



MEMORANDUM

To: Interested Parties
From: Jonah Goldman, Breakthrough Energy
Date: Wednesday, September 16, 2020
Re: Impacts of Federal R&D Investment on the US Economy

The most important thing that Congress and public leaders can do is to find a way to stop this virus and establish a sustainable approach to rebuilding the economy. We have the opportunity to make the right decisions now and emerge stronger than ever with a foundation for the long-term economic adaptability the country needs to set it on the right path.

One part of ensuring a stronger future is reflecting on how the United States can continue to play the role of the world's innovator. Often, we think of innovation as offering a delayed economic benefit that is both powerful and important to our national economic health – but this crisis requires us to think about what we can do now to help alleviate the suffering that families and communities are feeling today because of the devastating impact COVID has had on jobs, income, and stability. The question that was previously unexplored was if there is an immediate economic benefit to investing in the long-term infrastructure of innovation that creates the industries, products, and companies our economy can grow towards? If there is, how do those benefits compare to other kinds of infrastructure investments?

Breakthrough Energy set out to understand the importance of federal investment in research and development (R&D) on our national economy and workforce. We thought that R&D, which is so crucial for enhancing human health, strengthening national security, and avoiding a climate crisis, might also provide immediate employment and economic impact that can be compared to other types of infrastructure investment. Our report, *Impacts of Federal R&D Investment on the U.S. Economy*, examines data on the near-term and future impacts of federal R&D investment on job creation, wages, general productivity, and technological improvements.

The results of our analysis are clear: federal R&D is a job creator and an economic booster: both today and over the long term.

The findings from the report, conducted for Breakthrough Energy by PricewaterhouseCoopers, show that every job supported with federal R&D investment creates almost three more jobs in the economy – and this investment provides higher than average wages, billions in added economic value, and substantial federal, state, and local tax revenue. Those benefits are distributed across the community. While we think of R&D as supporting highly educated and technical jobs – which it does – it also creates a productive economic community through both direct and indirect job creation that is much broader than expected. Taken together, these new figures show federal funding for R&D can and should play a key role in our recovery. It is one of the only mechanisms to invest in job creation and economic growth today while being a long term down payment on future employment, company creation, and economic expansion in the future.



We believe these findings show that lawmakers have an opportunity and an obligation to scale up funding for R&D to reap the benefits now and in the future. Federal R&D investment significantly contributes to national economic growth, creates good paying jobs, and provides wide-ranging economic, technological, and societal benefits. Over the next several years, increasing federal R&D funding would serve as an economic stimulus to reduce the impact of the economic downturn caused by the pandemic; expand direct and indirect employment opportunities for individuals who have recently lost their jobs due to budget cuts by businesses, state and local governments, academic institutions, and nonprofit organizations; and spur new infrastructure projects. Over the long run, the benefits of federal R&D investment become even greater, boosting productivity and American economic competitiveness.

As Breakthrough Energy's founder Bill Gates explains:

When it comes to R&D, it's hard to overstate the importance of public investment. Government funding is especially important to ensure scientists have the space and the freedom they need to test out bold new ideas and keep working on the ones that have the most promise for the future. That kind of risk-tolerant commitment is how we developed lifesaving vaccines and disease treatments, made revolutionary breakthroughs like the information technology that led to the Internet, and put people on the moon more than 50 years ago.

The next recovery legislation should include federal R&D funding – as a job-creation tool that meets the urgency of this moment and as a down-payment on broader economic, technological, and social benefits that will continue to pay dividends in the future.

Increasing federal funding of R&D over the next decade will support job and economic growth that bolsters the US economy's innovative capacity, potentially leading to major advancements in human health, clean energy, national defense, and other areas – including the solutions we need to stop a climate crisis.

Just as federal funding for health R&D will contribute to the development of therapeutic treatments and vaccine that ultimately leads us out of the pandemic, investing in R&D in other areas will ensure the nation is prepared to meet future challenges, including climate change. The alternative is that America, which should be a world leader on clean energy, will continue to fall behind, while our global competitors continue to develop the technological breakthroughs needed to get the world to net-zero greenhouse gas emissions by mid-century.

At Breakthrough Energy, we are working to ensure everyone has access to clean, reliable, and affordable energy so we can avert a climate crisis. We believe that by increasing federal R&D investment, America can once again lead on creating the solutions our country and the world need.



