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The Geopolitics of Energy Transformation

Governing the Shift: Transformation Dividends, Systemic Risks and New Uncertainties

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The transformation of the energy system is a global phenomenon, but the process itself is still progressing far too slowly to halt climate change. However, for "human security", it has immediate positive effects. An energy system that is increasingly electrifying offers reduced dependence on fossil fuel supply chains and strengthens access to energy, thus serving as an economic factor that indirectly promotes national and international security. However, the perceivable geographical concentration of technology leadership and an imbalance in global finance raise new threats. These may translate into veritable geopolitical risks that require global cooperation in order to be overcome.

The global energy transformation — is particularly evident in the expansion of renewable energies, and it is being helped by falling costs. In 2017, around €300 billion was invested in renewables worldwide (compared with €700 billion for oil and gas), and 174 countries have committed themselves to making voluntary contributions within the framework of the Paris Agreement (2015). Energy consumption is responsible for two-thirds of global greenhouse gas emissions. In order to stop climate change, it is therefore crucial to decarbonise the energy system. Geopolitically, the energy transformation is reinforcing a shift that has already commenced — away from traditional security policy and geographical spheres of influence towards the control of the flow of goods, knowledge, capital, and information.

A systemic change

The energy transformation essentially implies a systemic shift, the effects of which must not be underestimated. Three factors are key in this context:

- The energy transformation recalibrates value chains. In a low-hydrocarbon — i.e. decarbonised — energy system, the economic value is no longer generated primarily from the (fossil) resource. Rather, it is accrued at the stage of conversion into end-use energy and energy services. This, in turn, means that the ability to generate profits will hinge on the availability and use of low-carbon technologies.
- The energy transformation will yield new energy spaces, defined by infrastructure, production chains, and industrial clusters. This spatial effect results from (geo-)

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technological change, for example in the shape of local micro grids or region-spanning super grids, such as those promoted by China's Belt and Road Initiative.

- Today's focus still rests on individual sectors (i.e. electricity, buildings, transport, industry), each characterised by a dominant mix of (fossil) fuels. The future focus, by contrast, will be in sector coupling. Integrating electricity, heat, and mobility will reinforce the relocation and reconfiguration of energy spaces.

From a global perspective, the low-carbon transformation is likely to render the energy system more sustainable, but also much more heterogeneous. The conventional energy system, as it exists today, has been gradually shaped over a long period of time by global trade in crude oil, coal, and liquefied natural gas as well as by the combustion engine, which dominates transport. Therefore, it is relatively homogenous in nature. With the transformation of energy systems, however, the specific characteristics of individual countries and regions come to the fore more prominently. It is the geographical position (and the renewable energy endowment); the — often differing — political ambitions and state capabilities; national preferences in the energy mix (e.g. renewables, nuclear energy, or the use of gas); as well as the different approaches in the mobility sector that will determine the shape of a specific system.

Key technologies are moving to the centre of the energy transformation. Going forward, economic growth will rest on "technology rents", and these could become the decisive driver for the future welfare of societies, but also the success of the global transformation of energy systems. A precondition here is that states cooperate. If they do not, the result may well be a race to the bottom and national unilateralism. This is the ambivalence that characterises the geoeconomics of the ongoing shift within global energy systems.

Major benefit: A global security dividend

Undoubtedly, the central contribution of energy system transformation is the slowing of global warming. But decarbonisation also has far-reaching, positive effects for human security, such as improving air and water quality, and thus public health. Access to clean and safe energy is crucial for green growth. Citibank estimates that active climate investment and green growth will generate a net economic gain of $1.8 trillion by 2040. In developing countries, access to electricity is a prerequisite or multiplier for social and economic development. Today, 1.1 billion people still have no access to electricity. The energy transformation will successively reduce dependence on imports and the risks posed by perilous price volatility, thereby contributing towards reducing or avoiding conflicts over fossil fuels. In the long term, the market power of today's oligopolies, such as the new OPEC+ oil alliance, may fade away.

Hence, the energy transformation also promises a "security dividend". If more energy is produced locally, this has an impact on the relations between producer, transit, and consumer countries, arguably rendering the latter less dependent on the former. This goes hand in hand with an increase in sovereignty over energy supply.

The electrification of the system also levels out the role of states in the international arena, as they all become "prosumers", i.e. producers and consumers alike. In addition, states may well become part of an encompassing "grid community". This obviously requires conscious political decisions, both with regard to the domestic expansion or importing of renewables and to common control and cooperation mechanisms for the exchange of electricity in the grid. A single grid implies that vulnerabilities and sensitivities are distributed among all participating parties.

The need to defend critical infrastructure presents NATO with new challenges. This will likely also influence the discussion on burden-sharing in the alliance, as the ob-

jects of protection will shift geographically and change in substance, for example from sea passages and choke points to power grids.

New uncertainties

Securing these transformation dividends also comes with new risks and challenges. For instance, the electrification of the energy system is associated with considerable risks in the area of grid stability and cyber security. A breakdown of the power supply would have cascading effects for other critical infrastructure. The geopolitical implications will arguably have less of an effect on the defence and security realms. Rather, the flows within "energy ecosystems" and of network and energy services, data, technologies, and supply chains will become crucial. Controlling and governing these flows is likely to become an increasingly critical task.

