RESEARCH ARTICLE

Poland's strategic energy partnerships: key to success long-term energy security

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Abstract

Energy security is a top priority for import-dependent countries like Poland and is driving efforts to diversify supply and reduce dependence on dominant exporters. International cooperation - through infrastructure projects, technology sharing and joint investment - is increasing resilience and accelerating the clean energy transition. This article examines Poland's evolving international energy partnerships from 2015 to 2024 and their impact on the pace of Poland's energy transition. This article uses a mixed-method approach, combining policy analysis, document review, quantitative data analysis, and case studies to examine how international cooperation supports Poland's energy transition. Framed through a hybrid theoretical approach that combines elements of neoliberal institutionalism and certain aspects of realism, the study assesses how international regimes and market mechanisms influence Poland's energy diplomacy and decarbonization efforts. The research highlights that international energy cooperation plays a critical role in enhancing Poland's energy security, not only with a reference to security of supply but also through accelerating the development of renewable energy, and advancing key transition areas. One of the major findings is the untapped potential for collaboration in emerging sectors such as hydrogen, biomethane, and energy storage. The study also underscores the significant impact of European financial institutions. Furthermore, the author proposes a classification of Poland's foreign energy partners into strategic, sectoral, and potential partners, providing a framework for targeted policy engagement. The author also analyses the most important obstacles and drivers for Poland's international cooperation in the energy sector. The article concludes with actionable recommendations to strengthen and expand Poland's international energy partnerships. Strengthening international energy cooperation is not just beneficial but essential for Poland's secure and sustainable energy future. Unlocking partnerships in emerging sectors and leveraging EU financial support can significantly accelerate the country's transition efforts.

Keywords

Energy policy, international cooperation, energy security, energy transition

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Theoretical foundations of international cooperation in energy

In an era of growing interdependence, international cooperation has become a crucial mechanism for addressing global energy challenges. Energy security, the transition to renewables, and the mitigation of climate change require coordinated efforts that transcend national borders. No single state can fully secure its energy needs or achieve climate neutrality on its own. Instead, multilateral cooperation plays a key role in fostering stability, technological progress, and sustainable development in the global energy system.[1]

Simultaneously, the pursuit of energy security or autonomy (sovereignty) highlights the concept of national interest, a critical factor in evaluating states' actions on the international stage. Consequently, when seeking an appropriate theoretical framework, a hybrid model that explains the role of international cooperation in the energy sector is most suitable. This model should integrate elements characteristic of the liberal approach, emphasizing cooperation and interdependence, with those of realism, focusing on national interest and power dynamics.

From the perspective of neoliberal institutionalism, international cooperation is not only possible but essential in addressing collective action problems, such as energy security and climate change. Robert Keohane and Joseph Nye argue that complex interdependence reduces the likelihood of conflict and increases incentives for collaboration through international regimes and institutions.[2] In the energy domain, organizations such as the International Energy Agency (IEA)[3] or energy policy concepts such as European Union's Energy Union exemplify how cooperation can enhance energy security by ensuring information-sharing, joint investments, and coordinated crisis responses.[4] Although neoliberal institutionalism offers valuable tools for analysing international cooperation, its optimism about the role of institutions and mutual benefits ignores key elements of power, conflict and asymmetry

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[1] *Energy transition and the future of energy research, innovation and education: an action agenda for European universities* (European University Association, 2018), https://www.eua.eu/downloads/publications/energy-transition.pdf; A. Goldthau and N. Sitter, "A liberal actor in a realist world? The Commission and the external dimension of the single market for energy," *J Eur Public Policy* 21, no. 10 (2014): 1452–1472; M. Lacey-Barnacle, R. Robison and C. Foulds, "Energy justice in the developing world: a review of theoretical frameworks, key research themes and policy implications," *Energy Sustain Dev* 55 (2020): 122–138; "Reaching Zero with Renewables: Eliminating CO_2 Emissions from Industry and Transport in Line with the 1.5°C Climate Goal," *International Renewable Energy Agency*, 2020, https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2020/Sep/IRENA_Reaching_zero_2020.pdf; I. Todd and D. McCauley, "An inter-disciplinary approach to the energy transition in South Africa," *Discov Sustain* 2, no. 1 (2021): 33.

[2] R. Keohane and J. Nye, *Power and Interdependence: World Politics in Transition* (Boston, 1977).

[3] This is proven by numerous publications, including the overview of the global energy situation and sector reports published by the International Energy Agency, https://www.iea.org/.

[4] The EU's Energy Union concept assumes that through closer cooperation between member states, it will be possible to more effectively carry out important tasks such as reducing dependence on the supply of energy resources from outside the EU or more effectively implementing climate policy goals. See more *Energy Union*, https://www.consilium.europa.eu/en/policies/energy-union/.

that are inherent in global politics. In the context of contemporary challenges such as energy transition, energy security and great power rivalry, a hybrid approach that integrates elements of neoliberalism with realism is preferable.

Realism, especially Kenneth Waltz's neorealism, sees the world as anarchic, where states prioritise security and power, leading to conflict.[5] In the context of energy, strategic autonomy – the ability of a state to make independent decisions without external pressure – is also important.[6] Energy nationalism, i.e. treating energy resources as a tool of national security, should also be taken into account.[7] Countries such as Russia and Saudi Arabia use energy for geopolitical influence, e.g. through "weaponised interdependence" – the use of energy networks to exert coercion. This contrasts with neoliberal optimism about interdependence, which supposedly promotes peace. In reality, as Hirschman shows, asymmetric interdependence allows stronger states to exert an "influence effect", where control over supplies becomes a weapon.[8] Finally, energy justice – equal access to resources and fair distribution of benefits – is seen in realism through the prism of national interests, not global equality. Neoliberalism promotes it through institutions, but realism reminds us that in practice, the interests of powerful states dominate, e.g. the US blocks Chinese investment in solar panels to protect its own autonomy.

Therefore, hybrid theories, combining institutions with geopolitics, better explain energy challenges, especially when institutional asymmetries determine partnerships. In practice, for Poland or the EU, this means striking a balance: building institutions for cooperation, but strengthening autonomy for security.

The following section examines the theoretical foundations of international energy cooperation and its practical implications. It discusses why states participate in a cooperative energy policy, the role of international institutions and the strategic advantages of partnerships in the energy sector. The following section also indicates that countries' motivations for energy cooperation are aimed at pursuing their national interests.

The rationale for international energy cooperation

For many countries, **energy security** remains a core national interest. States heavily dependent on fossil fuel imports, such as Poland or Japan, seek to diversify their supply chains to reduce reliance on dominant suppliers like Russia or the Middle East. For example, for many years Poland was seeking to diversify its gas supplies to reduce its dependence on Russia, which should be perceived as a purely realistic move.

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[5] K.N. Waltz, *Theory of International Politics* (McGraw-Hill, 1979); K.N. Waltz, "The Emerging Structure of International Politics," *International Security* 8, no. 2 (1993): 44–79.

[6] M.T. Klare, *Resource wars: the new landscape of global conflict* (New York, 2002).

[7] R. Dannreuther, *International Security: The Contemporary Agenda* (Polity Press, 2013).

[8] A.O. Hirschman, *National Power and the Structure of Foreign Trade* (University of California Press, 1945); M.T. Klare, *Rising Powers, Shrinking Planet: The New Geopolitics of Energy* (Metropolitan Books, 2008).

On the other hand, neoliberal institutionalists argue that international cooperation facilitates security through interdependence, making energy supply disruptions less likely by promoting diversified and resilient networks of trade and infrastructure.[9] A practical example of such cooperation is the development of cross-border energy interconnections, such as the Baltic Pipe between Poland and Norway, which enhances regional gas security.[10] Similarly, the expansion of electricity interconnections in Europe, supported by initiatives like the ENTSO-E network, allows for a more efficient and flexible energy exchange between nations.[11]

Another major driver of energy cooperation is **technological innovation**. Countries that lead in energy research and development can accelerate the global energy transition by sharing knowledge and best practices. This aligns with regime theory, which argues that international institutions and agreements create rules that encourage cooperative behavior.[12] For example, EU-funded projects under Horizon Europe support international collaboration in green hydrogen, wind energy, and battery technologies, enabling countries to leverage collective expertise and scale up the deployment of clean energy solutions.[13] Cooperation in this area helps countries avoid duplication of research efforts and speeds up commercialization of breakthrough technologies.

Given the transnational nature of climate change, countries benefit from **harmonizing energy and climate policies**. The Paris Agreement adopted in 2015 illustrates how international frameworks facilitate collective action, setting emission reduction targets and encouraging green investments worldwide.[14] Neoliberal institutionalists argue that shared norms and legal frameworks - such as the EU's Emissions Trading System (ETS) - help align national energy policies, ensuring a more coordinated response to global environmental challenges.[15]

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[9] D.G. Victor, A.M. Jaffe and M.H. Hayes, *Natural Gas and Geopolitics: From 1970 to 2040* (Cambridge University Press, 2006).

[10] European Commission, "The Baltic Pipe: a subsea pipeline to transport natural gas under the North Sea," https://cinea.ec.europa.eu/featured-projects/baltic-pipe-subsea-pipeline-transport-natural-gas-under-north-sea_en.

[11] European Parliamentary Research Service, "EU energy infrastructure: Boosting energy security," October, 2023, https://www.europarl.europa.eu/RegData/etudes/BRIE/2023/753956/EPRS_BRI(2023)753956_EN.pdf; Ember, "Electricity Interconnection in Europe - data tool," https://ember-energy.org/latest-insights/breaking-borders-europe-electricity-interconnectors/electricity-interconnection-in-europe-data-tool/.

[12] R. Keohane, *After Hegemony: Cooperation and Discord in the World Political Economy* (Princeton University Press, 1984).

[13] European Commission, "Horizon Europe," https://single-market-economy.ec.europa.eu/industry/strategy/hydrogen/funding-guide/eu-programmes-funds/horizon-europe_en.

[14] United Nations, "The Paris Agreement," 2015, https://unfccc.int/sites/default/files/english_paris_agreement.pdf.

[15] J.B. Skjærseth and J. Wettestad, *EU Emission Trading: Initiation, Decision-Making and Implementation* (London, 2008).

Additionally, energy cooperation extends to **investment coordination**. Large-scale energy infrastructure projects, such as offshore wind farms in the North Sea or transcontinental hydrogen corridors, require capital-intensive investments that are often beyond the financial and technological capacity of individual states. By pooling resources through mechanisms like the Just Transition Fund, countries can mobilize joint investments and mitigate economic disparities between different regions.[16] It is important though that the transition is socially just (just energy transition).[17]

Therefore, the aim of this article is to examine how Poland's international energy cooperation has affected energy security and the pace of energy transformation in Poland in recent decade (2015–2024).

Research questions and methodology

The primary goal of this study is to analyze the role of international cooperation in strengthening Poland's energy security and accelerating its energy transition. Given Poland's dependence on fossil fuel imports and the necessity to diversify its energy sources, the paper explores how partnerships with foreign actors contribute to the development of nuclear energy, renewable energy sources (RES), energy storage, and hydrogen technologies. The study aims to determine which foreign partners are strategically crucial, which are important in specific sectors, and where untapped potential for cooperation remains. To achieve this goal, the paper seeks to answer the following research questions: Which foreign partners play a strategic role in Poland's energy security and energy transition? In which energy sectors (e.g., nuclear, RES, hydrogen, energy storage) are specific international partnerships most significant? Which bilateral and multilateral agreements have contributed the most to Poland's energy diversification and technological advancement? Where does Poland have untapped potential for deeper international cooperation in the energy sector? How do financial mechanisms from European and international institutions support Poland's energy projects? What are the key barriers and drivers to Poland's international cooperation in the energy area?

By addressing these questions, the paper provides a comprehensive assessment of Poland's external energy policy in the period of 2015–2024. In this context, the effectiveness of Poland's external energy policy is measured by two factors. Firstly, the degree of diversification of fossil fuel import sources (especially oil and gas) in order to reduce import dependence on Russia. Secondly, the extent

[16] European Commission, "The Just Transition Mechanism: making sure no one is left behind," https://commission.europa.eu/strategy-and-policy/priorities-2019–2024/european-green-deal/finance-and-green-deal/just-transition-mechanism_en.

