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Operationalising Belgium's 2050 net-0 emissions Transition

By Tomas Wyns & Gauri Khandekar
Brussels School of Governance, Vrije Universiteit Brussel

Introduction

As the window for effective climate action narrows, Belgium's commitment to achieving climate neutrality by 2050 brings both a formidable challenge and a unique opportunity. The imperative to decarbonise the country's energy system can also serve as a powerful catalyst for economic modernisation, enhanced energy security, and greater social inclusion.
The transition ahead is far more complex than simply replacing fossil fuels with renewables. It requires a systemic transformation—integrating electricity, heat, molecules such as hydrogen and e-fuels, and circular material flows—each of which is deeply interconnected across sectors and borders.

This policy paper aims to translate the latest insights from scenario modelling, sectoral pathways, and international best practices into actionable recommendations for Belgium's net-zero transition. Recognising that technical solutions alone are not enough, it underscores the critical role of integration—across technologies, sectors, governance levels, and national boundaries—as a cornerstone of effective climate action. By prioritising systems thinking, sector coupling, digitalisation, and collaborative governance, Belgium can avoid fragmented or inefficient investments and instead unlock synergies that strengthen economic competitiveness and long-term resilience.

To provide a clear structure for this transformation, the paper adopts a four-pillar framework: Infrastructure, Investment, Innovation, and Integration.

Infrastructure *refers to the physical backbone—networks for electricity, molecules, heat, and data—that will enable sector coupling and support flexible, efficient system operation.*

Investment *captures the significant capital mobilisation needed from both public and private sources to finance low-carbon assets, upgrade infrastructure, and ensure long-term system resilience.*

Innovation *is key to developing, scaling, and deploying breakthrough technologies and new business models that can accelerate decarbonisation, particularly in hard-to-abate sectors.*

Integration *weaves these elements together—ensuring coherence across technologies, sectors, governance levels, and borders, while maximising efficiency, sustainability, and societal benefit.*

Drawing on insights from the updated TIMES-BE model developed under the Procura project and the related PATHS2050 coalitions initiative, this paper presents a structured set of recommendations to operationalise Belgium's climate-neutral ambition. It is designed as a resource for policymakers, industry leaders, and civil society stakeholders ready to move from vision to implementation—ensuring that Belgium's path to net-zero is environmentally sound, economically viable and socially inclusive.

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1. Infrastructure: building the foundations for a net-0 emissions society

The transformation of Belgium into a net-zero emissions economy hinges on a rapid and large-scale upgrade of its fundamental infrastructure. This includes scaling up renewable energy generation, expanding storage capacity, reinforcing and digitalising the electricity grid, developing clean molecule supply chains (such as hydrogen and e-methane), deploying carbon capture and storage (CCS) infrastructure, and implementing sector-coupling solutions like the reuse of industrial waste heat.

With the EU's increased climate ambition for 2040— exceeding 80% emissions reduction — the urgency to develop infrastructure early is even greater. Major investments in climate-friendly technologies, especially by industrial actors, are likely to materialise only if key infrastructure (e.g. for hydrogen, CO_2, and upgraded power grid) is available, reliable, and future-proof.

By 2030, Belgium should have significantly increased its offshore wind and solar PV capacity. Achieving this requires not just technical deployment but also regulatory streamlining and efficient permitting processes.

The electricity grid must be substantially reinforced to accommodate decentralised production and rising electric demand from heating, industrial processes, and transport electrification.
Cross-border interconnections with neighbouring North Sea countries should be prioritised to enhance system stability and facilitate regional-scale integration of renewable energy, particularly offshore wind. Given its central role in Belgium's future power supply, investing in offshore wind connectivity is a no-regret decision.

Initial CO_2 pipeline networks should begin linking major industrial clusters with designated storage or export hubs.
Simultaneously, pilot hydrogen infrastructure must connect ports—where imports and local production will concentrate—with key industrial demand centres. This may include local pipeline networks as well as import terminals for hydrogen derivatives such as ammonia or methanol.

By 2040, Belgium's renewable electricity capacity should exceed 44 GW, including at least 11 GW of offshore wind. Upgrades to the transmission grid should be largely complete, enabling high levels of renewable integration and supporting at least between 1.6 – 2.5 GW of battery and vehicle-to-grid storage (combined) for short-term flexibility. Electricity interconnection capacity should allow for up to 25 TWh per year of net imports, if required for system balancing. North Sea offshore wind interconnections must be fully operational by this stage.

