

12 JUNE 2025 14.00 - 17.00

## Panel 20. Good Technoscience for the energy transition: Dealing with infrastructures implementation and renovation

Convenors:

Paolo Giardullo, Università di Padova

Ivano Scotti, Università di Napoli, Federico II

**Keywords: energy transitions; energy infrastructures; infrastructural turn**

This open panel aims to engage scholars with energy transition issues by using Science and Technology Studies lenses to focus on energy infrastructures. Following the recent focus into infrastructures in social science (Graham, Marvin 2022), this panel engages with the many facets of socio-material entanglements between infrastructures, users and built environment.

Energy transition is one of the most critical challenges facing contemporary society: although many differences may exist, national governments and local authorities are implementing and further planning investments to energy needs with technologies that are economically suitable and have near-zero environmental impact, improving access for citizens. The deployment of new infrastructures and/or the reconversion of already available ones is crucial. Renewable energy systems (on and off-grid) has been often promoted as the main solution for achieving energy transition for good of the environment and the future of humankind.

Energy transition is challenging for nations, local communities, and social groups in very different ways (Scotti, Carrosio 2019). The energy retrofitting of buildings is not exempt from criticism either: as is well-known, improving a building's energy efficiency, as well as planning new 'green' areas, can lead to disruptions in the real estate market, potentially triggering displacement dynamics. Often, the benefits appear limited compared to the side effects for some actors or territories that may be marginalized or sacrificed in the transition, risking being "left behind". In this sense, any low-carbon energy technology presents socioterritorial, organizational and environmental issues, particularly linked to its material constraints. Therefore, such a process is highly complex and uncertain with many social justice implications. At the same time, it is supported by the promises made by governments, researchers and private companies. This introduces a further issue concerning the discursive layer about new technologies for energy transition: technologies are framed positively carrying great expectations. Despite their limitations, there is a positive tone toward renewable energies and low impact energy sources (Giardullo 2024). Hydrogen for instance, as a versatile energy carrier, could replace fossil fuels in production and daily uses (e.g., refueling cars). Nuclear energy as well is facing a new momentum with promises about fusion and about new small-scale plants for fission. However, hydrogen technology is still immature, costly, and require dedicated infrastructure, while nuclear fusion is currently far from being operative and nuclear energy in general still faces local hostility.

As the shaping of infrastructures is a power-laden process (Silvast et al 2024) we invite scholars to submit their abstract proposals joining a conversation about mutual entanglements between infrastructures, users and discourses about energy transition across different contexts. More specifically we warmly invite contributions about, but not limited to the following:

- Socio-technical imaginaries of energy futures through infrastructures
- Energy justice and the politics of transition about territorial distribution of new infrastructures
- Public engagement and participatory governance in energy systems
- Social shaping of energy technologies in urban and rural context
- Participation about buildings re-use and retrofit
- Resistance, acceptance, and adaptation to energy transitions

Furthermore, we encourage contributions that promote interdisciplinary perspectives and methodologies for studying infrastructures of energy transitions.



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## ID 174 - The Bartelby effect: how Civitavecchia said no to the decoupling of work and health.

*Claudio Marciano, Università degli Studi di Genova*

**Keywords:** Energy Transition, Trade Union, Stakeholders Engagement, Social shaping of Technologies, Artifacts as politics

Better to die of cancer than starve. A banner with this slogan led, in 2002, a demonstration of workers at the petrochemical plant in Gela, southern Sicily, when the court had ordered its provisional closure for excessive polluting emissions. As tragic as it is, the slogan recounts a condition, the decoupling between the right to work and health, that was (and is) common to dozens of territories in Italy, and has marked the country's industrial policies from the post-World War II period to the present.

This script is recurrent, but not incontrovertible. In Civitavecchia, in particular, there seems to be an exception. In this city, located just a few kilometres from Rome, where two mega thermoelectric power plants are located, a 'Bartelby effect' has occurred: like the famous scribe in Melville's tale, the local community has 'preferred to say no' to the conversion to natural gas of the Torrevaldaliga Nord (TVN) power plant, currently fuelled by coal, and has proposed an alternative development plan based on the integration of off-shore wind and green hydrogen. When fully operational, i.e. in 2030, this investment would be able to generate 50 per cent more jobs, and significantly lower pollutants and greenhouse gases.

