is not prompting the energy innovation itself but making the need for it clearer. Still, the potential impact could be equally transformative.

In this article we attempt to offer a more granular view of what might be in store. We examine the possible effects of the war and its ramifications on the key requirements for a more orderly net-zero transition. We explore the war's potential effect on key sectors and how shifts in energy and finance markets could play out in the aggregate, both globally and within major regional blocs. Finally, we suggest steps that stakeholders could take as they navigate this turbulent period while continuing to drive toward as orderly a transition as possible. To do so, we start by considering the net-zero context at the time the conflict began.

## A precarious moment

The invasion of Ukraine came at a time already marked by insufficient progress toward the net-zero transition. Challenging economic conditions threatened its acceleration, and accumulating physical risks made its necessity even more evident.

Even before the invasion, despite the rising tide of public- and private-sector commitments made in 2021, the world was not on a path to achieve net-zero greenhouse-gas emissions by 2050. Indeed, if all existing commitments were achieved, the world would still fail to stabilize global warming temperatures at 1.5˚C.[3] Moreover, most of these commitments were not yet backed by the required financial resources and execution plans.

As for the world economy, it was already suffering from several preexisting conditions. A once-in-a-century, multistage global pandemic has caused an estimated 25 million deaths,[4] increased global public debt by 28 percent to 256 percent of GDP,[5] shrunk global GDP by 3.3 percent,[6] and given rise to rapidly increasing inflation across the globe.[7] Supply chains were under significant strain, energy markets were already tight, and global commodity prices had risen to ten-year highs.[8] The war in Ukraine has exacerbated all these trends, affecting lives and livelihoods both locally and globally and threatening the most vulnerable with the potential for a marked decline in energy and food security and affordability.

[2] Vaclav Smil, *Energy and Civilization: A History*, Cambridge, MA; MIT Press, 2018; Alex Roland, *War and Technology: A Very Short Introduction*, New York, NY; Oxford University Press, 2016.

[3] Rebecca Burdon et al., "Realization of Paris Agreement pledges may limit warming just below 2˚C," *Nature*, April 13, 2022.

[4] As measured by excess mortality; Sondre Ulvund Solstad, "The pandemic's true death toll," *Economist*, accessed April 2022.

[5] Vitor Gaspar, Paulo Medas, and Roberto Perrelli, "Global debt reaches a record $226 trillion," International Monetary Fund, December 15, 2021.

[6] "GDP growth (annual %)," World Bank Group, accessed April 2022.

[7] "Inflation (CPI)," OECD, accessed April 2022.

[8] "Global price index of all commodities," St. Louis Fed, accessed April 2022.

At the same time, the manifestations of climate change—among them unprecedented heat waves in India and worsening drought in the American West—continued to multiply. In that context, the *Sixth assessment report*,[9] published by the United Nation's Intergovernmental Panel on Climate Change, issued a few days after the invasion provided a stark warning that climate change was already exerting substantial effects on human and natural systems, that these effects would scale in nonlinear fashion in the face of continued warming, and that the window for avoiding the most catastrophic effects of climate change was fast closing. As we examine the potential impact of the current conflict on climate action, it may also be worth noting that the absence of climate action could well increase by itself the risks of future conflicts, within and across nations, as a result of contention over scarcer resources such as food and water.

## The war's impact on the key requirements for the net-zero transition

In earlier research we described the nine key requirements that we believe must be met to bring about the net-zero transition. These fall into three broad categories: necessary physical building blocks; economic and societal adjustments; and governance, institutions, and commitments, including public support for progress toward cutting greenhouse gases. Understanding the war's potential impact on each of these could help leaders better assess the prospects for the net-zero transition.

**In the near term, the availability of necessary physical building blocks could be reduced in the aggregate**

The transition requires three main physical building blocks: technology innovation, the creation of the supply chains that enable the deployment of new technologies, and the availability of the key natural resources needed. These three factors are subject to developments such as the interruption of production centers in Ukraine, economic sanctions against Russia, and reduced economic cooperation between nations. In the near term, technological innovation would likely speed up as stakeholders affected by rising energy or commodity inputs look for more economical substitutes or further see the importance of compensating measures such as carbon capture and sequestration. Indeed, since the war began a substantial influx of capital into renewable energy funds has taken place, reversing a multimonth downward trend.[10] On the other hand, while in the short-term desire to expand net-zero infrastructure may increase, its execution may be challenged by the logistical stresses of market reorganization (due to sanctions) and rising energy prices, which could stress the often complex, multinational (and therefore transport-intensive) supply chains for net-zero technology.

