Testimony

Subcommittee on Conservation, Credit, Energy, and Research

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Good Morning, Mr. Chairman and members of the Subcommittee, let me begin by thanking you for the opportunity to speak here today and represent my organization, the Environmental and Energy Study Institute. EESI is an independent non-profit organization founded by a bi-partisan Congressional caucus in 1984 to provide policymakers with reliable information on energy and environmental issues, to help develop consensus among a broad base of constituencies, and to work for innovative policy solutions. Our Board is interdisciplinary and is drawn from academia as well as the public and private sectors, including Dr. Rosina Bierbaum, Dean, School of Natural Resources and the Environment, University of Michigan, and Ambassador Richard Benedick, who was a lead U.S. negotiator of the Montreal Protocol. Our Board is chaired by Richard L. Ottinger of New York, a former chair of the House Energy & Power Subcommittee and the Dean Emeritus of Pace University Law School.

Summary

While skepticism about the reality of climate change has waned in light of overwhelming evidence, agreement on the policies, preferred technologies, and time frame for taking action are still very much in debate, and no clear consensus has yet emerged. Climate change and energy consumption have climbed to the top of the national policy agenda. Congress has addressed climate change in a number of pieces of energy legislation, including the *Energy Independence and Security Act of 2007* (P.L. 110-140) and the *Food, Conservation, and Energy Act of 2008 (P.L. 110-234)*, and we applaud this committee's leadership in this area. In addition, "green" technology has become an important economic driver. Multinational corporations and many others in the private sector, including many energy companies, have emerged as interested players in renewable energy and energy efficiency (RE/EE) technologies, seen as a way to combat climate change and improve their bottom lines. Biomass-to-energy technologies such as biofuels have been recognized by the federal government and many state governments, corporations and investors as a renewable energy technology that is a critical component of a climate change mitigation strategy.

At the same time the price of fossil fuels has skyrocketed due to a variety of factors, including fundamental restrictions in supply as development worldwide continues to fuel demand. Our nation's dependence on imported foreign oil poses a significant economic, energy, and national security challenge. In 2007, the transportation sector was 96 percent dependent on petroleum and consumed 70 percent of total U.S. petroleum demand,[1] of which roughly 60 percent was imported.[2] Such a reliance on foreign oil increases the vulnerability of the United States to higher oil prices and oil price shocks due to events such as natural disasters, terrorist attacks, and wars; undermines our ability to conduct foreign policy; and places us at the will of a small group of oil producing states that can use their market power to influence world oil prices.[3] There are many "hidden costs" or externalities associated with the consumption of imported oil including direct and indirect costs, oil supply disruption

[1] U.S. Energy Information Administration. Annual Energy Review. "U.S. Primary Energy Consumption by Source and Sector, 2007." June 23, 2008.
[2] U.S. Energy Information Administration. Monthly Energy Review. "Table 3.3a Petroleum Trade Overview." June 25, 2008. 43.
[3] Greene, David L., and Sanjana Ahmad. "Costs of U.S. Oil Dependence: 2005 Update." Oak Ridge National Laboratory. Paper prepared for U.S. Department of Energy. February 2005. xi.

impacts, and military expenditures.[4] According to the Government Accountability Office, the United States has subsidized the oil industry by more than $130 billion in the past 32 years.[5]

On December 19, 2007 the President and Congress took a huge step forward in trying to mitigate climate change and reduce our country's reliance on fossil fuels by enacting the Energy Independence and Security Act (EISA, P.L. 110-140). EISA substantially increases the Renewable Fuel Standard (RFS), calling for the production by 2022 of 36 billion gallons of renewable fuel with specific targets for greenhouse gas reductions. Within the 36 billion gallon mandate, 21 billion gallons must come from advanced biofuels, which means renewable fuel other than ethanol derived from corn starch. Additionally, there is a carve-out within the advanced fuels mandate that 16 billion gallons of cellulosic biofuel be derived from 'renewable biomass.' This is an aggressive and ambitious RFS. It is laudable, but it stirs up a lot of difficult issues regarding the sustainability of biofuels. One of the biggest factors in determining if a biofuel is sustainable is the choice of feedstocks used to produce the renewable fuel. Unfortunately, the definition of 'renewable biomass' included in the law deems several feedstocks ineligible, including thinning materials and woody residues from federal forests, some woody feedstocks from private forests, and a wide array of feedstocks from municipal solid waste.

Key Points :

- Renewable fuels are important to our climate and energy security strategy. They are reducing our dependence on foreign oil, reducing the cost of gasoline at the pump, and if produced sustainably, reducing greenhouse gas emissions.
- Renewable fuel facilities provide a market for low-value material produced through forest management practices.
- Abundant sources of woody biomass in the west can increase the distribution of liquid transportation fuels across the country. This will help to meet the large fuel markets of the west while further securing our energy supply.
- Mill residue and other woody materials create complications (in terms of collection) and should be carefully considered during implementation.
- Municipal solid waste is a low-value feedstock that several companies are investigating. Confusing or varying definitions included in public law create risk, limit innovation, and ultimately reduce the use of a feedstock currently considered a problem.
- Production of renewable fuels from low-value materials, such as woody biomass and municipal solid waste, reduces the pressure to develop feedstocks on sensitive land.
- A variety of stakeholders overwhelmingly support a broadening of feedstocks that could be eligible for the RFS. Specifically, low-value woody biomass sustainably harvested from both federal and private lands should be included.

