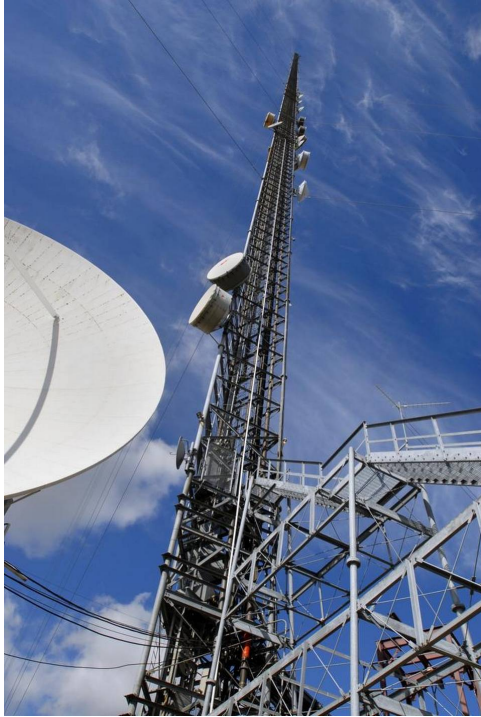


# California may have to fund climate modeling and renewable energy research

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BY ANN CARLSON AND DAN FARBER  
*Special to The Bee*

President Donald Trump's plans for climate and renewable energy research are no secret.

## OPINION

His leaked budget memo advocates eliminating most of the Department of Energy programs for climate and energy research. His advisers advocate axing NASA's climate programs. The proposed secretary of energy, Rick Perry, once advocated for eliminating the department he is now slated to lead, though he wasn't informed of the proposed DOE budget cuts before his confirmation hearing. Scientists are even worried that the incoming administration may erase critical climate data and are frantically trying to save it to nongovernmental computers.

In response to these attacks, Gov. Jerry Brown has said that California will push back and even help gather climate data. California should do even more by funding climate modeling and renewable-energy research.

Most scientists and economists believe we already spend too little on energy R&D. In 2015, the U.S. lagged nearly \$60 billion behind China, the global leader in renewable-energy investment. Deep federal cuts will create an energy innovation crisis. California can help limit the damage while boosting the state's innovation economy.

California has the most ambitious greenhouse-gas-reduction targets in the world. But by 2050, we will essentially need to decarbonize our economy. To meet these goals, we need technological breakthroughs in battery efficiency, noncarbon transportation fuels, carbon-capture systems and other emerging technologies.

We depend on federal funding for this research through our universities and national labs, including DOE's Lawrence Berkeley National Laboratory and NASA's Jet Propulsion Laboratory. If Trump acts as many fear, we stand to lose the benefit of this tremendously valuable research by some of the nation's leading scientists and engineers.

We also need climate impact, adaptation and mitigation research. As a coastal state, California is particularly vulnerable to climate change and resultant sea-level rise. Changes in rainfall and loss of snowpack in the Sierra and Rockies pose huge challenges due to our arid climate, complex water-supply system, large population and major agricultural sector. Our low-income communities will be hit especially hard. We can't plan the state's responses without sharper predictions and new technologies and approaches to make California climate resilient.

The federal government contributed \$6.6 billion to clean energy technology programs in 2015, with \$4.8 billion of that to DOE. With these kinds of cuts, how should California fund the necessary research? The options include bond funding; revenue from the state's cap-and-trade program; an increase in the gasoline tax or vehicle license fees; or a small surcharge on electricity bills. Several of these options would need to include exemptions for low-income Californians to avoid regressive effects.

Another possibility is a tax on the extraction of oil and natural gas. Such a tax on fuels that contribute to climate change would raise up to \$1.5 billion annually to support the necessary research and technology development that philanthropic and private monies typically don't support.

There's strong precedent for California taking research leadership when the federal government falters. When the Bush administration cut federal money for stem cell research, California voters responded by establishing the California Institute for Regenerative Medicine through government bonds. CIRM has been lauded for funding hundreds of millions of dollars worth of important, lifesaving research.

With new research funding, California can bolster two of its greatest strengths: its clean energy industry and the greatest public higher education system in the world. California's green-tech sector leads the country in job creation, venture capital funding and clean energy innovation. State research funding will strengthen this sector, especially when combined with venture-capital investments and funding from Bill Gates' Breakthrough Energy Initiative, which aims to bring promising technologies to market.

Research in climate science and energy innovation is an investment in our future. It will pay dividends many times over for our economy and for our environment. California, as the world's fifth-largest economy and environmental leader, should be at the forefront as the federal government bails out.



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