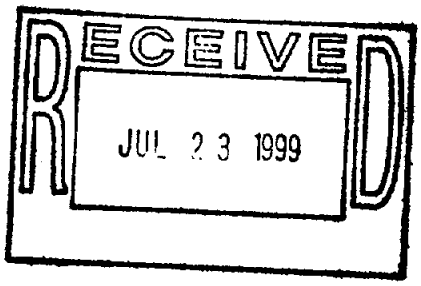
RENTECH, INC.



July 20, 1999

The Honorable Bill Richardson
Secretary
U. S. Department of Energy
1000 Independence Avenue, SW
Washington, D. C. 20585

Dear Mr. Secretary:

I am pleased to enclose Rentech Inc.'s petition seeking a rulemaking to designate Rentech's clean-burning, natural-gas-derived, Fischer-Tropsch (F-T) Diesel Fuel as an "alternative fuel" under Section 301(2) of the Energy Policy Act of 1992.

The Rentech process utilizes natural gas and other carbon-bearing materials as feedstock and produces a sulfur and aromatic free diesel fuel by means of an adaptation of the well-known Fischer-Tropsch process. As such, it is entirely non-petroleum-based and provides substantial environmental benefits. The environmental benefits have been confirmed in many U.S. Department of Energy (DOE) investigations and tests as well as in EPA-certified tests performed by Rentech. In addition, because this clean-burning diesel fuel can be produced from wholly non-petroleum-based domestic resources utilizing U.S. technology, its use will significantly add to the nation's energy security.

As you are well aware, the Energy Policy Act of 1992 may not meet its goals for conversions to Alternative Fueled Vehicles (AFVs) by the year 2000 and it is unlikely that the goal of 30% conversion by 2010 will be met. This is made clear in several DOE reports, as well as in the attached letter from The United States Senate to the Government Accounting Office (GAO). The goals have been elusive due, in part, to the costs of "alternative fuels;" the extra costs associated with manufacturing and maintenance of AFVs; and, the lack of and anticipated high cost of additional infrastructure required to utilize current "alternative fuels." Rentech's F-T Diesel is competitive with California Air Resources Board (CARB) diesel and requires no modifications to vehicles or infrastructure for fuel delivery and utilization.

With the designation of Rentech's F-T Diesel as an "alternative fuel" in a timely manner, progress toward reaching the stated goals of the Energy

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Policy Act of 1992 could be accelerated. We believe that approval of Rentech's clean-burning F-T Diesel Fuel as an "alternative fuel" is very much in the national interest. We respectfully request that this petition receive the Department of Energy's prompt consideration.

Very truly yours,

RENTECH, INC.

Dennis L. Yakobson
President and CEO

DLY/ldk

cc: Assistant Secretary Daniel Reicher

PETITION FOR RULEMAKING

To designate Rentech, Inc.'s clean-burning Diesel Fuel produced by its Fischer-Tropsch (F-T) process from natural gas or coal as an "Alternative Fuel" under Section 301(2) of the Energy Policy Act of 1992

Presented to the U.S. Department of Energy
Office of General Counsel

By

Rentech, Inc.
Dennis L. Yakobson, President and Chief Executive Officer

JULY 1999

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Summary

The purpose of this petition is to request the Secretary of Energy to initiate a rulemaking determining that the Fischer-Tropsch clean diesel fuel produced by Rentech, Inc.'s proprietary and patented Fischer-Tropsch process meets the criteria set forth in Section 301(2) of the Energy Policy Act of 1992 (EPACT) and is therefore found to be an "alternative fuel" under the law and implementing regulations.

EPACT was legislated for the purpose of reducing our country's dependence on foreign oil. Its passage affected virtually every sector of the energy industry. Among its many provisions are mechanisms to promote vehicles that run on non-petroleum-based fuels. EPACT listed several fuels that qualify as an alternative fuel and made provisions for the Secretary to determine, by rule, other fuels that meet certain criteria to also be classified as an "alternative fuel." Specifically, the criteria are that the fuel is "...substantially not petroleum and would yield substantial energy security benefits and substantial environmental benefits...."

Rentech has developed a proprietary iron-based catalyst which it utilizes in the Rentech Fischer-Tropsch process that takes natural gas, coal or refinery waste bottoms and converts them into a sulfur and aromatic free (no cancer causing agents) diesel fuel and other high quality by-products. Rentech's Diesel Fuel is clean burning (low smoke), sulfur free (reduced engine wear), has a high cetane index (fast starting), and contains no aromatics (low pollution). Additionally, its use does not require any existing diesel engine modifications. The Rentech iron-based catalyst is a non-hazardous material easily disposed of when it is spent.

Because the Rentech process uses natural gas or coal as its primary feedstocks to produce its clean diesel fuel, it is, by definition, not petroleum based. The feedstocks can be obtained from many under- utilized sources and will add to domestic production capacities and reduce our country's need for imported oil. Use of the fuel offers significant environmental benefits because the fuel can utilize waste materials as feedstock; is environmentally benign in its manufacture; and, is clean burning in existing diesel engines. The sulfur-free fuel will also be useful in the new generation of fuel cell technologies.

Fischer-Tropsch (F-T) diesel and Gas-to-Liquids (GTL) technology have been, and continue to be, tested by the DOE and other recognized institutions. These institutions include Southwest Research Institute, Francasis du Petrol, Instituto Motori, National Renewable Energy Laboratory (NREL), West Virginia University and others. Without fail, all conclude that the technology is viable and will provide an additional solution for the production of "alternative fuels." They further conclude that use of the fuel would significantly reduce all harmful emissions and provide additional reductions in carbon dioxide, aiding in the fight against Global Warming.

During its presentation at the Energy Frontiers International Conference (January 18-20, 1999) held in Tucson, Arizona, DOE made the following statements about the results of Fischer-Tropsch diesel fuel tests:

"...Shell Fischer Tropsch synthetic diesel fuel had properties conducive to low emissions...."

"...Drivers could not detect a performance difference between trucks operating on F-T diesel and California diesel...."

