A Look at Historical R&D Across the Agencies

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This spring was dominated by conversations of trimming down the federal budget to help reduce the U.S. national debt, culminating in the Fiscal Responsibility Act (FRA), which mandated a cut in total discretionary spending and a maximum 1% increase for the subsequent five years when signed into law. If appropriators do not reach a consensus that can be signed into law and a continuing resolution is still in effect on April 30, 2024, a sequestration would occur to bring discretionary spending down to FRA amounts.

This is not the first time that cuts have been mandated; we've only just recently finished the last wave of mandated discretionary spending caps: the Budget Control Act (BCA) that was signed in fiscal year (FY) 2011 and continued through FY 2021. The BCA cuts impacted R&D funding, costing an estimated $200 billion in federal R&D over the course of the decade BCA was implemented, despite the discretionary caps being waived on multiple occasions.

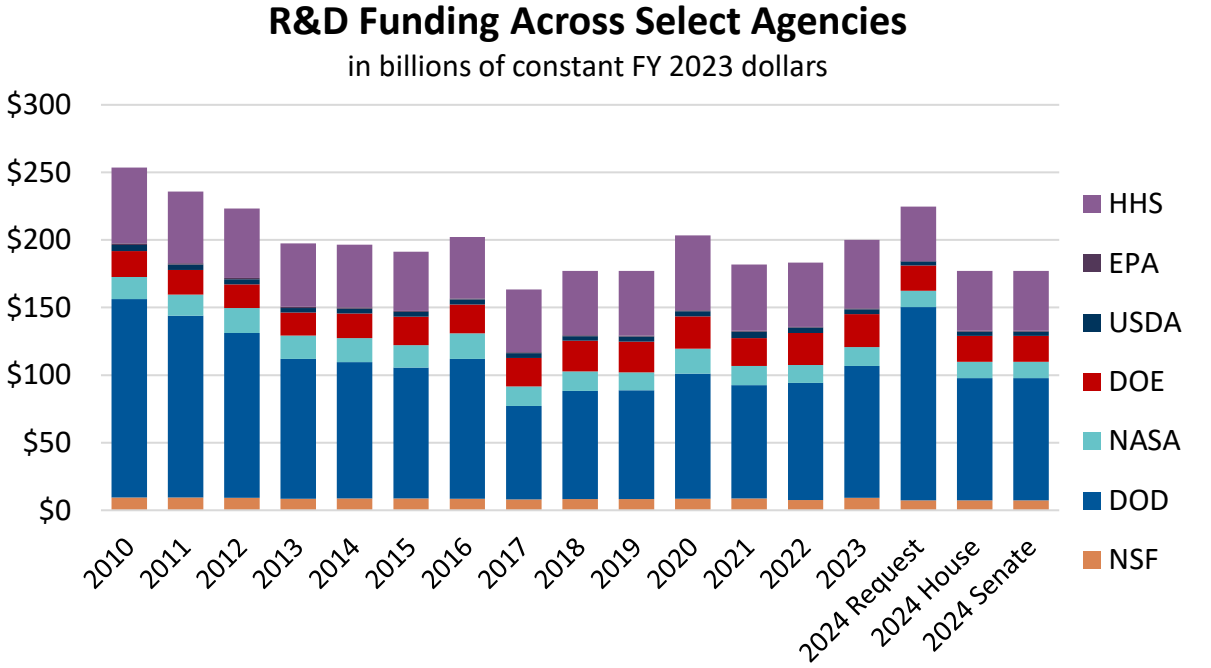
Legislators made deals six times over the lifespan of BCA to increase discretionary spending levels above the caps, meaning that the harsh cuts in the original deal were softened over time. This reality is built into the new FRA deal, requiring that the caps be maintained for the first two years, but leaving Congress the option to waive them in the subsequent three years.

The Congressional Budget Office (CBO) initially calculated that the BCA would reduce discretionary spending by $2 trillion, more than the FRA's current prediction of $1.5 trillion. In the end, the BCA did reduce federal spending, but several types of spending were exempt from the limits (e.g., military, pandemic) and coupled with the waived caps, the reduction was not as extreme as expected. FRA may have waived caps too, so the cut may become less severe with time, but it will still have impacts on R&D agencies.

Last month, we published a report breaking down the amount of 'pure' R&D in the various appropriations proposals currently in the House and Senate. The report looked at how much of the proposed agency budgets would go directly to the performance of basic, applied, and developmental research, along with the cost of maintaining and building the facilities that those researchers would use. These numbers essentially represent the R&D capacity of an agency.

In that report, we already saw the impact of cuts to R&D, with the House treating the FRA caps as a ceiling and identifying extra funding to reduce so they can match the original Limit, Save, Grow Act numbers. The Senate is adhering to the FRA numbers, with discussions of potentially adding extra funds to Defense (and maybe other agencies) through emergency supplementals.