Cellulosic biofuels can be produced from a highly diverse array of feedstocks, allowing every region of the country to be a potential producer of this fuel. (Cellulose is found in all plant matter.) As a result, support for cellulosic biofuels has brought together a broad array of constituents including environmentalists, farmers, national security experts, industry, and religious leaders. Unquestionably,

[4] Copulos, Milton, President of National Resource Defense Council Foundation. "The Hidden Cost of Oil." Testimony before the U.S. Senate Foreign Relations Committee. March 30, 2006. 1, 3.

[5] U.S. Government Accountability Office. "Petroleum and Ethanol Fuels: Tax Incentives and Related GAO Work." GAO/RCED-00-301R. September 25, 2000.

the production of renewable fuels needs to be done in a way that sequesters carbon and enhances natural resources, including soils, water supply and native habitats. Production of renewable feedstocks should not be deemed to be in competition with the goals of sustainable agriculture or forestry. In fact, there are opportunities for renewable fuel and energy production to aid conservation efforts and environmental sustainability beyond those associated conventional agriculture, forestry or fossil fuel production and consumption.

Renewable Fuels: Part of our Climate and Energy Security Strategy

EESI believes that the rapidly escalating pace of global climate change is the single most serious challenge facing the world today. According to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC)[6], the increase in concentration of greenhouse gases since the pre-industrial era is due primarily to human activities, especially the widespread combustion of fossil fuels. The report specifically concludes that the *"global net effect of human activities since 1750 has been one of warming"*. Evidence of existing climate change impacts is staggering, and alarming new ramifications of global warming are reported weekly. Among many such reports, scientists from the National Geographic Institute reported on June 20, 2008 that the Arctic Ocean may be ice-free this summer for the first time in recorded history[7]. Energy efficiency and renewable energy, specifically bioenergy, are important energy sources that can help mitigate phenomena such as this.

Renewable fuels are one of many important tools in the effort to reduce our national greenhouse gas emissions from the transportation sector. According to the U.S. Environmental Protection Agency's inventory of greenhouse gas emissions[8], the U.S. emitted a total of 7,260.4 Tg CO2-eq/yr in 2005, which was an increase of 16.3 percent compared to 1990. Twenty-three percent of these emissions (1669.9 Tg CO2-eq/yr) were from petroleum-based transportation fuels. Renewable fuels are especially attractive as a low- or no-carbon alternative to petroleum-based fuels such as gasoline and diesel. The technology is sustainable, rapid to implement, and available across the entire United States.

The United States has the resources necessary to provide for our energy needs, and renewable fuels can and will play a vital role as part of a larger strategy to diversify our energy supplies. A June 2008 report released by Merrill Lynch concluded that biofuels are the single largest contributor to global oil supply growth in light of the inability of non-OPEC crude oil supply to expand. *"According to the International Energy Agency, 'biofuels have become a substantial part of faltering non–OPEC supply growth, contributing around 50 percent of incremental supply in the 2008–2013 period."*[9] The use of domestically produced renewable fuels extends fuel supply by displacing the amount of foreign crude oil the United States needs to import.

According to the U.S. Energy Information Administration's 2008 International Energy Outlook, global energy consumption of liquids and other petroleum will grow from 83.6 million barrels of oil per day in 2005 to 112.5 million barrels of oil per day by 2030. The transportation sector will account for 74 percent of that increased demand, mostly from non-OECD nations. Additionally, world oil prices are

[6] IPCC, 2007: Summary for Policymakers. In: *Climate Change 2007: The Physical Science Basis. Contribution of Working Group 1 to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M.Tignor and H.L.Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.
[7] Mehta, Aolok. "North Pole May Be Ice-Free for First Time This Summer" June 20 2008 National Geography News
[8] U.S. Environmental Protection Agency. *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2005.* 15 April 2007.
[9] Renewable Fuels Association, Canadian Renewable Fuels Association, European Bioethanol Fuel Association, and UNICA. Financial Times. "OPEC Rakes in Billions, but Blames Biofuels…Confused?" July 16, 2008.

expected to be in the range of $113 to $186 per barrel in nominal terms in 2030.[10] Concern about a potential shortfall of supplies and high prices is intensified by the possibility of supply disruptions due to the instability of four of the top six sources of U.S. oil imports from the countries of Saudi Arabia, Venezuela, Nigeria, and Iraq.[11] Furthermore, two-thirds of the world's known oil reserves lie in the volatile Middle East,[12] while the United States contains less than three percent of the world's oil reserves but consumes one-quarter of the world's oil.[13]

Forests a Valuable Resource

Forests cover approximately one third of the nation's land area and much of that acreage is under some kind of forest management directive, whether that is timber management, habitat improvements, hazardous fuel reduction, or one of the many forms of stand improvement thinning activities. A number of NGOS support the use of sustainable woody biomass to produce renewable fuels. The Oregon Environmental Council said this in its 2005 *Fueling Oregon with Sustainable Biofuels* report,

> "*…if renewable fuels are produced sustainably, they can generate substantial reductions in greenhouse gas emissions and improvements in air and water quality…Thinning and removal of biomass from these forests* [at risk from fire] *would improve forest and provide a substantial supply of biomass for energy production. While there are clear environmental benefits to greater utilization of forest biomass, there are also real sustainability concerns."*[14]

Unfortunately, the majority of forest-derived feedstocks are rendered ineligible for the RFS because of the narrow definition of renewable biomass included in the law. As we read this definition, all materials harvested on national forests and public lands would be excluded (PL 110-140, Title II, Sec. 201[I]), with the exception of materials removed from the "*immediate vicinity*" of buildings and infrastructure at risk from wildfire (PL 110-140, Title II, Sec. 201[I][v]). This provision is exceptionally vague and it is altogether unclear how it will be interpreted. It is unlikely, however, that any reasonable interpretation would encompass more than a nominal portion of the acres that could benefit from hazardous fuels reduction and none of the biomass that could be removed from any other form of restoration or stewardship activity, including habitat improvements, recreation management, or timber stand improvement.

