



CEE PULSE 002

Why Technology Optionality Matters for Central and Eastern Europe

April 2026



CLEAN AIR
TASK FORCE

Breaking the Cycle: CEE's Path to a Resilient Energy Transition

Much has happened since the publication of our first CEEPulse in October 2025. Europe's steadfast aspiration towards energy sovereignty, energy affordability and industrial competitiveness is continually challenged by ever-increasing geopolitical rift. The ongoing escalation in the Middle East and the subsequent energy price volatility underscore that while fossil fuel dependency cannot be eliminated overnight, it is critical that a clean transition becomes the cornerstone of Europe's economic policy. In this edition of CEEPulse we are zooming in on what a diversified clean energy solutions portfolio means for Central and Eastern Europe – a region uniquely positioned to lead on reducing dependencies.

As we navigate the geopolitical headwinds abroad and several domestic elections - including Hungary's much-anticipated election in April – it is crucial that we collectively strive for the clean transition to be at the forefront of the agenda.

In this edition, we'll introduce what is called an optionality mindset. A philosophy that can broaden the range of options on the path to decarbonising an uncertain world. While not all options may succeed, some may deliver outsized benefits. I hope you enjoy reading.



Tamara Lagurashvili
Director, Central and Eastern Europe, CATF

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1. Keeping Options Open: Strengthening CEE's Clean Energy Transition

Central and Eastern Europe's clean energy transition is ultimately about strategic decision-making. As the region works to reduce its exposure to imported fossil fuels, it must also avoid exchanging one form of dependency for another. The task ahead is not simply to decarbonise, but to build an energy system that is cleaner, more secure, and better aligned with long-term economic resilience.

That means preserving clean energy optionality.

In practical terms, optionality means keeping multiple pathways to decarbonisation open rather than relying on a single solution. Because the future of technologies, costs, and political conditions is uncertain, an optionality approach supports a range of promising solutions and creates the flexibility to scale those that prove most effective.

A resilient strategy should not depend on a single technology, fuel, or external supplier. It should expand the range of viable pathways available to countries across the region, drawing on and enabled by the national

circumstances and geographic endowments. An options-based approach can reduce strategic vulnerability, strengthen system flexibility, and help governments respond to a more uncertain geopolitical environment.

Optionality is a mindset to achieve resilience and robustness in managing climate change.

This is also an industrial question. As global competition over clean energy technologies intensifies, CEE has a clear interest in strengthening domestic and regional capacity across manufacturing, infrastructure, and supply chains in a way that maximises domestic value creation. The region's future competitiveness will depend not only on deploying clean technologies, but on participating more fully in producing them.

Regional cooperation will be essential to that effort. Better interconnections, stronger infrastructure, and deeper coordination with neighbouring markets can improve resilience and widen the set of clean energy choices available to governments. In this sense, diversification is not only about replacing imports. It is about increasing strategic agency.

For Central and Eastern Europe, clean energy optionality is not a hedge against ambition. It is the basis for an energy transition that is secure, competitive, and resilient to political and geopolitical change. Optionality ultimately requires an energy system that can accommodate a diverse mix of technologies while maintaining reliability.

In this edition, we'll focus on **clean firm power** – low-carbon energy sources that can generate electricity reliably regardless of weather conditions – and the role they can play in addressing some of the structural challenges of the energy transition in CEE.

2. Why Clean Firm Power Matters

Achieving an affordable, reliable, and abundant clean energy future in the CEE region will require electricity systems to grow while rapidly decarbonising. Delivering a reliable, least-cost power system will depend not only on scaling renewables, storage, and demand-side solutions, but also on deploying clean electricity technologies with complementary capabilities. Wind, solar, storage, transmission, and demand-side solutions are indispensable, and scaling them significantly and quickly is essential. But evidence from decades of electricity system analysis shows that relying on these resources alone makes the path to a fully clean grid more challenging, expensive, and riskier than it needs to be.