In our view, however, the dominant near-term impact on the physical building blocks would be negative and come from reduced access to key natural resources. For example, Russia's strong position in natural resources, including key minerals such as copper, and comma: nickel, and silicon,[11] has already delivered a significant supply-side shock (Exhibit 1). These materials are essential inputs to four of the most important net-zero

[9] *Sixth assessment report*, Intergovernmental Panel on Climate Change, updated April 4, 2022.

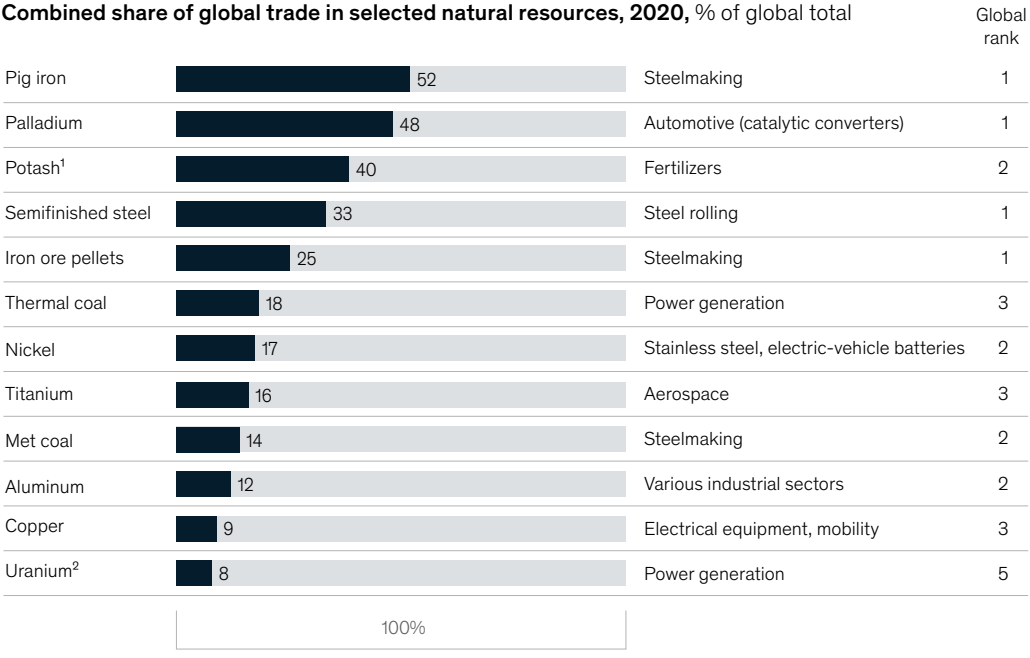
[10] Pippa Stevens, "Investors are plowing money into clean energy funds as Ukraine war puts energy needs in spotlight," CNBC, April 3, 2022.

[11] Russian Federation Minerals Exports by Country in US$ Thousand 2019 Database, World Integrated Trade Solution, accessed April 2022.

Exhibit 1

## Ukraine and Russia have significant share of global trade in many commodities.

**Combined share of global trade in selected natural resources, 2020,** % of global total




[1]Potash share includes Belarus data.
[2]Uranium lacks trade data; production share/ranking shown here.
Source: AME Group; EUPipeFlow; International Energy Agency; LNGFlow; MineSpans; *Resources and Energy Quarterly*; Spire; McKinsey analysis

technologies: onshore and offshore wind turbines, solar panels, electric vehicles, and battery storage. Shortages driven by the war in Ukraine would overlay an already stressed renewables supply chain, which drove long-term contracts for wind and solar generation up 19 and 12 percent, respectively, over the past year.[12]

That said, the impact of shortages on the attractiveness of net-zero technologies is not straightforward. For example, renewable-generation assets require one-time capital expenditures but minimal operating costs. As a result, input cost increases may impact the power sector less than sustained increases in fossil-fuel prices. Resource supply shocks may be felt less in Europe (which is more susceptible to sustained fossil-fuel price increases) than in the United States, where energy prices would provide less of a counterbalance to input costs. Furthermore, some large net-zero technology-producing countries are not participating in sanctions against Russia and could retain access to supplies, potentially leading to uncertainty in cost impacts for their trading partners. Likewise, the prospect of the ongoing shortages is already spurring a wave of prospecting for alternative sources, which would likely have a positive impact in the medium term.

