



MANAGING TURBULENCE IN GLOBAL ENERGY MARKETS

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EXECUTIVE SUMMARY

Broad geopolitical trends and forces are impacting the energy sector and the clean energy transition — and vice versa — and this turbulence is occurring as the realities of climate change unfold. In some ways, the current global energy situation has returned to where things were before the pandemic and the invasion of Ukraine, with fossil fuel demand largely back to pre-pandemic levels. The world is in a very different macroeconomic environment, however, with much higher borrowing costs. Upstream oil and gas investment also has not yet returned to pre-pandemic levels (though technological change, capital efficiency, and declines in demand in key markets may avoid a deficit in supply). In addition, a new clean energy economy is emerging quickly, though there is unevenness in the pace of change across geographies and in levels of investment across technologies.

The global energy crisis affected world actors in vastly different ways. In Europe, there were some initial supply disruptions and higher prices, but the European energy system proved to be more adaptable than anticipated. The crisis posed challenges for Europe's energy transition, but it also increased Europe's level of ambition on technologies seen as key pillars of the transition. European energy security going forward will be enhanced by more (not less) interconnectedness and a diversified import base. As bad as the energy crisis was in Europe, it has been felt most acutely in developing and emerging economies, many of which have struggled with high costs, energy shortages, and other impacts. Some

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countries priced out of expensive natural gas imports are moving away from gas, while others are not, and there are countries working to increase their uptake of energy efficiency technologies and renewable energy. Developing and emerging economies that are fossil fuel producers, meanwhile, have been benefiting from the crisis, particularly Gulf state producers, which are investing a lot of capital in both clean and fossil energy. Russia has proven to be more resilient than anticipated, under international pressure and sanctions. While Russia's connection to Europe and relationship with the West are the worst they have been in decades, its relationships with China and other developing and emerging economies have gotten stronger. Many countries, though, are trying to avoid taking part in great power competitions and strategic rivalries, causing global fragmentation into a range of alignments and non-alignments.

Investment in clean energy deployment in developing and emerging economies must be accelerated. Public and philanthropic money can invest in building capabilities in project preparation, administration, and regional cooperation.

Governments in emerging economies can also tackle project headwinds (e.g., difficult permitting) to create more attractive value propositions for investment. Financial flows that are conditional on good regulatory behavior can be levers for reform, but they can also open the door for others to come in that do not insist on such reforms. The ability to move to clean energy has been further hindered in many parts of the world by the high cost of capital, particularly given the huge fiscal pressures and levels of debt distress in many low-income countries. The old project finance model may no longer be fit for purpose, requiring new types of guarantees and additional mechanisms that can expand available capital. These issues are all very much at play in Africa, where countries face major investment hurdles. With sovereign credit ratings worse and — as in other developing and emerging economies — fiscally constrained governments not providing guarantees, clean energy projects are not getting to the finish line. Blended finance and domestic capital can play key roles, particularly given the limitations that development finance

institutions and Western governments place on the projects they will finance. There is also a sense in many African countries that the West — particularly Europe — is being hypocritical in wanting oil and gas from Africa (especially during the crisis) but not investing in oil and gas development in Africa. Securing finance for mining in Africa and other developing and emerging economies is similarly difficult, despite mining's importance to the transition.

Particularly in emerging economies, state-owned enterprises are important actors in the energy system that require more attention in the transition. Bridging market signals and government directives, these enterprises may take on risks and roles that private sector actors would not, potentially including buildout of transmission infrastructure and demonstration of complex, innovative, low-carbon technologies. To help state-owned companies make decisions to move toward decarbonization, the most effective incentives may be direct interventions and signals by government leaders, in contrast to something like carbon pricing that would have more impact on the private sector. Mobilizing financing for state-owned power companies to support their clean energy transitions can also be an important lever. Global finance markets generally have not been helpful for most state-owned companies — with investors concerned about cash flows, public perceptions, and the presence of fossil fuel assets — but some companies could take the route of developing dedicated subsidiaries for clean energy assets and bringing those to banks for financing.

All of these challenges and crises are taking place against the backdrop of a complicated and evolving global trade landscape. The world has seen a return of industrial policies and a larger role for governments in thinking about issues of energy security and competition as countries seek to gain a foothold in the new clean energy economy. The return of industrial policy in some nations has been driven at least in part by concerns about the concentration of technologies and materials in China, but those risks should be unpacked to better understand where it is acceptable to allow concentration and where real vulnerabilities arise. Trade can enable the transition, though different kinds of trade issues may emerge during the transition. For example, trade policy needs to pay more attention to cross-border trade of electricity and zero-carbon fuels, while countries have to make decisions about which products and fuels in the clean energy transition to produce and use domestically, which to import, and which to export. The transition economy is already being heavily debated and fought over, and the world may need to revise trade principles in light of the urgency of the transition. Developed countries are considering using trade measures to coerce other countries to do more on climate — an approach that is finding both opposition and pockets of support in developing countries and that faces some significant data and verification challenges. All in all, there is a real crisis of confidence in trade. Bringing along policymakers and the public can be challenging, and there are deep levels of distrust between global traders. If everything is decoupled, however, it will delay decarbonization. The world has to make the transition happen with one system, which will require collaboration.

TURBULENCE & TRENDS

A number of unfolding trends have been brought to the fore and exacerbated by Russia's aggression in Ukraine, leading to global energy turbulence. Across the globe, energy systems, energy security, geopolitics, and the energy transition are all increasingly critical to thinking about the future.

A CONFLUENCE OF FACTORS

Energy security is again at the front of the agenda. Energy security is an important policy priority in many countries, especially with heightened geopolitical tensions, world divisions, war in Ukraine, and difficulties in securing investment.

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The broad geopolitical trends and forces underway are impacting the energy sector and the clean energy transition, including the return of great powers rivalries, market fragmentation, trade conflicts, sanctions, and the global rise of middle powers. The inverse is also true, as developments in the energy sector, the renewed focus on energy security, and the clean energy transition are affecting foreign policy and a rapidly shifting international order. The energy transition has to move faster, but if energy security, affordability, or reliability are (or are even perceived to be) compromised, that will slow the transition.

All of the turbulence and forces are occurring against the backdrop of the unfolding realities of climate change. Climate change is affecting people now, but there is also demand for energy that has to be met now. Climate change itself is having geopolitical impacts, and decisions to either accelerate or slow the clean energy transition will likewise be sources of geopolitical risk in the coming years and decades. Some argue for a more pragmatic, realistic, and balanced approach to climate change in order to preserve energy security, given how incredibly difficult it is to change the global energy system. On the other hand, tipping points (e.g., widespread social unrest) can happen as climate impacts intensify. It is worth thinking about the political and geopolitical implications over the next 5-20 years of falling far short of climate goals. If the

poorest countries are struggling to afford energy, that can breed more resentment against rich countries, but the same is also true if developing and emerging economies are experiencing ever more frequent and severe floods, droughts, and other impacts. For these and many other reasons, the energy transition is likely to unfold in messy and disorderly ways.

TRENDS IN FUELS & TECHNOLOGIES

The current global energy situation is something of a return to where things were in 2019, pre-pandemic. Oil demand in 2023 for pretty much all products is back to 2019 levels, natural gas consumption has already bounced back to pre-pandemic levels, and 2022 was probably a record year for global coal demand.

Not everything is the same, of course. Some aspects of natural gas security remain perilous, though the United States has been central to providing supplies to address problems, is the largest natural gas exporting country in the world, and has a lot of new capacity coming online. The world is also in a very different macroeconomic environment than in 2019.

Borrowing costs, for instance, are much higher, and rising interest rates globally and regionally could change volumes and compositions of energy investments. The world is entering a stage of the energy transition after the age of cheap money, which entails a unique set of challenges.

One of the few pieces of the global energy picture that has not yet returned to 2019 levels is upstream oil and gas investment. There was more capital spending in 2022 than 2021, but expenditures have not returned to 2019 levels, much less to the peak levels of spending in 2014-15. If there is substantial demand growth, limited production capacity could be a problem in the future, especially with declining investment in exploration and production in many parts of the world. Many analysts expect a deficit. Looking at spending levels alone, however, does not take into account technological change and the efficiency of capital. Consolidation in the industry and other forces have led to less spending, but longer laterals, re-fracking, and other approaches mean the efficiency of capital is much greater than it was – which means supply could be available.

A critical issue is what is happening in fossil fuel demand. Demand projections from the Organization of the Petroleum Exporting Countries (OPEC) may be inflated. Gas demand in Europe has declined and will not rebound because of efficiency gains and migration of industry out of the continent. Diesel demand is either peaking or has already peaked, depending on which jurisdiction one is considering. China had a brief spurt of oil demand for mobility, but looking forward, electric vehicle (EV) penetration is rising, gasoline demand is expected to peak soon, and fossil demand has been coming down rapidly. That leaves demand growth from petrochemical projects (which do not have to be based on oil) and from jet fuel. Demand from key markets does not seem to be there, and supply from non-OPEC countries looks to be higher than demand growth. Even with OPEC's efforts, prices are relatively low because the supply-demand balance warrants it. There may be some deficit in summer, but supply may well outweigh demand by the end of the year.

That said, China's exposure to global markets for oil and gas is not shrinking, even as its demand growth slows. China seems to be building more energy inventory than it will need, which could impact global balances of fossil and clean energy. China, learning from the situation with Russia after the Ukraine invasion, is looking to sanction-proof its economy. It is nationalizing its oil and gas supply chains (and has been for a long time) through trading and shipping. It is contributing to the fragmentation of oil markets with both sanctioned and non-sanctioned crude.

Looking further ahead and aggregating all the elements, fossil fuel demand is likely to peak before the end of the 2020s. Coal is projected to head downhill in the mid-2020s, gas demand is expected to plateau by the end of the decade, and oil demand is projected to flatten in the early 2030s. That is still a long way from a trajectory consistent with the climate goals in the Paris Agreement, but things are shifting in interesting ways.

Since 2019, there have been 3-4 years of consistently high global greenhouse gas emissions, with implications for the pressures on the global climate. The 1.5°C target is a window that is closing fast. Huge increases in renewables deployment are needed to stay on track for global climate goals, and change in the energy sector has accelerated, with a new clean energy economy emerging quickly. There is now a large-scale movement towards transition to clean and renewable energy, as energy security and cost concerns are reinforcing the push for clean energy technologies in many countries. Clean electrification has been moving fastest, with rapid growth of renewables in the power sector, as well as rapid growth in electrified end uses (e.g., growing heat pump and EV sales). Global weighted average costs for solar and wind fell in 2021, though impacts on project costs may be more visible in the 2022 figures. Still, 2022 was a momentous year for renewable energy, with hundreds of gigawatts added globally and record-high investments in energy transition technologies. It was a year of contradictions, though, as fossil fuel capital investments were almost double the investment in renewables. Governments also reacted to shocks by announcing new support not only for clean energy deployment, but also for energy affordability, providing large fossil fuel subsidies to households and businesses.