"...Use of Fischer-Tropsch diesel in place of CARB diesel in the test trucks led to

12% lower NO_X	24% Lower PM
18% lower CO	40% lower HC...."

Sandra Wailsey, DOE Associate Deputy Assistant Secretary for the Office of Natural Gas and Petroleum Technology in the Office of Fossil Energy, stated in the February 1999 issue of *Gas to Liquids News:*

> "...DOE, in working with other federal agencies like the Environmental Protection Agency, also sees natural gas to liquids as a part of the solution to reducing motor vehicle emissions that can pollute the air. It generates far less CO_2 than coal or oil...."

DOE and other tests continue to confirm the results of the Rentech tests performed under EPA-certified guidelines.

With the extensive testing of F-T diesel and the support of the DOE, NREL, EPA and industry for the implementation of F-T diesel in the mix of transportation fuels in the United States, we assert that it is in the national interest to have Rentech's clean Fischer-Tropsch Diesel Fuel approved as an alternative fuel under EPACT. Such approval will speed the market's acceptance of this and similar fuels and will lead to the construction and long-term operation of many production facilities, adding jobs to the economy and a clean fuel to the marketplace.

Table of Contents

I. EPACT – Background and Purpose

The Energy Policy Act of 1992 ("EPACT") (Public Law 102-486) came into being as part of our nation's efforts to decrease its dependence on foreign supplies of energy.[i] Its passage was the first such legislation in over a decade and touched virtually every sector of the energy industry. EPACT underscores the need of the U.S. to increase its energy security in a cost-effective and environmentally-beneficial manner.

The House Energy and Commerce Committee, which drafted certain provisions of EPACT, stated in its House Report on H.R. 776 that the bill seeks to:

- reduce the costly, impending rise in U.S. oil imports;
- conserve energy and use it more efficiently;
- reduce our use of oil-based fuels in our motor vehicle sector;
- increase competition in the electricity, natural gas, coal, renewable energy, and oil market in order to provide new energy options and more diverse supplies;
- increase the strategic oil reserves that shield us from another world oil disruption;
- implement solutions to our nuclear waste and uranium enrichment problems; and,
- address greenhouse warming.[ii]

Pertinent to the purpose of this petition is 10 CFR part 490 that sets forth the regulations that implement Title V of EPACT. This section mandates alternative fueled vehicle acquisition requirements for certain alternative fuel providers and state government fleets. Part 490 is one of a variety of EPACT programs to promote alternative and replacement fuels that reduce reliance on imported oil, reduce criteria pollutants and greenhouse gas emissions, increase energy efficiency, and help displace 10 percent and 30 percent of conventional motor fuels by 2000 and 2010, respectively.

Title III of EPACT requires federal fleet acquisitions of alternative fueled vehicles. Title IV includes specific authority for a financial incentive program for states; a public information program; and, a program for certifying alternative-fueled-vehicle technician training programs. In addition to the mandates for the purchase of alternative-fueled vehicles by certain alternative fuel providers and state government fleets, Title V provides for a possible similar mandate for certain private and municipal fleets. Title VI provides for a program to promote electric motor vehicles.

The types of vehicles that satisfy the alternative fuel provider and state government fleet mandates in Title V are determined, in part, by the definition of "alternative fuel" in Section 301(2). That definition states:

> "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*; 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.*[iii] [Emphasis added.]

For reasons set forth in the remainder of this petition, Rentech asserts that its clean-burning F-T Diesel Fuel is an "alternative fuel" as described in the first two emphasized definitions above and also complies with the criteria set forth in the concluding emphasized clause. Therefore, F-T diesel fuel should be specifically added to the definition of "alternative fuel" in 10 CFR 490.2.

II. The Rentech Fischer-Tropsch Process

Rentech's technology is based upon the Fischer-Tropsch ("F-T") process that was originally developed in Germany during the 1930s to create synthetic fuels. Based in part on those efforts, Rentech developed its own conversion process including a proprietary, iron-based catalyst. The process can convert any carbon-bearing material including, but not limited to, natural gas, coal and refinery bottoms, into premium quality liquid and solid hydrocarbon products. These products are totally free of sulfur, nitrogen, nickel, vanadium, asphaltenes, and aromatics that are typically found in crude hydrocarbons. The process plant can be designed so that the products of the synthesis reaction are either collected by a relatively simple condensation system or are separated by conventional distillation means into five major fractions: water, a water/alcohol mixture, clean burning diesel fuel, naphtha, and tail gases.

The Rentech process is quite flexible and produces a varied slate of products depending on the type of catalyst used. In general, however, Rentech will produce a two-product slate focusing on the highest volume production of diesel fuel possible:

Naphtha (C_5-C_9)	23 vol%
Diesel (C_{10}-C_{19})	77 vol%

In simple terms, if the feedstock is natural gas, the Rentech GTL process takes place in four steps:

1. **Gas Collection, Clean-up, and Compression as Required** — **Methane gas must first be gathered through a traditional gas well and gathering system and fed into the gas compression and cleanup process.**

2. Synthesis Gas Production

The natural gas, recycled tail gas and oxygen are fed to a partial oxidation (POX) reactor or other synthesis gas generation technology to produce synthesis gas – a mixture of hydrogen and carbon monoxide. In addition the outlet gases from the POX reactor also contain water which is removed, and the synthesis gas is fed to the slurry F-T reactor.

3. Rentech Synthesis

Rentech's proprietary iron-based catalyst powder is suspended in a molten wax slurry in a vertical synthesis reactor. The synthesis gas bubbles up through the slurry, contacts the catalyst particles and forms straight-chain hydrocarbons. Long straight chain hydrocarbons are drawn off as a liquid heavy wax. Shorter chain hydrocarbons are withdrawn as overhead vapors and condensed to soft wax, diesel fuel and naphtha. Any hydrocarbons not condensed are recycled to the plant inlet or are used as fuel gas for necessary power generation.

4. Product Upgrading

The raw products can be further treated to maximize their sales value or to meet particular market needs. The following operations can be carried out:

- Thermal or hydrocracking of the waxes to produce only naphtha and diesel
- Vacuum separation of the waxes into distinct high value product lines
- Distillation of the combined diesel/naphtha stream into multiple separate products such as: mineral spirits, white oils, kerosene, and or jet fuel

Additional detailed information on the process is included in the Appendix attached hereto and made a part hereof.

