Testimony of David G. Hawkins
Director of Climate Programs
Natural Resources Defense Council

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Thank you, Chairman Boxer and Senator Inhofe, for the opportunity to testify today on legislation to build a clean energy economy and reduce global warming pollution. My name is David Hawkins. I am Director of Climate Programs at the Natural Resources Defense Council (NRDC). NRDC is a national, nonprofit organization of scientists, lawyers and environmental specialists dedicated to protecting public health and the environment. Founded in 1970, NRDC has more than 1.2 million members and online activists nationwide, served from offices in New York, Washington, Los Angeles and San Francisco, Chicago and Beijing.

NRDC is a member of the U.S. Climate Action Partnership (USCAP), the business-environmental coalition that supports enacting climate legislation this year. The House Energy and Commerce Committee drew heavily on USCAP's recommendations in drafting the American Clean Energy and Security Act (ACES). NRDC is also a member of the labor-environmental Blue-Green Alliance, whose legislative principles are also reflected in the ACES bill.

Helping Congress pass effective climate legislation is NRDC's highest priority. It is vital to enact legislation this year – to help deliver economic, energy, and climate security. As President Obama has said, the choice is "between a slow decline and renewed prosperity; between the past and the future." Clean, sustainable energy is one of the pillars of growth and prosperity in the 21st Century, and enacting comprehensive energy and climate legislation is the way to put that pillar in place. The time to act is now.

That is why NRDC strongly supports the Committee's intention to move quickly on legislation before the August recess. Working together with other committees, you have the opportunity to put together comprehensive legislation for consideration and adoption by the full Senate early this fall. Today I will focus on the key issues facing this Committee: in particular, why we believe the best policy package is a comprehensive limit on global warming pollution that becomes tighter each year, combined with complementary programs for key sectors, structured like the one in the ACES bill recently passed by the House of Representatives.

It is often the case that bills passed by the House are based on a fundamentally different political logic than that which is needed in the Senate. But that is not true for the ACES bill. Given the make-up of the Energy and Commerce Committee, the House bill was crafted to meet the needs of the regions of our country that rely on coal-based electricity and that are home to energy-intensive and trade-sensitive manufacturing industries. Thus, in the allocation of allowances and many other features, the ACES bill offers concrete solutions to concerns that will be important in the Senate.

This is certainly not to say that the ACES bill is perfect as is. In this testimony, I'll address key strengths and shortcomings of the bill, and make recommendations on improvements this Committee should make.

I. We Have To Act Now

Action on global warming has been delayed far too long. Every day we learn more about the ways in which global warming is already harming our planet, our health, and the natural systems on which our civilization is built. We must act now to begin making serious emission reductions if we are to avoid truly dangerous levels of global warming pollution. Climate scientists warn us that we face extreme dangers if global average temperatures are allowed to increase by more than 2 degrees Fahrenheit from today's levels (equivalent to 2 degrees Celsius over pre-industrial levels). The Intergovernmental Panel on Climate Change (IPCC) reports that it is still possible to stay below this temperature increase if atmospheric concentrations of CO_2 and other global warming gases are held to 450 ppm CO_2-equivalent and then rapidly reduced.

Staying under this target is very challenging, even with allowance for some period of "overshoot." It cannot be done without the cooperation of both the industrial North and the emerging South. But it can be done. And for the United States to secure a claim to leadership in the 21st century, we must be instrumental in forging the necessary coalition. Enacting U.S. legislation this year is the single most important step we can take to unlock the global negotiating gridlock of the past decade.

If we delay and emissions keep growing, bad investments and business uncertainty will continue and it will become much harder to avoid the worst impacts of a climate gone haywire. In short, a slow start means a crash finish, with steeper and more disruptive emission cuts required for each year of delay or insufficient action.

The ACES bill appropriately establishes a declining cap on emissions of carbon dioxide and other heat-trapping gases. It sets long-term limits that are consistent with the science, reaching a 42 percent reduction by 2030 and an 83 percent reduction by 2050, from 2005 levels. In the near-term, however, NRDC believes we can and must aim to achieve at least a 20 percent reduction in 2020 in the emissions of capped sources and in total U.S. emissions. A slow start in the early years condemns us either to even faster reductions later, or to even more severe climate impacts.

According to both the Environmental Protection Agency and the Congressional Budget Office, the actual per household cost of the ACES bill in 2020 will be less than a postage stamp a day. NRDC's research shows that under this bill by 2020 American households will save $6 per month on their electricity bills and $14 per month on the cost of owning and driving their vehicles. Plus, the bill will create a net increase of 1.7 million jobs. These savings and job numbers are detailed on a state-by-state basis in the maps appended to this testimony.

A 20 percent reduction in 2020 is within the range recommended by USCAP. We can achieve that near-term target while continuing to achieve strong economic and job growth for all Americans. According to EPA's most recent analysis, moving from a 17 percent reduction target to 20 percent would increase households' average annual cost by only $27 ($140 versus $113).[1] In the meantime, due to healthy GDP growth, households will have more than $9,000 in additional income to spend ($25 per day). Household costs in 2020 would still be less than a first class postage stamp per day, even with this more effective target.

Some will argue that a 20 percent target for 2020 would place too much pressure on coal-fired electricity or energy-intensive, trade-exposed manufacturing, and on the regions where those industries are most important. The most recent Department of

[1] EPA Analysis of H.R.2454 - Appendix, p. 56

Energy forecast for U.S. emissions in the absence of ACES is for emissions of energy-related carbon dioxide in 2020 to be 1 percent *lower* than 2005 levels, in sharp contrast to the 17 percent increase forecast for 2020 just two years ago.[2] This implies that achieving a 20 percent reduction by 2020 will actually be far easier than the previously anticipated effort required to achieve lesser reductions. Furthermore, the ACES bill's allowance distribution gives the local electricity distribution companies and energy-intensive, trade-exposed manufacturers a large fraction of the allowances they will need for compliance well past 2020. That is true whether the target is a 17 percent or 20 percent reduction. And the bill provides generous incentives for investing in power plants and other industrial facilities equipped with carbon capture and storage. The bill also allows the use of up to two billion tons of offsets per year to further cushion these concerns. A twenty percent reduction by 2020 is both needed and do-able.

II. ACES Is Built on a Fundamentally Strong "Cap and Trade" Architecture

To meet the climate protection challenge, the ACES bill employs a fundamentally sound architecture. As mentioned, it establishes a declining cap between 2012 and 2050, covering approximately 85 percent of U.S. emissions of carbon dioxide and other heat-trapping gases. The cap directly attacks the pollution that drives global warming by setting a specific limit on the total quantity of dangerous pollution emitted each year, creating certainty that our environmental goals will be achieved.

The ACES bill uses proven methods to achieve this pollution cap at minimum cost. Instead of specifying exactly what every source must do to help meet the cap, it creates a defined number of carbon pollution allowances. Covered sources must

[2] DOE/EIA Annual Energy Outlook 2009 with ARRA (SR/OIAF/2009-03) compared to the Annual Energy Outlook 2007.

surrender an allowance for each ton of carbon emissions at the end of each year. The opportunity to purchase allowances at auction, or to buy and sell them in the marketplace, creates clear economic rewards for investing in energy efficiency and clean energy innovation and allows each covered source to find its lowest cost way to comply – thereby minimizing the cost for the entire economy. Additional cost management flexibility comes from the ability to bank allowances into future years, and to borrow them in limited circumstances.

For further market stability and predictability, ACES creates a strategic reserve of allowances that can be sold into the market should there be a period of unusually high prices. The very existence of this reserve should deter speculative activity in the compliance market. Similarly, to avoid market prices so low that innovation could be stifled, ACES establishes a minimum price for sales of allowances from the regular auction under the bill.

The ACES bill also provides for very large amounts of domestic and international offsets – up to two billion tons per year of reductions achieved outside the capped sectors – to further reduce costs. With a reasonable limit on the total number of offsets, and with strong safeguards to assure that offset credits are earned only for real reductions that would not have happened anyway, offsets can be a valuable component of climate legislation. There are significant problems, however, in the offset provisions added to the ACES bill just before House floor action. I will return to those issues below.

The ACES bill includes important provisions to transparently and effectively regulate the market for trading greenhouse gas allowances, as well as futures and other derivatives. Given recent experience on some other trading markets, the American people have a right to demand that rules for regulating carbon trading be clear and transparent, and effective in preventing speculative manipulation. The ACES bill gives important new powers to the Commodities Futures Trading Commission, as well as the Federal Energy Regulatory Commission and EPA. Key requirements include limiting any emitting company from purchasing more than 20 percent of the allowances sold in any one auction, fining companies involved in market manipulation up to $25 million, and preventing any single participant from owning more than 10% of any class of derivatives.

NRDC recommends including three additional safeguards in the bill. First, the Senate should consider requiring all trading in allowances and in futures to take place on regulated exchanges to provide the greatest possible transparency to trading activity and prices, and to reduce counter-party risk – the risk that one of the contract participants will fail to perform when the contract is due. At a minimum, the bill should require the reporting to regulators of all non-standardized trades greater than a specified amount – for example, above $10 million. As a further safeguard against manipulation, Congress should set tighter "position limits" on the fraction of allowance futures that any one participant can hold in the carbon market. We recommend that no one be allowed to have more than a five percent (not 10 percent as in ACES) position in the market for the most actively traded futures (for example, the market for contracts to deliver allowances at the end of the next compliance year). This would be more than sufficient for hedging and trading purposes and would deny any single market participant the market power to meaningfully influence prices. Congress should also direct the administration to work with other nations to provide comparable safeguards as a condition of linkage to the U.S. carbon market.

Is there a viable alternative to this cap and trade architecture? Comprehensive cap bills like ACES have been attacked from two contradictory flanks. First, there are those who mischaracterize ACES as a tax bill, and oppose it for that reason. A cap and trade program is not in any way a tax. It is a firm limit on carbon pollution, directly tied to protecting us from the worst effects of global warming. Fundamentally, this is a smart program to curb extraordinarily dangerous pollution. While it guarantees an overall limit on carbon pollution, it also allows individual sources a great deal of flexibility to find the lowest cost pathway to compliance. But the ACES bill is not a tax any more than any of the nation's other air and water pollution control laws.

At the opposite extreme, there are opponents of caps on pollution like the ACES bill who say it *should be* a tax, and oppose it because it is not. Beyond the obvious political obstacles to this approach, NRDC does not support a carbon tax first and foremost because it would not guarantee achievement of the emissions reductions necessary to limit cumulative emissions over time to a level compatible with a stable climate. A carbon tax would represent, at best, a congressional guess at the imposed cost needed to induce myriad covered sources to limit their emissions enough to meet desired annual emissions targets for the country as a whole. That guess could be wrong on the high or low side – most likely on the low side given the aversion of many political actors to charges of raising taxes. It would require Congress to constantly reconsider the tax rate – or to adopt some form of automatic adjustment. Some carbon tax proponents claim a tax would be a lot simpler than cap and trade. But this is the fallacy of comparing an idealized concept to a flesh and blood bill. When was the last time Congress wrote a simple tax bill? There would be just as many pressures for exemptions, exceptions, offsets, and other special treatment as we have seen regarding emission cap bills. In short, a carbon tax would be neither environmentally effective, simple, nor politically appealing. The ACES architecture is proven to work and is a far better alternative.

Other opponents of the ACES bill have argued for a "New Manhattan Project" like the substitute offered on the House floor that would have authorized a grab-bag of goals, prizes, and grants for new technologies. While most of the goals are laudable, and while prizes and grants have their place, there are two fatal faults to the call for a grand scale research and development program as an alternative to a comprehensive cap and invest approach. First, the proponents of the Manhattan project have identified no visible means of providing the funding they advocate – without a cap and allowance system, they would have to rely entirely on ever-more-difficult annual appropriations. Second, government-sponsored research and prizes, while useful, cannot remotely hope to create private sector incentives for clean energy innovation on the necessary scale. In marked contrast, the ACES bill does create incentives on this scale by establishing an ever tighter cap on emissions that tells every innovator large and small that there is a predictable, expanding market for low-carbon products and services. The primary barrier to a clean energy economy is not a shortage of American ingenuity or even a shortage of financial resources to apply to the task; it is the lack of a powerful and sustained set of predictable market rewards that are needed to motivate private sector innovators to invest in bringing low-carbon options to market rather than products and services where the carbon footprint is ignored. In addition, the ACES bill uses some allowances strategically to invest in efficiency and clean energy technology. As I explain below, the ACES bill's allowance allocation can be further improved to more fully seize the cost-saving energy efficiency opportunity and save American households and businesses even more.

Others are touting a collection of worn-out ideas stitched together under the catch-all name "All of the Above." The list includes massive subsidies and free rides for all the old energy technologies, with just enough window-dressing on efficiency and renewables to support a talking point or two. It's little more than political point scoring to call for oil and gas drilling everywhere, even in our most precious natural wonders; to massively subsidize construction of economically-dubious nuclear power plants (while ignoring weapons proliferation risks); or to build more conventional coal plants without regard for carbon emissions. In the simplest terms, this is a recipe for *increasing* our carbon pollution, *increasing* our energy bills, *reducing* our energy security, and doing *nothing* to help re-power the American economy. A program that lacks a cap on carbon pollution, and pursues every energy option regardless of merit, just lets global warming keep getting worse and makes our energy and economic challenges worse.

Effective answers for climate protection, energy security, and economic vitality can be found only by wasting less and investing serious sums in clean energy resources, all within the framework of clear limits on global warming pollution. Of all these approaches, only comprehensive legislation like the ACES bill will create the clarity and drivers for the investments we need to shift to the low-carbon economy.

III. Complementary Standards to Enhance and Ensure Emission Reductions

A key element of the ACES bill is its provision for complementary energy efficiency, renewable electricity, and carbon pollution control standards. Strong energy efficiency standards for buildings, appliances, vehicles, and other equipment are crucial to meeting our carbon pollution goals effectively and at the lowest cost. In fact, still-untapped energy efficiency opportunities can save thousands of dollars per household. I will not speak at length about the ACES bill's generally strong energy efficiency standards and its combined renewable energy and efficiency standard, because these fall mainly in the jurisdiction of the Energy and Natural Resources Committee. We will work with that committee and on the floor to achieve the maximum gains in these areas.

In areas within this Committee's jurisdiction, the ACES bill contains important carbon pollution performance standards for vehicles and power plants. With regard to light-duty vehicles, it appropriately leaves in place the current requirements of the Clean Air Act under which California and EPA are setting greenhouse gas standards and the Department of Transportation is setting mileage standards. Under the historic agreement announced by President Obama in May, these three regimes will be coordinated and will deliver the benefits of the California program nationwide. The ACES bill includes specific mandates to use existing Clean Air Act authority to set greenhouse gas standards for other classes of vehicles and equipment. Further improvements can be made in these areas to deliver more emission reductions – and fuel savings – from a wide range of mobile sources, including aircraft.

ACES also includes new standards and incentives to deploy carbon capture and disposal technology at scale. Because of the importance of these provisions in shaping future investments in coal both in the U.S. and globally, I will discuss the ACES coal sections in some detail.

The role of carbon capture and disposal

As you know, coal is used to generate about 50% of U.S. electric generation today. U.S. coal plant capacity is aging: about one-third of U.S. coal capacity is over 40 years old today; in 2025, more than half of U.S. coal capacity will be over 50 years old. I have testified previously before this Committee on the toll from coal as it is mined and burned today and on the need to act now to begin reducing CO_2 emissions from the U.S. coal and global coal fleets and to prevent new coal plant investments that release their CO_2 to the air.

Coal is the most abundant fossil fuel and is distributed broadly across the world. It has fueled the rise of industrial economies in Europe and the U.S. in the past two centuries and is fueling the rise of Asian economies today. Because of its abundance, coal is comparatively cheap and that makes it attractive to use in large quantities if we ignore the harm it causes. However, per unit of energy delivered, coal today is a bigger global warming polluter than any other fuel: double that of natural gas; 50 per cent more than oil; and, of course, enormously more polluting than renewable energy, energy efficiency, and, more controversially, nuclear power.

To reduce the contribution to global warming from coal use, we can pursue efficiency and renewables to limit the total amount of coal we consume but to reduce emissions from the coal we *do* use, we must deploy and improve systems that will keep the carbon in coal out of the atmosphere, specifically systems that capture carbon dioxide (CO_2) from coal-fired power plants and other industrial sources for safe and effective disposal in geologic formations. These systems are referred to as carbon capture and storage (CCS) or carbon capture and disposal (CCD), which is the term I will use.

The Need for CCD

Any significant additional use of coal that vents its CO2 to the air is fundamentally in conflict with the need to keep atmospheric concentrations of CO2 from rising to levels that will produce dangerous disruption of the climate system. Given that an immediate world-wide halt to coal use is not plausible, analysts and advocates with a broad range of views on coal's role should be able to agree that, if implemented in a safe and effective manner, CCD should be rapidly deployed to minimize CO2 emissions from the coal that we do use.