[17] E. Baker *et al.*, "Who is marginalized in energy justice? Amplifying community leader perspectives of energy transitions in Ghana," *Energy Res Soc Sci* 73 (2021): 101933; V. Castán Broto *et al.*, "Energy justice and sustainability transitions in Mozambique," *Appl Energy* 228 (2018): 645–655; A.B. Setyowati, "Mitigating inequality with emissions? Exploring energy justice and financing transitions to low carbon energy in Indonesia," *Energy Res Soc Sci* 71 (2021): 101817.

of international energy cooperation aimed at accelerating the transition and thus reducing the role of imported fossil fuels in the national economy. Therefore, by identifying key areas for enhanced collaboration to ensure long-term energy security and a faster transition toward a sustainable energy system.

The final aim of the analysis will be to distinguish between: **strategic partnerships** - countries and organizations essential for Poland's long-term energy security and low-carbon transition; **sectoral partnerships** - actors playing a key role in specific energy sub-sectors, such as nuclear power, renewables, and gas infrastructure; and **partners with untapped potential** – countries with whom deeper cooperation could enhance Poland's energy resilience and accelerate decarbonization.

The text is divided into several sections, which essentially focus on three groups of topics. The first group analyses the cooperation initiated by Poland to diversify its sources of fossil fuels in order to reduce its dependence on Russia and improve security of supply.

The second part deals with the development of cooperation in areas related to the energy transition. After briefly analysing the assumptions and goals of Polish energy policy in this area, the impact of Poland's cooperation with foreign partners in the development of renewable energy sources in Poland, partners in the nuclear energy sector, partners in the biomethane and biomass sector, partners in energy storage projects and the development of hydrogen projects will be presented. The importance of international financial institutions in supporting energy transition projects in Poland is also analysed.

The third and final part analyses the main obstacles and driving factors for the development of Polish energy cooperation followed by the list of some recommendations.

This article adopts a mixed-method approach, combining qualitative and quantitative analysis to assess the role of energy cooperation in Poland's energy transition. The study relies on energy data, policy documents, and international agreements to provide an evidence-based examination of Poland's evolving energy landscape. A key methodological tool is policy analysis, which involves reviewing Poland's energy strategy documents, such as the *Polish Energy Policy until 2040* (PEP2040), to understand national priorities and their alignment with international commitments.

The research also incorporates document analysis of bilateral and multilateral agreements, including signed contracts with strategic partners like the US, France, and Ukraine, as well as Poland's engagement in EU-funded projects and financial instruments supporting the energy transition. The study examines official records from institutions such as the European Investment Bank (EIB) and the European Bank for Reconstruction and Development (EBRD) to evaluate the financial mechanisms facilitating infrastructure development. Furthermore, a data-driven approach is applied by analyzing energy production, import diversification, and investment trends, using statistics from sources such as Argus, Eurostat, the International Energy

Agency and International Gas Union. This allows for a comparative assessment of Poland's progress relative to other European countries.

The article also employs case study analysis, focusing on implemented projects, such as the Baltic Pipe, nuclear energy partnerships, and renewable energy investments, to illustrate how international cooperation enhances Poland's energy security and decarbonization efforts. By triangulating policy analysis, statistical data, and case studies, the study ensures a comprehensive and empirically grounded understanding of Poland's energy transition through international collaboration. By applying the lens of hybrid theoretical approach that combines elements of neoliberal institutionalism and certain aspects of realism, this paper will explore how international regimes, market mechanisms, and cooperative agreements shape Poland's energy diplomacy and policy choices.

Poland's key partners in strengthening the security of energy supplies

For many years, a key objective and motivation for Poland's development of international cooperation in the energy sphere has been to ensure security of fossil fuel supplies. Although Poland has some raw materials deposits, mainly coal and to a lesser extent gas and oil,[18] they are not sufficient in terms of consumption needs. As a consequence, Poland is heavily dependent on fossil fuel imports from abroad (according to the Energy Forum report for 2023, Poland's dependence on imported raw materials remains high at 43 per cent)[19] (Table 1).

Making diversification of fossil fuel supply sources a priority of external energy policy was understandable. For decades, Russia was the main source of oil and gas imports to Poland. In 2016, Russia's share of gas imports to Poland was almost 89 per cent,[20] and for oil, Russia's share of imports to Poland in 2015 was almost

Table 1. Gas imports to Poland in 2016–2023 (in bcm).

2015	2016	2017	2018	2019	2020	2021	2022	2023
9.4	11,5	13,7	13,5	14,9	14,8	16,1	13,9	14,1

Source: Own compilation based on data published by Polish companies PGNiG and Orlen

[18] Zob "Surowce mineralne Polski," Polski Instytut Geologiczny, https://www.pgi.gov.pl/surowce/strona-glowna.html.

[19] Za "Transformacja energetyczna w Polsce," Edycja 2024, Forum Energii, kwiecień, 2024, https://www.forum-energii.eu/rocznik-dane-o-energetyce.

[20] PGNiG, *2018 - kolejny rok mniejszego importu gazu z Rosji i większego importu LNG*, Press Release, January 9, 2019, https://pgnig.pl/aktualnosci/-/news-list/id/pgnig-2018-kolejny-rok-mniejszego-importu-gazu-z-rosji-i-wiekszego-importu-lng/newsGroupId/10184.

89 per cent.[21] Hence, Polish decision-makers, in particular during the 2015–2023, saw the threat of supplies from Russia as one of their main strategic objectives, even years before Russia's invasion of Ukraine in 2022.

Efforts to become independent of Russian gas supplies were particularly important, and Poland had been preparing to phase out gas supplies from Russia for many years. The political parties that came to power in Poland in 2015 have clearly signalled to Moscow that Poland does not intend to extend its long-term contract with Gazprom after it expires in 2022.[22] Cooperation with foreign partners, both regarding the development of energy infrastructure and new fossil fuel supply contracts, was crucial in the process of diversifying gas supply sources. The first step towards diversification of gas supply sources was the commissioning of the regasification terminal in Świnoujście in 2015.[23] Thanks to it, Poland imports liquefied natural gas from many sources, including the USA, Qatar and Norway. A strategic step in the process of diversifying supply sources was the decision to build and commission the Baltic Pipe gas pipeline in September 2022, which will enable gas imports from Norway via Denmark to Poland.[24] An important role in the process of expanding gas infrastructure was played by cooperation with Lithuania and Slovakia, enabling the construction of interconnectors that increase the possibility of importing gas to Poland from directions other than Russia. On 1 May 2022, the gas interconnector between Poland and Lithuania (GIPL) was launched,[25] which not only strengthens the security of gas supplies to Poland, but also fits in with the priorities of the European Union energy policy.[26] Thanks to the interconnector, Poland will gain access to the Lithuanian LNG terminal in Klaipeda, which is important in the context of plans to develop small-scale LNG projects, which are important in the context of the energy transition. LNG is indeed the only viable alternative to a completely emission-free fuel for heavy road transport.[27] Moreover, in the future, GIPL may also be used for hydrogen transport, as already explicitly signalled by

[21] POPiHN, *Przemysł i handel naftowy 2015* (Warszawa, 2016), https://popihn.pl/wp-content/uploads/2023/09/RAPORT-ZA-ROK-2015.pdf.

[22] Ministry of Climate and Environment, *Polska wypowiedziała porozumienie gazowe ws. Jamału*, Press Release, May 23, 2022, https://www.gov.pl/web/klimat/polska-wypowiedziala-porozumienie-gazowe-ws-jamalu.

[23] GAZ-SYSTEM, *Informacje o Terminalu LNG*, Press Release, https://www.gaz-system.pl/pl/terminal-lng/informacje-o-terminalu-lng.html.

[24] Ministry of Climate and Environment, *Otwarcie gazociągu Baltic Pipe*, Press Release, September 27, 2022, https://www.gov.pl/web/klimat/otwarcie-gazociagu-baltic-pipe.

[25] *Polsko-litewski gazociąg GIPL oficjalnie otwarty*, https://www.gov.pl/web/klimat/polsko-litewski-gazociag-gipl-oficjalnie-otwarty.

[26] European Commission, "Baltic Energy Market Interconnection Plan," https://energy.ec.europa.eu/topics/infrastructure/high-level-groups/baltic-energy-market-interconnection-plan_en.

[27] "For sustainable heavy goods transport: LNG from Westfalen," https://www.westfalen.com/de/en/mobility-filling-stations/alternative-fuels-for-sustainable-mobility/lng-as-a-fuel/lng-in-heavy-duty-transport.

representatives of the Lithuanian operator Amber Grid.[28] In turn, the Polish-Slovak gas interconnector,[29] commissioned in November 2022, is one of the key links in the North-South gas corridor. It allows Poland to export gas sourced from the Świnoujście terminal to the south of the region and to import gas from LNG terminals and fields in Greece, Turkey, Croatia, the Mediterranean and the Caucasus, via Slovakia, Hungary and Romania.[30]

With its infrastructure investments, both domestically and in cooperation with foreign partners, Poland was prepared for the scenario of fossil fuel supply being cut off from Russia. When it finally came to Gazprom cutting off supplies to Poland for the first time in April 2022 (although the long-term contract expired at the end of 2022)[31] Poland was well prepared for this scenario.

Norway and US currently play the role of strategic partners in terms of gas supplies to Poland. In 2023, Poland imports gas mainly in the form of LNG (46 per cent) and from Norway[32] (Table 2).

Norway has become the largest supplier of natural gas to Poland with its import share of 44 per cent,[33] thanks to the Baltic Pipe pipeline launched in 2022. Moreover, between 2016 and 2023, Norway was also a supplier of negligible quantities of LNG to Poland.[34] Deliveries are made on the basis of long-term contracts concluded in September 2022 between Poland's PGNiG and Norway's Equinor.[35] The partnership with Norway is valuable in that some of the raw material comes from Norwegian deposits in which the Polish energy company Orlen has its stakes (as of 2024, Orlen had a stake in 104 exploration licenses in Norway).[36] Orlen plans to

[28] ZW, *Gazociąg litewsko-polski zostanie w przyszłości przystosowany do transportu zielonego wodoru*, December 7, 2000, https://zw.lt/gospodarka/gazociag-litewsko-polski-zostanie-w-przyszlosci-przystosowany-do-transportu-zielonego-wodoru/.

[29] GAZ-SYSTEM, *Interkonektor gazowy Polska – Słowacja zbudowany*, Press Release, August 26, 2022, https://www.gaz-system.pl/pl/dla-mediow/komunikaty-prasowe/2022/sierpien/26-08-2022-gaz-system-interkonektor-gazowy-polska-slowacja-zbudowany.html.

[30] GAZ-SYSTEM, *Interkonektor gazowy Polska – Słowacja zbudowany*.

[31] S. Kardaś, *Rosja wstrzymuje dostawy gazu do Polski i Bułgarii*, Analizy OSW, April 27, 2022, https://www.osw.waw.pl/pl/publikacje/analizy/2022-04-27/rosja-wstrzymuje-dostawy-gazu-do-polski-i-bulgarii.

[32] In addition, Poland imports natural gas also from the southern and western directions as well as from Ukraine and Lithuania. See ORLEN, *ORLEN w pełni zabezpiecza dostawy gazu dla polskich odbiorców*, Press Release, March 1, 2024, https://www.orlen.pl/pl/o-firmie/media/komunikaty-prasowe/2024/Marzec-2024/ORLEN-w-pelni-zabezpiecza-dostawy-gazu- dla-polskich-odbiorcow.

[33] ORLEN, *ORLEN w pełni zabezpiecza dostawy gazu dla polskich odbiorców*.

[34] International Gas Union, "World LNG Report 2024," June 26, 2024, https://www.igu.org/igu-reports.

[35] PGNiG, *PGNiG i Grupa Equinor podpisały pakiet kontraktów na dostawy gazu do Baltic Pipe*, Press Release, September 23, 2022, https://pgnig.pl/aktualnosci/-/news-list/id/pgnig-i-grupa-equinor-podpisaly-pakiet-kontraktow-na-dostawy-gazu-do-baltic-pipe/newsGroupId/10184.