Given the anticipated rise in heat pump deployment and decentralised solar PV generation, the distribution grid must be reinforced early to prevent bottlenecks and delays in deployment. By this time, Belgium's CO_2 pipeline backbone should be fully operational, capable of transporting up to 20 Mt CO_2 per year from industrial sites. Depending on developments in neighbouring countries, this capacity may need to increase to accommodate transit flows—for example, from Germany to CO_2 terminals at Belgian seaports.

The hydrogen (import) network should extend from ports and production hubs to major industrial users across Belgium's manufacturing heartland.

By 2050, Belgium's renewable energy capacity should reach 65–80 GW, supported by over 10 GW of advanced storage solutions and a fully digitalised grid capable of providing some seasonal balancing via cross-border interconnections.

The CO_2 backbone must be able to accommodate all residual emissions from hard-to-abate sectors. Hydrogen and hydrogen derivative import terminals and pipelines will be essential for industrial supply, and—though to a lesser extent—for power generation.

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Policy Recommendations – Infrastructure

A timely and adequate development of infrastructure is a critical stepping stone for enabling the energy and climate transition across all sectors. Without access to reliable, affordable, and clean power, the electrification of transport, buildings, and industry risks significant delays. Similarly, robust national infrastructure for CO_2 liquefaction and transport will be an essential precondition for industries such as chemicals, steel, and cement to invest in new process technologies for CO_2 capture and utilisation.

Time is of the essence. With increased EU greenhouse gas reduction ambitions likely by 2040—and a binding net-zero emissions target for 2050—most major investments in industry, transport, and buildings must occur within the next 15 years. This means the enabling infrastructure must be in place within the next decade at the latest.

General infrastructure recommendations include ensuring that the regulatory context (e.g. permitting procedures) supports fast deployment and that early adopters are not penalised by disproportionate costs. Integrated spatial planning should be pursued to align new infrastructure with urban development, biodiversity conservation, and other land use priorities. This can also streamline environmental impact assessments and accelerate permitting. Additionally, fast-track procedures should be considered for infrastructure projects of national strategic importance, such as power transmission lines.

The **upfront financing** of infrastructure often results in high costs for the first, often limited, group of end-users, as network operators seek to recover capital expenditure. To mitigate this, mechanisms should be developed to mobilise patient capital. One option is the creation of a national **Infrastructure Development Bank** to support large-scale investments in renewables, grids, clean molecule logistics, and carbon capture and storage (CCS). Such a bank could help lower financing costs, enable public-private risk sharing, or use bond-based approaches that allow cost recovery over longer timeframes.

For the **power sector** specifically, policy should prioritise grid reinforcement and the seamless integration of offshore wind connections into the mainland grid. Belgium must also expand cross-border interconnections with its North Sea neighbours to create a truly regional electricity market—capable of efficiently sharing balancing resources and surplus renewable energy. All major grid investments should be designed with embedded digitalisation from the outset to support smart system management and future flexibility. At the local level, reinforcing the distribution grid should be a top priority to avoid bottlenecks for distributed PV, heat pumps, and electromobility. Failure to act risks delaying electrification—one of the key contributors to net-zero emissions—and undermining industrial and economic competitiveness.

Beyond infrastructure investments, **governance** also deserves close attention—specifically regarding which new installations (on either the supply or demand side) receive priority access to infrastructure. This is a complex issue. Should new electro-intensive data centres, industrial electrification projects, or grid-scale batteries be given preferred access? The current "first come, first served" approach is likely unsustainable, as it may hinder or delay the transition to a net-zero energy system.

In **industry**, shared infrastructure for CO_2, steam, and hydrogen should be developed to reduce costs through economies of scale, while ensuring timely access for major emitters to transport and storage facilities. Public support should be made available where needed—for instance, to develop CCS hubs and to enable electrification or hydrogen use as feedstock in existing or new industrial sites.