Decisions being made today in corporate board rooms, government departments, and congressional hearing rooms are determining how the next coal-fired power plants will be designed and operated. Power plant investments are enormous in scale, more than $1 billion per plant, and plants built today will operate for 60 years or more. The International Energy Agency (IEA) forecasts that more than $5 trillion will be spent globally on new power plants in the next two decades. Under IEA’s forecasts, about 1800 gigawatts (GW) of new coal plants will be built between now and 2030—capacity equivalent to 3000 large coal plants, or an average of ten new coal plants every month for the next two decades. This new capacity amounts to 1.5 times the total of all the coal plants operating in the world today.

If we decide to do it, the U.S. and the world could build and operate new coal plants so that their CO_2 is returned to the ground rather than polluting the atmosphere.

The ACES bill contains a comprehensive approach to make this happen in the U.S. Modeled closely on the USCAP Blueprint for Legislative Action recommendations, the ACES bill combines a declining cap on greenhouse gas emissions with emission standards that will require new coal plants to capture a substantial amount of their CO_2 emissions. In addition, to allow CCD to be deployed without significant impacts on consumers' electricity rates, the ACES bill provides for a program of direct payments for capture and disposal of CO_2 from the early generations of new coal plants.

USCAP Recommendations

The USCAP Blueprint contains a comprehensive proposal for CCD deployment as part of a broad climate protection law. In addition to an economy-wide cap, the Blueprint recommends Congress adopt the following measures:

- requirements for the government to issue needed regulations for siting CO_2 repositories and pipelines;
- government financial support to build 5 GW of CCD-equipped commercial power plants by 2015;
- a transitional program to pay for tons of CO_2 emissions captured and disposed through use of CCD;
- mandatory emission standards for new coal plants that are not already permitted as of January 1, 2009.

ACES CCD Provisions

Subtitle B of Title I of the ACES bill provides a strong foundation for the deployment of CCD systems that can achieve substantial reductions in emissions from large fossil fuel sources. In NRDC's opinion, proposed sections 111, 112, and 113 of the ACES bill would effectively implement the USCAP recommendation to develop and implement a national strategy to address legal and regulatory barriers to commercial-scale CCD deployment.

USCAP also recommends an early grant program to establish at least 5 gigawatts (GW) of coal fueled facilities equipped with CCD and meeting an emission rate no more that 1100 pounds of CO_2 per megawatthour by 2015, including at least one pulverized coal retrofit project. The ACES bill does not contain a provision that specifically requires deployment of this amount of CCD capacity by 2015. The ACES bill does, in proposed section 114, authorize creation of a corporation to provide grants, contracts and financial assistance for commercial-scale demonstrations of carbon capture or storage technology projects. While NRDC believes the section 114 program can be useful in advancing practical knowledge and experience with CCD, we are concerned that as drafted, it does not appear to have a clear enough focus to assure that the USCAP-recommended 5 GW of CCD projects will be established by 2015. If this section is included in a Senate bill, NRDC recommends that it be revised to specifically incorporate an objective to achieve this important early deployment component by 2015.

USCAP also calls for a program of direct payments on a dollar per ton of CO_2 avoided basis for the first ten years of operation of CCD systems. Payments would be based on two sliding-scales. Higher payments per ton avoided would be provided for earlier projects to reflect estimated higher costs and to provide an added incentive for early operation of CCD projects. The payment schedule would be highest for the first 3 GW of projects in the program, with successively smaller payments for later projects. In addition, a separate sliding scale would provide higher dollar per ton payments for projects with higher capture rates. This would reflect the expected higher costs for high capture rate systems and would provide an incentive to achieve lower emission rates than the minimum mandatory emission standard. For example, for a project in the first 3 GW of the program that achieved a high level of capture (85-90%), the payments for the expected incremental costs are estimated to be on the order of $90 per ton avoided. USCAP recommends that the total size of the financial incentive program should be large enough to support on the order of 72 GW of CCD projects.

Section 115 of the ACES bill includes a direct payment program for captured and stored CO_2. This provision includes a requirement for payments to be made based on sliding scales with higher payments provided for early projects and for projects employing higher levels of capture. In NRDC's opinion, this approach is consistent with the USCAP recommendations. As in the USCAP recommendation, ACES specifies payments for the first ten years of CCD system operations and calls for a total program size of 72 GW.

Next, USCAP recommends a mandatory emission standard of 1100 pounds per megawatt hour (lbs/MWh) for coal plants permitted between January 1, 2009 and 2020 and an 800 lbs/MWh mandatory standard for plants permitted after the start of 2020, with authority for EPA to establish tighter standards as justified by technical and economic feasibility considerations. Under the USCAP proposal, compliance with the initial emission standard would be required upon startup for plants permitted after January 1, 2015. For plants permitted between now and January 1, 2015, compliance would be required within four years after either 2.5 GW of commercial scale CCD power plants are operating in the U.S. or 5 GW of such plants are operating globally. This recommendation guarantees that any proposed coal project not already permitted today must meet an emission standard that requires the operation of CCD, either upon startup or early in its operating life.

The ACES bill modifies both the emission standard compliance dates and the CCD payment provisions in some significant respects, with the two provisions working in tandem to create incentives for more rapid compliance and greater levels of emission reduction from new coal plants. The ACES bill also makes CCD projects that are retrofit to existing coal plants eligible for CCD payments.

Section 116 of the ACES bill, creates a new section 812 to the Clean Air Act, which establishes a minimum stringency emission standard for new coal power plants initially permitted after January 1, 2009. The mandatory emission standard in ACES is expressed as a minimum percentage reduction in annual CO_2 emissions produced by the unit: for units permitted after January 1, 2009 and before January 1, 2020, a 50% minimum reduction is required; for units permitted on or after January 1, 2020, the unit must achieve a 65% minimum reduction or meet any more stringent requirement established by EPA. The minimum percentage reduction requirements in ACES are intended to be equivalent to the 1100 and 800 pound emission rate limits recommended by USCAP.

In ACES, the mandatory emission standard compliance dates for units permitted before 2020 are somewhat delayed compared to the USCAP recommendations but as discussed below, the CCD financial incentives program is structured to provide a strong economic incentive for earlier compliance. In general, new units permitted before 2020 must comply within four years after a minimum amount (4 GW) of electric generating capacity equipped with CCD systems is in commercial operation in the U.S. but in no event later than 2025.[3] Units permitted on or after January 1, 2020 must meet the minimum emission standard upon initial operation.

Section 115 of ACES creates a program for direct payments for CO_2 captured from power plants and other industrial sources and disposed of in permanent geologic repositories. The CCD program is structured to reward early projects and projects that achieve greater reductions than the minimum emission standards set in new CAA section 812. In contrast to traditional government R&D grant programs, the earliest projects do not apply for grant approval. Rather, they are paid for performance with a statutory schedule of payments in dollars per ton of CO_2 avoided[4] through the use of CCD systems. The program is technology neutral, with no capture system favored over another.

To encourage early deployment of CCD, phase I of the payment program establishes a statutorily guaranteed payment amount for the first 6 GW of electric power plant capacity that captures CO_2. The bill specifies a payment of $90 per ton of avoided CO_2 for phase I units capturing 85% or more of the unit's CO_2 and $50 per ton for units capturing 50%, with EPA to set payments on a sliding scale for intermediate capture

[3] There is provision for a case-by-case 18-month extension of the 2025 date upon a showing of technical infeasibility for the unit.
[4] Technically, the provision awards allowances, not dollars. But the number of allowances is prescribed to equal a specified dollar per ton value.

rates. In addition, to reward the very earliest actors, the bill increases the payment amounts by another $10 per ton for units that begin to capture CO_2 on or before January 1, 2017.

For projects that are built after the initial 6 GW are operating, phase II of the ACES program would provide for payments to be made using an annual reverse auction approach: projects proposing the lowest incentive payment per ton of CO_2 avoided for a ten-year period would be selected first, with higher bidders selected next until the funds available for that auction are fully committed. The bill authorizes EPA to establish an alternative payment distribution approach for phase II if the Administrator determines that the reverse auction would not provide for efficient and cost-effective CCD deployment.

As I mentioned, compared to the USCAP recommendations, ACES delays the mandatory compliance date for new coal units permitted before 2020. But to create an incentive for earlier compliance, ACES would reduce or eliminate the amount of CCD payments available to units that delay compliance. For new units permitted before 2015, if the unit does not have CCD in operation at the minimum 50% reduction level by the earlier of 2020 or five years from unit startup, it would be subject to a 20% reduction in CCD payment amounts for each year of delayed CCD deployment. Second, new units permitted between 2015 and before 2020 are ineligible for CCD payments if they do not employ CCD at the minimum 50% reduction level when the unit starts operations.

This approach allows compliance date flexibility as a legal matter but attaches a loss of financial benefits to significant delays in CCD deployment at new coal units. As a practical matter, this approach should result in nearly all new coal projects planning to employ CCD either immediately or within a few years of initial plant operation. For example, a new coal unit receiving a permit in 2010 would most likely start commercial operation in 2014. To be eligible for full CCD payment amounts, the unit would need to be operating a CCD system by 2019. For each year past 2019 the unit delayed CCD operation, it would lose 20% of eligible payments—a delay to 2024 would mean the unit would not receive any CCD payments. Since the new unit has an outer limit compliance date of 2025 in any case, there will be a strong economic incentive to deploy CCD within five years of unit operation in order to secure full payments for 10 years of CCD operations. The more generous payment schedule for the first 6 GW of CCD in operation will add to the incentive for these first units to employ CCD promptly.

In the case of a unit permitted in 2015, it would likely start up in 2019 and would have a mandatory compliance date of no later than 2025 in any case. But if it failed to employ CCD upon startup, it would not be eligible for any CCD payments. Accordingly, there would be a strong economic incentive for immediate compliance for units permitted between 2015 and the end of 2019.

These provisions of the ACES bill will help speed the deployment of CCD here at home and set an example of leadership globally. That leadership will help reconcile coal and climate protection; it will bring us economic rewards in the new business opportunities it creates here and abroad; and it will speed engagement by critical countries like China and India.

The first CCD projects are technically ready for deployment today but the lack of a policy framework means there are regulatory and economic barriers that are difficult to overcome. The ACES bill would correct this problem by directing the adoption of required siting rules and providing both the financial incentives and clear standards for emission performance that are needed to make CCD a reality in a timely manner.

Concerns with ACES Clean Air Act and State program provisions

In constructing a new program to cap and reduce carbon pollution, we should build on, not replace, the existing Clean Air Act. The ACES bill, however, makes a number of unnecessary and, we believe, damaging changes the Clean Air Act.

Several changes do not, in our judgment, raise significant concerns. Sections 831 and 832 of the ACES bill exclude greenhouse gases from coverage under the ambient standards and hazardous air pollutant programs. NRDC believes these changes are sensible as these programs are not well suited to managing emissions of greenhouse gases.

In addition, NRDC believes it is appropriate to specify minimum CO_2 emission performance standards for new coal- and petroleum coke-fired sources, as is done in the ACES bill's section 812 standards, rather than relying on EPA rulemaking under the more general authority of the current Act's section 111 New Source Performance Standard provision. NRDC also supports a change to the current law's New Source Review (NSR) provisions to establish an applicability threshold for greenhouse gases of 10,000 tons per year carbon dioxide-equivalent, a move that would remove the much trumpeted possibility of subjecting small sources to NSR.

NRDC disagrees, however, with sections 811 and 833 of the ACES bill as written. Section 811 would entirely repeal current Section 111's New Source Performance Standards for sources covered by the ACES bill's cap. Section 833 would exempt consideration of greenhouse gases under the current Act's New Source Review (NSR) provisions for all sources, capped or not. NRDC believes these provisions are too sweeping and would inappropriately eliminate the government's ability to establish reasonable and affordable performance requirements that would complement the cap and contribute to achieving the goals of the ACES bill in an efficient and cost-effective manner.

Since the first comprehensive federal clean air law enacted in 1970, Congress has recognized the value of providing complementary approaches to achieving our air quality and emissions objectives, rather than relying exclusively on a single instrument. Thus, Congress coupled an air quality management program focused on ambient air concentrations of pollutants and state implementation plans (sections 108-110) with technology-based programs to continuously reduce emissions from motor vehicles (section 202) and large stationary air pollution sources (section 111). Congress created this dual system because it recognized that without emission reductions from these sources as technology evolves, there would be too much strain placed on the ambient air quality standards. In the 1977 amendments to the Act, Congress established a case-by-case process under the NSR Program in order to assure a more rapid updating of improvements in pollution control technology as new plants were built and old ones modernized.

The argument has been made that with an overall cap or budget on greenhouse gas emissions, we should simply not care about the amount of emissions from individual sources or even entire sectors. But Congress rejected that approach in the 1990 amendments when it enacted a cap on sulfur dioxide emissions from the electric power sector to combat acid rain. Congress retained the NSPS and NSR programs for the sources covered under the acid rain program, and those programs have continued to function well to minimize emissions from new sources, thereby reducing pressure on the sulfur dioxide cap and demonstrating improved and less expensive means of emission reduction that can be used to reduce emissions from existing sources as well.

Like for acid rain, in this case the cap on total greenhouse gas emissions is a core element of an effective greenhouse gas reduction strategy. It creates a market for the many innovations that will be required to achieve the deep reductions we need to protect the climate. But we should not rely on this alone. The RECLAIM program in Southern California is an example of overreliance on the cap mechanism alone: There exclusive reliance on a cap program led to long delays in reducing emissions from major sources, and to a totally avoidable compliance crisis when the final deadline arrived.

For these reasons, NRDC believes it is important to preserve EPA's authority to set reasonable emission standards under Section 111 even for major industrial sources that are subject to the cap. We also recommend retention of NSR provisions for truly large sources of greenhouse gas emissions. Critics have complained that applying NSR to carbon pollution would result in burdensome coverage of barbecues and donut shops. That concern is easily addressed by raising the NSR threshold to a level that would cover only truly large industrial sources, such as 10,000 tons per year of CO_2-equivalent emissions, and we recommend that change be made.

New legislation should also retain important provisions of the current Clean Air Act that protect the rights of states to go beyond federal minimum requirements. During the long period of federal abdication, states pioneered control of greenhouse gas emissions from vehicles, and they developed effective programs to deploy energy efficiency and renewable energy resources. States, and entities that states regulate (such as local distribution companies) have program delivery capabilities that the federal government cannot match. If the federal program should fall short of what is needed at some point in the future, it is extremely important that states be able to pick up the slack once again.

We are concerned, however, by section 861, which suspends for six years states' authority to implement or enforce their own cap-and-trade programs. Even temporary preemption of this state authority is very troubling. NRDC does not believe a real case has been made why any such suspension is warranted. In its place, recognizing the potential value of integrating state programs into a suitable national program, NRDC recommends a means through which states can voluntarily suspend the adoption or enforcement of state caps so long as the national program provides a strong national cap, retains other state authorities and adequately supports state energy efficiency, renewable energy, and transportation efficiency programs. As this Committee determines the distribution of the valuable emissions allowances, it is essential to provide sufficient resources for these state-run and state-regulated energy efficiency, renewable energy, and transportation efficiency programs.

The bill should also provide a means to assure that the carbon reduction benefits of these state energy efficiency and renewable energy deployment programs will not be lost when we have a national carbon cap. The bill should allow EPA to reduce the national cap by an appropriate amount if states show that their in-state programs have reduced emissions beyond the national program and in a way that does not raise allowance prices in other states.

IV. Using Allowance Value for Public Benefit, Not Private Enrichment

The distribution of the carbon allowances is one of the fundamental decisions that Congress must make. This choice is often debated by using the shorthand "auction versus free allowance giveaway." However this shorthand misses the important policy point—more important than whether allowances are sold at auction or distributed for free is the question of what purposes are established for the use of distributed allowance value, whether free or auctioned. A free allowance that the law requires be used to serve a public purpose is just as effective in promoting that purpose as a provision that requires an equivalent amount of auction proceeds to be used for that purpose. While the ACES bill allocates most of the allowances without charge in the early years, most of those free allowances are required to be used for public purposes and an increasing number – eventually effectively all of them – are auctioned over time.

Even though most allowances are allocated without charge at the outset, the vast majority – more than 80 percent over the life of the bill, according to Harvard economist Robert Stavins[5] – are distributed for public purposes, not private windfalls. Nevertheless, significant improvements can be made. Here are the most significant categories:

Consumer protection for utility customers. The largest fraction of the initial allowance distribution goes to electric and natural gas local distribution companies (LDC) (30-35 percent and 9 percent, respectively, phasing out by 2030). Amendments

[5] Robert Stavins, *The Wonderful Politics of Cap-and-Trade: A Closer Look at Waxman-Markey* (May 27, 2009), *http://belfercenter.ksg.harvard.edu/analysis/stavins/.*

on the House floor allocated an additional fraction of one percent to small utilities, primarily co-ops, and added protections against allocating any LDC more than it requires for compliance purposes. The LDCs, which are regulated by state public utility commissions, are strictly required to use the value of these allowances for the benefit of their customers. They can do this by investing in cost-saving efficiency or pass the value on to their customers in ways that lower total electric bills.