III. Fuel Description and Characteristics

The Rentech Diesel Fuel meets all ASTM specifications (see table below) and it is a premium fuel that is clean burning (low smoke), sulfur free (reduced engine wear), has a high cetane index (fast starting), and contains no aromatics (low pollution). Its use does not require any modifications to existing diesel engines.

Comparison of Fuel Characteristics

Fuel Characteristic	*Commercial Diesel*	*NAS Recommendations* [1]	*Rentech Diesel*
Cetane Index, Minimum	46	>48	67
Sulfur, % wt max	0.35	<0.25	<0.001 [2]
90% Distillation	617	<600	571
Aromatics % vol	33	<20	< 0.001[2]

(1) National Academy of Science – Diesel Technology 1981
(2) Analyses were below limits of detection

Rentech's F-T Diesel Fuel has been vehicle tested to EPA specifications in light duty vehicles at sea level by the California Air Resources Board, El Monte, California, and at high altitude by the Environmental Testing Corporation, Aurora, Colorado. (See the *Appendix* for the results for both of these tests.) The two tests compared Rentech's F-T Diesel Fuel against commercial No.2 diesel fuel (Phillips Specification diesel). The Rentech F-T Diesel Fuel demonstrated significant reductions in harmful emissions. At high altitude, there was a 35% reduction in particulates, a 53% reduction in hydrocarbons, and a 41% reduction in carbon monoxide. At sea level, similar results were achieved but with a 56% reduction in particulate emissions.

Detroit Diesel Corporation conducted a limited particulate emission test on one of its heavy-duty coach engines. (See *Appendix* for the test results.) The test indicated a reduction of almost 35% in fuel related emissions when using Rentech's No. 2 Diesel Fuel as compared to commercial No.1 diesel fuel, a much cleaner burning fuel than the more widely used No.2 diesel fuel. Based upon the absence of aromatics in the Rentech Diesel Fuel, a substantial reduction in the amount of carcinogens released is also expected. The Detroit Diesel tests are the basis of the Detroit Diesel paper on Rentech's F-T Diesel and oxygenates, as well as the basis for patents granted to Rentech regarding Rentech's F-T Diesel containing oxygenates.

Considerable testing and investigation on GTL technology and F-T diesel have been performed by and through the DOE. As recently as February of this year, an interview with DOE officials related that F-T Diesel has significant environmental benefits, including contribution to the reduction in global warming.[iv] The National Renewable Energy Laboratory (NREL) has specifically tested F-T Diesel in unmodified heavy-duty trucks and concludes that it shows significant reductions in all pollutants with no performance degradation.[v]

A selection of test results, articles and papers are presented in the Appendix attached hereto and made a part hereof.

IV. The Market for the Fuel

Three distinct markets exist for F-T Diesel. The first is the EPACT market, the subject of this petition. The second is the California market that has more stringent fuel quality and engine emission requirements for diesel vehicles than does the rest of the nation. The third market is the conventional diesel fuel market.

EPACT Market – Under EPACT, by the year 2001, seventy-five percent of all affected federal and state government vehicle purchases, and ninety percent of all affected vehicle purchases by private alternative fuel suppliers must be AFVs (alternative fuel vehicles). These requirements began in 1997 and affect centrally fueled fleets with twenty or more light-duty vehicles (less than 8500 lbs.) that operate in major urban areas.[vi]

DOE modeling information suggests that fleet use of alternative fuels could reach as much as thirty-eight percent of all light duty vehicle fuels (about 600,000 barrels per day), by 2010. However, progress in this area has been minimal, with only 0.2% of the transportation fuel mix being supplied by "alternative fuels" by 1996.[vii] A significant hurdle to meeting this projection is that the majority of highway transportation vehicles are not light-duty vehicles, but yet are diesel powered. Without F-T Diesel, there is virtually no alternative fuel available for them without changing engine types (LNG, natural gas, etc.) and installing a massive refueling infrastructure.

The financial impact for the infrastructure modifications necessary to meet the EPACT goals for 2010 are staggering according to a 1990 DOE report.[viii]

1990 Estimated Costs for Delivery

Liquefied Petroleum Gas (LPG)	$4.3 billion
Methanol (M)	$2 billion
Compressed Natural Gas (CNG)	$3 billion
Electric (E)	$2 billion

In addition, the tax credits and subsidies for the five designated "alternative fuels" to reach a market penetration of 5% each by the year 2010 adds an additional $13 billion to the cost. These costs do not reflect the added costs for the "alternative fuels" technology in the vehicles or the added costs to maintain the "alternative fuels" vehicles, which is estimated by DOE to be as high as 25% compared to conventional fueled vehicles.

Because use of F-T diesel requires no engine modifications and no change to the current refueling infrastructure, its availability as a designated alternative fuel under EPACT will assure its acceptance in the market. With an assured market, the investment community will quickly capitalize the development of F-T facilities, and the level of alternative fuels in use will increase more quickly than with other replacement fuel opportunities.

California Market – The State of California has, since the early 1970s, required different fuel formulations to meet its more stringent emission requirements. Beginning in the early 1990s, in its efforts to reduce emissions, the California Air Resources Board (CARB) turned its attention to diesel fuel in addition to conventional gasoline. Essentially, CARB is creating its own "alternative fuel" requirements. F-T diesel fuel has a significantly better emissions profile than CARB diesel[ix] and will, therefore, have a market as a diesel blending stock and/or a "premium" diesel. F-T diesel has been a blending stock for two refiners in California to meet the California diesel requirements. The F-T diesel for this blending stock was imported from Shell's Indonesian F-T facility.

Conventional Market – Current on-road diesel fuel usage for the entire nation is approximately 2,450,000 barrels per day.[x] This market is presently driven by price only. However, there is action on the part of the US EPA, within its promulgation of the upcoming Tier-2 standards, to require the

reduction of sulfur in diesel fuel. As stated earlier, F-T diesel contains no sulfur so it will, therefore, have an additional market nationwide as a diesel blending stock and/or a "premium" diesel in those areas concerned about emissions.