[36] ORLEN, *PGNiG Upstream Norway with 12 new licenses on the Norwegian Continental Shelf*, Press Release Upstream, January 17, 2024, https://norway.pgnig.pl/news/-/news-list/id/pgnig-upstream-norway-with-12-new-licenses-on-the-norwegian-continental-shelf/newsGroupId/2187025?changeYear=2024&currentPage=1.

Table 2. Gas imports to Poland in 2016–2023 - share (in percent).

	2015	2016	2017	2018	2019	2020	2021	2022	2023
Imports from Russia (gas pipeline)	87	88,9	70,4	66,8	60,2	60,9	61	20,9	-
LNG imports	-	8,4	12,5	20,1	23,1	25,4	24	43	46
Imports from the west And southern (gas pipelines)	13	2,7	17,1	13,1	16,7	13,7	15	27	6,5
Imports from Norway (via the Baltic Pipe gas pipeline)	-	-	-	-	-	-	-	5	44
Imports from Lithuania	-	-	-	-	-	-	-	4,1	1,75
Imports from Ukraine	-	-	-	-	-	-	-	-	1,75

Source: Own compilation based on data from Polish companies PGNiG and Orlen.

increase gas production, which is expected to reach 12 bcm by 2030, half of which is expected to be from Norwegian fields,[37] which according to government forecasts could account for more than 50 per cent of Poland's consumption needs in 2030.[38] Norway also became the second most important oil supplier to Poland in 2023 after Saudi Arabia (share in supplies to Polish refineries at 35.2 per cent)[39] (Table 3). Norwegian oil reaches Poland on the basis of contracts concluded both with Norwegian companies and other foreign companies trading in oil from Norwegian deposits.[40] The import of fossil fuels from Norway is not only more valuable in terms of security of supply, but also due to the less emission-intensive way of extracting this raw material from Norwegian deposits. This is a result of efforts to electrify the oil and gas extraction process on the Norwegian Continental Shelf.[41]

[37] ORLEN, *Grupa ORLEN zwiększy wydobycie gazu i ropy naftowej w Norwegii*, Press Release, November 7, 2023, https://www.orlen.pl/pl/o-firmie/media/komunikaty-prasowe/2023/listopad-2023/grupa-orlen-zwiekszy-wydobycie-gazu-i-ropy-naftowej-w-norwegii.

[38] Ministry of Climate and Environment, *Prekonsultacje projektu aktualizacji Krajowego Planu w dziedzinie Energii i Klimatu do 2030 roku*, Press Release, September 6, 2024, https://www.gov.pl/web/klimat/prekonsultacje-projektu-aktualizacji-krajowego-planu-w-dziedzinie-energii-i-klimatu-do-2030-roku.

[39] POPiHN, *Przemysł i handel naftowy 2023* (Warszawa, 2024), https://popihn.pl/wp-content/uploads/2024/05/RAPORT-ZA-ROK-2023-1.pdf.

[40] ORLEN, *ORLEN i bp podpisały kontrakt na dostawy ropy naftowej*, Press Release, August 19, 2024, https://www.orlen.pl/pl/o-firmie/media/komunikaty-prasowe/2024/Sierpien-2024/orlen-i-bp-podpisaly-kontrakt-na-dostawy-ropy-naftowej.

[41] M. Cavcic, "Electrification of North Sea field lends a helping hand to Poland's energy giant in slashing emissions," *Offshore Energy*, May 10, 2024, https://www.offshore-energy.biz/electrification-of-north-sea-field-lends-a-helping-hand-to-polands-energy-giant-in-slashing-emissions/.

Table 3. Share of crude oil supply to domestic refineries (in %).

	2015	2016	2017	2018	2019	2020	2021	2022	2023
Russia	88,5	81,4	77,2	76,3	66,6	69,7	60,9	41,9	2,0
Iraq	6,3	5,8	4,3	1,5	-	-	0,7	-	-
Saudi Arabia	1,4	6,0	7,0	7,6	13,9	16,0	19,3	29,0	45,2
Norway	1,2	0,7	1,8	3,0	1,9	2,0	5,1	12,3	35,2
Lithuania	0,1	0,2	0,2	0,2	0,2	0,1	0,1	0,1	0,1
Iran	-	1,1	1,0	0,5	-	-	-	-	-
Azerbaijan	-	0,3	-	-	-	-	-	-	0,4
Kazakhstan	-	0,3	3,0	0,7	1,9	2,6	1,8	1,5	-
Nigeria	-	0,3	-	1,4	5,0	5,4	6,8	1,1	5,0
Canada	-	-	0,4	-	-	-	-	-	-
Denmark	-	-	0,3	-	-	-	-	-	-
USA	-	-	0,9	2,5	2,6	-	0,3	4,1	5,3
United Kingdom	-	-	-	2,4	2,4	0,5	1,3	6,3	2,4
United Arab Emirates	-	-	-	0,4	-	-	-	-	-
Angola	-	-	-	-	1,9	-	-	-	-
Guiana	-	-	-	-	-	-	-	0,5	1,0
Poland	2,5	3,9	3,9	3,5	3,6	3,7	3,7	3,2	3,4

Own elaboration based on data published in subsequent editions of the POPiHN Reports.

The US, on the other hand, although it only started exporting gas to Poland in 2017,[42] has steadily increased exports becoming the US largest supplier of LNG to Poland in 2022.[43] These supplies are based on a number of long-term contracts that Polish energy companies PGNiG and Orlen have signed with US companies between 2018 and 2023. The US is also a supplier of oil to Poland, although its share of imports is relatively small, at 5.3 per cent in 2023. The value, however, is that the

[42] PGNiG, *Historyczna dostawa gazu do Polski. PGNiG odebrało amerykańskie LNG*, Press Release, June 8, 2017, https://pgnig.pl/aktualnosci/-/news-list/id/historyczna-dostawa-gazu-do-polski-pgnig-odebralo-amerykanskie-lng/newsGroupId/10184.

[43] International Gas Union, "World LNG Report 2024," June 26, 2024, https://www.igu.org/resources/lng2023-world-lng-report/.

supplies are made on the basis of a contract with Exxon Mobil, one of the largest oil companies in the world.[44]

Denmark also plays a role in the context of security of supply. The Baltic Pipe gas pipeline, which will be commissioned in 2022, runs through its territory.[45] In addition, the Danish company Ørsted Salg & Service A/S is supplying gas to Poland on the basis of a long-term contract concluded in October 2020 with the Polish company PGNiG[46] (Table 4).

Poland's cooperation with foreign partners such as Norway, the USA and Denmark in the diversification of oil and gas supplies is a key element in strengthening energy security. From the perspective of neoliberal institutionalism, this enables the creation of a permanent framework for cooperation, the dismantling of market barriers and the stabilisation of commodity trade. Realism, on the other hand, emphasises the importance of this cooperation in reducing dependence on supplies from sources exposed to geopolitical risks. A hybrid approach combining both paradigms shows how institutional instruments and strategic national interests can reinforce each other, to increase the resilience of the Polish energy system in an unstable international environment.

Table 4. LNG imports to Poland in 2016–2023 by supplier (in million tonnes).

	2015	2016	2017	2018	2019	2020	2021	2022	2023
Qatar	0,08	0,73	1,13	1,68	1,7	1,64	1,75	1,63	1,74
Norway	-	0,06	0,06	0,25	0,1	0,25	-	-	0,07
USA	-	-	0,07	0,07	0,7	0,7	1,09	2,56	2,69
Nigeria	-	-	-	-	-	0,06	-	0,15	-
Trinidad and Tobago	-	-	-	-	-	0,05	-	0,07	0,07
Egypt	-	-	-	-	-	-	-	0,07	-
Equatorial Guinea	-	-	-	-	-	-	-	-	0,07
Total	0,08	0,79	1,26	2,00	2,5	2,7	2.84	4,48	4,64

Own elaboration based on successive editions of the World LNG Report.

[44] ORLEN, *PKN ORLEN ma pierwszy terminowy kontrakt na dostawę amerykańskiej ropy*, Press Release, March 9, 2021, https://www.orlen.pl/pl/o-firmie/media/komunikaty-prasowe/2021/marzec/pkn-orlen-ma-pierwszy-terminowy-kontrakt-na-dostawe-amerykanskiej-ropy.

[45] GAZ-SYSTEM, *Pierwsza rocznica uruchomienia Baltic Pipe*, Press Release, October 6, 2023, https://www.gaz-system.pl/pl/dla-mediow/komunikaty-prasowe/2023/pazdziernik/06-10-2023-gaz-system-pierwsza-rocznica-uruchomienia-baltic-pipe.html.

[46] PGNiG, *Grupa Kapitałowa PGNiG kupi gaz ziemny od duńskiego Ørsted*, Press Release, October 21, 2020, https://pgnig.pl/aktualnosci/-/news-list/id/grupa-kapitalowa-pgnig-kupi-gaz-ziemny-od-dunskiego-rsted/newsGroupId/10184.

Allies in energy transition goals

Prioritising security of supply was and is understandable in the context of Poland's external energy policy goals, but in the long term it is more important to develop international partnerships that best serve the energy transition agenda. Indeed, accelerating the energy transition is the only effective way to sustainably strengthen energy security in the long term.

New energy policy priorities in Poland

Although under the previous government (2015–2023) companies declared their will to achieve climate neutrality, the new cabinet that was appointed as a result of parliamentary elections in 2023 has declared more ambitious targets in this respect, as illustrated by the draft National Energy and Climate Plan (NECP).[47] In the draft NECP submitted in 2024, in the so called active (ambitious) scenario, Poland wants to increase the share of RES in the electricity sector to 56 per cent by 2030, in heating and cooling to 35.4 per cent and in transport to 17.7 per cent. In order to achieve this, the Polish government plans to increase photovoltaic generation capacity from the current 16.5 GW to 29 GW in 2030, onshore wind power from the current 10 GW to 15.8 GW in 2030 and offshore wind power to 5.9 GW of generation capacity by 2030. In addition, new biomass power plants, biogas plants and new hydroelectric power plants are to be built.[48] Furthermore, the government wants to reduce emissions across the economy by 2030 just over 50 per cent compared to 1990. Many Polish companies are planning to achieve the climate neutrality target by 2050, e.g. Orlen,[49] KGHM.[50]

The government also assumes that achieving these targets will require a significant increase in capital expenditure compared to the plans in the previous version of the NECP 2019. According to the new proposals, investment spending in the active scenario (the most ambitious) should amount to PLN 792 billion in the period 2026–2030 (in the NECP it was PLN 424 billion), PLN 687 billion in the period 2031–2035 (in the NECP 2019 it was PLN 384 billion) and PLN 721 billion in the period 2036–2040 (in the NECP 2019 it was PLN 330 billion). The government rightly points out that failing to transform will be more expensive than spending on transformation. While the average annual expenditure on transformation is estimated by the government at PLN 158 billion, the annual cost of maintaining the status quo

[47] European Commission, "National energy and climate plans," https://commission.europa.eu/energy-climate-change-environment/implementation-eu-countries/energy-and-climate-governance-and-reporting/national-energy-and-climate-plans_en.

[48] Ministry of Climate and Environment, *Prekonsultacje projektu aktualizacji Krajowego Planu w dziedzinie Energii*.

[49] *Polityka klimatyczna Grupy ORLEN*, https://www.orlen.pl/pl/zrownowazony-rozwoj/odpowiedzialnosc-za-klimat/Polityka-klimatyczna-Grupy-ORLEN.

[50] *Polityka Klimatyczna KGHM Polska Miedź S.A.*, https://raportcsr2021.kghm.com/srodowisko-naturalne/polityka-klimatyczna-kghm-polska-miedz-s-a/.

is around PLN 259 billion (in 2023, PLN 140 billion is accounted for by fossil fuel imports, PLN 100 billion by the estimated cost of smog, PLN 13 billion by the value of the entitlement deficit and PLN 6 billion by the estimated annual cost of covering the consequences of natural events).[51]

Although national efforts, both financial and operational, will be required to achieve the above objectives, appropriately developed international cooperation can have a significant positive impact on the pace of transformation. In order for the energy policy to be as effective as possible from the point of view of Polish interests, it is necessary to particularly cultivate relations with those partners with whom cooperation in the energy sector will bring Poland comprehensive benefits.

