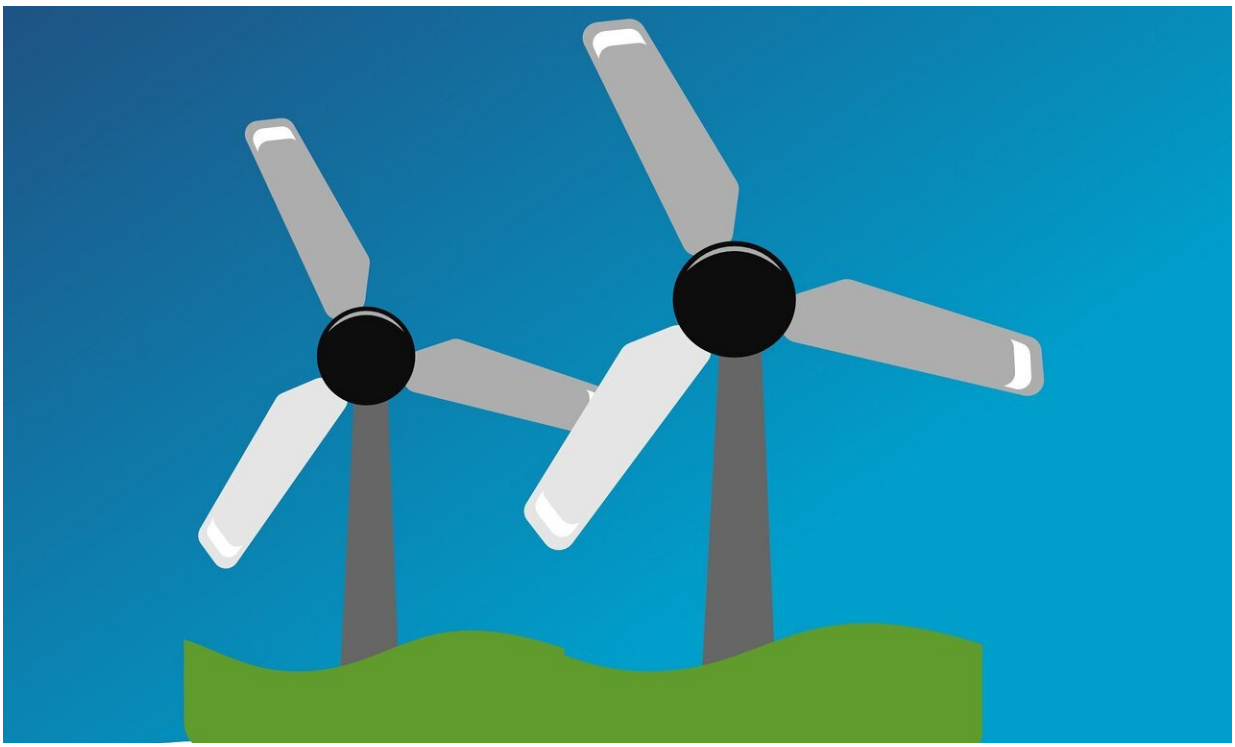
# ARPA-type funding gives green technology an 'innovation advantage', study finds

September 14 2020



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A new analysis of the successes and failures of green energy companies in the US has found that those with ARPA funding filed for far more patents in the years after launching than other "cleantech" startups from the same time.

The "innovation advantage" bestowed by ARPA-E—an energy version of the legendary DARPA (Defense Advanced Research Projects Agency) - was not shared by startups funded via other US government initiatives.

ARPA-type agencies were developed in the US to fund "high risk, high reward" research with the aim of fostering major breakthroughs, often by providing greater freedom to take on highly ambitious technical challenges.

The new findings offer encouragement to a UK government considering its own British ARPA (or 'BARPA'), but any agency adopting this model requires a focus in order to flourish—and BARPA's should be climate, argues Professor Laura Diaz Anadon from the University of Cambridge.

"Our US-based research points to the value of ARPA agencies. The UK may well benefit from such an approach in a post-pandemic world, given the technological capital within its universities and private sector," said Anadon, co-author of the US innovation study.

"The UK should adapt the ARPA model to create an agency for the climate challenge as part of any COVID-19 recovery package. Focusing research and development on next-generation energy storage and renewables, and solutions for decarbonizing shipping, aviation and construction, could boost productivity and deliver large benefits to society," said Anadon.

Dr. Anna Goldstein, first author of the study from the University of Massachusetts Amherst, said: "ARPA is not a one-size-fits-all solution. ARPA agencies are mission-focused, and there is no evidence to suggest this model would work well as a fund for general science and technology."

The research was conducted by the University of Cambridge, UK (Prof. Laura Diaz Anadon), the University of Massachusetts Amherst, US (Dr. Anna Goldstein and Prof. Erin Baker), and the Technical University of Munich in Germany (Prof. Claudia Doblinger). It is published today in the journal *Nature Energy*.

ARPA-E was established at the US Department of Energy under Obama, using a portion of the economic stimulus package that followed the 2009 financial crisis. To date, it has allocated US$3.38 billion.

The aim was to accelerate innovation in "clean" technologies such as biofuels, smart grids and solar power at a time when it was out of favour with Venture Capital investors, due in part to long development cycles and low initial returns.

For the latest study, researchers investigated whether ARPA-E—a "posterchild" of mission-orientated innovation now under threat from the Trump administration—had translated its unique approach into real-world success.

By constructing a database of 1,287 US cleantech startups, and using patents as a proxy for innovation, they found that companies funded by a fledgling ARPA-E in 2010 went on to file patents at an average of twice the rate of other green energy companies in the years that followed.

The researchers also measured "business success" by looking at how many companies were taken public or acquired by larger firms, as well as levels of private VC funding and overall survival rates.

While ARPA-funded companies do better than those turned down by ARPA-E, in general they fare no better or worse than other cleantech startups with the same amount of patents and private funding before 2010.

As such, the researchers argue that ARPA-E support alone does not bridge the "valley of death": the phase between initial funding injection and revenue generation during which startups often fold.

Goldstein said: "It appears that ARPA-E helps startups working on riskier but potentially more disruptive technologies to reach the same levels of success as other, less risky, cleantech firms."

"However, there is still a need for public funding to bring innovations in clean technology through the 'valley of death' so they can become commercial products that compete with legacy technologies and reduce emissions."

Writing for Cambridge Zero, the University's new climate change initiative, Laura Diaz Anadon points out that, at just 1.7% of GDP, the UK lags in R&D investment: below the EU28 average, and way behind the US, South Korea and Japan.

"While the UK dramatically increased energy investment over the last 20 years, it is still below the levels this country saw in the 1970s and 1980s," said Anadon, Professor of Climate Change Policy at the University of Cambridge.

"My co-authors and I would recommend trialing a UK version of ARPA-E that can ramp up energy innovation, and support selected projects through to demonstration phase. R&D investments in energy transition would be an inexpensive but essential component of a COVID-19 recovery package."

"The UK has solid recent experience in the energy space, but in the past several initiatives have fallen prey to volatile government funding before success can be properly gauged. Future efforts will need consistency as well as a set up that would enable state-of-the-art and independent

evaluation."

**More information:** Patenting and business outcomes for cleantech startups funded by the Advanced Research Projects Agency-Energy, *Nature Energy* (2020). DOI: 10.1038/s41560-020-00683-8 , www.nature.com/articles/s41560-020-00683-8

Provided by University of Cambridge

Citation: ARPA-type funding gives green technology an 'innovation advantage', study finds (2020, September 14) retrieved 24 April 2024 from https://techxplore.com/news/2020-09-arpa-type-funding-green-technology-advantage.html

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