Pricing – F-T diesel pricing will be directly related to the feedstock costs and the capital costs of the plant. Rentech's domestic strategy is to convert methanol facilities that are currently shut down to F-T facilities, significantly reducing the capital costs and schedule for F-T plant development. This, plus a creative product slate, will allow the Rentech F-T diesel products to be competitive with CARB diesel. With the EPACT designation, the Rentech F-T Diesel could have a lower cost based on energy content than LPG, LNG, CNG or methanol. When conversion and infrastructure costs are considered, the cost savings are tremendous.

V. Compliance with EPACT Criteria

In the definitions presented in Section 301(2), both "natural gas" and "coal-derived liquid fuels" are enumerated as qualified alternative fuels for the purposes of EPACT.[xi] Rentech asserts that the F-T Diesel Fuel produced as a result of the gasification of coal and the Rentech process is a "coal-derived liquid fuel" and is therefore, *prima facie*, an alternative fuel. Similarly, as the Rentech process simply alters natural gas from a gaseous to a liquid state without adding any molecules other than carbon and hydrogen, the resultant F-T diesel fuel from this feedstock should also qualify, *prima facie*, as an "alternative fuel." Finally, because there is no difference in the characteristics of the diesel fuel no matter what the feedstock, the Rentech F-T Diesel Fuel should qualify as an alternative fuel even if only one of the listed "alternative fuels" is found to directly apply. Rentech sees no reason to petition separately based on the choice of feedstock.

However, Rentech acknowledges that the alternative fuel definitions do not specifically cite F-T diesel fuel. Therefore, this petition also seeks to fortify the basis for certification as an alternative fuel under that part of Section 310(2) that allows the Secretary to determine so by rule. In order for the Secretary to certify "by rule" that a certain fuel is an alternative fuel, the fuel must pass three (3) tests. These are that the fuel:

1. is substantially not petroleum;
2. would yield substantial energy security benefits; and,
3. would yield substantial environmental benefits.

The evidence that the Rentech clean Diesel Fuel complies with each of these requirements is presented below.

Criterion 1: **Substantially Not Petroleum**

Summary: The raw material utilized by the Rentech process to make its clean-burning diesel fuel is not crude oil. As such, it is *wholly* not petroleum by volume or any other measure.

Rentech's F-T process technology can utilize a wide range of carbonaceous materials as its feedstock (primarily natural gas but including solids such as coal). Brief descriptions of the most important of these feedstocks are presented below.[xii]

Natural Gas – Natural gas can be categorized as several types: stranded gas, associated gas, substandard gas, and hydrates. *Stranded gas* is that for which there is no local market or for which it is uneconomical to build a pipeline spur for transport. *Associated gas* is natural gas occurring in stasis with and produced along with crude oil. Such gas is stranded if there is no local market and is often flared or re-injected. *Substandard gas* is non-associated natural gas that contains excessive amounts of carbon dioxide, nitrogen, and hydrogen sulfide that makes it undesirable for commercial markets. *Hydrates* are essentially frozen natural gas (methane). Additionally, methane can be gathered from the decomposition of garbage in landfills or from processes of anaerobic digestion.

Solids and Liquids – These are carbon-bearing materials such as coal, coke, biomass and other carbon-bearing materials.

Each of these materials can be converted to synthesis gas through various gasification technologies.[xiii] The resulting synthesis gas (a mixture of carbon monoxide and hydrogen) is then processed through the Rentech technology to make F-T products, primarily clean diesel.

Therefore, whether it is natural gas found in its "natural" state, gathered from the decomposition of organic matter, or synthesized from coal or another solid or carbonaceous liquid, the raw feedstock for the production of Rentech's clean-burning F-T Diesel Fuel is gas and not petroleum in any form.

Criterion 2: **Substantial Energy Security Benefits**

Summary: Rentech's clean-burning F-T Diesel Fuel can be produced with 100% domestic content, replacing imported crude oil or imported conventional diesel fuel on a gallon-for-gallon basis. Domestic supplies of natural gas and carbon-containing waste solids suitable for gasification are abundant. In addition, this fuel can be made with 100% U.S.-based technology, further adding to energy security protections.

Section 301(2) is unclear in its definition of "substantial" as it relates to energy security benefits. Rentech suggests that compliance with three modifiers to the term "substantial" is appropriate for the purposes of this petition. These modifiers are domestic content, equivalency, and potential production volume.

Domestic Content – As stated in the discussion of Criterion 1, Rentech's clean-burning F-T Diesel Fuel can be processed from many different forms of carbonaceous materials, most notably natural gas. Each of the feedstock materials is found in abundance in the U.S. Therefore, Rentech asserts that its clean-burning Diesel Fuel can be produced with 100% domestic content.

The stranded natural gas reserves on Alaska's North Slope and in the deepwater Gulf of Mexico, totaling about 275 Tcf, are the focus of major research programs by DOE. According to DOE's Sandra Wailsey, it has identified gas reserves in Prudhoe Bay in excess of 25 Tcf. The U. S. Geological Survey report estimated that there is a 200,000 Tcf resource offshore.[iv]

It is, of course, quite feasible that other countries, especially Canada with its vast amount of natural gas reserves, will also produce F-T diesel. However, due to the environmental benefits of the fuel and differing tax structures, it will most likely be marketed in-country to satisfy intentions similar to our EPACT.

Equivalency – A gallon of common No. 2 diesel fuel has a Btu value of approximately 146,000 per gallon. Rentech's clean-burning F-T Diesel Fuel has a Btu value of 139,800 per gallon. Therefore, it is clear that Rentech's Diesel can, in general, replace conventional diesel on a one-to-one basis. Additionally, an analysis of the net carbon dioxide emissions used to produce a gallon of Rentech's F-T Diesel Fuel shows a positive balance and a net decrease in carbon dioxide emissions over that for the production of conventional diesel fuel.

