Clean energy: Experts outline how governments can successfully invest before it's too late

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Governments need to give technical experts more autonomy and hold their nerve to provide more long-term stability when investing in clean energy, argue researchers in climate change and innovation policy in a new paper published today.

Writing in the journal *Nature*, the authors from UK and US institutions have set out guidelines for investment based on an analysis of the last twenty years of "what works" in clean energy research and innovation programs.

Their six simple "guiding principles" also include the need to channel innovation into the private sector through formal tech transfer programs, and to think in terms of lasting knowledge creation rather than 'quick win' potential when funding new projects.

The authors offer a stark warning to governments and policymakers: learn from and build on experience before time runs out, rather than constantly reinventing aims and processes for the sake of political vanity.

"As the window of opportunity to avert dangerous climate change narrows, we urgently need to take stock of policy initiatives around the world that aim to accelerate new energy technologies and stem greenhouse gas emissions," said Laura Diaz Anadon, Professor of Climate Change Policy at the University of Cambridge.

"If we don't build on the lessons from previous policy successes and failures to understand what works and why, we risk wasting time and money in a way that we simply can't afford," said Anadon, who authored the new paper with colleagues from the Harvard Kennedy School as well as the University of Minnesota's Prof Gabriel Chan.

Public investments in energy research have risen since the lows of the mid-1990s and early 2000s. OECD members spent US$16.6 billion on new energy research and development (R&D) in 2016 compared to $10b in 2010. The EU and other nations pledged to double clean energy investment as part of 2015's Paris Climate Change Agreement.

Recently, the UK government set out its own Clean Growth Strategy,

committing £2.5 billion between 2015 and 2021, with hundreds of million to be invested in new generations of small nuclear power stations and offshore wind turbines.

However, Anadon and colleagues point out that government funding for energy innovation has, in many cases, been highly volatile in the recent past: with political shifts resulting in huge budget fluctuations and process reinventions in the UK and US.

For example, the research team found that every single year between 1990 and 2017, one in five technology areas funded by the US Department of Energy (DoE) saw a budget shift of more than 30% up or down. The Trump administration's current plan is to slash 2018's energy R&D budget by 35% across the board.

In the UK, every Prime Minister since 2000 has created new institutions to manage energy innovation and bridge the public and private sectors. Blair's UK Carbon Trust; Brown's Energy Technologies Institute; Cameron's Catapults; May's Faraday Challenge as part of the latest industrial Strategy.

"Experimentation has benefits, but also costs," said Anadon. "Researchers are having to relearn new processes, people and programmes with every political transition - wasting time and effort for scientists, companies and policymakers."

"Rather than repeated overhauls, existing programs should be continuously evaluated and updated. New programs should only be set up if they fill needs not currently met."

More autonomy for project selection should be passed to active scientists, who are "best placed to spot bold but risky opportunities that managers miss," say the authors of the new paper.

They point to projects instigated by the US National Labs producing more commercially-viable technologies than those dictated by DoE headquarters - despite the Labs holding a mere 4% of the DoE's overall budget.

The six evidence-based guiding principles for clean energy investment are:

- Give researchers and technical experts more autonomy and influence over funding decisions.
- Build technology transfer into research organisations.
- Focus demonstration projects on learning.
- Incentivise international collaboration.
- Adopt an adaptive learning strategy.
- Keep funding stable and predicable.

From US researchers using the pace of Chinese construction markets to test energy reduction technologies, to the UK government harnessing behavioural psychology to promote energy efficiency, the authors highlight examples of government investment that helped create or improve clean energy initiatives across the world.

"Let's learn from experience on how to accelerate the transition to a cleaner, safer and more affordable energy system," they write.

More information: Gabriel Chan et al, Six principles for energy innovation, *Nature* (2017). DOI: 10.1038/d41586-017-07761-0

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