

# Full-spectrum innovation: What is needed to create the low-carbon economy

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## Abstract

Accelerating the transition to a low-carbon economy is essential. This will require faster development, commercialization, and scaling of technologies—commonly called climate technologies—that help reduce greenhouse gas emissions or remove them from the atmosphere. At the industry and the policy level, strategies to foster the crucial markets for climate technologies are increasingly being activated across the globe. For instance, forward market commitments can catalyze markets, and policy and tax incentives can spur progress along the innovation S-curve. In this context, how can individual business leaders, whether startup founders or innovators within large organizations, maximize their impact?

Actors in the emerging low-carbon economy are exploring multiple avenues to bring their solutions to market and put innovative technologies and practices into production. What follows are some of the lessons revealed by the experiences of companies across multiple sectors. We believe they show that scientific progress and technical innovation must be complemented by creativity and innovation in finance, business models, and partnerships. Individuals, enterprises, and policymakers seeking to make a significant impact on address the pressing issue of climate change should take note.

## Take full advantage of government incentives

The success of many of current climate tech leaders can be attributed, at least in part, to intelligent use of government incentives. Tax credits, grants, and policy inducements can reduce the cost of developing and deploying new technologies and have already shown themselves to be instrumental in the development of the wind and solar power industries. The global electric vehicles (EV) market grew from less than 10,000 sales in 2010 to more than two million in 2020, with early leaders in the market availing themselves of billions of dollars in government incentives,<sup>i</sup> as well as credits to consumers that spurred EV purchases. The U.S. Department of Energy (DOE) has also provided loans, grants, and other funding to various early climate tech deployments including hydrogen production, carbon capture, and long duration energy storage projects.

Government R&D funding can also support the development of new technologies or help improve existing technologies. In the E.U., various programs are making billions of euros available to researchers and innovators working on energy and environmental

solutions.<sup>ii</sup> In the U.S., the Inflation Reduction Act expanded the R&D tax credit for small companies, for instance, and the DOE provides funding to companies pursuing clean energy R&D. The availability of R&D funding can also be an important factor in attracting private investment.<sup>iii</sup>

Government procurement policies can help drive the market for climate-friendly technologies as well. The Federal Buy Clean Initiative in the U.S., for instance, supports Federal purchase of low-carbon construction materials, and makes funds available for technical assistance, and tools to measure, report, and lower the levels of embodied carbon and other greenhouse gas emissions associated with the production, use, and disposal of construction materials and products.<sup>iv</sup> Government procurement can not only provide an important source of revenue, it can help demonstrate the effectiveness of the technologies.

To make the most of these incentives, innovators should have an in-depth understanding of them—and the capacity to act on them. The mere existence of incentives may not be sufficient to mobilize action at the scale and speed required, however. This is due in part to lack of awareness and inertia from entrenched relationships and processes. Some observers have suggested the need for additional tactics to drive the uptake of climate technologies, ranging from citizen activism to government-supported concierge services to help the private sector take advantage of incentives.

## Partner wisely

Achieving net zero greenhouse gas emissions will likely require the widespread deployment of technologies that may not yet be available at commercial scale. It can be very challenging for climate tech inventors or early-stage companies to attract the capital they

require to develop and prove their technology and, equally important, ensuring that their technologies are accepted by the market. Early-stage companies can leverage partnerships with larger companies to help them get to the next level. A vote of confidence and the funds needed to achieve an early proof of value from an industry participant, even one that is not in the innovator's target market, can end up attracting interest from venture capital investors as well shape future development. One example: An inventor of a battery technology, with aspirations to support the transition to a clean energy economy, entered quite counter-intuitively into a partnership with an oil-field services company that saw a niche application for the technology. The partnership was successful, and the startup ended up attracting more investors, further developed their core technology, and made its mark by being acquired by a leader in the clean energy industry.