Production Volume – As discussed earlier, the Rentech process can utilize a variety of feedstocks for the production of its clean-burning diesel fuel. While it is not certain how much of the feedstocks will actually be used to produce Rentech F-T Diesel, an estimate of how much can be produced can reasonably be made. It takes approximately 10 million Btu in feedstock energy to produce one barrel of clean diesel. A 10,000 bbl/day GTL plant would use 100,000 million Btu's of natural gas.

Stephen Goguen, Office of Heavy Vehicle Technologies, U.S. Department of Energy, in his New Fuels and Diesel Technology presentation at the Monetizing Stranded Gas Reserves Conference held in San Francisco, CA (October 1998) stated:

> "...In the near term, the reinjected natural gas in the North Slope of Alaska would produce about 3.7 billion barrels of F-T diesel. In the Mid term the identified sub-quality gas in the lower 48 states could produce about 24 billion barrels of F-T diesel (more than twice the original Prudhoe Bay oil discovery). The combination of coal and biomass gasification plus use of the lower 48 sub-quality gas could lead to very large quantities of F-T Products...."

Clearly, the DOE believes that this presents an opportunity to produce a substantial amount of F-T diesel fuel as a replacement for conventional diesel and to add to the increasing slate of alternative fuels for heavy vehicles.

Criterion 3: **Substantial Environmental Benefits**

Summary: Rentech's clean-burning F-T Diesel Fuel, as does all F-T diesel fuel, has an emissions profile significantly better than conventional or CARB diesel. In addition, its manufacture can utilize many types of waste materials as feedstock.

As detailed above in *Section III. Fuel Description and Characteristics* and in the various articles and test papers presented in the attached Appendix, Rentech's F-T Diesel Fuel has a high cetane index, and contains no sulfur or aromatics. Therefore, the fuel significantly reduces the emission of NO_x, CO, particulates and total hydrocarbons. It can be a wholly domestic resource that replaces conventional diesel refined from imported oil and it can also reduce the environmental impacts of the transshipment of oil (fuel spills, use of petroleum in transport, etc.).

Rentech F-T Diesel Test Results
% Reduction in Emissions

Testing Facility	HC	CO	NOx	Particulates
ETC, Golden, CO (High Altitude Tests)(1)	52%	41%	6%	35%
CARB(1)	22%	30%	6%	55%
Detroit Diesel Allison(2)	15%	14%	-6%	18%

(1) Compared with Phillips #2 Diesel Fuel

(2) Compared with Phillips #1 Diesel Fuel

While natural gas is the intended feedstock for the purposes of this Petition, it should be noted that the Rentech technology could be utilized with a variety of waste products and other gasified carbon-bearing materials. As stated in *Criterion 1*, above, opportunities for production of Rentech's clean-burning F-T Diesel Fuel include liquids and solids such as refinery bottoms that would otherwise be underutilized, refinery coke, and coal.

VI. Conclusion

Because the Rentech clean F-T Diesel Fuel meets the tests set forth in the Energy Policy Act in that it is "...substantially not petroleum and would yield substantial energy and environmental benefits...," by this petition Rentech, Inc. respectfully requests the Secretary of Energy to take prompt action to initiate a rulemaking determining that the Rentech F-T Diesel Fuel qualifies as an alternative fuel under Section 301(2) of EPACT.

Submitted the 20th day of July, 1999

Dennis L. Yakobson
President and Chief Executive Officer
Rentech, Inc.

Endnotes

[i] The energy security and environmental conditions that led to the passage of the Act in 1992 are even more acute today. They are well documented by the DOE and others and will not be addressed in this petition.

[ii] House Report No. 102-274(I), p. 132.

[iii] Energy Policy Act of 1992, Public Law 102-486, 42 U.S.C. 13211(2).

[iv] Belcher, Jack "DOE Sees GTL as Solution for Stranded Gas, Global Warming" *Gas-to-Liquids News*, February 1999, Hart Publications, Inc.

[v] Vertin, Keith "Gas-to-Liquid Fuels for On-highway Truck & Bus Engines" The National Renewable Energy Laboratory, A Department of Energy National Laboratory, Proceedings from, January 18-20, 1999, Energy Frontiers International Conference, Tucson, Arizona.

[vi] *Federal Registe*, Vol. 61, No. 51, March 14, 1996, p. 10622 et seq.

[vii] "Replacement Fuel And Alternative Energy Fuel Vehicle Technical and Policy Analysis," US DOE Energy Efficiency and Renewable Energy Office of Transportation Technologies, July 1997, p. 5.

[viii] DOE/PE 00959 and 1992 EA Engineering report to Congress.

[ix] From the results of an unpublished test by Southwest Research Institute in 1996 using F-T diesel fuels from three different sources.

[x] Energy Information Administration/*Petroleum Marketing Monthly,* June 1999. "Table 3. U.S. Refiner Volumes of Petroleum Products To End Users."

[xi] Energy Policy Act of 1992, Public Law 102-486, 42 U.S.C. 13211(2).

[xii] Much of this information is taken from the report, "Fischer-Tropsch Technology – Gas-to-Liquids, Solids-to-Liquids, Liquids-to-Liquids" by Howard, Weil, Labouisse, Freidrichs Incorporated, December 18, 1998.

[xiii] Rentech recently licensed its proprietary Fischer-Tropsch technology to Texaco, giving Texaco the exclusive right to use or sub-license Rentech's F-T technology to convert liquids and solids to F-T products. For example, in a refinery setting, Texaco's gasification technology creates synthesis gas (a mixture of carbon monoxide and hydrogen) from petroleum coke, residual oil, asphalt, etc., at a hydrogen to CO_2 ratio which is ideal for Rentech's F-T process, thus avoiding the need for additional capital expenditures for equipment to modify the ratio.

Appendix

To The

PETITION FOR RULEMAKING

To designate Rentech, Inc.'s clean-burning Diesel Fuel produced by its Fischer-Tropsch (F-T) process from natural gas or coal as an "Alternative Fuel" under Section 301(2) of the Energy Policy Act of 1992

Presented to the U.S. Department of Energy
Office of General Counsel

By

Rentech, Inc.
Dennis L. Yakobson, President and Chief Executive Officer

July 1999

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Rentech

Fischer-Tropsch Fuels Analysis and Testing Results

1. Rentech Brochure.

2. Rentech Process Description.

3. Yakobson, D.L., Letter to Mr. R. Cross at California Air Resources Board, regarding analysis and testing results to CARB, 1984.