This report aims to reflect on the impact of the prior cuts, looking back at the R&D



Based on Agency and OMB data and appropriations | AAAS

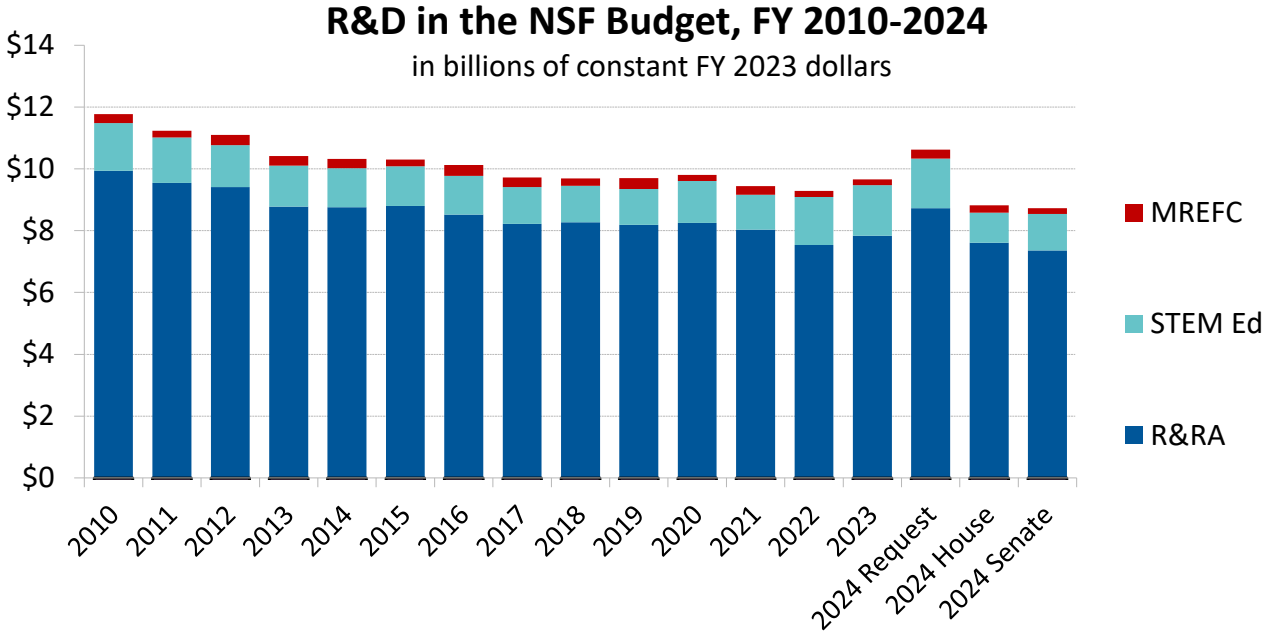
estimates for each agency during the BCA period (FY 2012-2021) to put into context the potential impact that the House and Senate appropriation proposals will have for the first year of FRA cuts (FY 2024), as well as how agencies have fared since the height of R&D spending in FY 2010. FY 2010 spending was so high that it was the impetus for the BCA in 2011, and is thus a good starting point for our retrospectives. All the numbers in the following breakdowns are the estimates of 'pure' R&D in the agencies (not total agency appropriations) and are adjusted for purchasing power to reflect how far those dollars can go.

The graph above is a representation of that R&D capacity across the agencies the report will examine, showing the FY 2010 highs, the drops as BCA was formulated and then implemented, and the occasional rise as necessary, or as BCA caps were waived throughout the years.

National Science Foundation

Despite increases in certain years, the National Science Foundation's overall R&D budget trend, when adjusted for purchasing power, has been decreasing since FY 2010 – even before the BCA caps were enacted in FY 2012. In fact, the signing of the CHIPS and Science Act in 2022 resulted in the first major rise in pure R&D for NSF in over a decade. The FY 2024 Presidential Budget Request, published before the debate that led to the FRA, set an optimistic increase but will be ignored as the House and Senate debate over how much to cut in final FY 2024 appropriations.

The current proposals would actually roll back the NSF's ability to perform research,



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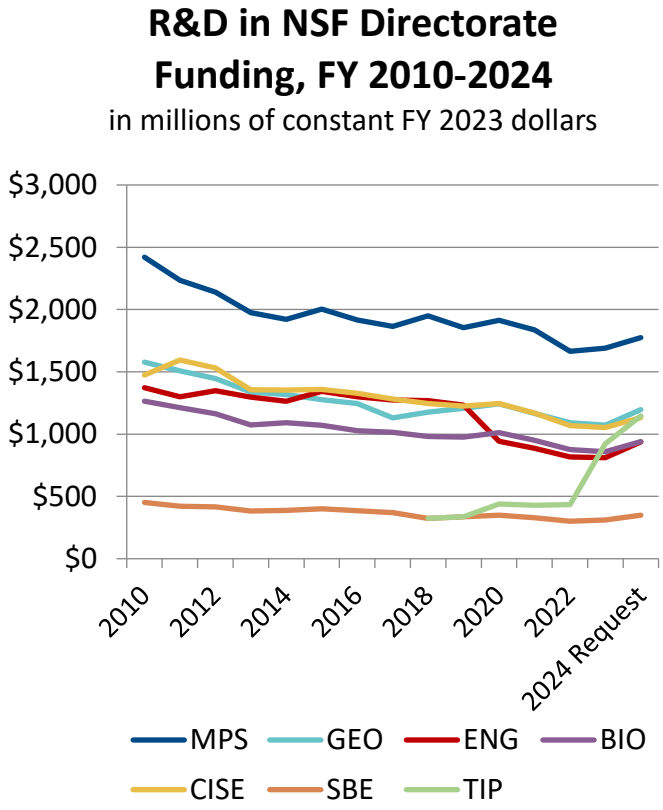
when accounting for inflation, to its lowest point in more than 30 years.

