



The Economic Benefits of Military Biofuel Programs



E2 supports the development of an American advanced biofuels industry as a key component of a clean energy economy. We are [tracking the growth in this sector](#), and supporting federal policies to enhance biofuels expansion, including the [biofuel targets set by the U.S. Department of Defense, \(DoD\)](#).

DoD has set aggressive goals for incorporating advanced biofuels into the Air Force and Navy fuel mix to enhance mission capacity and security. At the same time, the military's biofuel requirements create an important market signal for the growth of the industry.

E2 commissioned a study to assess the impact of DoD's biofuels investments and demand signal on the growth of domestic clean fuels production and the potential economic benefits to the U.S. economy. The report found that the value chain of the nascent biofuels industry in response to these military targets will create thousands of jobs and billions of dollars in new revenue, especially in states or regions with biorefineries.

The impacts of the military's biofuel strategy transcend the defense market by attracting private capital into technology development and biorefinery construction, accelerating the scale up and deployment of biofuels. Biofuels will become increasingly cost competitive as production volume increases, providing clean fuel choices for the civilian sector, particularly in the commercial aviation industry.

Conclusions

- Meeting DoD's biofuel targets will directly generate between \$9.6 and \$19.8 billion of economic activity by 2020.
- Between 14,000-17,000 new jobs will be created by 2020. If measured on a job-year basis, the total number of jobs created would be more than twice that amount.
- Of these jobs, 3,000-5,000 will be permanent rural agricultural jobs from biomass production, and about 1,200 will be in biorefinery operation. An additional 10,000 jobs will be created from biorefinery construction.
- These economic and job impacts will be broadly distributed geographically, with the greatest benefits to states that create the strongest incentives for biorefineries.
- In order to meet the military's cost and volume targets, advanced biofuel companies are leveraging \$3.4 billion of private capital invested since 2007 to build new commercial facilities.
- Military demand is helping to shape the early market and scale the advanced biofuel industry

Clean Fuels

Advanced biofuels are renewable, liquid transportation fuels that can replace traditional gasoline and diesel while creating significantly lower greenhouse gas (GHG) emissions. These fuels contain a similar molecular structure, and are therefore compatible with existing infrastructure. Such fuels are commonly referred to as "drop-in" fuels.

Advanced technologies in public transportation and vehicle electrification are critical to reducing our fossil fuel demand. However, there will be a long-term demand for liquid fuels for industrial, shipping and aviation needs which must be addressed in part by encouraging the development of sustainable, domestic fuels.



E2 recently analyzed [the state of the advanced biofuel market](#), and found that 165 domestic companies are positioned to provide 1.6-2.6 billion gallons of fuel to the U.S. market, given appropriate market signals and support from regulations such as the Renewable Fuel Standard and Low Carbon Fuel Standard.

Department of Defense Clean Energy Goals

As part of its national security strategy, the Department of Defense is actively pursuing energy efficiency and clean energy initiatives, both to reduce the military's total energy needs and to ensure domestic sources of energy and fuel. The Navy and Air Force lead the clean fuel initiatives, with goals to replace half their consumption of petroleum-based fuels with alternatives by 2016 and 2020, respectively. This is backed by a joint investment from the Navy, DOE and USDA to provide \$510 million over a three-year period for the development of advanced biofuels compatible with the military's infrastructure. The Air Force and the Navy's goals will jointly require about 770 million gallons of advanced biofuel capacity.



Direct Economic Impacts

With the variety of technology platforms and feedstocks that can be used to produce advanced biofuels, this nascent industry has many alternative pathways to success. However, this versatility also makes economic modeling inherently difficult. The cost of construction, feedstock supply and operation vary significantly based on the specific fuel pathway.

In order to accommodate these many options our report casts a wide net around the upper and lower limits of the cost components of the major value chain sectors. This approach provides a 'first order' assessment as to the economic impacts of DOD's programs, no matter the specific biofuel combination used to meet military demand.

Total revenue generation will be on the order of \$9.6 billion - \$19.8 billion by 2020. Of that, roughly \$6 billion will be attributable to construction, and an additional \$1.6 billion to \$4.9 billion will be attributable to feedstock production.

Job Creation

14,000 to 17,000 jobs will be created between 2013 and 2020 for biorefinery construction and operation, fuel distribution, and feedstock production. These jobs are heavily concentrated in the agricultural sector, with about one-third coming from biomass production.

Because the study focuses exclusively on economic activity related to the military's specific targets, it does not reflect the fact that biorefinery construction will scale up to meet the demand of additional end-users, such as the civil aviation industry, resulting in significantly greater job creation.



Regional Impacts

Between 2013 and 2020, a typical 50 million gallon biofuel plant can add the following to a rural economy with biomass resources:

- 750 construction jobs
- 491 permanent jobs
- \$1.2 billion in output

In addition to these direct contributions, the plant would have indirect and induced economic benefits, a significant portion of which would remain within the regional economy. The study calculates the value of direct, indirect and induced benefits as potentially reaching \$3.8 billion of output and 19,000 job-years over the eight-year period.



NORTHERN CALIFORNIA, PACIFIC NORTHWEST
& ROCKY MOUNTAINS
111 Sutter Street, Fl 20
San Francisco, CA 94104
TEL 415 875-6100 FAX 415 875-6161

NEW YORK & NEW ENGLAND
40 West 20th Street
New York, NY 10011
TEL 212 727-2700 FAX 212 727-1773

SOUTHERN CALIFORNIA
1314 Second Street
Santa Monica, CA 90401
TEL 310 434-2300 FAX 310 434-2399

As advanced biofuels can use existing petroleum distribution infrastructure, biorefineries could be located in just about any state or region of the country to supply the military or civilian markets. What will determine the location of biorefineries are local incentives and biomass supply. Advanced biofuels may come from a variety of feedstocks found across the country – energy crops, agricultural residues, waste materials, algae and more – thus providing a highly distributed opportunity for biorefinery location.

Beyond Military

The larger implication of military biofuels initiatives is the establishment of an industry that can also serve the private sector. This is analogous to what the military has done with other technologies such as Global Positioning System (GPS) or the Internet, technologies with ramifications that have found applications far beyond military use.

Already, the aviation industry is actively exploring the use of advanced biofuels for civil aviation. The military's leadership provides a platform for scaling the industry, accelerating adoption and extending advanced biofuels into the civilian market. For example, the Pentagon is partnering with the Commercial Aviation Alternative Fuels Initiative, Air Transport Association and American Society for Testing Materials International to promote the development, certification, commercialization and marketing of alternative fuels. This could be transformative for the civilian aviation industry, providing clean fuels at affordable prices, while reducing greenhouse gas emissions.

About E2

Environmental Entrepreneurs (E2) is a non-partisan national community of 850 business people who believe in protecting the environment while building economic prosperity. Our mission is to provide a platform for an independent business voice to promote environmentally sustainable economic growth. E2 represents entrepreneurs, investors and professionals from every sector of the economy. We work at both the state and national levels through bipartisan efforts. Learn more at www.e2.org.

Press contact: Bob Keefe, 202.289.2373 or bkeefe@e2.org



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