

Task Force 2: Energy, Climate and Sustainable Development



Energizing the Future: A Holistic Approach to Global Sustainability

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Abstract

The global shift to sustainable energy demands a comprehensive policy approach for an equitable transition, ensuring energy security and addressing rising energy needs. The G7's urgency to phase out unabated coal-based power plants globally requires crucial financing of their retirement through transition financing mechanisms similar to the Just Energy Transition Partnerships and Energy Transition Mechanism. At the same time, challenges persist with the

reliability of solar and wind energy due to their intermittency. In addition, dependency on limited geographies supplying renewable energy technologies highlights vulnerabilities in critical mineral supply chains. The G7 faces complexity in ensuring global energy security amidst enhanced geopolitical risks. However, with the implementation of the proposed solutions, there is a potential for significant positive change. Energy demand growth due to population growth, improvements in energy access, electrification, new technologies, and income growth rises ever higher despite gains from energy efficiency. This policy brief proposes solutions, including financing the retirement of unabated coal-fired power plants, incentivizing local content-based energy technology manufacturing, diversifying technology providers, and increasing electricity trading by developing common principles for electricity trading to support G7's goals and extending these benefits globally.

The challenge

The continuous advancement towards a sustainable energy future on a global scale requires a comprehensive policy approach to navigate the changing landscape of achieving an (i) equitable transition, (ii) ensuring energy security, (iii) meeting growing energy demand, (iv) reliability and (v) affordability. Addressing these five aspects is critical to ensuring a sustainable energy future. Recent events (e.g., the war in Ukraine) have illustrated that failure to address these issues will mean an increase in unabated fossil fuel usage, negating the progress toward greenhouse gas emissions reductions globally.

The G7 has emphasized expediting the phase-out of domestic unabated coal-based power generation, underlining the critical financing requirement to replace current such facilities with low-carbon options (Dlouhy 2023). Despite significant cost reductions in solar and wind energy, inherent intermittencies could impact their reliability. Addressing these challenges effectively requires grid integrative technologies such as energy storage, a capacity-enhanced network of transmission lines, and enhanced grid connectivity (Lin 2023; Oliva H. 2022). Additionally, cross-border electricity interconnections could offer a more sustainable and cost-effective alternative to energy storage and utility-level solutions, enabling the continuous flow of electrons and helping reduce the demand for storage (Haji Bashi et al. 2022; Katz and Cochran 2015; Thukral et al. 2017; Abrell and Rausch 2016). Such a system of cross-border transmission corridors and electricity trading can enhance efficiency and sustainability in the energy sector while enabling the cost-effective retirement of unabated coal-fired power plants (Alam 2023; IRADe 2022; MIT Energy Initiative 2011; Bahar and Sauvage 2013).

The G7's commitment to achieving a green transition highlights the challenges in guaranteeing energy security concerning the security of energy supply and the security of energy technologies and their manufacturing processes (G7 2023b). Nations, notably those rich in fossil fuel resources, are transitioning from energy self-sufficiency to reliance on imported energy transition

technologies like solar PV, wind turbines, and batteries. This shift poses different challenges to energy security, as well as employment. The G7's heavy reliance on single geographies for renewable energy technologies demonstrates the drawbacks of the potential coercive influence of concentrating critical mineral mining, processing, and refining in specific geographical regions (Lee 2023). These technological and resource dependencies leave the G7 vulnerable to geopolitical impacts, some immediate, as observed during the Ukrainian conflict and Europe's reliance on Russian energy supply, and some long-term, as can be observed in disruption in supplies of titanium and other minerals (G7 2023c). To foster the energy transition, it is crucial to alleviate concerns about energy security and promote local content development, thus ensuring both energy security and local jobs.

These issues of ensuring a stable energy transition while ensuring a just transition and energy security are further exacerbated by the growth of electrification as a part of the energy transition. As society increasingly leans on digitalization and automation, future electricity needs will rise significantly despite potential gains that can accrue from energy efficiency, digitalization, and automation. This highlights the need for energy policies to proactively adapt to these technologies' evolving energy demands.