This cut is even steeper considering the emergence of a new directorate in recent years. Born out of a program in the Engineering Directorate, the Technology Innovation Partnership was elevated to a directorate with the signing of the CHIPS and Science Act into law in the summer of 2022. The data in the table below separates out that Engineering program to more accurately reflect the growth of the new TIP Directorate as it evolved.

As the directorates are not allocated funding directly in the appropriations bills, it will fall to the NSF to parse out the final appropriation totals to the seven directorates, many of which have been on a downward trend that the Presidential Budget Request tried to reverse.



Directorate funding is not yet available for FY2024 Appropriations

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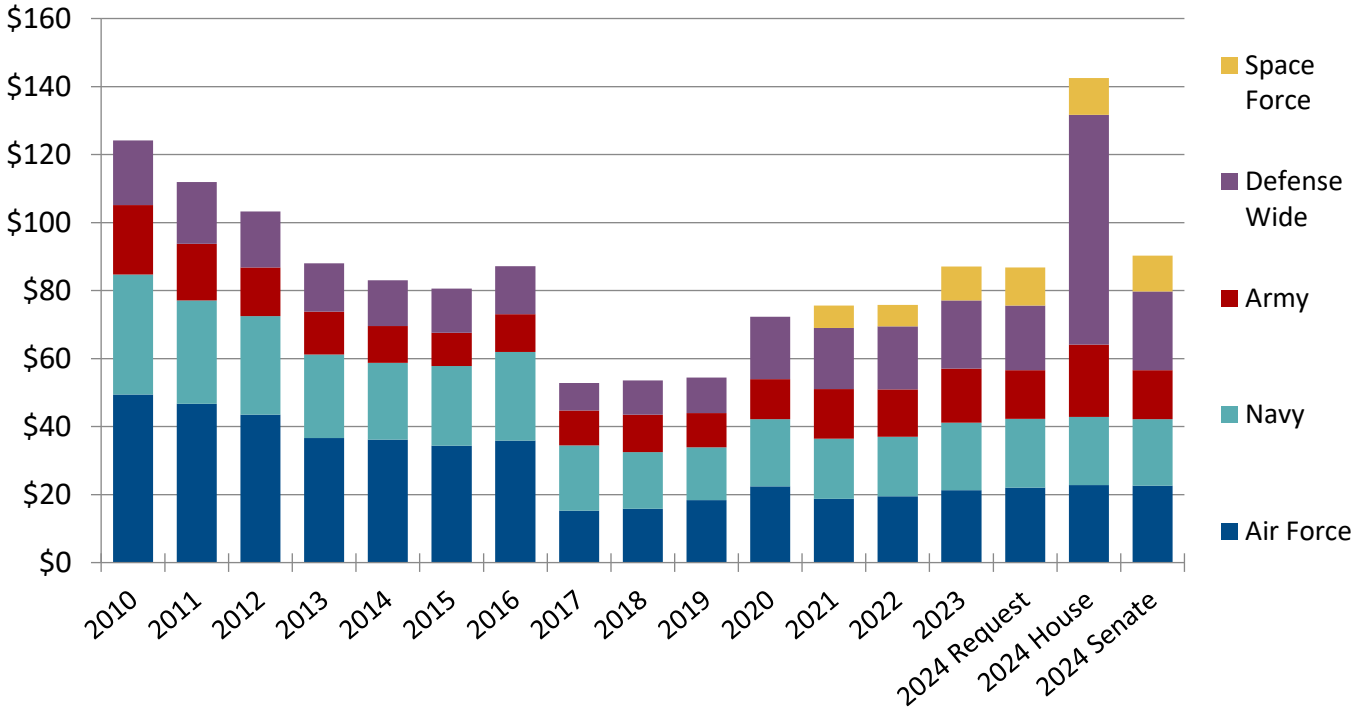