The plan has turned into executive projects, carried out by various entrepreneurial actors, whose development, however, is still in the incubation phase. Since August 2023, the Ministry of the Environment has been considering the granting of authorisation for off-shore wind power plant. Moreover, Enel, the owner of the current power plant, has diverging industrial interests with respect to the project and has not joined the groupings of companies involved in the alternative projects.

However, this case study is interesting not because of the results that haven't yet been achieved, but because of the governance process that can be analysed empirically. Leading the development of the proposal was the majority trade union among the plant's workers, the FIOM-CGIL, which acted as a 'broker' between companies, local authorities, the port authority and environmental associations: a completely different orientation from that taken by the same confederation on the occasion of the conversion of the plant to coal.

This article aims to reconstruct this process in the light of the theoretical model of experimentalist governance. The reference to experimentalism is useful for interpreting the organisational behaviour of different social actors, and for reading the intersectionality and associations between themes usually presented in a divergent manner in the literature, such as the conflict between capital, labour and nature; the role of trade unions in guiding technological transformations and public policies on technologies; the post-privatisation of the energy sector in Italy, with the emergence of conflicts between mixed and private enterprises; the path dependencies of industrialism and the right of local communities to express themselves on environmental easements, beyond mere economic compensation.

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## ID 190 - Is nuclear power good for energy transition? A long-term analysis of the Italian daily press

*Camilla Fiz, Università degli Studi di Padova*

*Paolo Giardullo, Università degli Studi di Padova*

**Keywords:** nuclear renaissance, nuclear infrastructure, energy transition, media discourse, sociotechnical imaginary

Currently, nuclear power is being framed as a 'nuclear relaunch' or 'renaissance', otherwise a low-carbon



solution that could accelerate or empower the process of energy transition. Nevertheless, the goodness of nuclear energy for energy transition remains an open question, since its envisioned futures and the present state of the industry can be negatively shaped by numerous aspects. Major disruptive events over time, such as the accidents of Chernobyl and Fukushima, have contributed to embed the nuclear discourse, and those on the overall energy system, into a crisis frame. Moreover, public discourse in the media about nuclear infrastructure's economic, material, and social implications can significantly influence public perception of nuclear risk. This discourse often evokes broader imaginaries than other energy sources, spanning from dystopian futures to optimistic visions of progress.

Drawing on the perspective of Science and Technology Studies (STS), our study proposes a long-term exploration of the discourse about nuclear power infrastructures and energy transition in the Italian newspapers. Indeed, the recent ambivalence of Italy towards nuclear power has made this country of particular interest. Whether energy policies have excluded the use of nuclear energy for many years, in June 2024 both fusion and fission plants were involved in the country's strategy for energy transition, as outlined in the National Plan Integrated for Energy and Climate (PNIEC). For a better understanding of the features of nuclear renaissance in Italy and its role in the energy transition, we analyse the media discourse that can participate in the construction of collective narratives and expectations about technoscientific issue.

The research question is: How do past and future perspectives shape the current nuclear discourse in the Italian media over time? Analytically we look for: how desirable and undesirable futures are shaped, the expectations of different actors, and the role assigned, for example, to technological solutions and scientific advisors on nuclear risk management. For this purpose, we rely on the model of green metacycle of attention, that is inspired by the attention cycle of Anthony Downs and has been recently applied in the media study of renewable energy. We employ three main approaches: analysis of the media coverage by assessing salience; analysis of frames, combining advanced tools for quantitative content analysis; and analysis of actors by the Named Entity Recognition. We conduct the analysis on several newspapers, such as: La Repubblica, Il Corriere della Sera, La Stampa, Il Sole 24 Ore, Avvenire, Il Giornale, Il Messaggero, and Il Mattino. All together they cover most of the mainstream journals available in Italy.