For the **buildings sector**, a detailed analysis is required to identify where district heating is feasible and whether the associated infrastructure can be developed adequately and on time. Ideally, heat networks should use surplus low-temperature heat from nearby sustainable industries, including future data centres. Given that the buildings sector will predominantly electrify, it is also essential to proactively strengthen electricity distribution networks—through physical infrastructure upgrades, smart end-user energy management, and digitalisation.

Similarly, for **transport**, Belgium's electric vehicle (EV) charging infrastructure must be prepared to support over two million EVs by 2030 and four million by 2040. Due to the rapidly expanding market for battery electric vehicles, public support will likely not be required for deploying the charging infrastructure itself. However, the public sector must still play a key facilitation role. As with buildings, distribution networks must be proactively upgraded to handle increased transport electrification, including the integration of smart charging and large-scale vehicle-to-grid capabilities.

2. Investment: Scaling Capital Commitments in Stages

Meeting decarbonisation targets requires a step-change in both the scale and efficiency of capital mobilisation across all sectors of the economy.

By 2030, annual investments in the energy system must reach at least €25 billion. hese funds should be channelled into the rapid scale-up of renewable energy—particularly offshore wind and solar PV—comprehensive grid upgrades including digitalisation, initial deployments of battery storage and vehicle-to-grid technologies, smart charging infrastructure, and pilot CCS projects such as Kairos@C. Additional priorities include early-stage ammonia imports for fertiliser and chemical use, a quadrupling of the building renovation rate to at least 4% annually, widespread adoption of heat pumps in residential and commercial buildings, and a substantial expansion of EV charging networks.

By 2040, annual investments must increase further to €40–45 billion, reflecting the deployment of large-scale battery systems and full vehicle-to-grid integration across the power system. If supported by national policy frameworks, this period may also see the commercial rollout of flexible nuclear capacity, such as Small Modular Reactors (SMRs), to provide baseload electricity and industrial heat. Industry will require substantial capital to scale CCS across chemical production, cement kilns, and steelmaking, as well as for deep electrification of high-value processes like naphtha cracking. Based on the progress of pilot projects, a fully operational hydrogen network will require public funding for backbone infrastructure and private investment from early industrial adopters. In the buildings sector, deep retrofits must achieve at least 70% penetration of heat pumps or district heating. In transport, nearly all road vehicles will need to be electric—with 1–2 million EVs expected by 2030 and around 4 million by 2040—while the shipping and aviation sectors must undergo modernisation to enable compatibility with e-fuels.

By 2050, investment priorities will shift toward maintenance and renewal of critical infrastructure assets, deployment of negative emissions technologies such as bioenergy with carbon capture and storage (BECCS) or direct air capture (DAC) where necessary, optimisation of system performance through advanced digital management platforms, and resilience-building in supply chains for imported clean molecules.

Policy Recommendations: Enabling Investments

Achieving net-zero emissions across the economy will hinge not only on the timely development of infrastructure but also on the ability to **mobilise private capital at scale**. The overwhelming majority of the required investments—ranging from industrial process upgrades to energy-efficient building renovations and full electrification of transport—must come from the private sector. Ensuring these financial flows materialise on time is, alongside infrastructure, one of the greatest challenges to achieving climate neutrality.

However, a range of **economic and non-economic barriers** can prevent the mobilisation of private investment. Overcoming these will require public policy interventions, including:

- Carbon pricing
- New financing instruments
- Removal of regulatory barriers
- Reform of energy pricing and taxation
- Review of accounting rules (e.g., asset depreciation)
- The use of public procurement and standards

The **EU Emissions Trading System (ETS)**, initially targeting the power sector and heavy industry, has introduced an EU-wide carbon price, currently fluctuating between €60–80/tCO_2. This pricing mechanism is intended to incentivise investment in climate-friendly technologies and low-carbon energy carriers.

Yet, this price range remains insufficient to support key technologies, particularly **carbon capture and storage (CCS)**—a vital mitigation tool for industry. CCS typically requires a sustained CO_2 price well above €150/tCO_2 to become viable, at least until 2040. Other decarbonisation pathways, such as electrification and the use of green hydrogen as industrial feedstock, would also benefit from higher carbon prices. However, their competitiveness depends heavily on electricity pricing and the cost gap between gas and power. In its long-term energy model (TIMES-BE), Belgium applies a shadow carbon price of €480 (2024 value) per tonne by 2050 to achieve full economy-wide decarbonisation.