Note: In FY 2017, federal agencies revised what they count as R&D. Late-stage development, testing, and evaluation programs, primarily within the Defense Department, are no longer counted as R&D.
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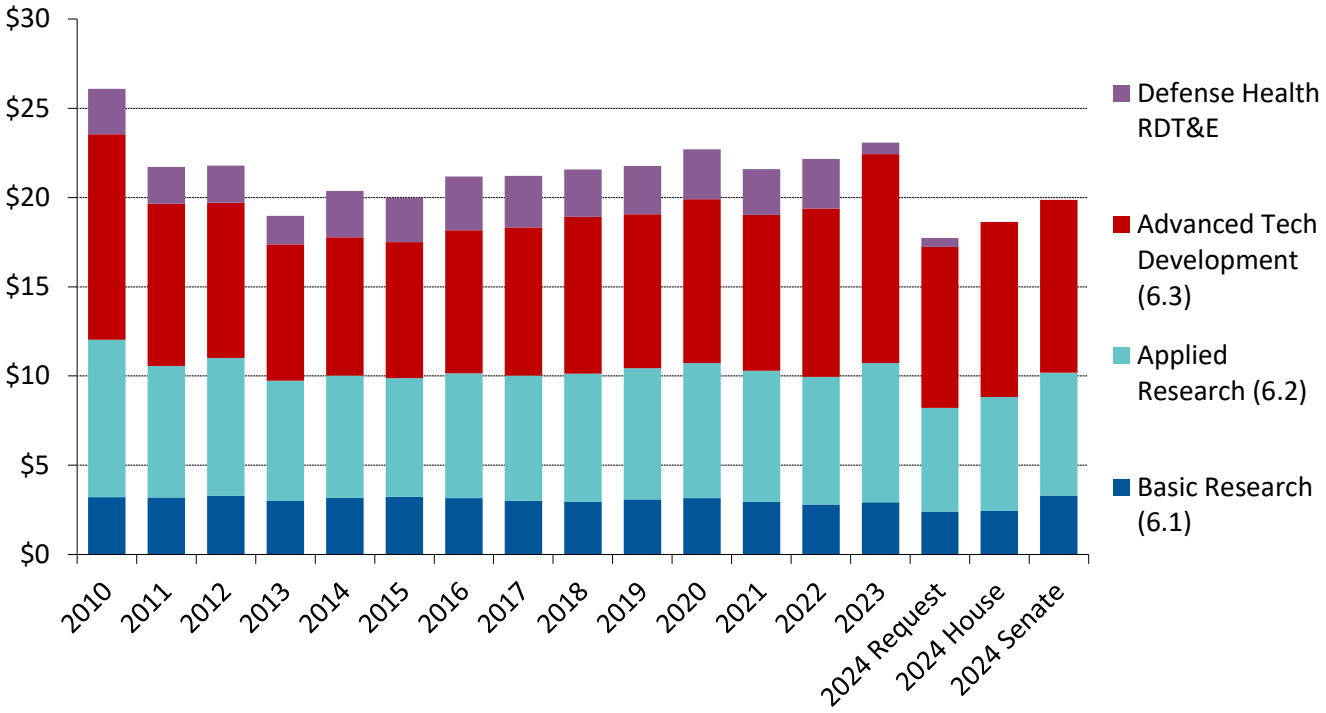
Department of Defense

The Department of Defense was front and center for a lot of the deficit reduction talks because while Republican negotiators were arguing hard for cuts to overall discretionary spending, there was also a strong need to safeguard the current defense funding levels. In the end, FRA allowed for an increase to the defense 302(b) allocations above FY 2023, and both the House and Senate honored it in their FY 2024 appropriations.

The R&D estimate for the DOD is also benefitting from this decision, with the House instead putting a significant amount of new funding into Defense-Wide and Army R&D. As noted in our prior report, that new funding is primarily in the developmental research accounts (or as the DOD would put it, 6.4-6.7).

Looking at just the basic and applied research portions of the DOD budget, there are some significant cuts, though the House and Senate plans are providing more R&D funds than the Presidential Budget Request. In the congressional plans, the science and technology accounts of the DOD will be rolled back almost a decade in terms of investment progress, depending on what the final numbers are negotiated to.

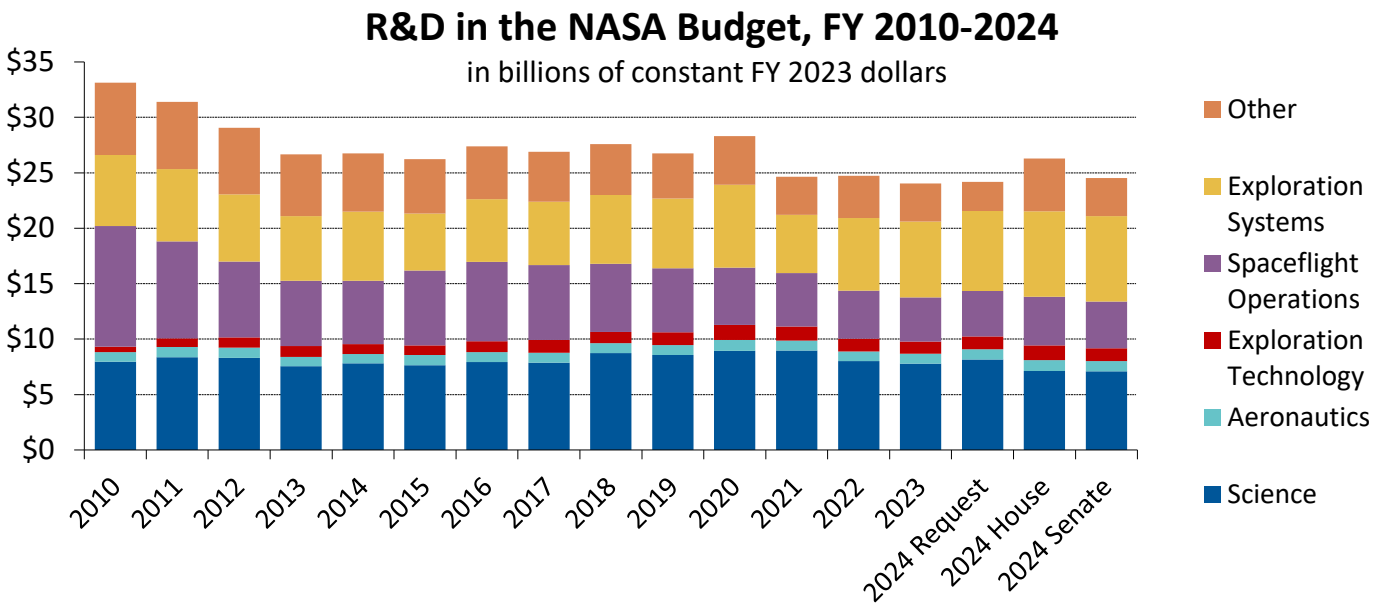


Note:Medical Research is is not currentl available for FY 2024 Appropriations
Based on DOD and OMB data and appropriations | AAAS

National Aeronautics and Space Administration

The National Aeronautics and Space Administration is different than many of the other R&D intensive agencies – much of its R&D capacity is internal and occupied with years-long projects in varying stages of progress. This means that NASA's R&D estimates will have more variation than any other agency, not because their funding is being cut, but simply because a large project has moved from development to deployment and has stopped being counted as R&D. Consequently, the share of the NASA budget spent on R&D saw peaks and valleys over the BCA years, with lower funding levels in recent years as programs within Exploration R&D transition out of the development stage.