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In addition, the pace of change is quite uneven across geographies. Most of the increase in clean energy deployment around the world has occurred in a handful of advanced economies, as well as China and India. There has not yet been broad-based deployment of clean energy globally. The divide between the haves and the have-nots is getting bigger.

Clean energy technologies also are not receiving investment evenly. There is strong concentration in solar, with less in wind and no real increase in deployment in dispatchable zero-emission technologies. The electricity needs of the energy transition will be huge, and dispatchable zero-emission sources such as nuclear could play a key role in the energy mix. There is rising interest in many countries in nuclear power, but there are many issues to overcome for widescale deployment. Nuclear takes years to build, while energy systems are changing dramatically and quickly; a nuclear plant will become operational in a totally different energy system than when it began. Nuclear also faces risks in terms of the continued availability of river water to cool plants during summers. In terms of advanced reactors, some argue it is not realistic to depend heavily on and plan immediately for small modular reactors (SMRs) and other technologies that have yet to be commercially tested. Others argue that small-scale reactors are not that expensive, involve new modes of manufacturing (e.g., assembly lines), and have order books that are growing. They assert that the infrastructure for mass production will be there as more orders come in, making SMRs potential problem-solvers within a decade.

Hydrogen is also the subject of a lot of hype. Clean hydrogen, while talked about a lot, has seen very little actual development. The amount of capital spent on hydrogen is still relatively miniscule, and there are only a couple of major global projects. The move to hydrogen is not going quickly, which leads some to suggest that the world may need natural gas to get through the transition without even greater domestic and international turbulence.

Trends in energy efficiency investment are insufficient.

With more electrification happening, energy efficiency also must play an important role, and the momentum needed in that space is not happening. Trends in energy efficiency investment are insufficient. In addition, network planning is behind the deployment curve in most economies around the world, with delays in deploying much-needed infrastructure such as transmission lines. All in all, the investment that is occurring does not necessarily reflect the balance of technology deployment needed to guarantee a clean, reliable supply of energy.

IMPLICATIONS OF THE ENERGY CRISIS

The global energy crisis affected world actors in vastly different ways.

EUROPE

The energy crisis triggered by the tragedy in Ukraine was a challenge for Europe, shedding light on the vulnerabilities and complexities of the European energy system. The winter of 2021-22 was difficult for ensuring adequate energy supplies, and Europe saw some supply disruptions, rising prices, and increased reliance on fossil fuels. The increase in energy prices put strains on industries and consumers. Industries that heavily consume natural gas experienced energy price increases, price volatility, and production curtailments.

When Europe did not get the fuels it needed from Russia, it got them from other parts of the world. The crisis proved that oil and gas are very fungible in the market, moving where there is demand, though markets adapted more easily to oil supply issues. Except for liquefied natural gas (LNG), gas does not have the same fungibility as oil; a country cannot just flip from one pipeline to another. In the fungible market, Russian crude oil and petroleum products shifted from Europe to Asia, while Gulf States have seen their markets begin to shift back to Europe. U.S. LNG exports to Europe also increased, becoming the price-maker in the European gas market, and a lot of LNG terminals were built in Europe at record speed. (The permitting acceleration was notable, reflecting the existential situation.)

The energy crisis made Europe think about and do things that it had been delaying. It made visible a lot of problems in the European energy system, as well as huge opportunities that had been ignored. Some countries that were wholly dependent on Russian gas and horrified by the idea of cutting imports found, once their supplies were cut off, that they had enough infrastructure, alternative sources, and energy savings opportunities to avoid significant problems. After decades of talk and arguments about being locked into dependency on Russia, the crisis helped countries understand they did not have the problem they always thought they had. The European (and global) energy systems proved to be more resilient than anticipated.

Overall, the European policy and institutional framework maintained European energy markets in the face of geopolitical shocks. The existing institutional capacity seemed to handle the crisis fairly well. On the other hand, Europe lacked data on oil flows, gas imports from Russia, and other fundamental issues. In that respect, institutions were not ready and empowered; the International Energy Agency and others helped a lot and bailed Europe out intellectually. The lack of real-time monitoring apparatus hinders Europe's ability and willingness to course-correct, so it is surprising how little debate there is about investing in European administrative capacity to deliver on goals.

The crisis also posed challenges for the energy transition, as near-term energy security tended to override climate concerns. For example, power sector emissions in 2022 in Europe went up tremendously, in part because of some re-started coal-fired power plants. Thought is also needed on how to de-risk the slate of new LNG projects given Europe's major ambitions on renewables, hydrogen, and decarbonization. The buildout of gas infrastructure suggests gas will remain in the European energy mix, though Europe's unprecedented scale-up of regasification capacity was to meet near-term, not

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long-term, needs. While some deals extend into the late 2030s or the 2040s, there are debates about whether long-term contracts for gas are needed or not. Europe needs LNG now, but it does not know if it still needs LNG by 2030, which complicates the contracting picture with North American LNG exporters. A realistic conversation is needed about different energy sources and their associated carbon and methane emissions. Gas will have to be delivered with great attention to emissions, and the EU methane strategy (whenever it comes) is intended to enable differentiation of gas supplies based on greenhouse gas intensity. There is also a need to make sure the crisis does not leave European industry behind and lead to carbon leakage.

While the crisis posed challenges for the transition in some ways, it also enhanced the political appetite for more resilient and stable energy systems and increased Europe's level of ambition on the energy transition and on technologies seen as key pillars of the future. Europe increased targets for and accelerated deployment of renewables and made its energy supply chains more resilient. Europe saw some fossil demand reduction and demand destruction, but Europe has significant further energy savings potential, if it continues to work to discover it. Energy savings have not been at the center of crisis politics, however. It is not clear if the promising acceleration in energy efficiency improvements mark a permanent shift in behavior; as with the pandemic, society may shift back to previous comfort zones.

There are debates about whether the European gas crisis is over. Gas, crude oil, and energy prices are lower compared to last year's peaks, which is beneficial for energy-consuming (i.e., importing) countries. European gas prices are below expectations due to a mild winter, reduced LNG demand from China, and Russia not completely shutting off the gas supply. Levels of gas in underground storage are also high. The global energy market, however, is likely to continue being volatile, and there are many factors that could still affect the picture in Europe, including the coming winter's weather, China's energy appetite, the flexibility in the European gas market, and more. If the coming winter is very cold, storage levels could be depleted quickly. If demand growth in Asia returns, LNG supplies could become harder or more expensive to procure. An active hurricane season in the Gulf of Mexico, where many U.S. LNG plants are, could also affect supplies.

The war in Ukraine and Russia's behavior are additional risk factors. After decades of peace on the continent, Europe is now in a divided and militarized world that will affect everything, including energy strategies. War is approaching closer to Europe, and catastrophes such as the destruction of a major dam in Ukraine show the types of risks the war could bring. Critical infrastructure in wartime is under threat. European independence from Russian energy is also less than many people think. The fact that Russia has not shut off the gas supply to Europe completely — continuing to supply Europe and the United Kingdom via pipeline and LNG — means that source of supply remains a risk.

Looking beyond this coming winter, Russia's role in European energy will likely decline as the war continues. It is hard to see a post-war scenario in which Russia returns to an integral role in the European energy picture. Europe faces potential risks in depending on the United States for LNG as well. Politics, for example, could pose future problems. If U.S. exports lead to higher domestic prices, there will be more political pressure to restrict exports, and a future president in a dispute with European leaders could threaten such restrictions. There are scenarios that Europe should wargame with respect to all countries it depends on.

One narrative that has emerged from the crisis is that dependence is bad, but security may well come from more interconnectedness, not less. The lessons learned from the crisis should include the importance of long-term energy planning and resource management through a diversified import base. There are costs to not utilizing available suppliers (whoever they may be), and integrated markets, flexibility in infrastructure, and the ability to pull in additional supplies can mitigate any disruptions to supply. There may be limits to those mitigating factors, though, so it may be sound to have guardrails around levels of import dependence. China, for instance, is a big importer but has limited the amount of oil or anything else that it will import from any country. To limit dependency, Europe may want to consider something similar for gas and other imports. (Some suggest implementing something like tariffs that are dependent on the market share of trade partners, so importing from a country that has market dominance would involve higher tariffs than from one that does not, but such an approach might violate most-favored-nation principles.) Europe should also be careful not to move from overdependence on Russia for gas to an overdependence on China for green technologies and manufacturing of critical raw materials. Still, in a global market, more interconnectedness, not isolation, provides security.

The EU-US relationship also has to be much deeper, more complex, and based on the reality that they are fighting the same geopolitical fight. The two should be much closer on technology, competitiveness, and research (including on energy). The crisis mode relationship that was focused on gas should evolve to encompass other potential areas of cooperation, including hydrogen, batteries, and dozens of other new technologies. It is essential to start working on those in a much more serious way than biannual joint commissions.

Internally, Europe is at a crossroads moment in some ways; it can pursue either a more regionally integrated pathway or more self-sufficiency at the national level. The European Union is a patchwork of competencies. The energy mix lies with the member states (e.g., about half of EU member states have nuclear), while climate change is with the EU in Brussels. Member states do not want to relinquish sovereignty; when pushed to the brink, they react together just enough to move away from the brink, but not to the extent of really forming an energy union (which has been on the table for years). For example, Europe responded to the crisis with joint procurement of natural gas, but for both energy security and climate reasons, similar use of procurement power should be considered for various technologies and products needed for the transition, such as hydrogen, sustainable aviation fuels, and new materials. While it is good that energy restrictions were not put in place between member states during the crisis — which would have destroyed trust — an energy union does not yet exist.

There were some very national dynamics and rhetoric during the crisis. Hungary, for example, put through a law to restrict energy flows and exports, and there was some debate in Norway about whether electricity exports were increasing domestic prices. Nevertheless, there was a lot of value during the energy crisis in having a regionally integrated energy system for gas and electricity. There was an unprecedented shift in gas flows across Europe; much of the infrastructure had been based on east-to-west flows, but the system was asked to do more with west-to-east (and some north-and-south) flows. With respect to electricity, the regionally integrated system also paid dividends. France, for example, had significant problems with hydro production (due to drought) and nuclear production (due to capacity that was out), but it was able to import power from neighbors. Volatility during the crisis decreased because of integration.