There is an important difference between the ACES provisions for electricity and gas utilities, however. The bill directs one-third of the emissions allowances given to natural gas LDCs to helping their residential, commercial, and industrial customers make cost-saving energy efficiency investments. Congress should do the same for electricity LDCs. If local electric companies invested a third of their allowances in efficiency, national energy efficiency investments would increase by about $10 billion per year. This would lower consumers' electricity bills and lower carbon allowance prices significantly for all sources.

Low-Income Consumers. Fifteen percent of the allowances are devoted every year to protecting low-income consumers, who spend a higher percentage of their income on food, transportation, and other necessities. The Congressional Budget Office concluded that these provisions will be effective in assuring that the ACES bill is progressive, with the lowest income fifth of the population being better off under the bill by about $40 per year.

Preserving Domestic Competiveness. The bill provides as much as 15 percent of the allowances to energy-intensive manufacturers of products such as steel, aluminum, cement, and chemicals that are subject to strong international competition. The rebates are intended to counter pressures to shift production, jobs, and emissions to countries without comparable carbon reduction programs. Rebates are based on an industry average emission rate (e.g., tons of CO_2 per ton of cement) and facility-specific output data (e.g., tons of cement produced) and phase out by 2035. The bill also provides for border adjustments after 2020 if rebates do not adequately address competitiveness. Refinements are needed, however, to provide the president with appropriate discretion in applying border adjustments, and to ensure that firms are not overcompensated and that these two measures phase out as other countries step up to the plate.

Oil Refiners and Merchant Coal Generators. Oil refiners and merchant coal plants do not qualify for allowances either as LDCs or energy-intensive, trade-exposed manufacturers. Nevertheless, under the ACES bill these sources initially receive about seven percent of the allowances for free. The bill contains an important provision for reducing the merchant coal allocation if EPA finds it will lead to windfall profits. The same provision to avoid windfalls should be attached to any allocation to oil refiners.

Energy efficiency, renewables, and domestic adaptation. Other major slices of ACES allowances go to State Energy and Environment Deployment (SEED) funds for energy efficiency and renewable energy programs, and to incentivize new clean energy technologies, including carbon capture and storage, retooling and infrastructure for hybrid- and all-electric vehicles, and efficient building and appliance deployment. Allowances are also dedicated to domestic public health and natural resources adaptation programs.

Green jobs and worker transition. The ACES bill creates a program of worker training, education, and transition for clean energy jobs. It also provides transition assistance to qualifying workers who may be displaced by the effects of the legislation.

International objectives. A critical portion of the ACES allowances is devoted to international objectives, including reducing deforestation, helping the most vulnerable countries adapt to climate change impacts, and promoting clean technology exports. NRDC urges this Committee not only to include these allocations for international purposes, but to enlarge them. The five percent of allowances dedicated to reducing tropical forest loss is one of the key provisions of the ACES bill, simultaneously tackling the devastating loss of forests and helping to demonstrate that the U.S. is taking action on a scale comparable to other developed countries. NRDC joined in supporting this deforestation allocation with a strong coalition of business, environmental, and conservation groups including American Electric Power, Environmental Defense Fund, Duke Energy, the Sierra Club and others. We urge the Committee to increase the allocations for helping the poorest countries cope with unavoidable climate impacts, and to promote market opportunities for U.S. clean technology. This is in our national interest. Global warming impacts can significantly increase threats to our national security. These allocations are critical to U.S. credibility and engagement with other countries. The clean energy export provision also provides an important tool to help secure a strong commitment from all major emitters as they are made available only to countries that take significant action to reduce their pollution. At the same time, this provision helps create and support the demand for U.S. clean energy technologies.

V. Market Risks from Subprime Offsets and Biofuels

NRDC's greatest concerns with the ACES bill lie with the agricultural offsets and bioenergy amendments made after mark-up by the Energy and Commerce Committee and before the bill went to the floor. These amendments run the risk of creating a subprime market in both offsets and biofuels. They seriously damage the environmental integrity of the bill, and they will undermine public confidence in the markets for both products.

Fixing the offset rules

The ACES bill allows a very large number of offset credits – up to two billion tons per year. Domestic offset credits can be earned by reducing or sequestering emissions from agricultural sources and smaller industrial sources that are not subject to the emissions cap. International offset credits can be earned by reducing rates of deforestation, as well as by measures taken in the electricity and industrial sectors, and agricultural, and reforestation sectors if determined eligible. In order to turn offset use into an engine for making net reductions in carbon pollution, the original Waxman and Markey proposal provided that capped sources acquire 1.25 tons of reductions or sequestrations for each ton of extra emissions they wished to emit. Thus, with every offset transaction, net global emissions were to be reduced by a quarter of a ton of CO_2. In this way, using offsets would not merely let us run in place. Rather, the more offsets we used, the faster we would make progress reducing overall emissions. This was a win-win: while offset users benefited from reduced compliance costs, the world benefited from faster emission reductions.

The bill as passed by committee and the full House retained that 25 percent dividend for international offsets after 2017, but allows domestic offsets (and international offsets before 2017) to be used on a one-ton-for-one-ton basis. NRDC believes this Committee should extend the offset dividend to apply to all offsets, as in the original Waxman-Markey proposal.

The Committee also needs to pay close attention to assuring the *quality* of all offsets as this is essential to the integrity of any carbon pollution reduction targets. If an offset credit is not backed by a real reduction, or if that reduction would have happened anyway, then total system emissions actually increase above required levels when that credit is used to enable a capped source to emit an extra ton of carbon.

It is no secret that poor offset quality has been a serious problem in implementation of the Clean Development Mechanism under the Kyoto Protocol. That is why the ACES bill as passed out of the House Energy and Commerce Committee focused much attention on creating a reliable framework for ensuring the reality and additionality of each ton of reductions or sequestrations claimed under an offsets program.

First, the Committee bill established a science-driven process for developing the offset system's rules by creating an Offsets Integrity Advisory Board consisting of experts with the relevant backgrounds and experience, drawn from public, private sector, and university settings. This Board is critical to ensure that regulators are given strong, independent, and scientifically driven guidance on the rules.

Second, the Committee bill placed primary responsibility for ensuring offset quality in EPA, on the sound premise that since offsets are alternate compliance instruments, the agency Congress charges with assuring overall compliance with the cap should bear primary responsibility for determining the quality of offsets that will accepted for compliance purposes. Third the Committee bill requires that offset credits be based on standardized performance-based methodologies, rather than case-by-case reviews that have proved so problematic under the Clean Development Mechanism. Fourth, the Committee bill required independent third-parties to play an essential role in certifying that offset projects meet the quality standards established by the regulator. Lastly, the Committee bill provided for random audits of projects and mandated a full program review every five years.

Ensuring offset quality through the development and implementation of sound rules should be in the common interest of business, environmentalists, farmers, foresters, ranchers, and the American public. Otherwise, we run the risk of creating a subprime asset. If offsets do not actually reduce emissions as promised, they will quickly lose public trust and support. The loss of public trust will penalize the good actors by reducing confidence in the offset market, while simultaneously damaging our environment. That result isn't in the interest of anyone. As we have seen in the financial markets, loss of confidence in market instruments can have broad and costly ripple effects.

In this regard, we have serious concerns with changes to the offset provisions made after the ACES bill passed out of the Energy and Commerce Committee. In particular, we are concerned by the floor bill's transfer of authority over the development and implementation of the quality safeguards for domestic agricultural and forestry offsets from the EPA to the U.S. Department of Agriculture (USDA). USDA has an important role to play in bringing its scientific expertise to bear, and in serving as an extension agent to enable thousands of farmers and foresters to take part in the opportunities provided by a well-run offsets market. But for the reasons mentioned above it is not sound policy to divide compliance determination responsibility between two agencies. We are concerned as well with other changes that weakened aspects of the offsets rules, including diminishing the role of the Offsets Integrity Advisory Board regarding agricultural offsets.

One constructive amendment made on the House floor establishes a domestic program administered by USDA to provide incentives, outside the offsets program, for supplemental farm-based emission reductions and carbon sequestration. This program provides an avenue to encourage practices that are beneficial but would have difficulty meeting the strict measurement, verification, and additionality requirements needed for offsets. This concept provides a leading role for USDA in promoting farm-based practices to reduce emissions and store carbon without presenting any risk to compliance with the cap.

It bears noting that the principals in the House negotiations over these issues have explicitly stated that the formulation included for purposes of floor action in the House should not be viewed as the approach that should become law. In a letter to President Obama, Chairmen Waxman and Peterson stated:

> [W]e have not yet agreed upon the appropriate roles of the U.S. Department of Agriculture and U.S. Environmental Protection Agency in developing and implementing the program. For the purposes of House action, we have given responsibility exclusively to USDA, rather than resolve the specific responsibilities of the two agencies.[6]

The letter continues to ask the Obama administration for its advice on appropriate roles for the two agencies.

[6] Letter from Chairmen Henry Waxman and Colin Peterson to President Barack Obama (June 24, 2009).

NRDC believes this issue can be resolved in a manner that ensures each agency plays an appropriate role both in aiding farmers, ranchers, and foresters to participate and in ensuring that resulting offsets meet the high quality standards needed to ensure that we meet our emissions objectives. Well-designed domestic agriculture and forestry projects can play an important role in solving global warming, and so we look forward to working with this Committee, the administration, and other stakeholders to improve these provisions in the Senate bill and in Conference.

Fixing the treatment of bioenergy

Sustainably produced biomass feedstocks, processed efficiently and used in efficient vehicles or burned to generate electricity, can reduce our dependence on fossil fuels, cut emissions of heat-trapping carbon dioxide, and contribute significantly to a vibrant rural economy. Based on its potential, bioenergy has benefited from tremendous public investment in the form of production mandates and tax dollars.

Pursued without adequate environmental safeguards, however, bioenergy production can damage in significant ways our lands, forests, water, wildlife, public health and climate. As a result of floor amendments, ACES includes three fundamental flaws in bioenergy policy that if not corrected will significantly undermine the achievement of the carbon pollution reduction targets in this legislation, wreak unintended harm on our natural resources, and undermine the market for bioenergy.

- First, the bill creates a large biomass loophole in carbon accounting that ignores the global warming emissions related to biomass production and combustion when determining if the bill's emissions caps are met. The loophole could dramatically diminish the emission reductions achieved by the bill, bringing actual reductions in

2020 achieved by capped sources to as low as 11 percent, rather than the 17 percent reduction promised by 2020.

- Second, the bill weakens current law by stripping from the renewable fuels standard under the Clean Air Act the requirement for a full lifecycle accounting of the carbon emissions from producing and using biofuels – including market-driven impacts such as international deforestation. This would cause the ACES bill to work at cross-purposes, with one part of the bill using allowance revenue to reduce deforestation while another part drives increases in deforestation.
- Third, the bill eliminates safeguards on the sourcing of biomass that protect federal forests, sensitive ecosystems, and wildlife habitat.

These changes fundamentally threaten the foundation of sound bioenergy policy by pitting environmental objectives and bioenergy production objectives against each other. NRDC and many other environmental organizations have championed bioenergy in the past and NRDC wishes to continue to support this potentially clean and sustainable source of energy. However, if bioenergy is sourced and produced in a manner that conflicts irreconcilably with solving global warming and safeguarding natural resources, it will destroy the support -- by a broad coalition, including NRDC -- that bioenergy has up to now enjoyed. For example, NRDC and a wide range of other organizations have already gone on record that without adequate safeguards, they will have to oppose implementation of the existing biofuels mandate under the RFS.

Fixing the biomass loophole in carbon cap accounting. The ACES bill is supposed to require a 17 percent reduction in carbon emissions by 2020. Because of the biomass loophole in the House-passed bill, the real reduction achieved could be far less –

as little as 11 percent.[7] The loophole is created by not requiring covered sources to account for the life-cycle emissions of biomass and biofuels. In other words, if a coal power plant replaces half of its coal with biomass, it has to hold carbon allowances for only half of its pollution. This makes sense only on the assumption that 100 percent of the carbon dioxide released when the biomass is burned was taken up from the atmosphere during its production. That assumption is true when biomass is grown in a sustainable, low-carbon manner. It is not true if biomass is taken from old growth forests or other practices that result in large releases of sequestered carbon into the atmosphere before the fuel reaches the power plant.

A rational, environmentally-sound market for bioenergy would account for these upstream carbon emissions. The marketplace would then favor sustainable, low-carbon sources of biomass, and shun those that make our climate problem worse. The biomass loophole will encourage ineffective "junk" biomass, disadvantaging and punishing providers of sound biomass. It also punishes providers of other low-carbon energy – wind and solar, for example – and even hurts providers of fossil energy who have to incur the cost of carbon allowances, while no allowances would be required if the source switched to bioenergy.

Fortunately, Chairmen Waxman and Peterson recognized in another letter that this issue requires further work.[8] The common sense solution is to close the loophole by ensuring that covered entities that burn or process biomass report the full net carbon

[7] Drawing on several independent scientific analyses, NRDC estimates that under the ACES bill uncounted bioenergy emissions in 2020 could be 45-354 million metric tons greater than in 2005. Our best estimate is 193 million metric tons, based on results of a preliminary analysis of ACES using a version of the Department of Energy's NEMS model and land-use-related emission factors from EPA's RFS2 proposal. This would erode the effective 2020 emission reductions to only 14 percent using our best estimate, and to as little as 11 percent using the high end of the scientific range.
[8] Letter from Chairmen Waxman and Peterson to Speaker Nancy Pelosi (June 24, 2009).

impacts of that fuel, capturing net emissions reduction benefits from the most sound biomass sources and accounting for emissions increases associated with other types o of biomass.

Preserving full carbon accounting in the RFS. The ACES bill as passed on the floor compounds the above problem by creating a second biomass loophole that strips, for at least five years, a critical safeguard from the renewable fuels standard (RFS) included in the Clean Air Act by the 2007 Energy Independence and Security Act (EISA).

As this Committee is well aware, the expanded RFS mandate established in EISA 2007 included life-cycle greenhouse gas performance requirements for new biofuels. EISA's amendments to the Clean Air Act required EPA to conduct a full life-cycle analysis of emissions associated with producing biofuels – including the emissions from market-driven impacts like deforestation and land conversion in other countries. The amendments specifically defined life-cycle emissions to include "direct and significant indirect emissions such as significant emissions from land-use changes."

The amendments made to the ACES bill before floor action would delay inclusion of so-called "international indirect" emissions from the required life-cycle accounting for at least five years, even though the best available science already establishes that these emissions are real and significant. The loophole could not be closed unless EPA and USDA jointly agree on a new accounting methodology after studies by the National Academy of Sciences.

Emissions from market-driven deforestation and land use change are large. In the California Air Resources Board's adopted rule and in EPA's proposed RFS rule, expert agencies have found that the emissions from the biomass-generated incentive for clearing land equal between 31 percent and 66 percent of the life-cycle greenhouse gas emissions of gasoline.[9]

As the USDA stated in recent testimony to Congress: "There is little question that increased biofuel production will have effects on land use in the United States and the rest of the world."[10] The USDA testimony also noted: "EPA's proposal reflects considerable input, guidance, and data from USDA. EPA's proposal also utilized many of the same data and assumptions that USDA uses regularly in near-term forecasting agricultural product supply, demand, and pricing."[11]

Ignoring market-driven emissions from land-use change in other countries will allow world-wide emissions to increase as carbon is released from forests and soils, worsening global warming instead of abating it. To be sure, calculation of the emissions associated with market-driven land-use changes is complex. But a sound scientific basis already exists for these calculations. EPA is using the best science and peer-reviewing its proposal.

In fact, EPA is relying on the same peer-reviewed models that the Congress has relied on for years to assess the impacts of the farm bill. These are the same models the corn ethanol industry has pointed to arguing that ethanol subsidies are good because they raise the price of corn and thus lower agricultural subsidies. The main difference in how

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[9] California Air Resources Board (CARB), "Staff Report: Proposed Regulation to Implement the Low Carbon Fuel Standard - Initial Statement of Reasons (ISOR), Volume 1," March 5, 2009. Table IV-5, p. IV-15 AND Regulation of Fuels and Fuel Additives: Changes to Renewable Fuel Standard Program (Notice of Proposed Rulemaking). Federal Register 74:99 (May 26, 2009) p. 25041.