That is not to say that holding steady at FY 2023 levels will not hinder R&D progress or that there are no programs facing unexpected cuts thanks to FRA. STEM Education is particularly trimmed down in the House appropriations bill, and the Science mission directorate is looking at a



Note: "Other" includes support, construction, OIG, and STEM education programs.
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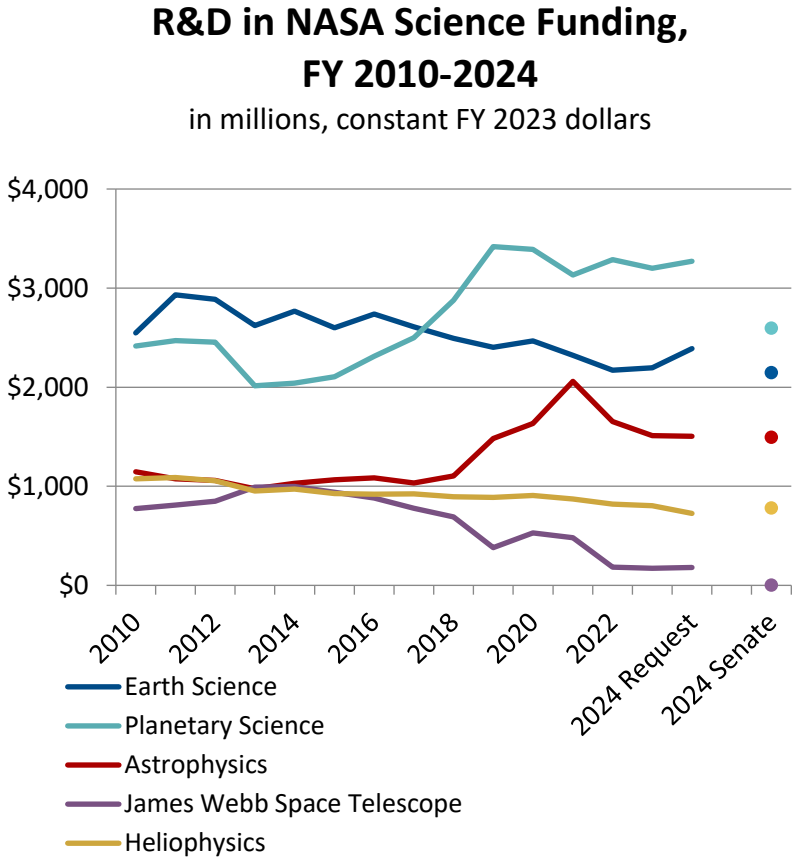
much lower R&D funding level than it has in decades under both chambers' plans.

The following graph shows funding for Science directorate programs, which have seen an increase despite the BCA cutbacks due to an increase in focus on climate change research within the Planetary Science area. The rise in Astrophysics is in large part due to the shift of the James Webb Space Telescope to the Astrophysics account starting in 2019 and thus not a true increase.

While the House hasn't posted its appropriations for the Science directorate because it hasn't yet finished the Commerce-Justice-Science bill, the Senate has, and many of the program areas are looking at either a decrease from or remaining at FY 2023 levels.