In addition to the public land exclusion, the 'renewable biomass' definition has the potential to exclude the majority of the biomass that could be made available from private lands. The definition allows for the usage of "*planted trees and tree residue from actively managed tree plantations on non-federal land cleared at any time prior to enactment*…" and "*slash and pre-commercial thinning that are from non-federal forestlands...*" (PL 110-140, Title II, Sec. 201[I][ii],[iv]) This language limits the use of commercial-size trees to those coming from intensively managed tree plantations and allows only logging residues and pre-commercial thinning from naturally-regenerated forests. This provision draws an entirely arbitrary distinction between trees that are planted and trees that grew from seed in the mistaken notion that a forest composed of the latter must somehow be more wild, pristine, or valuable. This is

[10] U.S. Energy Information Administration. "International Energy Outlook 2008." June 2008, 2, 5.
[11] Copulos 2006. 2-3.
[12] Renewable Fuels Association. "Ethanol Facts: Energy Security."
[13] Cooper, Mark. "No Time to Waste: America's Energy Situation is Dangerous but Congress can adopt new policies to secure our future." Consumer Federation of America. October 2007. 2.
[14] Gilman, Dan. *Fueling Oregon with Sustainable Biofuels.* Oregon Environmental Council. October 2005.

not true. There are ample examples of well-managed, biodiverse plantations and plenty of poorly treated, cut-over and eroded "natural" forests. The reverse is also true. The entire package of management practices, of which a regeneration system is one component, must be used to determine what is and is not sustainable on a given landscape.

Renewable Fuels Market: Important for Materials from Stand Improvement Activities

Stand improvement activities, specifically thinning of small-diameter trees, can be a valuable tool for managing forests for many other values and objectives. Thinning can result in improved tree vigor, increased drought tolerance, and increased growth by decreasing the stand density and reducing competition between trees for sunlight, water, and nutrients. Because vigorous fast-growing trees are generally more proof against pests, thinning can be a successful means to reduce the extent and lethality of insect infestations in many forest systems. In addition, harvesting of small-diameter trees can be an important component of habitat management for wildlife species that require early successional habitat or low stand density. Finally, forest thinning and other silvicultural activities can have positive effects on watershed functioning, and specifically water yield[15], one of the most essential ecosystem services from federal forests in much of the western United States.

What trees should be removed during a restoration treatment is a question that differs dramatically depending on the forest type, location, stand conditions, and restoration objectives. **Forest restoration in forests where stand conditions (whether fire regimes, habitat elements, or ecosystem functioning) have radically departed from the past often requires vegetation management across a wide spectrum of tree species, ages, and sizes - not only the removal of "*slash and pre-commercial thinnings*"**. The differences between forests require management to be determined on the ground, but prescribed in detail at the national level. This is the reason that detailed, site-specific management plans are mandated for all public forests. In a study by the Pinchot Institute for Conservation[16], management at five national forests was evaluated against the standards adopted by the Forest Stewardship Council (FSC) and Sustainable Forestry Initiative (SFI), the two largest forest certification programs in the United States. The study found that management practices on these forests met or exceeded the majority of the substantive sustainability criteria in both certification schemes. One area where the Forest Service was not in conformance was in addressing management activities:

> *"Consistent delays or backlogs in meeting treatment objectives led [FSC and SFI] auditors to find most case study forests falling short of their stated economic, ecological, and social goals. FSC and SFI auditors suggested the backlog in harvest treatments and persistent lack of funding has exposed forests to increased risk of disease, insect outbreaks, stand-replacing wildfires, and in some cases, being unable to provide key habitat features for certain endangered species."*

Unfortunately, as we described earlier, this material, like all material from federal land, is excluded from the definition. Although the Forest Service is not currently looking into certification, these independent evaluations demonstrate that the level of stewardship on public forests is comparable to private forests

[15] Stednick, J.D. 1996. Monitoring the effects of timber harvest on annual water yield. Journal of Hydrology 176: 79-95.
[16] Sample, A.V., W. Price, J.S. Donnay, and C. Mater. October 22, 2007. National Forest Certification Study: An evaluation of the applicability of Forest Stewardship Council (FSC) and Sustainable Forest Initiative (SFI) standards on five national forests. Pinchot Institute for Conservation. 83 p.

that have achieved FSC and SFI certification. For more information on stand improvements please see the two attached factsheets on public and private forests.

Pre-commercial thinning, habitat restoration, hazardous fuels reduction, and other stand improvement activities are expensive operations, however, and feasibility is often limited by the lack of widespread markets for small-diameter trees and woody biomass. Transportation costs and low market value for this material limit its removal, so the majority of materials are chipped in the field or burned in open piles. These open fires are still generating renewable energy, but it is energy that is being wasted instead of being put to productive work in vehicle engines. Without a financial outlet, forest and woodlot owners (private or public) can rarely afford to invest in thinning or other stand improvement activities.