[10] USDA, *Statement of Joseph Glauber, Chief Economist, U.S. Department of Agriculture Before The House Agriculture Committee, Subcommittee on Conservation, Credit, Energy, and Research*, May 6, 2009, Pg. 15.

[11] *Id*. at 2.

EPA is using these models is that it is including the economic ripple effect those higher corn and crop prices have around the world. If these models are good enough to make the case for ethanol subsidies, they should be good enough to make sure that ethanol actually provides benefits in return for those subsidies.

Addressing this issue, more than 170 scientists wrote to the California Air Resources Board saying:

> As scientists and economists with relevant expertise, we are writing to recommend that you include indirect land use change in the lifecycle analyses of heat-trapping emissions from biofuels and other transportation fuels. This policy will encourage development of sustainable, low-carbon fuels that avoid conflict with food and minimize harmful environmental impacts.[12]

NRDC believes if EISA's requirement for full life-cycle analysis is postponed, then it is necessary to delay further implementation of the Renewable Fuel Standard as well. If a "time-out" is called, it should extend to all the players on the field, including a time out for all increased volume requirements under the RFS. Anything less than keeping the accounting and the volume requirements on the same schedule amounts to cooking the books.

A better approach would be to replace the RFS with a low-carbon fuel performance standard as soon as practically possible. Such a standard should set limits on the average carbon intensity of the entire transportation fuel pool, not simply on the portion added under the RFS. The federal standard, like the California low carbon fuel standard, should be technology-neutral and performance-based, thereby providing the maximum flexibility and incentive to innovate with new fuels and approaches to lower carbon intensity. Any sustainably-produced low-carbon fuel should be allowed to

[12] Matson et al., letter to Mary Nichols, Chair, California Air Resources Board (Apr. 21, 2009).

compete, including biofuels, electricity, natural gas, or even petroleum fuels produced in a lower carbon, more efficient manner.

At the same time, the full carbon emissions of high carbon fossil fuels, such as tar sands, oil shale and liquid coal, and today's conventional oils must also be counted – if these high-carbon fuels are allowed to grow unabated, they could increase transportation fuel carbon intensity by *one-third* by 2030.

This fuels standard would avoid the inefficiencies of the current technology-specific, volume-based mandates and performance thresholds that currently dominate U.S. biofuels policies. It would encourage maximum innovation across all transportation fuel options, which is the key to ensuring compliance at the lowest cost.

Preserving land and wildlife safeguards. The ACES bill's third step backwards for bioenergy policy is to eliminate key sourcing safeguards for biomass feedstocks. In addition to the minimum greenhouse gas standards, EISA 2007 includes a definition of renewable biomass that provides vital protections for wildlife, native grasslands, old-growth, natural forests, and federal forests. While providing this minimum level of protection, EISA makes available a wide range of high-volume biomass materials, assuring diverse opportunities for landowner participation and a wide diversity of feedstocks. These minimum safeguards should be retained for the RFS and extended to all policies that promote bioenergy, including the bill's Renewable Electricity Standard.

Instead, the floor amendments to the ACES bill move completely in the wrong direction. They eliminate all sourcing guidelines on non-federal lands and significantly dilute the level of protection for our federal forests. These new definitions are applied to the RFS, the RES, and to carbon accounting under the cap itself.

EISA's current definition of renewable biomass ensures that the RFS does not encourage biomass harvesting from sensitive wildlife habitat. The ecosystems placed off limits by the RFS are home to our most rare, threatened, and imperiled wildlife. While tree plantations and young forests are increasing in parts of the United States, older forests that provide critical wildlife habitat and store tremendous amounts of carbon are disappearing faster than they are being regrown, both nationally and globally. Loss of native habitat is the greatest threat to biodiversity here and abroad. The RFS safeguards also protect against the use of biomass harvested from native grasslands and old-growth and late successional forest. Loss of forests is one of the greatest threats to biodiversity worldwide and a major contributor to global warming.[13]

The RFS renewable biomass definition in current law allows use of all biomass from existing tree plantations, from new tree plantations established on previously cleared non-forested lands, and from "slash and precommercial thinnings" from natural forests. In concert, these provisions allow woody biomass to contribute to biofuels feedstocks, while protecting against the clearing of forests or the conversion of natural forests to monoculture tree plantations, thus losing their natural ecosystem functions.

The current definition properly discourages the conversion of natural forests to other uses. These forests are under severe threat from unsustainable logging practices, global warming, and real estate development. While outright deforestation is the most dramatic example, equally critical is the conversion of natural forests to single-species tree plantations. Plantations may look like "forests," but they are biological deserts

[13] Intergovernmental Panel on Climate Change, *Climate Change 2007: Synthesis Report Summary for Policymakers*, pg. 5. Available at http://www.ipcc.ch/pdf/assessment report/ar4/syr/ar4_syr_spm.pdf

compared to the natural forests they replace – lacking the diversity of species, structure, carbon content, and ecological functions that make natural forests so important.

The RFS sourcing safeguards also protect our federal forests. Federal lands are held in trust for the American public. Freed from immediate market pressures, their core purpose is a set of values and services largely unavailable from private lands. In the climate context, their highest functions are as carbon sinks, measures of U.S. credibility globally, and ecological refuges. Additionally, these forests represent unique reservoirs of genetic and other biologic diversity, provide many other ecological services like drinking water and flood control, and stand to play a critical role in the face of global warming's growing impacts on biodiversity, ecosystem resilience, and the spread of invasive species.[14]

Old growth forests and native grasslands store vast amounts of carbon. Most private and many state lands are managed with an intensity that greatly reduces carbon sequestration. U.S. national forests and Department of Interior lands are the exception. Their undisturbed areas can be kept intact; those damaged can be guided back to carbon-rich status. No other land use decision within Congress' direct control has so much potential to mitigate global warming.

Some logging enthusiasts optimistically argue that restoration of federal lands is actually enhanced by opening them to biomass sourcing. However, it has proven very difficult to create biomass incentives for these lands that provide reliable greenhouse gas benefits but do not jeopardize their core functions and values. Generally, the more wood removed, the greater the adverse impact on net sequestration and ecologic functioning.

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[14] See, for example, Lovejoy, Thomas, *Climate Change and Biodiversity*, Yale University Press, August 2006.

Thus, while light thinning may in some cases help remedy past abuses, allowing industrial demand to drive restoration decisions is a recipe for disaster.

Conservation of these public lands is also essential to American standing internationally. Climate change cannot be managed without halting native forest loss worldwide. To press that point credibly, we must practice what we preach. Putting our own house in order requires preserving intact federal forests and increasing the carbon storage of others.

These public lands are also vital to climate adaptation. Large undisturbed tracts, like national forest roadless areas, enjoy high ecological health. They are better positioned than altered systems to accommodate warming with their essential processes in place. As America's flora and fauna suffer the stress of climate change, these are the landscapes in which many can best survive. Intact public lands will preserve our natural heritage and biological diversity, and thereby help lessen pressure on private lands.

In sum, these floor amendments to ACES should be rejected to ensure that American agriculture reaps the benefits of bioenergy without damaging our natural resources and worsening climate change.

VI. Conclusion

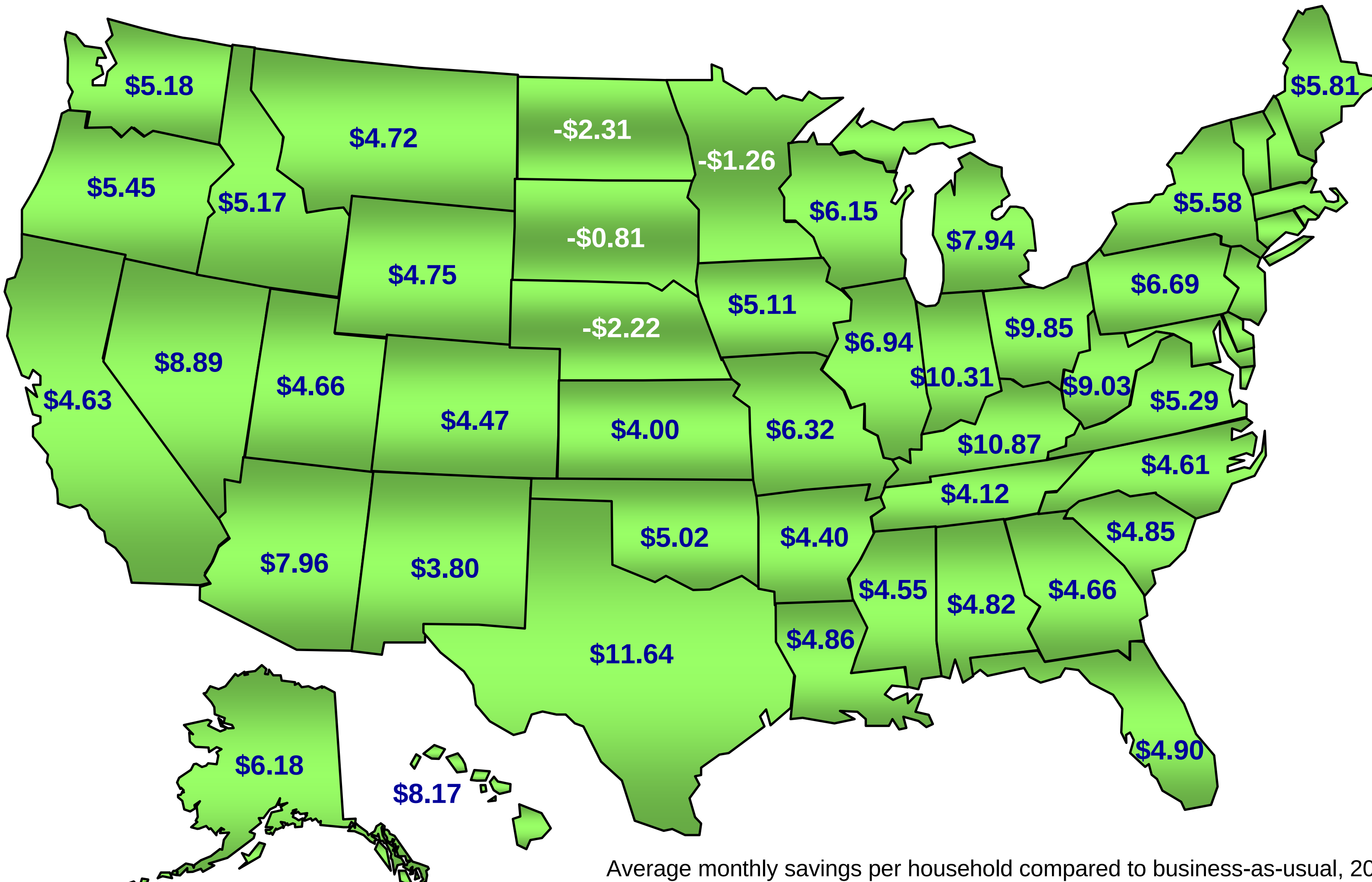
Chairwoman Boxer and members of the Committee, the time for action to address the triple threat of overdependence on insecure energy resources, a weakened economy, and an imperiled climate is long overdue. The ACES bill passed by the other body has the right broad architecture: a comprehensive limit on greenhouse gases that gets tighter over time, a set of complementary policies to spur rapid improvements in emission performance in key sectors of the economy, a balanced approach to allowance value distribution that addresses the different transition challenges for different regions and economic sectors and provides needed resources for clean energy deployment, well-designed provisions to manage program costs without weakening the program's environmental performance, and modest but important support for forest protection in other countries. The bill has its defects, some of them substantial as discussed above, and these should be corrected in the Senate. But ACES is a very good starting point that should allow the Senate to move promptly to pass a companion measure so that a bill can be presented to the President for his signature later this year.

There is a story about the advice a Chinese gardener gave to his employer. When the landowner asked, "what is the best time to plant an oak tree," the gardener replied, "100 years ago but the second best time is today." For climate protection perhaps the best time to enact a comprehensive program to fight global warming was thirty years ago but the second best time is this year.

Climate Bill Cuts Electricity Bills

H.R. 2454 saves Americans an average of $6 per month

Americans in nearly every state will save on their monthly electricity bill under the American Clean Energy and Security Act. With its energy-efficiency and consumer protection provisions, H.R. 2454 creates modest savings for most consumers. Even in the few states where savings compared to business-as-usual are not projected, bills still will be lower under H.R. 2454 than they were in 2007.



US Average Savings: $5.99/month

CT	$8.11
DC	$4.06
DE	$9.01
MA	$5.53
MD	$8.07
NH	$5.82
NJ	$6.28
RI	$4.45
VT	$5.27

Average monthly savings per household compared to business-as-usual, 2012-2020. Negative amounts indicate a slight smaller *savings* under H.R. 2454 than under business-as-usual. Methodology and sources on back.

Methodology and Sources

The data presented are based on analysis that NRDC commissioned from OnLocation Inc., using NEMS-NRDC. NEMS was developed by the U.S. Department of Energy, and is the model that the Energy Information Administration (EIA) uses to develop its Annual Energy Outlook. OnLocation has extensive experience with the NEMS model, and has provided NEMS model development and support to EIA for over 20 years. For this project OnLocation analyzed H.R. 2454 using a modified version of the model, which is referred to as NEMS-NRDC. NEMS-NRDC portrays the effects of H.R. 2454, including carbon price projections, energy efficiency improvements (represented by adopting EIA's High Technology case assumptions), allocations to local distribution companies (LDCs), and dynamic responses (e.g., demand reductions and fuel switching to lower carbon fuels). The bill's refunds to low-income consumers are not included in the results presented here. The NEMS model generates results resolved to the regional, not the state level. NRDC further focused the results to the state level by assuming each state's electricity prices and consumption would change by the same percentage as those of the region in which the state is located, and its population would change by the same percentage as the overall U.S. population. As variation may occur between state and regional and state and national trends, these results should be considered approximate.

Details:

- Electricity bill savings (or costs) are the difference in residential electricity expenditures (price multiplied by consumption) between the Business-as-usual (BAU) and H.R. 2454 cases, per household. Changes in expenditures on energy-using devices are not included.
- Business-as-usual state-specific electricity prices and consumption levels are projected to 2020 by scaling state-specific 2007 data in proportion to changes in the electricity prices and consumption levels of the region in which the state is located. [Sources: 2007 state data from EIA. Projected electricity prices and consumption levels of each region from NRDC-NEMS Reference case based on AEO2009.]
- The percentage changes in electricity prices and consumption levels per state under H.R. 2454 are assumed to be the same as the percentage changes in electricity prices and consumption levels of the region in which the state is located. [Sources: Projected changes in electricity prices and consumption levels of each region from NEMS-NRDC modeling of H.R. 2454.]
- State-specific number of households is projected to 2020 using 2000 state-specific data scaled in proportion to the projected change in the national total [Sources: 2000 data from U.S. Census. Projected growth in number of households in total U.S. from EIA.]
- Regions are based on the NERC regions and sub-regions that EIA uses in AEO 2009. If a state falls into more than one region then its projections are calculated through taking a population-based weighted average of the two or more regions into which it falls.
- Four states experience modest bill increases relative to the business-as-usual case despite electricity prices that are projected to be below 2007 levels under H.R.2454. In the region that all four states are in, electricity prices are projected to drop by 14.6% between 2007 and 2020 under BAU and by 2.6% under H.R. 2454.