Note: The FY 2019 request moved funding for the JWST out of Astrophysics.
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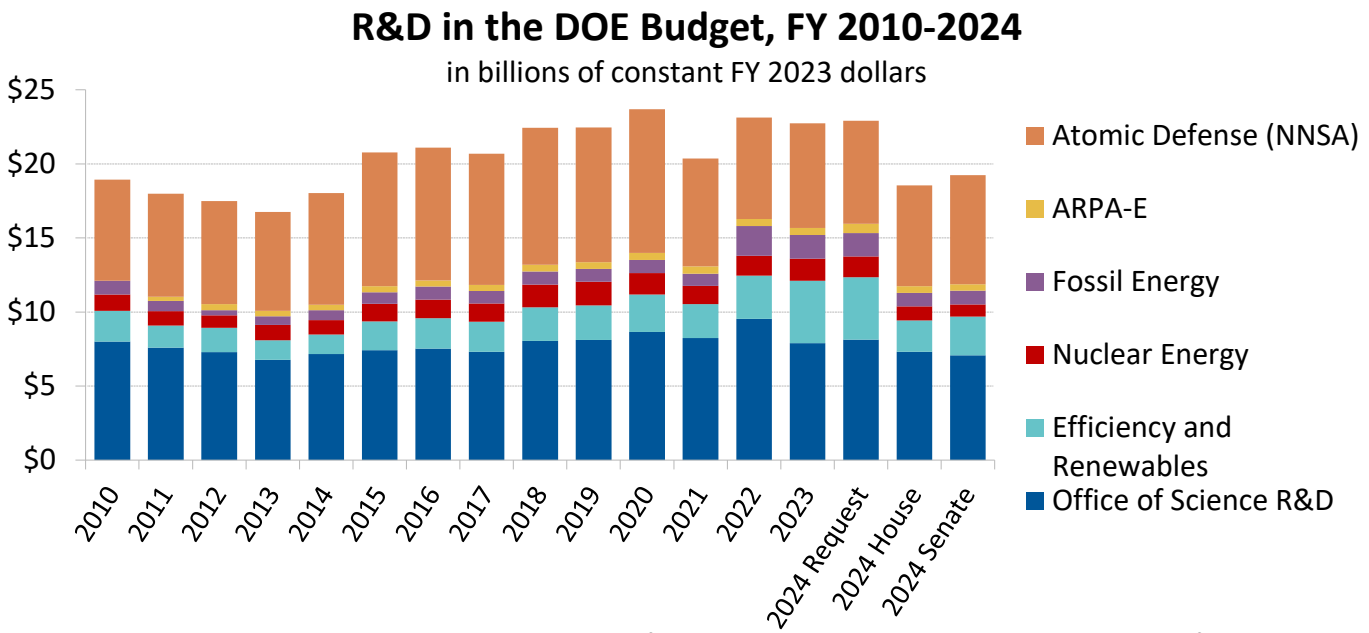

Note: DOE modified its R&D accounting practices such that totals after FY 2014 are elevated and not directly comparable to prior years.
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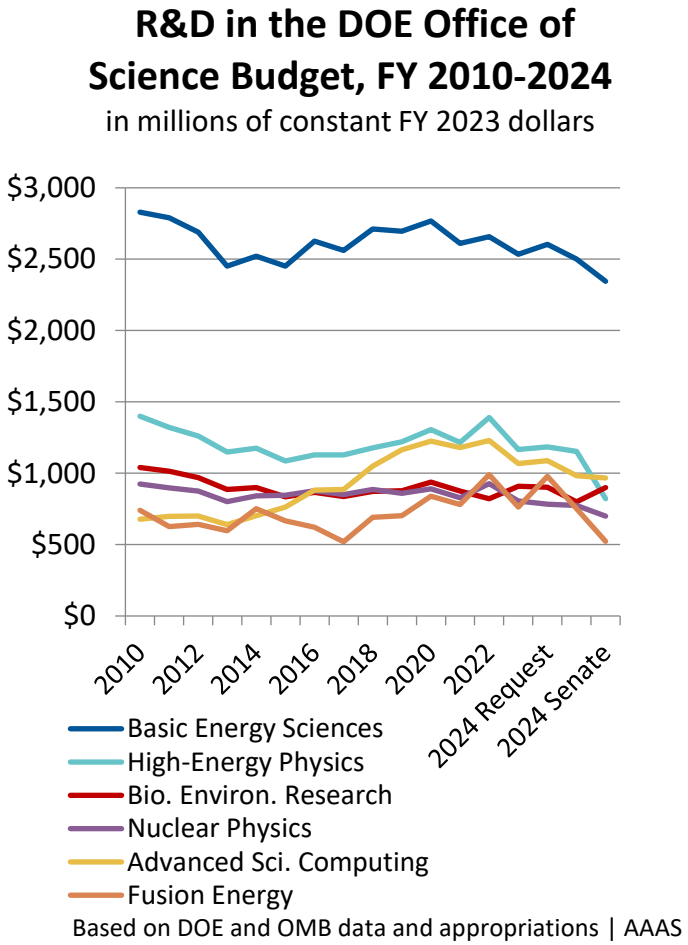
Department of Energy

The Department of Energy saw cuts in the early years of the BCA, primarily to the Office of Science account, though FY 2015 saw a significant increase to both the National Nuclear Security Administration and Office of Science R&D. That year was a complicated one, with the start of disputes over climate and energy funding, but the negotiations ended with some significant gains, especially for electricity delivery and nuclear energy.

The DOE would receive some similar cuts in the first year of FRA, with the NNSA and Office of Science seeing decreases in R&D capacity, but also the technology programs like Energy Efficiency and Renewable Energy, Nuclear Energy, and Fossil Energy.

The proposed congressional cuts would bring the DOE back to about FY 2014 in terms of R&D capacity, undoing a decade of



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investments and curtailing funding directed toward the translation of research into transformative technology that could turn the tide on climate change.

