The global transition from fossil fuels to renewables will lead to a geopolitical shift. The process will be defined by evolution rather than revolution, and the ‘dirty’ geopolitics of oil will be challenged but not abandoned.

Fundamental changes are occurring in the global energy system – changes that will affect almost all countries and that will have wide-ranging geopolitical consequences. Fossil fuels shaped the geopolitical map of the past two centuries. Petrostates – nations

**KEY POINTS:**
- The power that states derive from controlling energy resources will change fundamentally
- Hybrid forms of energy provision will dominate and complicate the geopolitics of energy for decades
- Supplies of raw materials critical for renewables will generate new conflicts and are a matter of global security.
whose economies depend heavily on the extraction and export of oil or natural gas – derived political power from the capacity to shut off energy exports, and export revenues could buy off or suppress dissent at home as well as abroad.

The political and economic power of petrostates will gradually decline as renewable energy sources become more widespread. This means that states like Russia and the Gulf States might lose their status as powerhouses in the geopolitics of energy. This can create internal instability with potential spillover risks for entire regions. Already, countries like Sudan, Nigeria and Chad may be facing ‘shock decarbonization’ as revenues from oil – their main export commodity – plummet, leaving regimes unable to sustain fragile political settlements.

In the absence of powerful global governance structures, we can expect new conflict lines to emerge from at least three central developments. First, the shift from carbon to renewable forms of energy also means a shift between different forms of power. Second, the future will be defined by governance forms tightly connected to specific energy technologies. Third, the global demand for transition-critical minerals to produce renewable energy will accelerate and pull new states to the center of geopolitical competition.

**Shift in geopolitical power**

The power to shut off oil and gas supplies dominated 20th century geopolitics, because fossil fuels were concentrated in specific geographical locations. With one decision in 1973, OPEC (Organization of Petroleum Exporting Countries) members could increase oil prices and plunge the economies of many developed countries into deep crisis. By turning a handle, Russia could stop gas flowing through Ukraine in 2006 with instant repercussions for Central and Eastern Europe. With the transition to renewable energy, this form of power may decrease. Greater reliance on renewable energy will increase the importance of electricity grids as energy carriers and lead to greater decentralization and interconnection of energy systems.

Whereas oil and gas typically flow from producers to consumers, electricity trade has a potential to enhance regional interconnectedness and cooperation with ‘grid communities’ forming in many places such as the planned ‘Asia Super Grid’, China’s ‘Global Energy Interconnection’ (GEI), the ‘Desertec’ project or the ‘North Seas Countries Offshore Grid Initiative’ (NSCO-GI). The grids can enhance the geopolitical standing of different regions, by improving their energy security.

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Wind and solar energy is harvested in a decentralized fashion – thus making it harder to use as an efficient political energy weapon. Instead, electricity cut-offs might become a new foreign policy tool and cyber-attacks a new threat to critical energy infrastructure worldwide.

In 2015 a cyber-attack on the Ukrainian power grid left a quarter of a million Ukrainians without electricity. As utilities around the globe turn to sources of renewable energy, digitalization, and smart solutions, cyber sabotage on a small scale is likely to become one of the key features of energy geopolitics. The cyber-attacks on key geopolitical players such as the US, China, Iran, or India illustrate how also large states can be hit.

As energy generation and transmission in the future geopolitics of energy becomes more modernized and diffused, so do the power tools to disrupt and control it.

**Energy independence**

Different forms of energy technology pave the way for specific governance structures. Struggles to secure a stable and affordable stream of carbon energy ranked high on the 20th century geopolitical agenda and involved interventions, arms deals, and the creation of dedicated international bodies such as the IEA.
Renewable energy, by contrast, can be generated by smaller harvesting and storage systems, independent from centralized energy grids. This has important economic and political implications. Small-scale distributed energy generation lowers strategic vulnerability of highly interconnected and digitalized systems, as control over energy supplies is exercised at the sub-national level, for instance through energy cooperatives and community energy networks. Thus, decentralized power generation contains the promise of energy independence at the local and regional levels. However, this may weaken the power of central governments, decrease their tax revenues, and empower local communities. Since it increases states’ energy self-sufficiency it also reduces geopolitical competition. This may alter, political alliances and hierarchies based on fossil fuels, like OPEC. On the other hand, hybrid systems that provide greater self-sufficiency and flexibility could make states more prone to conflict on the international stage than if they were dependent on energy monopolists. The EU may have taken a tougher stance over the Ukrainian conflict if it weren’t for dependence on Russian gas.

The foreseeable future, however, will likely be a geopolitical mixed bag, as energy systems will remain hybrid. Alongside the establishment of more renewable-based energy systems, fossil fuels will retain their strategic positions, and the development of large, centralized power generation units such as nuclear power plants and hydroelectric dam projects will expand.

**Global race for raw materials**

In the carbon era the material basis of energy geopolitics was the hydrocarbon. The shift to renewables puts new raw materials at the heart of energy geopolitics. The supply chains of minerals critical to producing green technologies will alter the geopolitical constellation.

The green transition is often welcomed as a political opportunity to abandon the dirty politics associated with securing oil supplies that shaped so much of 20th century geopolitics. However, renewable energy technologies require vast amounts of non-renewable

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**The relative preparedness of fossil fuel producing countries for the energy transition**

![Diagram](image-url)
minerals, entailing a global race to secure steady supplies. Demand for transition-critical minerals as copper, cobalt, lithium, and so-called rare earth elements is predicted to grow exponentially as advanced economies build electric vehicles, solar panels, wind turbines and the systems to store and distribute renewable energy.

Whoever controls the supply of these minerals will have geopolitical leverage in a post-carbon world. Their geographical distribution is rapidly becoming a key geopolitical pivot. The EU, the International Renewable Energy Agency, and the IEA all sound the alarm: control over mineral supply can be abused for political purposes and imperil the sustainability of the green transition.

Evolution vs. revolution
Who can process the minerals becomes the next big issue. As climate adaptation and mitigation is gaining global political urgency, control over adaptive technologies becomes a new geopolitical currency: those countries able to supply clean energy or renewable technologies gain an advantage over their counterparts. In this domain, China has established itself as a powerhouse, occupying a bottleneck position. The country has invested smartly and extensively in the extraction of transition-critical minerals across the world and has developed a domestic transformative industry of such a scale it outcompetes other great powers. It is also able to translate this into geopolitical clout. Its unilateral changes to export rules of critical minerals have already led to diplomatic moves uniting the US, Japan, India, and Australia around circumventing China for supplies of rare earth elements. This ‘Quadrilateral Security Dialogue’ – or ‘the Quad’ can be taken as an early sign of the renewable geopolitics to come.

Energy system transformation that gains speed to tackle the existential threat of climate change will bring evolution rather than revolution of energy geopolitics in the short to medium term. A new set of geopolitical tensions will be marked by competition over supply chains of critical materials, vulnerabilities of increasingly digitalized and transnational energy infrastructure, and new and unpredictable forms of energy power.