Increased energy security for Europe will rely on significantly enhanced interdependence among European countries. More cross-border capacity for power trade is needed. Replacing fossil fuels will involve a lot of low-carbon power, elevating the importance of having a stable, expanded, modernized, interconnected grid and better energy system integration across Europe. European energy interconnectedness should include a focus on high-voltage direct current (HVDC) infrastructure within Europe, as well as between Europe and other geographies (e.g., North Africa, perhaps trans-Atlantic). HVDC could start supplanting the extreme focus on gas interconnectedness. While there are challenges related to investment and the grid, the primary challenge is political. To reap resource endowments at a continental scale, some countries will have to be heavily structural exporters and others heavily structural importers, which will require political investment in comfort levels about being dependent. That kind of investment has not really begun yet.

The EU also does not appear to have a coherent strategic approach for working with countries in regions with gas to increase the amount of gas they can provide. Since the Russian reservoir of energy and materials has moved from Europe to Asia, Europe may need to shift its attention from the east to the south, finding new agreements and partnerships with African countries. In an era of decarbonization, though, it is very challenging for the EU to be engaging countries on gas. Pipelines that can be ready to switch to hydrogen could be a way to secure long-term supplies in climate-compatible ways, but using hydrogen as a justifying narrative for natural gas infrastructure is tricky and potentially dubious, as there are very few hydrogen projects in Europe, the ones that exist are small, and many are migrating to the United States because of the Inflation Reduction Act (IRA).

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DEVELOPING & EMERGING ECONOMIES

As bad as the recent energy crisis has been in Europe, it has been felt most acutely in developing and emerging economies. Energy price hikes were serious in Europe, Japan, and the United States, but Europe mostly exported its energy insecurity to the rest of the world; developing countries, which do not have the money to find other supplies, are the ones who have suffered. Price hikes had very strong regressivity on lower-income people and countries. The world is far from hitting the United Nations' Sustainable Development Goals and, if anything, has gotten blown further off course in recent years. Starting with the pandemic, there was a slowdown in improvement in access to electricity, but 2022 saw the first backsliding in the trend, with tens of millions of people around the world losing the ability to afford access to energy services. (Also concerning are challenges with food and fertilizer: fertilizer indices still are relatively high compared to pre-pandemic, and the war has disrupted grain supplies from Ukraine and Russia, as have the impacts of floods and other disasters on crops.)

Many developing countries have struggled with high costs, power shortages, and other impacts. Many Southeast Asian countries, for instance, were priced out of expensive LNG imports. It remains to be seen whether 2022 will be viewed as the year that destroyed policy confidence in LNG in Asia or whether it was just a temporary blip. Countries reacted in different ways, especially those facing natural gas shortages, and some countries may have locked themselves into energy systems that may be damaging for the climate. Pakistan, for instance, declared itself done with LNG and is expanding its coal-fired capacity. Others, such as Vietnam, have a strategy that involves robust trust in LNG going forward. Countries are coming from different places. The course countries take depends on their infrastructure, the availability of alternatives, their appetite for investment, the availability of trading, and other factors. Time will tell what the prices and appetite for LNG are in Asia in a few years.

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The energy crisis has also led some import-dependent countries to increase their uptake of energy efficiency technologies and renewable energy. Pakistan and India, for instance, have seen growth in industry's self-consumption of renewable energy and use of efficient motors and boilers, and the Indian government is thinking about trying to reduce demand for imported energy. Egypt has seen growing use of solar thermal. Thailand is moving towards more renewable energy development.

Developing and emerging economies are very heterogeneous, however, and those that are fossil fuel producers have been benefiting from the crisis. Developing country fossil fuel exporters fall into three general groups: the very wealthy and successful ones that have growing production (e.g., United Arab Emirates, Saudi Arabia, Qatar), the established producers with mature resources but facing challenges such as sanctions (e.g., Iran, Venezuela, Libya), and emerging producers (e.g., Guyana, Suriname, Namibia, Mauritania, Mozambique). These groups are in different positions, and the global energy crisis affects them in different ways. Within the OPEC+ group and among global gas exporters, there has been a shift in power towards Saudi Arabia and the UAE. As the energy transition proceeds, there is a question about what happens to countries that struggle to transition but where the traditional fossil industry cannot keep up (as seen in Venezuela over the past few years). There will be challenges, too, for the emerging producers that suddenly have a lot of wealth but also all the problems that have historically come along with that.

GULF STATES

The global energy crisis had varying effects in the Middle East, especially between energy-producing and non-energy-producing states. Gulf states such as Saudi Arabia, United Arab Emirates, and Qatar have seen record levels of revenues. As the war in Ukraine has reasserted the centrality of the Gulf for energy security, the leaders of energy-producing Gulf nations have found themselves courted by world leaders. At the same time, many parts of the Middle East and North Africa have been hit hard by rising food, commodity, and energy prices.

The energy-producing Gulf states are where a lot of capital is at the moment, for investment in both clean energy and growing production capacity in fossil energy systems. The Gulf may be one source for supporting the developing world's energy and development goals. The Gulf has been taking over ports for years, going into places others would not and investing government-to-government. The Gulf, for instance, has been very active on the east coast of Africa, including in Somalia and the Horn, and more sovereign wealth funds that understand political risk are coming into the continent on renewables.

As rich as some Gulf countries are, they do not have infinite money, and they have to spend on their own economic diversification plans. Gulf states have a wide range of potential fiscal break-even prices, and some are further down the road of diversification than others. If oil ends up in a lower price environment, the Gulf could face real economic challenges. When oil prices slump, it often brings political turmoil (and sometimes breakdown or wars), which can have huge implications globally. Some Gulf states, such as Saudi Arabia, require the higher levels of fossil revenue to support their visions for economic diversification — a fact that could introduce new levels of volatility into their energy policy decision-making. In the Gulf, there is a direct stake in ensuring the energy transition does not lead to a loss of fossil fuel revenues, which dominate economies even with diversification plans in place.

On the other hand, Gulf states (and some other non-democracies) have leaders staying in power longer and longer. In the Gulf, there is a cadre of younger leaders who could be in place for decades. That alters the time horizons of geopolitical considerations. Achieving net-zero by 2050 is multiple U.S. presidents and European prime ministers away, but for these Gulf leaders, 2050 (or 2070) could be on their watch. The impacts occurring then, including dangerous levels of heat, will also be on their watch. Climate change impacts — whether heat waves, floods, fires, or something else — could lead to massive population movements and be destabilizing. These leaders are operating on much different time horizons, and there could be ways to leverage their personal stakes in surviving and getting things right to support an energy transition.

RUSSIA

In the aftermath of Russia's invasion of Ukraine, distortions occurred in fossil fuel markets, including massive ones in oil products and crude oil. Russia started 2022 as the largest exporter of crude oil and petroleum products and ended the year no longer in that position. That said, Russia has proven to be more resilient, under international pressure and sanctions, than anticipated. It has redirected hydrocarbon exports to non-Western countries. Revenues are going down, but they are far from collapsing. The price cap may have had some impact in growing transaction costs for Russian exporters, but Russia is still raking in money from selling energy, albeit at lower prices. The Russian economy (which is smaller than the economy of Texas and about the same as Portugal) has even seen some minor growth. The average Russian in a major city has not really felt the economic impact of sanctions yet, and American and European plans to pressure Russia by sanctioning technocratic Russian elites have not worked. At the same time, hundreds of thousands of Russians have left the country since the war began, including many of the youngest and brightest Russian citizens, which will have serious consequences for human capital going forward in Russia.

In the aftermath of Russia's invasion of Ukraine, distortions occurred in fossil fuel markets, including massive ones in oil products and crude oil.

Russia's connection to Europe has ruptured and will not be restored soon. Russian oil and gas supplies to Europe likely will never recover, which means a lower volume of transit through Ukraine. Despite Russian efforts to invest in LNG expansion and redirection of gas flows, Russia probably will not be able to fully monetize its gas resources, which means the global gas market will lack those supplies. For the next few decades, Russia will not be Europe's partner in the energy transition, and projects that were jointly being explored before the war can be forgotten. Russia's supplies of critical minerals will all go to China, Southeast Asia, and other non-European destinations. The fate of progress on global methane emissions and other greenhouse gas emissions, which requires direct Russian participation and cooperation, remains unclear.

While Russia's relationship with the West is the worst it has been in decades, its relationships with China and other developing and emerging economies have gotten stronger. Russia has used the war to strengthen ties with countries in Africa, Latin America, the Gulf, and elsewhere. The West's increased use of sanctions and what some might view as an excessive focus on climate have created opportunities for Russia to build a non-Western economic and geopolitical alliance. Russia will use countries' dissatisfaction with the West dictating energy strategies and with Europe exporting its energy crisis to others. With a growing share of sanctioned oil supplies and shadow operations, Russia is attempting to win over and tie up as many players as possible in an alliance, including countries in Africa and Asia that are dissatisfied with Western policies. There is lots of support for Russia's policies, and it has influence in the energy world thanks to its nuclear and hydrocarbon resources. Sanctions could potentially push developing and emerging economies closer to Russia because they will have to trade with each other. That has important global implications.

GEOPOLITICAL NON-ALIGNMENT

The world may not fragment into Western and anti-Western alliances, however. There may just be a range of alignments and non-alignments.

Many middle and major powers are not aligned, seeking to avoid taking part in great power competitions and strategic rivalries. States such as India and Brazil have joined Gulf states such as Saudi Arabia in resisting alignment and adopting a policy of neutrality. India, for instance, is an important buyer of discounted Russian oil but is non-aligned on Ukraine and is part of Asia Pacific efforts.

Many countries see the situation in Ukraine as a European war that does not directly affect their interests, and they see what Russia is doing as not meaningfully different from what the United States and Europe have done in a wide range of countries in the past. The attitude of many of these countries toward the war and Russia is a function of their relationship and attitude towards the United States and Europe, which they see as being past colonial and imperial powers. These countries have not joined in sanctions or condemned Russia.

In addition, for countries such as India and Brazil, non-alignment has roots in democracy. Incumbents need to win elections and are prioritizing national interests during the energy crisis. Governments otherwise thought of as great allies of the United States and Europe took very domestic-centered positions because otherwise they would have faced disastrous election results. Domestic priorities come first and international alignments second. Local politics are dominating global politics.