The lack of global carbon pricing also impacts EU industrial competitiveness, but the **Carbon Border Adjustment Mechanism (CBAM)** is intended to mitigate this challenge by levying a carbon cost on certain imported basic materials. While CBAM remains limited in scope, it represents a critical tool to ensure a level playing field.

Starting in **2027**, the **EU ETS2** will introduce a carbon price for the buildings and transport sectors. Assuming ETS2 prices follow those of the original EU ETS, this mechanism could support investments in home energy renovations, heat pumps, and electric mobility. However, while carbon pricing can incentivise long-term savings, it does not address the substantial upfront costs faced by consumers. Therefore, it is essential that revenues generated from ETS and ETS2 are allocated equitably—especially to help households manage the financial burden of the transition.

Importantly, **carbon pricing alone will not suffice** to deliver net-zero emissions. As outlined above, current prices are too low to catalyse deployment of key technologies like CCS and green hydrogen or even make key investments electrification worthwhile. Additional financing instruments will likely be required. Furthermore, a number of structural barriers persist, such as difficult and long permitting procedures, creating investment uncertainty; the huge difference between end user prices for gas and electricity that can delay electrification and the lack of a mature consumer market for green products and services. These come on top of the necessary presence of enabling infrastructure as mentioned in the previous section.

For **new technologies** (e.g. demonstration or first of a kind units) the investment cost is often higher, and the private sector is more risk averse. The EU ETS innovation fund seeks to address this via co-financing of innovative renewable energy, hydrogen and industrial technologies. However, even with initial capital support, many clean technologies face higher operational costs compared to conventional systems. In response, several Member States (e.g., Germany and the Netherlands) have implemented **Contracts for Difference (CfDs)** to provide revenue stability and incentivise investment. At EU level, a new decarbonisation bank, which will apply a similar system, is being considered under the EU ETS innovation fund. Other instruments include tax-breaks for clean investments, public backed loans or similar risk reducing instruments. It is possible that investments in the expansion of power generation, for some technologies and limited in time, will require similar types of support e.g., offshore wind or small modular nuclear reactors, or fossil-based installation with low (or shrinking) capacity utilisation.

For the **building sector** further financial facilitation via low-cost loans or direct subsidies for socially vulnerable people remains essentials.

Cost parity between **battery electric vehicles (BEVs)** and fossil fuel cars is expected within the next five years. In Belgium, the electrification of company and salary cars is accelerating rapidly, driven by favourable tax incentives. This shift is likely to have a positive knock-on effect on the large second-hand car market, increasing access to electric vehicles. However, it is important to note that continued support for plug-in hybrid electric vehicles (PHEVs)—especially when combined with company fuel cards covering petrol costs—can undermine CO_2 reduction goals in the transport sector. To maximise emissions savings, fuel reimbursement schemes should be reformed to more strongly incentivise electric driving over fossil fuel use.

Complex and time-consuming permitting procedures, regulatory uncertainty, and inadequate strategies for engaging local communities can hinder the necessary investments in the industrial and power sectors. To address these barriers, **regulatory simplification** for clean investments should be prioritised, alongside political commitment to key enabling infrastructure projects. In the building sector, several non-financial obstacles continue to slow the renovation rate. These include challenges related to local permitting processes, energy labelling systems, and practical issues that arise before and during renovation activities. Furthermore, the rental market remains difficult with owners having less compulsion to renovate.

Even when supported by carbon pricing and subsidies, the **electrification** of buildings and industry can remain economically unattractive. In Belgium, electricity prices are often more than four times higher than natural gas prices for end-consumers, making the electrification of space heating a low or even negative return investment. To improve the economic case for electrification, a reform of taxation and surcharges on electricity and gas is necessary—shifting the burden away from electricity and increasing the relative cost of natural gas. The introduction of variable power pricing, already available to some consumers, could also help, particularly when combined with battery systems (including vehicle-to-grid technology), highly energy-efficient building design, refurbishments, and smart demand-side management.

Finally, the use of **green public procurement** and the introduction of clean product **standards** can support investment in clean production capacity by creating **lead markets** for low-carbon materials such as green steel, fertilisers, cement, and plastics. However, these measures may come with higher upfront costs.