   A letter to CARB that provided fuel analysis and test data from high altitude tests by the Environmental Test Corporation, Aurora, Colorado.

4. Yakobson, D.L., Presentation to the California Energy Commission, California, 1991.

   A presentation that described the Rentech Fischer-Tropsch technology and the fuel quality produced, including the test results.

5. Engineering Evaluation Section, Mobile Source Division, "Emission and Fuel Economy Tests of Rentech Diesel Fuel", State of California, Air Resources Board, California, 1984.

   The test results and report by the State of California Air Resources Board. The test confirmed reductions in pollutants that has since been confirmed in many tests by others on Fischer-Tropsch diesel.

6. Winsor, Dr. Richard, Letter to Mark Hennesy at Detroit Diesel Corporation, Summary of Detroit Diesel Test performed on an 8V-92TA coach engine, 1989.

   Detroit Diesel evaluated the Rentech Diesel in their 8V-92TA coach engine using the federal heavy-duty transient emission test. This paper is the result of the tests. This testing became the basis for an SAE paper demonstrating the significant reduction in pollutants and the affect of oxygenates on diesel fuel emission profiles.

Department of Energy

Summary of published papers by the United States Department of Energy, Natural Gas-to-Liquids

1. Venkataraman, V.K., et al., "Natural Gas-To-Liquids: Solution for the Next Millennium, U. S. Department of Energy", Gas-To-Liquids Processing 99 Conference, Texas, 1999.

   Describes the Department of Energy's RD&D program in Gas to liquids and the interesting opportunities for utilizing Fischer-Tropsch technology to extend the North Slope reserves and a rapid way to utilize the associated gas in the Gulf of Mexico.

2. Goguen, Stephen, "DOE Program on New Fuels and Diesel Technology: Performance, Emissions, and Durability Issues of New Diesel Fuels for Heavy Vehicles", Office of Heavy Vehicle Technologies, U.S. Department of Energy.

   Presentation on DOE's tests and market potential for F-T diesel and discussion on what makes F-T diesel a good fuel.

3. Venkataraman, V. K., et al., "Overview of U.S. DOE's Natural Gas-to-Liquids RD&D Program and Commercialization Strategy", U. S. Department of Energy.

   Describes how GTL allows use of North Slope and Gulf of Mexico gas reserves, and the benefits of the diesel fuels made from GTL have significant environmental and efficiency benefits over petroleum-derived diesel.

4. Singh, Gurpreet, " Alternative Fuels In Heavy Duty Vehicles Identifying Technologies and Markets for New Fuels", Office of Heavy Vehicle Technologies, U. S. Department of Energy, Gas-to-Liquids: Clean Fuels Strategy Conference, London, 1998.

   Describes the DOE testing program for heavy duty vehicles and the results of testing showing the significant environmental improvements that operating these vehicles with Fischer-Tropsch diesel produces. Then goes on to describe the factors that make Fischer-Tropsch diesel a good fuel.

5. Belcher, Jack " DOE Sees GTL as Solution for Stranded Gas, Global Warming" Gas-to-Liquids News, February 1999.

   The interview with Department of Energy officials explains that Department of Energy sees Gas-to-Liquids as a solution for stranded gas in Alaska and the Gulf of Mexico. In addition the Fischer-Tropsch diesel has significant environmental benefits and DOE sees it as offering a significant contribution to the reduction in carbon dioxide in the fight against global warming.

6. Vertin, Keith, "Gas-to-Liquid Fuels for On-highway Truck & Bus Engines" The National Renewable Energy Laboratory, A Department of Energy National Laboratory, Energy Frontiers International Conference, Arizona, 1999.

The National Renewable Energy Laboratory (NREL) discusses the use of gas-to-liquids products and how they could be exceptional future fuels because of the step change in emissions that result from its use in heavy trucks. The NREL has tested the Fischer-Tropsch diesel in unmodified engines and trucks and the results show significant reductions in all pollutants and no performance degradation.

SAE

Summary of published papers by SAE, The Engineering Society for Advancing Mobility Land Sea Air and Space International. These papers discuss and review all aspects of Fischer-Tropsch diesel and natural gas-to-liquid fuels.

1. Bennethum, James E. and Richard E. Winsor, "Toward Improved Diesel Fuel," SAE Technical Paper Series, International Fuels and Lubricants Meeting and Exposition, Canada, 1991.

   The paper presents the results of the Detroit Diesel Corp. test of the Rentech Fischer-Tropsch diesel fuel and discusses the significant emission reduction from the fuel and the surprising reductions from the natural occurring oxygenates that are in the Rentech Fischer-Tropsch diesel fuel.

2. Norton, Paul, et al., "Emissions from Trucks using Fischer-Tropsch Diesel Fuel," SAE Technical Paper Series, International Fall Fuels and Lubricants Meeting and Exposition, California, 1998.

   SAE with Department of Energy and West Virginia University tested Fischer-Tropsch diesel and blends of Fischer-Tropsch diesel on heavy trucks and buses comparing the emissions with California diesel. The results showed significant (>27%) overall reduction in pollutants with no engine modifications or fuel system modifications. In addition, blends of the Fischer-Tropsch with poorer quality California diesel produced significant reductions in pollutants and no adverse effects in blending or vehicle performance.

3. Atkinson, Christopher M., et al., "In-Cylinder Combustion Pressure Characteristics of Fischer-Tropsch and Conventional Diesel Fuels in a Heavy Duty CI Engine," SAE Technical Paper Series, International Spring Fuels & Lubricants Meeting and Exposition, Michigan, 1999.

   West Virginia University (in an SAE paper) looked at the combustion characteristics of Fischer-Tropsch diesel in unmodified diesel engines. The Fischer-Tropsch diesel was found to burn at lower temperatures, with shorter ignition delays and longer combustion duration. This results in lower emissions and points to even greater emissions reduction potential in engines with fuel injection systems that are tuned for Fischer-Tropsch diesel.