China has been somewhat more aligned with Russia, and having the West distracted by Russia is probably beneficial for the country, but it is not clear that the war in Ukraine and the energy crisis are good for China. They create uncertainty, instability, and higher energy costs. China also does not want to be too reliant on Russian pipeline gas. (In general, gas is not great for China from a geopolitical perspective.)

The problem with geopolitical analyses is that they tend to put countries on a simplistic friends-to-enemies continuum. The world is complex, and the tendency to see bipolar confrontations (e.g., between democracies and autocracies) may not reflect reality. There are many alliances, depending on the topic.

INVESTMENT IN DEVELOPING & EMERGING ECONOMIES

It is imperative to accelerate clean energy deployment in developing and emerging economies. Clean energy capital going into these economies needs to scale several-fold to be on track for global climate targets. Ways must be found to make it appealing to investors to finance more clean energy infrastructure in these economies.

INVESTMENT CHALLENGES

Investment flows to developing countries are down. There have been concerns from investors that there are not enough good projects coming forward, but there are also developers saying it is hard to identify affordable finance for projects. Each side points the finger at the other.

With respect to having financeable projects, public and philanthropic investment can play valuable roles in catalyzing clean energy projects in developing countries. To support the project pipeline, it is important and worthwhile for public money to invest in building capabilities in project preparation; a lack of project preparation leads to fewer bankable projects, as each transaction is bespoke and costs more. It also pays to invest in building capabilities on administration (e.g., to open, operate, and evaluate tenders).

In addition, since some markets are too small to create economies of scale, public investment can support regional cooperation among neighbors and creation of synergies among regional policy incentive regimes, tariffs, standards, and infrastructure. There is a role for learning and knowledge networks to sit alongside capital formation, risk mitigation, and other frequently highlighted elements of the enabling environment. All projects involve multiple entities coming together to eliminate, mitigate, and allocate risks, secure financing, and execute projects; sharing learnings and experiences through networks, while difficult in the current landscape, could be powerful. Connecting startups with experienced investors, training, and advocacy can help establish routes to viability for projects.

If emerging economies want to compete for capital, there are relatively simple things they can do to tackle project headwinds and create more attractive value propositions for investment. Factors such as difficult permitting, unclear legal rights, and burdensome responsibilities for building transmission can make a country an unattractive place for financiers and project developers. These are problems that governments can solve. (These problems in scaling clean energy are not unique to developing countries; the United States, for instance, will likewise struggle with capital, permitting, workforce, and other issues.) Political buy-in is needed. Once political leaders start pushing for clean energy as a component of development strategy, that is when there will be more legislative frameworks, prioritization, lending from local banks, capacity building, and creation of enabling institutions. There is a need to help political leaders see the projects as providing benefits in terms of energy, jobs, reduction of imports, and other macroeconomic benefits; case studies are needed on projects that have provided such benefits.

Climate finance and other financial flows that are conditional on good regulatory behavior in sectors can also be a lever for reform. The issues are sensitive, however. It is hard for developed governments and multilateral funds to offer small

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pots of money in exchange for potentially painful changes to suites of regulations. On the other hand, providing financing without asking for change encourages the same sorts of suboptimal regulation. There may be a need to mobilize larger pots of money or to find other ways to exert pressure that can support both climate and development goals. Giving developing countries market access to developed countries could provide sufficient cover for developing countries to make the relevant regulatory changes needed.

The West's regulatory reform demands, however, cost countries political capital and create hurdles, thereby opening the door for others to come in that do not insist on such reforms or safeguards. Countries want respect to make their own decisions, and countries such as China are offering financing without such demands. Gulf countries also have an increasingly large presence in the developing world. Country engagement requires a serious re-look.

With respect to affordable finance for projects, the cost of money has been very high in many parts of the world, hindering the ability to move to clean energy. For renewable energy projects, the vast majority of the cost is capital cost, which means the cost of capital has a much greater effect on renewable projects than on fossil. The high cost of capital

Globally, ratios of government debt to GDP are at unprecedented levels for peacetime economies, akin to the period after World War II. The energy transition discourse assumes there will be huge levels of public sector investment, but record-high sovereign debt levels and macro-financial stress in the emerging world might hinder the transition.

is a particular hindrance because there are huge fiscal pressures in many low-income countries, many of which are in debt distress. Globally, ratios of government debt to GDP are at unprecedented levels for peacetime economies, akin to the period after World War II. The energy transition discourse assumes there will be huge levels of public sector investment, but record-high sovereign debt levels and macro-financial stress in the emerging world might hinder the transition. For projects in developing nations, the cost of capital probably will not be lower than for the sovereign debt of a given country, plus various premiums.

The cost of capital has gone up in part because of anti-inflationary monetary policies by some governments. Interest rates may be among the scariest headwinds in the renewable energy space for emerging economies. Models have been pricing in scenarios that involve rates falling soon, but if interest rates do not in fact fall, the picture can get worse. That is an underappreciated risk for the future of renewables. In rich countries, this headwind has been at least somewhat mitigated; the IRA, for example, made it possible to build renewables and keep costs down even as interest rates rose. In emerging markets, however, developers have been spending less capital.

The financing picture is more complicated than just the cost of capital. For example, there are challenges related to the stability of technology curves, the likelihood of assets seeing a full economic life, currency risk, and other finance fundamentals that create challenges.

There are many facets of the finance equation in a state of high volatility and breakdown. The old project finance model may no longer be fit for purpose. A number of the most active potential host nations (e.g., Indonesia, Vietnam) no longer offer the types of guarantees that were once common; with those removed, the model breaks down for a range of reasons. There is a need to reexamine how international cooperation and institutions can drive finance in developing and emerging economies. The model of multilateral institutions providing finance against sovereign guarantees may need to change to a model in which subnational or regional entities are financed by private capital guaranteed by a separate pool of multilateral capital. Such an approach could avoid adding to the debt levels of sovereigns but still encourage the private sector to lend to regional or subnational entities. Multilateral development banks (MDBs) have a mandate to provide developing countries with cheap capital, and moving to guarantees could be one way to continue doing that.

Other mechanisms and changes are also worth exploring to expand available capital. For instance, international carbon crediting instruments could play key roles, enabling commercial banks to finance a variety of investments in emerging

countries, on the back of exporting the carbon credit proceeds. A more systematic effort to quantify, monitor, verify, and aggregate credits as multilateral institutions could potentially be a significant source of international climate finance. In addition, modalities are needed to make a broader diversity of capital available, so that development finance institutions (DFIs) and MDBs are not the only act in town. There used to be a wide diversity of sources of capital in developing countries, but that is no longer the case. The benchmarks for green investment also need to change; the transition narrative for developed countries, which affects environmental, social, and governance (ESG) and impact measurement benchmarks, is quite different from the situation in developing countries, and the benchmarks should be as well.

FINANCE IN AFRICA

Countries in Africa differ widely, but they share some commonalities. More than half of the population does not have access to electricity, and most people do not have access to clean cooking, still relying on firewood and charcoal. Most fuel goes to the transport sector, which is very polluting. Since the start of 2022, prices for electricity and fuel have increased drastically, which in turn has affected prices for food and fertilizers. In addition, climate change impacts are part of Africans' daily realities, causing human suffering, displacement, and conflicts. Africa faces more debt than in 2019, higher prices, greater awareness of climate impacts, and increasing frustration with the lack of finance and access to technologies.

At the same time, Africa is a continent blessed with huge resources (renewable and not), minerals, arable lands, and more. African critical minerals and energy commodities have a large role to play in the global transition, presenting an opportunity to support and underpin development on the continent. Africa also has a very high rate of population growth; by midcentury, more than half of the 20 largest cities in the world are projected to be in Africa. Even modest GDP-per-capita growth means a large increase in GDP. There will be growing demand for energy and a need for tens of millions of new homes, which require cement, steel, glass, and other materials. Ideally, the energy and materials will be green, but technologies and costs may not be feasible yet, and Africa cannot wait for them to catch up.

Given the lack of existing infrastructure, the issue in Africa is more about energy access than about energy transition. There is massive opportunity for investment in areas such as construction materials, agriculture, and critical minerals — in terms of both infrastructure and jobs. The profit opportunity in Africa, however, has not been signaled well to investors. The amount of green investment in 2022 that went to Africa was tiny — far below what would be warranted based on Africa's renewable resource potential. African countries face major investment hurdles that cause Africa to lose billions in development finance and private sector investment. The reason that has been given for the investment barriers and premiums is that Africa is seen as risky, and country ratings affect sectors seeking financing. It is also said that Africa does not have bankable projects. The risks, however, are manageable, and bankable projects exist. Africa also has a very low default rate on infrastructure projects, but that is not reflected in risk perceptions either. The ratings must change, but a lot of international capital wants foreign currency risk, price risk, and demand risk to be completely addressed.

For more than a decade, with the improving credit profiles of African sovereigns and high commodity prices, African governments have provided sovereign guarantees, and capital has been allocated with sovereign backing. The situation now has reversed, with sovereign credit ratings worse, and — as in other developing and emerging economies — fiscally constrained governments do not want to provide guarantees. Governments are having trouble issuing letters of support and government bonds. Large-scale clean energy projects are not getting to the finish line. Utilities are struggling and investing less in the grid and in infrastructure, making it hard for companies to rely on being able to grow their businesses.

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The result of the lack of grid investment in many African countries has been deployment of diesel standby generation, which now has a greater installed capacity than the grid and consumes tens of billions of dollars in fuel per year. Diesel generation is more expensive than grid value, while solar is substantially cheaper than grid value, but the upfront cost of equipment has hindered the move into solar. Some small companies have come into Africa and identified home solar systems as a good, albeit expensive, opportunity. Likewise, some heavy industry is adopting rooftop solar and only using the grid as backup. This means utilities are starting to lose their revenue-generating customers, making it harder for them to deliver services.

Some African countries are changing the business model, with more decentralized and private power and other moves away from a sovereign lens. There may need to be a larger-scale devolution of energy services through small-scale models, and there is room and need for both on- and off-grid systems in Africa. There are few organizations, however, trying to aggregate solar mini-grids and achieve scale. The model for allocating capital in that space has been difficult, and challenges such as currency exposures suggest a need for more domestic capital. Still, deployment of mini-grids may be analogous to how the Global System for Mobile Communications (GSM) sector evolved, with thousands of GSM telecom towers now in each country. Analyses of the load centers in Africa, including local agro-industrial processing facilities, can reveal the places that are the equivalent of where the telecom towers should go and provide the start of a plan for sequencing the buildout of mini-grids.