Moreover, we frequently hear the argument that public costs would be less (on a per acre basis) if funds were allocated for proactive fuels reduction as opposed to reactive fire fighting. In the long run this is probably true, but the transition in strategies will not be an immediate one and catastrophic fires will continue to be a major element of the landscape in the near future. After the expenditures associated with fighting the fires that are burning today, not much is left to begin restoring the vast acreage at risk of burning tomorrow. It is going to be a slow process. In the meanwhile we need to find a commercial outlet for thinning materials if we hope to deal with an issue of this scale and size. Lignol Energy Corporation, a Canadian based company, is planning to construct a demonstration scale facility in Commerce City, Colorado, which may be just the commercial outlet needed. It is expected that this facility will utilize woody biomass as one of its primary feedstocks to produce about 2.5 million gallons of renewable fuel annually. In June of 2007 Ross MacLachlan, President and CEO of Lignol, said this in reference to trial tests to convert Mountain Pine Beetle damaged softwood and other wood species to cellulosic ethanol,

> *"These results in converting Mountain Pine Beetle damaged softwoods to cellulosic ethanol confirm our view that this abundant feedstock currently found in British Columbia, Alberta and the Pacific Northwest of the United States represents a significant untapped potential for transportation fuels."*[17]

Thus, national efforts to promote production and use of cellulosic biofuels, such as the RFS, have tremendous potential to act as an important incentive for improved management practices and better stewardship of forest resources ……..if only the material qualified.

Forests Biomass: Readily Available and Abundant

In order to ensure that feedstock production is pursued sustainably, a national biomass assessment needs to be funded and carried out. The "billion ton study"[18], a joint report issued by the U.S. Department of Energy (DOE) and USDA, was done to determine if "a 30 percent replacement of the current U.S. petroleum consumption with biofuels by 2030" could be accomplished. Although this is a controversial document and many of its conclusions are disputed, it nonetheless provides the most rigorous national estimate to date. The "billion ton study" found that approximately 2.9295 billion tons of woody biomass could be obtained from public lands in the form of logging residue or thinning

[17] Lignol Energy Corporation. Lignol Receives Additional Funding from Ethanol BC and Announces Successful Trial Results for Mountain Pine Beetle Damaged Softwood and Other Wood Species. http://www.lignol.ca/news.html. (accessed July 21, 2008).

[18] Oak Ridge National Laboratory (DOE) and USDA. *DOE GO-102995-2135, Biomass as Feedstock for a Bioenergy and Bioproducts Industry: Feasibility of a Billion-Ton Annual Supply.* April 2005.

materials generated as a result of hazardous fuel reduction treatments annually. Most of this material is currently inaccessible due to topography, lack of infrastructure, or cost of removal. However, an estimated 21.5 million tons would be available using existing roads and infrastructure. The same study estimates that privately-owned forests have the potential to generate 5.5531 billion dry of woody biomass, of which 78.9 million tons is currently accessible. **In total, 100.4 million tons of woody biomass is currently available from private and federal lands.**

Converting this woody biomass to cellulosic ethanol could produce between 5.5 and 6.5 billion gallons of cellulosic ethanol using current technologies[19]. Ethanol is not the only biofuel option, however, nor is it necessarily the most efficient one. In a recent press release[20], Syntec Biofuel announced yields of 105 gallons per ton for a number of higher alcohols, such as methanol, n-butanol, and n-propanol. When yields of this scale become commercially feasible, our **public and private forests could produce almost 10.5 billion gallons of renewable fuels[21] – nearly 66 percent of the 16 billion gallons of cellulosic fuels** mandated by the RFS. These fuel estimates are not meant to be conclusive, but to illustrate that the potential fuel yield from federal forests is significant and depends strongly on what assumptions are made about resource availability, technological advances, and conversion efficiency. Unfortunately, **almost none of this material falls under the current definition of renewable biomass**. Federal forests are excluded in totality and only a minority of private forests can be classified as "*actively managed tree plantations*".

Additionally, federal forests are not evenly distributed across the nation. In total, they encompass about 43 percent of the national forest resource or approximately 323 million acres.[22] The Western Governors' Association report identifies 23 million acres in 12 states that are at high risk from wildfire. Thinning materials from this acreage could provide up to 318 million tons of biomass[23], of which 7.2 – 14.5 million tons annually is immediately accessible and available for fuel production. This number only includes thinning for fuel reduction, which is one source of biomass feedstock among many others already mentioned. Using the Syntec technology this could yield 750 million – 1.5 billion gallons.[24] These are some of the regions that are most threatened by catastrophic wildfire and are most in need of hazardous fuels reduction treatments. In counties and communities entirely surrounded by federal feedstocks, the entire local supply of woody biomass may be off limits. This could have drastic effects where it is possible to produce renewable fuels, favoring eastern states over western ones. When energy security is considered this imbalance in eligible feedstocks becomes even more illogical. During Hurricane Katrina in 2005, 25 percent of the country's oil refining capacity was off line initially. Since then the merits of distributed power as well as fuel production have been discussed as a national security issue. In 2006, 1.4175 billion barrels of petroleum were consumed in the 12 states that were

[19] Oak Ridge National Laboratory (DOE) and USDA. *DOE GO-102995-2135, Biomass as Feedstock for a Bioenergy and Bioproducts Industry: Feasibility of a Billion-Ton Annual Supply.* April 2005. Tables A.1-A.7.
Zerbe, John I. Liquid fuels from wood – ethanol, methanol, diesel. World Resource Review 3(4):406-414.
100.4 million tons * 55 gpt (dilute acid hydrolysis) = 5522 million gallons.
100.4 million tons * an average of 65 gpt (pretreatment + enzymes) = 6526 million gallons.
[20] Syntec Biofuels"Syntec Biofuel Achieves Yield of 105 Gallons per Ton of Biomass" 8 February 2008.
[21] 100.4 million tons * 105 gpt = 10542 million gallons.
[22] Mila Alvarez. "The State of America's Forests." Society of American Foresters: 2007.
[23] Biomass Task Force Report, Clean and Diversified Energy Initiative, WGA, January 2006, p. 37
[24] 7.2 and 14.5 million tons * 105 gpt = 756-1,522.5 million gallons.