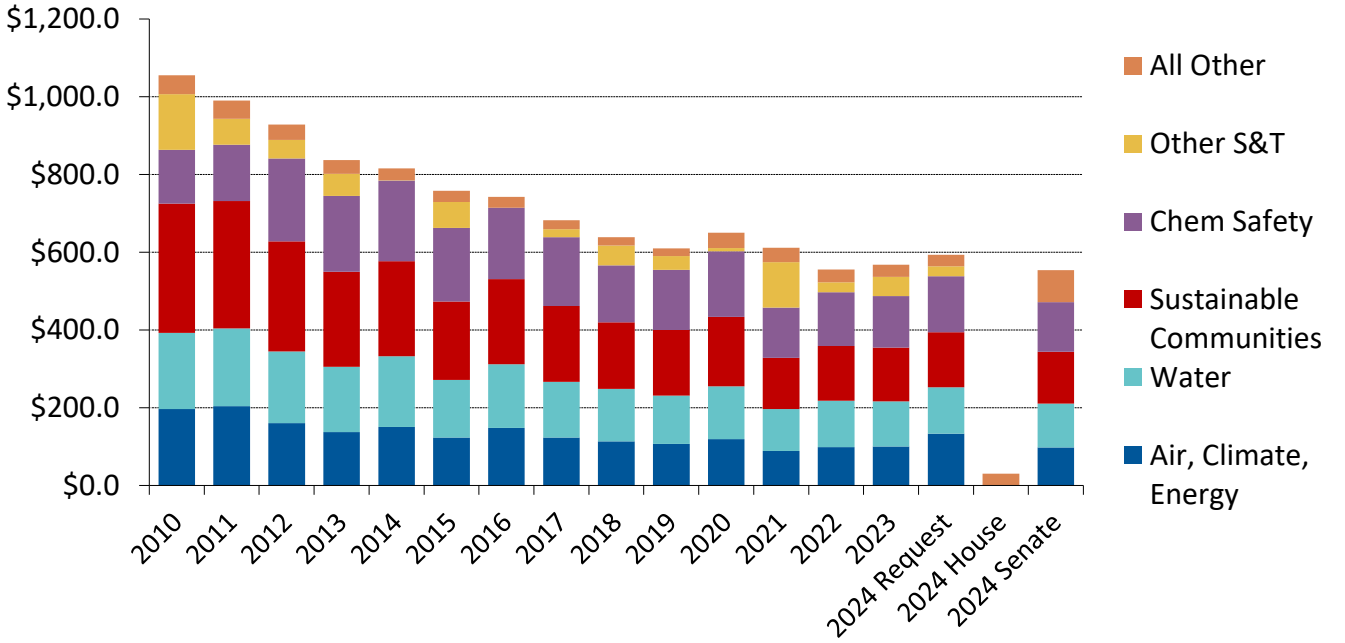
Looking deeper into the Office of Science, some of that rise in FY 2015 can be attributed to the increase in R&D within the Advanced Scientific Commuting program. However, all programs in the Office of Science have been on a downturn in terms of R&D capacity recently, which will be made worse by the House and Senate's proposed cuts.

Environmental Protection Agency

The Environmental Protection Agency had been decreasing in R&D capacity before the BCA cuts and continued to do so through the BCA years. The rate of the decreases, however, slowed down toward the end of the BCA, followed by a small increase in the first few years of the Biden administration. The EPA is an agency whose funding tends to be closely tied to the administration in power, and conservatives tend not to make EPA R&D a priority in comparison to other agencies. The FY 2024 plans are an example of this party dynamic, with the Senate plan keeping EPA's R&D capacity steady while the House plan almost completely defunds the agency's R&D programs. The House column in the chart below is not an error or a gap; the Interior and Environment appropriations bill has passed the committee in the House, and the Science and Technology account, which houses the majority of EPA's R&D, are cut in half, with none of the research programs given specific allocations in the bill report.

R&D in the EPA Budget, FY 2010-2024

in millions of constant FY 2023 dollars



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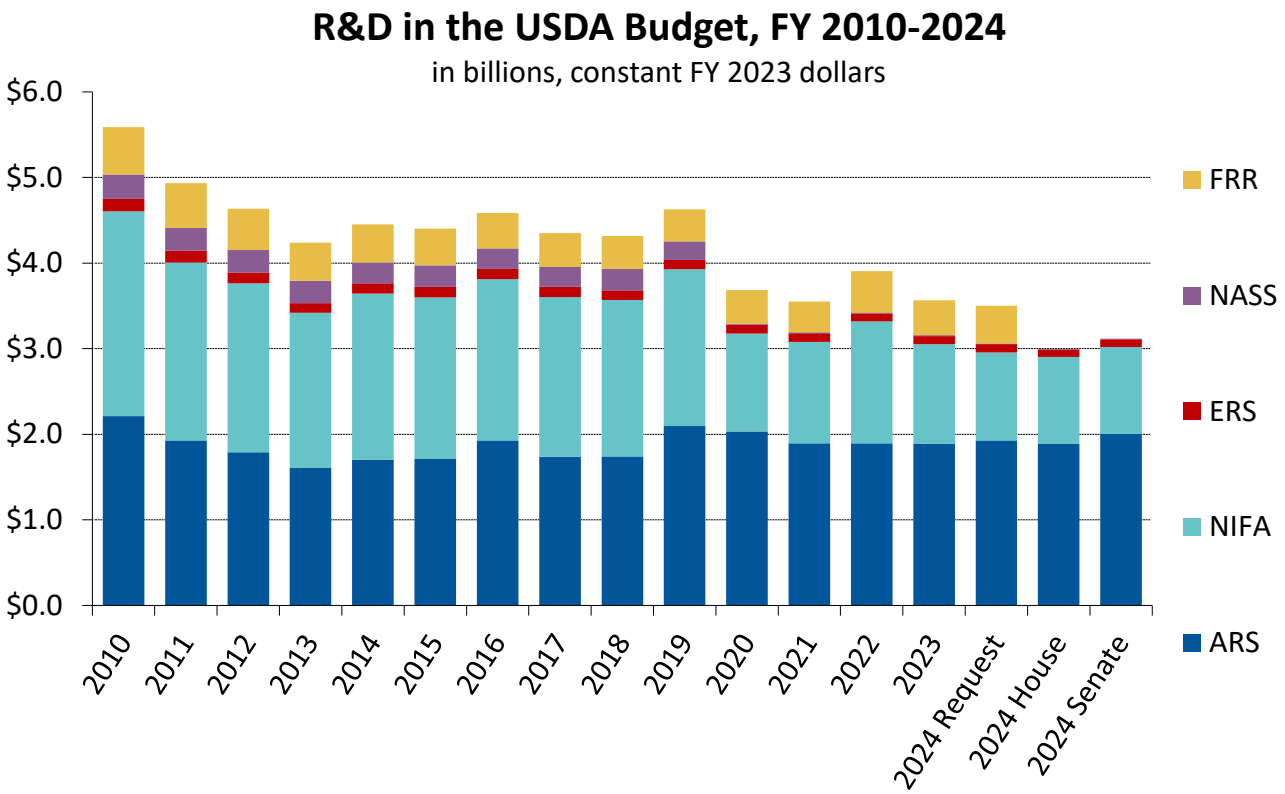

