

# Scaling green businesses: Next moves for leaders

New challenges—and opportunities—have emerged for green business builders. A set of actions could help companies scale during these uncertain times.

*This article is a collaborative effort by Rob Bland, Laura Corb, Anna Granskog, Tomas Naclér, and Giulia Siccardo, representing views from McKinsey's Sustainability Practice.*



**The transition to net zero** is well underway, but it is not happening fast enough. Growth in key climate technologies, including wind and solar power and electric vehicles (EVs), has helped accelerate decarbonization efforts worldwide. Solutions such as green hydrogen and long-duration energy storage (LDES) are becoming available and, if scaled, could reduce global emissions even further. But the pace of scaling these technologies has not kept up with projections for a warming planet. Governments and companies have done an admirable job developing and deploying climate technologies to date, but a significant acceleration is required to meet net-zero targets—and stave off the most dire effects of climate change.

Last year, we released a framework for launching and scaling green businesses, based on our work with both incumbents and start-ups.<sup>1</sup> A few of the key actions include leading with game-changing ambition, signing up captive demand before scaling, and building capacity with parallel scaling. In the interim, as the economic and geopolitical backdrop has changed, market dynamics for green business builders have shifted in both nuanced and fundamental ways. On the one hand, capital markets and public-sector institutions have started to galvanize behind green investments. Policy, including the Green Deal Industrial Plan in Europe and the Inflation Reduction Act (IRA) in the United States, promises to support companies looking to scale climate technologies. At the same time, inflation, economic uncertainty, and the invasion of Ukraine have all complicated the path to net zero.

Three areas have emerged that should now be priorities for those navigating the challenges and seeking opportunities: building up supply chains (often through cross-sector partnerships), proactively addressing an emerging skills gap, and

exploring different avenues for financing and investments.

Many of the unique challenges to scaling green businesses remain—high capital expenditures on physical assets (compared with building digital businesses), higher short-term costs, and customer education and adoption barriers for many sustainable products. However, the urgency to reach net-zero targets has only grown in many markets, and the industrial economy is now being reinvented around a lower-carbon energy system, circular-economy practices, and other emerging models. Companies that can innovate and scale during these fast-moving, uncertain times could set themselves up for exponential growth. Our analysis shows that growing demand for net-zero offerings could generate \$9 trillion to \$12 trillion of annual sales by 2030 across 11 value pools, including transport, power, and consumer goods.

In this article, we lay out the evolving landscape for scaling climate technologies and explore three areas of potential action for green business builders.

## **A significant scaling gap**

More than 4,000 companies have set or are in the process of committing to emissions reductions<sup>2</sup> and 70-plus countries have set net-zero targets.<sup>3</sup> How quickly would key climate technologies need to scale to help meet such goals?

To arrive at projections, we conducted an analysis of the current growth trajectory for climate tech relative to current net-zero commitments. Based on our analysis, even mature technologies—including wind and solar power—would need to scale by a factor of six to 14 times faster to remain on track for a 1.5° pathway by 2030 (exhibit).<sup>4</sup>

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<sup>1</sup> See Rob Bland, Anna Granskog, and Tomas Nauclicr, "Accelerating toward net zero: The green business building opportunity," McKinsey, June 14, 2022.

<sup>2</sup> "Companies taking action," Science Based Targets, accessed February 22, 2023.

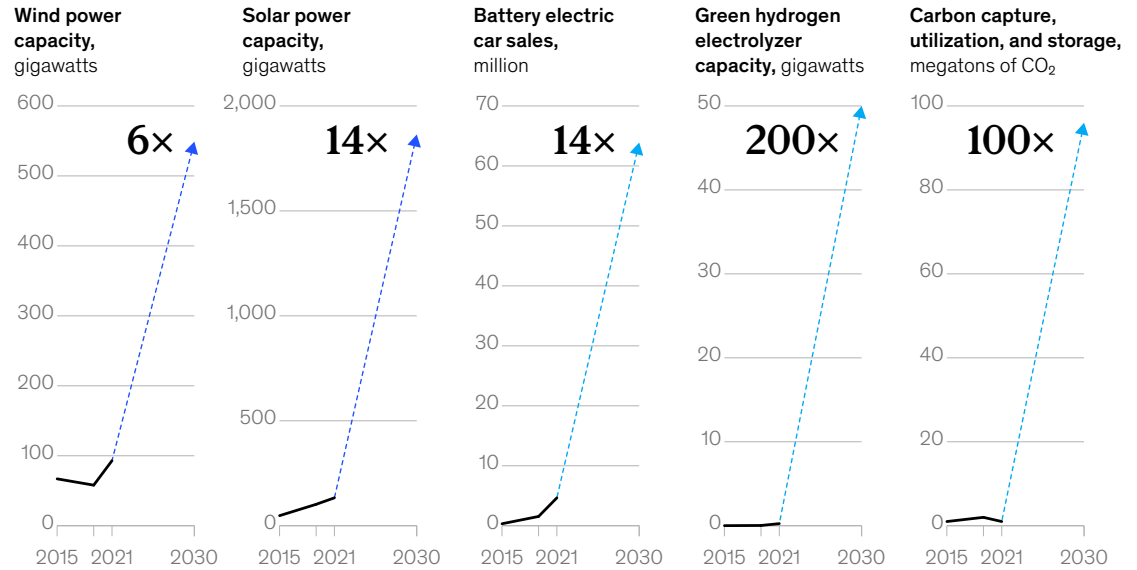
<sup>3</sup> "For a livable climate: Net-zero commitments must be backed by credible action," United Nations, accessed February 22, 2023.

