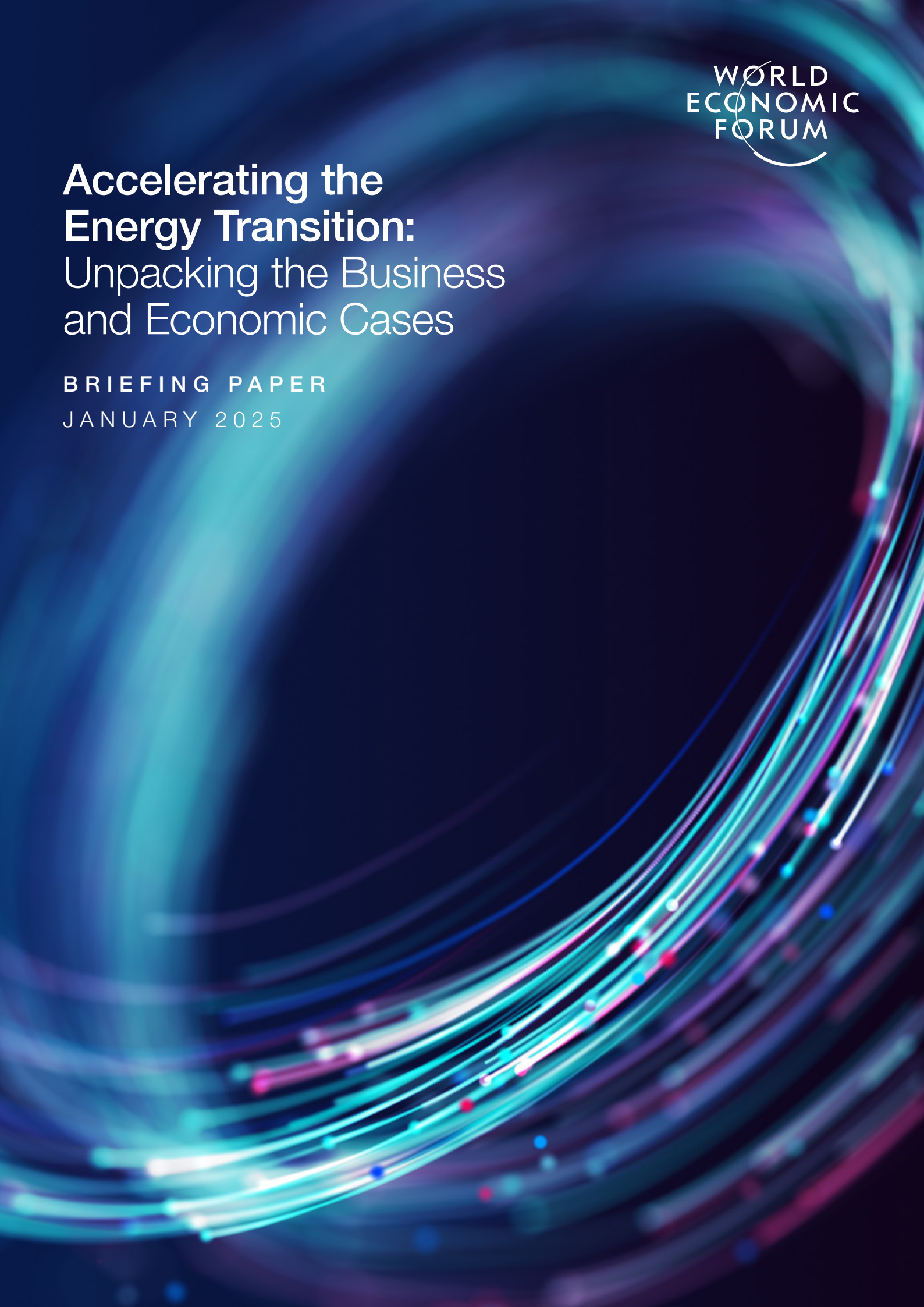

WORLD ECONOMIC FORUM

Accelerating the Energy Transition: Unpacking the Business and Economic Cases

BRIEFING PAPER

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Images: Getty Images

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Introduction

To build a future-ready and 1.5°C-aligned energy system, annual investments in clean tech must grow from $2 trillion today to over $5 trillion by 2030, demanding strong alignment of the economic and business cases.