3. Innovation: Phasing Technology Deployment for Systemic Impact

Accelerating decarbonisation depends on both rapid deployment of mature technologies at scale and fostering innovation breakthroughs where abatement remains technologically or economically challenging.

Before 2030, Belgium should prioritise the large-scale rollout of proven solutions such as offshore wind turbines (including floating platforms), advanced battery systems for grid balancing and storage, and smart grid platforms that enable real-time demand response. Industry should pursue electrification pilots—particularly for low-temperature processes using heat pumps—as well as demonstration-scale carbon capture and storage (CCS) and carbon capture and utilisation (CCU) projects, such as capturing CO_2 at ammonia or ethylene oxide plants. In the buildings sector, scaling prefabricated insulation solutions and digital energy management systems for households and commercial spaces is key. In transport, pilot initiatives should focus on vehicle-to-grid (V2G) integration and first-of-a-kind e-fuel demonstration projects for shipping and aviation.

Between 2030 and 2040, innovation efforts must shift toward commercialising higher-TRL (Technology Readiness Level) technologies, including flexible nuclear power plants—if adopted politically—and advanced electrolysers for large-scale hydrogen production from renewables or nuclear sources. Industrial innovation should target the electrification of high-temperature processes (e.g. electric kilns) and CCU pathways for converting captured CO_2 into methanol or aromatics via synthetic routes.

In parallel, **circular economy innovations**—such as advanced recycling systems and materials recovery—should become mainstream across value chains. In buildings, digital innovation should support smart controls for district heating networks and the use of digital twins to optimise large-scale renovation campaigns. In the transport sector, the focus must be on mainstreaming smart charging, expanding V2G infrastructure, and developing robust supply chains for e-methane and green ammonia in maritime shipping.

By 2050, full system digitalisation should enable real-time optimisation and predictive maintenance of energy and infrastructure assets. At the same time, negative emissions technologies, such as bioenergy with carbon capture and storage (BECCS) or direct air capture (DAC), will need to be deployed to offset residual emissions in hard-to-abate sectors. Belgium's innovation ecosystem—including universities, start-ups, industrial clusters, public agencies, and research institutes—should be strategically positioned to export next-generation climate solutions globally.

Policy Recommendations – Innovation

To meet Belgium's 2040 and 2050 climate targets, **innovation policy** must prioritise the rapid deployment of high Technology Readiness Level (TRL) solutions, supported by well-designed demonstration-to-commercialisation pipelines. These efforts should be backed by both national programmes and EU-level instruments such as the Innovation Fund.

In the **power sector**, dedicated demonstration zones should be established to test grid flexibility technologies—including smart grid systems, storage, and demand-response solutions—at scale before national rollout. R&D funding should also target flexible nuclear technologies and advanced long-duration storage, helping close key reliability and baseload gaps in a renewables-dominated system.

In **industry**, Belgium should develop dedicated innovation clusters focused on high-temperature electrification, carbon capture, utilisation and storage (CCUS) integration into production value chains (e.g., methanol and aromatics), and next-generation circularity solutions, such as high-yield mechanical and chemical recycling platforms and industrial symbiosis networks.

For the **buildings sector**, governments should support pilot projects that demonstrate smart retrofits, combining digital controls and automation. In parallel, public support should help mature the market for prefabricated renovation models, lowering installation costs and improving scalability.

In **transport**, "living labs" that integrate vehicle-to-grid (V2G) technologies with mobility-as-a-service platforms can accelerate systemic learning and deployment. Ammonia-fuelled shipping pilots should receive targeted public R&D support until commercial maturity is achieved.

With limited budgets available, federal and regional innovation funding streams should be tightly aligned with EU priorities and structured to maximise access to **EU co-funding opportunities**—especially for Belgian research institutions and private-sector R&D actors.

Finally, delivering the innovation required for climate neutrality will hinge on a **highly skilled and adaptable workforce**. The establishment of Net-Zero Academies, as proposed under the EU Net-Zero Industry Act, should be prioritised early in the transition. These institutions would play a vital role in reskilling and upskilling workers in key sectors such as engineering, digital technology, and renewable energy—helping mitigate labour shortages as demand shifts.