Poland's top foreign partners in renewables deployment

Norway and Denmark not only play an important role for Poland in the supply of fossil fuels (especially gas), but are also valuable partners in the development of RES projects, including those planned in the Baltic Sea. This is particularly important as the potential of the Baltic Sea in relation to renewable energy is huge. The European Commission estimates the offshore wind potential in the Baltic Sea region at 93 GW by 2050. According to a report compiled by Wind Europe and PWEA, Poland can even be credited with 28 GW, making it the country with the highest potential of all the countries in the Baltic Sea basin[52] (Table 5).

The **Norwegian** company Equinor is involved in investments in onshore and offshore RES projects. Of particular importance is Equinor's participation in the construction of the three offshore wind farms Baltic I,[53] Baltic II and Baltic III, which it is jointly developing with the Polish company Polenergia.[54] In total, all joint offshore wind projects are expected to have a capacity of 3,000 MW, which will be half of the generating capacity in offshore wind planned to be commissioned by Poland by 2030.[55] In addition, Equinor, through its subsidiary Wento, owns one onshore wind farm and three large photovoltaic farms in Poland producing a total of 280 GWh of electricity, covering the needs of 140,000 households.[56] Ultimately, Equinor plans

[51] Ministry of Climate and Environment, *Prekonsultacje projektu aktualizacji Krajowego Planu.*

[52] PSEW, *Believe in the Baltic Sea and its tremendous offshore wind potential*, https://www.psew.pl/en/believe-in-the-baltic-sea-and-its-tremendous-offshore-wind-potential/.

[53] Equinor, *Equinor i Polenergia stawiają kolejny istotny krok w rozwoju projektu Bałtyk 1*, Press Release, October 9, 2024, https://www.equinor.pl/aktualnosci/equinor-i-polenergia-stawiaja-kolejny-istotny-krok-w-rozwoju-projektu-baltyk-1.-to-najwieksza-farma-wiatrowa-na-morzu-baltyckim.

[54] See Polenergia, *Akcjonariat*, https://www.polenergia.pl/serwis-relacji-inwestorskich/akcjonariat/.

[55] "Wiatraki na morzu dadzą Polsce więcej energii niż atom," *Wysokie napięcie*, August 15, 2024, https://wysokienapiecie.pl/103293-wiatraki-na-morzu-dadza-polsce-wiecej-energii-niz-atom/.

[56] Equinor, *Equinor rozszerza portfolio odnawialnych źródeł energii w Polsce o nową farmę fotowoltaiczną*, Press Release, June 19, 2024, https://www.equinor.pl/aktualnosci/equinor-rozszerza-portfolio-odnawialnych-zrodel-energii-w-polsce-o-nowa-farme-fotowoltaiczna.

Table 5. Key offshore wind projects with foreign partners.

Partner country	Name of foreign company	Polish partner	Name of the project	Project parameters
Norway	Equinor	Polenergia	Baltic I	1.560 GW offshore wind farm
			Baltic II and Baltic III	Offshore wind farms with a total capacity of 1.440 GW
Denmark	Ørsted	PGE	Baltica 1	Wind power plant with a capacity of 0.9 GW. Plan for completion after 2030.
			Baltica 2	1.5 GW offshore wind farm. Plan to be operational by 2027
			Baltica 3	1 GW offshore wind farm. Plan for commissioning by 2030.
Canada	Northland Power	Orlen	Baltic Power	Offshore wind farm with a capacity of 1.140 GW. Northland Power holds a 49% equity interest in the project, with the remaining 51% retained by PKN ORLEN.

Own compilation based on information published by Polish energy companies.

to develop RES projects with a total capacity of 1.6 GW.[57] In addition to Equinor, through the company Danske Commodities (15 years of experience on the Polish market), it is active in the segment of the sale of produced energy on the Polish energy market.[58] The Norwegian company Statkraft - one of the European market leaders in the field of green energy generation - is also represented on the Polish market. Statkraft Poland currently has a project portfolio of 500 MW in Poland. The company plans to build more photovoltaic plants and energy storage facilities, so that by 2030 its portfolio will include advanced projects with a total capacity of 1 GW.[59] Norway also financially supports energy transition projects. Poland is the largest beneficiary of the Norwegian and EEA Funds, which are a key funding tool for Poland's energy transition. The Norway and EEA Funds are money granted by Iceland, Norway and Liechtenstein to a dozen Central and Southern European countries and the Baltic States. It is a form of non-refundable aid. Poland is the largest beneficiary of

[57] "Na Pomorzu powstała ogromna farma fotowoltaiczna," *Gram w Zielone*, June 27, 2023, https://www.gramwzielone.pl/energia-sloneczna/20150184/na-pomorzu-powstala-ogromna-farma-fotowoltaiczna.

[58] Equinor, *Equinor rozszerza portfolio odnawialnych źródeł energii*.

[59] P. Pająk, "Gigant na rynku OZE chce rozwijać projekty magazynowe w Polsce," *Gram w Zielone*, November 27, 2023, https://www.gramwzielone.pl/trendy/20170686/gigant-na-rynku-oze-chce-rozwijac-projekty-magazynowe-w-polsce.

these funds. Out of a pool of EUR 2.8 billion currently available for 14 EU countries, EUR 809.3 million has been earmarked for Poland.[60]

Denmark is also a very valuable partner for Poland in connection with the realisation of renewable energy projects. One of the largest Polish energy companies, PGE, is implementing one of the largest Polish offshore wind projects in the Baltic Sea with the Danish company Ørsted.[61] PGE Group's Offshore Programme envisages the construction of the Baltica Offshore Wind Farm by 2030, implemented in two stages - Baltica 2 and Baltica 3 with generating capacity of 1.5 GW and 1 GW respectively. Then, after 2030, the Baltica 1 Wind Farm, with a generating capacity of approximately 0.9 GW, will be added to the Group's portfolio. By acquiring new areas for development in the Baltic Sea, the PGE Group will be able to build further offshore wind farms by 2040.[62] PGE and Ørsted plan to complete Baltica 2 by the end of 2027 and Baltica 3 by 2030. The commissioning of all three offshore wind farms in the Baltic Sea will significantly contribute to the transformation of the Polish energy sector and supply almost 4 million households in Poland with green energy (the total number of households in Poland is 14.8 million)[63] and avoiding about 8 million tonnes of CO2 emissions per year.[64]

As Denmark is among the EU countries the main source of wind turbine imports to Poland (import value of 10.5 million EUR in 2023),[65] the construction of a wind turbine blade factory in Szczecin by the Danish company Vestas (holding over 16% of the world wind turbine market)[66] will be of significant importance. The investment, due to be completed in 2026, will produce turbine blades for export, but also for further RES projects in Poland, including the Baltic Power offshore wind farm.[67] In turn, Danish company Rambøll will be responsible for the development of design

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[60] Ministry of Climate and Environment, *Hajnówka OdNowa – Zielona Transformacja. Podsumowanie projektu*, Press Release, March 18, 2024, https://www.gov.pl/web/fundusze-regiony/hajnowka-odnowa--zielona-transformacja-podsumowanie-projektu.

[61] Ørsted, *Ørsted and PGE form 50–50 joint venture on Baltica 2 and 3*, February 10, 2021, https://orsted.com/en/company-announcement-list/2021/02/2173022.

[62] PGE, *Polska firma wykona projekt koncepcyjny dla MFW Baltica 1*, Press Release, August 1, 2024, https://pgebaltica.pl/dla-mediow/aktualnosci/polska-firma-wykona-projekt-koncepcyjny-dla-mfw-baltica-1.

[63] PGE, *PGE i Ørsted podpisały kolejną umowę dotyczącą wyprowadzenia mocy dla projektu Baltica 2*, Press Release, February 28, 2024, https://pgebaltica.pl/dla-mediow/aktualnosci/hdd_przewiert.

[64] "PGE podpisała umowę z Orsted ws. projektów wiatrowych na Morzu Bałtyckim," *Forsal*, February 10, 2021, https://forsal.pl/biznes/energetyka/artykuly/8092761,pge-podpisala-umowe-z-orsted-ws-projektow-wiatrowych-na-morzu-baltyckim.html.

[65] J. Frączyk, "Zielona energetyka pochodzi u nas głównie z dwóch krajów. Polacy ignorują europejskie produkty," *Business Insider*, October 14, 2024, https://businessinsider.com.pl/gospodarka/zielona-energetyka-pochodzi-u-nas-glownie-z-dwoch-krajow-polacy-ignoruja-europejskie/0j8zc6l.

[66] C. King, "Top 10 Wind Turbine Manufacturers," *Energy Digital*, August 23, 2023, https://energydigital.com/top10/top-10-wind-turbine-manufacturers.

[67] "Fabryka Vestas'a w Polsce coraz bliżej! Producent czeka na decyzję środowiskową," *Globenergia*, May 17, 2024, https://globenergia.pl/fabryka-vestasa-w-polsce-coraz-blizej-producent-czeka-na-decyzje-srodowiskowa/.

documentation for the Baltic II and Baltic III offshore wind farm locations.[68] Rambøll has also been selected by PGE as technical advisor for all its offshore wind farm projects.[69] The large Danish company European Energy is also present on the Polish market. According to the company's 2023 data, it has 130 MW of installed capacity in Poland and more than 5 GW of projects in development.[70]

The cooperation with Denmark is development-oriented and can also help to accelerate the energy transition in areas other than renewable energy. In April 2023, the gas network operators of Denmark and Poland - Energinet and GAZ-SYSTEM - signed a memorandum of understanding to accelerate the energy transition and strengthen regional energy security. The agreement addresses both gas supply issues via the Baltic Pipe (which runs through Danish territory) and the development of carbon-free energy projects including biomethane and hydrogen.[71] During the visit of the Danish royal couple to Warsaw in January 2024, the need for cooperation between the two countries in the areas of energy efficiency, climate and energy security in the region was again emphasised.[72]

Poland's cooperation with foreign partners in the RES sector has significantly accelerated the country's energy transition. Companies from Germany, Portugal, France, Canada, and Spain also play an important role in this process, realising some of the largest projects in Poland in both the photovoltaic and wind energy sectors.

The **German** company RWE, which is one of the leading investors in Polish renewable energy, has installed 541 MW of wind and photovoltaic capacity and is developing Poland's first offshore wind farm project in the Baltic.[73] Another important player is Siemens Gamesa Renewable Energy, a supplier of wind turbines for key offshore projects in Poland, such as Bałtyk II and Bałtyk III,[74] Baltica 2[75]

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[68] Polenergia, *Equinor i Polenergia z umowami na zaprojektowanie fundamentów morskich farm wiatrowych Bałtyk II i III*, Press Release, https://www.polenergia.pl/equinor-i-polenergia-z-umowami-na-zaprojektowanie-fundamentow-morskich-farm-wiatrowych/.

[69] "Ramboll doradcą technicznym PGE Baltiki," *Gospodarka morska*, August 20, 2020, https://www.gospodarkamorska.pl/ramboll-doradca-technicznym-pge-baltiki-80014.

[70] B. Blaczkowska, "Duży wzrost generacji z OZE. European Energy na fali," *Gram w Zielone*, April 2, 2024, https://www.gramwzielone.pl/trendy/20192552/duzy-wzrost-generacji-z-oze-european-energy-na-fali.

[71] GAZ-SYSTEM, *GAZ-SYSTEM i Energinet podpisały umowę o współpracy*, Press Release, April 27, 2023, https://www.gaz-system.pl/pl/dla-mediow/komunikaty-prasowe/2023/kwiecen/27-04-2023-gaz-system-i-energinet-podpisaly-umowe-o-wspolpracy.html.

[72] Ministry of Climate and Environment, *Minister Paulina Hennig-Kloska o polsko-duńskiej współpracy w dziedzinie energii*, Press Release, January 31, 2024, https://www.gov.pl/web/klimat/minister-paulina-hennig-kloska-o-polsko-dunskiej-wspolpracy-w-dziedzinie-energii.