4. Norton, Paul, et al., "Emissions from Buses with DDC 6V92 Engines Using Synthetic Diesel Fuel," SAE Technical Paper Series, International Spring Fuels & Lubricants Meeting and Exposition, Michigan, 1999.

   The National Renewable Energy Laboratory (NREL), West Virginia University and the Department of Energy (in an SAE paper) presented a study of buses using Fischer-Tropsch diesel fuel. The conclusions are that Fischer-Tropsch diesel reduced all pollutants and provides a viable fuel in older buses needing little retrofit to improve emissions. The bus operators found no performance difference in the bus operations and less than 3% variation in fuel consumption, which is less than experienced in variations of driver technique.

5. Suppes, G. J., et al., "Type Performance of Fischer-Tropsch Liquids (FTL) in Modified Off-Highway Diesel Engine Test Cycle," SAE Technical Paper Series, International Spring Fuels & Lubricants Meeting and Exposition, Michigan, 1999.

   The University of Kansas performed a study presented to SAE on the use of Fischer-Tropsch diesel and Fischer-Tropsch Liquids in Off-Highway Diesel Engines. The results demonstrated significant emission improvements and no engine performance degradation. Use of the Fischer-Tropsch liquids could lower the costs of production through the elimination of the distillation step. The crude Fischer-Tropsch performed well in the engines and reduced pollution.

CO_2

Summary of a published paper on the net carbon dioxide balance for the Fischer-Tropsch process compared with conventional processes

1. Gray, David, and Glen Tomlinson, "CO_2 Emissions from Fischer-Tropsch Fuels," Mitretek Systems, Fuels, Lubricants, Engines and Emissions Meeting, Arizona, 1999.

   Carbon emissions, when compared to gasoline from crude, diesel from crude and Fischer-Tropsch from coal/gas are determined to be 45% less than gasoline from crude as the standard. This reduction per mile includes production, combustion and relative efficiency. Overall, the study demonstrates the lower carbon emissions from Fischer-Tropsch technology.

SRI

Summary of published papers by Southwest Research Institute on testing of Fischer-Tropsch fuels

1. Ryan III, Thomas, "Emission Performance Of Fischer-Tropsch Diesel Fuels", Southwest Research Institute, Gas-To-Liquids Processing 99 Conference, Texas, 1999.

   The paper presents a summary of results of the most recent emission studies from the use of Fischer-Tropsch diesel fuel in diesel engines. All the studies demonstrate the emission reduction realized by the use of Fischer-Tropsch diesel. The paper demonstrates that the fuel quality of high cetane, zero sulfur and zero aromatics makes it an ideal fuel for diesel blends or as a replacement for diesel in urban environments.

2. Ryan III, Thomas, and Daniel A. Montalvo, "Emissions Performance of Fischer-Tropsch Diesel Fuels," Southwest Research Institute, 1997 AIChE Spring Meeting, Texas, 1997.

   Following the California Air Resources Board (CARB) protocol for diesel engine testing, Southwest Research performed tests comparing Fischer-Tropsch diesel, CARB diesel and commercial diesel. All the emissions are significantly reduced and the reductions are attributed directly to the quality of the Fischer-Tropsch fuel.

3. Ryan III, Thomas, and Daniel A. Montalvo "Near ULEV Emission Level in a Heavy-Duty Diesel Engine Using Fischer-Tropsch Diesel Fuel," Southwest Research Institute, Texas.

   The paper compared three Fischer-Tropsch diesels with a standard U.S. diesel and a California Air Resources Board (CARB) diesel in a heavy-duty diesel engine. The conclusions are that all three Fischer-Tropsch diesels performed with similar characteristics and all significantly reduced pollutants compared to either the standard U.S. diesel or the CARB diesel. There was no engine optimization for the high quality Fischer-Tropsch diesel which it is predicted would improve the performance further.

Miscellaneous

Papers and presentations of Fischer-Tropsch diesel fuel studies

1. Lyons, James M., "The Effect of Diesel Fuel Properties on Emissions From Current and Future-Technology Engines," Sierra Research, Inc., California.

   This paper looks at the diesel fuel properties and the affects on emissions. The conclusion is the lower the sulfur and aromatics, the better the emissions profile and the higher the cetane the lower the nitrogen oxide emissions.

2. Belcher, Jack, "Tests Begin to Qualify Syntroleum Fuel for U.S. Fleet Mandates," Gas-to-Liquids News, Vol. II, No. 3, March 1999.

   Article shows the continued tests on Fischer-Tropsch diesel and how it reduces emissions compared to conventional diesel and CARB diesel.

3. Belcher, Jack, "Shell GTL Hopes for April, 2000 Restart; 25% Capacity Boost," Gas-to-Liquids News, Vol. II, No. 3, March 1999.

   Article discussing the Shell GTL facility and improvements in efficiency and lower capital potential. Shell expects a restart in early 2000.

4. Peckham, Jack, "Joint European Study Finds Benefits of FT Diesel," Gas-to-Liquids News, January 1999.

   The article reviews a joint European study sponsored by the European Commission to look at emissions from Fischer-Tropsch diesel, biodiesel and ultra-low sulfur diesels. Fischer-Tropsch diesel was the best from all aspects of handling and emissions as well as a blending stock for improving other diesel fuels.

5. Peckham, Jack, "Study Confirms FT Diesel Cuts Emissions in Real Vehicles," Gas-to-Liquids News, January 1999.

   Article reviews the SAE study on unmodified Detroit diesel buses and showed a significant reduction in emissions in real vehicles in real operations. The study was completed by the Department of Energy, The National Renewable Energy Laboratory and West Virginia University.

6. Peckham, Jack, "Fischer-Tropsch Diesel Cuts All Emissions, Unlike Biodiesel," Gas-to-Liquids News, May 1999.

   Article reviews the study by West Virginia University on tests comparing biodiesel and Fischer-Tropsch diesel and all tests indicate that Fischer-Tropsch diesel reduces emissions and is a better blending stock than biodiesel.

