Statement of Vinod Khosla to Committee on Finance hearing on "Grains, Cane, and Automobiles: Tax Incentives for Alternative Fuels and Vehicles."

Mr. Chairman and honorable members of the Committee, there is a climate crisis, a security crisis and an impending oil crisis - and as Stanford economist Paul Romer has said**, a crisis is a terrible thing to waste. The country that first finds solutions to these crises will be the leading economic power in the 21st century.** America's scientists and technologists, powered by new ideas and the energy of America's entrepreneurs, are best equipped to solve this problem**. It is an unprecedented economic opportunity with many beneficial side effects**, which has attracted wide-spread attention and support across the political spectrum. It even includes business leaders like the CEOs, from companies like DuPont, GE and Duke Energy, who have called for tough federal limits on carbon dioxide emissions. Recently, that call was echoed by institutional investors managing $4 trillion in assets.

However, there are many forces that will oppose this change. Each $4 change in the price of a barrel of oil costs Saudi Arabia (a country with a smaller population than California) a trillion dollars. Our own Renewable Fuels Association, in my opinion, is not sufficiently supportive of E85 and cellulosic ethanol because of its closeness to the oil industry and it's reluctance to support any agenda that the oil industry opposes. Hundreds of billions of dollars are at stake for the oil producing companies. My impression is that the American Petroleum Institute is on a massive PR campaign to prevent or slow this transition. **In my Wall Street Journal editorial on January 23, 2007, I called on President Bush to declare a war on oil. This war is winnable, politically feasible with small compromises, and a great boon to all Americans - rural or urban. It will direct three hundred billion dollars of oil money from the terrorism financing mid-east countries to rural America each and every year, and will lead to $1 a gallon wholesale cellulosic ethanol within a decade.**

For those of you who don't believe this is possible, there are many precedents for massive change. In 1982 when I started Sun Microsystems, I was told that one could not compete against IBM, Digital Equipment Corporation, Data General, Burroughs, Control Data and other stalwarts of the computer business. Most of them are now gone and a few have adjusted, humbled by the seemingly "toyish" microprocessor. In 1996 I got in a room with the CEO's of nine major US media companies, including the Washington Post, New York Times, Knight-Ridder, Tribune, Cox, Times-Mirror and others and tried to explain how the internet would disrupt their business models, and little companies like Yahoo, Ebay, Google and others would be a threat. Today Google is worth as much as all of them combined. The pharmaceutical companies went through a similar experience, ignoring biotechnology in the early days. Ten years ago every major telecommunications company told me that they would never adopt the internet IP protocol as their core network just as we were starting a telecommunications equipment company called Juniper to produce IP equipment. Major "experts" like AT&T laughed at the idea that all long distance calls would be virtually free to consumers. Today, for failing to heed that trend, major players like AT&T are mere brands, their company sold for a song. Less than ten years later, yesterday's "unthinkable fact" is today's "conventional wisdom".

Wind power now costs about five percent of what it did 25 years ago. Solar energy costs are down more than 90 percent since 1970. With the right policies, the unthinkable transition from oil to renewable fuels can happen in the oil industry too - in fact it is likely to happen because it makes sense for consumers, for the climate, for national security, and it makes economic development sense for America as a whole. And it won't stop there. We will go on to not only replace gasoline but diesel, then jet fuel, then many plastics and polymers and home insulation and much more, all from renewable resources grown by America's and the world's farmers. This is leadership we must show the world.

America's farmers and corn ethanol producers have done this country a great service and I have written often in defense of the much maligned corn ethanol. **It is the most important new economic phenomenon in rural America and the most important new energy development in decades. Biomass and agricultural based energy could permanently correct the rural/urban economic development imbalance. It could shift much of the oil portion of our GDP to rural GDP and create millions of new jobs.** The farmer must make as much money with cellulosic crops for us to achieve substantial availability. Appendix C (C.1 and C.2) shows estimated farmer economics. Farmers can make more money growing biomass crops than corn (Ideally, they would grow them in corn/soy/biomass crop rotations). Biomass's lower input costs both improve farmer economics and environmental sustainability requiring less water and fertilizer. Energy crops will make it possible to replace all of America's gasoline in twenty five years on about 60 million acres of land (Appendix E.1 shows production and E.2 consumption capability). The Khosla Ventures investments in cellulosic and corn ethanol are shown in Appendix B. **Our best estimate of current cellulosic ethanol development shows cost effective production in 2009, subject only to feedstock availability at economic cost.**

We are investing in entrepreneurs and scientists in all these areas. It is heartening that leading scientists from MIT, Harvard, Caltech, Berkley, Stanford, and many other such institutions, that previously had no work going on in energy, are now the founders of these innovative startups. Such focus on the part of our best scientists and innovation is key to the technological breakthroughs and surely will not come form the American Petroleum Institute and its "cannot do" attitude. We have found scientists working on energy breakthroughs at Dartmouth (Mascoma), in pipe-fitting shops in Denver (Range), using platforms developed for malaria drugs in Berkeley (Amyris), in other university labs at Harvard, Stanford and Caltech (Gevo and LS9), in India (Praj), in New Zealand (Lanza) and in other parts of the world. The DOE went looking for 3 biomass fuel projects to fund, and instead found twice as many worthwhile projects (see Appendix F).The conventional wisdom says that we will have to stay dependent on oil. I ask all the experts who pontificate about this to look at the facts, and at the latest developments in our labs, and imagine the future instead of extrapolating from the old energy world using conventional platitudes. We must empower these entrepreneurs, and signal to them that we are serious about winning the war on oil. Some of the optimists in the startup world will surely be wrong, but will dozens of efforts all fail? Could so many companies and investors (Appendix D –a selection of companies we know of), each with a different source of technology, all be wrong? My analysis (refer back to Appendix E.1) shows **39**

billion gallons of biofuels production is possible in the U.S., at reasonable cost, by 2017 on 19 million acres; and 139 billion gallons by 2027 on 49 million acres. Details of potential production and consumption of E85 ethanol if an FFV mandate is instituted is shown in Appendix E.2

One of the benefits of the switch to biomass based liquid fuels (to replace oil) is the positive effects with regard to world poverty. A focus on biomass will generate new income for Africa, India and Latin America's rural poor in addition to America's rural population. Almost certainly, America will produce all its own fuel given its agricultural advantages; Latin America might supply Europe and China; Africa might supply Europe and India and result in a new, more distributed and diverse geopolitical balance on energy and incomes.

What do we need to do?

1. **Set a very high RFS with an appropriate "automatic" relief valve** as the President has proposed, so all new technology developers have an incentive to invest in R&D knowing if they can produce and sell a product within a $1.00 per gallon of the cost of gasoline initially, a market will exist for their product. This incentive of a large market is critical to encourage the risk capital investment and to encourage America's scientists, technologists, and entrepreneurs. I suggest the President's goal of 35 billion gallons by 2017 is reasonable. **If we don't achieve it the relief valve mechanism automatically protects consumers and increases funding for advanced biofuels** as I shall explain below.
2. **Offer consumers price protection** against high ethanol prices by allowing the notion of identification numbers that the President has proposed. I would suggest that these numbers can be purchased at $1.00 per gallon limiting the price of ethanol and hence the price of corn, **protecting livestock producers too** and blunting fuel versus food arguments. I have written about why (in my opinion) most such arguments are specious anyway. Otherwise, why would developing countries be clamoring for lower farm subsidies? Incidentally the roughly $3 billion in ethanol subsidies last year I was told decreased farm subsidies by about $6 billion in 2006. A net gain to the treasury!
3. My proposal will allow us to **pay as we go** in today's constrained budget environment. The purchase of identification numbers combined with a high RFS will allow us to set an ambitious target; if this target is not **reached**, it will raise funds **if the proceeds of the identification number purchases are put into a pool to allow incentives for cellulosic biofuels (under my proposal)**. The President has proposed such funds go into treasury instead. The more we miss our target the larger the funds we will have to incentivize their development under my proposal. Incentives will be self funding.
4. **Create a "producers credit" for cellulosic ethanol and all advanced biofuels** independent of the VEETC credit which expires in 2010. A credit of $0.76 per gallon to any producer of advanced biofuels (as defined in the Appendix to this testimony) as long as it achieves atleast a 50% reduction in carbon emission per mile driven and uses **scalable feedstocks like cellulosic biomass or renewable**

large scale waste will encourage such production. I propose such a credit start declining by $0.15 per year starting in 2015 and expire completely by 2020. I am specifically proposing that vegetable oils that are used for biodiesel are not a scalable feedstock and should not be included because it will not be land efficient. **To solve our long term problems, any agricultural feedstock must generate at least 1500 gallons per acre by 2030**. My calculations show that land use is the most critical variable and cellulosic biofuels can produce between 2500-3000 gallons per acre by 2030. Certain food kernel based fuels are unlikely to even approach 1000 gallons per acre. We should be **encouraging technologies with long term potential to scale** but not be funding technologies that won't eventually produce atleast 25% of our gasoline replacement.

5. There is much resistance among certain circles to removing tariffs. I submit that **removing tariffs in the right way is good for America's farmers** and will result in much larger markets eventually for E85 and result in cheaper fuels for consumers. Today we buy the cheapest Saudi Arabian oil in the world and add a tariff to the much greener and cheaper Brazilian ethanol which it competes with. We should protect corn ethanol producers who have done so much for our country by keeping the tariffs for ethanol blending up to 20% blends by **setting a separate RFS of 15 billion gallons per year for the blend market – this will protect corn ethanol producers**. **By removing tariffs for E85 use only, we will dramatically expand the market for E85 ethanol while still making room for cellulosic ethanol from America's farms by having a 20 billion gallon "primary fuels market" RFS for advanced biofuels like cellulosic E85**. We should encourage Europe to do the same. The gasoline equivalent price can be reached with imported ethanol and cellulosic incentives, getting the E85 markets, including cars, pumps and fuel production going. Today we have the blend market "tail" wagging the development of the E85 market "dog". This anomaly in the long term is not good for America's producers who would benefit from a 1000% bigger E85 market than a small "blend market" for ethanol, or for American consumers who will keep paying a higher price for gasoline.
6. The oil interests would like to distract us with just the blend market and not encourage the creation of fleets of vehicles capable of taking a fuel alternative to gasoline like E85 ethanol. I believe the Renewable Fuels Association has not been sufficiently supportive of E85 and cellulosic ethanol because of its closeness to the oil industry - I don't believe they are acting in the best interest of America's farmers, corn growers or it's national security interests. To get long term energy security and diversity we need to create a fleet of cars capable of multiple fuels. We should **mandate that 50% of the cars be FFV's by 2012 and 70% by 2015**, capable of E85 ethanol and other advanced biofuels like butanol and mixed alcohols. I estimate this costs less than $50 per car, and probably around $35. To be more technology neutral we could potentially require all cars to offer at least one renewable fuel by these dates, - plug-in hybrids, E85, butanol, biogas based CNG are among the alternatives offered to automakers. Renewable fuels should be defined as broadly as possible including all mixtures of alcohols, and renewable diesel and gasoline form scalable feedstocks.

