**Patenting invention: Clean energy innovation trends and priorities for the Trump administration and Congress**

SUMMARY

At a moment when the Trump administration has proposed draconian budget cuts, signs indicate that United States clean energy innovation could be lagging. The looming budget cuts raise concerns about the future of the nation’s long-term commitment to low-carbon economic development. To see where the 14 most prominent clean technology areas in the U.S. are, play around with new data in an interactive below. Some regions may surprise you.

<INTERACTIVE>

Clean energy innovation holds immense potential to spark job creation in U.S. regions, support the manufacturing sector, and make the U.S. more competitive internationally. However, several indicators of U.S. cleantech innovation competitiveness are raising warning lights. Eleven countries around the world now spend more on energy research and development (R&D) as a percentage of their economies than the United States does; China spends three times as much.[[1]](#endnote-1)

As Congress considers the Trump budget proposals and develops its own plan, it is appropriate to assess the status of the U.S. cleantech innovation enterprise, both nationally and regionally. To that end, this brief and a forthcoming one look closely at trends and issues involving two key aspects of U.S. cleantech innovation—technology patenting and VC investment—as they are playing out across 14 clean technology areas and the nation’s diverse metropolitan areas.

Patenting matters, because patenting—a measure of new technology invention—is an intermediate step toward innovation, and patent data provide indirect and partial indicators of innovation. Patenting activity has showed a positive correlation with regional economic health, as high rates of patent creation are geographically associated with higher-than-average wages, lower regional unemployment, and more startup company activities.[[2]](#endnote-2) VC is important because it is a key form of the early-stage financing that is frequently necessary to allow innovative new energy companies to grow.[[3]](#endnote-3) VC has also played a key role in advancing crucial segments of the innovation economy of the U.S. over the last several decades.[[4]](#endnote-4)

<GRAPH>

What do these data show? The report explores the dynamics, emphases, and patterns in clean-technology patenting since 2001 both nationally and by metropolitan area, providing a baseline look at the pace and geography of cleantech innovation, focusing on how to inform decisionmaking. There are five initial findings from the research:

* **U.S. cleantech innovation has grown significantly since 2001, but patenting may now be slowing**
* **Cleantech patenting tends to be concentrated in relatively few technology domains such as advanced green materials, energy efficiency, and transportation**
* **Large metropolitan areas host a disproportionate share of cleantech patenting but they do not monopolize it; overall, cleantech patenting is widely distributed across the nation**
* **The nation’s metro areas, both big and small, display distinctive profiles in cleantech patenting**
* **The share of U.S. cleantech patents owned by foreign companies has grown over the years, raising concerns about the global competitiveness of U.S. companies**

Likewise, flows of the venture capital (VC) needed to help cleantech entrepreneurs build companies peaked in 2011 and have since dwindled.[[5]](#endnote-5) There is also a perception problem: while energy innovation is a matter of broad national interest, too few Americans understand that the research, invention, testing, and commercialization that goes into it extends far beyond the usual short list of elite, green coastal tech centers in California and Massachusetts and actually reaches across the country.

A subsequent report looks closely at trends and issues involving two key aspects of U.S. cleantech innovation—technology patenting and VC investment—as they are playing out across these 14 clean technology areas and throughout the nation’s diverse metropolitan areas.

1. Virum Sivaram, Teryn Norris, Colin McCormick, and David Hart, “Energy Innovation Policy: Priorities for the Trump Administration and Congress” (Washington: Information Technology and Innovation Foundation, 2016). [↑](#endnote-ref-1)
2. Jonathan Rothwell et al., “Patenting Prosperity: Invention and Economic Performance in the United States and Its Metropolitan Areas” (Washington: Brookings Institution, 2013). [↑](#endnote-ref-2)
3. Shikhar Ghosh and Ramana Nanda, “Venture Capital Investment in the Clean Energy Sector,” Working Paper 11-020 (Cambridge, Mass.: Harvard Business School, 2010). [↑](#endnote-ref-3)
4. Several papers have examined the key role of venture capital in advancing the innovation economy of the United States over the last several decades. See Richard Florida and Donald Smith, “Venture Capital, Innovation, and Economic Development,” *Economic Development Quarterly*, 1990; Rudra Pradhan et al., “Venture Capital, Innovation Activities, and Economic Growth: Are Feedback Effects at Work?” *Innovation Organization and Management*, 2017; Will Gornell and Ilya Strebulaev, “The Economic Impact of Venture Capital: Evidence From Public Companies,” Working Paper No. 3362 (Stanford, Calif.: Stanford Graduate School of Business, 2015). [↑](#endnote-ref-4)
5. Forthcoming Brookings research will show trends in cleantech venture capital investment across 14 technology areas for the United States and its regions. [↑](#endnote-ref-5)