Despite ambitious targets set by governments and companies globally, a comprehensive energy transition that enhances equity, security and sustainability still faces major challenges. In 2024, total energy investments surpassed $3 trillion for the first time, with $2 trillion directed towards clean technologies – renewables, electric vehicles (EVs), nuclear power, grids, storage, low-emission fuels and heat pumps.[1] While these investments are expanding clean energy projects in many regions, progress remains uneven across economies and sectors.

To build a future-ready energy system aligned with a 1.5°C pathway, annual investments must grow to over $5 trillion by 2030,[2] creating a $3 trillion gap from today's clean technology spending. Assuming a 10% weighted average cost of capital (WACC), approximately $300 billion in additional annual returns would be needed to attract this level of investment – equivalent to nearly three times the annual profit of some major corporations, or potentially $1 billion in additional annual profits across 300 medium to large-sized companies.

BOX 1 **Significant acceleration of advanced energy solutions needed to hit net zero**

Achieving a net-zero emissions pathway by 2030 demands an extraordinary scale-up of advanced energy solutions. Carbon capture and storage (CCS) capacity must grow 20-fold, energy storage 35-fold, clean hydrogen production 70-fold and sustainable aviation fuel (SAF) 190-fold.

Furthermore, mass deployment of new advanced modular nuclear reactors will be needed. The required growth and investment across these technologies presents an unprecedented challenge – and opportunity – for the global energy transition.

Source: World Economic Forum.

This raises a key question: How can governments and businesses across diverse economies and sectors align their objectives and actions to accelerate the energy transition and unlock this value?

The path forward is complex. The economic case for the energy transition is promising net societal benefits; however, the challenge lies in clearly articulating and translating these into compelling business cases that attract private investment. Businesses face significant hurdles in scaling-up clean energy and energy efficiency investments, including uncertainties around which technologies will prevail, how markets will develop, geopolitical and country risks, and the timing and sequencing of investments. These factors directly influence risk-adjusted returns, making it more difficult to build a compelling business case for investment.

Governments often aim to maintain a level playing field, avoid picking technology "winners" and promote fair competition among energy sources. Meanwhile, businesses are hesitant to take investment risks without clearer signals about market viability and returns. This dynamic environment requires industries to continuously adapt their strategies in real-time, while governments, typically slower to adjust, may need to become more agile.

Building momentum for the energy transition and unlocking necessary investments requires a strong alignment of the economic and business cases. Governments play a key role in setting clear policy direction, strengthening institutions, creating a conducive macro-economic environment and, in some cases, directly investing in energy systems.

> **Up to 90% of the funding across energy demand, supply and finance sectors must come from international private capital in most countries.**

However, the scale of funding required, especially in emerging market and developing economies (EMDEs), necessitates substantial private sector participation. The International Monetary Fund (IMF) estimates that up to 90% of the funding across energy demand, supply and finance sectors must come from international private capital in most countries.[3] This is achievable only if the business case is sufficiently strong and the risk-return balance is favourable.

Coordinated public-private action is important, with governments and businesses learning new ways of working together. When both move together towards shared objectives, momentum for the transition will build, driving progress towards a balanced energy future.

This paper outlines the business and economic cases for the energy transition, identifying key enablers and proposing actionable strategies for both policy-makers and businesses.

1 Framing the business and economic cases

Bridging the gap between costs and returns requires mechanisms to translate societal benefits into financial incentives that attract investors.

The energy transition is driven by a clear economic case that benefits society at large: secure and resilient access to energy, economic growth and job creation, improved health outcomes, upskilling and reskilling of the workforce and long-term competitiveness – in addition to decarbonization. However, realizing these benefits requires mechanisms that attract investments and distribute costs effectively.