Finally, it is important to note the near-term impact on a critical but often overlooked natural resource for the net-zero transition: land. In addition to their role in exporting a wide range of minerals, Ukraine and Russia are important producers of key agricultural

[12] Katherine Blunt and Jennifer Hiller, "Ukraine war drives up cost of wind, solar power," *Wall Street Journal*, March 27, 2022.

commodities. Shortages resulting from sanctions and destruction of Ukrainian production centers are likely to reduce the availability of key agricultural commodities including wheat and fertilizer. Additionally, climate forecasts for 2022 indicate it could be a below-average period for breadbaskets globally,[13] resulting in an additional reduction in supply. Supply shortages and price increases in agricultural markets could lead to conversion of additional land to agricultural production across the globe, which would increase deforestation rates and agricultural emissions.

**In the near term, the impact on effective economic and societal adjustments would vary across geographies**

The economic and social adjustments needed to reach net zero in a more orderly manner depend on management of demand shifts and unit costs, compensating mechanisms to address the socioeconomic impacts of transition, and effective capital allocation and financing structures. In the near term, management of demand shifts and unit costs could be positively affected, as increased energy costs move forward the break-even point for decarbonization solutions for many hard-to-abate industries, and commodity shortages boost movement toward increased recycling. However, the war in Ukraine has introduced new domestic priorities in many countries—including increasing defense spending, blunting the regressive impacts of rising energy prices—and providing humanitarian aid. This could negatively affect compensating mechanisms, particularly with respect to the flow of capital from the Global North to Global South. Even before the war, the flow of capital to developing nations was already almost 20 percent below the developed nations' pledge of $100 billion in annual aid by 2020.[14]

Overall, we believe that the dominant near-term impact on economic and social adjustments would be a shift in capital allocation and financing structures toward increased fossil-fuel production in response to rising prices.

In Europe, rising energy prices would drive an increase in short-term capital allocation to fossil-fuel production and consumption, particularly from existing or recently decommissioned assets. This is not because renewable alternatives are not economical or available or cannot be deployed. Rather, these alternatives would take time to deploy, and the rise in energy prices poses an immediate economic and political crisis that must be addressed. Furthermore, a move to diversify sources of fossil-fuel imports is likely, in the interest of both price and energy security, although diversifying away from Russian gas would require time to overcome logistical hurdles, contract negotiation, pipeline-capacity restrictions, and import-facility development, as demonstrated by Europe's purchase of more than $46 billion in Russian gas since the invasion of Ukraine.[15] Finally, where lowering price is not possible via increased domestic production or source diversification, a shift back toward cheaper but more emissive fuels, such as coal, is likely, and already being observed in, for example, Germany.[16] As for parallel investments in accelerating the deployment of net-zero technologies, there may be a contention for resources with other immediate needs such as defense, mitigation of the most regressive impacts of energy price increases, and humanitarian action.

[13] Jeff Tollefson, "What the war in Ukraine means for energy, climate and food," *Nature*, April 5, 2022.

[14] Jocelyn Timperley, "The broken $100-billion promise of climate finance—and how to fix it," *Nature*, October 20, 2021.

[15] Jack Guy, "Europe has bought $46 billion worth of Russian energy since the Ukraine war began," CNN, April 29, 2022.

[16] Nikolaus J. Kurmayer, "Germany reactivates coal power plants amid Russian gas supply threats," Euractiv, March 10, 2022.

In the United States, the near-term trend is also likely toward increasing fossil-fuel production to address domestic price rises and to support the diversification of European supply. The medium- to long-term trend is less certain. Given abundant domestic fossil-fuel reserves, the United States is less susceptible to energy price increases, but equally exposed to shortages of key net-zero materials. The economics of transition may not improve as much in the United States as they could in Europe, nor would the concerns about energy security be as severe. One potential impact on the medium-term energy landscape in the United States could be an acceleration of the displacement of more expensive and more carbon-intensive oil on the global market with Permian oil from the US Southwest, which is a key step for a successful net-zero transition, given that some level of oil demand will remain through to the late stages of the transition. We would also note that the United States also faces a unique opportunity to reduce its fossil-fuel consumption through the implementation of broad energy-efficiency policy, discussed in more detail below, which could lower costs for consumers, improve energy security, and make progress toward its climate goals.