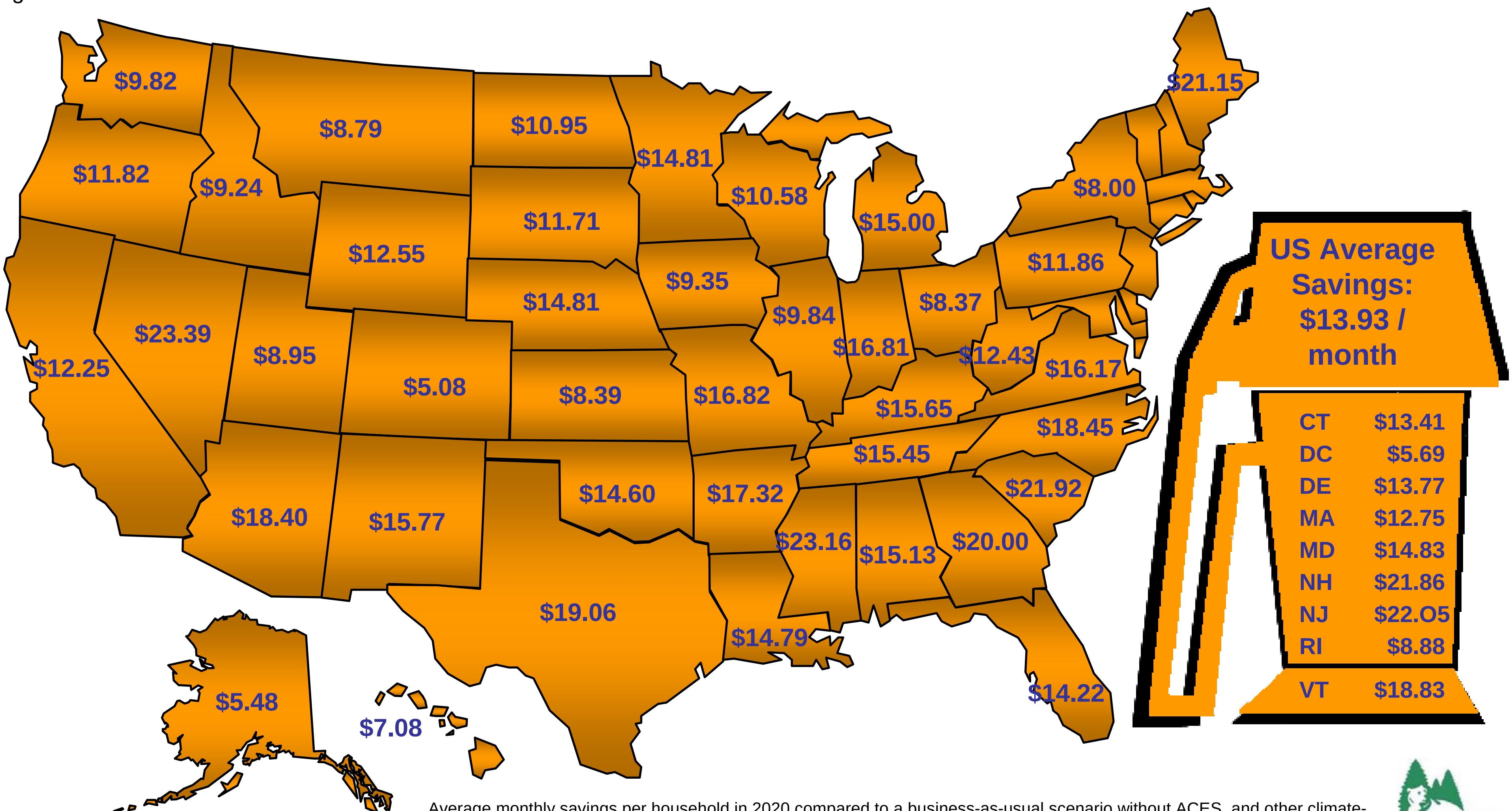
Sources used are: NEMS-NRDC modeling of H.R. 2454 (built upon AEO 2009). Department of Energy's Energy Information Administration. U.S. Census Bureau.

For more information, please contact Antonia Herzog at aherzog@nrdc.org

Climate-Protection Policies Cut Fuel Bills

ACES Bolsters Other Fuel Policies to Save Americans $17 Billion/yr by 2020

The American Clean Energy and Security (ACES) Act allocates funding to produce the next generation of clean, fuel-efficient vehicles in the United States, and when combined with clean vehicle performance standards adopted by the Obama administration, the American on-road fleet will become about 25% more fuel efficient over the next decade. As a result, by 2020, Americans will drive more efficient vehicles and have lower household transportation costs. Even in the face of rising gasoline prices, cleaner vehicles will save money by sipping instead of guzzling gasoline.



Average monthly savings per household in 2020 compared to a business-as-usual scenario without ACES, and other climate-protection legislation, including CAFE and GHG standards. The analysis takes into consideration fuel savings from more efficient vehicles, allowance costs, and the incremental purchase cost of more efficient vehicles. Methodology and sources on back.

NRDC
THE EARTH'S BEST DEFENSE

Methodology and Sources

Methodology and Assumptions

The bulk of the average American household's transportation costs come from owning and operating personal vehicles, such as cars, minivans, SUVs, and pickup trucks. We calculate the savings to households in 2020 by taking the difference in the cost of driving a fleet made up primarily of vehicles that get the same fuel economy as the average new vehicles sold today and the cost of purchasing and driving more efficient vehicles. The cost of driving is simply the product of fuel consumption and gasoline prices. For both the base and more efficient vehicle cases, we start with gasoline prices as projected by DOE's Energy Information Administration (EIA). When calculating the transportation cost of the more efficient fleet, however, we adjust the cost to include two counteracting effects: (1) fuel prices increase because of the carbon cap under ACES (about 5% in 2020), and (2) state gasoline expenditures decrease because a reduction in U.S. oil demand puts downward pressure on world oil prices, and therefore state gas prices. It should be noted that, even without the cost-reduction effect in (2), all states have net savings. A national vehicle fleet stock turnover model developed by Therese Langer at ACEEE projects on-road vehicle efficiency. When that efficiency is divided into mileage estimates, it provides national fuel consumption projections. For this analysis, the 2020 national consumption is then allocated to states in proportion to historic state-level consumption data from EIA. State-level fuel costs are calculated by multiplying a state's consumption by its gasoline prices.

Vehicle Efficiency

The Obama Administration recently enacted new vehicle standards of 27.3 mpg for model year (MY) 2011 and announced an extension of those standards to reach 35.5 mpg for MY 2016. The savings in our calculations reflect a comparison of these new standards with a fleet that remains at 2008 levels for cars and 2011 levels for light trucks (based on EPA data and regulations enacted before the Energy Independence and Security Act). The improved fleet increases linearly between 2011 and 2016 and then remains at the 2016 level.

Gasoline Prices

State gasoline prices for the base case are assumed to equal the regional prices for the region in which the state is located, as reported by EIA's Annual Energy Outlook 2009 (Updated Release, which reflects the American Recovery and Reinvestment Act). In the ACES+vehicle standards case, those base case gasoline prices were increased in proportion to the carbon content of fuel consumption using allowance prices (in $/MTCO2e) from the Congressional Budget Office (CBO). Also in the ACES+vehicle standards case, we accounted for the fact that changes in U.S. oil demand can affect world oil prices and therefore U.S. gasoline prices. Today, the U.S. consumes nearly a quarter of world daily production and a reduction in demand from driving more efficient vehicles will lower worldwide demand and therefore oil prices. We estimate that for each gallon saved, total state costs decrease by $0.27, which is the estimate from NHTSA's MY2011 CAFE rule.

Vehicle Costs

The technology to make more efficient vehicles increases the price of the vehicles. The Obama Administration estimates that MY2016 vehicles that average 35.5 mpg will cost approximately $1300 more than today's vehicles. NHTSA estimates that achieving the shorter run MY2011 standard will cost less, at $91 per vehicle. To get costs for MY2012-2016, we interpolate linearly between MY2011 and MY2016 costs. We also assume that the incremental cost is not paid for entirely upfront but is included in a 5-year loan with an 8 percent interest rate. We allocate the more efficient vehicle incremental costs to individual states according to an estimate of new vehicles sales in each state. We use the EIA AEO 2009 projection of national sales and assign each state a share of the sales according to a recent breakdown of vehicles per state provided by Ward's Automotive Group for 2006.

It is also worth noting that though a main driver of savings is the switch to more efficient vehicles, and low income households tend to drive older and less-efficient vehicles, there are provisions in the bill to ensure that low-income households are not negatively impacted. More specifically, ACES provides 15% of allowance value to low-income households in the form of a rebate to fully cover their increased costs (not only for transportation, but for home energy and all other direct and indirect costs). In fact, a recent CBO analysis shows that low-income households will actually benefit slightly under ACES.

For more information, please contact Antonia Herzog at aherzog@nrdc.org

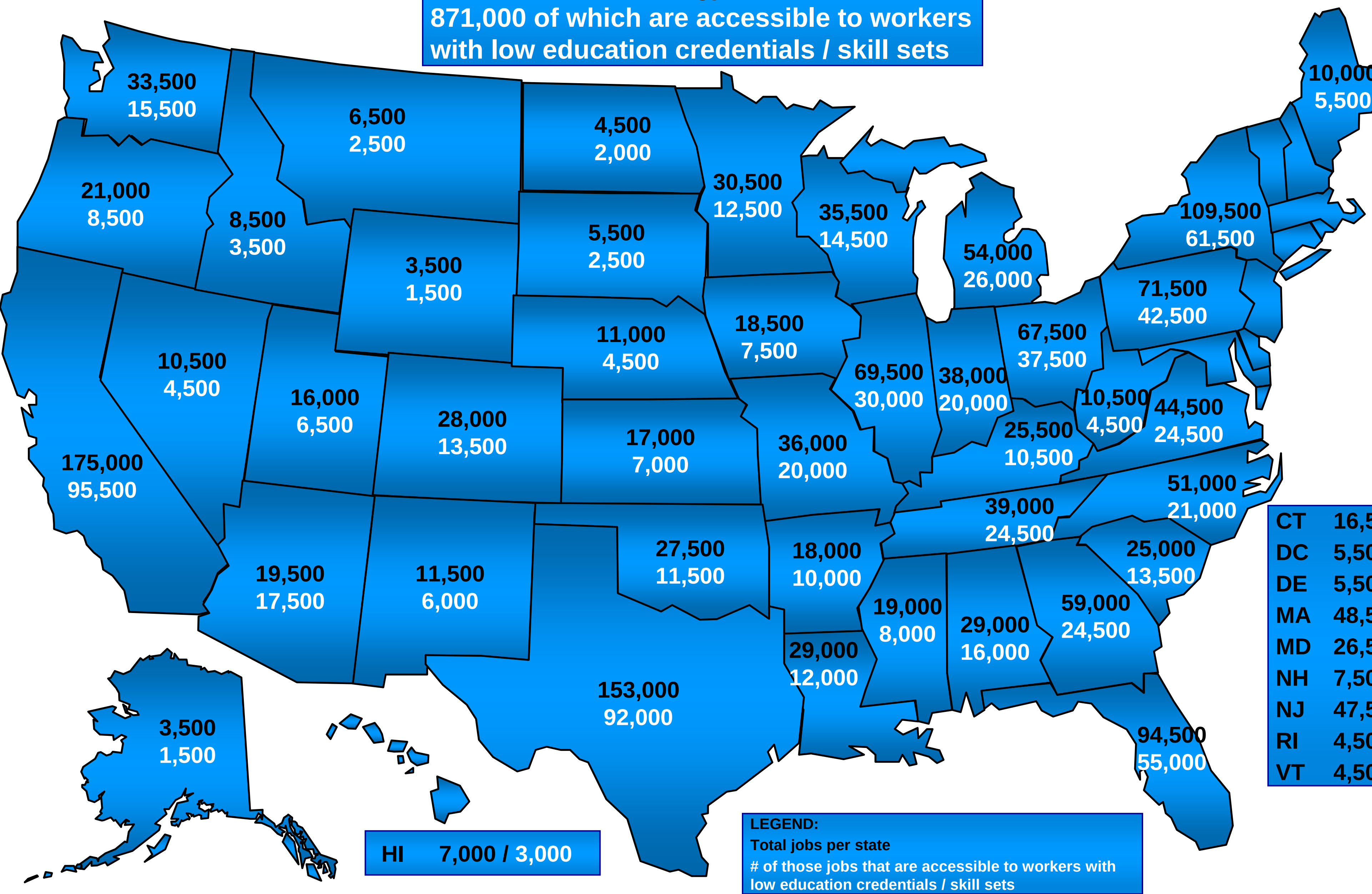
Clean Energy Investments Create More Jobs

The American Clean Energy and Security Act will help spur $150 billion in clean energy investments, which will create 1.7 million good-paying jobs throughout the United States. Clean energy jobs are labor intensive, and clean energy investments create more jobs across all skill and education levels than comparable investments in fossil-fuel energy sources. Clean energy investments create 3.2 times as many jobs as fossil-fuel investments overall. Among workers with few educational credentials and little work experience, clean energy investments create 5.5 times as many jobs as fossil-fuel investments. Furthermore, 75% of those clean energy jobs provide opportunities for advancement and higher salaries, enabling workers to lift their families out of poverty.

US Total:

1,713,500 Clean Energy Jobs Created

871,000 of which are accessible to workers with low education credentials / skill sets



CT	16,500 / 6,900
DC	5,500 / 2,500
DE	5,500 / 2,500
MA	48,500 / 16,000
MD	26,500 / 11,000
NH	7,500 / 3,000
NJ	47,500 / 28,000
RI	4,500 / 2,000
VT	4,500 / 2,000

LEGEND:

Total jobs per state

# of those jobs that are accessible to workers with low education credentials / skill sets

Methodology and Sources

The figures presented are based on analysis by the Political Economy Research Institute (PERI). Overall job figures per state are from the PERI report "The Economic Benefits of Investing in Clean Energy" commissioned by the Center for American Progress. The figures on jobs accessible to workers with limited educational and work credentials are based on the PERI report "Green Prosperity: How Clean Energy Policies Can Fight Poverty and Raise Living Standards in the United States, commissioned by the Natural Resources Defense Council and Green for All.

Both reports fully explain the methodologies used.

Notes:

- The jobs shown would be created roughly within the year in which the clean energy investments are made.
- PERI calculated the jobs accessible to workers with limited education and work credentials in the "Green Prosperity" report for 21 states. NRDC derived estimated figures for the remaining states by allocating the remainder of the national figure for low-credential jobs reported by PERI among those states for which the figure was not originally calculated. This was accomplished by taking the percentage of low-credential jobs in the states for which such jobs were calculated, and applying that percentage to the total number of jobs (i.e. all levels of credentials) in each of the remaining states. States for which NRDC calculated low-credential accessible jobs by this method are Alabama, Alaska, Connecticut, Delaware, Georgia, Hawaii, Idaho, Iowa, Kansas, Kentucky, Louisiana, Maryland, Massachusetts, Minnesota, Mississippi, Montana, Nebraska, Nevada, New Hampshire, North Carolina, North Dakota, Oklahoma, Oregon, Rhode Island, Utah, Vermont, West Virginia, Wisconsin, Wyoming and the District Of Columbia. Figures for these states should be considered approximations.
- All figures are rounded to the nearest 500.
- The job figures presented indicate the net jobs that will be created by investing $150 billion in clean energy, an amount PERI calculates based on spending from the American Reinvestment and Recovery Act, plus the American Clean Energy and Security Act, plus the private investments that both will spur. The imposition of a carbon price in the ACES act is particularly important to leveraging the private investments assumed.
- State job figures may not add up to national total due to rounding errors.

Sources:

"The Economic Benefits of Investing in Clean Energy" downloadable from http://www.americanprogress.org/issues/2009/06/clean_energy.html.

"Green Prosperity: How Clean Energy Policies Can Fight Poverty and Raise Living Standards in the United States" downloadable from http://www.nrdc.org/energy/greenjobs/.

For more information, please contact Antonia Herzog at aherzog@nrdc.org

Congress of the United States
Washington, DC 20515

June 24, 2009

The President
The White House
1600 Pennsylvania Avenue, NW
Washington, DC 20500

Dear Mr. President:

The American Clean Energy and Security Act (H.R. 2454) includes specific provisions for agricultural offset credits, which can be used to comply with the pollution reduction requirements in the bill. We have agreed upon the terms of a program to issue such credits, but we have not yet agreed upon the appropriate roles of the U.S. Department of Agriculture and the U.S. Environmental Protection Agency in developing and implementing the program. For purposes of House action, we have given responsibility exclusively to USDA, rather than resolve the specific responsibilities of the two agencies.

To assist us in resolving this issue as this bill moves through the legislative process, we respectfully request that you provide us with recommendations for the appropriate roles for the two agencies.

Thank you for your consideration of our request.

Sincerely,

Henry A. Waxman
Chairman
Committee on Energy and Commerce

Collin C. Peterson
Chairman
Committee on Agriculture

June 24, 2009

The Honorable Nancy Pelosi
Speaker of the House of Representatives
Washington DC, 20515

Dear Madam Speaker:

The American Clean Energy and Security Act (H.R. 2454) includes several provisions related to the use of biomass and biomass-based fuels. We have agreed on the definition of renewable fuels to be used in this bill for the renewable electricity standard, the renewable fuel standard, and the global warming pollution program. As a result of changing the definition of renewable biomass from what was in the Energy and Commerce reported bill, we also agree on the need to account for the carbon footprint of biofuels and biomass used for electricity and power generation through the carbon accounting system in the global warming pollution program or an equally effective mechanism.

Implementing this change in the bill raises a number of details that will need to be worked through between us and with stakeholders. We do not have time to resolve these details before House passage, so we are not including biomass and biofuels under the cap for purposes of House action. But we want you to know that we are both committed to developing appropriate provisions so that we can have a complete resolution of this important matter.

We also agree to look at additional options for promoting energy independence and protecting the environment, such as a national low-carbon fuel standard.