<sup>4</sup> Based on the McKinsey 1.5°C achieved commitments scenario, which represents existing commitments from companies and policies from countries. To conduct this analysis, we estimated the current trajectory of supply of key climate technologies (based on current activity) across four categories of maturity: mature, early adoption, demonstrated at industrial scale, precommercial; factored in current emissions-reductions commitments from countries and governments; and assessed the supply of these technologies that would be required by 2030 to stay on track for a 1.5° pathway.

Exhibit

## To reach net-zero targets, a set of existing climate technologies would need to scale exponentially by 2030.

Annual deployment of climate technologies needed,<sup>1</sup> multiples of current supply



<sup>1</sup>Based on the McKinsey 1.5°C achieved commitments scenario, which represents existing commitments from companies and policies from countries. To conduct this analysis, we estimated the current trajectory of supply of key climate technologies (based on historic and current activity), factored in current emissions-reductions commitments from countries and governments, and assessed the supply of these technologies that would be required by 2030 to stay on track for a 1.5° pathway.  
Source: EV-Volumes; IEA; International Renewable Energy Agency; McKinsey analysis

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Historically, growth in solar and wind has often outpaced projections, and new players entering the market (oil and gas companies, private equity players, and institutional investors, for example) show signs that the current pace of deployment could speed up.<sup>5</sup> Nevertheless, the potential gap for renewables to meet net-zero targets looks steep.

Climate technologies that are high-potential but relatively less advanced in their commercialization (compared with renewables) would need to scale at an even greater rate. Consider hydrogen. Our

analysis indicates that supply of green hydrogen, which is produced with renewables, would need to grow by a factor of 200 times.

### Next moves for green business builders

Scaling climate technologies often requires companies to think and act in bold and innovative ways. While our seven actions for scaling green businesses hold true, they continue to evolve (for a summary of the original framework, see sidebar, “Seven actions for scaling green businesses”).

<sup>5</sup> “Renewable-energy development in a net-zero world,” McKinsey, October 28, 2022.

Economic uncertainty, inflation, new public funding, technological risks, and supply chain considerations have altered the landscape for green business building.

Actions that have become particularly important for organizations during these volatile times include creatively developing supply chains (including through partnerships), proactively addressing emerging skills gaps in the workforce, and exploring new avenues for financing and investment.

### **Build up the supply chain through cross-sector partnerships**

Green business building efforts are often supply chain building efforts. For hydrogen-powered vehicles to scale and help decarbonize long-haul freight transport, for example, a supply of hydrogen and hydrogen infrastructure also needs to scale. We are increasingly seeing green business builders develop their supply chains by forging partnerships across sectors and, in some cases, creating a growth strategy with complementary players as collaborators. These partnerships are getting a boost from major climate legislation packages in the United States and the European Union. For example, the IRA in the United States allocates \$369 billion for climate and energy spending,<sup>6</sup> with a focus on ventures that address critical gaps in the North American supply chain. These collaborations happen upstream, downstream, or horizontally in the value chain.

Upstream partnerships are operational partnerships that propel vertical integration. They occur when a company partners far upstream to secure critical supply of a product or service. In one example, the Volkswagen Group announced a joint venture with Umicore,<sup>7</sup> a circular-materials technology

company, to boost the supply of low-carbon battery materials. The collaborators aim to scale capacity to meet demand for 2.2 million EVs per year. Such a partnership could not only help fortify the supply chain for battery recycling, it could also help solidify demand for players across the EV and energy storage value chains (charging infrastructure, grid storage markets) and help reduce commercial risk for investors. In another example of a large-scale upstream partnership, Dow Chemical and Mura Technology, an advanced-recycling company, announced they will pair up to construct multiple recycling facilities for plastics that could add up to 600 kilotons of capacity by 2030.<sup>8</sup>

Downstream partnerships are demand-based partnerships that drive vertical integration. They occur when a company uses a demand commitment from a purchaser to help stabilize or enable their financing. As an example, advanced-market commitments are one tool for helping to guarantee future demand for technologies. Take Frontier, a joint effort among organizations including Alphabet, Meta, Shopify, and Stripe.<sup>9</sup> These organizations have collectively made a \$925 million commitment to purchase carbon removal, enabling carbon removal suppliers to have a line of sight to their end customers while they are still scaling operations.