The role of G7

“We, the leaders of the G7, are acting and enhancing cooperation to address the climate crisis and accelerate the global clean energy transition to reach net zero emissions by 2050 at the latest.” (G7 2023b)

The G7 must acknowledge the need for a holistic policy approach that addresses the intertwined dynamics of the energy transition, energy security, and energy demand growth while emphasizing the need to balance them. The G7 must support financing the retirements of legacy coal-fired power plants, ensuring higher self-sufficiency in renewable energy and energy transition technologies through incentivizing local manufacturing and diversifying technology providers to reduce dependencies. It is also essential to address the issue of future energy demand growth due to improvements in energy access, population growth, electrification and automation, and the increasing development and incorporation of new technologies in our daily lives (while considering the overall additional energy demand growth from urbanization, population growth, and increase in economic prosperity and other drivers). Against this backdrop, increased reliance on renewable energy creates many challenges relating to intermittency, transmission, grid reliability, and other aspects. Cross-border electricity trading can help ease several of these challenges but will require updated regulations for grid governance and market structures to enable the flow of clean electricity.

G7 countries, already overexposed to imports from a single country regarding the supply of rare earth elements (REEs) needed to exploit renewable energy resources like solar and hydroelectric energy, run the risk of increasing this dependence even more (Baskaran, 2024). The People's Republic of China dominates the world market of REE, processing 90 per cent of the world's REEs (China Power 2021). Despite the positive welfare implications of comparative advantage, the G7 has already expressed concerns about the lack of geographical diversification in REE processing and manufacturing supply chains and its willingness to reduce over-dependence on the supply of critical materials (White House 2022).

The G7 could focus on enhancing technical and industrial capabilities within the G7 member countries and integrate other partner member states, i.e., African and Asian countries, to explore, extract, and exploit such critical minerals to increase its manufacturing of such materials. Recent initiatives by the G7, like the Five Point Plan for Critical Minerals and the G7 Clean Energy Economy Action Plan, constitute solid foundations for building such capacity (G7 2023a; G7 2023b).

The Green Transition also represents a threat for G7 countries through an indirect channel mediated by the socio-economic disruption it can bring about in the traditional energy sectors of such countries. The said disruption frequently manifests itself as the job destruction implied by the phasing out of fossil fuels-related legacy industries, which can, in turn, ignite social unrest, thereby fostering national resentment and populism (Atkins 2022; Çevik 2024; Barrett 2022; Patterson 2023; Lockwood 2018).

Such a rise in resentment and populism appears to be a recurring pattern in almost all G7 countries with widespread observations. One cannot avoid tracing parallelism between the decline of jobs in local non-renewable energy sectors and the rise in imports of renewable energy technology solutions and cheaply manufactured, imported goods, negatively impacting local manufacturing sectors (Autor et al. 2013; Inglehart and Norris 2016; Autor et al. 2016). Job destruction risks targeting both indiscriminately, as both typically represent blue-collar sectors. Indeed, partisan and populist support has been associated with a willingness to pay to save fossil fuel jobs, highlighting nostalgia and a sense of belonging to a local community based on coal-related jobs (Mayer 2022; Hielscher et al. 2022). Another aspect is the disruption and subsequent deterioration of socio-economic welfare mechanisms (often primarily driven by increased energy prices) related to increased social unrest (Belaïd 2022).

Several studies have highlighted the impact of economic globalization on the local manufacturing sector and related it to social unrest, as represented by populist votes, in other G7 countries (Colantone and Stanig 2018a). These studies have also highlighted the challenges that the local labour market faces in competing, with lack of adequate training and skill development having been highlighted as a significant factor leading to the declining competitive spirit, leading to dislocation of local industries to other regions and negatively impacting jobs and livelihoods

(Colantone and Stanig 2018b). Similar patterns of “globalization-induced community loss” could quickly reproduce more widely if G7 countries don’t implement suitable welfare mechanisms (Siddiqui 2021). Finally, it is essential to note that fiscal responses to these challenges carry the potential to create rifts within the G7, such as tensions that arose between the EU and the United States about the relocation of firms from Europe to the United States as a result of the Inflation Reduction Act incentives and subsidies. The G7 must know of such challenges and work diligently to address the multiple stakeholders’ requirements.