As our new report [Clean Firm Electricity Technologies: What, Why, How](#) lays out, that is where clean firm generation technologies come in.

“By delivering clean electricity that is available whenever it is needed, independent of weather, clean firm resources – like geothermal, nuclear energy, fusion, and fossil generation with high levels of carbon capture – can reduce the scale of infrastructure required, lower total system costs, and expand the set of viable pathways to deep decarbonisation.”



[Lea Romm](#)
Europe Policy Associate,
Electricity Program, CATF

While each of these technologies has unique characteristics, their common value lies in their ability to dramatically reduce the total installed capacity of clean energy resources needed to reduce emissions of the power sector and achieve decarbonisation targets, because of their high utilisation rates, remaining available during prolonged periods of low wind and solar output, and operating independently of seasonal generation patterns.

Complementing variable renewable energy sources with clean firm generation technologies can provide a number of benefits, including:

1. Reduced need for fossil fuel back-up generation

To address renewable variability, the European power system often relies on unabated and imported fossil fuels as dispatchable backup. Increasing electricity costs, concerns about reliability, import dependency and energy security, and projected but uncertain load growth, are putting more pressure on domestically produced clean energy generation. Replacing fossil fuels with clean firm generation can ensure low-carbon electricity even during periods of low wind and solar generation and achieve decarbonisation at lower costs.

2. Reduced infrastructure buildout

The deployment of clean firm resources drastically reduces the scale of the infrastructure buildout necessary to decarbonise the power sector while meeting demand growth, in comparison to pathways without clean firm generation technologies. This generally also translates into additional benefits such as low land use, flexible siting, low material requirements overall, and low critical mineral requirements in particular.

3. Reduced costs of power sector decarbonisation

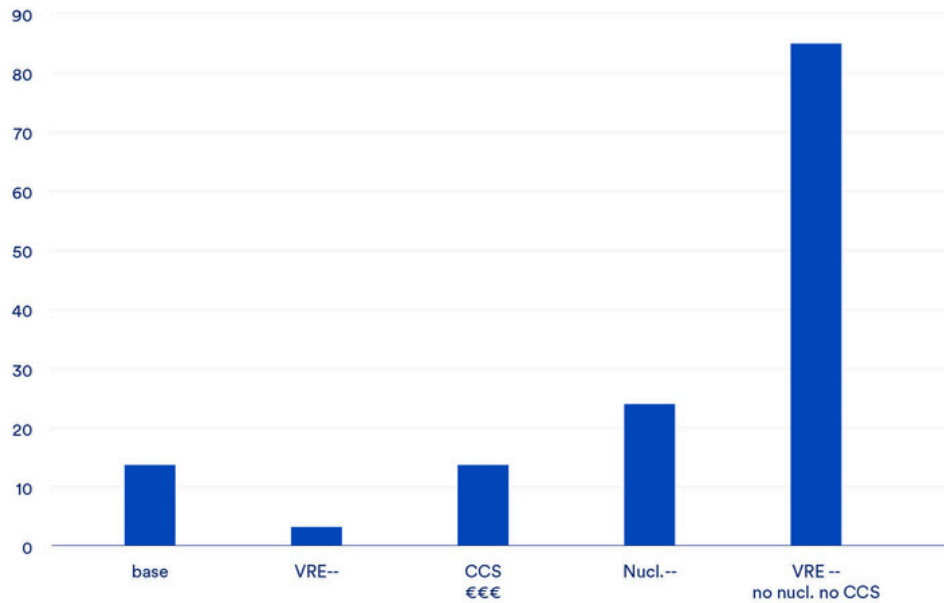
The cost of fully decarbonising the electricity sector could be significantly lowered through the development and cost-effective commercialisation of one or more clean firm generation technologies, as they reduce the cost of meeting seasonal and extreme-weather reliability requirements, which dominate costs in deeply decarbonised grids.