Horizontal partnerships are ecosystem partnerships that bring together a cross-section of organizations along the value chain. For example, the Center for Houston's Future and the Greater Houston Partnership have laid the groundwork for a clean-hydrogen hub in the Gulf Coast region by bringing together both public and private entities that span production, infrastructure, and electrolyzer capacity.<sup>10</sup> Another example is the LDES Council, a group of more than 60 member institutions that

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<sup>6</sup> Inflation Reduction Act of 2022, H.R. 5376, 117th Congr. (2022).

<sup>7</sup> "PowerCo and Umicore establish joint venture for European battery materials production," Volkswagen Group, September 26, 2022.

<sup>8</sup> "Dow and Mura Technology announce largest commitment of its kind to scale advanced recycling of plastics," Dow Chemical, July 21, 2022.

<sup>9</sup> McKinsey Sustainability is a partner in Frontier. For more, see *New at McKinsey Blog*, "McKinsey partners with Stripe, Alphabet, Shopify, and Meta on \$925 million carbon removal commitment," blog post, April 13, 2022.

<sup>10</sup> McKinsey's Houston office has been working in collaboration with the Greater Houston Partnership's Houston Energy Transition Initiative and Center for Houston's Future. Over the past two years, McKinsey has supported these initiatives through a variety of efforts, including a pro bono study, *Houston leading the energy transition - strategy report*, Greater Houston Partnership, June 2021, and a report, *Houston as the epicenter of a global clean hydrogen hub*, Center for Houston's Future and the Greater Houston Partnership, May 2022.

has committed to accelerating the scale of LDES technologies.<sup>11</sup> Members include technology providers, customers, and investors.

### **Get ahead on the skills gap**

The net-zero transition has created a shift in needed job skills, as markets are reshaped and organizations institute new operational practices and processes. The range of skills is broad: from honing technical skills in manufacturing EVs, solar panels, and wind turbines to engaging with low-emissions suppliers to having executive expertise in carbon accounting and project finance. Green business building opportunities have encouraged many entrepreneurs, but the available talent to scale operations—in infrastructure, engineering for capital projects, and in process engineering, for example—has not quite caught up.

Looking into the next decade, skills shortages<sup>12</sup> could loom for certain sectors, particularly as more companies concurrently scale up manufacturing and operations in the United States to access the incentives offered by the IRA and the Bipartisan Infrastructure Law. For example, McKinsey analysis shows that bursts of factory building in Michigan could strain labor supply by close to 200 percent and manifest differently across skill categories of workers, with growing needs for architectural, equipment, and electrical work. To address these potential shortages, companies must not only acquire the right talent, they also need to figure out how to upskill and reskill labor for future opportunities. In the United Kingdom, for example, Octopus Energy has opened a heat pump R&D and training facility to help accelerate adoption of the technology.<sup>13</sup>

Building up the talent pipeline at academic institutions is another way for companies to fill the

skills gap. For example, Shell is a founding partner of the Energy Transition Institute at the University of Houston, where students work with Shell scientists across three core areas: hydrogen, carbon management, and circular plastics.<sup>14</sup> Governments can support such talent-building efforts at universities. The US Department of Energy, for example, has funded a new research center at the University of Michigan for EV battery technology.<sup>15</sup> Private and public entities will both need to contribute to workforce development going forward.

### **Explore different avenues for financing and investments**

Financing the scale-up of climate technologies can come with challenges, as many technologies rely on significant up-front investments in physical assets, including large-scale facilities and infrastructure. Technologies that haven't yet reached technical maturity or commercialization can come with a higher risk profile for investors. As we have written about before, securing purchase agreements and inviting customers to invest in the business up front are some ways that green business builders have successfully addressed these challenges.

Project finance is an increasingly common approach for green business builders that can help mitigate the risks for capital-intensive infrastructure projects. Project finance is a nonrecourse or limited-recourse structure in which the project company shareholders' liability is limited to their equity investment and the project lenders rely primarily on the project's cash flow for repayment—meaning principal repayment usually begins after the project is operational. Northvolt, a Swedish battery maker, quickly turned to project financing and has plans for at least a third gigafactory manufacturing plant.<sup>16</sup>

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<sup>11</sup> McKinsey has collaborated with the LDES Council as a knowledge partner, including on the reports *Net-zero power: Long duration energy storage for a renewable grid*, LDES Council and McKinsey, November 22, 2021; *A path towards full grid decarbonization with 24/7 clean Power Purchase Agreements*, LDES Council and McKinsey, May 2022; and *Net-zero heat: Long Duration Energy Storage to accelerate energy system decarbonization*, LDES Council and McKinsey, November 2022.

