

Emerging Technologies Evaluation Framework Implementation and Commercialization Strategy

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An important counterpart to this evaluation framework is to identify key elements for a commercialization strategy so that innovative manufacturers can improve their emerging technology's adoption potential and move their products into commercial use.

The Department of Energy's (DOE) Building Technologies Office uses the market readiness level (MRL) scheme, which evaluates the "readiness of a market to accept and adopt a new technology" (DOE 2024). A new or emerging technology may fall anywhere along this continuum and may fail to graduate from lab scale to engineering scale to commercial operational scale for a variety of reasons. Such technologies benefit from support in the intervening "valleys of death" to successful transition between these major stages. Figure 1 shows the tech-to-market process, which incorporates different technology readiness level (TRL) and MRL stages, roles of market players, and potential pitfalls on the way to commercialization for an innovative technology (DOE 2024).

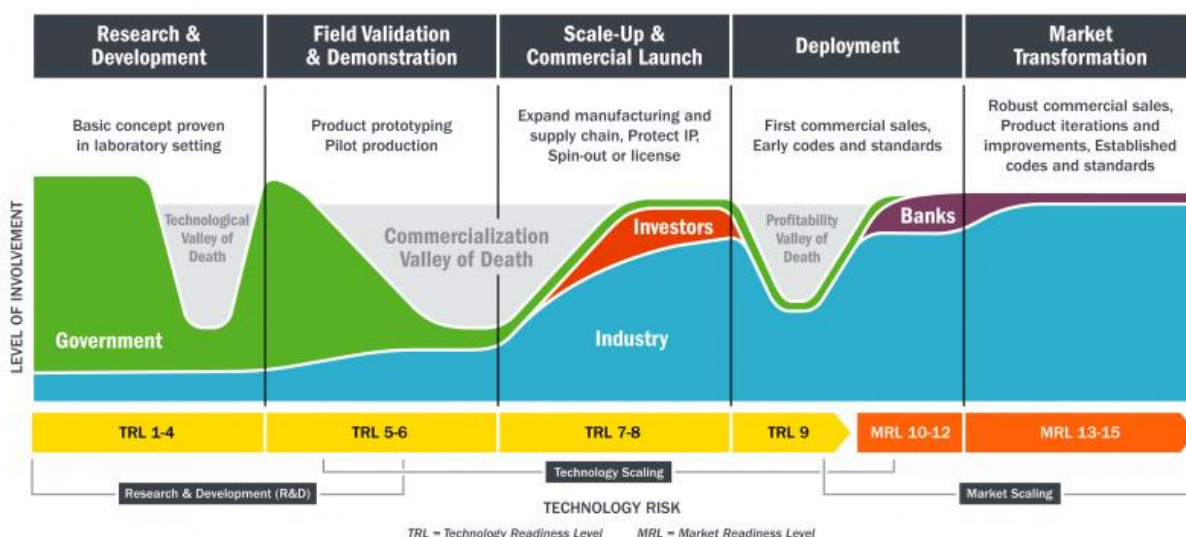


Figure 1. Tech-to-Market process. Source: DOE 2024.

Our proposed commercialization of low-embodied-carbon technologies strategy is built around three main elements that require action from various stakeholders across the value chain:

Creating Market Demand and Aggregation

To increase market demand for a new, innovative product, the innovator must get buy-in. This involves educating building sector professionals; having the product specified by architects, builders, design engineers, and contractors; being involved in a pilot project; and leveraging that experience to build relationships and get additional opportunities to test the product in more projects. If the innovative product solves a design, construction, or related problem while reducing emissions for the end-user, for example, it will improve market demand for the product.

The American Council for an Energy-Efficient Economy (ACEEE), a nonprofit research organization, develops policies to reduce energy waste and combat climate change. Its independent analysis advances investments, programs, and behaviors that use energy more effectively and help build an equitable clean energy future.

Demonstrating Product Performance and Gathering Data

Real world demonstrations of new and emerging technologies are critical to their evaluation and market acceptance/adoption by target applications. There are several options for demonstration including large-scale flagship projects, projects funded by state or federal agencies, public-private partnerships, and challenge programs. The value of real-world demonstrations lies in the opportunity to collect real time field data and feed that information into evaluation frameworks to allow more robust assessments of technology capabilities and to test and study their performance in real applications.

Information sharing through educational resources and tools about technical specifications of the product, and its applications along with technical assistance, can reduce the transaction friction associated with converting from an older, more established product to a new innovative product. Trade associations, professional organizations, and other partnership entities can help to socialize the product, increase awareness, generate legitimacy, and subsequently increase demand.

An illustration of this strategic approach for concrete may be seen in how limestone calcined clay cement (LC3) developed by the École Polytechnique Fédérale de Lausanne (EPFL) in Switzerland has formed and promoted market demand as a globally scalable alternative to portland and portland limestone cement. The approach involved global education and awareness-raising efforts, followed by trials, pilots and demonstration building projects on five continents, and coordination and partnership with manufacturers and plant equipment suppliers, offering technical assistance to projects using LC3. Most importantly, EPFL promoted a substantial value proposition around carbon emissions reductions, thereby offering a scalable solution for the problem of greenhouse gas emissions using a simple, widely available raw material (EPFL 2024).

Photo background courtesy of Daniel Duque from Cementos Argos SA

The data gathered from demonstration projects can be used to update the ratings of an emerging technology given the data feedback loop in which performance characteristics, such as emission reduction potential, of the product can be improved. As demonstrations increase, the products' TRL, scalability, and perhaps market size could increase, driving down the delivered cost. As a result, the emerging technology could receive the maximum rating across the evaluation framework's criteria and progress into commercialization. Additionally, conducting product/technology data validation and verification can increase the potential for higher ratings and adoption in the market.

Scaling the Technology with Partners

Developers of new and innovative technologies may not have the necessary entrepreneurial skills to build their business and take their product from the lab scale to the marketplace. Different skillsets are required, including attracting financing and investment, building partnerships, and figuring out how to de-risk their technology to ensure commercial success (Singh 2022).

After developing the product, the next stage is to achieve market validation of the product, improve the product, and attract investment. Other valuable skills include building a formal business structure, ecosystem, or market for the product (Burton 2020).

The third or *scaling* stage, requires optimizing inputs to increase product output, consolidating the market brand, and expanding the business enterprise (Burton 2020).

Innovator cohorts like DOE's IMPEL, a tech-to-market program focused on building technologies, offer another avenue to support and help early-stage entrepreneurs from business, academia, and DOE's national labs translate their technology into a viable business and bring it to market (IMPEL 2024).

To learn more about our evaluation framework, please [visit our website](#).

References

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