4. Higher likelihood of an effective and timely decarbonisation

The inclusion of more technology solutions means that risks that affect technologies asymmetrically are less likely to become severe bottlenecks to decarbonisation. If one technology pathway faces unique constraints at any point in time or in any region, a diverse technology portfolio ensures that other options are available to fill the gap.

A significant barrier to boosting clean firm generation capacity, however, is the fact that this category remains underappreciated and insufficiently incentivised in EU climate and energy policy. For instance, while the EU has a binding target for the share of energy from renewable sources, there is no comparable incentive mechanism for clean firm generation.

Figure 1: Estimated transmission capacity required in different scenarios of achieving a decarbonised power grid in Poland by 2050.



Scenario names	Descriptions
‘base’	Central technology cost forecasts with all technologies available for contribution. Technical land-use potential is considered, but local socio-political opposition (i.e. NIMBY behaviour) are not taken into account.
‘VRE --’	Development of costs for wind and solar stagnates, while simultaneously facing public opposition, resulting in lower maximum renewable expansion potential, for instance, 28 GW in total for onshore wind.
‘CCS €€€’	Cost forecasts for carbon dioxide transport and storage are higher than in the base case.
‘nucl. --’	Initial nuclear energy projects don’t obtain a strong governmental support and start off expensive. Following projects see a learning rate owing to serial construction.
‘VRE – no nucl. no CCS’	The decarbonisation strategy heavily relies on wind and solar technologies; however, their cost decrease stagnates, and they struggle with negative public opinion (NIMBY).

See [Decarbonising Poland’s Power System: A Scenario-Based Evaluation](#)

Beyond that, clean firm generation commercialisation and deployment include early-stage project costs and risks, policy gaps or uncertainty, and electricity system planning shortfalls focusing on too narrow timeframes to capture the long-run value of clean firm resources.

Policymakers need to work along two parallel paths to help overcome near-term barriers and unlock the long-term benefits of clean firm power: first, enabling near-term deployment of clean firm generation technologies to support technology commercialisation and cost reduction, and second, implementing long-term planning and policies that enable optimal integration of clean firm generation technologies into the electricity sector.

Although Central and Eastern Europe holds significant

renewable energy potential—especially in onshore wind, solar photovoltaic, and hydropower—these resources alone cannot ensure consistent energy reliability throughout the year. The region's energy transition must incorporate clean firm technologies, such as nuclear and advanced geothermal, which can deliver reliable, dispatchable power regardless of whether variability or seasonal changes. Clean firm power is essential for maintaining balance, particularly as the integration of renewables rises and grid systems face heightened stress due to variability. In the absence of robust low-carbon generation, excessive dependence on renewables and battery storage may result in energy security vulnerabilities and increased system expenses. The following sections explore examples of how geothermal and nuclear energy are already making a difference in CEE.