7. **Mandate that all pumps dispensing more than 2m gallons of fuel have atleast one E85 pump by 2009** and all pumps dispensing more than 1.5m gallons have one E85 pump by 2011. Only gas stations with millions of dollars of annual revenue will be subject to this mandate.
8. We must encourage research on biomass feedstocks, tomorrow's "energy crops." Switch grass or miscanthus grass are economic for farmers at the yields of 6-10 tons per acre today, but we need even higher yields and "grass cocktails" to avoid the problems of monoculture agriculture and lower biomass prices. We need significantly more research in agronomy practices focused on energy crops and crop rotation schemes. I have proposed a "7 year by 7 year crop" rotation between food crops and biomass "cocktail crops" that improve yields and sustainability while reducing crop inputs like water and fertilizer. Miscanthus already yields 15 tons per acre in a wide variety of regions, including the U.K., and in Illinois test plantings. **My analysis shows that 24 tons per acre is possible by 2030 and about 50 million acres will replace most gasoline consumption in the US. I have proposed twenty universities in geographically disparate areas each manage five plots of biomass crops for a total of two million acres of biomass energy crop plantings**. This will create a realistic map of our biomass capabilities, of optimal crops, logistics and sustainable crop practices. Feedstock availability of one million tons within a thirty mile radius of a 100 million gallon per year cellulosic plant is likely to be the single biggest impediment to scaling cellulosic ethanol availability.
9. Create incentives for E85 sales. This is key to scaling usage and create demand pull, but will not happen unless E85 is at 70% of the cost of gasoline. A limited period (ten years or the first 5 billion gallons per year dispensed) **E85 tax exemption from federal taxes** would help together with the cellulosic credit mentioned above.
10. **I prefer to see no coal to liquids included in the alternate or renewable fuels standards. Coal to liquids could be included in the RFS (as the administration prefers) if there is a $0.50 per gallon penalty** unless the technology is at least carbon emission neutral (relative to gasoline on a per mile driven basis). Without this provision, if coal to liquids is allowed as part of a general alternative fuels standard (as the administration has proposed) **coal as feedstock will permanently kill biomass to fuels since coal will always be cheaper** as a feedstock and the scale of the plants will be larger for coal based fuels, making cellulosic biofuels uneconomic relative to coal to liquid fuels. We can convert our Georgia forest based ethanol plant to coal to liquids and achieve lower production costs**. Coal to liquids will hurt America's farmers,** making cellulosic crops uneconomic and be a real disincentive against distributed rural economic growth.
11. **Ideally, in this "pay as you go" environment VEETC should be capped at the maximum amount invested in the capital of the plant but this can only be done if VEETC is made a producers credit.** No producer should get more of a VEETC subsidy from the government than the total cost of the physical plant which typically happens within the first three years. This will materially limit the cost of the program to the federal government and would allow more funding of

cellulosic incentives. It is unconscionable that the federal government is paying many times the cost of plant construction for old plants. Further by making VEETC a blenders credit it becomes a highly inefficient funding mechanism providing little support to producers when they need it most in times of excess supply and low prices as blenders have pricing power at such times. This hurts small producers the most as the more sophisticated producers engage in sophisticated financial transactions and avoid these dynamics. **I suspect that the principal reason for this distortion is ADM's desire not to be perceived as receiving $750 million annually** (which they do receive) **in direct subsidies** (as a pure profit measure, that would have ranked 184th on Fortune 500 in 2005 from subsidies alone) from the government every year as they expand capacity to 1.5 billion gallons annually - they prefer to make it look like blenders are getting this subsidy. Maybe half the funds provided as credits probably end up with the small corn ethanol producers **making the current credit format a very inefficient use of government funds**. As a result we have a very inefficient funding mechanism under the excuse that small producers cannot use tax breaks. The latter problem can be solved through the mechanism of tradable identification numbers as the administration has proposed.

12. **All advanced biofuels** that use large volume feedstocks capable of tens of billions of gallons of production without disrupting markets, and replacing petroleum based products **should be treated equally**. Beyond cellulosic ethanol and waste based ethanol, entrepreneurial and larger companies are working on butanol, diesel like fuels from cellulosic materials, jet fuels from cellulosic materials, and even gasoline directly from cellulosic and waste materials.
13. Legislation should make accounting rules uniform between the oil industry and the biofuels industry; many tax advantages and subsidies are embedded in the arcane accounting rules (for e.g. "excess of percentage over cost" rule which has been a $80b subsidy for the oil industry). **A revocation of the "excess of percentage over cost" accounting rule that allows oil companies to take more than 100% depreciation would probably fully fund the cellulosic incentives** proposed here.
14. In today's "pay as you go" environment" **subsidies can be reduced while providing increased benefits in the form of insurance to ethanol producers – variable subsidies will provide insurance to producers by linking any ethanol VEETC subsidies to the price of oil**. Just as tax breaks for oil should be phased out as the price rises, subsidies for clean energy should be decreased if oil price rises and increased as the price of oil falls. This would signal to oil suppliers – and OPEC in particular – that predatory pricing would be futile. Such oil price manipulation by the OPEC cartel happened in the early 1980's. Alternatively, we can mandate a "price floor" tax for oil, to prevent market manipulation. Implement a $40 floor on oil (as suggested in the past) such that any time the price goes below $40, funds can be placed in a "price stabilization fund", which can be used to reduce the price of oil when the price inevitably rises or to fund alternatives to oil. The benefit of a price floor mechanism is that it would encourage all alternative technologies, not just ethanol
15. Most renewable technologies get an "Investment Tax Credit". We should consider

making advanced biofuels facilities eligible for this. However this would encourage higher capital cost technologies that trade off upfront capital costs for lower operations costs. This may not be the optimal tradeoff.

16. A "carbon emission fee" per gallon of gasoline or diesel sold could alternatively provide the funds necessary to fund the cellulosic ethanol and advanced biofuels producers' credit. This can help with "pay as you go" and get us started on accounting fro carbon costs till such time that a "cap and trade system" for carbon emissions is instituted.

I humbly submit a markup of Senator Bingaman's bill (Appendix A) with additional mechanisms that move us faster towards energy security and green house gas mitigation and faster rural economic development, that is revenue positive, that protects corn ethanol producers, that protects consumers form high ethanol prices and livestock producers from high corn prices, that allows for corn ethanol, cellulosic ethanol, E85 and even coal to liquids in a way even many environmentalists can support.

- Why is this good for farmers & rural America?
  - Long term agricultural alternative to gasoline
  - Long term value to "land products" & land
  - Rural % of GDP will increase changing the traditional rural/urban balance
  - Increased plant financing & ethanol (substitute biofuel) IPO's ➔ demand for "land products"
  - More upside for farmer owned Biofuels plants
  - Cellulosic ethanol (same for butanol, biogasoline, fermentation diesel with cellulose as a feedstock) will increase land value without hurting livestock farmers
  - No "blend wall" that is captive to oil company blending of biofuels – means more R&D money for cellulosic
  - Increase in total farm GDP and the creation of new jobs for the economy

- Why is it good for America?
  - Reduce Carbon Dioxide emissions and take steps towards combating the climate risks associated with global warming

- Increase fuel diversity in the US and internationally, offering choices to the consumer (and perhaps even energy independence)
- Support domestic fuel production and reduce dependence on foreign oil. It reduces security costs and costs to the US economy by hundreds of billions of dollars annually (Senator Lugar estimated our import costs at approximately $320 billion per year, as well as an additional $50 billion a year in oil-related military spending in the Middle East)
- Improve the rural economy and reduce the trade deficit. Offer the nation multiple fuel options in the future by facilitating a flex-fuel fleet
- Geopolitically, the world will be less dependent on oil and thus countries like Iran, Iraq, Venezuela, Nigeria, and Russia

❖ Why is it good for Consumers?

- Biofuels will create an alternative to oil, hence competition; advanced biofuels are fully compatible with hybrids
- Biofuels will decrease demand for oil, decreasing the price of gasoline
- Biofuels will start a trajectory of oil alternatives, opening energy to new innovative fuels like bio-butanol, bio-gasoline, fermentation diesel and more that are cheaper and cleaner

❖ Why is it good for the world?

- Reduces the developing world's exposure to risky, expensive gasoline that is often heavily subsidized (to make it affordable)
- Biomass is plentiful worldwide, and offers the possibility of energy independence for developing countries
- Takes steps towards alleviating world poverty and reduces there exposure to climate risk (i.e. – what happens to Bangladesh, Mauritius, etc if the ocean level rises?)
- Enables China, India, and other fast-growing economies to continue to do so while limiting their greenhouse gas emissions

Appendix A – Proposed Markup to Senator Bingham's Bill

1. Title: To enhance the energy security of the United States by promoting biofuels, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. SHORT TITLE; TABLE OF CONTENTS.

(a) Short Title.—This Act may be cited as the “Biofuels for Energy Security and Transportation Act of 2007”.

(b) Table of Contents.—The table of contents of this Act is as follows:

SEC. 2. DEFINITIONS.

In this Act:

(1) ADVANCED BIOFUEL.—

(A) IN GENERAL.—The term “advanced biofuel” means fuel derived from renewable biomass other than corn kernels.

(B) INCLUSIONS.—The term “advanced biofuel” includes—

Comment [vk1]: It would be nice to state a minimum carbon emission reduction relative to petroleum of atleast 50% per mile driven as a “requirement”

(i) ethanol derived from cellulose, hemicellulose, or lignin;

(ii) ethanol derived from sugar or starch, other than ethanol derived from corn ***or wheat kernels or sugarcane sugars;***

(iii) ethanol derived from ***renewable*** waste material, including crop residue, other vegetative waste material, animal waste, and municipal solid waste;

(iv) diesel, ***gasoline or aviation fuel*** -equivalent fuel derived from renewable biomass, including oil ***or algae or renewable waste material***;

(v) biogas produced by the anaerobic digestion or fermentation of organic matter from renewable biomass; and

(vi) butanol ***or higher alcohols*** produced by the fermentation of renewable biomass.