included in the Western Governors' Association thinning assessment. If the 750 million – 1.5 billion gallons are used within those states, 18 – 39 percent of the demand could be supplied.[25]

Mill Residue and Other Woody Materials: Implications of Exclusions

The restrictive nature of the current definition could also exclude, in practice, woody biomass from secondary or mixed sources. In many locations, residues from sawmills and pulp operations source materials from a mixture of federal, private, plantation, and natural 'forests'. Mill residues (chips, sawdust, bark, etc.) could represent some of the most available, convenient, and economically attractive sources of woody biomass, but this material may not be eligible for the RFS if separating residue streams proves difficult or prohibitively expensive. This problem would also exist in integrated biorefineries where a number of additional biobased products are produced in addition to renewable transportation fuels and heat and power. The biorefinery is a desirable industrial model, as utilization of waste from one process is the feedstock for another. This minimizes waste, increases sustainability and greatly increases economic viability. These facilities would very likely source from a number of different owners.

Furthermore, these secondary residues can also be one of the most low carbon and environmentally friendly sources of woody biomass. Because these materials are waste products of existing industries, they do not have a direct impact on practices or conditions in the forest. Compared to harvesting biomass directly in the woods, the use of residues does not increase traffic on forest roads, as material is generated at the mill site. Excluding these materials could be a lost opportunity.

In addition to the biomass intentionally removed during forest management activities, an important secondary source of material could be recovered from debris generated by natural disasters. Hurricanes, floods, ice damage, and other natural disasters annually destroy significant amounts of urban trees, forest growth, and wooden structures on both private and public lands. Very little of this material is recovered and put to a productive use. Instead, it is landfilled, incinerated, piled and burned in the field or often left in the forest (which emits greenhouse gases, including carbon dioxide, methane (which is 21 times more powerful than carbon dioxide) and air pollutants). Increasing the recovery rate for this material would be beneficial for a number of reasons, including emergency clean-up, reduction of fire hazard, recovery of economic losses, and as a potentially significant feedstock for production of renewable fuels. The availability of this material is difficult to predict, as it depends largely on chance events. Infrequent, large-scale disasters (like Hurricane Katrina, for example) have the potential to contribute additional millions of dry tons of woody biomass when they do occur. Moreover, since all materials are subject to the appropriate life-cycle analysis and some materials are totally excluded from the RFS all together an uneven playing field is created, making some materials favored over others (because some materials will be more difficult to track than others); again creating illogical barriers to available feedstocks which are waste materials generally considered a societal and environmental problem.

One illustration of this is the Gulf Coast Energy Inc.'s wood waste-to-ethanol pilot-scale facility in Livingston, Alabama. It is expected to go online this month and is capable of producing 200,000 gallons of ethanol and 30,000 gallons of biodiesel annually.[26] The fuel will be sold at a reduced rate to the city

[25] Table F9a: Total Petroleum Consumption Estimates by Sector, 2006." Energy Information Administration. http://www.eia.doe.gov/emeu/states/sep_fuel/html/fuel_use_pa.html (accessed July 21, 2008).
[26] McGraw, Tommy. "Second in a series about Livingston's new ethanol/bio-diesel plant." Gulf Coast Energy, Inc.

of Hoover, Alabama, which is already using leftover cooking oil to produce biodiesel at a cost of $0.75 per gallon. The city, whose employees have been busy collecting enough downed trees, branches, and limbs from storms to produce 350,000 gallons of biofuel, is expecting to save at least one dollar per gallon on fuel compared to what it is spending now and is planning for its entire fleet of more than 340 vehicles to become self-sufficient in energy by the end of the year.[27]

Gulf Coast Energy Inc. is also planning to build three commercial-scale wood waste-to-ethanol facilities in Livingston, Alabama; Mossy Head, Florida, and Jasper, Tennessee. The company plans to use a carbon-neutral, zero-emission process[28] and take advantage of the synergies of ethanol and biodiesel production by combining the production of these biofuels into a single facility. The company will use the glycerin byproduct from biodiesel production with its biomass gasification technology to produce ethanol; the methanol stream created during ethanol production will be used during the biodiesel production process.[29] By the end of 2009, Gulf Coast Energy Inc. plans to complete Phase I, which entails producing 10 million gallons of biodiesel and 35 million gallons of ethanol annually at all three commercial-scale facilities. Plants may be expanded after the process is proven successful.[30] The Mossy Head, FL, facility received a $7 million Florida Farm to Fuel Grant for the company's $62 million project.[31] These are the kind of innovative solutions we are seeking to solve our climate and energy problems.

Nonindustrial Private Forest Owners and Encroachment

By giving preference to plantation forests, the renewable biomass definition favors the owners of large, industrial forest plantations over the nonindustrial private forest owners (NIPF), who generally do not have the capital to use artificial regeneration. NIPFs contain the majority of diverse, mixed-species woodlands in the nation. Not only do these forests generally boast higher biodiversity than plantations, but the periodic income from selective harvesting on these properties is often the only thing standing between these forests and the very real pressure to sell out to land speculators and real-estate developers.