7. Gray, David, and Glen Tomlinson, "Natural Gas to Ultra-Clean Liquid Transportation Fuels," Mitretek Systems, Clean Fuels Strategy Conference, London, 1998.

Presentation on the technical and economic risks of GTL applications showing there is significant potential in GTL.

8. Slodowske, Warren J., "Diesel Technology Today & A Bit Beyond," Navistar, Diesel Issues Forum, 1999.

Presentation on the significant progress by diesel engine manufacturers on the reduction of emissions over the past ten years. The barriers to further improvements are the fuel quality and oil quality. The one comment of Fischer-Tropsch diesel is that it is the "ultimate" fuel for diesel engines.

9. Grimes, Gary, "Economics and Experience of Blending Fischer-Tropsch Diesel at Paramount Petroleum," Paramount Petroleum, Gas-To-Liquids Processing 99 Conference, Texas, 1999.

Paramount Refinery has several years of experience using Fischer-Tropsch diesel as a blending stock to meet the CARB diesel requirements in California. This presentation describes that experience and the Tosco Refinery's similar experience and the benefits of Fischer-Tropsch diesel as a blending stock.

10. Vachon, Tom, "Clean Diesels, Clean Fuels," Caterpillar, Inc., EFI Conference, 1999.

The presentation makes an argument for cleaner fuels and the need to drive the diesel standards toward that of Fischer-Tropsch diesel with ultra-low sulfur and aromatics.

11. Tower III, Arthur W., "Fischer-Tropsch Technology – Gas-to-Liquids, Solids-to-liquids, Liquids-to-Liquids", Howard, Weil, Labouisse, Freidrichs Incorporated, 1998.

General paper on all F-T technologies, the stage of development, the market, and opportunities.

CFDC CLEAN FUELS DEVELOPMENT COALITION

July 23, 1999

Mr. David Rodgers, Director
Office of Technology Utilization
U.S. Department of Energy
Mail Code EE-345G-086
1000 Independence Avenue, SW
Washington, DC 20585

Dear David:

Greetings! I am sorry we did not get much chance to talk when we were both in Iowa a few weeks ago, but it was pretty obvious you were in meetings the whole time you were there and left before any of the evening festivities.

As you may recall, one of my newer members is Rentech, Inc., a gas-to-liquid technology provider that is utilizing the Fischer-Tropsch (FT) process. They are applying for alternative fuel status under Section 301(2) of the Energy Policy Act. Accompanying this letter is a copy of their petition, other copies have been delivered to the General Counsel's office. I hope you can take a look at this application and petition. We are very excited about it as a means of further expanding our options to meet the goals of EPACT.

Dick Sheppard of Rentech is in town from time-to-time and we would be very pleased to discuss this petition with you in more depth at your convenience. Until then, I wish you well!

Sincerely,

Douglas A. Durante
Executive Director

Enclosure

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United States Senate

WASHINGTON, DC 20510

January 20, 1999

The Honorable David M. Walker
Comptroller General of the United States
U.S. General Accounting Office
441 G Street, NW
Washington, DC 20548

Dear Mr. Comptroller General:

We are writing to request that the General Accounting Office (GAO) conduct a study regarding the implementation, enforcement and effectiveness of the Alternative Fuel Vehicle (AFV) program authorized by Titles III, IV, and V of the Energy Policy Act of 1992 (EPACT).

As you know, EPACT was enacted to stimulate the research and development of technologies which potentially can shift the focus of national energy demand away from imported oil and toward renewable or domestically produced energy sources. One area of energy consumption which EPACT targets is the use of imported oil by the transportation sector.

The AFV program of EPACT attempts to further the dual benefits of promoting energy security, and of attaining air quality standards and other environmental benefits by displacing substantial quantities of the petroleum consumed by motor vehicles with cleaner domestically produced fuels. To this end, the AFV program requires Federal and other fleets to acquire alternative-fueled vehicles (AFVs), and also encourages the creation of programs to promote the development and use of replacement fuels, especially domestic replacement fuels.

The stated goal of EPACT is to replace ten percent of petroleum-based motor fuels by the year 2000 and thirty percent by the year 2010 with alternative fuels. To meet these goals, EPACT requires federal and state government fleets, and a limited number of private fleets, to purchase AFVs.

During the 105th Congress, officials from the Department of Energy testified before the Senate Energy and Natural Resources Committee that EPACT controlled fleets, including federal fleets, are not meeting their AFV purchase requirements under the law. Consequently, it is extremely unlikely the petroleum displacement goals included in EPACT will be met.

With the first deadline for the EPACT petroleum displacement goals – the year 2000 – rapidly approaching, the problems and the progress made during the implementation of the EPACT AFV program to date must be reviewed thoroughly. A report from the GAO would provide valuable information to members of the House of Representatives and Senate interested in examining the progress made toward the EPACT goals.

Specifically, we are interested in information on the following issues: 1) How much progress has the federal fleet made toward the stated goals of EPACT? 2) How could the program better promote the development and use of alternative fuels? 3) Does the counting mechanism in EPACT provide an incentive for new AFV procurement? 4) What are the merits and short-comings of continuing to focus on purchase requirements for centrally-fueled fleets, and would fuel use requirements or fuel credits be more effective? 5) Are the current manufacturing incentives effective and how might additional purchasing incentives be used to meet EPACT goals? 6) What impediments exist to reaching the stated petroleum-replacement goals? 7) Has EPACT been a cost effective means of reducing our nation's reliance on imported oil? 8) How do the technologies and fuels approved for use under EPACT contribute to improved air quality? 9) What estimated amount of resources/appropriated funds would be necessary in FY2000 and FY2001 for the Federal government (broken down by agency) to comply with EPACT, given current prices and vehicle availability? 10) Finally, are the program flaws primarily legislative, or regulatory, or both?

Failure to come close to meeting the goals of EPACT will be a harsh blow to this nation's efforts to strengthen our energy security. We are hopeful that a close examination of the EPACT AFV program by GAO will provide Members with definitive information about what is and what is not working in the EPACT AFV program so we can knowledgeably reexamine the program during the 106th Congress.

We appreciate your consideration of our request.

Sincerely,