(v) "hydrocarbon fuel equivalent" products produced from renewable feedstocks or renewable waste materials

(2) CELLULOSIC BIOMASS ETHANOL.—The term "cellulosic biomass ethanol," means ethanol, ***butanol, mixed alcohols or hydrocarbon fuel equivalent products*** derived from any cellulose, hemicellulose, or lignin that is derived from renewable biomass ***or from renewable waste materials. "Gallon equivalent" of cellulosic biomass ethanol will be computed base don the energy content of the fuel product or fuel mix relative to ethanol.***

(3) CONVENTIONAL BIOFUEL.—The term "conventional biofuel" means ethanol derived from corn ***or wheat kernels***.

(4) RENEWABLE BIOMASS.—

(A) IN GENERAL.—The term "renewable biomass" means any organic matter that is available on a renewable or recurring basis.

(B) INCLUSIONS.—The term "renewable biomass" includes—

(i) renewable plant material, including—

(I) feed grains;

(II) other agricultural commodities;

(III) other plants and trees grown for energy production; and

(IV) algae; and

(ii) renewable waste material, including—

(I) crop residue;

(II) other vegetative waste material (including wood waste and wood residues);

(III) animal waste and byproducts (including fats, oils, greases, and manure); and

Comment [vk2]: Could generalize to "food kernels"

Comment [vk3]: Fuels produced from oils may never be land efficient; biodiesel and gasoline can also be produced from corn kernels which will then move to cellulosic materials; such direct production of diesel, jetfuel and gasoline equivalents should be encouraged if they transition to cellulosic materials.
"Vegetable oil" should be excluded from the definition of advanced biofuels.

Comment [vk4]: Other grains like sweet sorghum may be more desirable as they grow on less fertile lands

(IV) municipal solid waste.

(C) EXCLUSIONS.—The term "renewable biomass" does not include old-growth timber of a forest from the late successional stage of forest development

Comment [vk5]: Might be worth also excluding biomass produced on lands that were ecologically sensitive lands in the last twenty years such as rain forests, peat forests etc.

(5) RENEWABLE FUEL.—

(A) IN GENERAL.—The term "renewable fuel" means motor vehicle fuel, ***aviation fuel,*** boiler fuel, or home heating fuel that is—

(i) produced from renewable biomass; and

(ii) used to replace or reduce the quantity of fossil fuel present in a fuel mixture used to operate a motor vehicle, ***aeroplane,*** boiler, or furnace that would otherwise operate using fossil fuel.

(B) INCLUSION.—The term "renewable fuel" includes—

(i) conventional biofuel; and

(ii) advanced biofuel.

(6) SECRETARY.—The term "Secretary" means the Secretary of Energy.

(7) SMALL REFINERY.—The term "small refinery" means a refinery for which the average aggregate daily crude oil throughput for a calendar year (as determined by dividing the aggregate throughput for the calendar year by the number of days in the calendar year) does not exceed 75,000 barrels.

TITLE I—RENEWABLE FUEL STANDARD

SEC. 101. RENEWABLE FUEL STANDARD.

(a) Renewable Fuel Program.—

(1) REGULATIONS.—

(A) IN GENERAL.—Not later than 1 year after the date of enactment of this Act, the President shall promulgate regulations to ensure that motor vehicle fuel, ***aviation fuel***, home heating oil, and boiler fuel sold or introduced into commerce in the United States (except in noncontiguous States or territories), on an annual average basis, contains the applicable volume of renewable fuel determined in accordance with paragraph (2).

(B) PROVISIONS OF REGULATIONS.—Regardless of the date of promulgation, the regulations promulgated under subparagraph (A)—

(i) shall contain compliance provisions applicable to refineries, blenders, distributors, and importers, as appropriate, to ensure that the requirements of this subsection are met; but

(ii) shall not—

(I) restrict geographic areas in the contiguous United States in which renewable fuel may be used; or

(II) impose any per-gallon obligation for the use of renewable fuel.

(C) RELATIONSHIP TO OTHER REGULATIONS.—Regulations promulgated under this paragraph shall, to the maximum extent practicable, incorporate the program structure, compliance, and reporting requirements established under the final regulations promulgated to implement the renewable fuel program established by the amendment made by section 1501(a)(2) of the Energy Policy Act of 2005 (Public Law 109–58; 119 Stat. 1067).

(2) APPLICABLE VOLUME.—

(A) CALENDAR YEARS 2008 THROUGH 2022.—

(i) RENEWABLE FUEL.—For the purpose of paragraph (1), subject to clause (ii), the applicable volume for any of calendar years 2008 through 2022 shall be determined in accordance with the following table:

Applicable volume of renewable fuel	
Calendar year:	(in billions of gallons):
2008	8.5
2009	10.5
2010	12.0
2011	12.6
2012	13.2
2013	13.8
2014	14.4
2015	15.0
2016	18.0
2017	21.0
2018	24.0
2019	27.0
2020	30.0
2021	33.0
2022	36.0

(ii) ADVANCED BIOFUELS.—For the purpose of paragraph (1), of the volume of renewable fuel required under clause (i), the applicable volume for any of calendar years 2016 through 2022 for advanced biofuels shall be determined in accordance with the following table:

Applicable volume of advanced biofuels	
Calendar year:	(in billions of gallons):
2016	3.0
2017	6.0

Comment [vk6]: Personally the administrations approach of having a higher standard but having a "relief valve" with a $1 "ID" purchase is a very good idea. Already we might find that these numbers are too low, causing instability in ethanol markets. The administrations proposal will put an upper limit of ethanol at $1 above the price of gasoline but will ensure the maximum possible renewable fuel use that can be produced at this "$1 above gasoline price"

Comment [vk7]: Personally the Presidents goal of 35b gallons by 2017 is more desirable as long as obliged parties can get out of it by paying $1 per gallon as the administration has proposed. That generates funds to incentivize the sale of advanced biofuels and E85 fuel cheaper. The $1 per gallon extra will also encourage the sale of E85 which is key to increasing demand among consumers. It would also allow for imports and still provide a price umbrella for US producers. It would also allow the coal to liquids as long as they achieved atleast a 10% reduction in carbon emission per mile driven.

Comment [vk8]: Personally I would set standards starting at 100m gallons in 2009 so as not to discourage all the technologies currently being commercialized. A "relief valve" like the one the administration has proposed would also work here and allow for more aggressive RFS standards. Three billion gallons in 2016 feels very low. I would recommend 100m in 2009, growing 100% per year till 3b gallons is achieved and then growing 50% per year through 2016. We could put easy outs for advanced biofuels in 2009-2016 if they are not available giving DOE Secretary to make the determination.

2018	9.0
2019	12.0
2020	15.0
2021	18.0
2022	21.0

(B) CALENDAR YEAR 2023 AND THEREAFTER.—Subject to subparagraph (C), for the purposes of paragraph (1), the applicable volume for calendar year 2023 and each calendar year thereafter shall be determined by the President, in coordination with the Secretary of Energy, the Secretary of Agriculture, and the Administrator of the Environmental Protection Agency, based on a review of the implementation of the program during calendar years 2007 through 2022, including a review of—

(i) the impact of renewable fuels on the energy security of the United States;

(ii) the expected annual rate of future production of renewable fuels, including advanced biofuels; and

(iii) the impact of the use of renewable fuels on other factors, including job creation, the price and supply of agricultural commodities, rural economic development, and the environment.

(C) MINIMUM APPLICABLE VOLUME.—Subject to subparagraph (D), for the purpose of paragraph (1), the applicable volume for calendar year 2023 and each calendar year thereafter shall be equal to the product obtained by multiplying—

(i) the number of gallons of gasoline that the President estimates will be sold or introduced into commerce in the calendar year; and

(ii) the ratio that—

(I) 36,000,000,000 gallons of renewable fuel; bears to

(II) the number of gallons of gasoline sold or introduced into commerce in calendar year 2022.

Comment [vk9]: Should the ratio increase by 2-3% per year? This would add less that 3b gallons per year but offer continuity. It could be subject to an assessment of the factors above on impacts

(D) MAXIMUM QUANTITY DERIVED FROM CONVENTIONAL BIOFUEL FEEDSTOCKS.—For the purpose of paragraph (1), the applicable volume for calendar year 2023 and each calendar year thereafter shall not exceed 15,000,000,000 gallons of conventional biofuel.

Comment [vk10]: A similar limitation can be placed on imports and coal to liquids if a higher RFS is picked. If a 35b by 2017 standard is picked then coal to liquids (subject to being better than gasoline in carbon emission) and imports should constitute no more than 10b of the standard. Further we can specify that the blend market is not subject to tariff free imports

(b) Applicable Percentages.—

(1) PROVISION OF ESTIMATE OF VOLUMES OF GASOLINE SALES.—Not later than October 31 of each of calendar years 2008 through 2021, the Administrator of the Energy Information Administration shall provide to the President an estimate, with respect to the following calendar year, of the volumes of gasoline projected to be sold or introduced into commerce in the United States.

(2) DETERMINATION OF APPLICABLE PERCENTAGES.—

(A) IN GENERAL.—Not later than November 30 of each of calendar years 2008 through 2022, based on the estimate provided under paragraph (1), the President shall determine and publish in the Federal Register, with respect to the following calendar year, the renewable fuel obligation that ensures that the requirements of subsection (a) are met.

(B) REQUIRED ELEMENTS.—The renewable fuel obligation determined for a calendar year under subparagraph (A) shall—

(i) be applicable to refineries, blenders, and importers, as appropriate;

(ii) be expressed in terms of a volume percentage of gasoline sold or introduced into commerce in the United States; and

(iii) subject to paragraph (3)(A), consist of a single applicable percentage that applies to all categories of persons specified in clause (i).

(3) ADJUSTMENTS.—In determining the applicable percentage for a calendar year, the President shall make adjustments—

(A) to prevent the imposition of redundant obligations on any person specified in paragraph (2)(B)(i); and

(B) to account for the use of renewable fuel during the previous calendar year by small refineries that are exempt under subsection (g).

(c) Volume Conversion Factors for Renewable Fuels Based on Energy Content or Requirements.—

(1) IN GENERAL.—For the purpose of subsection (a), the President shall assign values to specific types of advanced biofuels for the purpose of satisfying the fuel volume requirements of subsection (a)(2) in accordance with this subsection.

(2) ENERGY CONTENT RELATIVE TO ETHANOL.—For advanced biofuel, 1 gallon of the advanced biofuel shall be considered to be the equivalent of 1 gallon of renewable fuel multiplied by the ratio that—

(A) the number of British thermal units of energy produced by the combustion of 1 gallon of the advanced biofuel (as measured under conditions determined by the Secretary); bears to

(B) the number of British thermal units of energy produced by the combustion of 1 gallon of pure ethanol (as measured under conditions determined by the Secretary to be comparable to conditions described in subparagraph (A)).