In market economies, the business case is a subset of the economic case, serving as a mechanism to mobilize private investment from different types of investors through incentives that make clean energy solutions and projects financially viable and bankable (see Figure 1). Companies assess investments based on factors such as favourable pricing structures, clear demand signals, accessible and affordable capital and a strong policy framework that aligns with market needs. Without these enablers, it becomes difficult to build a compelling business case and deploy the assets needed to operationalize the economic case.

Different investors and companies have varying return requirements, risk tolerance and investment horizons. Unlocking more private capital requires offering attractive, risk-adjusted return opportunities tailored to diverse investor profiles.

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In state-directed economies, the economic case itself can drive government-led action, with resources mobilized to achieve broader societal benefits and competitive advantage, regardless of individual company profitability through a business case. Effective government policies and regulations in these economies guide markets towards associated clean energy infrastructure investments and objectives.

For example, in China, centralized policies such as five-year plans allow the government to strategically directly and mobilize resources towards large-scale renewable deployment. This approach has driven down technology costs domestically and internationally, giving China a competitive edge in global energy technology markets. At the same time, the business case matters for private sector companies making investment decisions.

The approaches differ across economies. The US and Europe depend on a strong business case to actualize the economic case. The US relies on subsidies, tax breaks and incentives ("carrots") while Europe's more regulation-orientated approach ("sticks") creates different market dynamics and, at times, greater fragmentation.

Additional factors such as higher interest rates, capital costs, lengthy permitting and administrative processes, supply chain and trade constraints, and a growing skills gap further impact a business's ability to profitably deploy new projects, underscoring the complexity in aligning the business and economic cases in these regions.

A key challenge of the energy transition is that while economic benefits are broadly shared over time, the costs and investments are borne upfront by a limited set of stakeholders. To bridge this gap, mechanisms are needed to translate societal benefits into financial incentives that attract investors – a complex but important task.

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In areas such as clean hydrogen, sustainable aviation fuels (SAF) and carbon management, especially in hard-to-abate sectors, the business case for investment remains too weak to support commercial-scale adoption. Understanding and articulating the systemic value of investment beyond molecules and electrons can help inform policies on pricing, subsidies and mandates, making the business case more viable.

FIGURE 1 **The business and economic cases for the energy transition**

Source: World Economic Forum.

2 Key enablers for the business and economic cases

Accelerating the energy transition requires building public support for policies, mandates, incentives and risk-sharing mechanisms that enhance technological readiness and lower the green premium.

The economic case for the energy transition is strong; however, it needs to be framed in a way that clearly highlights economic and societal value to drive momentum. In market economies, strong business cases within this broader economic case are needed to attract private investment and accelerate the transition; otherwise, progress will be much slower.

This chapter analyses the following key enablers that support both economic and business cases:

Economic case:
- Public support
- Technology readiness

Business case:
- Pricing
- Confidence in demand
- Cost of capital
- Policy credibility

Certain "dual impact" levers address both the economic and business cases, underscoring that these are not competing objectives. Examples include scaling-up enabling infrastructure, such as grids and transmission networks, establishing stable regulatory environments and streamlining permitting processes. These levers are crucial to accelerating the transition, as they improve both societal outcomes and financial viability for investors.

This paper discusses the challenges and enablers specific to each case while emphasizing that they are integral parts of a cohesive strategy that requires balanced, coordinated action across stakeholders.

2.1 Enablers for the economic case

Public support

Public support is critical for building the economic case in the energy transition. Broad community buy-in helps minimize resistance, increase societal acceptance and enhance the willingness to pay for cleaner technologies, even at higher costs. However, despite a strong economic case, public support for policy changes and infrastructure investments can be undermined by misinformation, concerns over real or perceived negative impacts, unawareness of broader benefits and scepticism around the benefits of government policies and business actions.