In this way, we can track the continuities and discontinuities in the discourse about nuclear energy over time and measure the main sociotechnical imaginaries and actors involved, such as experts, politicians and environmental movements. Beyond these aspects, this study critically discuss what is predicated as "good energy policies" over time on the media. Therefore, we contribute to the ongoing discussions in STS about the goodness of technoscientific solutions in addressing climate change and energy security.

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## ID 374 - Futureproofing ageing nuclear sites: Local Perceptions of Small Modular Reactors near Marcoule (France) and Sellafield (UK)

*Mathias Sabbe, Liège University*

**Keywords:** Small Modular Reactors, Local perceptions, Nuclear communities, Sociotechnical imaginaries

Small Modular Reactors (SMRs) are increasingly advocated by their proponents as a cheap and reliable, low-carbon option for climate change mitigation (IAEA, 2024). Vendors advertise a paradigm shift in nuclear energy generation, claiming lower capital costs, enhanced safety, greater flexibility, and improved public acceptance. Although only a handful are operational, private and public interest is high, with over 90 projects at various development stages reported in 2024 (NEA, 2024).

Despite growing interest in SMRs within the STS literature (e.g., Kari et al., 2023; Sovacool, 2019), few studies have examined local perceptions and expectations in areas that may potentially host these novel reactors in the future. The literature on siting controversies highlights how proposals for nuclear new build often generate public concerns and opposition from residents near new proposed sites, indicating that a strong not in my backyard (NIMBY) effect remains associated with nuclear-related projects (e.g., Di Nucci & Brunnengraber, 2017; Woo et al., 2017; Easterling & Kunreuther, 2013). Consequently, public authori-



ties have typically resorted to concentrating new nuclear infrastructure within existing nuclear sites (e.g., Greenberg et al., 2017), hence suggesting that first SMRs will likely also be built in these locations.

This study, conducted as part of a European project (ESFR-Simple), presents a comparative analysis of local perceptions of SMRs near two legacy nuclear sites that may potentially host these small reactors in the future: Marcoule (Gard region, France) and Sellafield (West Cumbria, UK). Empirically, the research relies on field observations, two focus groups, and 30 semi-structured interviews with local elected officials, environmental protection associations, concerned citizens, farmers, social workers, and local industry representatives near these sites. Theoretically, we build on extensive literature on nuclear communities (e.g., Vilhunen et al., 2022; Venables et al., 2012) and sociotechnical imaginaries (e.g., Jasanoff & Kim, 2009; Rudek, 2022; Smith & Tidwell, 2016) to highlight how industrial trajectories can shape local visions of desirable futures.

Strikingly, initial findings suggest a strong local appetite for the siting of SMRs near both Marcoule and Sellafield, with dissenting opinions being often marginalized, or even silenced, in these traditionally pro-nuclear contexts. Over the past decades, both Marcoule and Sellafield have gradually shifted towards decommissioning and dismantling as their primary activities. This shift, while vital to sustaining local economies, also brings a sense of finality, as dismantling efforts are locally interpreted as a sign that the site's purpose is coming to an end. In this context, SMRs are often narrated as a strategic means to future proof ageing nuclear sites, maintaining their relevance while also sustaining local economies. Indeed, beyond immediate job creation, SMRs are also perceived as a catalyst for attracting industries seeking to decarbonize their manufacturing processes. This strongly resonates with a local attachment to past industrial heritage. For instance, in West Cumbria, once renowned for its steel industry, the idea of using SMRs to produce green steel, was depicted as an opportunity to restore a severed link with the area's industrial past.

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## ID 441 - Socio-technical challenges in implementing decentralized energy infrastructures in off-grid communities: The LoCEL-H2 Project

*Alice Palmieri, Università di Napoli Federico II*

*Dario Minervini, Università di Napoli Federico II*

*Rosanna De Rosa, Università di Napoli Federico II*

**Keywords:** Decentralized energy infrastructures, Energy justice, Energy transitions, Participatory approaches

Energy poverty remains a pressing global issue, with 750 million people – primarily in sub-Saharan Africa – still lacking access to electricity (IEA 2024). In many cases, the extension of national grids is technically, financially, and politically unfeasible, making decentralized renewable energy infrastructures a critical pathway for energy access. However, beyond technological feasibility, the deployment of such infrastructures is deeply entangled with local socio-economic, political, and cultural dynamics, raising issues of governance, trust, and social acceptance.