Even though demand for power in Africa is great, prices for renewables (especially solar) are falling, and diesel and petroleum prices are high, projects cannot get off the ground because of some of the fundamental risks. Solving for foreign exchange and other risks has to be a priority, and blended finance and domestic capital can play key roles. Foreign currencies (e.g., dollars, euros, pounds) can be used at distinct points in the gestation of projects, but once projects are done and operating, those positions should be sold into domestic markets. Local banks must be brought into the picture. International financial markets and domestic capital markets have to come to the table, partner with DFIs, and find ways to deliver capital, share risks, and get projects done.

Some climate champions agree that there needs to be a realistic role for gas in the clean energy transition, but many environmentalists do not see gas as having any role — and support for that view has been growing. International analyses showing that limiting warming to 1.5°C requires no new investments in hydrocarbons create further headwinds for such investments.

The need for domestic capital is further highlighted by the limitations that DFIs place on their financing. For example, if oil and gas companies want to put solar on their thousands of petrol stations in Africa, DFIs will not qualify such a project for funding because they do not want the oil and gas industry benefiting from their funding. The energy transition sometimes gets simplified into a superhero-movie dynamic, with “goodies” and “baddies”, and the baddies generally are oil and gas companies (and mining companies). In Africa, however, oil and gas companies have built a lot of the infrastructure and could be among the biggest boons for African clean energy. Solar on petrol stations may be the best route to convert petrol stations into charging stations. Multinational oil companies have also invested in biofuels, employing thousands of farmers. With their expertise in drilling, exploration, and geoscience, they are also going into geothermal production. Oil and gas companies are critical partners in Africa’s transition.

The situation is somewhat similar when it comes to DFI and Western positions on African oil and gas development. Some African countries are developing their natural gas resources but are having a hard time getting financing for natural gas from their usual donors (e.g., the World Bank), who do not want to support fossil fuels. Countries such as Senegal have a

lot of power generation fueled by oil and so see natural gas as part of their clean energy transition and as key to building their domestic economies, increasing access to energy, and supporting domestic industries. Some climate champions agree that there needs to be a realistic role for gas in the clean energy transition, but many environmentalists do not

see gas as having any role — and support for that view has been growing. International analyses showing that limiting warming to 1.5°C requires no new investments in hydrocarbons create further headwinds for such investments. A key problem in developed democracies such as the United States and the European Union (which have a lot of influence over international finance) is how to square civil society activist beliefs about what is right and wrong in energy with what may pragmatically be needed to reach the end goal. The only way no new fossil investments can be feasible is if demand drivers are targeted aggressively; otherwise, prices will skyrocket.

Exacerbating tensions around natural gas financing is the sense in many African countries that the West — particularly Europe — is being quite hypocritical. Europe wants oil and gas from Africa, but ostensibly only for the next few years, and because of climate commitments, Western countries will not invest in oil and gas development in Africa. European countries have been buying their gas from African countries but have not provided finance for those countries to develop their own power generation from gas. When the energy crisis hit, after previously telling Africa not to invest in natural gas, European heads of state were suddenly asking African countries to invest in natural gas for exports (though some of the export developments were also supposed to have paths dedicated to serving domestic gas demand). Europe is losing credibility. Many African countries are producing and exporting natural gas for revenue, trying to keep a balance between the local and export markets. Western policymakers need to approach fossil fuel financing in African countries in ways that are equitable and just.

DFIs and other donors generally focus on alleviating poverty, but Africans also want to create wealth. Some DFIs have stated that they are not keen to back projects in urban areas because they are not trying to make people rich, but the geopolitics of wealth must change. A wealthier, higher-income Africa is better for the world. There is a need for a development narrative that envisions the Africa of the future, considers the underlying energy and infrastructure requirements for it, and moves beyond poverty eradication to focus on wealth creation. Africa must simultaneously create wealth, have affordable energy that encourages development, and address greenhouse gas emissions.

INVESTMENTS IN MINING

Whether in Africa or elsewhere, mining in developing and emerging economies will be central to the transition. DFIs, however, tend not to finance mining. DFIs focus on poverty alleviation, not growth, prosperity, and wealth creation. Governments and the private sector also need to be investing more in mining, but investments have been insufficient.

To scale up the energy transition, critical minerals are central, but so is copper. Copper gets overlooked sometimes but is fundamental to renewable electricity, EVs, and more. Mining for copper must increase, or there will not be a transition. The copper market is much larger than the lithium market and needs to grow significantly over the next decade. Production is very concentrated, however, in a few countries (e.g., Chile, Peru, Congo) that may have politically unstable environments. For example, if the constitution that Chile proposed last year had been approved, mining would basically have stopped. For Chile to keep up with the expected increase in demand, the state-owned company has to invest tens of billions of dollars over the next few years, and private companies need to invest tens of billions more, but that level of investment is not even close to happening. Since it takes many years to develop a copper project, it seems almost inevitable that the world will be short on copper (which suggests price spikes will be coming).

To the extent investment in mining is occurring, it has to take better account of mining companies' significant environmental and social impacts. Mining, for example, affects indigenous communities, as well as water resources and biodiversity. ESG investing is talked about a lot, but it is not yet evident in developing countries where mining occurs. Companies and investors can either take those impacts seriously or decide to take the minerals and think about the challenges later. Thinking more deeply about communities affected, tribal rights, indigenous rights, and how to share benefits has to be higher on the agenda, as opposed to just approving projects as fast as possible.

STATE-OWNED ENTERPRISES

State-owned enterprises (SOEs) are an important part of the energy system, particularly in emerging economies. Despite their central role, SOEs tend to be somewhat overlooked as actors in the global energy transition. To achieve anything close to a net-zero future, more focus is needed on SOEs.

SOE ROLES IN THE ENERGY TRANSITION

SOEs can be national oil companies, power companies, or companies dealing with other sectors (e.g., transport, finance). They bridge market signals and government directives. In many developing and emerging economies, the majority of investment is made by SOEs, and SOEs are often major emitters. At the same time, especially for national power companies, SOEs can be major suppliers of low-carbon alternatives. Given global emission and population trajectories, SOEs will be an even bigger part of the emissions landscape in the future.

To meet government directives and targets, SOEs may take on risks and roles that private sector actors would not. For example, SOEs in some countries could seek to advance the buildout of transmission infrastructure. Likewise, it is worth considering what role SOEs can play in technology demonstration to accelerate learning and an energy transition. Many emission reduction solutions needed by mid-century either do not yet exist or are still in the very early stages of development, and the technologies that may make the biggest difference may be complex and expensive, with lots of engineering and design risks that make them hard for individual private entities to take on. Because they have government backing, SOEs could play a role in demonstrating these complex technologies — whether carbon capture and storage (CCS), nuclear, big hydro, hydrogen, or something else — ideally in open innovation systems that foster collaboration and shared learning. Some SOEs are innovative and able to take on these kinds of projects. For example, the first at-scale CCS project was done by an SOE in Canada.

SOEs outside the energy sector might also have key roles. For example, in China, state-owned banks have been involved in the state grid and in offering financing for infrastructure in other countries. (Some countries have privatized their previously state-owned power sector companies only to have state-owned Chinese companies come in and buy large portions of the system; China sees an advantage in being a big owner of global assets, driven by the very low cost of capital it can export.) With the Chinese economy slowing, thinking may be evolving on how to better use financing. That means it may be a good time to engage Chinese state-owned banks in conversations about how to promote the energy transition.

MOTIVATING SOES

To help SOEs make decisions to move toward decarbonization, the most effective incentives will be different than for private-sector actors. SOEs face some serious political sensitivities, and direct interventions can be important. For SOE power companies, for instance, shifts in approach can be effectively spurred by the government appointing or changing CEOs (as occurred in Mexico) and sending other formal and informal signals.

In contrast, something like carbon pricing is likely to have more muted impact on SOEs compared to the private sector. This is not to say that carbon pricing cannot be used with SOEs. The impact may vary by location, the extent to which energy rates are market-based, how much of the carbon price is passed through, and other factors. In theory, a carbon price can influence costs and rates if passed on to consumers, which could change behavior — though in a lot of emerg-

ing economies, tariffs are not set that way. China has an emissions trading scheme that covers SOE power companies, but the actual experience thus far has shown very little trading under the system. Shadow pricing techniques might also have some effect on state-owned power companies. Even if they have some influence, though, incentives such as carbon pricing may not be the most effective starting points to spur SOEs to decarbonize.

FINANCE FOR SOES

Mobilizing complementary financing for SOEs, especially state-owned power companies, can be an important lever. The world does not have the luxury of decades to reform SOEs; their emissions have to be addressed quickly. There is a need to pull together commercial banks, SOEs, and others to figure out how to mobilize more private sector capital to support their clean energy transitions. Expert thinking is needed on ways to tap international markets more effectively.

Global finance markets generally have not been helpful for most SOEs. Investors and financing institutions have some perception issues about currency and country risk, leading them to add sizable margins to hedge against those risks, which can be detrimental to funding projects at low cost. Ratings agencies penalize SOEs, and commercial banks hold back their capital due to concerns about creditworthiness. While many state-owned power companies are not profitable or effective, even those that are still borrow at a premium compared to U.S. private sector corporates. (For the few SOEs that are investment-grade, however, ratings agencies can provide a credit rating uplift close to or equivalent to the sovereign the SOE's debt profile is anchored to.)

Investors historically have had mixed views of SOEs. There are important differences country to country. Some but not all SOEs are publicly listed; while the government is the controlling shareholder, investors matter and can be a source of critical growth capital. Investors also look at whether SOEs have sufficient tariff support and positive cash flows. Investors have immense tariff sensitivity, as tariffs can affect cash flow and the amount of debt the SOE can and will take on. Banks cannot get excited about a company with negative cash flows, which largely signify that the SOE's revenues are dictated by government ministries. That does not provide any long-term comfort; at any time, there could be a political decision to change the price of electricity in the country. It also matters whether the public perceives the company as doing a good job. If the public perception of the power company is not positive, the public will not be excited about the company selling shares to foreign investors and promising to adopt measures that could lead to tariff increases and customers paying more money.