Finally, in Asia there is a risk of a shift back to coal in the near term. If sanctions reduce access to the pipelines Russia primarily uses to transport oil and gas to Europe, it will take time for Russia to build alternative pipelines to tap the Asian market. With the market for natural gas likely to tighten substantially, the resulting price rise could push less economically robust consumers in Asia out of the market and back toward coal, which is abundant, cheap, and more lightly regulated.

**Governance, institutions, and commitments could weaken at the international level but strengthen in regional and private spheres in the near term**

The success of governance, institutions, and commitments depends on three conditions: having the necessary standards, market mechanisms, and effective institutions in place; commitment by and collaboration among public-, private-, and social-sector leaders; and support from citizens and consumers. In the near-term, the invasion of Ukraine could weaken all these requirements globally, but also strengthen a subset of them in regional and private spheres.

The war could negatively affect international cooperation and jeopardize the creation of the international standards, agreements, and institutions that a more orderly transition requires. Furthermore, the introduction of competing priorities at all levels could deprioritize decarbonization and transition for decision makers. For example, survey data support a short-term weakening of attention on climate across the public.[17]

While a move toward increased national rivalries and the introduction of competing priorities could negatively affect international cooperation on many fronts, many major economies, including China, have entrenched incentives to continue to support global action on the net-zero transition, given their large and continued investment in producing green technologies and components. For example, China produces a third of global wind

[17] IPSOS polls of approximately 20,000 people across 30 countries between August and September 2021, and February and March 2022, showed climate falling from the fifth-most pressing issue (ranked behind cost of living, COVID-19, poverty, and the healthcare system in 2021) to the eighth-most pressing issue in 2022, where it was overtaken by war (the second-highest concern globally), crime, and education prospects; "Earth Day 2022: Global attitudes to climate change," Ipsos, April 18, 2022; *Obs'COP 2021: Presentation of the findings of the International Climate and Public Opinion Observatory*, EDF and Ipsos, December 2021.

turbines, 70 percent of global solar photovoltaics, and is home to three-fourths of the world's global capacity for lithium-ion battery manufacturing.[18] Importantly, commitment by and among private- and social-sector leaders could also be strengthened in response to diminished international cooperation. Most corporate and social-sector entities are multinational, benefit from coordination, and thus have incentives to maintain strong international ties.

## A short-term detour or a long-term deviation?

Considering these new forces and differing effects, we believe that the war would overall have a negative impact on the key requirements in the short term and cause a detour on the path of a more orderly transition. The long-term impact, however, could still prove a positive turning point if leaders act with farsightedness and courage and if they are supported by a growing popular mandate in doing so.

This future hinges on two things. The first is that the scope of the war in Ukraine remains contained and does not widen. The net-zero transition would very likely be derailed by an expanding conflict, and a derailed transition could in turn multiply, by orders of magnitude, its catastrophic impact. The second is that an acceleration of the transition postconflict would only be possible given sufficient commitment from public-, private-, and social-sector leaders to recognize that investments in renewables, energy efficiency, and decarbonization are not causes of energy price increases and insecurity but solutions to those problems. Forward-looking leadership will require leveraging the awareness of the moment to seek a broad public mandate and to leverage that mandate to make substantial, thoughtful, near-term investments in these solutions and their supporting supply chains.

For example, while commodity shortages and price increase may exhibit a negative impact on the transition in the near term, supply chain chokepoints, like lithium production in battery components, have long been identified as limiting factors to transition speed.[19] The present supply shock highlights a clear need and opportunity to make investments in expanding and securing supply of key minerals, which will not only have benefits for future transition speed, but also for lowering the costs of other common consumer goods, particularly electronics, that require the same inputs.

While near-term energy price rises could result in an increase in fossil-fuel production and a revival of recently decommissioned generation assets, in the long term, energy-security concerns could drive investment into energy efficiency and renewable energy as a key tool for energy independence and price management. For example, the latest proposed RePowerEU plan put forth by the EU Commission on May 18 includes plans to almost double European biomethane production and triple capacity of green hydrogen via production increases and imports by 2030, a massive deployment of 510 gigawatts of installed wind and 600 gigawatts of installed solar photovoltaic power by 2030, the

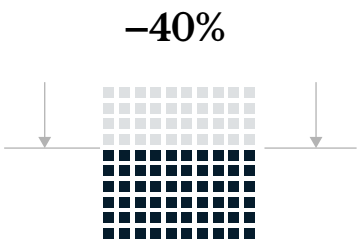
[18] Sarah Ladislaw and Nilos Tsafos, "Beijing is winning the clean energy race, " *Foreign Policy*, October 2, 2020.