<sup>12</sup> Christopher Boone and Karen C. Seto, "With green jobs booming, here's how to plug the sustainability skills gap," World Economic Forum, January 9, 2023.

<sup>13</sup> *Octopus Energy Blog*, "How Octopus Energy is revolutionising heat pumps," blog entry by Aimee Clark, October 29, 2021.

<sup>14</sup> Chris Stipes, "Leading energy," University of Houston, accessed February 22, 2023.

<sup>15</sup> "\$11M DOE center for next-gen battery technology," University of Michigan, August 30, 2022.

<sup>16</sup> "Northvolt announces its third gigafactory will be established in Germany's clean energy valley," Northvolt, March 15, 2022.

## Seven actions for scaling green businesses

**Through our work** with organizations that have built and scaled green businesses successfully, we have identified seven key principles. This framework is a way for leaders to navigate both the opportunities and risks involved in scaling climate technologies—and potentially set their companies up for significant growth. There is no one right combination of these factors, and most existing players have combined several of these elements.

**Lead with game-changing ambition.** Effective green business builders tend to set their sights on creating something significant from the start. Game-changing ambition may mean aspiring to produce a zero-carbon product at a competitive cost (which enables a competitive price), compared with a less sustainable alternative, and scaling new capacity fast.

**Accelerate to the point of cost advantage.** Building a business around a clean technology may require analyzing different technological pathways, including some technology options that are not yet commercialized. When analyzing a new technology, leaders must understand the scale break point for cost competitiveness, to reach lower unit costs faster and potentially be competitive on price from the start.

**Sign up captive demand before scaling.** Successful green business builders often set up demand with a strong commercial

plan prior to expanding, to reduce risk. One way of accomplishing this is through purchase agreements. For example, Swedish battery manufacturer Northvolt signed a supply agreement with BMW.<sup>1</sup>

**Build capacity with parallel scaling.** To reach scale-up goals, the ability to drive several investments or market introductions in a limited time frame is key. We've seen leaders “parallelize the scaling” from the start—that is, initiate additional growth waves before they complete the first one. One approach is scaling through partnerships in the value chain. For example, investing in production capacity in a company's home region while finding a partner to deploy the same technology in another. Or coinvesting in expanding manufacturing capacity with suppliers.

**Proactively create business ecosystems.** As we explore in the accompanying article, scaling most climate technologies won't happen by companies “going it alone.” Achieving scale requires coordination among governments and regulatory bodies, investment and financing institutions, incumbent players, and disruptive innovators. Finding the right scaling partners along the value chain—partners that have a similar strategic interest—is key. And coalitions dedicated to scaling access, cost-effectiveness, and supply across green ecosystems are a must for transitioning to a green future.

**Lead on sustainable operations, through ambitious targets, innovation, and partnerships.** Successful green business builders are leaders in how their operations minimize carbon emissions and other environmental impacts. Sustainable operations start from the beginning—designing with low-carbon inputs (green materials), implementing low-emissions processes (circularity), and controlling for emissions through the value chain. Supply chains for some key materials (lithium, for example) could be in high demand. Solidifying a sustainable, resilient, and cost-effective supply chain is therefore important.

**Dedicate recruiting resources early in the process.** As we cover in the accompanying article, the range of skills required to scale successful green businesses can be wide—and in an especially tight labor market, scarce. Green business builders can invest early in building their talent base, project the needed skill sets for the future workforce, dedicate resources to upskilling and new capabilities, and create the technical infrastructure to enable superior talent performance.

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<sup>1</sup> “BMW Group signs long-term supply agreement for battery cells with Northvolt,” Northvolt, July 13, 2020.

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Many green business builders look to blended finance models, which rely on a mix of private capital and public or philanthropic funding. Public-funding pools utilize grants as a means of reducing debt and mitigating risk, for example, and multilateral climate funds, such as the Green Climate Fund, have factored into these blended finance models.

Financing partnerships are also playing a larger role, from joint ventures between local start-ups and global technology companies to multistakeholder-funded research, development, and demonstration (RD&D) programs that provide early-stage and growth-stage equity capital for high-risk first deployment projects. These RD&D programs are particularly showing up in developing countries, to help increase private investments into businesses that serve underrepresented communities most affected by climate change.

When it comes to purchase agreements, inflation could be a top concern for suppliers and buyers. In response, we're seeing green business builders offer agreements to customers that have inflation-adjustable price formulas.

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Scaling new, green businesses may seem more challenging than it did a year ago, but we see many companies addressing the complications with determination and foresight. Organizations that evolve with the times and embrace a new set of actions could set themselves up for significant growth opportunities—and help the climate get back on track.

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