[73] See more *RWE w Polsce*, https://pl.rwe.com/.

[74] P. Rapacka, "Kto jest kim w polskim offshore? Siemens Gamesa: Tworzymy Baltic Sea Offshore Execution Center," *Zielona Gospodarka*, October 3, 2022, https://zielonagospodarka.pl/kto-jest-kim-w-polskim-offshore-siemens-gamesa-tworzymy-baltic-sea-offshore-execution-center-8522.

[75] "Grupa PGE i Ørsted podpisały umowę z Siemens Gamesa Renewable Energy na dostawę turbin wiatrowych dla projektu Baltica 2," *Gospodarka morska*, April 20, 2023, https://www.gospodarkamorska.pl/pge-i-orsted-wybraly-turbiny-siemens-gamesa-do-farmy-wiatrowej-na-baltyku-70467.

which underlines the growing importance of offshore energy in Poland. **Portuguese** company EDPR has built nearly 1.2 GW of renewable energy capacity in Poland, and its further plans include also energy storage storage projects.[76] Meanwhile, **Canadian** company Northland Power is working with Orlen on Baltic Power, one of the largest offshore project in Poland, which will provide clean energy to more than 1.5 million households and contribute to reducing Poland's emissions by around 2.8 million tonnes per year.[77] Cooperation with **French** partners such as Qair is also contributing to the development of the Polish RES sector, with plans to reach 3 GW capacity by 2030.[78] In turn, companies from **Lithuania** and **Estonia**, such as Ignitis[79] and Enefit Green,[80] are investing in wind and photovoltaic farms, strengthening regional cooperation and green energy development. Poland is also attracting investors from the **UK** and the **Netherlands**. The British company Lightsource bp[81] and the Dutch company Vortex Energy[82] are developing photovoltaic projects with a total capacity of several hundred MW, which support the national goal of reducing CO2 emissions and increasing the share of RES in the energy mix. **Spanish** energy company Iberdrola has also been active in Poland since 2021, but the scale of involvement is below potential. Iberdrola controls a portfolio of five onshore wind farms in Poland with a total installed capacity of 212.8 MW.[83] Although Iberdrola's attempts to build the implementation of joint projects with Polish Enea companies failed,[84] the Spanish partners' plans are still ambitious and the company announces investments in Poland in projects with a total capacity of around 2 GW.[85] Norway, Denmark and Germany play a key role in the development of renewable energy sources (RES) in

[76] See more *EDPR w Polsce*, https://www.edpr.com/poland/pl#edpr-w-polsce.

[77] More one the Baltic Power project see https://balticpower.pl/o-projekcie/.

[78] https://e-magazyny.pl/aktualnosci/qair-polska-uruchamia-swoja-najwieksza-farme-fotowoltaiczna-w-polsce/.

[79] See more Ignitis Polska, https://ignitis.pl/ignitis-polska/.

[80] "Estończycy wybudują w Polsce farmy wiatrowe," *Gram w Zielone*, April 17, 2024, https://www.gramwzielone.pl/energia-wiatrowa/20194687/estonczycy-wybuduja-w-polsce-farmy-wiatrowe.

[81] "Lightsource bp uruchomiło pierwszą farmę fotowoltaiczną w Polsce o mocy 40 MW," *Wysokie napięcie*, July 22, 2024, https://wysokienapiecie.pl/krotkie-spiecie/lightsource-bp-uruchomi-o-pierwsz-farm-fotowoltaiczn-w-polsce-o-mocy-40-mw/.

[82] "Vortex Energy zbuduje farmy fotowoltaiczne i wiatrowe," *Gram w Zielone*, January 23, 2024, https://www.gramwzielone.pl/energia-sloneczna/20180202/vortex-energy-zbuduje-farmy-fotowoltaiczne-i-wiatrowe-o-mocy-110-mw.

[83] B. Blaczkowska, "Iberdrola ze stabilnymi wynikami i planem wydania 40 mld euro na OZE," *Gram w Zielone*, March 26, 2024, https://www.gramwzielone.pl/trendy/20191417/iberdrola-ze-stabilnymi-wynikami-i-planem-wydania-40-mld-euro-na-oze.

[84] "Enea zakończyła rozmowy z Iberdrolą ws. potencjalnej inwestycji w morskie farmy wiatrowe," *Bankier.pl*, September 9, 2020, https://www.bankier.pl/wiadomosc/Enea-zakonczyla-rozmowy-z-Iberdrola-ws-potencjalnej-inwestycji-w-morskie-farmy-wiatrowe-7958926.html.

[85] P. Pająk, "Hiszpański potentat wrócił na polski rynek OZE. Jakie ma plany?," *Gram w Zielone*, December 27, 2023, https://www.gramwzielone.pl/trendy/20174261/hiszpanski-potentat-wrocil-na-polski-rynek-oze-jakie-ma-plany.

Poland, and support the energy transition through technology transfer and investment. Norway is involved in offshore wind energy projects as well as solar and hydro energy technologies through companies such as Equinor and Statkraft. Denmark, which is a leader in the wind sector, supports the development of wind farms in the Baltic Sea and the supply of turbines through Ørsted and Vestas, and strengthens supply chains. German companies are also involved in numerous RES projects in Poland.

All these initiatives show that foreign partners play a key role in the development of Poland's RES sector, not only by supporting technology development, but also by strengthening the country's energy security. This cooperation combines a realistic, energy security-focused approach with a liberal model of international integration and accelerates the development of renewable energy in Poland. This cooperation is the basis for further decarbonisation and energy transition in Poland. From an energy security perspective, these partnerships reduce dependence on fossil fuels, increase resilience to geopolitical disruptions such as regional conflicts, and strengthen stability through projects such as the Nordic-Baltic Hydrogen Corridor. This cooperation not only increases Poland's energy autonomy, but also integrates the country into the European green energy ecosystem, minimises systemic risk and supports sustainable development.

Partners for cooperation in nuclear energy

Although the **US** does not play the same role in the Polish energy sector as Norway or Denmark in the development of RES, it has become a strategic partner in the Polish nuclear program, the implementation of which could make a significant contribution to Poland's energy transition. On 19 October 2020, Poland and the US signed an agreement on cooperation in the field of civil nuclear energy.[86] In November 2022, the Polish government selected the Westinghouse AP1000 technology for the construction of the country's first nuclear power plant, and in December 2022, Polskie Elektrownie Jądrowe and Westinghouse Electric Company signed an agreement defining the principles of cooperation in the preparation of the process of building Poland's first nuclear power plant.[87] In turn, in September 2023, US companies Westinghouse Electric Company and Bechtel signed agreements to form a consortium to cooperate in the design and construction of Poland's first nuclear

[86] Chancellery of Prime Minister of Poland, *Polska i USA podpisały międzyrządową umowę o rozwoju polskiego programu energetyki jądrowej*, Press Release, October 19, 2020, https://www.gov.pl/web/premier/polska-i-usa-podpisaly-miedzyrzadowa-umowe-o-rozwoju-polskiego-programu-energetyki-jadrowej.

[87] Ministerstwo Klimatu i Środowiska, *Polskie Elektrownie Jądrowe i Westinghouse Electric Company podpisały umowę określającą zasady współpracy przy przygotowaniu procesu budowy pierwszej elektrowni jądrowej w Polsce*, December 15, 2022, https://www.gov.pl/web/klimat/polskie-elektrownie-jadrowe-i-westinghouse-electric-company-podpisaly-umowe-okreslajaca-zasady-wspolpracy-przy-przygotowaniu-procesu-budowy-pierwszej-elektrowni-jadrowej-w-polsce.

power plant.[88] According to a PWC report commissioned by Westinghouse, the construction of six AP1000 units in Poland would, in addition to the economic benefits, result in a 39 per cent reduction in CO2 emissions compared to current emissions from power generation sources, while providing emission-free energy to more than 13 million households.[89] The US is also being considered very seriously as a partner in plans to build a second large nuclear power plant in Poland.[90]

US companies are also seen as important partners in the construction of so-called Small Modular Reactors (SMRs) in Poland. Polish company Orlen's plans to build SMRs (in 2023, the corporation declared its willingness to build as many as 76 reactors at 26 locations)[91] have even been included in the US Phoenix Initiative (a US government initiative to support Europe's transition from fossil fuel-based energy to SMR reactors). The project provides US government financial support to develop feasibility studies for SMR technology.[92] In total, the US plans to allocate USD 2 million from the Phoenix programme to projects in Poland, the Czech Republic and Slovakia.[93]

Although the US currently holds a key position in nuclear cooperation, the circle of potential partners of value to Poland is wider. **France** comes to the fore in this regard, as it has the technologies and declares its interest in implementing large nuclear projects in the EU, including Poland.[94] The V4 countries could be important partners for Poland. This is particularly important in the context of Polish-Czech relations - both countries are planning to build new nuclear power plant units.[95]

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[88] Westighouse, *Westinghouse i Bechtel podpisują umowę konsorcjum dla pierwszej w Polsce elektrowni jądrowej*, Press Release, September 21, 2023, https://info.westinghousenuclear.com/poland/news-and-insights/westinghouse-i-bechtel-podpisuja-umowe-konsorcjum-dla-pierwszej-w-polsce-elektrowni-jadrowej.

[89] Westinghouse, *Westinghouse opublikował raport na temat korzyści dla polskiej gospodarki wynikających z zastosowania technologii AP1000® w Polsce i wybrał kluczowych polskich dostawców*, Press Release, April 9, 2024, https://info.westinghousenuclear.com/poland/news-and-insights/westinghouse-opublikowal-raport-na-temat-korzysci-dla-polskiej-gospodarki-wynikajacych-z-zastosowania-technologii-ap1000-w-polsce.

[90] B. Oksińska, "Amerykanie liczą na kontrakt przy drugiej elektrowni jądrowej. "Im więcej bloków, tym taniej"," *Business Insider*, April 9, 2024, https://businessinsider.com.pl/biznes/amerykanie-licza-na-kontrakt-przy-drugiej-elektrowni-jadrowej-im-wiecej-blokow-tym/zjcrcfp.

[91] "To tam powstanie pierwszy reaktor SMR!," *Globenergia*, August 23, 2024, https://globenergia.pl/to-tam-powstanie-pierwszy-reaktor-smr/.

[92] "Obajtek: Reaktor jądrowy Orlenu ze wsparciem amerykańskiego programu Phoenix," *Bankier.pl*, November 12, 2023, https://www.bankier.pl/wiadomosc/Obajtek-Reaktor-jadrowy-Orlenu-ze-wsparciem-amerykanskiego-programu-Phoenix-8644566.html.

[93] "2 million US dollars to finance Small Modular Reactors in Slovakia, Czechia and Poland," *CEENERGY NEWS*, November 19, 2023, https://ceenergynews.com/nuclear/2-million-us-dollars-to-finance-small-modular-reactors-in-slovakia-czechia-and-poland/.

[94] "France confirms interest in building nuclear plant in Poland," *Reuters*, January 26, 2024, https://www.reuters.com/world/europe/france-confirms-interest-building-nuclear-plant-poland-2024-01-26/.

[95] F. Derewenda, "Poland and Czechia to strengthen energy cooperation, following high-level meetings," *CEENERGY NEWS*, May 29, 2023, https://ceenergynews.com/oil-gas/poland-and-czechia-to-strengthen-energy-cooperation-following-high-level-meetings/.

South Korea, on the other hand, is developing SMR capabilities and is interested in implementing such projects in third countries.[96]

Future nuclear projects in Poland, carried out in cooperation with foreign partners, such as the American consortium (Westinghouse and Bechtel) for the first nuclear power plant in Poland, and the search for partners for the second plant, are a key element of the energy strategy. These initiatives strengthen national security by reducing dependence on fossil fuel imports, especially from unstable geopolitical sources, and increasing energy autonomy and resilience to external disruptions. As part of the energy transition, these projects accelerate decarbonisation by integrating low-carbon nuclear sources into a diversified portfolio, supporting the EU's 2050 climate neutrality targets. They illustrate a hybrid theoretical approach: realism emphasises the protection of national interests through increased security; neoliberalism highlights the benefits of international cooperation and the role of stable partnerships. This synthesis of theories emphasises the pragmatism of Polish energy policy in the face of global challenges.