The LoCEL-H2 project (Low-cost, Circular, plug and play, prosumer Energy system for off-grid Locations including Hydrogen) focuses on developing decentralized energy infrastructures in off-grid communities in Zambia and Ivory Coast. By integrating photovoltaics, battery storage, and an innovative hydrogen system, the project seeks to reduce dependency on firewood and charcoal – key drivers of deforestation and indoor air pollution, with severe health consequences. However, the effectiveness of such low-carbon energy infrastructures depends on their ability to align with local energy cultures, knowledge systems, and socio-material constraints.

SSH critically examines how energy technologies are negotiated, adapted, or resisted by communities, particularly in relation to territorial justice, gender roles, and local governance structures.

This contribution reflects on the socio-technical aspects and politics of decentralized energy infrastructures, discussing how policy frameworks, community trust in technology, and participatory governance



mediate their implementation. Through ethnographic fieldwork, including focus groups, interviews, and participatory planning, the research highlights how access to energy operates as a "derivative right", shaping broader transformations in health, education, and economic agency.

In other words, the infrastructural and justice dimensions of energy transitions underscores the necessity of a bottom-up governance to foster local capacity building, community-led interventions and long-term sustainability.

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## ID 526 - Testing AI in Brussels energy communities. Exploring the frictions with material and legal infrastructures

*Simone Casiraghi, Vrije Universiteit Brussel*

*Rocco Bellanova, Vrije Universiteit Brussel*

**Keywords: Artificial Intelligence, Energy transition, Energy communities, Sociology of testing, Infrastructure**

The constitution of local energy communities provides a critical space to explore the socio-material entanglements of energy transition, where citizen-driven actions to support renewable energy intersect with complex material and legal infrastructures. This contribution examines the development, in a research project, of an AI-driven system (proxy) designed to facilitate the coordination and distribution of renewable energy within energy communities in Brussels, focusing on its relations with the existing energy infrastructures and community practices.

In the context of energy crises and rising demands, alongside increasing information overload in households, AI is positioned in the project as a means to create more efficient and coordinated energy use behaviors (Fernández Domingos et al., 2022). The vision behind the adoption of AI is to enable more efficient and cost-effective decision-making among energy prosumers - community members who both produce and consume energy. However, this seemingly straightforward narrative overlooks the nested infrastructures that underpin these AI systems.

Energy communities depend not only on existing technological infrastructures like solar panels and smart meters but also on legal infrastructures (European directives and national laws, as well as contracts) that govern the relationships between community members, third-party actors, and regulators. These infrastructures, both material and legal, shape the possibilities and constraints for AI integration in energy sharing, highlighting the complexity of transitioning to more decentralized, community-driven energy systems (Lennon & Dunphy, 2024). The AI system in this case interacts with and is constrained by these pre-existing infrastructures, creating frictions that may be invisible in the design and co-creation phases.

Drawing on insights from the sociology of testing (Marres & Stark, 2020) and taking seriously the claim to think "from and within infrastructure" (Anand et al., 2018), this paper interrogates what and whose concerns are reflected in testing exercises of AI proxies for energy communities in Brussels.

This allows us to examine two interrelated aspects. First, some tensions arise between the expectations of different stakeholders (researchers, community members, and institutional actors) regarding what is being and what should be tested. These differences in what should be tested (e.g. the scientific validity of a device, disaggregation techniques, methodologies, coordination mechanisms, behavioral patterns, economic models...) often reveal underlying assumptions about what matters in the energy transition and how AI can facilitate or hinder that process. Second, it allows us to uncover the frictions that emerge when these AI systems interact with the existing legal and material infrastructures. These frictions challenge assumptions about the smooth integration of AI into existing infrastructures and complex energy systems that rely on such infrastructures.