> **Confidence in the transition depends on governments and businesses crafting a compelling "societal case" that clearly demonstrates the tangible benefits of clean energy solutions.**

Confidence in the transition depends on governments and businesses crafting a compelling "societal case" that clearly demonstrates the tangible benefits of clean energy solutions. Building consensus and addressing public concerns early and transparently are key to securing sustained, long-term support. This effort should focus not only on expanding renewables but also on a broader set of clean energy solutions and infrastructure, including shifts from coal to lower-emission fuels, tailored to each country's unique energy context. The transition must be gradual, building on existing resources and capacities.

India serves as an example of balancing economic realities and public support. The country faces the dual challenge of providing affordable energy to its growing population and industries through existing sources such as coal, while simultaneously expanding its renewable energy markets to meet rising demand. This reflects both the complexities and opportunities of transitioning to meet diverse energy needs.

Reforms to reduce or phase out fossil fuel subsidies are often promoted for both economic and environmental reasons. However, successfully implementing these measures requires a focus on fostering public support and ensuring equitable outcomes throughout the energy transition.

Governments play a key role in building public support by ensuring that the benefits from clean energy projects are visible and distributed fairly across communities, particularly those most impacted by the transition. Governments need to lead by designing equitable policies, while businesses must actively participate in dialogue to build public trust. The G20's endorsement of 10 voluntary principles for a just and equitable transition reinforces the importance of these efforts.[4]

Clear, long-term energy planning at both regional and national levels is key to setting a vision and direction that empowers businesses, financiers and communities to effectively contribute to the energy transition.

Technology readiness

Technology readiness plays a key role both for both the economic and business cases. Some technologies such as thermal storage, clean hydrogen, SAF, advanced nuclear solutions and carbon capture, utilization and storage (CCUS) are proven and ready to scale-up, while others continue to progress towards market readiness. However, misconceptions persist about the maturity of many advanced solutions, particularly for technologies such as small modular reactors, which are often perceived as nascent, despite being based on decades-old technology.

The evolution of technology readiness can be viewed in two phases: what has been achieved and what remains to be done. Solar, wind and batteries, now considered mature and commercially viable, reached this point after decades of sustained government support through subsidies, tax incentives and market creation efforts, alongside

significant reductions in technology costs. They now operate with established industries and supply chains, benefiting from a clear economic case and significantly reduced costs, which in turn strengthens the business case for continued investment. A similar trajectory is also needed for emerging technologies but with one critical difference: what took decades for solar and wind must now be replicated in a fraction of the time to meet Paris Agreement targets, while keeping energy affordable and secure for all.

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Although many projects are already operational, accelerating these emerging technologies towards commercial viability to meet 2050 net-zero targets will require unprecedented levels of investment and capacity growth.

Several issues hinder capital deployment in the technologies needed to drive the energy transition:

- The business case for developers, particularly financial returns and policy predictability, remains weak.
- Many technologies are not yet cost-competitive either for final or intermediate consumers, due to limited manufacturing capacity and insufficient economies of scale.
- Deep emission reductions in hard-to-abate sectors rely heavily on disruptive technologies that are not yet economically viable.[5]
- Businesses may hesitate to adopt cutting-edge technologies when current assets with long operational lifespans are still financially viable.
- Emerging technologies require multi-year product, project, supply-chain and related infrastructure development, creating uncertainty about their effectiveness and reliability.[6]

Many stakeholders recognize the need and potential for these solutions but hesitate to be first movers or advance at the necessary speed and scale. Governments must step in with supportive policy frameworks that encourage R&D and investment, including early-stage pilot projects that help bridge the gap between technological promise and commercial viability. For countries with strong technological capabilities, investing early in R&D can create an economic case, even before a business case for scaling-up emerges.