Sincerely,

Henry A. Waxman
Chairman
Committee on Energy and Commerce

Collin C. Peterson
Chairman
Committee on Agriculture

STATEMENT OF JOSEPH GLAUBER,
CHIEF ECONOMIST, U.S. DEPARTMENT OF AGRICULTURE
BEFORE THE HOUSE AGRICULTURE COMMITTEE,
SUBCOMMITTEE ON CONSERVATION, CREDIT, ENERGY, AND RESEARCH

May 6, 2009

Mr. Chairman, members of the Subcommittee, thank you for the opportunity to discuss the indirect land use provisions that are part of the Energy Security and Independence Act of 2007 (EISA). Renewable fuels produced from renewable biomass feedstocks are defined in terms of their impact on lifecycle greenhouse gas (GHG) emissions. EISA further defined lifecycle GHG emissions to mean "the aggregate quantity of GHG emissions (including direct emissions and significant indirect emissions such as significant emissions from land use changes), as determined by the Administrator of the EPA, related to the full fuel lifecycle, including all stages of fuel and feedstock production and distribution, from feedstock generation or extraction through the distribution and delivery and use of the finished fuel to the ultimate consumer, where the mass values for all greenhouse gases are adjusted to account for their relative global warming potential."

The feedstock limitations associated with the exclusion of some sources of renewable biomass as defined in EISA-particularly with respect to cellulosic materials from both private and public forest lands-may serve to limit the opportunity to replace fossil fuels. In the future, ethanol produced from cellulosic sources, including wood biomass, has the potential to cut life cycle GHG emissions by up to 86 percent relative to gasoline (Wang et al. 2007).

Yesterday, the Administrator of the Environmental Protection Agency (EPA) signed a notice of proposed rulemaking for the Renewable Fuel Standard (RFS) included in the EISA. EPA's proposal reflects considerable input, guidance, and data from USDA. EPA's proposal also utilized many of the same data and assumptions that USDA uses regularly in near-term forecasting agricultural product supply, demand, and pricing. They further acknowledge the uncertainty associated with the various models and input assumptions involved in their lifecycle modeling, present a number of different sensitivity analyses, and seek comment on what, if any changes should be made for the final rule.

While the effects of biofuel production on GHG emissions are expected to increase land under cultivation, existing estimates of the magnitude due to land use conversion vary. Work such as that published in *Science* by Searchinger et al. (2008) concluded that if GHG emissions from indirect land use changes were taken into account, GHG emissions from biofuel production were potentially far larger than previously estimated. On April 23, 2009, the California Air Resources Board adopted a regulation that would implement a Low Carbon Fuel Standard (LCFS) for the reduction of GHG emissions from California's transportation fuels by 10 percent by 2020. The LCFS would take into account the GHG emissions of indirect land use from biofuel production, potentially resulting in the exclusion of corn-based ethanol produced in the Midwest from California fuel markets.

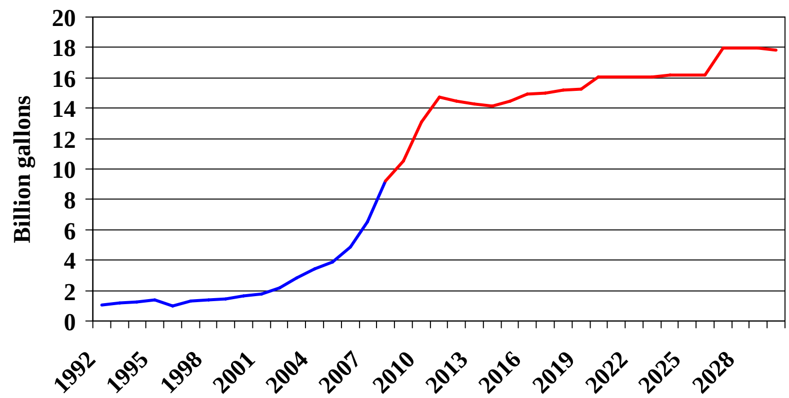
Today, I would like to discuss how biofuel production affects land use in the United States and the rest of the world, and will discuss what is meant by emissions associated with land use change. I will defer to EPA to describe the results of their most recent research , but will present some various other research on GHG emissions from renewable fuels and discuss some of the key uncertainties noted in these research efforts in estimating the effects of land use change on GHG emissions.

Historic Trends in US Agricultural Land Use and Biofuel Production

Before getting into each of these issues, I would like to present some context for this discussion by presenting a brief overview of the historic trends in U.S. biofuel production and agricultural land use in the United States and the rest of the world. Figure 1 shows the growth in corn and other starch based ethanol in the United States since 1992 as well as the forecasted growth in corn and other starch based ethanol to 2030 based on the latest long-term forecast from the Energy Information Administration (EIA). The chart shows that EIA forecasts much of the growth in corn and other starch based ethanol will occur in the next couple of years and then stabilize at about 15 billion gallons per year into the future. The EIA projection of a plateau of 15 billion gallons of corn and other starch based ethanol reflects the limits placed on the volume of non-advanced ethanol that may qualify for credits under the RFS in the EISA, mandated minimum levels of cellulosic-based ethanol under RFS, and projected improvements in the profitability of cellulosic-based ethanol.

In 2008/09, corn use for ethanol production is projected to be 3.7 billion bushels and account for about 31 percent of total corn use in the United States (figure 2). By 2015/16, assuming current baseline assumptions remain constant, corn use for ethanol is expected to exceed 4.8 billion bushels, about 34 percent of total corn use in the United

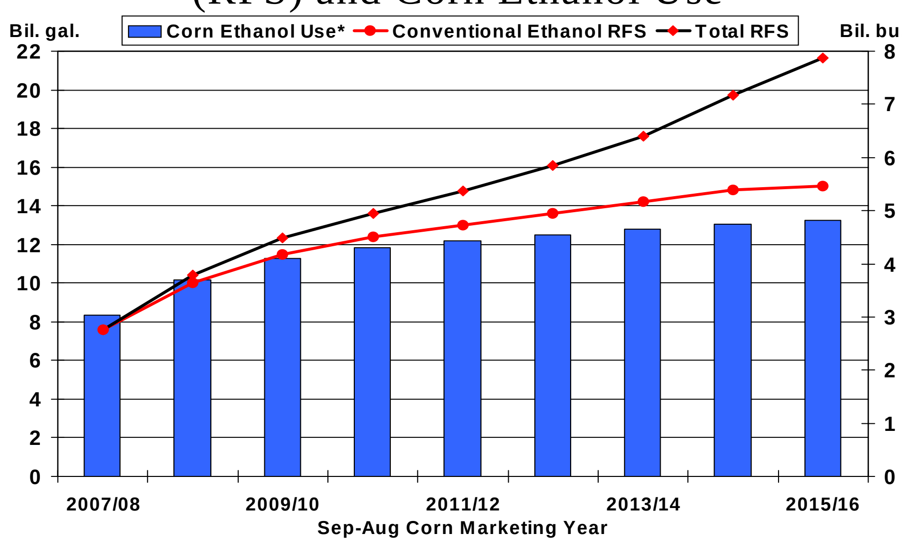
Figure 1--Corn-Starch Based Ethanol Production in the United States



Source: EIA

Primarily corn-starch based ethanol but also including minor amounts of ethanol from other crops.

Figure 2—The Renewable Fuel Standard (RFS) and Corn Ethanol Use



* 2008/09 is projected based on the *World Agricultural Supply and Demand Estimates*, April 9, 2009. 2009/10 is projected based on USDA's *Grains & Oilseeds Outlook*, Agricultural Outlook Forum, Washington, D.C., February 27, 2009. Projections for 2010/11-2015/16 are from USDA *Agricultural Projections to 2018*, February 2009.

States.   Corn production in the United States is expected to increase from 12.1 billion bushels in 2008 to 14.0 billion bushels in 2015, an increase of 15.7 percent. Corn plantings are expected to increase from 86 million acres to 90 million acres, up 4.7 percent, while yields are anticipated to increase by almost 10 percent, from 154 bushels per acre in 2008 to 169 bushels per acre in 2015.

What is the potential for expansion of cropland in the United States? Cropland use in the United States has varied considerably over the past 30 years. Figure 3 shows planted acreage to the eight row crops (wheat, corn, barley, grain sorghum, oats, soybeans, rice and cotton) since 1975. Over 297 million acres were planted to these crops in 1981. Plantings fell off to less than 245 million acres in the late 1980s and generally remained between 245 to 255 million acres during the early 1990s as land was idled. The annual Acreage Reduction Programs authorized by the 1981, 1985 and 1990 farm bills, and Conservation Reserve Program (CRP) starting under the 1985 farm bill contributed significantly to this acreage reduction. Planted acres to the eight principal crops rose to almost 261 million acres in 1996, however, as grain prices spiked.

From 1996 to 2006, plantings to the eight row crops generally trended downward due to lower commodity prices, increased planting flexibility offered by the 1996 and subsequent farm bills which allowed producers to fallow land that had formerly been maintained in more permanent cultivation, and expansion of minor crops such as canola. With the return of higher prices in 2007, however, plantings to the eight row crops rose again, reaching 253 million acres last year. Based on producer planting intentions, NASS estimates that 246 million acres will be planted to the eight row crops in 2009.

Figure 3--Area planted to 8 principal row crops

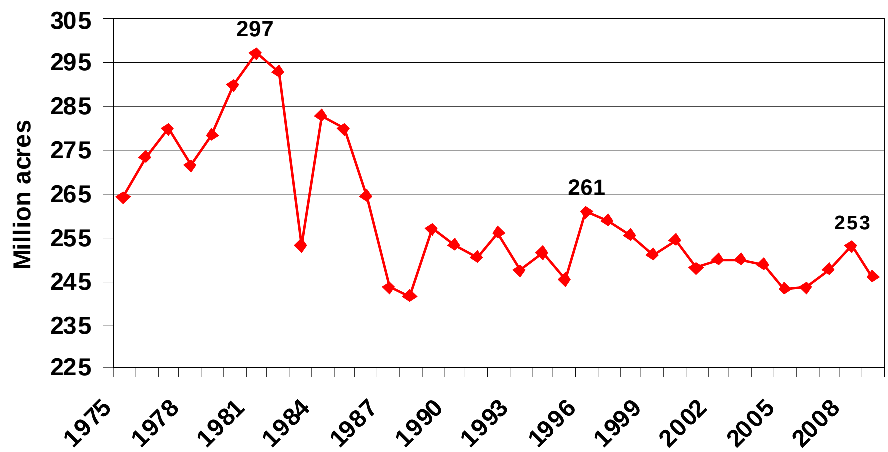


Table 1—US Planted Acreage in 1996 and 2008
(million acres)

Crop	1996	2008	Change from 1996 to 2008
Wheat	75.1	63.1	-12.0
Corn	79.2	86.0	6.8
Other feed grains	24.8	15.7	-9.1
Soybeans	64.2	75.7	11.5
Rice and cotton	17.5	12.5	-5.0
8 row crops	260.8	253.0	-7.8
Hay 1/	61.2	60.1	-1.1
Other crops	11.7	10.9	-0.8
Principal crops	333.7	324.0	-9.7
CRP	34.5	34.5	0.0
Principal crops plus CRP	368.2	358.5	-9.7

1/ Harvested acreage

Table 1 compares plantings in 1996 to plantings in 2008. Even though acreage enrolled in the CRP was unchanged between 1996 and 2008, total acreage planted to the eight row crops in 2008 was down nearly 8 million acres (about 3 percent) and acreage planted to principal crops was down almost 10 million acres from 1996 levels. Corn and soybean acreage were up by over 18 million acres in 2008 compared with 1996; however, this was more than offset by declines in wheat, small feed grains and cotton acreage. Thus, while it is clear that producers planted substantially more acreage as recently as 1996, most of the implied capacity is likely in areas more suitable for wheat and small grain production.

Estimated Land Use Effects of Biofuel Production

The literature on biofuel production and international land use has developed largely over the past 5 years. Most of the focus has been on the effects of biofuel production on U.S. agriculture (see, for example, USDA, ERS/Office of the Chief Economist 2007; FAPRI 2008; Biomass Research and Development Board 2008; de Gorter and Just 2009). However, several more recent studies attempt to also model the ripple effects that would occur in agricultural markets around the world due to increased biofuel use within the U.S., and the implications this might have on GHG emissions. Table 2 presents the results from several recent modeling efforts that estimate the effects of ethanol production on global land use. These studies attempt to quantify the market response in the United States and in other countries to increases in commodity prices due to increases in biofuel production. These studies also quantify the GHG emissions from these market responses and attribute these emissions to biofuel production. The table is not meant to be comprehensive, but shows a selected range of central estimates. Other models, such as MIT's Emissions Prediction and Policy Analysis model, have also been used to examine indirect land use change impacts (Gurgel et al. 2007; Melillo et al. 2009). Key uncertainties are discussed below.

One of the first studies of the effects of biofuels on GHG emissions was published by Searchinger et al., in the February 2008 issue of *Science*. That study used a worldwide agricultural model to estimate emissions from land-use change, and reached the conclusion that corn-based ethanol nearly doubles greenhouse emissions over 30 years, and increases greenhouse gases for 167 years. In contrast, when emissions from land use change were not included in their model, corn-starch based ethanol reduced GHG emissions by 20 percent compared to gasoline. Using the multi-market, multi-commodity international FAPRI (Food and Agricultural Policy Research Institute) model, Searchinger et al. assessed the land use change and GHG implications of increasing corn ethanol production in the United States by 14.8 billion gallons and found that an additional 26.7 million acres of land would be brought into crop production world-wide (1.8 million acres per billion gallons of ethanol). In terms of GHG emissions per unit of energy produced, Searchinger et al. estimated that the emissions from land use change alone (104 grams of CO2 equivalent per MJ of energy in fuel) outweighed the emissions from gasoline (92 g CO2-eq/MJ).

Using the 2007 FAPRI baseline, Fabiosa et al. (2009) estimated that a 1-percent increase in U.S. ethanol use would result in a 0.009 percent increase in world crop area. Most of the increase in world crop area is through an increase in world corn area. Brazil and South Africa respond the most, with multipliers of 0.031 and 0.042, respectively. Fabiosa et al. did not estimate the GHG implications of the lower land requirement.

Based on the 10-year averages of U.S. ethanol use and world crop area taken from the 2007 FAPRI international baseline, and using the world area impact multiplier from Fabiosa et al. (0.009), the results suggest an impact multiplier of 1.64 million acres per 1 billion gallons of additional ethanol use, which is lower than the acreage effect estimated in the Searchinger study.

The California Air Resources Board (CARB), as part of their recent proposed low carbon fuel standard, also estimated the GHG emissions associated with renewable fuels. CARB employed the Global Trade and Analysis Project (GTAP) model and also found significantly less land is required to produce ethanol than Searchinger et al. In the CARB study, each additional billion gallons of corn-starch based ethanol requires only 726,000 acres; about 60 percent less compared to Searchinger et al. Primarily as a result of this reduced acreage, CARB estimated the GHG emissions associated with land use change were 70 percent less than those estimated by Searchinger et al. The GHG emissions due to land use change were reduced from 104 grams of CO2 equivalent per MJ of ethanol to 30 grams of CO2 equivalent per MJ of ethanol.

A more recent article by Tyner et al. (2009), which like the CARB study, employed the GTAP modeling framework, differentiated between various levels of ethanol production. Their results show smaller GHG emissions impacts from corn-starch based ethanol than the CARB study and one-forth of those estimated by Searchinger et al. Tyner et al. note their results are significantly less than Searchinger et al. due to three factors: 1) the significantly smaller change in total land use, 2) differences in which part of the world the change in land use occurs, and 3) differing assumptions regarding the percent of carbon stored in forest vegetation that is emitted when forest is converted into cropland (Searchinger et al. assumes 100 percent of carbon stored in forest vegetation is emitted while Tyner et al. assumes 75 percent of the carbon stored in forest vegetation is emitted with the remaining 25 percent stored in long-term wood products).

Table 2—Land Use Change and CO2 Emissions from Ethanol

Study	Modeling framework	Increase in ethanol production	Change in Global Land Use	Change in Global Land Use	CO2 equivalent emissions
		Billion gallons	Million acres	Million acres per bil. gal	Grams CO2-Eq. per MJ of Ethanol
Searchinger et al. 2008 1/	FAPRI/ CARD	14.8	26.73	1.81	104
Fabiosa et al. 2009 2/	FAPRI/ CARD	1.174	1.923	1.638	na
California (CARB) 2009	GTAP	13.25	9.62	0.726	30
Tyner et al. 2009 3/	GTAP				
2001 to 2006		3.085	1.8	0.576	20.8
2006 to 7 BG		2.145	1.3	0.625	22.7
7 to 9 BG		2	1.3	0.658	23.8
9 to 11 BG		2	1.4	0.689	24.9
11 to 13 BG		2	1.4	0.722	26.1
13 to 15 BG		2	1.5	0.759	27.4
2001 to 15 BG		13.23	8.77	0.663	24.0

1/ Searchinger et al. reported their results in terms of a 55.92 billion liter increase in ethanol production which resulted in a 10.8 million hectare change in global land use.
2/ Based on a 10 percent increase in U.S. ethanol use using 10 year averages of US ethanol use and world crop area taken from the 2007 FAPRI baseline. Impact multiplier of 0.009 taken from Fabiosa et al., table 2.
3/ Based on data from Table 7 and Table 8 and converted to MJ of ethanol by assuming each gallon of ethanol contains 76,330 Btu's of energy and each Btu is equal to 0.00105 megajoules (MJ).