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## ID 546 - The role of infrastructure in energy communities: Evidence from Austria

*Michael Ornetzeder, Austrian Academy of Sciences*

**Keywords: Energy communities, Commons, Commoning, Infrastructure, Case study**

Energy communities are seen as the key to a successful energy transition. A recent commentary by the International Energy Agency highlights that putting communities at the heart of the energy transition is crucial to the successful implementation of energy and climate policies. Energy communities, the report argues, are demonstrating global benefits by deploying renewable technologies, improving efficiency, ensuring reliable energy supplies, reducing costs and creating local jobs. In addition, these initiatives are gaining recognition for promoting inclusive, equitable and resilient energy systems. As the legal framework for the establishment of energy communities has been significantly improved in recent years, many new initiatives have been established. Austria is one of the pioneers in Europe. However, the question of what kind of community is actually being created in these many new initiatives has received little analysis. What is meant by community? Are members organising themselves to share common resources, or are they more like economic platforms where prosumers can buy and sell energy? This paper explores this question through the concept of energy-commoning. Energy-commoning refers to the idea of collaborative management and use of energy resources. Similar to the concept of commons in general, which refers to shared resources, energy-commoning specifically refers to the approach of organising energy sources, technologies and infrastructure democratically and participatively to enable a more equitable and sustainable energy supply. In this paper we present two contrasting case studies of energy communities from Austria, which show large differences in the quality and number of common pool resources, material engagement, especially in terms of shared infrastructure, economic engagement and self-governance responsibilities. The construction and management of energy infrastructure seems to be an important driver for the formation of stronger communities.

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## ID 603 - Energy Communities and Socio-Technical Transformations: Energy Democracy and Justice in the ECOEMPOWER Project's Pilot Sites in Trentino, Italy

*Letizia Zampino, Università di Trento*

*Attila Enrico Bruni, Università di Trento*

*Vincenzo D'andrea, Università di Trento*

*Aurore Jeanne Stanislava Dudka, Università di Trento*

**Keywords: Energy Communities, Energy Justice, Socio-technical transformations, Energy Democracy**

Energy communities are often framed as attempts for achieving energy democracy – enhancing citizen participation in energy governance (van Veelen & van der Horst, 2018) – and energy justice – ensuring fair distribution of benefits and burdens (Jenkins et al., 2016; Sovacool et al., 2019). These two dimensions are deeply interwoven: without democratic decision-making, justice risks being procedural; without justice, democracy may remain an exclusive privilege rather than a universal right.



Drawing from empirical research within the ECOEMPOWER European project, this paper explores how energy communities materialize these interconnections. While the project includes five European countries (Italy, Germany, France, Greece, and the Czech Republic), this paper focuses on the Italian context, specifically on three pilot sites in the Trentino region, where efforts to establish energy communities are currently underway. The research adopts a mixed-methods approach, integrating quantitative data – including indicators of participation, governance structures, and distributive outcomes – with qualitative insights from key stakeholders involved in the development of energy communities. Through interviews and participatory observation, we analyze the expectations, challenges, and power dynamics that shape local energy governance.

By examining governance models, participatory mechanisms, and distributive outcomes, we critically assess whether energy communities genuinely foster democratic and just energy futures, or whether they become devices for shifting energy transition's responsibilities to citizens while maintaining structural asymmetries. This contribution calls for a deeper interrogation of energy democracy and energy justice processes to ensure an energetic transition not only technically efficient but also socially transformative.

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## ID 819 - The Naples East biogas Plant: between technological innovation and just transition

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**Keywords: biogas plant, ecological transition, just transition, stakeholder engagement, territorial governance, circular economy**

The transition towards a more sustainable energy model and circular economy has positioned biogas plants as key infrastructures in waste management and renewable energy production. The case of the planned biogas plant in Naples East presents an opportunity to explore the complexities surrounding these infrastructures, particularly in urban areas characterized by socio-economic and environmental vulnerabilities. While policymakers and project proponents highlight its potential contribution to Italy's National Recovery and Resilience Plan (PNRR) objectives, it remains to be seen whether the project will encounter significant local opposition or develop into a broadly accepted innovation for sustainable waste management.