(3) TRANSITIONAL ENERGY-RELATED CONVERSION FACTORS FOR CELLULOSIC BIOMASS ETHANOL.—For any of calendar years 2008 through 2015, 1 gallon of cellulosic biomass ethanol shall be considered to be the equivalent of 2.5 gallons of renewable fuel. ***The 2.5 gallons of renewable fuel factor will also be used for purposes of calculating the VEETC credit as per the Energy Policy Act of 2005 with the additional 1.5 times VEETC credit being issued as additional***

"identification numbers" to producers of advanced biofuels at the rate of 0.76 gallons per gallon of advanced biofuels produced. Only US producers of advanced biofuels will be eligible for this additional credit.

(d) Credit Program.—

(1) IN GENERAL.—The President, in consultation with the Secretary and the Administrator of the Environmental Protection Agency, shall implement a credit program to manage the renewable fuel requirement of this section in a manner consistent with the credit program established by the amendment made by section 1501(a)(2) of the Energy Policy Act of 2005 (Public Law 109–58; 119 Stat. 1067).

(2) MARKET TRANSPARENCY.—In carrying out the credit program under this subsection, the President shall facilitate price transparency in markets for the sale and trade of credits, with due regard for the public interest, the integrity of those markets, fair competition, and the protection of consumers and agricultural producers.

(3) The regulations promulgated under sections A and B shall provide that

(i)Unique identification numbers be generated and assigned to each batch of or other quantity of production of renewable fuel by the producer for facilities located in the United States and by the importer for renewable fuels imported into the United States.

(ii) Identification numbers are based on the volume of alternative fuel, adjusted for volume conversion factors under section (c) above.

(iii) Identification numbers may be used to demonstrate compliance with the renewable fuel volume obligation.

(iv) Identification numbers may be held by any party or transferred to any party.

(v) Identification numbers are valid for the compliance purposes for the year in which they are generated.

(vi) The President shall make additional identification numbers available for sale to all parties at a price of $1.00 per gallon of ethanol equivalent. Any obliged party that is unable to acquire sufficient identification numbers to meet its obligations under this Act may purchase such identification numbers. Funds received in payment for identification numbers shall be used by the President to encourage advanced biofuels production as per programs recommended by the Department of Energy. Such funds will primarily be used to encourage advanced biofuels production facilities.

(e) Seasonal Variations in Renewable Fuel Use.—

(1) STUDY.—For each of calendar years 2007 through 2020, the Administrator of the Energy Information Administration shall conduct a study of renewable fuel blending to determine whether there are excessive seasonal variations in the use of renewable fuel.

(2) REGULATION OF EXCESSIVE SEASONAL VARIATIONS.—If, for any calendar year,

the Administrator of the Energy Information Administration, based on the study under paragraph (1), makes the determinations specified in paragraph (3), the President shall promulgate regulations to ensure that 25 percent or more of the quantity of renewable fuel necessary to meet the requirements of subsection (a) is used during each of the 2 periods specified in paragraph (4) of each subsequent calendar year.

(3) DETERMINATIONS.—The determinations referred to in paragraph (2) are that—

(A) less than 25 percent of the quantity of renewable fuel necessary to meet the requirements of subsection (a) has been used during 1 of the 2 periods specified in paragraph (4) of the calendar year;

(B) a pattern of excessive seasonal variation described in subparagraph (A) will continue in subsequent calendar years; and

(C) promulgating regulations or other requirements to impose a 25 percent or more seasonal use of renewable fuels will not significantly—

(i) increase the price of motor fuels to the consumer; or

(ii) prevent or interfere with the attainment of national ambient air quality standards.

(4) PERIODS.—The 2 periods referred to in this subsection are—

(A) April through September; and

(B) January through March and October through December.

(f) Waivers.—

(1) IN GENERAL.—The President, in consultation with the Secretary of Energy, the Secretary of Agriculture, and the Administrator of the Environmental Protection Agency, may waive the requirements of subsection (a) in whole or in part on petition by one or more States by reducing the national quantity of renewable fuel required under subsection (a), based on a determination by the President (after public notice and opportunity for comment), that—

(A) implementation of the requirement would severely harm the economy or environment of a State, a region, or the United States; or

(B) extreme and unusual circumstances exist that prevent distribution of an adequate supply of domestically-produced renewable fuel to consumers in the United States.

(2) PETITIONS FOR WAIVERS.—The President, in consultation with the Secretary of Energy, the Secretary of Agriculture, and the Administrator of the Environmental Protection Agency, shall approve or disapprove a State petition for a waiver of the requirements of subsection (a) within 90 days after the date on which the petition is received by the President.

(3) TERMINATION OF WAIVERS.—A waiver granted under paragraph (1) shall terminate after 1 year, but may be renewed by the President after consultation with the Secretary of Energy, the Secretary of Agriculture, and the Administrator of the

Environmental Protection Agency.

(g) Small Refineries.—

(1) TEMPORARY EXEMPTION.—

(A) IN GENERAL.—The requirements of subsection (a) shall not apply to small refineries until calendar year 2013.

(B) EXTENSION OF EXEMPTION.—

(i) STUDY BY SECRETARY.—Not later than December 31, 2008, the Secretary shall submit to the President and Congress a report describing the results of a study to determine whether compliance with the requirements of subsection (a) would impose a disproportionate economic hardship on small refineries.

(ii) EXTENSION OF EXEMPTION.—In the case of a small refinery that the Secretary determines under clause (i) would be subject to a disproportionate economic hardship if required to comply with subsection (a), the President shall extend the exemption under subparagraph (A) for the small refinery for a period of not less than 2 additional years.

(2) PETITIONS BASED ON DISPROPORTIONATE ECONOMIC HARDSHIP.—

(A) EXTENSION OF EXEMPTION.—A small refinery may at any time petition the President for an extension of the exemption under paragraph (1) for the reason of disproportionate economic hardship.

(B) EVALUATION OF PETITIONS.—In evaluating a petition under subparagraph (A), the President, in consultation with the Secretary, shall consider the findings of the study under paragraph (1)(B) and other economic factors.

(C) DEADLINE FOR ACTION ON PETITIONS.—The President shall act on any petition submitted by a small refinery for a hardship exemption not later than 90 days after the date of receipt of the petition.

(3) OPT-IN FOR SMALL REFINERIES.—A small refinery shall be subject to the requirements of subsection (a) if the small refinery notifies the President that the small refinery waives the exemption under paragraph (1).

(h) Penalties and Enforcement.—

(1) CIVIL PENALTIES.—

(A) IN GENERAL.—Any person that violates a regulation promulgated under subsection (a), or that fails to furnish any information required under such a regulation, shall be liable to the United States for a civil penalty of not more than the total of—

(i) $25,000 for each day of the violation; and

(ii) the amount of economic benefit or savings received by the person resulting from the violation, as determined by the President.

(B) COLLECTION.—Civil penalties under subparagraph (A) shall be assessed

by, and collected in a civil action brought by, the Secretary or such other officer of the United States as is designated by the President.

(2) INJUNCTIVE AUTHORITY.—

(A) IN GENERAL.—The district courts of the United States shall have jurisdiction to—

(i) restrain a violation of a regulation promulgated under subsection (a);

(ii) award other appropriate relief; and

(iii) compel the furnishing of information required under the regulation.

(B) ACTIONS.—An action to restrain such violations and compel such actions shall be brought by and in the name of the United States.

(C) SUBPOENAS.—In the action, a subpoena for a witness who is required to attend a district court in any district may apply in any other district.

(i) Effective Date.—Except as otherwise specifically provided in this section, this section takes effect on January 1, 2008.

TITLE II—RENEWABLE FUELS INFRASTRUCTURE

SEC. 201. INFRASTRUCTURE PILOT PROGRAM FOR RENEWABLE FUELS.

(a) In General.—The Secretary, in consultation with the Secretary of Transportation and the Administrator of the Environmental Protection Agency, shall establish a competitive grant pilot program (referred to in this section as the "pilot program"), to be administered through the Vehicle Technology Deployment Program of the Department of Energy, to provide not more than 10 geographically-dispersed project grants to State governments, local governments, metropolitan transportation authorities, or partnerships of those entities to carry out 1 or more projects for the purposes described in subsection (b).

(b) Grant Purposes.—A grant under this section shall be used for the establishment of refueling infrastructure corridors, as designated by the Secretary, for gasoline blends that contain at least 85 percent renewable fuel, including—

Comment [vk11]: *Too much room to manipulate this as biodiesel and diesel don't require different infrastructure. There is no need for this.*

(1) installation of infrastructure and equipment necessary to ensure adequate distribution of renewable fuels within the corridor;

(2) installation of infrastructure and equipment necessary to directly support vehicles powered by renewable fuels; and

(3) operation and maintenance of infrastructure and equipment installed as part of a project funded by the grant.

(c) Applications.—

(1) REQUIREMENTS.—

(A) IN GENERAL.—Subject to subparagraph (B), not later than 90 days after

the date of enactment of this Act, the Secretary shall issue requirements for use in applying for grants under the pilot program.

(B) MINIMUM REQUIREMENTS.—At a minimum, the Secretary shall require that an application for a grant under this section—

(i) be submitted by—

(I) the head of a State or local government or a metropolitan transportation authority, or any combination of those entities; and

(II) a registered participant in the Vehicle Technology Deployment Program of the Department of Energy; and

(ii) include—

(I) a description of the project proposed in the application, including the ways in which the project meets the requirements of this section;

(II) an estimate of the degree of use of the project, including the estimated size of fleet of vehicles operated with renewable fuel available within the geographic region of the corridor;

(III) an estimate of the potential petroleum displaced as a result of the project, and a plan to collect and disseminate petroleum displacement and other relevant data relating to the project to be funded under the grant, over the expected life of the project;

(IV) a description of the means by which the project will be sustainable without Federal assistance after the completion of the term of the grant;

(V) a complete description of the costs of the project, including acquisition, construction, operation, and maintenance costs over the expected life of the project; and

(VI) a description of which costs of the project will be supported by Federal assistance under this subsection.

(2) PARTNERS.—An applicant under paragraph (1) may carry out a project under the pilot program in partnership with public and private entities.

