

**Department of Defense
Report to Congress on
Synthetic Fuel Utilization**



**Director, Defense Research and
Engineering**

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Department of Defense Report to Congress

Synthetic Fuel Utilization

REPORTING REQUIREMENT

Senate Report No. 110-155, accompanying H.R. 3222, at page 266, directed the Secretary of Defense to submit a report to the congressional defense committees no later than March 31, 2008, which, for each military department, describes;

- the anticipated fuel requirement that may be met by synthetic fuel, including the amounts and types of such fuel,
- a schedule for the transition to synthetic fuels,
- the infrastructure required for the distribution of synthetic fuels, including cost estimates for construction and operation and maintenance, and
- the status of any long-term contracts or other agreements to encourage private sector investment to ensure the availability of synthetic fuels that meet military requirements.

BACKGROUND

Synthetic fuels, or synfuels, have similar chemical properties as petroleum-based fuels and can be comingled in the distribution system but are produced from non-traditional sources. Synthetic fuels are not refined from petroleum, but are produced from non-petroleum sources such as coal, natural gas, and biomass. Synthetic fuels are a subset of alternative fuels.¹

The Department purchases fuel from distributors at particular locations worldwide, and the specifications and refining processes vary depending on the area. For example, in Europe, for aviation fuel, the Department uses Jet A-1, and in Canada, Jet-A. Our goal is to be able to use fuel derived from any source and process. However, within the U.S., we are considering the use of synthetic fuel as an alternative to petroleum-based fuels, thereby reducing our dependence on non-assured sources of oil and positively impacting the U.S. economy by initiating a domestic market in such alternative fuels.

The Department acquires fuel worldwide from refiners manufacturing products to both commercial and military specifications using various refining processes. Commercial specification fuel is typically purchased at commercial airports and seaports in accordance with commercial specifications and operating procedures, and commercial

¹ For purposes of this report, the definition of “alternative fuel” contained in 42 U.S.C. § 13211(2) is applied: ““alternative fuel” means methanol, denatured ethanol, and other alcohols; mixtures containing 85 percent or more (or such other percentage, but not less than 70 percent, as determined by the Secretary, by rule, to provide for requirements relating to cold start, safety, or vehicle functions) by volume of methanol, denatured ethanol, and other alcohols with gasoline or other fuels; natural gas, including liquid fuels domestically produced from natural gas; liquefied petroleum gas; hydrogen; coal-derived liquid fuels; fuels (other than alcohol) derived from biological materials; electricity (including electricity from solar energy); and any other fuel the Secretary determines, by rule, is substantially not petroleum and would yield substantial energy security benefits and substantial environmental benefits.”

specification fuels are also acquired for installation motor pool and power plant operations. DoD also procures large volumes of military specification fuel for storage and distribution in support of the Department's mobility fuel requirements (i.e., ships and aircraft). Our goal is to be able to use fuel derived from any source or process with an emphasis on using synthetically derived fuels. Within the U.S. we are considering the use of domestically sourced synthetic fuel as an alternative to traditional petroleum, thereby reducing our dependence on non-assured sources of oil, with the desire of positively impacting the U.S. economy by initiating a domestic market for synthetic fuels and strengthening our energy security.

The first step is to certify our systems to use synfuel. In August 2007, the Air Force certified the B-52 to use a 50/50 blend of synfuel. Tests are underway to certify the C-17 and the B-1 in the near future, with an objective to certify the entire fleet by early 2011. In December 2007, a C-17 completed the first transcontinental flight using a synfuel blend, and a B-1 flew at supersonic speeds using a synfuel blend in March 2008, demonstrating the applicability of synfuels for operational use.

The Department is pursuing a variety of efforts in alternative fuels, primarily focused on testing and certification, enabling our systems to use different fuels, regardless of the feedstock or production method. Efforts include improving the combustion process of engines using alternative fuels, optimizing fuel composition, understanding the equipment and systems impacts of alternative fuel use, such as corrosion and wear, and establishing protocols for alternative fuels qualification in aircraft, ships, vehicles, yellow gear and stationary sources. Although this report is limited to synthetic fuel requirements, there are other efforts ongoing within the broader category of alternative fuels, including synthetic crude from algae oil and biomass waste.