Partners in biomethane and biomass projects

In 2040, Poland is expected to be among the top biomethane producing countries in Europe. In the EU-27 ranking, we will be in 5th position with a production of over 8 bcm. According to the report 'Biogas to 2040 and beyond: a realistic and sustainable pathway to climate neutrality', Europe, i.e. the 27 EU countries plus the UK, Norway and Switzerland, could reach a biomethane production level of 111 bcm by 2040. The largest producers and sellers in 2040 are expected to be Germany, France, Spain, Italy and Poland, as well as the UK. It should be recalled that in the REPowerEU plan, the European Commission set itself the ambitious target of producing 35 bcm of biomethane in 2030, while recent analyses predict that biomethane production in 2030 could rise to as much as 44 bcm and reach 165 bcm in 2050. Much in this regard depends on political and legal conditions and the development of technologies to optimise the production of green fuels.[97]

Ukraine could be an important partner for Poland in the area of biomethane cooperation. Ukraine has the capacity to produce up to 22 billion cubic metres of biomethane annually, with potential for export to the EU, using its existing infrastructure, abundant raw material resources and extensive arable land for agricultural biomethane production. The agreements concluded between Poland and Ukraine in recent years form the basis for the development of cooperation in this area. On 16 March 2023, GAZ-SYSTEM and the Ukrainian transmission system operator GTSOU signed a memorandum of understanding. It provides for the development of gas infrastructure,

[96] "South Korea plans SMR industrial complex," *World Nuclear News*, June 20, 2024, https://www.world-nuclear-news.org/articles/south-korea-plans-smr-industrial-complex.

[97] "Europa już czeka na polski biometan," *Magazyn Biomasa*, June 18, 2024, https://magazynbiomasa.pl/polski-biometan-europa-juz-na-niego-czeka/.

support for the transport of natural gas and renewable gases such as biomethane and hydrogen.[98] In March 2024, Poland and Ukraine signed a MoU on energy cooperation, covering joint activities on energy security, infrastructure reconstruction, market integration, and cooperation on climate-neutral technologies and transport of energy resources.[99] The development of international cooperation is also fostered by regulatory changes adopted in Ukraine. In March 2024, the Ukrainian parliament adopted a law that stipulates that customs control and clearance of biomethane transported by pipeline will be done in the same way as for natural gas.[100]

Poland's cooperation with Ukraine in the field of biomethane is an important element in accelerating the energy transition, diversifying energy sources and reducing greenhouse gas emissions. Ukraine has significant production potential in the biomethane sector, which, in combination with its transmission infrastructure, can support the stability of supplies to Poland. The integration of biomethane markets contributes to increasing energy security by reducing dependence on fossil fuels and imports from areas with high geopolitical risk and fostering technological innovation in the context of EU climate and energy policy.

Partners in energy storage

The potential for international cooperation in the field of energy storage is still underdeveloped. Most activities to date have involved non-binding talks on joint projects. In December 2023, the Enea Group and the Spanish Grupo Cobra signed a letter of intent to develop cooperation in the field of energy storage. The memorandum of understanding between the Polish runner-up in power generation and the global leader in industrial technology and specialised services in the energy sector provides for cooperation in the development of energy storage projects and technologies. The aim is to share experiences in order to launch a pilot energy storage project that will work with a large number of renewable energy sources connected to Enea's distribution network.[101]

With the Netherlands, we have great untapped potential in terms of energy storage projects. Dutch companies are quite advanced in the development of large storage

[98] GAZ-SYSTEM, *GAZ-SYSTEM i Gas Transmission System Operator of Ukraine podpisali porozumienie o współpracy*, Press Release, March 16, 2023, https://www.gaz-system.pl/pl/dla-mediow/komunikaty-prasowe/2023/marzec/16-03-2023-gaz-system-i-gas-transmission-system-operator-of-ukraine-podpisali-porozumienie-o-wspolpracy.html.

[99] Ministry of Climate and Environment, *Wzmacniamy relacje z Ukrainą. Podpisano porozumienie o współpracy w dziedzinie energii*, Press Release, March 9, 2024, https://www.gov.pl/web/klimat/wzmacniamy-relacje-z-ukraina-podpisano-porozumienie-o-wspolpracy-w-dziedzinie-energii.

[100] L. Bojarski, "Ukraina będzie mogła eksportować biometan," *Magazyn Biomasa*, March 21, 2024, https://magazynbiomasa.pl/ukraina-bedzie-mogla-eksportowac-biometan/.

[101] Enea Group, *Grupa Enea i hiszpańska Grupo Cobra będą wspólnie rozwijać technologie magazynowania energii*, Press Release, December 13, 2023, https://media.enea.pl/pr/825686/grupa-enea-i-hiszpanska-grupo-cobra-beda-wspolnie-rozwijac-technologie-magazynowania-energii.

projects in Europe. For example, the developer Corre Energy, which specialises in the distribution of storage systems for renewable energy, signed a joint venture agreement with the Dutch company SemperPower - the local market leader for BESS - in July 2024. The aim of the collaboration is to develop an advanced energy storage project in Zuidwending (ZW1) in the Netherlands.[102]

Poland's cooperation with foreign partners in the field of energy storage is important for accelerating the energy transition by increasing the flexibility of the power system and integrating renewable energy sources. The transfer of technology and know-how enables the optimisation of investment costs. International energy storage projects help to increase the resilience of infrastructure, stabilise supply and minimise the risks associated with the instability of renewable energy generation. Such partnerships strengthen Poland's energy security by reducing dependence on fossil fuels and increasing the ability to respond to fluctuations in energy supply and demand in a dynamic market environment.

Multilateral alliances - important for the development of hydrogen projects

Hydrogen will play a key role in achieving climate neutrality by replacing gas and serving as an energy storage medium. In 2024, the Polish Parliament passed a law regulating the hydrogen market in Poland to accelerate the development of the hydrogen economy and eliminate the current lack of regulation that hinders investment; the planned changes are in line with the EU's gas and hydrogen package, and the estimated added value of hydrogen projects by 2040 amounts to 870 million euros and new jobs.[103] International cooperation can be crucial for the government's plans in the field of hydrogen power. This is why the joint projects in which Poland has been involved in recent years are so important.

Poland is part of a The Nordic-Baltic Hydrogen Corridor project, listed on the PCI under BEMIP (Baltic Energy Market Interconnection Plan), aims to develop hydrogen infrastructure in the Baltic region to support the REPowerEU 2030 targets, increase energy security and reduce dependence on fossil fuels. A feasibility study is currently being developed and will be completed in the second half of 2024.[104] In June 2024, Gaz System, the Polish gas network operator, signed an MoU

[102] "W Holandii powstanie jeden z największych systemów magazynowania energii w Europie," *E-magazyny.pl*, July 9, 2024, https://e-magazyny.pl/aktualnosci/magazyny-energii/w-holandii-powstanie-jeden-z-najwiekszych-systemow-magazynowania-energii-w-europie/.

[103] Ministry of Climate and Environment, *Przygotowujemy ustawę, która przyspieszy rozwój gospodarki wodorowej w Polsce*, Press Release, July 4, 2024, https://www.gov.pl/web/klimat/przygotowujemy-ustawe-ktora-przyspieszy-rozwoj-gospodarki-wodorowej-w-polsce.

[104] GAZ-SYSTEM, *Nordycko-Bałtycki Korytarz Wodorowy otrzymał status priorytetowego projektu inwestycyjnego w Unii Europejskiej*, Press Release, April 12, 2024, https://www.gaz-system.pl/pl/dla-mediow/komunikaty-prasowe/2024/kwiecen/12-04-2024-nordycko-baltycki-korytarz-wodorowy-otrzymal-status-priorytetowego-projektu-inwestycyjnego-w-unii-europejskiej.html.

with eight operators on cooperation in developing a hydrogen network and building a hydrogen market in the region. The parties to the agreement are gas network operators from Poland, Estonia, Denmark, Finland, Lithuania, Sweden, Germany and Latvia. The aim of the cooperation is to coordinate the activities of gas transmission system operators in the development of hydrogen transmission and storage infrastructure in the region. The agreement provides for the exchange of information on the development of the hydrogen market and projects related to the production and demand for renewable hydrogen. The companies also plan to work closely with European and national institutions, including within the framework of the EU initiative BEMIP.[105]

Poland has also been involved, together with a dozen other EU countries, in hydrogen projects that have been awarded IPCEI (Important Projects of Common European Interest) status. These are projects that have been assessed by the European Commission as having a positive impact on the internal market and society across the European Union, in line with common European objectives. Poland participates in three projects: Hy2Tech,[106] Hy2Use[107] and Hy2Infra.[108] The first, approved by the EC in July 2022, focuses on the development of end-user hydrogen technologies.[109] The IPCEI Hy2Use project, on the other hand, approved in September 2022, focuses on hydrogen applications in the industrial sector.[110] The Hy2Infra project, on the other hand, involves investments in the area of infrastructure, which are outside the scope of the first two IPCEI projects. Several IPCEI Hy2Infra projects are expected to be completed in the coming years. The commissioning of the large-scale electrolysers is planned for 2026–2028 and the pipelines for 2027–2029[111] (Table 6).

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[105] GAZ-SYSTEM, *Operatorzy systemów przesyłowych gazu z regionu Morza Bałtyckiego podpisali Porozumienie w celu przyspieszenia rozwoju infrastruktury wodorowej*, Press Release, June 17, 2024, https://www.gaz-system.pl/pl/rynek-wodoru/aktualnosci/17-06-2024-operatorzy-systemow-przesylowych-gazu-z-regionu-morza-baltyckiego-podpisali-porozumienie-w-celu-przyspieszenia-rozwoju-infrastruktury-wodorowej.html.

[106] Ministry of Climate and Environment, *Komisja Europejska zatwierdziła pierwsze projekty wodorowe w mechanizmie IPCEI Hydrogen*, Press Release, July 15, 2022, https://www.gov.pl/web/klimat/komisja-europejska-zatwierdzila-pierwsze-projekty-wodorowe-w-mechanizmie-ipcei-hydrogen.

[107] Ministry of Climate and Environment, *Kolejny polski projekt otrzymał status projektu IPCEI*, Press Release, September 22, 2022, https://www.gov.pl/web/klimat/kolejny-polski-projekt-otrzymal-status-projektu-ipcei.

[108] "Projekt Hy2Infra zatwierdzony – 142,77 mln euro na zielony wodór w Polsce," *Energetyka Rozproszona*, February 28, 2024, https://www.energetyka-rozproszona.pl/artykuly/projekt-ipcei-hy2infra-zatwierdzony-14277-mln-euro-na-zielony-wodor-w-polsce/.

[109] European Commission, *State Aid: Commission approves up to €5.4 billion of public support by fifteen Member States for an Important Project of Common European Interest in the hydrogen technology value chain*, July 15, 2022, https://ec.europa.eu/commission/presscorner/detail/en/ip_22_4544.

[110] European Commission, *Commission approves up to €1.4 billion of State aid by seven Member States for the fourth Important Project of Common European Interest in the hydrogen value chain*, May 28, 2024, https://ec.europa.eu/commission/presscorner/detail/en/ip_24_2851.

[111] K. Poprawska-Borowiec, *Wodorowy projekt z udziałem Polski dostał 6,9 mld euro*, February 21, 2024, https://www.gramwzielone.pl/woddor/20185032/wodorowy-projekt-z-udzialem-polski-dostal-69-mld-euro.

Table 6. Cooperation of Poland with third countries on hydrogen projects.

Name of the project	Poland's partners	Volume of state support (in billion euro)	Expected private sector support (€ billion)
Hy2Tech	Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Italy, Netherlands, Portugal, Slovakia and Spain	5,4	8,8
Hy2Use	Austria, Belgium, Denmark, Finland, France, Greece, Italy, the Netherlands, Portugal, Slovakia, Spain and Sweden	5,2	7,0
Hy2Infra	France, the Netherlands, Germany, Portugal, Slovakia and Italy	6,9	5,4
Nordic-Baltic Hydrogen Corridor	Estonia, Finland, Latvia, Lithuania and Germany	na	na

Own compilation based on data from official project websites.