(d) Selection Criteria.—In evaluating applications under the pilot program, the Secretary shall—

(1) consider the experience of each applicant with previous, similar projects; and

(2) give priority consideration to applications that—

(A) are most likely to maximize displacement of petroleum consumption ***at the lowest cost per gallon of petroleum displaced***;

(B) demonstrate the greatest commitment on the part of the applicant to ensure funding for the proposed project and the greatest likelihood that the project will be maintained or expanded after Federal assistance under this

subsection is completed;

(C) represent a partnership of public and private entities; and

(D) exceed the minimum requirements of subsection (c)(1)(B).

(e) Pilot Project Requirements.—

(1) MAXIMUM AMOUNT.—The Secretary shall provide not more than $20,000,000 in Federal assistance under the pilot program to any applicant.

(2) COST SHARING.—The non-Federal share of the cost of any activity relating to renewable fuel infrastructure development carried out using funds from a grant under this section shall be not less than 20 percent.

(3) MAXIMUM PERIOD OF GRANTS.—The Secretary shall not provide funds to any applicant under the pilot program for more than 2 years.

(4) DEPLOYMENT AND DISTRIBUTION.—The Secretary shall seek, to the maximum extent practicable, to ensure a broad geographic distribution of project sites funded by grants under this section.

(5) TRANSFER OF INFORMATION AND KNOWLEDGE.—The Secretary shall establish mechanisms to ensure that the information and knowledge gained by participants in the pilot program are transferred among the pilot program participants and to other interested parties, including other applicants that submitted applications.

(f) Schedule.—

(1) INITIAL GRANTS.—

(A) IN GENERAL.—Not later than 90 days after the date of enactment of this Act, the Secretary shall publish in the Federal Register, Commerce Business Daily, and such other publications as the Secretary considers to be appropriate, a notice and request for applications to carry out projects under the pilot program.

(B) DEADLINE.—An application described in subparagraph (A) shall be submitted to the Secretary by not later than 180 days after the date of publication of the notice under that subparagraph.

(C) INITIAL SELECTION.—Not later than 90 days after the date by which applications for grants are due under subparagraph (B), the Secretary shall select by competitive, peer-reviewed proposal up to 5 applications for projects to be awarded a grant under the pilot program.

(2) ADDITIONAL GRANTS.—

(A) IN GENERAL.—Not later than 2 years after the date of enactment of this Act, the Secretary shall publish in the Federal Register, Commerce Business Daily, and such other publications as the Secretary considers to be appropriate, a notice and request for additional applications to carry out projects under the pilot program that incorporate the information and knowledge obtained through the implementation of the first round of projects authorized under the pilot program.

(B) DEADLINE.—An application described in subparagraph (A) shall be submitted to the Secretary by not later than 180 days after the date of publication of the notice under that subparagraph.

(C) INITIAL SELECTION.—Not later than 90 days after the date by which applications for grants are due under subparagraph (B), the Secretary shall select by competitive, peer-reviewed proposal such additional applications for projects to be awarded a grant under the pilot program as the Secretary determines to be appropriate.

(g) Reports to Congress.—

(1) INITIAL REPORT.—Not later than 60 days after the date on which grants are awarded under this section, the Secretary shall submit to Congress a report containing—

(A) an identification of the grant recipients and a description of the projects to be funded under the pilot program;

(B) an identification of other applicants that submitted applications for the pilot program but to which funding was not provided; and

(C) a description of the mechanisms used by the Secretary to ensure that the information and knowledge gained by participants in the pilot program are transferred among the pilot program participants and to other interested parties, including other applicants that submitted applications.

(2) EVALUATION.—Not later than 2 years after the date of enactment of this Act, and annually thereafter until the termination of the pilot program, the Secretary shall submit to Congress a report containing an evaluation of the effectiveness of the pilot program, including an assessment of the petroleum displacement and benefits to the environment derived from the projects included in the pilot program.

(h) Authorization of Appropriations.—There is authorized to be appropriated to the Secretary to carry out this section $200,000,000, to remain available until expended.

SECTION. XXX, BIOMASS CROP RESEARCH AND DEVELOPMENT

(a) In general – The Secretary, in consultation with the USDA, shall establish a competitive grant program to provide 20 geographically disbursed universities to conduct pilot biomass energy crop research, including yield maximization, input minimization, storage, and handling of biomass at five sites managed by each of the twenty universities.

(b) Grant Purposes – A grant under this section shall be used for the establishment of biomass energy crops over two million acres including-

a. Maximizing the yield potential of various potential biomass crops in various parts of the country with a view to establishing long term goals for the biomass potential in the country and selecting optimal crops for each region of the country.

b. Providing low cost biomass feedstocks to early producers of advanced biofuels.

c. Optimizing crop management, including sustainable ways to produce biomass crops, optimal crop rotation schemes

d. Establishing best practices for harvesting and storage and handling of biomass crops.

SEC. 202. BIOENERGY RESEARCH AND DEVELOPMENT.

Section 931(c) of the Energy Policy Act of 2005 (42 U.S.C. 16231(c)) is amended—

(1) in paragraph (1), by striking "$213,000,000" and inserting "$326,000,000";

(2) in paragraph (2), by striking "$251,000,000" and inserting "$377,000,000"; and

(3) in paragraph (3), by striking "$274,000,000" and inserting "$398,000,000".

SEC. 203. BIORESEARCH CENTERS FOR SYSTEMS BIOLOGY PROGRAM.

Section 977(a)(1) of the Energy Policy Act of 2005 (42 U.S.C. 16317(a)(1)) is amended by inserting before the period at the end the following: ", including the establishment of at least 7 bioresearch centers that focus on biofuels, of which at least 1 center shall be located in each of the 4 Petroleum Administration for Defense Districts with no subdistricts and 1 center shall be located in each of the subdistricts of the Petroleum Administration for Defense District with subdistricts".

SEC. 204. LOAN GUARANTEES FOR RENEWABLE FUEL FACILITIES.

(a) In General.—Section 1703 of the Energy Policy Act of 2005 (42 U.S.C. 16513) is amended by adding at the end the following:

"(f) Renewable Fuel Facilities.—

"(1) IN GENERAL.—The Secretary may make guarantees under this title for projects that produce advanced biofuel (as defined in section 2 of the Biofuels for Energy Security and Transportation Act of 2007).

"(2) REQUIREMENTS.—A project under this subsection shall employ new or significantly improved technologies for the production of renewable fuels as compared to commercial technologies in service in the United States at the time that the guarantee is issued. ***Such new technologies must have the potential to achieve scalability and competitive cost with traditional biofuels within five years.***

Comment [vk12]: I would suggest a limit of the first five plants of any substantially similar technology. Eligibility for low cost loans is key to getting these going.

"(3) ISSUANCE OF FIRST LOAN GUARANTEES.—The requirement of section 20320(b) of division B of the Continuing Appropriations Resolution, 2007 (Public Law 109–289, Public Law 110–5), relating to the issuance of final regulations, shall

not apply to the first 6 guarantees issued under this subsection.

"(4) PROJECT DESIGN.—A project for which a guarantee is made under this subsection shall have a project design that has been validated through the operation of a continuous process pilot facility with an annual output of at least 50,000 gallons of ethanol.

"(5) MAXIMUM GUARANTEED PRINCIPAL.—The total principal amount of a loan guaranteed under this subsection may not exceed $250,000,000 for a single facility.

"(6) AMOUNT OF GUARANTEE.—The Secretary shall guarantee 100 percent of the principal and interest due on 1 or more loans made for a facility that is the subject of the guarantee under paragraph (3).

"(7) DEADLINE.—The Secretary shall approve or disapprove an application for a guarantee under this subsection not later than 90 days after the date of receipt of the application.

"(8) REPORT.—Not later than 30 days after approving or disapproving an application under paragraph (7), the Secretary shall submit to Congress a report on the approval or disapproval (including the reasons for the action).".

(b) Improvements to Underlying Loan Guarantee Authority.—

(1) DEFINITION OF COMMERCIAL TECHNOLOGY.—Section 1701(1) of the Energy Policy Act of 2005 (42 U.S.C. 16511(1)) is amended by striking subparagraph (B) and inserting the following:

"(B) EXCLUSION.—The term 'commercial technology' does not include a technology if the sole use of the technology is in connection with—

"(i) a demonstration plant; or

"(ii) a project for which the Secretary approved a loan guarantee.".

"(iii) fewer than five commercial plants built with substantially similar technology

(2) SPECIFIC APPROPRIATION OR CONTRIBUTION.—Section 1702 of the Energy Policy Act of 2005 (42 U.S.C. 16512) is amended by striking subsection (b) and inserting the following:

"(b) Specific Appropriation or Contribution.—

"(1) IN GENERAL.—No guarantee shall be made unless—

"(A) an appropriation for the cost has been made; or

"(B) the Secretary has received from the borrower a payment in full for the cost of the obligation and deposited the payment into the Treasury.

"(2) LIMITATION.—The source of payments received from a borrower under paragraph (1)(B) shall not be a loan or other debt obligation that is made or guaranteed by the Federal Government.

"(3) RELATION TO OTHER LAWS.—Section 504(b) of the Federal Credit Reform Act of 1990 (2 U.S.C. 661c(b)) shall not apply to a loan or loan guarantee made in

Comment [vk13]: I would suggest the use of a minimum amount of investor equity that should be first at risk (for e.g. 20% of project cost) instead of the 50,000 gallon number. If investors are subordinated to the Federal loan guarantee the program will achieve its purpose. No investor will want to lose their equity and they will be prudent about the projects where they request loan guarantees.

accordance with paragraph (1)(B).".

(3) AMOUNT.—Section 1702 of the Energy Policy Act of 2005 (42 U.S.C. 16512) is amended by striking subsection (c) and inserting the following:

"(c) Amount.—

"(1) IN GENERAL.—Subject to paragraph (2), the Secretary shall guarantee up to 100 percent of the principal and interest due on 1 or more loans for a facility that are the subject of the guarantee.

"(2) LIMITATION.—The total amount of loans guaranteed for a facility by the Secretary shall not exceed 80 percent of the total cost of the facility, as estimated at the time at which the guarantee is issued.".

(4) SUBROGATION.—Section 1702(g)(2) of the Energy Policy Act of 2005 (42 U.S.C. 16512(g)(2)) is amended—

(A) by striking subparagraph (B); and

(B) by redesignating subparagraph (C) as subparagraph (B).

SEC. 205. GRANTS FOR RENEWABLE FUEL PRODUCTION RESEARCH AND DEVELOPMENT IN CERTAIN STATES.

(a) In General.—The Secretary shall provide grants to eligible entities to conduct research into, and develop and implement, renewable fuel production technologies in States with low rates of ethanol production, including low rates of production of cellulosic biomass ethanol.