Initiatives such as the US Department of Energy's Loan Programs Office (LPO) play a key role in financing early-stage clean technology projects, mitigating risks and pushing the technology frontier towards net-zero emissions.[7] Intergovernmental collaborations such as Mission Innovation are also critical in fostering cross-national learning and cooperation.[8]

Meanwhile, businesses must be incentivized to act on government policy signals and incentives and take an active role in scaling-up proven technologies, while continuing to invest in emerging ones. Ultimately, the success of the energy transition will depend on the collective confidence and commitment of businesses, policy-makers and financial institutions to invest and scale-up these solutions.

2.2 Enablers for the business case

Pricing

Pricing is foundational for building the business case for the energy transition. As advanced energy solutions continue to innovate and scale-up by 2030, costs are expected to decrease. However, many emerging clean technologies still carry a "green premium", making them less competitive with conventional energy sources.

For example, SAF has the potential to significantly reduce emissions in the aviation sector but is expected to remain two or three times more expensive than kerosene by 2030. Absorbing this cost could increase flight ticket prices by 18% to achieve a 50% emissions reduction.[9] This highlights a key challenge: how to absorb the cost of greener technologies while ensuring market competitiveness.

Understanding and addressing the green premium is essential for driving market demand and scaling-up clean technologies. Governments and businesses on both the supply and demand sides must work together to implement mechanisms that offset the green premium, such as creating first demand, subsidies, tax incentives, offtake agreements or consumer price adjustments.

For example, Norway's Northern Lights project for carbon capture and storage (CCS) demonstrates what can be achieved when governments and industry work towards the same goal and co-invest to reduce risks, making it viable to capture and store CO_2 at commercial scale.[10]

> **Governments and businesses on both the supply and demand sides must work together to implement mechanisms that offset the green premium.**

Beyond pricing, it is important to quantify the broader economic benefits that transition technologies – especially those at an early stage – bring to society, in terms of jobs created, improved public health, security of strategic supplies and enhanced industrial competitiveness. These benefits must be factored into policy incentives to kickstart scaling-up.

As these technologies mature, reliance on government pricing support mechanisms will gradually decrease as they move down the cost curve. Coordination across the value chain – from production to end-use – is key, along with targeted policies aimed at correcting market distortions and stabilizing pricing models. While governments can internalize the true costs of pollution through carbon pricing and other instruments, businesses can focus on developing cost-effective solutions that absorb green premiums and maintain competitiveness, particularly in sectors vulnerable to price volatility.

Confidence in demand

Predictable demand signals are crucial for companies to confidently invest in scaling-up technologies, even if they are proven and commercially ready. While sectors such as EVs, solar and wind have reached commercial maturity and large-scale deployment due to clear demand signals and strong policy support, other technologies such as green hydrogen and low-carbon steel remain niche markets. Despite a robust market outlook, private sector confidence in the potential to create both industrial and household demand remains low.

For example, green hydrogen, although promising for decarbonizing heavy industries such as steel, has yet to reach a point where its business case is strong enough for large-scale investment. Some commercial-scale projects to produce low-carbon steel using green hydrogen for direct reduced iron (H_2-DRI) have emerged in Europe and Asia. However, challenges such as high energy demand, infrastructure barriers and a lack of clear global standards for hydrogen production, handling and storage hinder cost-effective scaling-up.[11]

Additionally, in order to provide upfront financing, banks often require projects to secure offtake agreements covering at least 75-80% of production capacity, with sufficient revenue to support costs throughout the financing period – factors that further complicate project viability.[12]

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This underscores the need for demand-side policies that encourage the use of clean electrons and molecules to provide more market certainty. Policy-makers and businesses can leverage strategies such as government procurement, corporate sustainability commitments and disclosures, financial support mechanisms, advance purchase and offtake agreements to create strong demand signals, giving suppliers confidence to invest in infrastructure and production facilities.