According to a report released by the Southern Forest Resource Assessment[32] of the U.S. Department of Agriculture, it is expected that approximately 12 million acres of timberland in the Southeast will be lost due to urbanization between 1992 and 2020. An additional 19 million acres is expected to be lost between 2020 and 2040 assuming that trends established in the 1990s persist. The loss of timberland is expected to be concentrated near urban centers such as Charlotte, Raleigh, Atlanta, Nashville, and throughout much of Florida while rural areas in Arkansas and Mississippi may gain timberland. The report does state that moderate increases in timber prices combined with unchanging agricultural returns could offset much of the loss due to urbanization by allowing crop and pasture land to be converted to forest uses. On the other hand if timber prices remain unchanged, it can be expected that a total of 31 million acres of forest land could be lost to urbanization by 2040. The renewable fuels market has real potential to provide additional value to forests while helping to keep family forests off the auction block.

[27] Gulf Coast Energy, Inc. "In the News."
[28] Reeves, Steve. "Livingston Plant's Efforts May Yield New Energy Source." Gulf Coast Energy, Inc. June 19, 2008.
[29] Santosus, Melissa. Exec Digital. "Exploiting Potential in Renewable Fuels." April 2008. 289-290.
[30] Santosus 2008, 290-291.
[31] Florida Department of Agriculture and Consumer Services. "Farm to Fuel Grants Program Winners." January 22, 2008.
[32] Wear, D.N., D.R. Carter, and J. Prestemon. "The U.S. South's Timber Sector in 2005: A Prospective Analysis of Recent Change." Southern Forest Resource Assessment, 2007.

Furthermore, according to estimates made for Range Fuels using data from the USDA Forest Service Forest Inventory and Analysis Program (FIA)[33], over 76 percent of forests in 10 southeastern states do not qualify as forest plantations. In Georgia and Alabama, two of the biggest timber producing states, this definition would exclude 67.6 percent and 70.9 percent of private forests, respectively. Range Fuels Director of Project Development Ron Barmore said this when discussing the limitations of the current RFS,

> *"Range Fuels is very concerned about ambiguity in the current definition of Renewable Biomass in the Energy Policy and Security Act that, under some interpretations, could severely limit the potential benefits that can be derived from the advancement of cellulosic ethanol production. The vast majority of commercial timber that is grown and logged for the forest products industry is harvested from naturally regenerated forests."*[34]

These percentages are surprisingly high given the enormous importance of plantation forestry to the economy and culture of the southeastern states. In many other regions, such as New England, the acreage of qualifying private forest plantation will be almost non-existent.

Stakeholder Support for Biomass from Forests

As more and more acres of forest land are bulldozed to make way for suburbia, burned in massive conflagrations, or destroyed by pests, a number of environmental organizations are beginning to see the value in sustainable, multiple value forest management for helping to ensure the perpetuation of diverse, vibrant forest ecosystems and the many values they offer – clean water, wildlife habitat, recreational opportunities, and diverse forest products, including renewable fuels. The Pinchot Institute for Conservation came out with this statement in 2007 identifying the potential value in renewable energy to make possible a better and more sustainable form of forestry,

> *"…wood energy could help address several longstanding challenges in sustainable forest management: treating hazardous fuels accumulations to minimize future threat of wildfires, creating economic outlets for small-diameter and low-grade wood to reduce forest degradation, and strengthening community economic development on the basis of sustainable use of local forest resources."*[35]

The problems I have identified in the current definition have received similar attention from a number of other groups and organizations. The Society of American Foresters and the National Association of State Foresters, two of the largest and most well-respected forestry organizations in the nation, have both written letters to Congress expressing their concern about the way in which forest materials are treated in the RFS. SAF is the premier national organization representing forest science, research, education and the forestry profession in the United States and is the largest forestry organization in the world. SAF publishes several of the most esteemed scholarly publications dedicated to forestry, including both *The Journal of Forestry* and *Forest Science.* In a letter to the House Committee on Energy and Commerce dated February 12, 2008, the president of SAF, Tom Thompson, wrote,

[33] Range Fuels, unpublished data.
[34] In an email message to the Jetta Wong on July 22, 2008.
[35] Sample, V. Alaric. *Ensuring Forest Sustainability in the Development of Wood-based Bioenergy.* Pinchot Institute For Conservation. 2007. 6 p.

> "*At a time when considerable legislative and agency efforts are being made to address global climate change, wildfire severity, and renewable energy production, it is regrettable that a definition would be promulgated that would equally obstruct all of these goals. The current definition will interfere with the ability to remove non-merchantable, small-diameter trees from our public lands, both as renewable fuels, and as a means for addressing the increasingly devastating wildfires we are experiencing. Any notion of climate change mitigation and adaptation of existing forests to changing environmental conditions will require the maximum in management flexibility for both public and private forests, and hampering that management with an unscientific and ill-conceived renewable biomass definition is unacceptable. Finally, the definition's arbitrary limits on qualifying private forest lands can only exacerbate the land-use conversion pressures face by our smaller, private working forest landowners.*"

The National Association of State Foresters is a non-profit organization representing the directors of the forest agencies in all the states, the U.S. territories, and the District of Columbia. In a letter to the same committee dated February 7, 2008, Kirk Rowdabaugh, President of NASF, expressed a similar view, "*Our nation's forests can provide a ready supply of feedstock for renewable fuels, and any exclusion of woody biomass from the Renewable Fuel Standard would hamstring the nation's efforts to reduce our reliance on foreign oil*."

A number of similar letters have originated from organizations other than those dedicated to forestry, including the Western Governors' Association and 25x'25, a non-profit organization encouraging 25 percent of our nation's energy supply to come from renewable sources by 2025. In addition to these, a number of private citizens, scientists, and local organizations have written or are in the process of writing similar letters, some of which I have submitted with my testimony. These letters express the concerns of those who work in our woodlands and forests and who understand the failure of the current definition to realize the use of forest resources for renewable energy in a way that complements sustainable management for critical ecosystem services, habitat values, biodiversity, timber resources, and recreation.