4. Integration: Advancing Systemic Coordination in multi-level governance

Achieving deep decarbonisation in an efficient and cost-effective manner requires systemic integration across sectors, energy carriers, and governance levels. This coordination must advance simultaneously in the following areas:

- **Integration of energy, feedstocks and materials**, including electricity, heat, hydrogen, carbon molecules, and (plastic) waste
- **Sector coupling**, connecting the power sector, industry, buildings, and transport
- **Effective multi-level governance**, linking local authorities, regional governments, federal bodies, and the EU

By 2030, Belgium should operationalise sector-coupling pilots—for example, using industrial waste heat to supply district heating in major urban areas. Power-to-X projects converting surplus renewable electricity into green hydrogen and e-fuels must be commercially underway. A national transition council, bringing together stakeholders across governance levels, is essential to ensure coordinated planning and policy alignment. Belgium should also engage in regular cross-border infrastructure forums with France, Germany, the Netherlands, and the UK to align investments and planning. Early deployment of smart grid platforms should enable real-time demand response, linking energy use across buildings, industry, and transport.

By 2040, Belgium's industrial clusters and ports should host multi-vector energy hubs that integrate power, heat, and hydrogen management. Shared infrastructure corridors—such as bundled CO_2 and hydrogen pipelines—will reduce system costs and optimise spatial planning. Governance alignment must extend to cross-border operation, with Belgium playing a leading role in shaping EU certification regimes for clean molecules and carbon removals. Advanced digital platforms should be in place to coordinate distributed energy resources and flexibility markets across the country.

By 2050, full system integration must be achieved. Surplus renewable energy will be routinely converted into green molecules or stored seasonally. Vehicle-to-grid (V2G) and smart charging will deliver several gigawatts of daily flexibility. Real-time carbon tracking and data-driven optimisation will support economy-wide efficiency. Belgium will be fully integrated into EU energy markets, both physically (via high-capacity interconnections and shared infrastructure) and digitally (through harmonised market and data platforms).

Policy Recommendations – Integration

To drive the systemic integration agenda forward, policymakers may wish to:

- Approach the net-zero transition as a complex, interconnected system, encompassing not only energy but also heat, molecules, and recycled materials.
- Enable greater sector coupling to unlock synergies and improve overall system efficiency.
- Strengthen the effectiveness of governance structures in Belgium while enhancing coordination with neighbouring countries.

Integration should be understood as the connective tissue that holds together Belgium's evolving climate-neutral energy system. Rather than treating decarbonisation as a series of isolated sectoral efforts, a systems approach views electricity, heat, hydrogen, e-fuels, and circular materials as increasingly interconnected. This perspective helps avoid fragmented investments and unlocks greater economic and operational efficiency.

To operationalise this approach, sector coupling should become a mainstream component of industrial development. This includes the integration of power-to-X technologies, industrial waste heat recovery, and multi-vector energy hubs. These solutions allow for flexible renewable electricity use, more efficient thermal management, and valorisation of industrial by-products—strengthening both competitiveness and resilience. Integration objectives can be advanced by including them in subsidy criteria and streamlining permitting for cross-sector investments.

Shared infrastructure is also critical. Aligning the development of CCS and hydrogen backbones with EU-level corridors can reduce capital costs and ensure interoperability across borders. At the industrial cluster level, exploring shared pipelines, storage, and processing facilities can cut duplication, reduce system costs, and enhance resilience. Improved foresight and coordination between governments will be vital for timely infrastructure development.

In the **power sector**, enhanced regional grid integration will support system stability and enable large-scale renewable integration. Cross-border coordination on grid upgrades will be essential. Concurrently, developing system-wide demand response platforms can help manage supply–demand variability and lower system costs for end users. These considerations should guide Belgium's future grid investment strategies.

Digitalisation is expected to underpin many aspects of system integration. Real-time data exchange between distributed energy resources enables smarter balancing of the system and more precise forecasting. Transparent digital certification platforms can facilitate the trading and tracking of clean molecules or carbon removals, boost market transparency, support compliance, and build trust in emerging value chains.

Urban energy planning is another area where integration can deliver value. Greater coordination among local governments, utilities, and building owners—supported by robust data-sharing—could help optimise district heating, and electricity distribution.