Note: Forest and Rangeland Research does not typically appears in appropriations.
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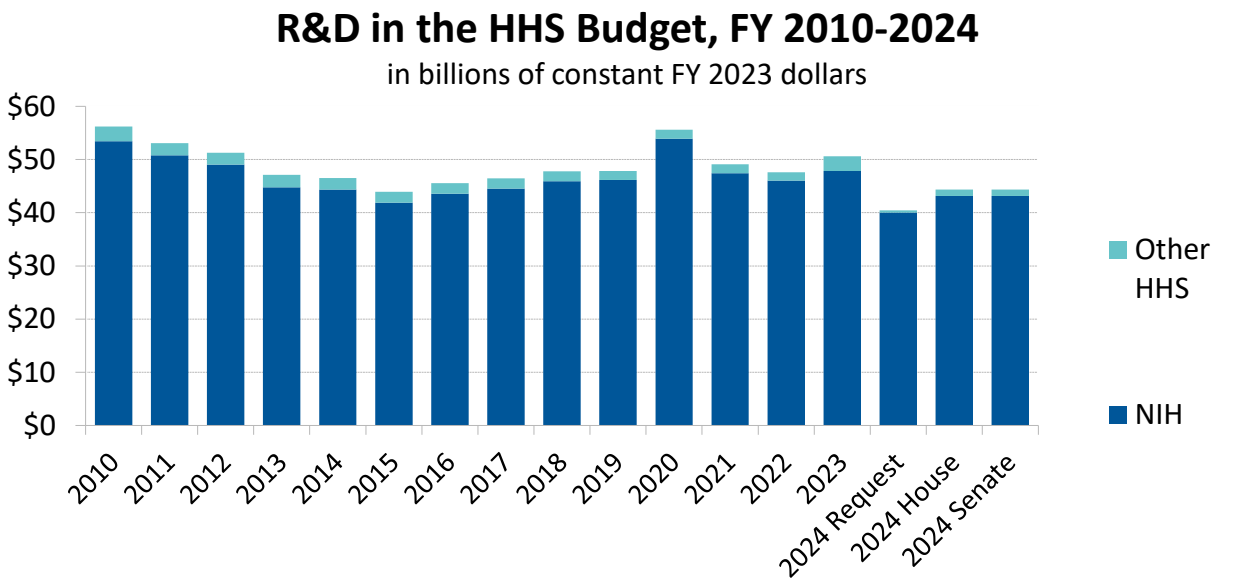
Department of Agriculture

The U.S. Department of Agriculture saw some cuts in the early BCA days but is one of the few departments that did not see major cuts in congressional appropriations throughout the BCA years. That same trend, however, does not carry over under the FRA. The agency's R&D capacity will remain at about FY 2023 levels. Though it is too small to see on the graph, the National Agricultural Statistics Service still received R&D funding past FY 2019, but like many programs at USDA saw a significant decrease in funding in FY 2020 following a historically large FY 2019. That year, many programs requested lower appropriations and instead shifted their focus from expansion of programs to an increase in staff. Additionally, the National Institute of Food and Agriculture (NIFA) and the Economic Research Service both invested significant funds from their budget ($9.5 and $15.5 billion respectively) for a controversial move to new headquarters outside of the DC area. Both the reductions and the restructuring took from funds that would otherwise have gone towards R&D capacity for the next several years.

Health and Human Services

The Health and Human Services R&D estimate is dominated by the National Institutes of Health, the biggest non-defense R&D agency in the U.S. The NIH R&D estimate saw cuts in the early years of



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the BCA, followed by a moderate increase back to prior levels and a sharp increase in R&D during the pandemic due to redirected funds. Congressional appropriations as currently proposed would bring the NIH back to around FY 2015 levels, the lowest point since the doubling of the NIH in the late 90s.

Conclusion

Not every agency had the same path through the BCA years, with some receiving cuts consistently throughout the lifespan of the act while others received boosts in the years the caps were waived. This means that the path forward with FRA may be similarly murky – we can expect cuts to the R&D capacity of the agencies for the first couple of years, and then once the opportunity to loosen the caps begins, some agencies will likely be favored, while others may continue to see decreases in their ability to invest in research and produce life-changing innovations that would make Americans' lives better.