Municipal Solid Waste

One potential biofuel feedstock that is not currently included within the definition of 'renewable biomass' is some portions of organic material comprising municipal solid waste (MSW). While the RFS includes, *"Biogas (including landfill gas and sewage waste treatment gas) produced through the conversion of organic matter from **renewable biomass**,"* (PL 110-140, Title II, Sec. 201[A](ii)V) the definition of renewable biomass only includes *"separated yard waste or food waste, including recycled cooking and trap grease,"* (PL 110-140, Title II, Sec. 201[I](vii)). It is unclear how this definition will be implemented by EPA, specifically because most landfill gas is produced from existing landfills where a mixture of organic, inorganic and MSW already exists.

The United States already has an abundant amount of this material. EPA estimated in 2006 that 169 million tons of MSW were disposed of after recycling, including 96.81 million tons of organic material. Although per capita waste generation has been relatively stagnant since 1990 due to increased recycling rates, overall waste generation has risen as the population of the United States has continued to grow.

At the same time, the number of landfills in the United States has fallen from 7,924 landfills in 1988 to 1,754 in 2006 meaning that wastes must be transported over farther distances, which consumes more fuel, currently fossil based.[36] Generation of MSW varies regionally with the highest concentration located in urban areas. In 2007, New York City generated 3.6 million tons of MSW and spent $283.3 million to export its waste to landfills outside of the city.[37] As of 2006, only 12.5 percent of the MSW generated in the United States before recycling was combusted for energy recovery.[38] The Energy Information Administration (EIA) has estimated that the electricity generated from MSW totaled nine million MWh in FY 2007 with an additional six million MWh generated from landfill gas.[39]

As these statistics show, there is a significant amount of organic material that must be disposed of after recycling. Even though MSW is not currently included in the Renewable Fuels Standard, several states including Maryland[40] and New Jersey[41] currently include it in their Renewable Portfolio Standards for energy and Pennsylvania[42] includes MSW as part of its Alternative Energy Portfolio Standard. The State of Hawaii currently includes MSW as a potential source of renewable energy as part of its Renewable Portfolio Standard and includes MSW as a potential feedstock for ethanol production in its Ethanol Facility Tax Credit.[43] Even other federal policies allow for the use of MSW for biofuel production. In the Department of Energy's Integrated Biorefinery and Demonstration grant program of the Energy Policy Act of 2005 (EPAct '05, P.L. 109-58), the definition of biomass notes *"any waste material that can be converted to energy is segregated from other waste materials"*. The only explicit exclusion of MSW pertains to wood waste materials including paper waste.[44] According to this definition, some organic portions of MSW including food waste would be included. This section of the EPAct '05 is the basis for several large grants given to commercial-scale biorefinery projects, a series of which were awarded in 2007 including BlueFire Ethanol, which plans to use portions of MSW as a potential feedstock.[45] The enactment of the RFS was suppose to be a clear signal to investors of the government's commitment to renewable fuels as a part of the country's energy and greenhouse gas reduction strategies. Unfortunately this restrictive definition and the government's mixed signals illustrated in the different definitions of biomass may not be the clear signal intended.

Although waste-to-biofuel conversion technologies are similar to other cellulosic feedstock technologies, there are several unique challenges to utilizing MSW as a feedstock. One challenge in converting MSW to biofuels is pollution control. In any waste stream there will be chemicals and substances of concern and although the fuel derived from MSW will be clean, other materials may still contain contaminants. It must be noted, though, that traditional waste-to-energy generation has made significant progress in reducing emissions of pollutants. This is largely due to the implementation of

[36] Environmental Protection Agency. "Municipal Solid Waste Generation, Recycling and Disposal in the United States: Facts and Figures for 2006." Environmental Protection Agency, 2007.
[37] Niblack, P. "More Recycling Needed to Help Lower City's Trash Costs." New York City Independent Budget Office, 2007.
[38] Environmental Protection Agency, 2007.
[39] Energy Information Administration. "Federal Financial Interventions and Subsidies in Energy Markets 2007." Energy Information Administration, 2008.
[40] Md. Code, Com. Law § 7–701
[41] New Jersey Clean Energy Program. "Renewable Energy Compliance Certification Forms for the State of New Jersey." New Jersey
[42] 73 Pa. Cons. Stat. § 1648.2
[43] Haw. Rev. Stat. § 235-110.3
[44] Energy Policy Act of 2005 § 932(a), 42 U.S.C. § 923(a) (2005).
[45] Department of Energy. "DOE Selects Six Cellulosic Ethanol Plants for Up to $385 Million in Federal Funding." Department of Energy. http://www.energy.gov/news/4827.htm (accessed July 16, 2008).

scrubbers to remove acids as well as filters to remove particulates.[46] As MSW-to-biofuels technology becomes more mature, it can be expected that pollution controls will be developed in accordance with appropriate government regulations.

In Lake County, Indiana, there are two municipal solid waste-to-biofuel facilities that are currently under development. Genahol-Powers, LLC and Indiana Ethanol Power, Inc. are both in negotiations with Lake County officials to obtain waste disposal contracts to convert the county's waste into biofuels. It is expected that, if constructed, these facilities will process waste not only from Lake County, but also from surrounding areas including nearby Chicago. Proposed plans for Genahol and Indiana Ethanol Power have a combined capacity to produce 110 million gallons of biofuel per year while processing waste at the same time. It should be noted that Indiana Ethanol Power has received a $100,000 grant from the Indiana Office of Energy & Defense Development.[47] Under current legislation, it is unclear whether fuel produced from these facilities would be included in the RFS.