National hydrogen associations from various European countries, including Poland, have signed a Cooperation Charter to enhance Europe's leadership in hydrogen technologies. The participating countries include Croatia, Estonia, Hungary, Slovakia, Slovenia, and Ukraine. By joining this agreement, the associations aim to collaborate on advancing hydrogen technologies, mitigating investment risks, and fostering growth in the hydrogen sector across Europe.[112]

Polish energy companies have also joined the European Clean Hydrogen Alliance initiative launched by the European Commission in July 2020. It is a platform for wide-ranging cooperation to build a hydrogen economy in Europe within three decades. Companies, research institutions, universities, non-governmental organisations and public administration institutions of EU countries at the national and regional level participate in the work of the network. Polish entities participating in the Alliance include among others PKN Orlen and GAZ-SYSTEM.[113]

Poland's cooperation with foreign partners in the hydrogen sector is helping to accelerate the energy transition through technology transfer, infrastructure development and market integration. From the perspective of neoliberal institutionalism,

[112] C. Patricolo, "CEE hydrogen associations join forces to advance clean hydrogen technologies," *CEENERGY NEWS*, May 29, 2024, https://ceenergynews.com/hydrogen/cee-hydrogen-associations-join-forces-to-advance-clean-hydrogen-technologies/.

[113] See more European Commission, "European Clean Hydrogen Alliance," https://single-market-economy.ec.europa.eu/industry/industrial-alliances/european-clean-hydrogen-alliance_en.

this enables the creation of a stable framework for cooperation, strengthening the effectiveness of investments and reducing barriers to trade. At the same time, realism emphasises the importance of hydrogen for strategic autonomy and the minimisation of geopolitical risks through the diversification of energy sources.

Financial partners: EU funds and international banks

Financial support received from the EU and financial institutions has played an important role in the implementation of energy projects. In the case of banks, this includes two European banks, the European Bank for Reconstruction and Development (EBRD) and the European Investment Bank (EIB), which are increasingly funding projects to accelerate the energy transition.

In September 2024, the European Commission approved Poland's €1.2 billion state aid program to support investment in strategic sectors of the economy to accelerate the transition towards net zero emissions. The program is of great importance for the implementation of Poland's Green Deal industrial plans.[114] Earlier, in October 2023, the European Commission approved a Polish state aid program worth €1.2 billion for Polish companies (industrial and mining companies).[115] Poland is also a beneficiary of support from the EU Modernisation Fund. In 2022, support of €244.2 million was granted for energy efficiency improvements in industry in Poland.[116]

In 2023, Poland was the largest recipient of EBRD financing in the European Union. The bank's total exposure to Poland between 1991 and 2024 amounted to €13.9bn and involved more than 500 different projects, 92 per cent of which in the form of debt or equity in private sector companies.[117] In 2023, the EBRD invested a record annual amount of €1.3 billion in Poland. As much as 75 per cent of the funds raised were earmarked to finance so-called green investments, i.e. those aimed at decarbonisation or, more broadly, accelerating the energy transition.[118] These funds are used to implement RES projects, such as the planned projects of the Polish company PL-SUN - construction and operation of 16 photovoltaic power plants in

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[114] European Commission, *Commission approves €1.2 billion Polish State aid scheme to support investments in strategic sectors to foster the transition to a net-zero economy*, Press Release, September 17, 2024, https://ec.europa.eu/commission/presscorner/api/files/document/print/en/ip_24_4141/IP_24_4141_EN.pdf.

[115] "Miliardowe wsparcie dla polskich firm. KE dała zielone światło," *Money.pl*, October 7, 2023, https://www.money.pl/gospodarka/miliardowe-wsparcie-dla-polskich-firm-ke-dala-zielone-swiatlo-6949568018745984a.html.

[116] European Commission, *Fundusz modernizacyjny*, Press Article, June 8, 2022, https://poland.representation.ec.europa.eu/news/fundusz-modernizacyjny-2022-06-08_pl.

[117] "EBOR i Eiffel Investment Group udzielą 45 mln euro kredytu dla PL-Sun na farmy PV," *Ecoekonomia*, March 4, 2024, https://ecoekonomia.pl/2024/03/04/ebor-i-eiffel-investment-group-udziela-45-mln-euro-kredytu-dla-pl-sun-na-farmy-pv/.

[118] *Polska największym w Unii Europejskiej odbiorcą finansowania z EBOiR*, January 25, 2024, https://bank.pl/polska-najwiekszym-w-unii-europejskiej-odbiorca-finansowania-z-eboir/.

Poland[119] or RES projects implemented by Baltic Sea Polska II and C&C Wind - subsidiaries of Eurowatt Green Energy Group (Eurowatt).[120] The EBRD has invested PLN 240 million (equivalent to €55.8 million) for 24 per cent of a PLN 1 billion local currency bond issued by Tauron to support its decarbonisation strategy.[121] The EBRD provided a €140 million loan to the project company Baltic Power for the construction of an offshore wind power plant in the Baltic Sea.[122] R.Power, a power producer and developer of photovoltaic farms operating in Poland and Europe, was also a beneficiary of EBRD support.[123] R.Power, one of the largest companies operating in Poland in the RES sector, is also active outside Poland (e.g. in Portugal, Italy and Spain).[124]

The European Investment Bank (EIB) has maintained its strong commitment to financing in Poland, providing almost €5.1 billion of financing in 2023. Funding from the EIB amounted to €4.67 billion and €632 million from the European Investment Fund (EIF). Energy transition financing in Poland increased by 80 per cent from 2022 to €1.78 billion. The share of green financing and commitment to climate-friendly projects increased to 52 per cent from 49 per cent in 2022.[125] For example, in December 2023, the EIB and NordLB signed an agreement to finance renewable energy projects in the European Union, with a focus on projects in Poland, Denmark and Sweden.[126] In December 2023, the EIB signed an agreement to finance the modernisation of ENEA electricity distribution network in western Poland.[127]

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[119] Dentons, *Dentons doradza EBOR oraz Eiffel Investment Group przy udzieleniu pionierskiej pożyczki typu construction bridge na finansowanie projektów fotowoltaicznych*, Press Release, March 8, 2024, https://www.dentons.com/pl/about-dentons/news-events-and-awards/news/2024/march/dentons-advises-ebrd-and-eiffel-investment-group-on-a-pioneering-bridge-loan-to-finance-photovoltaic.

[120] "EBOR rozszerzył pakiet finansowy dla Grupy Eurowatt na OZE do 126,1 mln zł," *Ecoekonomia*, January 9, 2024, https://ecoekonomia.pl/2024/01/09/ebor-rozszerzyl-pakiet-finansowy-dla-grupy-eurowatt-na-oze-do-1261-mln-zl/.

[121] K. Kukula, "EBRD supports green transition of Poland's electricity producer Tauron," *EBRD*, November 2, 2020, https://www.ebrd.com/news/2020/ebrd-supports-green-transition-of-polands-electricity-producer-tauron.html.

[122] "EBOR udzieli 140 mln euro kredytu na budowę MFW Baltic Power," *Offshore Wind Poland*, September 27, 2023, https://offshorewindpoland.pl/ebor-udzieli-140-mln-euro-kredytu-na-budowe-mfw-baltic-power/.

[123] K. Świsłowski, "EBOR drugi raz inwestuje w R.Power. Wcześniej spółka pozyskała od funduszu 150 mln euro," *Green News*, October 24, 2023, https://www.green-news.pl/3757-rpower-ebor-inwestycje-oze.

[124] B. Supernak, "R.Power ma umowę z EBOR i akcjonariuszem mniejszościowym dot. inwestycji EBOR w wys. 75 mln euro," *Inwestycje.pl*, October 23, 2023, https://inwestycje.pl/biznes/r-power-ma-umowe-z-ebor-i-akcjonariuszem-mniejszosciowym-dot-inwestycji-ebor-w-wys-75-mln-euro/.

[125] EIB, *Finansowanie Grupy EBI w 2023 roku wsparło rozwój gospodarczy w Polsce i wyniosło 5,1 miliarda euro*, Press Release, March 25, 2024, https://www.eib.org/en/press/all/2024-128-poland-received-eur5-1-billion-from-eib-group-in-2023-to-bolster-economy?lang=pl.

[126] EIB, *EBI i NordLB podpisały umowę na finansowanie projektów w zakresie energii odnawialnej w Unii Europejskiej*, Press Release, December 5, 2023, https://www.eib.org/en/press/all/2023-496-eib-and-nordlb-sign-agreement-to-finance-renewable-energy-projects-in-the-european-union?lang=pl.

[127] EIB, *Polska: EBI wspiera strategiczny plan modernizacji ENEA SA finansowaniem w wysokości 1 miliarda złotych*, Press Release, December 22, 2023, https://www.eib.org/en/press/all/2023-556-poland-eib-provides-pln-1-billion-in-financing-to-support-strategic-modernisation-plan-of-enea-s-a?lang=pl.

Strategic allies, sectoral partners and countries with untapped potential

Norway, the USA and Denmark have become **strategic partners** for Poland in the energy sector, and cooperation with them brings and will continue to bring comprehensive benefits to Poland. Stable supplies of fossil fuels, and gas in particular, are important in the context of the energy transition. Indeed, natural gas is regarded as a transitional fuel, one of the sources providing security for growing RES capacity and a less carbon-intensive alternative to coal. According to the Polish government's assumptions in the NECP, the consumption of natural gas in Poland will reach 23.5 bcm in 2025 and 23 bcm in 2030,[128] which implies the need to maintain cooperation with reliable suppliers. In addition, the main suppliers of fossil fuels to Poland also play an important role in the context of plans to accelerate the energy transition: Norway with RES, and the USA with nuclear projects. The US is Poland's key strategic partner in nuclear energy, particularly through the adoption of Westinghouse AP1000 technology for Poland's first nuclear power plant. Additionally, US companies Westinghouse and Bechtel are involved in the design and construction process. The US also plays a crucial role in Poland's SMR ambitions, with Orlen planning to build up to 76 SMRs under the US Phoenix Initiative, which financially supports feasibility studies for Poland, the Czech Republic, and Slovakia. Denmark, through whose territory important gas and oil export routes to Poland run, is also an important ally in developing RES potential or improving energy efficiency indicators.

There are a number of countries that are important partners for Poland in selected energy sectors **(sectoral partners).** Poland's cooperation with foreign partners in the field of renewable energy sources has significantly accelerated the country's energy transition. A key role in this process is played by companies from Germany, Portugal, France, Canada and Spain, which are implementing some of the largest projects in Poland, both in the field of photovoltaics and wind energy. There are also many EU countries that are involved in multilateral hydrogen projects with Polish companies.

There are many countries with **untapped potential** for energy cooperation with Poland. Some of them are already working with Poland in other areas, but also have other promising areas for cooperation. Firstly, there is also room for cooperation with other partners in the field of nuclear energy. A potential strategic partner for Poland due to its extensive experience in the nuclear sector and its willingness to invest in large nuclear projects in the EU. Poland and the Czech Republic are both planning to develop nuclear power plants, which offers opportunities for regional collaboration in the field of nuclear energy. Poland could seek partnerships with South Korea, which has advanced SMR technologies and is interested in cooperating with third countries on nuclear projects. Expand nuclear partnerships beyond the

[128] Ministry of Climate and Environment, *Prekonsultacje projektu*.

US (e.g. with France, South Korea and the V4 countries) to increase technological diversity and reduce dependence on a single supplier.

Ukraine is a promising partner in the biomethane sector, mainly due to its annual biomethane production capacity of 22 billion cubic metres and regulatory changes that encourage pipeline exports. The agreements signed between GAZ-SYSTEM and GTSOU (the Ukrainian gas transmission company) in 2023 and 2024 will facilitate the cross-border transport of biomethane and hydrogen. Expansion of the biomethane infrastructure with Ukraine using its pipeline-capable biomethane export capacity. There is also untapped potential in the biomethane sector with Germany, France, Spain, Italy and the United Kingdom. Poland is expected to rank fifth in biomethane production in Europe by 2040, making collaboration with leading European producers essential to expand production and trade.