[19] Neil Winton, "Lithium shortage may stall electric car revolution and embed China's lead: Report," *Forbes*, November 14, 2021.

Exhibit 2

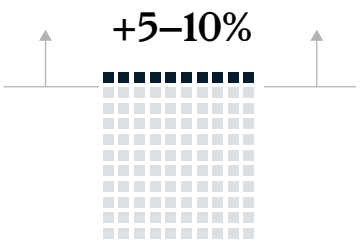
## Energy efficiency is imperative to tame total production costs that rose by 50 percent in recent months.

**Potential energy reduction**




Heavy industry planned to reduce 50% of their energy and $CO_2$ footprint by 2030. Current utility prices make most of these business cases attractive much more quickly. Pulling forward high-impact cases could secure up to **40% energy-cost reduction** over the next 2–3 years.

**Potential EBITDA[1] advantage**




Companies taking bold action and performing at speed could make energy efficiency and supply a competitive advantage worth **5–10% EBITDA margin** over sales, while abating their $CO_2$ footprint by more than 40%.

[1]Earnings before interest, taxes, depreciation, and amortization.

installation of about 30 million heat pumps, the enhancement of domestic manufacturing capability, and a substantial simplification of approval and permitting processes for renewable generation and infrastructure development projects, all over the next eight years. Such policies could be further accelerated by the fact that despite input price rises, construction of net-new solar and wind capacity remains faster and more economical than coal or natural gas.[20]

Energy-efficiency measures have long been economically viable,[21] but have often failed to attract sufficient public mandate for deployment.[22] Survey data now suggest 80 percent of European citizens support government subsidies for improving home energy efficiency. Similar levels of support are also seen in the United States, where 89 percent of respondents to a March 2022 Gallup poll demonstrated support for tax credits for home renewable-energy systems, 71 percent setting fuel-efficiency standards for cars, trucks, and buses, and 61 percent tax incentives for the purchase of electric vehicles, among other policies.[23] Some of these tax incentive splits show majority bipartisan support.

In addition to driving the uptake of renewable energy and energy efficiency, current utility prices could make the business case for hard-to-abate industry decarbonization more attractive. Putting forward high-impact, ready-to-deploy cases could secure up to 40 percent energy-cost reductions and deliver significant additional earnings (Exhibit 2).

Finally, the current situation further underscores the importance and urgency of adaptation. Even a short-term detour is still a detour and a further accumulation of

[20] *Leveled cost of energy, levelized cost of storage, and levelized cost of hydrogen*, Lazard, October 28, 2021.

[21] "Net zero or bust: Beating the abatement cost curve for growth," McKinsey, April 13, 2021.

[22] Jeffrey M. Jones, "Climate change proposals favored by solid majorities in U.S.," Gallup, April 11, 2022.

[23] Ibid.

physical risk. Actions and investments in adaptation were already inadequate before the war and are even more so at this juncture.

## Navigating the moment, driving toward transition

Our earlier research catalogued the actions that key stakeholders could take with respect to the net-zero transition. We will not reiterate them here but focus on the key actions that we believe have become more timely and critical in light of the conflict.

Governments can't accomplish the net-zero transition alone. Private-sector leaders have an opportunity to assume more prominent roles in advancing this critical goal. Success, however, requires visionary and forward-looking leadership at both individual and institutional levels. In that connection, companies could consider three actions:

- *Strengthen the risk identification and response muscle*. One consequence of the war is a clear increase in global volatility. Now more than ever, it is important to develop a robust capability for managing under uncertainty. A key requirement is to be able to identify and respond in real-time to rapidly evolving circumstances, whether they be related to supply chain function or acceleration of transition risks. The need is certainly not new, but its intensity and the magnitude of the effort required even for the most mature corporations are.

- *Accelerate decarbonization of core operations*. Companies would benefit from focusing on levers most directly under their control (such as their production process) or those that provide strategic advantage by hedging against energy price volatility or future transition risk. This would be particularly true for commodity firms experiencing cash windfalls with high prices. This also means building a strong green procurement muscle, with respect to both raw materials and components, reflecting new risks and realities. Industry associations and public–private collaboration would likely also be required to address supply constraints.