Sources of Uncertainty

Modeling the change in land use resulting from the expansion in the production of corn-starch based ethanol, requires making projections about future values of parameters that cannot be known with certainty. Therefore, judgments and assumptions must be made as to the likely values these uncertain data will take. Each assumption, whether made explicitly or implicitly in the structure and data of the model, will influence the outcome. Here is a partial list of some of the major assumptions that influence the estimate of GHG emissions from corn-starch based ethanol and other biofuels.

Yields on converted lands. Estimating the yields on converted land is one of the most important aspects associated with the GHG emissions and land use change. In the CARB analysis, a small change in the expected yields on converted land had a large impact on the amount of land necessary to meet the added demand for renewable energy and, therefore, on GHG emissions. When yields on converted land were expected to be more similar to yields on existing land, only 500,000 acres of additional cropland were required to produce each billion gallons of ethanol and the emissions associated with land use change fell to 18.3 grams of CO2 equivalent per MJ of ethanol; a reduction of almost 40 percent. Alternatively, when yields on converted land were expected to be lower than yields on existing land, 850,000 acres of additional cropland were required to produce each billion gallons of ethanol and the emissions associated with land use change increased to 35.3 grams of CO2 equivalent per MJ of ethanol; an increase of about 18 percent. Unfortunately, as discussed in the CARB analysis, there is little empirical evidence to guide modelers in selecting the appropriate value for estimating the productivity of converted land. There is even experience to suggest that yields on converted land may be higher than yields on existing land. For example, when Brazil began expanding soybean production from the temperate South into the tropical Center-West, research led to the development of a soybean variety that flourished in the tropics. As a result, soybean yields in the tropical Center-West were double that of the national average. On the other hand, in many other regions, existing crops are already on the most productive agriculture land, so yields on newly converted lands would be lower than on existing cropland. On net, we would not expect to see significantly higher yields on converted land, but there is little information on how yields may change when land is converted.

Shifts between different land uses. Converting land from one land use to another can have dramatic impacts on the emissions associated with land use change. However, it is difficult to model the specific contribution of the many factors that determine land use, especially when changing between broad land use categories. It is one thing to try to estimate the movement of land allocation among different crops, such as switching between corn and soybeans. However, land conversion between land uses, such as from forest to pastureland or cropland can be very costly and therefore driven by longer-term economic factors. For example, Midwest farmers can readily move cropland between corn and soybeans when the relative profitability of those crops change. In contrast, expansion of agricultural land into other areas will depend on the cost of conversion of that land and land supply availability. For land that is currently in active use there are decisions to be made on long term profitability, for example for land to be converted from forest to cropland, long term decisions must be made regarding the relative profitability between agricultural and forestry commodities for many years into the future. Conversion of land that does not have a current market use (grassland or unmanaged forest) would be based on costs of conversion, land availability, and in addition, there are several non-economic factors that may significantly affect land conversion decisions in a particular area or country, such as national conservation and preservation policies and programs.

Some studies have suggested that conversion of land into cropland would be associated with grassland conversion because it costs less to clear and prepare grassland than clearing and preparing forestland. In the Tyner et al. study, for example, 23 percent of the increase in cropland comes from conversion of managed forest. The remaining 77 percent of the increase in cropland is a result of the conversion of grassland to cropland. While a majority of the land conversion is from grassland to cropland, a majority of the emissions due to land use change result from the conversion of forests to cropland, due to the relatively larger GHG pulse associated with forest conversion. If we assume there is no forest conversion and only grassland conversion, the emissions associated land use change estimated by Tyner et al. would fall by 50 percent. In many studies, estimates of forest conversion surfaces as a key factor driving the lifecycle GHG results. In addition, the GTAP modeling framework used by CARB and Tyner et al. includes only managed lands. This could also influencing the type of land conversion predicted by the model.

Yield growth over time. Another important factor driving the amount of land required to produce biofuels is the growth in yields that are expected to occur over time. At USDA, we estimate that corn yields in the United States will grow at 2 bushels per acre. If we assume that global corn yield growth increases at the same rate as in the

United States, by the 2015, the average corn yield in the rest of the world would be about 10 percent higher than used in the CARB study. The increase in land productivity in the rest of the world would reduce the estimated amount of land converted into cropland in the CARB study from 726,000 acres to 663,000 acres for each additional billion gallons of corn-starch based ethanol, and the average GHG emissions due to land use change would fall from 30 grams of CO2 equivalent per MJ of ethanol to 27 grams of CO2 equivalent per MJ of ethanol.

In addition, higher commodity prices due to greater demand for renewable fuels would likely result in some increase in crop yields. In the CARB analysis, each 1 percent increase in the price of corn relative to the input costs associated with growing corn was assumed to increase corn yields by 0.4 percent. Varying that assumption from a 0.1 to a 0.6 percent increase in yields for each 1 percent in the price of corn relative to inputs costs altered the estimate of GHG emissions due to land use change by 49 percent.

Substitutability of Distillers Dried Grains (DDGs). DDGs are a co-product of corn-starch based ethanol production, and can substitute for corn as feed, thereby reducing the amount of corn which goes directly into livestock feed. Thus, the more DDGs that are assumed to be used in livestock feed, the fewer total cropland acres will be needed and therefore less GHG emissions. For example, each bushel of corn generates about 2.8 gallons of ethanol and almost 18 pounds of DDGS. In the CARB study, each pound of DDGs is assumed to displace one pound of corn. However, DDGs have attributes that may allow a greater than a one-for-one displacement of corn in animal feed. DDGs have higher protein and fat content compared to corn. Tyner et al. assume each pound of DDGs replaces 1.16 pounds of corn as animal feed. Arora et al. recently found that 1 pound of DDGs displaces 1.271 pounds of conventional feed ingredients. However, DDGs cannot completely replace traditional feed.

Other Sources of Uncertainty. In addition to the uncertainties discussed above, many other modeling assumptions will influence the predicted impact of added renewable fuel production on GHG emissions, (e.g., the level of disaggregation in the underlying crop data, assumptions about international trade in agricultural commodities, assumptions about changes in fertilizer use, etc.). There are also simplifying assumptions that relate to accounting for future GHG emissions. Generally, when comparing the GHG emissions of renewable fuels to nonrenewable alternatives, studies assume that increases in GHG emissions from land use conversion occur in the year of conversion, while reductions in GHG emissions due to the production and use of renewable fuels occur over several years into the future. For example, the results from the studies referenced in this testimony assume the reduction in GHG emissions from expanded ethanol production occur over a period of 30 years. Increasing the expected time frame for renewable fuel production on converted land reduces their net GHG emissions, because the total emissions reductions associated with producing and using renewable fuels will be greater.

Conclusions

There is little question that increased biofuel production will have effects on land use in the United States and the rest of the world. The more interesting question concerns magnitude. To the degree to which the supply response to increased biofuel production is met through increased yields, cropland expansion will be less. Land use change is more likely to occur where producers are more responsive to price changes. How much pasture and forest is converted to cropland will ultimately depend on the region, national and local land use policies and the degree to which competing uses (grazing, forest products) impose constraints for expansion.

While economic modelers have a long history of policy analysis in agriculture, most of the analyses have focused on impact of various domestic or international trade policies (e.g., farm bills, trade agreements) on cropland. By contrast, the empirical literature on land use and GHG emissions is relatively young, with most studies appearing in the last two or three years. Sensitivity analysis suggests wide variation in results. In particular, much is to be learned about land conversion from forest to pasture and from pasture to cropland.

We have had a very constructive and cooperative relationship with EPA as they have developed their RFS2 proposal. Their proposal raises challenging issues for public comment and will do much to advance the scientific understanding of the lifecycle GHG emission impacts of biofuels, and in particular the land-use change impacts. USDA looks forward to continuing our relationship with EPA as they complete the work necessary to finalize the RFS2 rule.

Mr. Chairman, that concludes my statement.

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April 21, 2009

Mary D. Nichols, Chairman
California Air Resources Board
Headquarters Building
1001 "I" Street
Sacramento, CA 95812

Dear Chairman Nichols,

As scientists and economists with relevant expertise, we are writing to recommend that you include indirect land use change in the lifecycle analyses of heat-trapping emissions from biofuels and other transportation fuels. This policy will encourage development of sustainable, low-carbon fuels that avoid conflict with food and minimize harmful environmental impacts.

Our comments are relevant to the development of California's Low Carbon Fuel Standard (LCFS), which the Air Resources Board (ARB) will consider for adoption in its April hearing, as well as other policies that evaluate lifecycle heat-trapping emissions from biofuels. For policies like the LCFS to successfully reduce GHG emissions, it is critical to include all major sources of emissions, including indirect land use emissions from biofuels.

We encourage you to investigate and include significant direct and indirect emissions from all fuels, including conventional petroleum, heavy oils, natural gas for transportation, oil sand-based fuels, and the range of fuels used to power electrified transportation, consistent with the best available science. However, you should not delay inclusion of known sources of emissions, including indirect emissions from biofuels, pending discovery of potential effects from other fuels.

Recent peer-reviewed research indicates that conventional biofuels can directly or indirectly result in substantial heat-trapping emissions through the conversion of forests and grasslands to croplands to accommodate biofuel production. Increased demand for crops to make fuel results in higher global commodity prices that can induce farmers in other countries to plow up sensitive, high-carbon ecosystems—including rain forests in South America and Southeast Asia. Previous lifecycle analyses did not adequately account for these emissions, giving biofuels credit for greater carbon savings than actually achieved.

There are uncertainties inherent in estimating the magnitude of indirect land use emissions from biofuels, but assigning a value of zero is clearly not supported by the science. The data on land use change indicate that the emissions related to biofuels are significant and can be quite large. Grappling with the technical uncertainty and developing a regulation based on the best available science is preferable to ignoring a major source of emissions. Over time, greater accuracy and detail in a more refined analysis can be reflected in future LCFS rulemakings.

The need to address uncertainties applies to other areas the analysis as well, and we urge you to evaluate the increasing use of nitrogen fertilizers and herbicides associated with greater biofuel production. In particular, nitrogen fertilizers enhance the emission of nitrous oxide—a powerful greenhouse gas in Earth's atmosphere.

To spur innovation in low carbon fuels, the LCFS must send an accurate signal to the growing clean energy market. Strategic investment decisions should be based upon the best available data of the carbon footprint of alternative fuels. Failure to include a major source of pollution, like indirect land use emissions, will distort the carbon market, suppress investment in truly low carbon fuels, and ultimately result in higher emissions.

The work you are doing in California sets an important precedent for transportation fuel policy nationally and internationally, as well as for action to confront climate change more broadly. We urge you to ensure that your policies are based on the best science, including consideration of emissions from indirect changes in land use.

Sincerely,

- Original Authors -

PAM MATSON, Ph.D.
Chester Naramore Dean of the School of Earth Sciences
Richard and Rhoda Goldman Professor of Environmental Studies
Stanford University
Stanford, CA
Member of the United States National Academy of Sciences

STUART L. PIMM, Ph.D.
Doris Duke Professor of Conservation Ecology
Nicholas School of the Environment and Earth Sciences
Duke University
Durham, NC

WILLIAM SCHLESINGER, Ph.D.
President
Cary Institute of Ecosystem Studies
Millbrook, NY
Member of the United States National Academy of Sciences

PETER C. FRUMHOFF, Ph.D.
Director of Science and Policy
Chief Scientist, Climate Campaign
Union of Concerned Scientists
Cambridge, MA

W. MICHAEL HANEMANN, Ph.D.
Chancellor's Professor
Department of Agricultural and Resource Economics
University of California, Berkeley
Berkeley, CA

Organizational affiliations are for identification purposes only.

KENNETH ARROW, Ph.D.
Palo Alto, CA
Nobel Laureate, Economics
Member of the United States National Academy of Sciences
Recipient of the United States National Medal of Science

FRANK WILCZEK, Ph.D.
Herman Feshbach Professor of Physics
Physics
Massachusetts Institute of Technology
Cambridge, MA
Nobel Laureate, Physics
Member of the United States National Academy of Sciences
MacArthur Fellow

F. CHAPIN, III, Ph.D.
Professor of Ecology
Institute of Arctic Biology
University of Alaska Fairbanks
Fairbanks, AK
Member of the United States National Academy of Sciences

WILLIAM CLARK, Ph.D.
Professor
Kennedy School of Government
Harvard University
Cambridge, MA
Member of the United States National Academy of Sciences
MacArthur Fellow

DAVID GIBSON, Ph.D.
Professor Emeritus
University of Iowa
Iowa City, IA
Member of the United States National Academy of Sciences

RICHARD HOUGHTON, Ph.D.
Acting Director
Woods Hole Research Center
Falmouth, MA

ROBERT KATES, Ph.D.
Trenton, ME
Member of the United States National Academy of Sciences
MacArthur Fellow

THOMAS E. LOVEJOY, Ph.D.
Heinz Center Biodiversity Chair
The H. John Heinz III Center for Science, Economics and the Environment
Member of the United States National Academy of Sciences

MICHAEL O'HARE, Ph.D.
Professor of Public Policy
Goldman School of Public Policy
University of California, Berkeley
Berkeley, CA

RICHARD AMBROSE, Ph.D.
Professor
Environmental Health Sciences
University of California, Los Angeles
Los Angeles, CA

JASMIN ANSAR, Ph.D.
Visiting Assistant Professor
Lorry Lokey Business School
Mills College
Oakland, CA

LOWELL ASHBAUGH, Ph.D.
Project Scientist
Crocker Nuclear Laboratory
University of California, Davis
Davis, CA

BEVIN ASHENMILLER, Ph.D.
Assistant Professor of Economics
Economics
Occidental College
Los Angeles, CA

DENNIS BALDOCCHI, Ph.D.
Professor of Biometeorology
Environmental Science Policy and Management
University of California, Berkeley
Berkeley, CA

EDWARD BARBIER, Ph.D.
John S. Bugas Professor of Economics
Economics and Finance
University of Wyoming
Laramie, WY

PETER BAYLEY, Ph.D.
Fisheries and Wildlife Department
The Ohio State University
Corvallis, OR

KENNETH BERGMAN, Ph.D.
National Aeronautics and Space Administration (retired)
Earth Sciences
Ashland, OR

DONALD BOESCH, Ph.D.
President
University of Maryland, Center for Environmental Science
Cambridge, MD

SEVERIN BORENSTEIN, Ph.D.
Professor
Haas School and University of California Energy Institute
University of California, Berkeley
Berkeley, CA

CHARLES BOYCE, Ph.D.
Assistant Professor
University of Chicago
Chicago, IL

GUY BRASSEUR, Ph.D.
Earth and Sun Systems Laboratory
National Center for Atmospheric Research
Boulder, CO

HOLGER BRIX, Ph.D.
Assistant Researcher
Atmospheric and Oceanic Sciences
University of California, Los Angeles
Los Angeles, CA

PETER BRUSSARD, Ph.D.
Professor Emeritus
Biology
University of Nevada
Reno, NV

HAROLD BURSTYN, Ph.D.
Electrical Engineering and Computer Science
Syracuse University
Syracuse, NY

CHRISTOPHER BUSCH, Ph.D.
Economist
Policy Director
Center for Resource Solutions

JOHN CAMPBELL, Ph.D.
Assistant Professor
College of Engineering
University of California, Merced
Merced, CA

PETER CHESSON, Ph.D.
Professor
Ecology and Evolutionary Biology
University of Arizona
Tucson, AZ

ROBERT CIFELLI, Ph.D.
Senior Research Scientist
Atmospheric Science
Colorado State University
Fort Collins, CO

RAYMOND CLARKE, Ph.D.
Biology
Sarah Lawrence College
Bronxville, NY

DANIEL COLBERT, Ph.D.
Executive Director
Institute for Energy Efficiency
University of California, Santa Barbara
Santa Barbara, CA

ALAN CUNNINGHAM, Ph.D.
Professor Emeritus
Chemistry
Monterey Peninsula College (retired)
Carmel Valley, CA

MARIA DAMON, Ph.D.
Assistant Professor
Daniel J. Evans School of Public Affairs
University of Washington
Seattle, WA

ERIC DAVIDSON, Ph.D.
Senior Scientist
The Woods Hole Research Center
Falmouth, MA

PETER DORMAN, Ph.D.
The Evergreen State College
Olympia, WA

ELLEN DOUGLAS, Ph.D.
Assistant Professor
Department of Environmental, Earth and Ocean Sciences
University of Massachusetts Boston
Boston, MA