Cellulosic biofuel startup Coskata, Inc. is currently planning to construct a cellulosic ethanol demonstration facility in Madison, Pennsylvania, in coordination with General Motors. It is expected that this facility will use a variety of feedstocks such as municipal solid waste, woody biomass and steel off gases. In addition, Coskata will also use other feedstocks including agricultural wastes which are included in the RFS. Coskata's demonstration scale facility is expected to produce 40,000 gallons of cellulosic ethanol per year. The company is also planning to construct a commercial scale facility in the future at the same site producing 50-100 million gallons per year.[48] *Coskata is particularly interesting because of their ability to use multiple feedstocks.* By eliminating certain feedstocks, the government may be artificially restricting their decision-making process.

Utilization of Waste Materials Reduces Stress on Other Feedstocks

Another possible side effect of these exclusions is that they shift the entire burden of production onto non-federal forests and agriculture land, promoting intense production and increasing the odds that unsustainable and environmentally-degrading management practices may be used. This could lead to soil erosion, reduced productivity, compromised habitat, and reductions in water quality. Among these issues are some fundamental agriculture issues, including competition for land and natural resource protection.

The competition for land is a complicated issue that stems from the perceived differences between growing crops for food, feed, fiber and now fuel. Land is the most finite of resources and ultimately the basis for all wealth – we rely on it to feed, clothe, and shelter our civilization. When land is managed in an unsustainable way, our ability to provide these and other basic values is compromised. For every acre of land that is eroded or acidified or desertified or otherwise degraded, we have one less productive acre that can provide food, biofuel feedstocks or ecosystem services. Likewise, inappropriate allocation of land for the wrong use can carry negative consequences, including adverse impacts to the

[46] Environmental Protection Agency. "Solid Waste Combustion/Incineration." Environmental Protection Agency. http://www.epa.gov/epaoswer/non-hw/muncpl/landfill/sw_combst.htm (accessed July 8, 2008).
[47] Shaw, Dan. "Evansville Companies Bid to Make Ethanol from Lake County Trash." *Evansville Courier & Press*, June 2, 2008.
[48] Coskata, Inc. "Coskata Inc. Selects Madison, Pa. for Commercial Demonstration Facility to Produce Next-Generation Ethanol." Coskata, Inc. http://www.coskata.com/pagebody/Madisonannouncement.htm (accessed July 16, 2008).

environment and the economy. Fortunately, good stewardship and wise allocation of our precious land resources can provide abundant biomass for fuels, food, and diverse, healthy ecosystems.

In this respect, the wisest course of action would be to focus on feedstocks that do not compete for land resources, such as low-value forest residues and other waste materials. The RFS is a very aggressive mandate, but it is not an impossible one, as long as we do not exclude any of those feedstocks that can be produced sustainably and that meet important environmental and greenhouse gas emissions reductions. With conversion technologies still in development, we must keep our options open and strive to produce renewable fuels that meet objective and appropriate standards of sustainability. Fortunately, our nation possesses abundant and readily available feedstocks that satisfy this criterion.

Conclusion

By utilizing the renewable biomass resources from America's farms, forests, and open spaces, we have the potential to lower our greenhouse gas emissions, increase energy security, and stimulate economic development in rural communities. Renewable fuels from biomass feedstocks (coupled with increased fuel efficiency, plug-in hybrids, and similar technologies) provide the most immediate means to begin reducing the emissions associated with liquid transportation fuels. By adding value to forests and forest products, the renewable fuels market is one tool that can help slow down urban encroachment, improve wildlife habitat, reduce the threat of forest fires, and improve timber stocks, all while driving local economic development through the creation of jobs in rural communities.

The United States has the resources necessary to provide for our energy needs, and renewable fuels can and will play a vital role as part of a larger strategy to diversify our energy supplies. A June 2008 report released by Merrill Lynch concluded that biofuels are the single largest contributor to global oil supply growth in light of the inability of non-OPEC crude oil supply to expand. "According to the International Energy Agency, 'Biofuels have become a substantial part of faltering non–OPEC supply growth, contributing around 50 percent of incremental supply in the 2008–2013 period."[49] The use of domestically-produced renewable fuels extends fuel supply by displacing the amount of foreign crude oil the United States needs to import. On June 12, 2008, Alexander Karsner, DOE Assistant Secretary for Energy Efficiency and Renewable Energy, testified before the Senate Committee on Energy and Natural Resources that gasoline prices would be between 20 to 35 cents per gallon higher if it was not for ethanol production and use.[50] Simply put, the use of renewable fuels eases the strain of transportation costs on American consumers. Time is of the essence if the United States is to lay groundwork for a sustainable future that will mitigate climate change, reduce dependency on foreign oil, and reduce costs of transportation fuels.

I would like to thank the committee once again for the opportunity to speak before you. Let me also extend my gratitude for your part in creating and passing this important renewable fuels standard and recognizing the role it plays in our climate protection and national security efforts.

[49] Renewable Fuels Association, Canadian Renewable Fuels Association, European Bioethanol Fuel Association, and UNICA. Financial Times. "OPEC Rakes in Billions, but Blames Biofuels…Confused?" July 16, 2008.

[50] Karsner, Alexander. Assistant Secretary for Energy Efficiency and Renewable Energy. "Biofuels and the Food Versus Debate." Testimony before the U.S. Senate Energy and Natural Resources Committee. June 12, 2008.