In addition, some SOEs are better positioned for the transition than others, depending on their assets, relationships with markets, and ability to access finance with the support of domestic credit agencies, banks, and pension funds. Many SOEs have a mix of old and new assets, and some have effectively stranded assets carried on the public balance sheet. The age of the fleet is critical. Some Asian SOEs have very young carbon-intensive fleets that will run for at least another two or three decades. For the next couple of decades, whether one likes it or not, there will be a base of coal plants in some parts of the world. Finance is needed to help make that base more efficient and reduce emissions, whether through CCS, hydrogen, or other means. These technologies will require huge amounts of investment. Early retirement also has to be part of the discussion, but it is challenging to create an institutional framework to help make it domestically acceptable to phase coal out.

There may be national reasons for maintaining a coal fleet, but many investors from developed markets do not want brown assets. Many commercial banks no longer touch coal. If SOEs still have coal plants in their asset bases, commercial banks cannot finance them, since they have pledged to stop financing any company with coal-fired power plants.

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SOEs could develop dedicated subsidiaries for clean energy assets and bring those to banks for financing; this subsidiary model is one that many companies are pursuing to match better with green pools of capital. Investors will have more confidence where there is policy support from government and clear SOE articulation of a net-zero pathway that aligns with government goals. The power industry needs long-term finance (to amortize long-lived assets), and financiers need to see stability and alignment in regulations and the political environment to be convinced to lend a country long-term money.

Some SOEs are better prepared than others to work with markets on newer sustainable finance tools. Sovereign green and sustainable bonds and loans will play important roles, and there will be administrative organizational issues within governments about how the money will flow to SOEs and how the greener capital's performance and disclosure requirements will be met. These tools will work best for SOEs that have a management culture that can cope with the complex needs of investors and ratings agencies.

A COMPLICATED GLOBAL TRADE LANDSCAPE

Since the end of World War II, there has been a paradigm that peace is reached through prosperity, and prosperity is reached through exchange. The idea was that with global trade, and with the hegemony of the United States, all would be smooth. The paradigm has changed. Everything now is very complex and urgent, and there are tradeoffs everywhere.

RETURN OF INDUSTRIAL POLICY

The world has seen a return of industrial policies as countries seek to gain a foothold in the new clean energy economy. Industrial policy is back in vogue, as exemplified by the Inflation Reduction Act in the United States and production-linked incentives in India. Europe's proposed Net-Zero Industry Act is about producing things domestically with state support, and price controls are being discussed. The fact that industrial policy has re-emerged implies there is a development agenda in developed countries as well. Every country feels like the new environment provides opportunities to manufacture and provide added value in global trade; that must be managed so the climate, development, finance, and trade measures that emerge as a result do not collide.

There has also been a larger role for governments in thinking about issues of energy security, diversification, resilience, and competition. Europe built LNG terminals with state money, nationalized energy companies, handed out huge subsidies, and put in place significant sanctions. Policy support has gone beyond clean electricity to include areas such as low-emission fuels and CCS. Governments may play a much larger role in the energy sector going forward than they have in the past. European market design discussions on electricity, for instance, are looking at much stronger roles for member states in deciding which plants are built.

Industrial policy can have benefits, but it risks inefficiency in the transition. For example, the IRA (which blends industrial and trade policy) is having positive impacts in the United States, but there were projects (e.g., green hydrogen) in the works in developing countries that are now moving to the United States. That is good for the United States and positive for the world if it accelerates technology development and makes clean energy cheaper. However, if the investment and infrastructure are being deployed in places where the resources are not as good (e.g., lower wind and solar capacity factors), that may not be the most efficient way for the world to decarbonize. Similarly, inefficiency could result to the extent that industrial policy is used as a means for energy-intensive incumbents in developed countries to seek government protection to fight against insurgents. In addition, inefficiency may occur because markets, technology, consumer demand, and world affairs are all very complex and change rapidly. With industrial policy, policymakers are loathe to admit they made mistakes in projecting the future, whereas markets can respond more rapidly to changing conditions. At the least, policymakers involved in trade and climate may want to listen more to those allocating capital to the green transition than to the trade-exposed producers that have historically dominated the trade process.

Overall, the role of energy markets within Europe and globally seems to have declined in the short term and might continue to in the long term. It is worth thinking about whether this is a trend that should be dialed back or that must be accepted. If industrial policy increases, care should be taken to ensure it is forward-looking, increases comparative advantages in things countries are good at, and moves the whole globe forward. What has occurred over the past year heralds a new risk of fractured markets. The transition will be very difficult and costly, and fragmentation of markets and protectionism could mean missing out on affordability levers and on supporting global development imperatives.

Industrial policy is back in vogue, as exemplified by the Inflation Reduction Act in the United States and production-linked incentives in India.

CHINA

The return of industrial policy in some nations has been driven at least in part by concerns about China's dominance in several realms related to energy. China embodies many tensions. China is investing heavily in new coal, LNG, and other energy sources, but it is also investing heavily in solar, other renewables, nuclear, critical minerals, and more. Although many things are made almost entirely in China, there seems to be less concern about Chinese dominance in manufacturing those finished goods (e.g., toilet seats) than about energy or semiconductor chips. China did not necessarily start down this path with the aim of market domination. The big drivers of its investments in clean energy, mobility, and critical minerals were around energy security and the livability of its cities.

In response to China's market dominance, there have been some efforts in the West to begin to de-couple from China. Even though China is a rising global supplier in almost everything related to clean energy, some companies are now fearful of buying from China, worried about getting in trouble with other governments. If developed economies decide to sanction or decline to buy Chinese EVs or other technologies, however, emerging economies will still buy them, further leading to a fragmented world. (Developing and emerging economies have their own strong views and understandings of other countries on the global stage; while some may not want to do lots of business with China, others may be happy to have the United States more out of the picture.) In addition, China is relocating some production to avoid having things originate in China; this not only makes sanctions harder but also makes it more difficult for countries to choose between China and the West if asked to do so.

It is good that the world has woken up to the concentration of technologies and materials in China, but it is imperative to be careful about risks, how to assess them, and policies to respond to them. China cannot simply be caricatured as a bogeyman. China's scaling up of renewables, especially wind and solar, accelerated the energy transition by helping

to reduce the costs associated with those technologies. Likewise, China's deliberate industrial policy to scale up production of (and ensure quality standards for) LEDs played a central role (along with trade and approaches such as bulk-buying models) in dramatically dropping the price of LEDs and helping them grow rapidly to market dominance. To meet any serious climate target, global clean energy deployment has to expand and accelerate dramatically, and it is hard to see that happening without Chinese manufacturing capacity and deployment.

That is not to say that diversifying supply chains is not worthwhile, but it should be done cleverly. There are areas where developed nations need China, and areas where they need to hedge and ensure a diversity of sources. It is important to figure out which parts of the supply chain are of concern, and if those concerns are security risks, ESG risks, concentration risks, or other risks. Manufacturing dominance is not necessarily geopolitical risk, as factories can be built in a year or two; it is much harder, though, to bring upstream resources online in less than a decade. The risks should be unpacked to better understand where it is acceptable to allow concentration and

where the real vulnerabilities arise. It is imperative to understand the various supply chains, understand where China has leverage and coercive power, determine the types of risk involved, and then gauge the appropriate response.

Dependence on China for batteries, wind turbines, EVs, and so forth is not the same as depending on, say, Russia for natural gas supplies. Shutting off gas supplies can be crippling, whereas disruptions to supplies of solar panels and wind turbines might merely have a negative inflationary impact. In addition, other than rare earths and a few other critical minerals, supply chains are integrated; China gets inputs of supplies from other countries and needs export markets for its products. China therefore has an interest in remaining integrated and not exploiting its market dominance. That said, there have been times in the past when China has limited the exports of minerals. In addition, at the same time China works diligently to build dominance where it can, it carefully calibrates its own reliance on supply chains dominated by others.

It is good that the world has woken up to the concentration of technologies and materials in China, but it is imperative to be careful about risks, how to assess them, and policies to respond to them.

TRADE & THE TRANSITION

In the short term, trade can enable the transition. Trade in clean energy technologies is currently hindered by a range of measures, such as tariffs, though countries have also decided to implement trade policy by subsidizing clean energy — which comes at high cost to taxpayers but has the potential to reduce clean energy costs. In the long term, in a climate-friendly future, a very different kind of trading regime may emerge. The whole point of the global trading system is to facilitate commerce; as economies change, the policy needs of trade also have to change.

During the transition, transporting energy may get more expensive, and the location of competitive energy may shift from where coal mines or oil deposits are to where sun, wind, and cheap capital are. There may be new energy-intensive sectors, including solar production, battery production, and data centers. Energy-intensive industries may end up migrating to countries with good renewable energy or CCS resources. The overall picture of advantages might change drastically and quickly in a new energy world. Trade policies may need to evolve to allow for imports from countries that are low-profile now but may become major industrial hubs.

There may be evolution in trade of existing sources of energy as well. Policies in the European Union will be trying, for instance, to distinguish between cleaner and dirtier sources of gas in order to rank sources based on methane and carbon footprints. There are questions and worries about how companies will calculate those footprints, as well as whether that approach will take hold only in the EU or more broadly. There could likewise be differentials on cleaner and dirtier oil, and the implications of that are unclear.

Overall, the energy transition likely means less energy-related trade, since the trend is toward electrification and electricity tends to be more local. To the extent there is trade in electricity, that raises some very acute energy security risks. While the European market last year showed how a well-functioning market design can deliver security benefits (with neighboring countries helping out France when it had power shortfalls), the geostrategic security risk may be different if the cross-border trade is not with Germany, Italy, Belgium, and so forth but rather with countries that may have political instability or differing geopolitical motivations. In Europe last year, there were already huge debates in Norway — which reaped tremendous profits from the export of oil, gas, and electricity — about whether the level of interconnection was a strategic liability and causing higher domestic prices. Going further afield could be much trickier. Still, private sector demands could provide the impetus for regional electricity trade. For instance, Singapore has many data centers that are looking to go green, so the government has had to look at regional import options.

Trade policy needs to pay more attention to electricity trade, including rates and interconnectivity across borders. Within a decade, there may be a need for clean electrons to move around both within and across countries. In addition to high-voltage transmission, hydrogen and ammonia could potentially serve as energy carriers. Those who move early to build generation capabilities and the ability to control the movement of clean electrons within and across countries could have significant influence over clean energy. There is too little investment happening in this space. Saudi Arabia, Brazil, and China are positioning themselves in clean energy generation and for when green hydrogen or some other way to move clean electrons around is ready. Unless others take action, sourcing of clean electrons in a decade could resemble, to a degree, the current status of critical minerals, with control mainly in the hands of a few.