(b) Eligibility.—To be eligible to receive a grant under the section, an entity shall—

(1)(A) be an institution of higher education (as defined in section 2 of the Energy Policy Act of 2005 (42 U.S.C. 15801)) located in a State described in subsection (a); or

(B) be a consortium of such institutions of higher education, industry, State agencies, or local government agencies located in the State; and

(2) have proven experience and capabilities with relevant technologies.

(c) Authorization of Appropriations.—There is authorized to be appropriated to carry out this section $25,000,000 for each of fiscal years 2008 through 2010.

SEC. 206. GRANTS FOR INFRASTRUCTURE FOR TRANSPORTATION OF BIOMASS TO LOCAL BIOREFINERIES.

(a) In General.—The Secretary shall conduct a program under which the Secretary shall provide grants to local governments and other eligible entities (as determined by the Secretary) (referred to in this section as "eligible entities") to promote the development of infrastructure to support the transportation of biomass to local biorefineries, including by

portable processing equipment.

(b) Phases.—The Secretary shall conduct the program in the following phases:

(1) DEVELOPMENT.—In the first phase of the program, the Secretary shall make grants to eligible entities to assist the eligible entities in the development of local projects to promote the development of infrastructure to support the transportation of biomass to local biorefineries, including by portable processing equipment.

(2) IMPLEMENTATION.—In the second phase of the program, the Secretary shall make competitive grants to eligible entities to implement projects developed under paragraph (1).

(c) Authorization of Appropriations.—There are authorized to be appropriated such sums as are necessary to carry out this section.

SEC. 207. BIOREFINERY INFORMATION CENTER.

(a) In General.—The Secretary, in cooperation with the Secretary of Agriculture, shall establish a biorefinery information center to make available to interested parties information on—

(1) renewable fuel resources, including information on programs and incentives for renewable fuels;

(2) renewable fuel producers;

(3) renewable fuel users; and

(4) potential renewable fuel users.

(b) Administration.—In administering the biorefinery information center, the Secretary shall—

(1) continually update information provided by the center;

(2) make information available to interested parties on the process for establishing a biorefinery; and

(3) make information and assistance provided by the center available through a toll-free telephone number and website.

(c) Authorization of Appropriations.—There are authorized to be appropriated such sums as are necessary to carry out this section.

SEC. 208. CONVERSION ASSISTANCE FOR CELLULOSIC BIOMASS, WASTE-DERIVED ETHANOL, APPROVED RENEWABLE FUELS.

(a) Definitions.—In this section:

(1) APPROVED RENEWABLE FUEL.—The term “approved renewable fuels” means an alternative or replacement fuel that—

(A) has been approved under title III of the Energy Policy Act of 1992 (42

U.S.C. 13211 et seq.); and

(B) is made from renewable biomass.

(2) PRODUCER.—The term "producer" means—

(A) a merchant producer;

(B) a farm or dairy cooperative; or

(C) an association of agricultural producers.

(3) WASTE-DERIVED ETHANOL.—The term "waste-derived ethanol" means ethanol derived from—

(A) animal waste (including poultry fat and poultry waste) and other waste material; or

(B) municipal solid waste.

(b) Conversion Assistance.—The Secretary may provide grants to producers of cellulosic biomass ethanol, waste-derived ethanol, and approved renewable fuels in the United States to assist the producers in building eligible production facilities described in subsection (c) for the production of ethanol or approved renewable fuels ***provided that such new technologies have the potential to achieve scalability and competitive cost with traditional biofuels within five years and their potential production by 2030 exceeds 25% of US biofuels requirements.***

(c) Eligible Production Facilities.—A production facility shall be eligible to receive a grant under this section if the production facility—

(1) is located in the United States; and

(2) uses renewable biomass.

(d) Authorization of Appropriations.—There are authorized to be appropriated to carry out this section—

(1) $400,000,000 for fiscal year 2008;

(2) $500,000,000 for fiscal year 2009; and

(3) $600,000,000 for fiscal year 2010.

SEC. 209. ALTERNATIVE FUEL DATABASE AND MATERIALS.

The Secretary and the Director of the National Institute of Standards and Technology shall jointly establish and make available to the public—

(1) a database that describes the physical properties of different types of alternative fuel; and

(2) standard reference materials for different types of alternative fuel ***or fuel mixtures.***

(3) define the fuel specifications as broadly as possibel to encourage innovation,

lower costs of each unit of energy in fuels and fuel mixtures, and related specifications.

SEC. 210. FUEL TANK CAP LABELING REQUIREMENT.

Section 406(a) of the Energy Policy Act of 1992 (42 U.S.C. 13232(a)) is amended—

(1) by striking "The Federal Trade Commission" and inserting the following:

"(1) IN GENERAL.—The Federal Trade Commission"; and

(2) by adding at the end the following:

"(2) FUEL TANK CAP LABELING REQUIREMENT.—Beginning with model year 2010, the fuel tank cap of each alternative fueled vehicle manufactured for sale in the United States shall be clearly labeled to inform consumers that such vehicle can operate on alternative fuel ***and the fuel tank cap will be of a designated color."***

TITLE III—STUDIES

SEC. 301. STUDY OF ADVANCED BIOFUELS TECHNOLOGIES.

(a) In General.—Not later than October 1, 2012, the Secretary shall offer to enter into a contract with the National Academy of Sciences under which the Academy shall conduct a study of technologies relating to the production, transportation, and distribution of advanced biofuels ***and feedstocks for such biofuels.***

(b) Scope.—In conducting the study, the Academy shall—

(1) include an assessment of the maturity of advanced biofuels technologies;

(2) consider whether the rate of development of those technologies will be sufficient to meet the advanced biofuel standards required under section 101;

(3) consider the effectiveness of the research and development programs and activities of the Department of Energy relating to advanced biofuel technologies; and

(4) make policy recommendations to accelerate the development of those technologies to commercial viability, as appropriate.

(c) Report.—Not later than November 30, 2014, the Secretary shall submit to the Committee on Energy and Natural Resources of the Senate and the Committee on Energy and Commerce of the House of Representatives a report describing the results of the study conducted under this section.

SEC. 302. STUDY OF INCREASED CONSUMPTION OF ETHANOL-BLENDED GASOLINE WITH HIGHER LEVELS OF ETHANOL.

(a) In General.—The Secretary (in cooperation with the Secretary of Agriculture, the Administrator of the Environmental Protection Agency, and the Secretary of Transportation) shall conduct a study of the feasibility of increasing consumption in the United States of ethanol-blended gasoline with levels of ethanol that are not less than 10 percent and not more than 25 percent, including a study of production and infrastructure constraints on increasing the consumption.

(b) Report.—Not later than 1 year after the date of enactment of this Act, the Secretary shall submit to Congress a report describing the results of the study conducted under this section.

SEC. 303. PIPELINE FEASIBILITY STUDY.

(a) In General.—The Secretary, in coordination with the Secretary of Agriculture and the Secretary of Transportation, shall conduct a study of the feasibility of the construction of dedicated ethanol pipelines.

(b) Factors.—In conducting the study, the Secretary shall consider—

(1) the quantity of ethanol production that would make dedicated pipelines economically viable;

(2) existing or potential barriers to dedicated ethanol pipelines, including technical, siting, financing, and regulatory barriers;

(3) market risk (including throughput risk) and means of mitigating the risk;

(4) regulatory, financing, and siting options that would mitigate risk in those areas and help ensure the construction of 1 or more dedicated ethanol pipelines;

(5) financial incentives that may be necessary for the construction of dedicated ethanol pipelines, including the return on equity that sponsors of the initial dedicated ethanol pipelines will require to invest in the pipelines;

(6) technical factors that may compromise the safe transportation of ethanol in pipelines, identifying remedial and preventative measures to ensure pipeline integrity; and

(7) such other factors as the Secretary considers appropriate.

(c) Report.—Not later than 15 months after the date of enactment of this Act, the Secretary shall submit to Congress a report describing the results of the study conducted under this section.

SEC. 304. STUDY OF OPTIMIZATION OF ALTERNATIVE FUELED VEHICLES TO USE E-85 FUEL.

(a) In General.—The Secretary shall conduct a study of methods of increasing the fuel efficiency of alternative fueled vehicles by optimizing alternative fueled vehicles to operate using E-85 fuel.

(b) Report.—Not later than 180 days after the date of enactment of this Act, the

Secretary shall submit to the Committee on Energy and Natural Resources of the Senate and the Committee on Natural Resources of the House of Representatives a report that describes the results of the study, including any recommendations of the Secretary.

SEC. 305. STUDY OF CREDITS FOR USE OF RENEWABLE ELECTRICITY IN ELECTRIC VEHICLES.

(a) Definition of Electric Vehicle.—In this section, the term "electric vehicle" means an electric motor vehicle (as defined in section 601 of the Energy Policy Act of 1992 (42 U.S.C. 13271)) for which the rechargeable storage battery—

(1) receives a charge directly from a source of electric current that is external to the vehicle; and

(2) provides a minimum of 80 percent of the motive power of the vehicle.

(b) Study.—The Secretary shall conduct a study on the feasibility of issuing credits under the program established under section 101(d) to electric vehicles powered by electricity produced from renewable energy sources.

(c) Report.—Not later than 18 months after the date of enactment of this Act, the Secretary shall submit to the Committee on Energy and Natural Resources of the Senate and the Committee on Energy and Commerce of the House of Representatives a report that describes the results of the study, including a description of—

(1) existing programs and studies on the use of renewable electricity as a means of powering electric vehicles; and

(2) alternatives for—

(A) designing a pilot program to determine the feasibility of using renewable electricity to power electric vehicles as an adjunct to a renewable fuels mandate;

(B) allowing the use, under the pilot program designed under subparagraph (A), of electricity generated from nuclear energy as an additional source of supply;

(C) identifying the source of electricity used to power electric vehicles; and

(D) equating specific quantities of electricity to quantities of renewable fuel under section 101(d).

Appendix B – Khosla Ventures Portfolio

Cellulosic:

Mascoma - Mascoma Corporation is leading the development of bioprocess technologies for cost-effective conversion of cellulosic biomass to ethanol.

Celunol - Celunol is a leader in the effort to commercialize the production of cellulosic ethanol from an engineered bacterium.

Range – Will build the first commercial cellulosic ethanol plant in the US using a proprietary anaerobic conversion and heterogeneous catalyst technology.

Coskata – Coskata is commercializing a fermentation technology for the production of fuel-grade ethanol from syngas.