3. Why Next-Generation Geothermal Matters

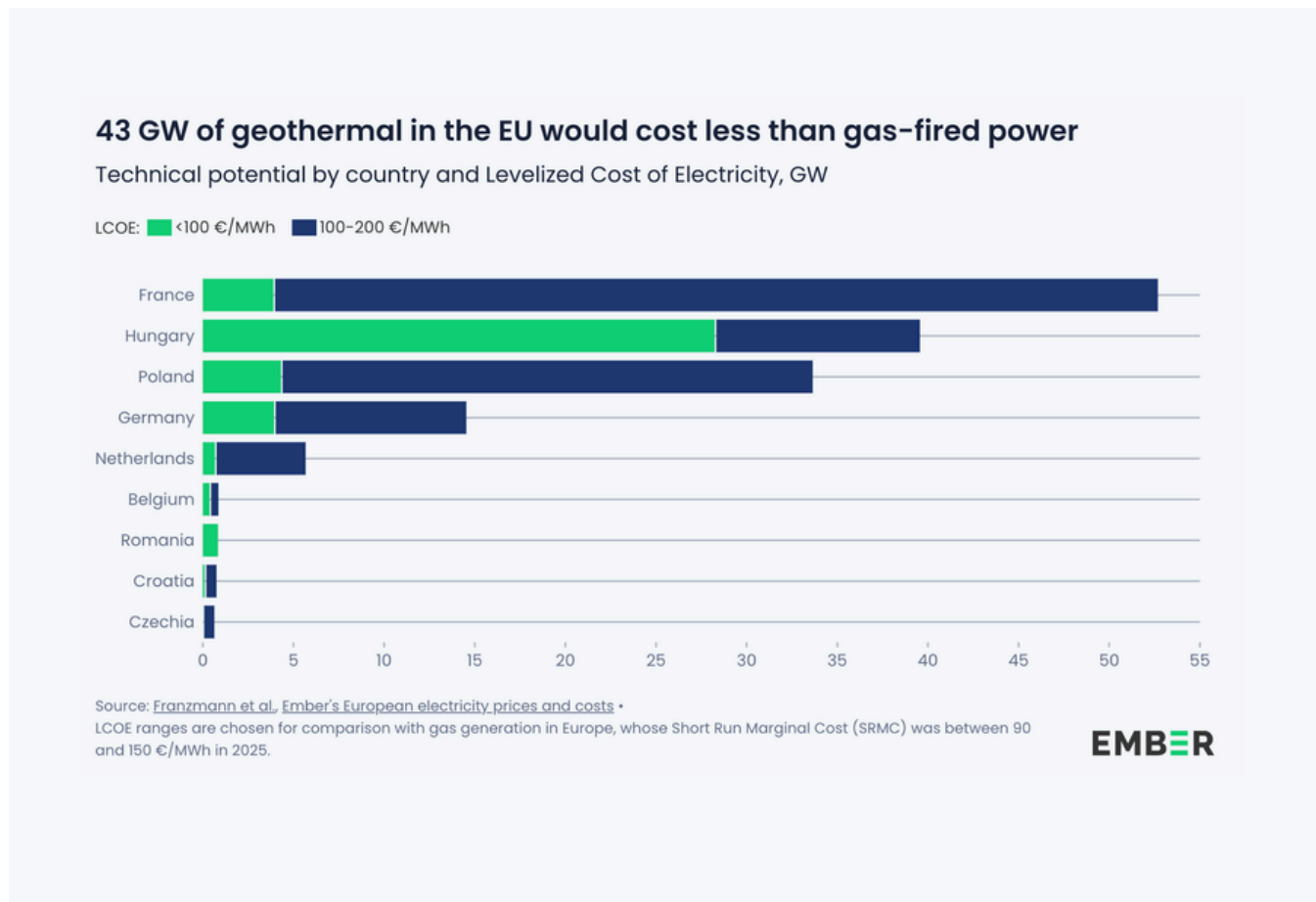
Geothermal is gaining attention across Europe as a strategic clean energy solution that can deliver both clean firm power and zero-carbon heat. Geothermal provides 24/7 baseload energy, which is increasingly valued as Europe works to strengthen energy security while accelerating decarbonisation.

In many CEE countries, large district heating systems are still powered by gas and coal. Geothermal offers a domestic, low-carbon alternative that can decarbonise cities, reduce fuel imports, and stabilise energy costs. At

the same time, next-generation geothermal technologies (e.g. enhanced geothermal systems and high-temperature/ superhot rock concepts) are expanding the geographic and technical potential of geothermal beyond traditional resource hotspots, opening the door to clean firm power and industrial heat across much of Europe.

As EMBER’s recent report “Hot stuff: Geothermal energy in Europe” shows, technological advances are expanding where geothermal electricity can be produced, positioning it as a cost-competitive and secure alternative to gas for industry and other power-intensive users. CATF is focusing on measures to deploy and advance geothermal innovation that expands geothermal potential in CEE countries even further. In addition to technical potential, this graphic shows LCOE for geothermal in each country. However, much of the benefit of geothermal in CEE is due to its value as a local, secure, 24/7 resource.