Trading of hydrogen and other zero-carbon fuels raises additional issues. Sourcing of green hydrogen will mostly come from developing countries, while importers could include Japan, South Korea, and the EU. Trade routes will be going from developing to developed countries. Industries located in the importing countries will have to decide whether it makes more sense to import hydrogen (which could be expensive), produce more energy domestically (which could also be expensive), or develop industrial capacity in developing countries with access to cheaper clean hydrogen and then

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export the products. (The challenges are similar with other aspects of the transition as well; within Europe, for instance, there are choices to be made about whether to import more green steel from elsewhere or to use scarce resources to produce it domestically.) On the other side of the transaction, there are decisions to be made in developing countries about how much hydrogen production should be directed toward domestic needs (e.g., fertilizer, steel) versus export. If developed countries are paying developing countries to develop and export cheap hydrogen, leaving developing countries with fossil fuels and energy access challenges, that amounts to problematic eco-colonialism. National hydrogen strategies in some developing countries are about both export and domestic consumption. These decisions will have implications for nations' industrial policies and the future of industrial sectors in both developed and developing countries.

New energy technologies could lead to new constellations of geopolitical interests and alignment. In the geopolitics of tomorrow, some production may be more widespread, while other production may be more concentrated. With respect to solar panel manufacturing capacity, a huge amount of exports go from China to the rest of the world. These panels are very thin, which means customers are essentially paying for the transportation of air. Countries could import cells from China and make modules domestically, creating local jobs, bringing in investment, and reducing supply chain disruptions. Making modules from cells is cost-effective and is beginning to happen across the world. Making cells, however, is difficult, requiring raw materials, electricity, know-how, and more. Because China has invested heavily in it, anyone else who does it will be at a higher price level, requiring incentives (such as in India and, with the IRA, the United States). Very few countries can do that. The number of countries where cells are manufactured will be much lower than the number where cells are converted to modules. There could be a similar geopolitical story with regard to critical minerals, with countries (e.g., in Africa) that did not make much money from their fossil fuel reserves looking to avoid making the same mistake with critical minerals by developing local refineries. The geopolitics of tomorrow may depend on where production occurs and where processing occurs, and it is too early to know which countries will win out.

Designing trade regimes to facilitate the scaling of clean energy globally will face additional challenges. For example, the fact that there are many paths to making green products can make it harder to have trading rules around all of them. Countries have difficult strategic choices to make about which green routes to pursue; there are multiple ways to make green steel, for instance, and countries have different potential advantages. Countries risk placing a bet on a route that ends up not winning the market; they are gambling their trade futures. Trade rules for one specific route to a commodity may not work for other routes; either multiple rules will be needed or the rules must be flexible enough to accommodate many possibilities (e.g., by just focusing on carbon standards).

Trade agreements remain important, to agree on disciplines, shared principles, market access, and rules. (Alternatives to binding trade agreements are political sleights of hand but are sometimes needed; no one wants to negotiate a trade agreement with the United States, for instance, because it would have to go through Congress.) There is a familiar pattern in trade: conflict, negotiations, and new rules or disciplines to facilitate commerce. On the climate front, things are solidly in the conflict phase. The transition economy is already being heavily debated and fought over, in a variety of fora, because now it is economically worthwhile to transition. A lot of the issues, at a broad level, are not new; it is just that clean energy and green technologies were small until recently. The world may need disciplines and principles to reorganize trade agreements in light of the urgency of the energy transition. There is a very narrow timeframe to transition, however, so the traditional timeline for the trade pattern (10-30 years) will not work here. There are only about five years to come up with new disciplines to facilitate commerce in the transition economy.

There is a robust agenda discussing what types of disciplines are needed in trade to address climate change and clean technologies. The topics fall into several categories. First, there are discussions about internalizing the costs of greenhouse gases. Carbon border adjustment mechanisms (CBAMs) are central in this, and the discussions concern how to figure out uniform accounting, whether to preserve the right to regulate, standards for performance equivalency, and what to do about legacy infrastructure and emissions. Second, discussions involve technology transfer and the enabling environment for the clean transition, including liberalizing environmental goods and services, the role of intellectual property rights, and regulatory coherence in clean tech markets. Third, there are discussions about disciplining green

government action, such as how to define clean subsidies that are non-actionable and how to discipline things like fossil fuel subsidies. Fourth, there are discussions about critical supplies for clean technologies, including topics such as sustainable mining, labor standards, and circular economy. Fifth, there are discussions about special and differential treatment for developing countries, equitable distribution of benefits, and protection of social values. These discussions include treatment of developing countries under CBAMs, how to make carbon credits fungible across borders, how to manage fees and licensing, how to compensate developing countries for existing carbon sinks, and how to address issues of forced labor and human rights. Finally, biodiversity and habitat protection are key topics on the agenda.

While the agenda is robust, there are massive gains from trade that must not be lost in debating the details. For example, one could argue that if climate is an existential risk, there should be less emphasis placed on where and how solar panels are made than on how cheap they are. That may be a step too far, as considerations about human rights, labor, security, and more must play a role, but the need for lots of deployment really quickly suggests that clean energy needs to be as cheap as possible. The United States, in contrast, has implemented difficult trade barriers on the import of solar panels; there are ways to be more surgical about preventing forced labor while still enabling the free flow of goods, but the United States has placed tariffs on top of other trade barriers on solar. The world has to solve an existential crisis and is way behind schedule. In addition, it is worth remembering that while developed countries debate climate trading rules, China is acting — building infrastructure, manufacturing technologies, setting standards, making deals, and more.

DEVELOPMENT IMPERATIVES & CBAMS

There is universal awareness of the importance of greenhouse gas emissions, but that does not mean that everyone shares Europe's prioritization of emission reductions. The world also has other priorities, especially in emerging economies with growing middle-class populations. There is an opportunity to tie development goals with climate goals. In some African countries, for instance, infrastructure development is being planned on the back of plans to massively grow new clean energy exports (e.g., green hydrogen or ammonia). Several developing and emerging economies are looking into green hydrogen, sustainable aviation fuels, and other options.

From a climate perspective, however, some countries' actions are more important than others. Conversations about Africa are largely development conversations, not particularly climate conversations; capital allocation decisions in African countries are about driving capital not just toward renewables but also toward other infrastructure. There are real development imperatives in other emerging economies as well, such as India, Indonesia, Vietnam, and others, but they are soon reaching the point where the next big projects may need to involve prioritization of climate considerations over other development considerations. With the rich world largely aligned around fairly ambitious climate policies, there may soon be a point where the dynamic with major emerging economies will be less about the developed world mobilizing finance for them and more about developed countries seeking to impose their will.

CBAMs, climate clubs, governments penalizing countries with higher carbon intensity, and other similar approaches are coercive measures to force countries to do more on climate. That could lead to huge backlash from various parts of the world. Many of these approaches have been crafted with China in mind, but if the EU's CBAM and similar measures are implemented, it is not just China that is on the other side. It is many emerging economies. Measures taken to coerce reductions in greenhouse gas emissions can affect developing countries' competitiveness. Developed countries cannot just "lead" and have the world follow. There is a need to be less dogmatic and more realistic about different pathways and speeds. The reorganization of global trade is broader than just developed countries and cannot leave the rest of the world behind. (The sets of issues of concern to developing countries are also not uniform, as countries vary in their capabilities and endowments; broad categorizations of "developed" and "developing" countries are an insufficient basis for organizing international cooperation.)

On the other hand, the EU's CBAM could be seen as an invitation for cooperation at the international level. The European Union is taking it seriously, having submitted measures to the World Trade Organization (WTO) and spoken about socializing the measures for two or three years to take into account developing country concerns. How the measures are designed will make them more or less friendly to developing countries' climate and development efforts. In addition, there are manufacturers in developing countries that are quite interested in the CBAM. Harmonized standards on the definition of green steel, for instance, would ease concerns from manufacturers and importers, creating a framework within which they can trade.

As for China, there are concerns that it would just deal with CBAM through resource shuffling, with, for example, the lower-carbon steel it produces directed to Europe and the higher-carbon steel directed to other markets (domestic or international). The cost of steel for European companies would be higher, but similar companies in China and elsewhere would not see commensurate increases and would thus be more competitive. Resource shuffling is a policy design challenge that trade can manage (e.g., through national averages), though the EU CBAM does not.

There are others in China who would support the idea of a CBAM as a key driver for decarbonization. Renewable energy interests, for instance, could use the CBAM to make the case to government officials in Beijing for more renewable power purchase agreements and other elements. CBAM and other similar mechanisms, whether implemented by the European Union or crafted in some way by the United States, could empower motivated constituencies within China (and other countries) facing their own political economy challenges.

While they create incentives for emerging economies to decarbonize (whatever one's views are of the morality of those incentives), the net effect of CBAMs on the climate are not yet clear. Such measures risk raising prices for inputs, such as steel, used in clean energy technologies. Supporting lower-carbon production may or may not balance increases in the cost of materials needed for clean energy deployment.

Implementing CBAMs and similar measures will require a combination of standards and disclosure, and capacity building will be needed for manufacturers to help make those less burdensome.

Implementing CBAMs and similar measures will require a combination of standards and disclosure, and capacity building will be needed for manufacturers to help make those less burdensome. The data and verification challenges should not be underestimated. Although regulators have a vast reservoir of data about a lot of manufacturing and mostly have the data they need to estimate the carbon footprints of many products, the estimates of carbon content have huge error bars, and most trade is in products with many sources. The data needed for accurate carbon accounting does not exist. For example, the fundamental tools to allow for carbon accounting of natural gas systems' methane emissions or hydrogen production are still being built; all that exists now are estimations of carbon intensity. It is

imperative to invest in developing better tools, moving beyond estimation to actual measurements. Measurement technologies have not yet been operationalized; operators still need to evaluate their effectiveness in different situations, develop standardized ways of putting them to use and getting data from them, and figure out how to provide the data in transparent ways people trust for regulatory reporting and certification schemes. As for tracking and verification, blockchain technologies may help, though blockchain may create more carbon output than the product being tracked.