- *Support multinational cooperation*. International sustainability agreements, commitments, standards, and practices can also be championed and driven by industry associations and ecosystems. Corporations could and should endeavor to increase the momentum through their commitments and actions at this juncture. This means taking a leadership role at the company level, at the industry level, and within ecosystems as users can help influence providers and their practices. This leadership could indeed prove a critical factor in determining the impact of the war on the prospects of the net-zero transition.

For *government leaders*, a more active role in energy markets seems natural in light of conflict. The rise in energy and commodity prices, as well as in concerns about energy security, gives leaders an unprecedented opportunity to accelerate the deployment of net-zero technology. Governments could consider three sets of actions in particular:

- *Develop an integrated economic and national resource strategy*. This could include working closely across departments and with industries to develop a roadmap

identifying and coordinating the policy, innovation, infrastructure, and financial inputs necessary to achieve decarbonization and energy security commitments. This would also include developing plans for facilitating the retirement, and minimizing the impact, of stranded assets (and very carefully optimizing and guiding the deployment of the new high-emissions assets that may be required in the short term in certain geographies). Finally, this would mean accelerating efforts to project future mineral resource requirements under various scenarios and defining as resilient and diversified an approach as possible to securing those resources.

- *Establish clear demand signals*. This could entail putting in place or enhancing a range of incentives and requirements for the deployment of key net-zero transition technologies, accelerating emissions-reduction (and therefore energy security) commitment timelines, and deploying regulation to price or phase out emissive assets over time. However, it is critical that demand signals be coordinated with a supply strategy in the spirit of the previous two points. And all of this is of course in the context of managing the short-term risks that energy systems face.

- *Deploy (further) financial incentives/guarantees and enhance guardrails*. This could mean deploying public funds and creating financial incentives to accelerate deployment of proven net-zero technology, particularly across energy efficiency and renewable generation. This would also mean reforming permit and approval processes to deploy net-zero technologies and infrastructure faster, for example the installation of wind and solar farms. In parallel, this could mean tightening the permit and approval processes for the development of emissive assets that would be "stranded on arrival."

Finally, the role of *finance* will continue to be critical. Financial institutions would benefit from three sets of actions:

- *Develop a more robust approach to reducing financed emissions*. In a world where emissions could well increase in the short term, strategies that were designed to see a linear and constant decrease in financed emissions are likely to be untenable. Financial institutions need to think through—at least initially—more complex decarbonization paths for companies and provide the right support and incentives to companies on these paths.[24] They also should continue to refine their ability to understand their financed emissions and work closely with clients on an orderly and gradual path of decarbonization.

- *Build capability to identify and capitalize on new decarbonization opportunities*. As fossil-fuel prices rise and renewable prices continue to fall, new decarbonization solutions along the marginal-abatement cost curve become economical. Financial institutions could build at greater scale the capability to identify and capitalize on the opportunity to finance these emerging opportunities.

- *Develop and scale new financial products and structures to help companies wind down legacy assets*. Solutions could include special-purpose vehicles that would

[24] The standard emerging approach for improving financed emissions sophistication is the application of portfolio alignment tools. For more information, see the guidance published recently by the Financial Stability Board's Task Force on Climate-Related Financial Disclosures and the COP26 Private Finance Hub: *Measuring portfolio alignment: Technical considerations*.

enable companies to ring-fence legacy-emitting assets and retire them in line with a science-based, net-zero pathway; financing structures such as long-term purchase agreements from renewables plants (with lower total life-cycle costs) to replace coal-generation assets; and new financial instruments (for example, for negative emissions or for nature-based solutions).

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The war in Ukraine has not only unleashed a humanitarian tragedy but has also dealt the effort to achieve net-zero greenhouse-gas emissions a powerful supply-side shock. Yet for public- and private-sector leaders willing to take the necessary bold steps, the new logic of energy security and economics holds the promise of making this a turning point in seizing the opportunity to address the globe's unfolding climate crisis. Q

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The authors wish to thank Carter Powis, Marcelo Azevedo, Hauke Engel, Sven Smit, Dan Stephens, Humayun Tai, Raffael Winter, as well as Spencer Glendon of Probable Futures and Matt Rogers of Mission Possible Partnership for their contributions to this article.

Designed by McKinsey Global Publishing