Offtake agreements further support the roll-out of cutting-edge technologies by easing capital burdens for developers, while providing guaranteed future clean energy supply for investors. The World Economic Forum's First Movers Coalition is an example of this approach, so far securing over 120 corporate commitments across six hard-to-abate sectors and carbon dioxide removal to purchase low-carbon solutions. By 2030, these commitments will represent $16 billion in annual demand for emerging technologies and 31 million tonnes of carbon dioxide-equivalent (CO_2e) in annual emission reductions.[13]

Cost of capital

Access to affordable capital is critical to scaling-up clean energy technologies. The cost of capital directly impacts investment decisions and whether a project can be profitably deployed or considered financially viable. Clean energy projects, which tend to be capital-intensive upfront with lower operational costs, are particularly sensitive to borrowing costs compared to fossil fuel alternatives.

In advanced economies, well-established clean technologies such as solar photovoltaics (PV) continue to attract investment due to their low risk,

cost competitiveness, stable demand and continued policy support.

However, in many emerging markets, where perceived or real risks are higher, capital costs can be more than double those in advanced economies, leading to fewer projects reaching final investment decisions (FID). Around 74% of low- to medium-income countries have sovereign risk ratings of B+ or lower[14] – levels that most private foreign investors are typically unwilling to accept.

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The affordability of capital, especially in EMDEs, will depend on optimized risk-sharing structures that engage a diverse range of investors – corporates, governments and households – drawing on multiple financing sources, including from commercial banks, the public sector, multilateral development banks (MDBs) and development finance institutions (DFIs).

Different investors will need to absorb different types of risk. For instance, more equity might be needed to finance low-emission fuels and CCS as these technologies often carry higher risks that require patient capital willing to absorb uncertainties. Meanwhile debt may be more suitable for low-emission power infrastructure such as nuclear which, despite being capital-intensive, typically offers stable and predictable cash flows over the long term once operational.

In addition, achieving scale will require an integrated policy approach with system-wide planning, such as ensuring that increases in renewable energy generation are matched by investments in grids and storage systems.

To attract investors, businesses must develop clear capital expenditure (CapEx) strategies to accompany transition plans, articulate expected returns and collaborate closely with key players across the investment value chain to build strong financial cases. The finance sector also plays a key role in shaping policy and guiding decisions that create favourable conditions for clean energy investments.

The World Economic Forum's Playbook of Solutions for mobilizing clean energy investment in EMDEs references replicable best practices, including successful policy measures, de-risking tools and finance mechanisms designed to strengthen the business case and increase capital for clean energy in emerging market and developing economies.

Policy credibility

A credible, stable and consistent policy framework is necessary for building investor confidence, reducing risk and fostering long-term commitment to the energy transition. Inconsistent policy signals from governments, frequent regulatory changes, or the absence of long-term targets create volatility and weaken the business case, making developers and investors reluctant to commit resources to new technologies and infrastructure. Short political cycles add to this challenge, as governments may struggle to provide the consistency required for a multi-decade transition.

> **Inconsistent policy signals from governments, frequent regulatory changes, or the absence of long-term targets create volatility and weaken the business case.**