Spain and the Netherlands have great potential for the development of international cooperation in energy storage. The Polish Enea Group has initiated cooperation with the Spanish Grupo Cobra to develop energy storage technologies and is planning a pilot storage project. Poland has considerable untapped potential for cooperation with Dutch companies in the field of energy storage, which are leaders in large-scale storage solutions. Corre Energy and SemperPower are currently developing advanced storage projects in the Netherlands, which represent a model for potential Polish-Dutch cooperation. Deepening cooperation with Spain and the Netherlands on energy storage projects, as both countries are leaders in battery and grid storage solutions, which are crucial for the integration of renewable energy in Poland.

Barriers and drivers of Polish energy cooperation with third countries Poland's endeavour to cooperate with third countries in the energy sector is a crucial part of its energy security and energy transition strategy. However, this process is determined by a complex interplay of barriers and drivers. Barriers, which include geopolitical, economic, regulatory, infrastructural, and social challenges, hinder effective cooperation, while drivers such as diversification needs, EU alignment, and technological innovation push Poland towards deeper international partnerships. This section analyses these factors to shed light on the dynamics of Polish energy cooperation with third countries.

Obstacles / challenges

Geopolitical tensions pose a significant obstacle to Poland's energy cooperation. The war between Russia and Ukraine and subsequent EU sanctions disrupted key supply routes, such as the Yamal gas pipeline, exposing Poland to political pressure and supply risks. While diversification efforts, including LNG imports from the United States and Qatar and gas supplies from Norway via the Baltic Pipe, have allowed Poland to become fully independent of Russia's supplies, these alternatives remain vulnerable to global conflicts, such as tensions in the Middle East. Poland's continued dependence on energy imports - which cover a significant part of its needs - highlights its vulnerability to geopolitical fluctuations and complicates p artnerships with third countries.

The economic costs of energy diversification is a significant challenge. Investments in infrastructure, such as the LNG terminal in Świnoujście and the Baltic Sea pipeline, have swallowed up billions of zlotys and burdened the state budget. In 2022, Poland's fossil fuel imports cost PLN 193 billion (around € 45.4 billion), highlighting the financial burden of external energy dependence. Limited funding for emerging projects, such as nuclear energy cooperation with the United States, limits Poland's ability to expand cooperation. In addition, the high cost of carbon capture and storage (CCS) technologies, which require coordination with the Baltic states, further limits investment due to insufficient funding.

Regulatory framework also hinders cooperation in the energy sector. The 10H Act, which imposes strict distance requirements for onshore wind farms, restricts partnerships with technology suppliers from countries such as China and the United States. The lack of harmonised approval procedures for nuclear power plants, particularly for small modular reactors from the United States, is also delaying the implementation of projects. Administrative bottlenecks in the integration of renewable energy sources into the national grid also hinder the import of photovoltaic panels, which limits cooperation with global suppliers and slows down the energy transition in Poland.

Poland's energy infrastructure is still not sufficient to support solid cooperation with third countries in some areas. The transmission grid is not able to fully integrate renewable energy, so surplus energy or CO_2 storage has to be exported to countries such as Norway or Denmark, which increases costs. The lack of suitable energy storage and CCS facilities further complicates efforts to manage domestic production and international partnerships, and creates logistical barriers to cooperation.

Social factors, particularly resistance from coal-dependent communities, pose an additional challenge. Miners' protests against the coal phase-out policy have influenced government decisions, in particular some long-term energy strategy goals. This social resistance creates a political environment that is less conducive to a rapid energy transition and international cooperation, particularly in the area of renewable and low-carbon technologies.

Drivers

Poland's harmonisation with the European Union's energy and climate policy is an important driver of cooperation. The EU Green Deal and the goal of carbon neutrality by 2050 incentivise Poland to cooperate with third countries in the field of renewable and low-carbon technologies, such as hydrogen projects with Germany and nuclear energy initiatives with the United States. These partnerships provide access to advanced technologies and financing opportunities, and support Poland's transition to a sustainable energy system.

The global push for innovative energy solutions, such as SMR, hydrogen, and CCS, encourages Poland to partner with technologically advanced third countries. Cooperation with the United States in the field of SMR and with the Baltic States in

the field of CCS offers the opportunity to utilise expertise and infrastructure, to drive technological progress in the Polish energy sector. In addition, the import of advanced PV panels and wind technologies from countries such as China strengthens Poland's renewable energy capacity, and is in line with global trends towards decarbonisation.

Economic incentives, such as access to global energy markets and competitive prices, are motivating Poland to deepen cooperation. Participation in international energy markets also allows Poland to benefit from economies of scale and shared infrastructure, such as cross-border pipelines and storage facilities, which increases the economic viability of cooperation.

Recommendations

The energy transition in Poland is a key element of the country's economic and environmental policy in the coming decades. The pursuit of climate neutrality and the diversification of energy sources require strategic action at both national and international level. Cooperation with foreign partners plays a crucial role in this. Although Poland is dynamically expanding cooperation with a number of important foreign partners, there are still some areas of action that could make foreign energy policy even more effective in realising the ambitious energy transition plans.

1. Completion and development of infrastructure projects for energy integration

Although Poland has made many valuable infrastructure investments in recent years, it should complete the unrealised investments that are part of the process of integrating energy markets in Europe. One example is the Stork II gas interconnector project with the Czech Republic, which is currently being called into question. Despite a declaration from the Czech Republic in July 2023,[129] real progress on this issue is minimal. The completion of this project would allow Poland to increase its gas transmission capacity and complete the development of gas interconnections with its neighbours, which would strengthen the energy security of Poland and its neighbouring countries. Poland should further develop electricity interconnections with Lithuania, e.g. the Harmony Link project, and complete the synchronisation of the Baltic States' electricity grids with the EU, which would enable the future transmission of electricity between Poland and Lithuania and the Baltic States.

It is also important to increase the capacity of gas connections with Ukraine, which can open up new opportunities for energy cooperation and contribute to strengthening energy security in the CEE region. Integrated gas and electricity grids between Poland and its neighbours will increase the flexibility and resilience of the

[129] PAP, *Kiedy zostanie uruchomiony gazociąg Stork II? Premier Czech komentuje*, Press Release, July 20, 2023, https://www.pap.pl/aktualnosci/news,1599599,kiedy-zostanie-uruchomiony-gazociag-stork-ii-premier-czech-komentuje.html.

national energy system to external disruptions. This could be particularly important in the context of importing clean energy from Ukrainian nuclear power plants or RES plants. Poland should intensify cooperation with countries that have been able to develop the potential of energy storage. Countries such as the Netherlands and Spain have great potential in this area.

2. Avoiding investment in 'stranded assets'

At the same time, Poland should avoid investments that lead to so-called stranded assets when expanding its energy infrastructure. One example of this is the plan to build a second floating LNG terminal in Gdansk with a planned capacity of 4.5 bcm per year. An open-season procedure carried out in 2023 showed a lack of interest from foreign partners,[130] suggesting that the investment could be economically unjustified. In this type of case, Poland should focus on projects with proven profitability and real market demand to avoid the risk of wasting financial resources.

3. Diversification of nuclear allies

One of the key elements of Poland's energy strategy is the development of nuclear energy projects. Currently, cooperation with the US dominates the development plans for nuclear power plants in Poland. However, in order to increase the efficiency and flexibility of these projects, Poland should diversify its partners by also inviting other countries such as France and South Korea to cooperate. France has extensive experience in the construction and operation of nuclear power plants, and South Korea could be a valuable partner in developing small modular reactor (SMR) technology, which could play a key role in Poland's energy mix.

Diversification of partners will reduce Poland's dependence on a single technology provider and open up new opportunities for financing and implementing cutting-edge solutions. Cooperation with different countries will also increase the competitiveness of projects, which can have a positive impact on their costs and efficiency.

4. Cooperation with countries moving away from coal

Poland, together with countries such as Germany and the Czech Republic, faces the challenge of moving away from coal as its main source of energy. Closer cooperation with these countries can bring tangible benefits, especially in the area of sharing experiences and technologies that will enable a faster transition to renewable energy-based power generation. Joint activities may include the development of carbon capture and storage (CCS) technologies, modernisation of electricity grids and cooperation on hydrogen projects. Poland should try to coordinate with other countries

[130] R. Kamiński, "Nie ma chętnych na drugi terminal gazowy FSRU w Gdańsku," *Gospodarka morska*, November 27, 2023, https://www.gospodarkamorska.pl/nie-ma-chetnych-na-drugi-terminal-gazowy-fsru-w-gdansku-74873.

that are in a similar situation in order to avoid duplication and optimise the costs of the energy transition.

5. Speeding up the permitting process

One of the main obstacles to the development of renewable energy sources in Poland are lengthy administrative procedures. Shortening the authorisation procedures in the wind industry is crucial to achieve the ambitious targets for the development of wind power capacity in the Baltic Sea. Poland, together with other Baltic countries, has committed to increase wind power capacity from 3 GW to 20 GW in the coming years.[131] Speeding up administrative procedures can significantly accelerate the realisation of these projects and also attract foreign investors for further RES projects in Poland. The appointment of a special government representative for offshore wind energy could provide additional support to the industry and enable more efficient investments.

6. Enhancing bilateral cooperation on hydrogen technologies

Hydrogen is playing an increasingly important role in global decarbonisation plans, and Poland should take full advantage of its opportunities in this area. While Poland is rightly involved in many multilateral projects in the EU, it should intensify bilateral cooperation with some partners. On a bilateral level, Germany, which already cooperating with Polenergia in the development of advanced hydrogen technologies, could be a valuable partner. In addition, Poland has signed a memorandum of cooperation on hydrogen with Japan, which opens up new opportunities for the production and distribution of renewable hydrogen. The development of hydrogen technology can not only contribute to the decarbonisation of industry, but also create new jobs and increase the competitiveness of the Polish economy on the global market.

7. Supporting the development of electromobility

The development of electromobility in Poland, which is seen as a key tool for decarbonising transport, should be a priority. Although the market for electric cars in Poland is still relatively small, it is growing rapidly - by September 2024, almost 67,000 electric cars and almost 62,000 hybrid vehicles were registered, which shows the growing interest in this segment. At the same time, the charging infrastructure is developing - the number of public charging stations increased from 6,000 in December 2023 to almost 8,000 in September 2024. Poland should intensify financial support for electric vehicle manufacturers and expand the charging infrastructure. Cooperation with foreign partners such as Greenway or Eesti Energia in the expansion of the charging network is already bringing benefits, but further investments is

[131] Ministry of Climate and Environment, *Polska łączy kraje bałtyckie – "Deklaracja Bałtycka na rzecz Morskiej Energetyki Wiatrowej" podpisana*, Press Release, September 30, 2020, https://www.gov.pl/web/klimat/polska-laczy-kraje-baltyckie--deklaracja-baltycka-na-rzecz-morskiej-energetyki-wiatrowej-podpisana.

needed to meet the growing demands of the market. Particular attention should be paid to further developing the infrastructure and supporting domestic production, which is currently being carried out by Stellantis in Tychy and Gliwice.

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International cooperation is an indispensable element of modern energy policy. Whether through security alliances, trade agreements, or technological collaboration, countries can achieve greater stability and sustainability in the energy sector. While national sovereignty remains an important factor in energy decision-making, the complexity of global energy challenges necessitates deeper cooperation at regional and international levels. In order for Poland to successfully pursue its energy transition goals, it is crucial to strengthen cooperation with foreign partners and accelerate the development of domestic RES, nuclear and hydrogen capabilities. Coordinating activities, diversifying partners and avoiding risky investments will allow Poland to successfully transition to a low-carbon economy while strengthening energy security and economic stability. A hybrid approach to both paradigms – neoliberal institutionalism and realism - explains how national interests and international cooperation mechanisms can complement each other, to strengthen Poland's energy security in the context of global competition and the transformation of the energy sector.

Ethic and consent

Ethical approval and consent were not required.

Data availability statement

Underlying data

No data associated with this article.