This research, still in its early stages, adopts a multi-layered methodological approach to investigate the socio-political landscape surrounding the project. By integrating PESTL analysis with stakeholder mapping and engagement strategies, the study aims to assess potential areas of conflict, cooperation, and negotiation. The methodology combines secondary data analysis, socio-demographic profiling of the Ponticelli



district - where the plant is to be built - and an initial exploration of public discourse surrounding the project. The objective is to formulate hypotheses regarding the key drivers that could shape stakeholder positions and the governance mechanisms that might influence the project's implementation.

Preliminary considerations suggest that the acceptability of the biogas plant will be contingent upon multiple factors, including institutional transparency, public participation and historical environmental concerns in the area. Some actors might emphasize the plant's potential to improve organic waste treatment efficiency, reduce landfill dependency, and contribute to the EU's decarbonization goals. Conversely, civic committees and environmental organizations might raise concerns over potential environmental impacts, perceived health risks, and governance processes. The hypothesis of conflict would find its foundation in the history of environmental degradation experienced by the Naples East area, with massive industrialization first, followed by devastating deindustrialization. These processes have exacerbated public distrust, particularly towards large-scale infrastructure projects, reinforcing skepticism about their long-term benefits.

By examining these dynamics, the study situates itself within the discussion on ecological transition, technological innovation, and energy justice. Rather than assuming fixed positions among stakeholders, the research seeks to identify the conditions under which such infrastructures can be socially and politically viable. Ultimately, we hypothesize that beyond technical feasibility, the success of biogas infrastructure will depend on the integration of social inclusion, participatory governance, and adaptive policy frameworks that address both local resistance and broader sustainability goals.

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## ID 873 - Are Smart Infrastructures Good Technoscience? The Promises and Perils of Smart Buildings

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*Aulanier Audran, Université Catholique de Lille*

**Keywords: Smart Building, Infrastructure, Energy, User, Imaginary**

Smart buildings are urban infrastructures presented as technological solutions for the ecological city of tomorrow. Envisioned as the "nodes" of the smart grids and the smart city, they carry a powerful imaginary of urban transformation and ecological solution, whether in terms of energy efficiency and decarbonization (renewable energy), as well as a positive imaginary of comfort, adaptability, and so on. Universities are then more and more numerous to retrofit their buildings in "smart" or to build new ones with this objective. Confronting the imaginary of smart buildings by their developers and designers with the daily experience of their users, this presentation will question the promises and perils of these infrastructures. What user involvement in the decision-making process and use of these buildings? What are the daily and long-term maintenance challenges for their technicians? What dangers do these buildings expose us to, and what futures do they open or close?

Using ethnographic and participatory methods, this presentation is based on the study of four smart university buildings in the Lille region, France (INCLUNIV project, funded by the French Agency for Ecological Transition - ADEME). First, we will analyze the promises of smart buildings and the imaginaries they convey. These infrastructures share with other smart technologies the imaginaries and promises of energy efficiency, security and transparency (Reigeluth, 2023), as well as comfort, adaptability and even agility in technical systems. In use, however, it is the inconveniences of these buildings (thermal, visual, sensory, aesthetic, etc.) and their inflexibility (lack of switches or thermostatic controls, inability to adjust blinds or open windows, etc.) that are highlighted by their users.

It's therefore the technicians and maintenance staff who are most likely to benefit from the smart building. Automation and the centralization of information make management, maintenance and security easier. However, while this work is facilitated, it does not disappear and is even accentuated compared to traditional buildings: without constant care of the technical systems that maintain them (Denis & Pontille, 2022), these buildings risk rapidly deterioration.



Ultimately, the smart building fails in both representation and practice to make the building the site of an ecological experience. The automation and airtightness of these buildings, justified by energy efficiency objectives, create a standardized environment that cuts individuals off from sensitive relationships with their milieu. By neutralizing the possibilities of creative adaptation, smart buildings reinforce an atmosphere of isolation and the depoliticization of infrastructures. In this party, we will discuss the new risks and vulnerabilities created by smart buildings, both for the users (sad atmosphere, breakdowns, cyber-attacks, etc.) and for the environment. By fragmenting the relationship between people and their environment, these infrastructures tend to close off, rather than open up, the possibility of new relationships with the world and new ways of living (Mathieu, 2014), which are essential if we are to meet the challenges of the environmental and energy crisis.