Recommendations to the G7

G7 countries (excluding Japan) aim to decarbonize their electricity sectors by 2035 fully. This policy brief intends to guide the G7 on what support will be needed to implement its decarbonization targets, what financing mechanisms are available, and to incentivize other countries to join this ambitious target. The G7 should become an example to other countries regarding mechanisms to foster the energy transition, e.g., with the phase-out of coal power plants so that developing countries can develop similar ambitious targets. Our policy suggestions below focus on an inclusive approach toward meeting the challenges that the energy transition has imposed.

1) *Support just transition by providing transition finance for sustainable development in developing countries and ensure fund allocation for social justice in g7 countries.* “Sustainable finance is about financing both what is already environment-friendly today (green finance) and what is transitioning to environment-friendly performance levels over time (transition finance)” (European Commission DG Finance 2024).

While green finance is more accessible (because many investors have committed to investing in green finance), transition finance,¹ while necessary for countries, especially developing countries, is more limited. For example, green finance taxonomy usually exclude funding fossil fuel-fired power plants, limiting access to finance for decarbonizing fossil fuel-powered plants (CICERO 2023; Iain and Deb 2023; Polzin and Sanders 2020).

“Transition finance is urgently needed to reduce greenhouse gas emissions by 55% and our environmental impact by 2030. It is often needed by companies that want to become sustainable but need to do so in steps over time – in other words, companies with different starting points that want to finance their journey towards a sustainable future” (European Commission DG Finance 2024).

¹ Transition finance refers to financial instruments and investments that support the transition to a more sustainable, low-carbon economy by decarbonizing hard-to-abate sectors like transport, power, steel, and industry (McCrossan 2024).

Recognizing the above, a few funding sources exist for transition finance in developing countries, namely, the existing financing mechanisms, such as the Asian Development Bank (ADB)-led Energy Transition Mechanism (ETM) and the Just Energy Transition Program (JETP) by the International Partners Group (IPG),² and the international carbon market, are focused on funding energy transition in developing countries. For example, ETM mobilizes funds from different sources (governments, multilateral banks, private) to retire coal-based power plant on an earlier schedule with proceeds for low-carbon energy. Developing countries joining ETM so far include Viet Nam, the Philippines, Indonesia, Kazakhstan, and Pakistan. Developing countries joining JETP so far include South Africa, Indonesia, Senegal, Viet Nam, and Kazakhstan. The energy transition is expected to bring global benefits (reducing global GHG emissions and rising global temperature) and local benefits such as cleaner air (with additional benefits including health), green jobs, and energy security. Ensuring that energy transition is ‘just’ is highlighted and recognized. We propose that the G7 highlight this aspect in international forums and provide more transition funds.

This policy brief calls for social justice funding of the Just Transition Fund (JTF) in the EU, providing support to local communities and vulnerable groups negatively impacted by the green transition and establishing similar financing mechanisms in Japan, Canada, and the United States. Primary emphasis should be put on the funds’ willingness to help workers reskill themselves, facing job replacement endemic to the phase-out of fossil fuels. These policies should also be coupled with effective communication campaigns in respective countries and regions to help educate the population about the benefits of the energy transition and ensure that the transition is an inclusive and equitable opportunity. The G7, working with the EU, should take advantage of the international institutional frameworks that the EU has created, shaping them to adapt to current challenges.

