In the long run, supporting energy innovation is among the most important things the federal government can do to address climate change. Naturally, Trump wants to end that. In what has become an annual ritual, his most recent budget proposal calls for eliminating the Advanced Research Projects Agency-Energy (ARPA-E). The agency's mission is to support "high-potential, high-impact energy technologies that are too early for private-sector investment" in order to develop "entirely new ways to generate, store, and use energy." Even when Republicans controlled the House and the Senate, they ignored Trump's past demands to kill the program. That's no wonder – by all accounts, ARPA-E is a hugely successful program.

ARPA-E has spent $2 billion on over 800 projects that have resulted in 376 patents, 2500 peer-reviewed publications, the formation of 76 new companies, and almost $3 billion in private-sector follow-on investment. A 2017 report by the National Research Council concluded that "ARPA-E is in many cases successfully enhancing the economic and energy security of the United States by funding transformational activities, white space (technology areas that are novel or underexplored and unlikely to be addressed by the private sector or by other federal research programs), and feasibility studies to open up new technological directions and evaluate the technical merit of potential directions."

Even Trump's Energy Secretary, Rick Perry, has praised the program, calling it "impressive" and "simply a preview of our possibilities," and touting it as one of the reasons the department "has had and is having such a profound impact on American lives." That was about the same time as Trump's last request for Congress to kill the program. Also att the same time, a White House technology officer, who apparently hadn't talked to the budget folks, called on innovators to "work together to discover that pathway that will transform the incredible innovations coming out of ARPA-E every day into the every day technologies of tomorrow."

I took a look to see what ARPA is funding these days. There are actually about fifty different projects, and I won't bother with listing each one. Storage, grid management, and electric vehicles seem to be getting a lot of attention, with a cluster of projects each. There are also some projects on carbon capture, fusion, and nuclear reactors. But here are some project areas that are a bit further from the beaten path:

- Technologies to do heating and cooling around the human body rather than throughout building spaces.
- Use of light rather than wires to carry information within data centers in order to save energy.
- Developing new materials for heat exchangers to improve efficiency in energy and

industrial facilities.
- Production of seaweed as an animal feed and feedstock for fuels and chemical production.
- Cheap new sensors to detect methane leaks.

Each ARPA-E project comes with an acronym, resulting in some truly awful project names like Design Intelligence for Formidable Energy Reduction Engendering Numerous Totally Impactful Advanced Technology Enhancements (DIFFERENTIATE). In case you're wondering, that's actually a program for incorporating AI (machine learning) into the energy technology development process. Maybe the first thing it could do would be to automate the process of acronym production, freeing up human minds for more productive endeavors.

ARPA-E is modeled on DARPA, the Defense Advanced Research Projects Agency, which laid the groundwork for the Internet. It only takes one big success like that to make it all worthwhile. Who knows, maybe it will be the seaweed project, and we'll move to a partially seaweed-powered energy system. Stranger things have happened.