Corn/Sugar Fuels:

Altra – Altra intends to become the leading integrated biofuels company in the U.S., producing ethanol and biodiesel from a variety of feedstocks

Cilion - Cilion is building destination ethanol plants, promising to be the cheapest and greenest ethanol from initially corn and incorporating cellulosic technologies as they come online.

Hawaii Bio – HBE is actively researching sugarcane and other potential fuel crops, processing techniques, and distribution channels for the production of renewable bio-fuels within Hawaii.

Brenco – Brenco uses Brazilian sugar-cane to produce ethanol in various mills across Brazil.

Future Fuels

LS 9 - LS9, Inc., the Renewable Petroleum Company™, is combining synthetic biology and cellulosic feedstocks to make petroleum replacements from bacteria

Gevo – Gevo is a leader in the bacterial production of biobutanol from sugars and cellulose.

Amyris - Amyris Biotechnologies is translating the promise of synthetic biology into industrial production of fermentation diesel and higher alcohols from sugars and cellulose.

LanzaTech – LanzaTech is developing a proprietary fermentation technology to convert industrial flue gas from steel mills as a resource for bio-ethanol production.

Efficiency:

Transonic – Transonic is using proprietary fuel injection technology to increase the efficiency of gasoline engines by 3X

Appendix C.1 – Income to Farmers from Biomass and Corn

This chart looks at the potential benefit to a farmer from planting biomass vs. corn under two price scenarios – in both cases, Biomass appears to be the attractive option.

	Biomass	Corn
Grain yield (bushel)	N/A	150
Grain price ($/bushel)	N/A	$3.50 / $3.00
Biomass yield (tons)	15	2
Biomass price ($/ton)	$40 / $30	$40 / $30
Total revenue	**$600 / $450**	**$605 /$ 510**
Variable costs	$84	$168
Amortized fixed costs	$36	$66
Net return	**$480 / $330**	**$371 / $276**

Source: Ceres Company, Khosla Ventures

Appendix C.2 – Economies of Miscanthus Farming vs. Corn/Soy Rotation

This study, down by the University of Illinois, compares the relative profitability of planting a hectare of a corn/soy rotation to growing Miscanthus over a 10 year period. The net results are staggering – the corn/soybean rotation provides a loss of $903 (hence farmers need farm subsidies to stay in business) over the period, while the miscanthus rotation provides a profit of $2,900. This makes biomass an attractive crop fro farmers to grow.

Annual and extended projected costs and profits for two cropping systems in Central Illinois over a 10 year period.

Costs ($ ha^{-1})	Corn/Soybean[1] rotation			*Miscanthus*[2] energy crop			
	Corn	*Soy*	**10 years**[3]	*1st year*	*2nd year*	*3rd–10th*	**10 years**
Fertilizer	131	47	**621**	62	60	23	**242**
Pesticides	77	79	**520**	15	0	0	**15**
Seed	84	47	**445**	316	0	0	**316**
Crop Drying	17	5	**77**	0	0	0	**0**
Machinery repair, fuel, hire	67	59	**423**	45	101	95	**635**
Labor	89	84	**580**	84	82	77	**562**
TOTAL VARIABLE COSTS	464	321	**2657**	521	242	195	**1770**
Machinery overhead, housing, depreciation, non-land interest	257	198	**1533**	22	58	54	**360**
Land	373	373	**2496**	373	362	341	**2496**
TOTAL OTHER COSTS	630	571	**4029**	395	420	396	**2856**
TOTAL ALL COSTS	1094	892	**6686**	916	662	591	**4626**
Yield (tons ha^{-1})	*10.5*	*3.5*					
Yield, (dry tons ha^{-1})				*0*	*17*	*35*	
Value ($ ton^{-1})	*98*	*195*		*40*	*39*	*38*	
GROSS REVENUE ($ ha^{-1})	1020	681	**5783**	0	663	1330	**7527**
NET PROFIT[4] ($ ha^{-1})	–74	–210	**–903**	–916	1	739	**2900**

[1] Corn and soybean costs and average yields for Central Illinois after (Hoeft et al. 2000) and prices based on Chicago Board of Trade Dec. 2002 futures.

[2] Miscanthus seed costs based on (Lewandowski et al. 2000) and harvest costs assuming cutting and baling as for corn silage. Machinery costs from University of Minnesota Extension and Illinois Farm Business Farm Management Association. A predicted yield of 35 t/ha for Central IL is assumed (Figure 1), and a price of $40/t. This compares to $44 /t proposed by (McLaughlin et al. 2002) for US biomass crops and an EU suggested price of $49 /t (Bullard 2001).

[3] Total values over 10 years, discounted annually at 3%.

[4] Farm gate price, excluding subsidies.

Source: http://www.aces.uiuc.edu/DSI/MASGC.pdf

Appendix D – Sampling of Biofuels Companies

The focus n biofuels has re-vitalized interest in the last year. Many new companies have been formed and old ones revitalized.

Terrabon – Terrabon is developing and commercializing the Mixalco Process, which involved the conversion of piles of biomass to organics acids using mixed microbial cultures, folloed by the chemical conversion of the acids to a liquid fuel.

BIOeCON – The biomass-waste will be directly converted with the use of a selective catalyst into a useful bio-oil. This will be an ethically and ecologically justified raw material: Green oil, ready for further processing in existing petrochemical refineries instead of fossil based crude oil.

Cobalt – Cobalt Biofuels is a renewable fuels company based in Mountain View, California, specializing in technology and processes for the transportation fuel industry.

Advanced Biofuels – Advanced BioFuels is at the forefront of research and development of combustible fuels, with a focus on butanol, derived from biological, renewable sources.

Environmental Energy – Environmental Energy is concentrated on the production of butanol using ABE fermentation.

Virent – Virent Energy Systems, Inc., headquartered in Madison, Wis., is dedicated to enabling the hydrogen economy by dramatically increasing energy densities and eliminating hydrogen storage issues through widespread use of its Aqueous Phase Reforming (APR) process. Virent's APR system offers a cost-effective method for producing hydrogen and natural gas using a renewable biomass. Virent is also developing routes to hydrocarbons.

BioFine – BioFine has designed a process that converts cellulosic biomass such as paper mill sludge, municipal solid waste, unrecyclable waste paper, waste wood and agricultural residues into chemicals for fuel, pesticides and other useful material.

LiveFuels – LiveFuels is partnering with Sandia National Labs to devise a version of car fuel out of algae. The algae would be grown in ponds and then sold to refiners for conversion to petroleum.

Iogen – Iogen is a world leading biotechnology firm specializing in cellulose ethanol - a fully renewable, advanced biofuel that can be used in today's cars.

BRI – BRI Energy is a company that ferments gasified waste, biomass or hydrocarbons such as coal into ethanol.

Choren - CHOREN is one of the world's leading gasification technology companies for solid biomass and oil based residue feedstock. The center-piece of the technology is the patented Carbo-V® process that made the production of tar-free synthetic combustion gas possible and provided the breakthrough for the conversion of biomass to energy.

Imperium - Imperium Renewables Inc. (IRI) is a national leader in next generation biodiesel refining and manufacturing technology. IRI is a technology driven full service system provider, manufacturer, and engineering corporation that specializes in renewable fuels, especially the petroleum diesel replacement, biodiesel.

Aurora Biofuels – Aurora Biofuels is a California based renewables company that converts algae to biodiesel.

ClearFuels – ClearFuels uses the gasification of biomass to syngas and then chemical catalysis to ethanol

Green Biologics- Green Biologics has isolated thermophiles from a range of compost environments and has built a library of these micro-organisms capable of converting waste plant material into valuable chemicals, such as butanol and ethanol.

Agrivida – Agrivida engineers plants with dormant cellulytic enzymes which can be activated with an external stimulus.

Edenspace – Similar to Agrivida, Edenspace is developing enhanced crop plants.

Sun Ethanol - Consolidated bioprocessing (CBP) using clostridia for low cost cellulosic ethanol production

Dow Chemical – Dow Chemical Co. is exploring how it could use crops and other plant materials to replace oil and gas as a chemical feedstoc

Dupont - DuPont and the U.S. Department of Energy [DOE] are jointly funding a research program to develop technology to convert non-food agricultural feedstocks into ethanol. This program is focused on corn stover - the leaves, stalks and cobs that are left in the field after harvest.

Convertech – Convertech has developed a process using a continuous steam auto-hydrolysis technique to convert plant materials from various sources (like straw or forestry waste or new annual plant crops) into a range of biochemical co-products with a minimum expenditure in energy.

Metabolix - Metabolix applies the cutting edge tools of biotechnology to create a new generation of highly versatile, sustainable, biobased, biodegradable, natural plastics and chemicals.

Changing Waste Technologies – Changing Waste Technologies, in Arkansas, is using animal waste (amongst others) to generate energy sources

Genotypes, Inc – Genotypes Inc is a biochemistry firm based in Pacifica, CA that is engineering yeast towards the production of biofuels

C3 BioEnergy - C3 BioEnergy will manufacture renewable propane and a hydrogen by-product from biomass feedstocks.

Advanced Catalyst Systems – Advanced Catalyst Systems is working on producing gasoline, diesel, and aromatics from ethanol using catalysts

Appendix E.1 – How Much Ethanol Can We Produce?

These are Khosla Ventures projections of the expected yields of cellulosic ethanol from 2005 to 2030, accounting for improvements in yield efficiency and increases in land usage. Over the period, crop yields are likely to increase four-fold! Additionally, it's worth noting that the gasoline demand does not take into account increased engine efficiencies (such as that proposed by Transonic, one of our investments) or increased CAFÉ (Demand is projected to grow 1% per year along historical lines.).