Partnering with large companies requires understanding their dynamics. These can be complicated and unfamiliar to startup founders. For example, a corporate partner's legal department can overwhelm a startup; poorly structured agreements or troubled relationships can sometimes lead to arguments over intellectual property. One innovation in this area is the simplified partnership agreement, developed with funding by the DOE, which could streamline the legal dimension of the partnering process.<sup>v</sup> Some larger companies may not be able to take such an approach, however. Any partnership involves aligning the objectives of the partners and navigating areas where objectives may diverge. Savvy technical founders of early-stage technology-based companies should be able to judge whether a partnership can provide the boost needed to get to the next level or whether it carries the risk of blowing the company off course entirely.

Established companies face different partnership opportunities and challenges than startups do. Partnering with an innovative startup can be a prudent way of outsourcing R&D risk while accessing top talent. But understanding and navigating the landscape of climate technology innovation may be overwhelming. There are hundreds of technologies and thousands of innovators, at every stage of maturity, from concepts in research university labs to the sales sheets of well-funded companies. Larger companies seeking partnerships with startups should systematically explore the technology ecosystem, and they should recognize that early-stage companies often need cultivation and support. Some companies have found

that establishing an incubator or accelerator to provide resources and guidance to promising inventors can give them early access to valuable innovations. Given the complex technological issues involved in at least the earlier stages of climate tech innovation, corporate partners sometimes have more success with founders with a strong engineering and technology background.

## Master the financial levers

The innovation required to scale up climate technology is not limited to the technology domain. Innovative thinking about operating model, business model, or financing, can be crucial for overcoming obstacles to commercializing and adopting climate technologies, particularly for incumbents in an industry. Often these obstacles take the form of a challenging financial and business case. As an example, a long-lived piece of equipment may be hard to replace even if future operating economics are favorable, due to the business case that was built when it was installed. Understanding the financial management processes of large enterprises, the relevant financial levers, and how to combine them will enable both startup and large-company innovators to better determine the right opportunities for change. Some innovative approaches in the business domain we've seen include:

**New revenue streams.** Low-carbon processes or inputs may carry higher prices, especially before they attain scale. Companies may be able to capture value from the upgrade by differentiating themselves as low-carbon providers. We are already seeing this, particularly in the consumer products industry.

**Preferential financing.** Green Bonds are a mechanism companies can use to raise funds at preferential interest rates for investments that can yield climate benefits.

**Risk management.** A changing climate brings not only physical risks. It also may bring changing policies, including new regulations, and changing buyer preferences. The potential for these changes all present risks for companies. The business case for investing in becoming a low-carbon company may be justified in part by mitigating such risks.

**Operating models.** Incumbents can use the imperative of the transition to low carbon as an opportunity to rethink their operating models, including using financial engineering, which may allow them to sidestep certain challenges. An example: a chemicals manufacturer chose to reduce carbon emissions from

heating, cooling, and electricity production at one of its manufacturing facilities. Rather than invest capital to decarbonize, it sold the infrastructure to an energy services company, which converted the facility from coal to natural gas. The two companies entered into a long-term power purchase agreement, which will supply the manufacturer's energy services while cutting greenhouse gas emissions in half.

## Full-spectrum innovation required

The transition to a low-carbon economy presents challenges unprecedented in our lifetimes. We are inspired by the innovators who are seeking to drive the progress needed to make this transition at the rapid pace required. Innovation in science and technology, while essential, is not sufficient. Innovation in finance, business models, and partnering, among other areas, can be decisive in enabling organizations to make their contribution to tackling the climate challenge. We encourage those who seek solutions to our world's big challenges to take a broad view of the role they can play in supporting the full spectrum of innovation required.

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## References

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<sup>i</sup> <https://www.iea.org/data-and-statistics/charts/global-electric-car-sales-by-key-markets-2015-2020>

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[https://ec.europa.eu/commission/presscorner/detail/en/IP\\_22\\_7404](https://ec.europa.eu/commission/presscorner/detail/en/IP_22_7404)

<sup>iii</sup> <https://www.energy.gov/science/articles/us-department-energy-announces-125-million-small-business-research-and-development>

<sup>iv</sup> <https://www.energy.gov/science/articles/us-department-energy-announces-125-million-small-business-research-and-development>

<sup>v</sup> <https://www.activate.org/sipa>