Key Findings

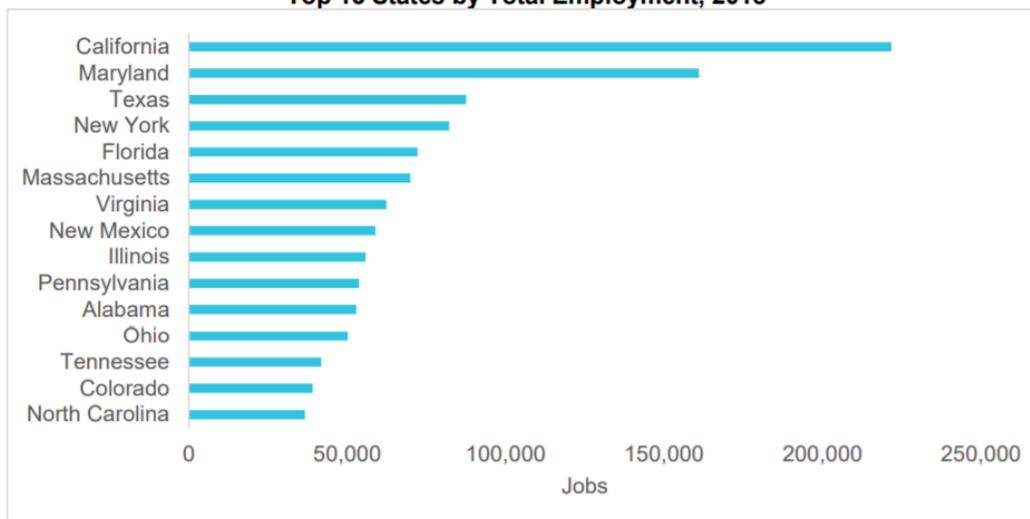
- **Federal R&D investment is a significant job creator.** In 2018 alone, it directly created 445,800 jobs for American workers. And for every direct job created by federal R&D investment, an average of 2.7 more are supported throughout the rest of the economy – meaning it supported over 1.6 million jobs that year.
- **Jobs created through this investment pay better wages,** at over 80 percent higher than the average in 2018 for direct jobs, and 24 percent higher including indirect and induced jobs. That includes researchers and scientists, maintenance and supply roles, and numerous other supporting jobs in industries ranging from agriculture to manufacturing.
- **R&D investment is an economic engine.** In 2018, it added \$197 billion in value to the U.S. economy. And it created nearly \$39 billion in tax payments to further drive economic gains at federal and state levels.
- **Federal investment has a “crowd in effect,”** promoting complementary private sector investment rather than competing with it.
- **Growing this investment would boost these benefits.** If we were to increase federal R&D to 1% of GDP by 2030, it would support an average of 2.7 million jobs annually over the next decade, resulting in \$2.30 trillion in labor income, \$3.7 trillion in economic value, and \$623 billion in federal and state tax revenue over the decade.

Nationally, federal R&D funding is a proven job creator

Federal R&D investment benefits the job market in communities across the country.

- These impacts can be seen in every region, from coast to coast. In 2018, every single U.S. state had at least 1,000 jobs supported by federal R&D investment, and more than 10,000 jobs in over 30.
- Job growth is not limited to any one part of the country. In 2018, the top states by jobs directly and indirectly supported through federal R&D investment include New York, New Mexico, Alabama, Ohio, Texas and Florida, among others.

**Figure 9. The Total Impact of Federal R&D Investment:
Top 15 States by Total Employment, 2018**



Source: PwC calculations based on the IMPLAN model. See Appendix A for underlying data.



Federal R&D investment not only creates jobs – it creates well-paying jobs that support a strong middle class.

- Including direct, indirect, and induced employment, across industries ranging from agriculture to manufacturing to retail, average labor income per federally funded R&D job is about 24 percent higher than the average for the overall economy.
- For jobs directly supported by federally funded R&D, compensation is over 80 percent higher than the average for the overall economy.
- Federally funded R&D jobs are also highly productive. The direct value contributed to GDP per federally funded R&D job is over \$158,000 in 2018, compared to about \$103,000 for the overall economy.

Across the health, energy, and defense sectors, federal R&D funding has a very strong economic multiplier effect

Federal R&D investment supports jobs and provides billions of dollars annually in labor income, economic value, and tax revenue. In 2018:

- Defense R&D contributed to 701,000 jobs, \$54 billion in labor income, \$84 billion in economic value added, and \$17 billion in federal and state tax revenue
- Energy R&D contributed to 112,100 jobs, \$9 billion in labor income, \$14 billion in economic value added, and \$2.8 billion in federal and state tax revenue
- Health R&D contributed to 449,200 jobs, \$35 billion in labor income, \$55 billion in economic value added, and \$11 billion in federal and state tax revenue

Increased federal R&D investment would boost productivity and position America to compete over the longer term

Sustained investment in R&D would support a steady stream of jobs and other economic benefits, in addition to the positive impacts of new knowledge and technological innovation.

- A short-term boost in federal R&D spending would provide an economic stimulus to address the current economic crisis and support employment opportunities for many Americans who have been or will be laid off due to budget cuts by businesses, state and local governments, academic institutions, and non-profits.
- A long-term sustained increase in federal R&D spending could offset COVID-19-related productivity losses at research labs, as well as the loss of innovative startups due to tightening capital markets.
- Increasing federal R&D investment to 1 percent of the GDP over the next 10 years would bring extensive benefits, supporting 2.7 million jobs per year on average and adding \$3.7 trillion in value to the U.S. economy, in addition to over \$600 billion in tax payments.



Table 7. Economic Impacts of Federal R&D on the US Economy with Possible Expansion, 2021-2030

	Direct Impacts	Indirect Impacts	Induced Impacts	Total Impacts
Employment (thousands of jobs)^a: 10-year average	719.2	717.7	1,269.5	2,706.4
Labor Income (\$billions)^b	\$919.6	\$606.8	\$778.1	\$2,304.5
Value Added (\$billions)	\$1,312.7	\$1,002.8	\$1,344.2	\$3,659.7
Tax Impact (\$billions)^c	\$238.1	\$191.7	\$193.1	\$622.9

Read the full report at breakthroughenergy.org.

To learn more about why Congress should incorporate R&D funding into its economic recovery legislation, contact Breakthrough Energy at press@breakthroughenergy.org.

ABOUT BREAKTHROUGH ENERGY

Breakthrough Energy is a network of entities and initiatives, including investment funds, nonprofit and philanthropic programs, and policy efforts linked by a common commitment to scale the technologies we need to avoid a climate disaster.