2) *Focus on enhancing energy security frameworks with policies for energy and resource self-sufficiency, green jobs, and local content development in G7 countries.* Energy transition could negatively affect some vulnerable groups leading to unemployment and income loss. Green job creation is necessary for just energy transition. Aligned with the pertinent challenge for the G7 as previously discussed, this policy brief advocates for increased energy self-sufficiency. On the one hand, this would imply renouncing cheap, efficient, and readily available green energy supply chain technologies, but on the other, it would bolster national security levels and green jobs. Such a strategy aims to prevent overreliance on non-aligned energy suppliers, particularly during the implementation of the Green Transition. In any case, energy self-sufficiency should be obtained with due attention to transition deadlines to not hamper the timely achievement of common targets, such as the ones outlined by the Paris Agreement, and during G7 ministerial meetings

² The International Partners Group (IPG), comprising the European Union, the UK, the US, Japan, Germany, France, Italy, Canada, Denmark, and Norway, aims to assist emerging economies in achieving a fair transition to low-carbon energy sources, emphasizing equity as a central principle (EGA 2023).

on climate energy and the environment. Moreover, self-sufficiency should complement and not entirely substitute the G7's energetic provision.

Firstly, the G7 industrial policy should incentivize their domestic renewable energy sectors to be more efficient and lower their production costs to be competitive globally. This would promote in-house production of energy transition technologies (such as solar PV, wind turbines, batteries, etc.), reducing the dependence on overseas suppliers. Reliance on overseas supplies could lead to declining local technology R&D and manufacturing scale (Azhgaliyeva et al. 2023). One way would be to implement a more compelling onshoring strategy by enhancing local mineral extraction and processing (subject to availability and development and extraction of mineral resources and related industrial processing capacity), leveraging the collaborative opportunities that the Minerals Security Partnership and other similar G7 member countries' critical minerals-focused collaborative frameworks have generated (US Dept of State 2024; USA et al. 2024).

Alongside the incentives for domestic production of renewable technologies, G7 countries should also focus on enhancing funding for recycling and incorporate local content policies that promote a circular economy from the design phase itself, promoting recycling. This is especially true considering the need for more REE endowment exploration, extraction, and processing in G7 countries.

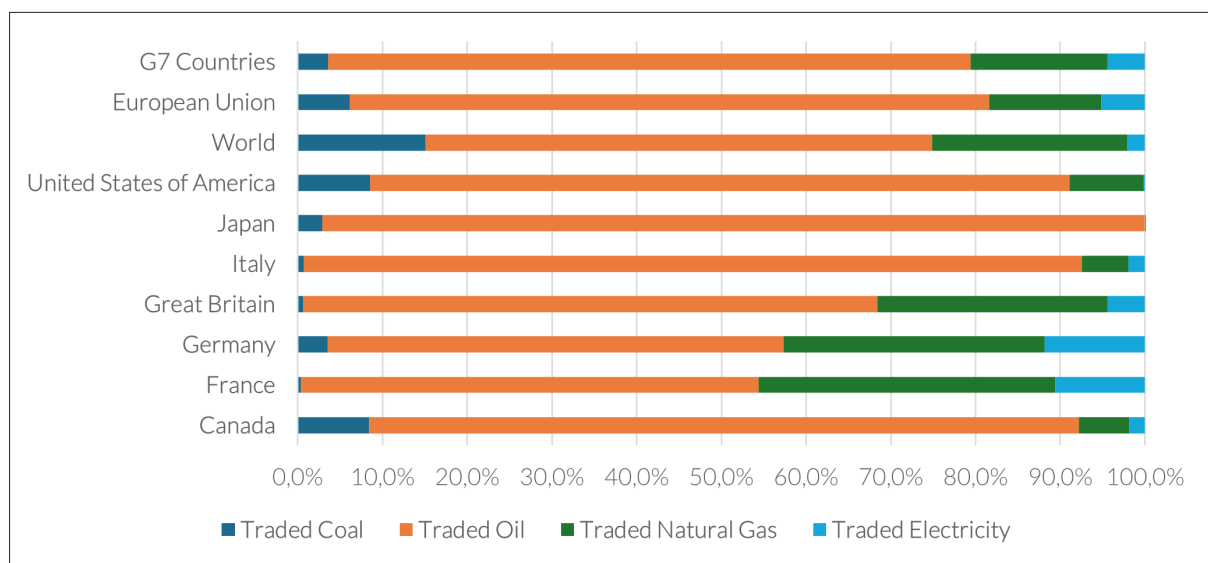
Diversifying external renewable technology and mineral providers by leveraging and enhancing existing collaborative frameworks, which enable G7 member countries to partner with aligned countries and global partners, can also help improve national security. This should be seen as an economic investment, negating any potential geopolitical impacts of focusing on a single country to jeopardize G7's supply of critical materials.