Year	Yield (tons/ac)	Yield (Gals/ton)	Million Acres Biomass Ac.	Production Cellu.Eth. Gals (Billions)	Production Corn Eth. Gals (Billions)	Production Total Eth (gals) (Billions)	Ethaol Prod. Gas. Eq Gals (Billions)	Gasoline Demand(1%) (Billions Gal)
2005	6	80	0	0	4.0	4.0	3.2	140
2006	6.3	83.2	0	0	4.8	4.8	3.8	141.4
2007	6.6	86.5	0	0	5.8	5.8	4.6	142.8
2008	6.9	90.0	0	0.0	6.9	6.9	5.5	144.2
2009	7.3	93.6	0.1	0.1	8.3	8.4	6.7	145.7
2010	7.8	97.3	1	0.8	10.0	10.7	8.6	147.1
2011	8.3	98.3	3	2.5	10.9	13.4	10.7	148.6
2012	8.9	99.3	5	4.4	12.0	16.5	13.2	150.1
2013	9.6	100.3	7.5	7.2	13.2	20.4	16.4	151.6
2014	10.2	101.3	10	10.4	14.6	24.9	19.9	153.1
2015	10.9	102.3	13	14.6	14.6	29.1	23.3	154.6
2016	11.7	103.3	16	19.4	14.6	33.9	27.1	156.2
2017	12.5	104.4	19	24.8	14.6	39.4	31.5	157.8
2018	13.4	105.4	22	31.1	14.6	45.7	36.5	159.3
2019	14.3	106.5	25	38.2	14.6	52.8	42.2	160.9
2020	15.4	107.5	28	46.2	14.6	60.8	48.6	162.5
2021	16.3	108.6	31	54.8	14.6	69.3	55.5	164.2
2022	17.2	109.7	34	64.3	14.6	78.9	63.1	165.8
2023	18.3	110.0	37	74.4	14.6	89.0	71.2	167.5
2024	19.4	110.0	40	85.3	14.6	99.8	79.9	169.1
2025	20.5	110.0	43	97.2	14.6	111.7	89.4	170.8
2026	21.8	110.0	46	110.2	14.6	124.8	99.8	172.5
2027	23.1	110.0	49	124.4	14.6	139.0	111.2	174.3
2028	24.5	110.0	52	140.0	14.6	154.5	123.6	176.0
2029	24.5	110.0	56	150.9	14.6	165.5	132.4	177.8
2030	24.5	110.0	60	161.7	14.6	176.3	141.0	179.5

Appendix E.2 – How Much Ethanol Can We Use (based on FFV's on the road)?

The table below contains projections of the expected trajectory of FFV vehicles and E85 demand in the US, assuming the implementation of an RPS standard and the FFV mandates discussed earlier.

		New cars/yr	New FFV's	Cum FFV Cars	% E85 (per car fuel %)	E85 Demand
		(000's)	(000's)	(000's)		(Billion Gallons)
2005		16,177	1,000	1,000		
2006		15,944	1,000	2,000		
2007		16,328	2,000	4,000		
2008		16,442	2,000	6,000		
2009		16,637	3,327	9,327	0.1	1
2010		16,799	5,040	14,367	0.15	2
2011		16,977	6,791	21,158	0.2	3
2012		17,085	8,543	29,700	0.25	6
2013		17,099	10,259	39,960	0.3	9
2014		17,139	11,997	51,957	0.35	14
2015		17,164	12,015	63,972	0.4	19
2016		17,281	12,097	76,069	0.45	26
2017		17,450	12,215	88,284	0.5	33
2018		17,664	12,365	100,648	0.55	42
2019		17,833	12,483	113,132	0.6	51
2020		18,011	12,608	125,739	0.65	61
2021		18,246	12,772	137,511	0.7	72
2022		18,508	12,956	149,467	0.75	84
2023		18,788	13,152	160,619	0.75	90
2024		19,077	13,354	171,973	0.75	97
2025		19,356	13,549	182,194	0.75	102
2026		19,664	13,765	190,919	0.75	107
2027		19,953	13,967	198,096	0.75	111
2028		20,192	14,134	203,688	0.75	115
2029		20,467	14,327	207,755	0.75	117
2030		20,735	14,515	210,272	0.75	118

Estimate assumes adoption of policy recommendations for flex-fuel mandates
Does not include "other" gasoline use (lawnmowers, boats,…), hybrid or plug-in hybrid FFV's, lighter vehicles, higher CAFÉ standards etc.

Appendix F – DOE Grant Press Release

United States Department of Energy

Office of Public Affairs

Washington, D.C. 20585

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For Immediate Release
February 28, 2007

DOE Selects Six Cellulosic Ethanol Plants for Up to $385 Million in Federal Funding

Funding to help bring cellulosic ethanol to market and help revolutionize the industry

WASHINGTON, DC – U.S. Department of Energy (DOE) Secretary Samuel W. Bodman today announced that DOE will invest up to $385 million for six biorefinery projects over the next four years. When fully operational, the biorefineries are expected to produce more than 130 million gallons of cellulosic ethanol per year. This production will help further President Bush's goal of making cellulosic ethanol cost-competitive with gasoline by 2012 and, along with increased automobile fuel efficiency, reduce America's gasoline consumption by 20 percent in ten years.

"These biorefineries will play a critical role in helping to bring cellulosic ethanol to market, and teaching us how we can produce it in a more cost effective manner," Secretary Bodman said. "Ultimately, success in producing inexpensive cellulosic ethanol could be a key to eliminating our nation's addiction to oil. By relying on American ingenuity and on American farmers for fuel, we will enhance our nation's energy and economic security."

Today's announcement is one part of the Bush Administration's comprehensive plan to support commercialization of scientific breakthroughs on biofuels. Specifically, these projects directly support the goals of President Bush's Twenty in Ten Initiative, which aims to increase the use of renewable and alternative fuels in the transportation sector to the equivalent of 35 billion gallons of ethanol a year by 2017. Funding for these projects is an integral part of the President's Biofuels Initiative that will lead to the wide-scale use of non-food based biomass, such as agricultural waste, trees, forest residues, and perennial grasses in the production of transportation fuels, electricity, and other products. The solicitation, announced a year ago, was initially for three biorefineries and $160 million. However, in an effort to expedite the goals of President Bush's Advanced Energy Initiative and help achieve the goals of his Twenty in Ten Initiative, within authority of the Energy Policy Act of 2005 (EPAct 2005), Section 932, Secretary Bodman raised the funding ceiling.

"We had a number of very good proposals, but these six were considered 'meritorious'

by a merit review panel made up of bioenergy experts. So I thought it would be best to front-end some more funding now, so that we could all reap the benefits of the President's vision sooner," Secretary Bodman said.

Combined with the industry cost share, more than $1.2 billion will be invested in these six biorefineries. Negotiations between the selected companies and DOE will begin immediately to determine final project plans and funding levels. Funding will begin this fiscal year and run through FY 2010. EPAct authorized DOE to solicit and fund proposals for the commercial demonstration of advanced biorefineries that use cellulosic feedstocks to produce ethanol and co-produce bioproducts and electricity.

The following six projects were selected:

- **Abengoa Bioenergy Biomass of Kansas, LLC of Chesterfield, Missouri, up to $76 million.**
  The proposed plant will be located in the state of Kansas. The plant will produce 11.4 million gallons of ethanol annually and enough energy to power the facility, with any excess energy being used to power the adjacent corn dry grind mill. The plant will use 700 tons per day of corn stover, wheat straw, milo stubble, switchgrass, and other feedstocks.
  Abengoa Bioenergy Biomass investors/participants include: Abengoa Bioenergy R&D, Inc.; Abengoa Engineering and Construction, LLC; Antares Corp.; and Taylor Engineering.
- **ALICO, Inc. of LaBelle, Florida, up to $33 million.**
  The proposed plant will be in LaBelle (Hendry County), Florida. The plant will produce 13.9 million gallons of ethanol a year and 6,255 kilowatts of electric power, as well as 8.8 tons of hydrogen and 50 tons of ammonia per day. For feedstock, the plant will use 770 tons per day of yard, wood, and vegetative wastes and eventually energycane.
  ALICO, Inc. investors/participants include: Bioengineering Resources, Inc. of Fayetteville, Arkansas; Washington Group International of Boise, Idaho; GeoSyntec Consultants of Boca Raton, Florida; BG Katz Companies/JAKS, LLC of Parkland, Florida; and Emmaus Foundation, Inc.
- **BlueFire Ethanol, Inc. of Irvine, California, up to $40 million.**
  The proposed plant will be in Southern California. The plant will be sited on an existing landfill and produce about 19 million gallons of ethanol a year. As feedstock, the plant would use 700 tons per day of sorted green waste and wood waste from landfills.
  BlueFire Ethanol, Inc. investors/participants include: Waste Management, Inc.; JGC Corporation; MECS Inc.; NAES; and PetroDiamond.
- **Broin Companies of Sioux Falls, South Dakota, up to $80 million.**
  The plant is in Emmetsburg (Palo Alto County), Iowa, and after expansion, it will produce 125 million gallons of ethanol per year, of which roughly 25percent will be cellulosic ethanol. For feedstock in the production of cellulosic ethanol, the plant expects to use 842 tons per day of corn fiber, cobs, and stalks.
  Broin Companies participants include: E. I. du Pont de Nemours and Company;

Novozymes North America, Inc.; and DOE's National Renewable Energy Laboratory.

- **Iogen Biorefinery Partners, LLC, of Arlington, Virginia, up to $80 million.**
  The proposed plant will be built in Shelley, Idaho, near Idaho Falls, and will produce 18 million gallons of ethanol annually. The plant will use 700 tons per day of agricultural residues including wheat straw, barley straw, corn stover, switchgrass, and rice straw as feedstocks.
  Iogen Biorefinery Partners, LLC investors/partners include: Iogen Energy Corporation; Iogen Corporation; Goldman Sachs; and The Royal Dutch/Shell Group.
- **Range Fuels (formerly Kergy Inc.) of Broomfield, Colorado, up to $76 million.**
  The proposed plant will be constructed in Soperton (Treutlen County), Georgia. The plant will produce about 40 million gallons of ethanol per year and 9 million gallons per year of methanol. As feedstock, the plant will use 1,200 tons per day of wood residues and wood based energy crops.
  Range Fuels investors/participants include: Merrick and Company; PRAJ Industries Ltd.; Western Research Institute; Georgia Forestry Commission; Yeomans Wood and Timber; Truetlen County Development Authority; BioConversion Technology; Khosla Ventures; CH2MHill; Gillis Ag and Timber.

Cellulosic ethanol is an alternative fuel made from a wide variety of non-food plant materials (or feedstocks), including agricultural wastes such as corn stover and cereal straws, industrial plant waste like saw dust and paper pulp, and energy crops grown specifically for fuel production like switchgrass. By using a variety of regional feedstocks for refining cellulosic ethanol, the fuel can be produced in nearly every region of the country. Though it requires a more complex refining process, cellulosic ethanol contains more net energy and results in lower greenhouse emissions than traditional corn-based ethanol. E-85, an ethanol-fuel blend that is 85-percent ethanol, is already available in more than 1,000 fueling stations nationwide and can power millions of flexible fuel vehicles already on the roads.

For more information on President's Bush's Twenty in Ten Initiative, visit: http://www.whitehouse.gov/stateoftheunion/2007/initiatives/energy.html.

Abengoa One pager
Alico One pager
Blue Fire One pager
Broin One pager
Iogen One pager
Range Fuels one pager

U.S. Department of Energy, Office of Public Affairs, Washington, D.C.