Figure 2: Hot stuff: Geothermal energy in Europe (EMBER, 2026)



Momentum is building

Momentum is strong in Central and Eastern Europe, where governments are beginning to treat geothermal as a core part of clean heat and energy security strategies. Countries like Hungary, Poland, Croatia, and Slovakia are advancing national roadmaps, geological databases, and permitting reforms to accelerate project development.

“CEE has the resources, expertise and early successes needed for a major geothermal push. With the right mix of policy, finance and innovation – and with this diverse community of actors working together – geothermal has all features to become a central pillar of the region’s energy security and decarbonisation over the coming decade”. Moreover, next to the geothermal expansion in heating, agriculture and industry, the potential for electricity and innovations should not be ignored.”



Jenna Hill

Superhot Rock Geothermal
Innovation Manager, CATF

A key example of this momentum is the CEE geothermal roundtable we co-organised with the [Slovak Foreign Policy Association \(SFPA\)](#) at the Central European Energy Conference (CEEC) in Bratislava in November 2025. The roundtable, “[Advancing Geothermal in CEE: Key aspects of national strategic frameworks, financial models and innovation potential](#),” brought together policymakers, public financiers, project developers, technology providers, geological institutes, and NGOs from across Hungary, Poland, Croatia, Romania, and Slovakia. Discussions focused on three themes: finance and risk sharing, innovation, and national strategic frameworks. The event’s key takeaway is clear: geothermal should be a backbone of clean, local, and reliable heat in the region.

4. Why Nuclear Energy Matters

At CATF, we are working to shape and inform policy, regulatory and market conditions to ensure they enable nuclear energy deployment in CEE and the wider EU. Nuclear power can play

an important role in Europe’s energy transition by providing reliable, low-carbon electricity and heat to strengthen Europe’s energy security and resilience.

To accelerate deployment, Europe also needs a robust delivery ecosystem that includes coordinated supply chains, skilled workforces, streamlined licensing, and grid planning that allows multiple projects to be delivered and connected at pace. One of the most effective ways to achieve this is through a fleet-based approach to nuclear deployment.

A fleet-based approach to scaling nuclear energy

Experience from other industries, such as aviation, shows that building standardised fleets rather than stand-alone projects, can significantly reduce costs, shorten construction timelines, and allow for knowledge sharing across developers. Nuclear energy orderbooks illustrate the benefit of such a standardised fleet approach.

CATF’s Advanced Nuclear Program is currently working on practical frameworks for multinational and multisite fleet deployment in the EU. The goal is to help governments coordinate on reactor design choices, licensing approaches, supply chains, policy and financing so that nuclear energy capacity can expand at scale and speed.

In March 2026, the European Commission published its [SMR Strategy](#), a roadmap toward developing and deploying SMRs in the EU. CATF had provided detailed [recommendations](#) for this initiative beforehand. Some components of the strategy we were pleased to see include:

- A strong focus on cross-country and stakeholder collaboration, including through a fleet-based approach and pooling resources in common projects;
- A call for Member States with an interest in SMR to establish an ‘SMR coalition’ for policy and regulatory cooperation, including aligning licensing procedures or mutually recognising each other’s licensing decisions;
- Setting up de-risking schemes for scaling up innovative nuclear technologies, including a potential additional temporary InvestEU top-up of EUR 200 million until 2028 to support the deployment of the initial commercial units.

Figure 3: SMR Deployment Roadmap and Financing Tools



Source: [Roadmap for Small Modular Reactors in Poland](#), Clean Air Task Force

“Nuclear technology can provide vital 24/7 clean firm baseload power for the industrial processes and district heating in the EU, all with minimal emissions and a low land use footprint. CEE Member States should work together to coordinate and collaborate on reactor technology selection, licensing standards, workforce and supply chain development. Working together in this way would send a clear signal to investors and suppliers that the region is serious about deploying nuclear energy at scale to support industrial competitiveness, energy security and decarbonisation.”