What is more, the energy transformation is developing quite unevenly across the globe. As global value chains re-scale, production clusters relocate to the local level, and flows of goods change, there is a direct impact on the international division of labour and the world trading system. About one-fifth of global trade volumes are comprised of products from the extracting industry, such as oil, gas, and coal. To the extent that energy supply becomes more of a technology- and innovation-driven process, states will therefore be affected in their participation in world trade, recalibrating welfare creation and generating profound consequences for the world economic system.

For the 2°C target to be achieved, some 80 per cent of the world's coal, one-third of the oil, and half of the gas reserves will have to remain in the ground. The far-reaching consequences for financial markets are illustrated in the debate about stranded assets, i.e. fossil fuel-related investments that will have to be written off prematurely due to decarbonisation.

Assets linked to fossil fuels represent up to 30 per cent of the capitalisation of international financial centres, such as the London Stock Exchange. Depending on the depreciation rate, this clearly will represent a systemic risk.

Geopolitically, the restructuring of the energy system will not threaten the major oil and gas producers, such as the Gulf States and Russia, as quickly and existentially as is generally assumed. Even as the industrialised countries are decarbonising, demand for oil and natural gas is likely to remain high for some time, thanks to consumption in China, India, and other developing economies flattening out only slowly. The much-discussed access to lithium, cobalt, and "rare earths", which are crucial for producing batteries, energy-saving lamps, wind turbines, and electric motors, is also a less severe problem in the long term. Price incentives will eventually increase supply and broaden the resource base. Increased recycling rates and a firm move towards a closed raw materials cycle will pay off.

This begs the question of how to foster prosperity and green growth in a low-carbon future. The key to success will lie in low-carbon technologies, as the technology rents that they yield will be the determining factor for societal welfare and prosperity. To some extent, the global transformation of energy systems has already become subject to classic industrial policy. A spectre of non-cooperative, mercantilist competition and policy uncertainty is looming, as epitomised by calls for "America First" and an accelerating global trend to serving alleged "national interests". As the EU tariffs on Chinese solar panels show, fierce industrial competition is already underway today in the realm of renewable energies. States could be tempted to further strengthen their hands and control over high-end technology so as to secure their "competitive edge" and to (re-)nationalize parts of the global value chain.

To make matters worse, patents for key technologies in the fields of smart grids, offshore wind, and composite materials are almost exclusively held by OECD countries and China. Around 90 per cent of invest-

ments in renewable energies are also currently being made in this "new Global North". Developing countries, on the other hand, run the risk of being cut out of capital flows and technological advances, notwithstanding the fact that the greatest growth in energy demand will happen in the Global South. Digitalisation can exacerbate these trends even further. This emerging imbalance in the global energy transformation needs to be addressed.

Governance matters

The global energy transformation is tantamount to systemic change. It yields a transformation dividend that is most evident in global climate protection and human security. The shift towards a sustainable energy system also means direct gains for societies and economies through local value creation and indirect benefits for current consumer nations, stemming from reduced import dependency.

For Germany and the EU, these changing geoeconomics are an opportunity, as economics to some extent crowd out (geo)politics in international relations. Countries going it alone will endure higher costs and lower levels of effectiveness. Germany — the country of the *'Energiewende'*, a leader in climate and renewable energy policy, and traditionally a multilateral player — should continue to firmly promote the advantages of international cooperation such as cost-effectiveness and co-benefits for human security. Germany's non-permanent seat on the UN Security Council from 2019 to 2020 offers an ideal framework for (concerted) action, and for highlighting the intertwined nature of the global energy transformation and "climate and security" — one of the country's priorities for the period.

To be sure, a heterogeneous, fragmented energy system would neatly fit an increasingly multipolar world order underpinned by a more protectionist stance towards trade. Yet, mercantilist energy policies present the threat of spiralling rivalries between "energy blocks", as states strive to "privatise" competitive advantages and technology rents. This makes multilateral cooperation an indispensable policy goal in order to radically and rapidly restructure the energy system worldwide. Sustainable and long-term transformation dividends can only be reaped if a liberal trade regime secures transnational supply chains and guarantees access to technology and know-how. As an industrial country, Germany is therefore called upon to strengthen international cooperation in the global energy transformation, not least with a view towards ensuring its own economic base in the long term. The crisis-ridden WTO will resume a central position in these efforts, as the green technologies of tomorrow are within its remit (unlike today's fossil fuels).

Within the framework of the EU, Germany should work towards facilitating technology transfer and cushioning political risk premiums that could prevent sustainable investment, particularly in non-OECD nations. Germany should use its 2020 EU Presidency to generate the political momentum for further developing tailored governance mechanisms. At the global level, it is important to inject more transparency into decarbonisation pathways and to foster exchange — not only with the major consumer countries, but also with traditional energy producers — on the pace at which the energy system is upgraded, energy efficiency is increased, and renewable energy is brought in.

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