CRISIS OF CONFIDENCE IN TRADE

Current trading regimes are under a great deal of pressure. Some of the unfettered belief in free markets and global economic integration (including integration of China into the global economy) that has dominated over the past few decades has been thrown into reverse. Deglobalization is happening, with trade declining and the largest economies focusing more on what they are importing and exporting. Deployers of capital into the green transition are entering a

dangerous period now, with a coinciding of clean technologies scaling up around the world and a sort of anarchic period in world trade. There are real economic opportunities from clean technologies, and countries around the world want their slice of the pie. Countries want to support their domestic manufacturing and restrict trade just at the point where free trade is needed the most to provide cheap, clean technologies. Amid economic realignment globally and renewed great power competition, there is growing belief in the insufficiency of the World Trade Organization and other trade institutions to deliver on their mandates. There has also been more flouting of WTO norms and de-fanging of the institution; for instance, the scale-up of clean energy technologies will require policies (e.g., local content requirements) that may previously have been seen as violating trade rules. Furthermore, the pain points in the system are designed for market economies and democracies, and there is a larger set of trading actors now that are not. There is a real crisis of confidence in trade.

**Trade only moves
at the speed of
trust.**

More cooperation is needed, not less, but the challenge is to bring along policymakers and the public. It is not accidental that CBAM emerged in Europe, as carbon leakage is something that is very concerning to a lot of decisionmakers in Europe at a time when Europe's economic fate has been buffeted by war and market tensions. Similarly, it is not accidental that the U.S. Congress passed a piece of legislation in the IRA that has deeply protectionist elements in it, as the U.S. public has lost faith in trade for many reasons, including that they have seen no increase in market access in China for U.S. companies despite China being part of the WTO for 20 years. At the same time, politicians in Western democracies face challenges in maintaining social and political acceptance of the energy transition. Western democracies have very sophisticated supply chains and lots of jobs in fossil fuels such as oil and gas, as well as in sectors (e.g., internal combustion engines, chemicals) that rely on those fuels. The people employed in those sectors already feel left behind and are voting for populist parties with strong anti-China and anti-globalization rhetoric. Anyone in the United States trying to make a nuanced argument about how to deal with China gets hammered in the political debate. Trade is vital, but navigating the pressures on it is tricky.

In addition, trade only moves at the speed of trust. The reason there is decoupling (or partial decoupling) happening with China is because of a lack of trust between one trader and many others. A big issue between the United States and the European Union on CBAM is the many times where European companies cheated on U.S. rules, benefitted from stolen American intellectual property, or otherwise engaged in behavior that deeply eroded trust. The EU-US dialogue does not have an encouraging history on energy issues. In numerous ways around the world, the situation with Russia and Ukraine has further frayed nerves and eroded trust. Better rules and more cooperation are needed quickly, but there is a deep level of distrust.

If the world is realigning and rethinking global free trade, especially with respect to China, that would suggest a need to embrace more partnerships with others. Even among countries that should be forming closer partnerships, however, the pendulum may have swung too far toward protectionism. Rather than de-coupling, there is a need to manage risks, as the world has in years past. There is a need to build a more resilient system of rules to deal with issues such as competition. If everything is decoupled, it will delay decarbonization. Supply chains around the world are intertwined, and resources (including human capital) are not abundant enough to build two (or more) parallel systems for everything. In addition, the increasing fragmentation of supply chains makes it hard for global companies to harness synergies. If fragmentation continues, companies will be forced to focus on fewer core markets — typically rich ones — because the lack of synergies forces them to duplicate their global business functions. The world has to make the transition happen with one system, which will require collaboration.

APPENDICES: PARTICIPANTS LIST

Amani Abou-Zeid, Commissioner for Infrastructure, Energy and Digitalization, African Union Commission

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Ana Palacio, Former Minister, Ministry of Foreign Affairs, Spain

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Francesca Reznik, Program Associate, Energy & Mitigation Policy, Energy & Environment Program

** Participants who will attend virtually*

APPENDICES: AGENDA

SUNDAY, JUNE 11, 2023

6:00 PM	Arrivals and Check-In
6:30 PM – 7:30 PM	Opening Reception
7:30 PM – 9:30 PM	Opening Dinner

MONDAY, JUNE 12, 2023

7:15 AM – 8:30 AM Breakfast

8:30 AM – 9:00 AM **Welcome:**
Greg Gershuny, The Aspen Institute
Jason Bordoff, Columbia University Center on Global Energy Policy
Ajay Mathur, International Solar Alliance (ISA)

9:00 AM – 10:30 AM **Session 1 | Briefing Room**
Moderated by **Jason Bordoff** and **Ajay Mathur**

Global energy markets have entered a time of heightened turbulence. The war in Ukraine has altered long-established patterns of trade. High prices, shortages, and imbalances in supply and demand are reverberating across the global macroeconomy, especially in developing nations, and food, chemical, and industrial sectors are reeling. What are the major trend lines that emerge from our new, unsettled reality in energy markets? Have we entered a new normal in which turbulence and high prices are core features, and if so, what are the implications for the energy sector and climate policy?

Discussants:
Amani Abou-Zeid, African Union
Tim Gould, International Energy Agency
Ed Morse, Citi
Gauri Singh, International Renewable Energy Agency

10:30 AM – 10:45 AM Break

10:45 AM – 12:15 PM **Session 2 | The Global Energy Crisis**
Moderated by **Ajay Mathur**

The energy-related impacts of war in Ukraine have had deep impacts on countries all around the globe – especially developing countries. Prices for imports of fuel, fertilizers and other fossil-fuel-based chemicals have shot upward, contributing to increased indebtedness and current account imbalances. In what ways have countries in Sub-Saharan Africa, Southeast Asia, South

**Participating Remotely*

Asia, and Latin America been affected by the challenging energy markets of the past two years? In what ways are energy and climate policies in the Global South changing in response to the global energy market turbulence?

Discussants:

Anne-Sophie Corbeau, Columbia Center on Global Energy Policy

***Ken Koyama**, Institute of Energy Economics of Japan

Michal Meidan, Oxford Institute for Energy Studies

Kristian Ulrichsen, Rice University

12:15 PM – 1:45 PM

Lunch

1:45 PM – 3:15 PM

Session 3 | Energy Crisis in Europe

Moderated by **Jason Bordoff**

Europe struggled through the winter of 2022-2023 to secure adequate energy supplies, stabilize European economies, and sustain climate progress in the wake of Russia's invasion of Ukraine. As preparations for the next winter proceed under what could be even more difficult circumstances, what lessons can policymakers, energy industry leaders, civil society, and the general public take from the tumultuous preceding year? How effective have European policies been at protecting vulnerable citizens, promoting economic vitality, and increasing sustainability? How can Europe balance the goals of securing alternatives to Russian fossil fuels and advancing climate action?

Discussants:

Tatiana Mitrova, Columbia Center on Global Energy Policy

***Julian Popov**, European Climate Foundation

Julia Reinaud, Breakthrough Energy-Europe

Christian Zinglensen, European Union Agency for the Cooperation of Energy Regulators (ACER)

3:15 PM – 3:30 PM

Break

3:30 PM – 5:00 PM

Session 4 | The New Energy Geopolitics

Moderated by **Jason Bordoff**

Today's energy turbulence is forging new relationships and reinforcing nascent geopolitical ties – for example, between Russia and Saudi Arabia, or between the Gulf Arab States and China. Today's turbulence is also stoking new sources of geopolitical tension around energy and climate issues – such as between the United States and China, and on certain issues even between the United States and long-time European and East Asian allies. To what extent have energy geopolitics been altered in an enduring fashion? What developments may lie ahead?

Discussants:

Ibrahim Al-Muhanna, former Ministry of Energy, Saudi Arabia

***Marta Dassu**, The Aspen Institute Italia

Ana Palacio, former Ministry of Foreign Affairs, Spain

***Angela Stent**, Georgetown University

6:30 PM – 9:30 PM

Forum Reception and Dinner

TUESDAY, JUNE 13, 2023

7:30 AM – 9:00 AM **Breakfast**

9:00 AM – 10:30 AM **Session 5 | State-Owned Enterprises, and Energy-Climate Policies**

Moderated by **Ajay Mathur**

State-owned enterprises pose special challenges and unusual opportunities in relation to energy and climate policies. In many cases around the globe, SOEs play strategically important socio-economic roles and have institutional capabilities and prerogatives unmatched by private energy companies. To what extent does the current condition of global energy markets argue in favor of bespoke policies aimed at SOEs? How can countries optimize the interaction between SOEs and private capital to advance energy sector modernization and just energy transitions?

Discussant:

Gurdeep Singh, NTPC Limited

Philippe Benoit, Columbia Center on Global Energy Policy

Melissa Brown, Daobridge Capital

Olivier Musset, Societe Generale

10:30 AM – 10:45 AM **Break**

10:45 AM – 12:15 PM **Session 6 | Scaling Up Clean Energy Development**

Moderated by **Ajay Mathur**

To build future energy systems that deliver reliable, affordable energy services on a sustainable basis requires solutions for a number of simultaneous challenges – the mobilization of finance, availability of human talent and skills, and capacity for project preparation. Especially in the Global South, shortfalls in these areas diminish economic development and delay climate solutions at the same time. What are the effective existing models and innovative new approaches that can help to address the key gaps in finance, personnel, and project pipelines? How can public and private resources be brought to bear most effectively, such as through Just Energy Transition Partnerships or other structures? How can the scale of clean energy development be expanded as aggressively as possible?

Discussant:

Tareq Emtairah, United Nations Industrial Development Organization

***Tariye Gbadegesin**, ARM-Harith Infrastructure Fund Managers

Andrew Kamau, Columbia Center on Global Energy Policy

Vivek Mittal, Africa Infrastructure Development Association

12:15 PM – 1:45 PM **Lunch**

1:45 PM – 3:15 PM

Session 7 | The Role of Trade in Future Energy and Climate Policies

Moderated by **Jason Bordoff**

To address the global need for affordable clean energy, clean energy technologies must be created, piloted, adapted, commercialized, and disseminated faster globally than at any time in the past. Trade will need to play a critical role in the dissemination and deployment of clean energy, but past trading patterns are increasingly being disrupted or placed under threat as political leaders and voters look skeptically at free trade agreements and instead favor industrial policy and local content. How can countries build and sustain domestic support for the energy transition while still enabling the movement of new energy technologies to foreign markets? Can instruments like carbon border adjustments or climate clubs play useful roles to facilitate trade on a sustainable and inclusive basis? How can future international trade agreements be improved to facilitate international commerce in climate solutions without undercutting domestic support for clean energy policies?

Discussant:

Maureen Hinman, Silverado Policy Accelerator

Ricardo Melendez-Ortiz, Caeruleum

Varun Sivaram, Ørsted

Georg Zachmann, Bruegel

3:15 PM- 3:30 PM

Break

3:30 PM- 4:00 PM

Closing Remarks

Forum Adjourns

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