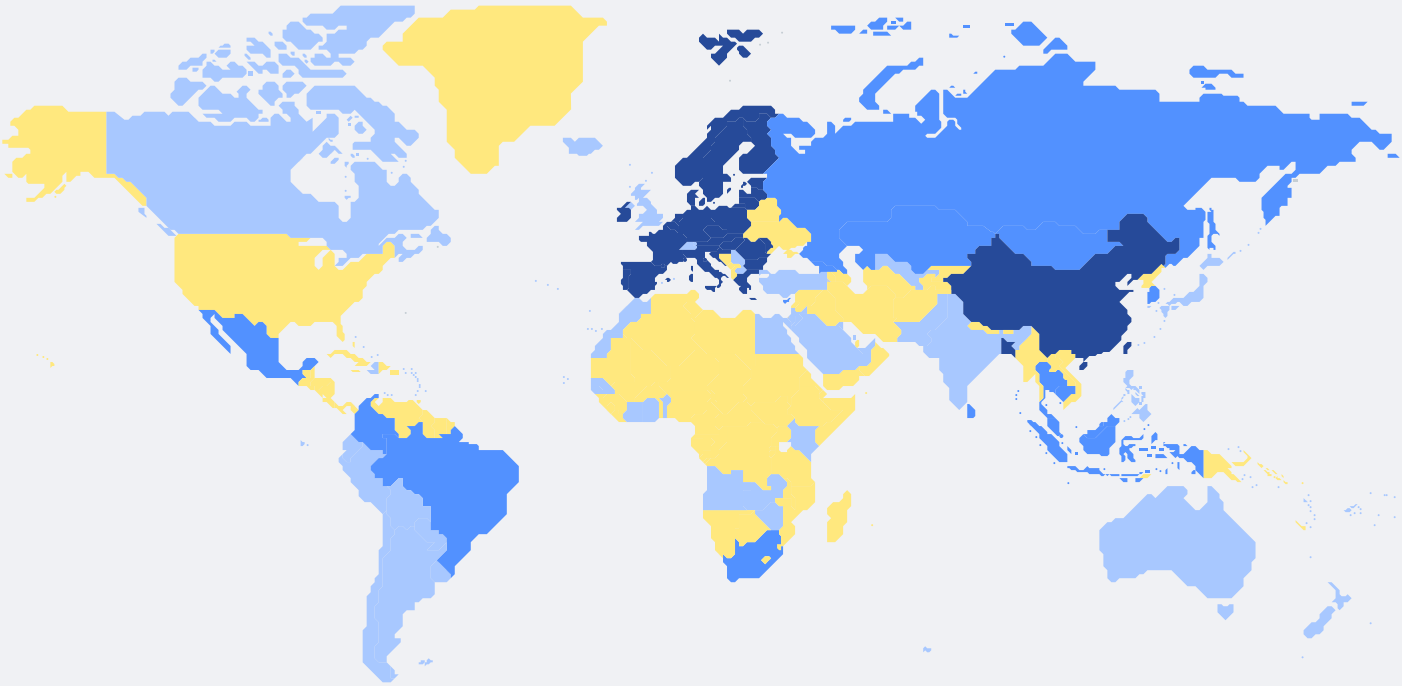
Policy effectiveness also depends on governments' capacity to design and implement industrial policies, which varies across countries and directly shapes investor confidence. Initiatives such as the US Inflation Reduction Act (IRA) demonstrate how clear policy signals from governments shape market demand and drive private sector investment. With tax incentives and targeted funding – particularly in underserved communities – the IRA is spurring a wave of announcements and projects across legacy and clean-tech sectors, shifting the focus from risk mitigation to opportunity capture[15] and making clean energy strategies a competitive and social imperative. However, as the political landscape evolves in the US, uncertainty remains about the long-term future of the IRA and its provisions.

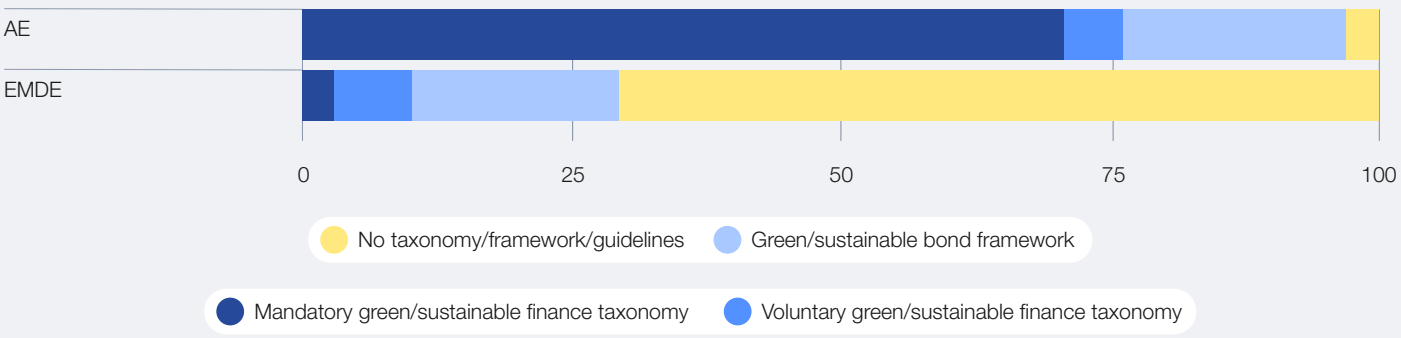
Similarly, the European Commission's EU Taxonomy sets standards for sustainable investment by providing clear criteria for businesses and investors to identify green opportunities.[16] In 2024, over 700 European companies reported €250 billion in EU Taxonomy-aligned investments, showing how structured policy frameworks can build corporate confidence and channel investment towards viable and sustainable projects.