HADI DOWLATABADI, Ph. D.
Canada Research Chair
Professor of Applied Mathematics and Global Change
Institute for Resources Environment and Sustainability
Liu Institute for Global Issues
The University of British Columbia
Vancouve, BC

AMY DUNHAM, Ph.D.
Research Faculty
Ecology and Evolutionary Biology
Rice University
Houston, TX

HALLIE EAKIN, Ph.D.
Assistant Professor
School of Sustainability
Arizona State University
Tempe, AZ

BRENDA EKWURZEL, Ph.D.
Climate Scientist
Climate Program
Union of Concerned Scientists
Washington, DC

Y. FARZIN, Ph.D.
Professor
Agricultural and Resource Economics
University of California, Davis
Davis, CA

TRACY FELDMAN, Ph.D.
Postdoctoral Associate
Biology
University of Wisconsin - Stevens Point
Stevens Point, WI

PAUL FERRARO, Ph.D.
Associate Professor of Economics
Department of Economics
Georgia State University
Atlanta, GA

MELANIE FITZPATRICK, Ph.D.
Climate Scientist
Climate Program
Union of Concerned Scientists
Cambridge, MA

ALLISON FLEGE, Ph.D.
Adjunct Assistant Professor
Geography
University of Cincinnati
Cincinnati, OH

JOHANNES FOUFOPOULOS, Ph.D.
Assistant Professor
School of Natural Resources
University of Michigan
Ann Arbor, MI

ROBERT GAMACHE, Ph.D.
Professor
Environmental, Earth, and Atmospheric Science
University of Massachusetts Lowell
Lowell, MA

CATHERINE GAUTIER, Ph.D.
Professor
Geography
University of California, Santa Barbara
Santa Barbara, CA

BART GEERTS, Ph.D.
Associate Professor
Atmospheric Science
University of Wyoming
Laramie, WY

KAREN GLENNEMEIER, Ph.D.
Science Director
Audubon-Chicago Region
Evanston, IL

DAVID GORCHOV, Ph.D.
Professor
Botany
Miami University
Oxford, OH

W. GRIFFIN, Ph.D.
Executive Director, Green Design Institute
Tepper School of Business
Carnegie Mellon University
Pittsburgh, PA

MARTHA GROOM, Ph.D.
Associate Professor of Conservation Biology
Interdisciplinary Arts and Sciences
University of Washington Bothell
Bothell, WA

THEODORE GROVES, Ph.D.
Professor of Economics
Economics
University of California, San Diego
La Jolla, CA

HOSHIN GUPTA, Ph.D.
Professor
Hydrology and Water Resources
University of Arizona
Tucson, AZ

DOUG GURIAN-SHERMAN, Ph.D.
Senior Scientist
Food and Environment Program
Union of Concerned Scientists
Washington, DC

M. ROBERT HAMERSLEY, Ph.D.
Assistant Professor of Environmental Microbiology
Environmental Studies
Soka University of America
Aliso Viejo, CA

DENNIS HANSELL, Ph.D.
Professor
Marine and Atmospheric Chemistry
University of Miami
Miami, FL

JOHN HARTE, Ph.D.
Professor
Energy and Resources Group
University of California, Berkeley
Berkeley, CA

EVAN HAZARD, Ph.D.
Professor Emeritus
Biology
Bemidji State University
Bemidji, MN

MARK HIXON, Ph.D.
Helen Thompson Professor
Department of Zoology
Oregon State University
Corvallis, OR

KAREN HOLL, Ph.D.
Professor
Environmental Studies
University of California, Santa Cruz
Santa Cruz, CA

ROBERT HOWARTH, Ph.D.
David Atkinson Professor of Ecology
Ecology & Evolutionary Biology
Cornell University
Ithaca, NY

DAVID INOUYE, Ph.D.
Professor
Biology
University of Maryland
College Park, MD

STEPHEN JACKSON, Ph.D.
Professor of Botany and Ecology
Botany
University of Wyoming
Laramie, WY

MILIND KANDLIKAR, Ph.D.
University of British Columbia
Liu Institute for Global Issues
Vancouver, BC

JAMES KASTING, Ph.D.
Distinguished Professor of Geosciences
Geosciences
Pennsylvania State University
University Park, PA

ANDY KEELER, Ph.D.
Associate Professor of Public Policy
John Glenn School of Public Affairs
The Ohio State University
Columbus, OH

ARTURO KELLER, Ph.D.
Bren School of Environmental Science & Management
University of California, Santa Barbara
Santa Barbara, CA

ALISSA KENDALL, Ph.D.
Assistant Professor
Civil and Environmental Engineering
University of California, Davis
Davis, CA

KENNETH KIMBALL, Ph.D.
Director of Research
Research
Appalachian Mountain Club
Gorham, NH

CHRISTOPHER KNITTEL, Ph.D.
Associate Profess and Chancellor's Fellow
Economics
University of California, Davis
Davis, CA

NIR KRAKAUER, Ph.D.
Department of Civil Engineering
City University of New York
New York, NY

DAVID LEAHY, Ph.D.
Research Scientist
Chemistry
Stanford University
Stanford, CA

SHERMAN LEWIS, Ph.D.
Professor Emeritus
Political Science
California State University Hayward
Hayward, CA

WILLIAM LIDICKER, Ph.D.
Professor of Integrative Biology Emeritus
Integrative Biology
University of California, Berkeley
Berkeley, CA

TIMOTHY LIPMAN, Ph.D.
Co-Director
Transportation Sustainability Research Center
Institute of Transportation Studies
University of California, Berkeley
Richmond, CA

LESTER LIPSKY, Ph.D.
Professor Emeritus
Conputer Science and Engineering
University of Connecticut
Storrs, CT

CREIGHTON LITTON, Ph.D.
Assistant Professor, Forest Ecology
Natural Resources and Environmental Management
University of Hawaii
Honolulu, HI

RAINER LOHMANN, Ph.D.
Assistant Professor
Graduate School of Oceanography
University of Rhode Island
Narragansett, RI

JOHN LORAND, Ph.D.
Professor Emeritus
Chemistry
Central Michigan University
Mt. Pleasant, MI

STEPHEN MANNING, Ph.D.
Professor of Biology
Biology
Arkansas State University - Beebe
Beebe, AR

PETRUS MARTENS, Ph.D.
Astrophysicist
Smithsonian Astrophysical Observatory
Cambridge, MA

JEREMY MARTIN, Ph.D.
Senior Scientist
Clean Vehicles
Union of Concerned Scientists
Washington, DC

MICHAEL MCCORMICK, Ph.D.
Assistant Professor
Biology
Hamilton College
Clinton, NY

MARGARET MELLON, Ph.D.
Senior Scientist and Director
Food and Environment Program
Union of Concerned Scientists
Washington, DC

ZEWEI MIAO, Ph.D.
Research Associate
Energy Biosciences Institute
University of Illinois
Urbana, IL

DAVID MITCHELL, Ph.D.
Associate Research Professor
Division of Atmospheric Sciences
Desert Research Institute
Reno, NV

RONALD MITCHELL, Ph.D.
Political Science
University of Oregon
Eugene, OR

DAVID MODARELLI, Ph.D.
Professor
Chemistry
University of Akron
Akron, OH

WILLIAM MOOMAW, Ph.D.
Professor
Center for International Environment and Resource Policy
Tufts University
Medford, MA

K. MURRAY, Ph.D.
Professor of Biology
Biology
Hope College
Holland, MI

RONI NEFF, Ph.D.
Research Associate
Environmental Health Sciences
Johns Hopkins Bloomberg School of Public Health
Baltimore, MD

CHARLES NELSON, Ph.D.
Professor of Physics
Physics
State University of New York
Binghamton, NY

JOHN NIELSEN-GAMMON, Ph.D.
Professor
Atmospheric Sciences
Texas A&M University
College Station, TX

RICHARD NORGAARD, Ph.D.
Professor of Energy and Resources
University of California, Berkeley
Berkeley, CA

GRETCHEN NORTH, Ph.D.
Associate Professor
Biology
Occidental College
Los Angeles, CA

REED NOSS, Ph.D.
Davis-Shine Distinguished Professor
Biology
University of Central Florida
Orlando, FL

MICHAEL PALMER, Ph.D.
Regents Professor
Botany
Oklahoma State University
Stillwater, OK

MARTIN POLZ, Ph.D.
Professor
Civil and Environmental Engineering
Massachusetts Institute of Technology
Cambridge, MA

R. RAU, Ph.D.
Physics
Brookhaven National Laboratory (retired)
Bellport, NY

DOROTHY READ, Ph.D.
Professor Emerita
Biology
University of Massachusetts Dartmouth
Dartmouth, MA

MICHAEL REICH, Ph.D.
Professor
Economics
University of California, Berkeley
Berkeley, CA

PETER REYNOLDS, Ph.D.
Adjunct Professor
Physics

North Carolina State University
Raleigh, NC

JANE RISSLER, Ph.D.
Senior Scientist and Deputy Director
Food and Environment Program
Union of Concerned Scientists
Washington, DC

GEORGE ROBINSON, Ph.D.
Professor
Biological Sciences
University at Albany,
State University of New York
Albany, NY

DIANNE ROCHELEAU, Ph.D.
Associate Professor
Geography
Clark University
Worcester, MA

JEFF ROMM, Ph.D.
Professor
Environmental Science, Policy and Management
University of California, Berkeley
Berkeley, CA

THOMAS ROONEY, Ph.D.
Assistant Professor
Biological Sciences
Wright State University
Dayton, OH

JULIETTE ROONEY-VARGA, Ph.D.
Associate Professor
Biological Sciences
University of Massachusetts Lowell
Lowell, MA

ARMIN ROSENCRANZ, Ph.D.
Visiting Professor
Johns Hopkins School of Advanced International Studies
Washington, DC

VOLKER RUDOLF, Ph.D.
Assistant Professor
Ecology and Evolutionary Biology
Rice University
Houston, TX

PATRICK RYAN, Ph.D.
Professor
Arts and Sciences
Johnson & Wales University
Denver, CO

ROBERT SANFORD, Ph.D.
Professor
Biological Sciences
University of Denver
Denver, CO

KAY SCHEETS, Ph.D.
Adjunct Assistant Professor
Botany
Oklahoma State University
Stillwater, OK

DAVID SCHIMEL, Ph.D.
Chief Executive Officer
National Ecological Observatory Network
Boulder, CO

LEE SCHIPPER, Ph.D.
Senior Research Engineer
Precourt Energy Efficiency Center
Stanford University
Stanford, CA

KURT SCHWABE, Ph.D.
Associate Professor
Environmental Sciences
University of California, Riverside
Riverside, CA

JASON SCORSE, Ph.D.
Assistant Professor
Monterey Institute of International Studies
Monterey, CA

THOMAS SHERRY, Ph.D.
Professor
Ecology and Evolutionary Biology
Tulane University
New Orleans, LA

JACK SITES, JR., Ph.D.
Professor and Curator
Biology
Brigham Young University
Provo, UT

JOHAN SIX, Ph.D.
Plant Sciences
University of California, Davis
Davis, CA

LOWELL SMITH, Ph.D.
U.S. Environmental Protection Agency (retired)
Berryville, VA

DANIELA SOLERI, Ph.D.
Geography
University of California, Santa Barbara
Santa Barbara, CA

ROGER SPARKS, Ph.D.
Professor of Economics
Economics
Mills College
Oakland, CA

SABRINA SPATARI, Ph.D.
Assistant Professor
Civil, Architectural and Environmental Engineering
Drexel University
Philadelphia, PA

THOMAS SPIRO, Ph.D.
Professor
Chemistry
University of Washington
Seattle, WA

THOMAS STRUHSAKER, Ph.D.
Evolutionary Anthropology
Duke University
Durham, NC

THOMAS TIETENBERG, Ph.D.
Mitchell Family Professor of Economics Emeritus
Economics
Colby College
Waterville, ME

ROBERT TURNER, Ph.D.
Professor
Economics and Environmental Studies
Colgate University
Hamilton, NY

MATHIAS VAN THIEL, Ph.D.
Physical Chemist
Physics and Space Technology
Lawrence Livermore National Laboratory (retired)
Hayward, CA

ASHWANI VASISHTH, Ph.D.
Director
Institute for Sustainability
California State University, Northridge
Northridge, CA

JEFFREY VINCENT, Ph.D.
Korstian Professor of Forest Economics and Management
Nicholas School of the Environment
Duke University
Durham, NC

BRIAN VON HERZEN, Ph.D.
Executive Director
The Climate Foundation
Beaverton, OR

BETSY VON HOLLE, Ph.D.
Assistant Professor
Biology
University of Central Florida
Orlando, FL

RICHARD WALKER, Ph.D.
Professor
Geography
University of California, Berkeley
Berkeley, CA

LINDA WALLACE, Ph.D.
Botany/Microbiology
University of Oklahoma
Norman, OK

DONALD WALLER, Ph.D.
Professor of Botany and Environmental Studies
Botany
University of Wisconsin-Madison
Madison, WI

ZHI WANG, Ph.D.
Associate Professor
Earth and Environmental Sciences
California State University, Fresno
Fresno, CA

CHRISTOPHER WEBER, Ph.D.
Assistant Research Professor
Civil and Environmental Engineering
Carnegie Mellon University
Pittsburgh, PA

RAY WEISS, Ph.D.
Distinguished Professor
Scripps Institution of Oceanography
University of California, San Diego
La Jolla, CA

MICHAEL WEISSMAN, Ph.D.
Professor of Physics
Physics
University of Illinois at Urbana-Champaign
Urbanna, IL

STEPHEN WIEL, Ph.D.
President of the Board
Center for Law and Social Policy (CLASP)
Washington, DC

ROBLEY WILLIAMS, Ph.D.
Professor Emeritus
Biological Sciences
Vanderbilt University
Nashville, TN

WILLIAM WILLIAMS, Ph.D.
Professor
Biology
St. Mary's College of Maryland
Saint Marys City, MD

HOWARD WILSHIRE, Ph.D.
Research Geologist
U.S. Geological Survey (retired)
Sebastopol, CA

HENDRIK WOLFF, Ph.D.
Economics
University of Washington
Seattle, WA

COLIN WRAIGHT, Ph.D.
Professor and Head
Biochemistry
University of Illinois
Urbana, IL

SONIA YEH, Ph.D.
Research Engineer
The Institute of Transportation Studies
University of California, Davis
Davis, CA

THOMAS YUILL, Ph.D.
Professor and Director Emeritus
Nelson Institute for Environmental Studies
University of Wisconsin-Madison
Madison, WI

HISHAM ZERRIFFI, Ph.D.
Ivan Head South/North Research Chair
Liu Institute for Global Issues
University of British Columbia
Vancouver, BC

SIMONE ALIN, Ph.D.
Seattle, WA

MATTHEW AUER, Ph.D.
Bloomington, IN

JEDEDIAH BRODIE, Ph.D.
Missoula, MT

CLIFFORD BUNTON, Ph.D.
Santa Barbara, CA

DAVID CAMPBELL, Ph.D.
Tuscaloosa, AL

MARK CHANDLER, Ph.D.
Madison, WI

BRUCE COLLETTE, Ph.D.
Washington, DC

JOHN COOPER, Ph.D.
Lewisburg, PA

CHRIS FOREST, Ph.D.
University Park, PA

VINCENT GUTSCHICK, Ph.D.
Las Cruces, NM

HAROLD HARRIS, Ph.D.
St. Louis, MO

GRAINGER HUNT, Ph.D.
Boise, ID

DOUG LAFOLLETTE, Ph.D.
Madison, WI

JUDITH LANG, Ph.D.
Ophelia, VA

KRISTIN LEWIS, Ph.D.
Cambridge, MA

ROBERT MASON, Ph.D.
Philadelphia, PA

MOLLY MCMUIRE, Ph.D.
Lewisburg, PA

KIRK MOLONEY, Ph.D.
Ames, IA

STEPHEN MUDRICK, Ph.D.
Columbia, MO

SIOBHAN REILLY, Ph.D.
Oakland, CA

JEFFREY STIBICK, Ph.D.
Riverdale, MD

CARLYLE STORM, Ph.D.
Kingston, RI

CLAUDIA TEBALDI, Ph.D.
Princeton, NJ

MAIKEN WINTER, Ph.D.
Ithaca, NY

Organizational affiliations are for identification purposes only.

cc. Governor Arnold Schwarzenegger
Lisa P. Jackson , Administrator, US-Environmental Protection Agency
Linda Adams, Secretary, Cal-EPA
Mike Scheible, Deputy Director, Air Resources Board
Karen Douglas, Commissioner, California Energy Commission
David Crane, Special Advisor for Jobs & Economic Growth, Office of Governor Schwarzenegger