POTENTIAL SYNTHETIC FUEL REQUIREMENT

Department of the Air Force

In Fiscal Year (FY) 2007 the Air Force used approximately 2.5 billion gallons of aviation fuel. By 2016, the Air Force has a goal to obtain 50 percent of its fuel used in the U.S. from domestically produced synfuel blends from domestic sources that utilize carbon capture and effective reuse resulting in the use of fuels that could have a "greener" life cycle foot print than traditional petroleum-derived products. This equates to approximately 400 million gallons of synthetic jet fuel (800 million gallons of synthetic fuel blend). Synthetic fuel is also being tested on Air Force ground vehicles and equipment which potentially could use synthetic diesel fuel.

Department of the Navy

In FY 2007 the Navy used approximately 700 million gallons of aviation fuel (65 percent JP-5, 33 percent JP-8, two percent commercial) and 600 million gallons of marine diesel fuel (primarily F-76). The percentage of these quantities that could be met using a cost effective synthetic fuel is strongly dependent on the properties of the synthetic fuel for storage onboard ships.

Department of the Navy analysis has shown that 50 percent of the current domestic requirements could be met by a synthetic fuel if it were blended with a petroleum-based fuel. In the FY 2010 through 2013 timeframe, the Navy will require approximately two million gallons of synthetic fuel to conduct system, platform and field trials for the certification process.

Department of the Army

The U.S. Army Petroleum Center reported that the Army used almost 109 million gallons of JP-8 in the U.S. during FY 2007 to support aviation assets and tactical ground vehicles and equipment. This could form the basis for a future synthetic fuel requirement.

SCHEDULE FOR TRANSITION TO SYNTHETIC FUELS

Department of the Air Force

The Air Force plans to certify its entire fleet to operate on a synfuel blend by early 2011. For fleet certification activities, the Air Force is spending approximately \$20.4M in FY 2008 and has requested \$56.4M in the FY 2009 President's Budget.

By 2016, the target is to acquire 50 percent of the Air Force's U.S. fuel requirements from domestic sources producing a synfuel blend that is market priced and cleaner than petroleum-based fuels. This goal equates to 400 million gallons (neat) of synfuel, or 800 million gallons as a 50/50 synthetic fuel-blend.

Purchasing of the fuel could begin when the domestic industry is available and meets the requirements established for the fuel. Current estimates indicate synthetic fuel plants will be operating in the United States no earlier than 2012.

Department of the Navy

The Navy currently has no funding allocated for synfuel certification or procurement. A test program would take two to three years to complete.

Department of the Army

The Army is assessing the feasibility of displacing up to 50 percent, by volume, of JP-8 with a synthetic JP-8 blend. The Army is finalizing a plan to complete its qualification of synthetic fuel blends paralleling the Air Force's certification goals by 2011.

REQUIRED INFRASTRUCTURE

Based on input from international industry representatives already utilizing a synfuel blend, the blended product utilizes the same storage and distribution systems at the end-use locations as current, conventional fuel. Accordingly, the Department of Defense does not anticipate any modifications or upgrades to its existing infrastructure

systems, consistent with the approach taken in the 1980s during the conversion from JP-4 to JP-8.

We are unable to identify or estimate the cost of construction and operation and maintenance that may be required in the commercial sector. Since we are requiring a 50/50 blend of synthetic/conventional fuel be provided by prospective contractors, there may be substantial investment in the commercial sector to not only construct the synthetic fuel production facilities, but to also blend the fuels to meet the Department's requirements. At this time, it is too early to speculate how prospective contractors would elect to accomplish such an effort (e.g. on-site blending or transport their synthetic fuel component to another facility for blending.).

LONG-TERM CONTRACTING

The Department currently has no long-term contracts or other agreements to encourage private sector investment to ensure the availability of synthetic fuels. Current law allows five-year contracts with a five-year option.

In May 2006, the Defense Energy Support Center (DESC), at the request of the Department of the Air Force and the Department of the Navy, issued a Request for Information (RFI) to identify potential sources of synthetic fuel. The RFI process was conducted as part of the government's market research to determine if commercial resources are available to meet the government's needs and on what contractual terms and conditions they are sold.

DESC received responses from 28 companies with 22 expressing interest in producing the fuel. 17 of the 22 companies addressed the issue of the length of the contract. Table 1 shows the desired length of contracts for the 15 companies that stated they required long-term contracts.

	Number of Responders
Long term, without specifying term of years	7
8 years	1
Long term, 10 years	2
15 years	1
20 years	2
15-25 years	1
Other (use contract to obtain commercial financing)	1

Table 1. Number of RFI Responders Requiring Contracts of Specific Terms

If the Department is able to enter into long-term contracts for the production of clean, domestic synthetic fuels with multiple companies, it could be the catalyst that would start a new synthetic fuels industry. It would reduce our reliance on imported oil and increase options for the military.