In 2024, over 700 European companies reported €250 billion in EU Taxonomy-aligned investments, showing how structured policy frameworks can build corporate confidence.

Despite challenges such as the cost of environmental impact analysis for small and medium-sized enterprises and complex regulatory requirements, 47 sustainable finance taxonomies have been issued globally as of April 2024, spanning regulatory tools to green bond frameworks (see Figure 2).[17]

FIGURE 2 **National and regional sustainable finance taxonomy coverage**





Notes: AE = Advanced economies. EMDE = Emerging market and developing economies.
Source: World Bank.[18]

The proliferation of standards and taxonomies can create market fragmentation, weakening the business case for multinational companies seeking scale across borders. Governments and businesses need common, agreed-upon standards for defining "clean" investments, providing investors with clear guidance to assess the sustainability of their portfolios.

Governments must work closely with businesses and stakeholders from the outset, designing clear, reliable and long-term policies that reduce regulatory risk and provide consistent signals to investors. These policies should be bold enough to kickstart investment and provide positive incentives that address actual market needs. Early engagement ensures that policies remain pragmatically focused, while businesses, in turn, can align their investment strategies with government priorities, fostering a collaborative approach to the energy transition.

3 Actions to accelerate the energy transition

Aligning public policy and private sector strategies through collaboration, innovation and a unified vision is necessary to build a compelling business case for clean energy investments.

The success of the energy transition, particularly in market economies, depends on building a strong business case within the context of a well-established economic case. Achieving this requires coordinated effort across the entire value chain, with governments and businesses aligning their goals and working together.

Governments should lead by defining and quantifying the economic case and broader socio-economic benefits, making these visible and tangible to the public. This foundation, supported by clear and effective policy measures, will enable companies to build a compelling business case that ensures profitability while advancing long-term energy transition goals.

Businesses, in turn, must actively engage with governments through regular, structured dialogues, articulating clear "asks" regarding specific policies and incentives needed to unlock clean energy investments. This collaboration will align public policy and private sector objectives, making clean energy projects more attractive to investors and allowing for more predictable returns on investment.

Governments can also support strategically or systemically important projects through targeted interventions, including investment incentives, risk mitigation mechanisms and strong regulatory frameworks that build investor confidence. Striking the right balance between regulation and collaboration will help establish a common vision and allow for course corrections as needed to sustain progress towards shared goals.

> **Innovation – in financing, technology, business strategies and policy – will be the differentiating factor to break through traditional barriers and accelerate progress.**

A holistic approach is necessary, with all stakeholders working together to establish clearly defined, value-based criteria for clean energy projects. Governments should set ambitious interim targets and milestones to guide private sector planning and investment, while businesses should provide feedback on what is feasible within these timeframes. This continuous feedback loop will ensure proper timing, sequencing and coordination of efforts, helping short-term measures align effectively with long-term energy transition goals.

While collaboration and engagement are foundational, moving forward, a stronger focus on innovation – in financing models, technology development, business strategies and policy frameworks – will be the key differentiating factor to break through traditional barriers and accelerate progress beyond what collaboration alone can achieve. Existing pockets of best practices can serve as replicable and scalable models to accelerate the transition across regions and sectors.

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