Transport integration should not be overlooked. Harmonising EV charging standards across Belgium and with EU countries can simplify deployment and enhance usability, while cross-border mobility planning can improve the efficiency and sustainability of freight and passenger transport. Promoting a modal shift towards cycling, car sharing, public transport, and other low-carbon mobility options is also essential for decarbonising the transport sector—though this was the primary focus of the Procura modelling.

Finally, successful integration hinges on **effective governance**. In Belgium, climate and energy transition responsibilities are shared between federal and regional levels. Given the scale and urgency of required investments, improved policy coordination and strategic alignment is essential. Establishing a national transition council with representatives from all levels of government, industry, and civil society could provide a unified platform for strategic direction and implementation. In parallel, Belgium should deepen collaboration with neighbouring countries on infrastructure, regulation, and innovation to ensure full interoperability within the broader EU energy system.

By focusing on systems thinking, sector coupling, shared infrastructure, digitalisation, urban and transport integration, and collaborative governance, Belgium can build a more efficient, flexible, and resilient path toward climate neutrality.

Conclusions

Belgium stands at a pivotal moment in its journey toward climate neutrality. The analysis presented in this policy paper demonstrates that achieving net-zero emissions by 2050 is both an urgent necessity and a realistic objective—provided there is ambitious, coordinated action across all sectors and governance levels. The transformation ahead will require not only unprecedented investment and rapid infrastructure deployment, but also targeted innovation, cohesive policy integration, and a proactive approach to workforce development.

Drawing on scenario data and other literature, the following conclusions highlight the key priorities and systemic shifts required to operationalise Belgium's just and effective energy transition.

Infrastructure Development is Urgent and Foundational
Belgium's net-zero pathway depends on the swift, large-scale deployment of renewable

energy, reinforced electricity grids, and early build-out of CO_2 and hydrogen infrastructure. These investments are foundational for decarbonising industry, retrofitting buildings, and electrifying transport. Streamlining regulation, accelerating permitting processes, and introducing innovative financing mechanisms—such as a national infrastructure investment bank—will be crucial to overcome long lead times and rising costs.

Investment Mobilisation Requires Public-Private Synergy
The scale of capital required by 2050 far exceeds historical trends and must be primarily delivered by the private sector. To unlock these flows, effective carbon pricing, well-designed public co-financing tools (e.g. Innovation Fund, Contracts for Difference), and the removal of regulatory bottlenecks are essential. Affordability and industrial competitiveness must be safeguarded through targeted support and reforms—particularly in energy taxation—to make electrification more attractive.

Innovation and Skills Must Progress in Tandem
While mature technologies must be deployed at speed, breakthroughs in areas such as flexible nuclear, advanced electrolysis, and negative emissions will also be required. However, Belgium faces an emerging skills gap across engineering, digital, and clean energy professions. Establishing Net-Zero Academies early in the transition can support workforce reskilling and upskilling, ensuring the labour force is prepared and the transition is fair.

Aligning Innovation Funding with EU Priorities Multiplies Impact
To maximise access to EU co-financing and accelerate technology deployment, Belgium's regional and federal innovation funding streams should be tightly aligned with EU instruments—such as Horizon Europe, the Innovation Fund, and IPCEIs. This alignment would allow Belgian researchers and industries to leverage larger funding pools, foster cross-border cooperation, and speed up the commercialisation of key technologies.

Systemic Integration Is Essential for Efficiency and Resilience
Deep decarbonisation will require systemic integration—across energy carriers (electricity, heat, hydrogen, e-fuels), sectors (industry, buildings, transport), and governance levels. Multi-level coordination, shared infrastructure planning for industrial clusters, and digital strategies for real-time system management will be key. Establishing a national transition council with representation across all governance levels and stakeholders can enhance alignment and social acceptance.

A Just Transition Demands Proactive Social Policy
Policies must anticipate distributional impacts of the transition. Revenues from carbon pricing should be used equitably to support vulnerable households with up-front costs for building renovation or clean mobility. Early engagement with citizens and workers—especially in industrial regions — will be critical to build trust and ensure no one is left behind.

Belgium Can Be a Regional Leader in Clean Industry
With its North Sea access, strong industrial base, and advanced research institutions, Belgium is well-positioned to lead in clean molecule logistics (e.g. hydrogen and ammonia), circular economy innovation, and digital energy solutions. Realising this potential will require bold decisions and coordinated implementation over the next decade.

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