3) *Develop a global, inclusive, and comprehensive regulatory policy framework to help navigate the complexities of cross border electricity trading.* Globally, the world trades in a significant amount of energy. Figure 1 below illustrates that the electricity trading share is comparatively small compared to other energy sources. G7 countries and the European Union, with 4.4 per cent and 5.2 per cent, have a higher share of electricity traded than the world average of 2.1 per cent (Gökçe and Hatipoglu 2022). With extensive experience developing business and regulatory models and institutional frameworks for trading electricity, the G7 is well-placed to lead the world to an electrified future.

The G7 should prepare to develop frameworks to help shape the regulations covering global cross-border electricity trading. As electricity trading increases globally, bilateral negotiations between trading nations must be harmonized through a joint framework agreement covering such engagements. Singapore and Australia have demonstrated the broad contours of such a framework through the "Ten Principles to Guide the Development of Cross-border Electricity Trade." The G7 should develop such principles that are applicable globally, helping accelerate

cross-border electricity trading (Australian Dept of Foreign Affairs and Trade 2024). This can be further supported by encouraging cross-border electricity trading. In geographies like the European Union, mandates and targets have been set to promote and regulate cross-border electricity trade. These mandates aim to enhance energy security, promote renewable energy integration, and create a more interconnected and efficient electricity market. Mandates, such as the Electricity Interconnection Targets, set specific goals for cross-border electricity interconnections between member states (European Council 2014; European Commission Expert Group 2017). The EU, for instance, has set targets to achieve at least 15 per cent electricity interconnection by 2030. This means that 15 per cent of the electricity consumed in each member state should be capable of being exchanged between member states (European Commission DG Energy 2024). EU member states develop National Energy and Climate Plans (NECP) outlining how they will contribute to the overall EU targets, including cross-border electricity interconnection targets. These plans detail each country's actions to increase interconnections with neighbouring countries. Such mechanisms and Projects of Common Interest (PCI) in the EU are crucial to an infrastructural push enabling cross-border electricity trading.

Figure 1 | Shares of traded energy (2022)



Source: Global Energy Relations Dataset (Gökçe and Hatipoglu 2022).

The G7 should focus on developing global institutions funded by the G7 member countries, similar to the Connecting Europe Facility (CEF), which provides grants to support the development of high-priority infrastructure, including energy infrastructure like interconnectors. Given its extensive leadership on cross-border electricity trading and the development of regulations and market rules for seamless cross-border electricity trade, the G7 is well placed to focus on developing such rules and institutions globally. A developmental and regulatory framework progressing towards a globally harmonized electricity trading framework will help generate a platform for the multiple stakeholders involved to engage in productive dialogue and create

policy solutions and prescriptions to enhance electricity trading.

In addition to financing grid interconnection projects, harmonized market rules are crucial when implementing market coupling. Once the grid infrastructure is in place, market coupling is commonly used to integrate different national electricity markets to maximize cross-border trading efficiency and promote fair competition. The G7 can push for more harmonization of electricity market rules through stakeholder engagement globally.

By focusing on these aspects – mandates, funding mechanisms, and regulatory harmonization – regions can facilitate increased cross-border electricity trade, leading to a more integrated and efficient energy market. This can help in reducing the development of cross-border electricity trading over much larger geographical areas, ensuring that the deployment of renewable energy resources and their integration into a vast cross-border electricity grid helps address issues of energy security and enables the benefits of cheap renewable energy to be integrated into a transitioning energy mix with minimum disruptions.

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