Lindsey Popken
Program Implementation
Manager, Nuclear Energy
program, CATF

We have also been coalescing CEE industrial representatives, policymakers, regulators, and peer NGOs in Poland to form a collaborative set of recommendations to the EU and Polish government on what is needed to unlock a fleet of SMRs that would bring clean firm reliable power to Poland’s grids. The figure below offers a helpful visual based on the findings from our coalition work that speaks to what is needed to get SMRs built and on the grid in Poland, with the goal of a fleet-based approach. You can read here our [Roadmap for Small Modular Reactors in Poland](#).

More of our recent work you might have missed

1. Making hydrogen work for Poland: Four insights from our expert roundtable in Warsaw

We hosted a roundtable in Warsaw to explore how Poland can unlock the full potential of clean hydrogen, bringing together experts from government, industry, and academia to tackle the key challenges and opportunities ahead. Discussions highlighted four core insights: the need for clearer policy and regulatory frameworks, improved coordination between public and private stakeholders, strategic investment in domestic hydrogen infrastructure, and the importance of aligning hydrogen development with broader decarbonisation and energy security goals.

2. Carbon capture and storage in Central and Eastern Europe: Three priorities to accelerate deployment.

We've been exploring why carbon capture and storage (CCS) will be critical for decarbonising heavy industry in CEE. Sectors like cement, steel, and chemicals generate large volumes of process emissions that cannot be eliminated through electrification alone, making CCS an essential part of the region's climate strategy. Yet despite accounting for nearly one-fifth of Europe's industrial emissions, CEE remains far behind in developing CO₂ transport and storage infrastructure. Our recent blog outlines what governments can do to change this—by closing funding gaps for first-of-a-kind projects, building public trust in CCS, and strengthening coordination to develop the transport and storage networks needed to scale the technology across the region.

3. Central and Eastern Europe's energy crossroads: What new public opinion data tells us about the path forward

We've taken a look at fresh public opinion data to understand how voters in Central and Eastern Europe view climate and energy policy. The data findings reveal a complex picture: while most voters recognise climate change as a serious threat and support expanding clean energy like wind, solar, and nuclear, concerns about energy prices, reliability, and national security dominate political priorities.

We've also been featured in the news:

■ Business Insider (August 2025):

[What can SMRs bring \(Clean Air Task Force on Polish nuclear support\)](#)

■ Carbon Herald (September 2025):

[CATF roadmap charts cost-effective CCS deployment for Central and Eastern Europe](#)

■ Hydrogen Fuel News (November 2025):

[Inside the Poland Hydrogen Strategy: Navigating low-carbon and green hydrogen's future](#)

■ The Parliament Magazine (July 2025):

[Five things to know about the EU's 2040 climate targets](#)

■ Foresight Podcast (February 2026):

[Cutting prices with new contracts and 24/7 clean power](#) featuring CATF's Lea Romm

Looking ahead

Central and Eastern Europe has a clear choice: a future defined by energy uncertainty or one powered by clean, reliable, and homegrown solutions. By keeping multiple technological pathways open, the region can turn today's challenges into long-term opportunities. Optionality is not just a strategy; it's a mindset and tool for resilience, competitiveness, and energy sovereignty.

The momentum is real, and the window to act is now. With coordinated policies, investment in innovation, and cross-border collaboration, CEE can lead the way in deploying clean firm power at scale. The energy transition is complex, but the region has the resources, expertise, and vision to build a secure, low-carbon, and resilient energy future.

Thank you for reading this far, and see you in the next edition!

Contact

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Tamara Lagurashvili, CEE Director
tlagurashvili@cleanairtaskforce.org



Sara Albares, Regional Manager
smartin@cleanairtaskforce.org



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