Summary:

Biomass Research & Development Technical Advisory Committee Meeting March 2-3, 2006

April 21, 2006

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Meeting Summary

Day One: March 2, 2006

A. Purpose

On March 2-3, 2006, a Biomass Research and Development Technical Advisory Committee (Committee) quarterly meeting was held at the National Renewable Energy Laboratory (NREL) Denver West Office Park in Golden, Colorado. The Committee was established by the Biomass Research and Development Act of 2000 (Biomass Act). The Committee's mandates under the Biomass Act include advising the Secretary of Energy and the Secretary of Agriculture, facilitating consultations and partnerships, and evaluating and performing strategic planning. This meeting was the first Committee meeting held during the 2006 calendar year. The Committee members came to the meeting to undergo an orientation for new members; to receive and update on current U.S. Department of Agriculture (USDA) and Department of Energy (DOE) collaborations; to review the status of its work to update the *Vision for Bioenergy and Bioproducts in the U.S.;* to review the impact of the Energy Policy Act of 2005 (EPAct) on biomass research and development; to review organization for 2006 workshops to update the *Roadmap for Biomass Technologies in the U.S.;* to discuss Policy and Analysis subcommittee business; to discuss public relations efforts; to talk with representatives from local state organizations; to discuss 2005 annual recommendations to the Secretaries of Agriculture and Energy, and to update its 2006 Work Plan. A list of attendees is provided in Addendum A.

B. Incoming Committee Member Orientation

The meeting was chaired by Vice Chair Terry Jaffoni. Chairman Thomas Ewing was unable to attend. Chairwoman Jaffoni called the meeting to order, and gave an overview of the agenda (Addendum B). To begin the orientation session for new Committee members, she asked all members to introduce themselves.

The new members present were:

Jim Barber – Metabolix, Incorporated
Bob Dinneen – Renewable Fuels Association (RFA)
Doug Hawkins – Rohm & Haas Company
Charles Kinoshita – University of Hawai'i at Manoa
Eric Larson – Princeton University
Jim Martin – Omni Tech International
Larry Pearce – Governors' Ethanol Coalition (GEC)
Ed White – State University of New York

New members not present included:

Butch Blazer – New Mexico State Forestry

Scott Mason – Conoco Phillips

Chairwoman Terry Jaffoni stated that the Committee has benefited from the energy of its current Designated Federal Officer (DFO), Neil Rossmeissl, appointed in July of 2005. In addition, the development of subcommittees for Policy and Analysis will focus Committee efforts, and she felt that the new membership provided good balance for the Committee. Mr. Rossmeissl stated that he looks forward to input from the new members present, and those to be appointed to replace members whose terms expired at the end of November 2005.

Mr. Rossmeissl gave a presentation regarding the Office of the Biomass Program (OBP) current work on the Biofuels Initiative (Attachment A). He stated that the Biofuels Initiative creates both a blessing and a challenge for OBP to deliver with current funding levels. Congressionally-directed projects can undermine the success of Presidentially-supported targeted investments.

Jim Martin asked for clarification regarding replacement of seventy-five percent of Middle-Eastern petroleum imports. Neil Rossmeissl responded that this petroleum can be either displaced by more efficient methods of fossil fuel use, or replaced with biobased fuels. The $53 per barrel price for 2025 given in the presentation is based on direct biofuel replacement of petroleum. Larry Pearce stated that not all oil comes specifically from the Middle East, which makes it hard to directly track prices.

Neil Rossmeissl elaborated that OBP is expected to provide for a rapid switchover due to a high-value ethanol product. The creation of regional feedstock centers will incorporate USDA input on the approach. Tom Binder asked from which source the biomass prices in Mr. Rossmeissl's presentation were taken, because $30/ton feedstock prices did not make sense to him. . Mr. Rossmeissl explained that industry surveys provided this information. Eric Larson asked what would be the ideal cost for feedstocks. Dr. Binder added that biomass energy crops are not grown if farmers are paid more for feed grain. Jim Martin felt that energy crop growth has been stagnant. Ed White considers the establishment and collaboration of regional feedstock centers is long overdue. He also felt that the cost figures for biomass per ton were accurate, though the pay for farmers calculated in the Biofuels Initiative figures seemed low.

Neil Rossmeissl responded that the integrated cellulosic ethanol biorefinery solicitation just announced per section 932 of EPAct accentuates the advancement of technology. A separate "validation" solicitation in the future will seek to increase production with specific technologies from woody biomass and agricultural residue by ten percent. OBP cannot predict how industry and agricultural producers will drive feedstock pricing down in the real market, though collaboration with farmers throughout early commercialization solicitations provides the technology options to allow for future market action.

Ralph Cavalieri asked whether funding for OBP research went up during 2005. Mr. Rossmeissl responded that a 2005 appropriations were higher, but there was also a higher percentage of funds set aside for Congressionally-directed projects, resulting in less funds

for discretionary research. Bill Hagy from the Office of Rural Development at the USDA noted that this level of Congressionally-directed funding was reflected at that agency as well. Ed White stated he does not favor the high percentage of Congressionally-directed projects, because it diverts funding from projects adhering to specific program objectives.

Ed White asked whether the regional feedstocks centers will work with the Sun Grant programs. Neil Rossmeissl responded that staff are working with USDA to identify overlaps, what can be achieved with the allotted time and funding, and how the Farm Bill Sun Grant money will be used at the Department of Transportation. Eric Larson asked whether gasification technology's greater efficiency in co-gasification with traditional coal is recognized by OBP. Mr. Rossmeissl said that it is, and that work in wet gasification and pyrolysis continues, though it does not receive as much funding as the biochemical platform. Dr. Larson suggested that OBP consider co-gasification technology available to Texaco, Shell, and GE. Mr. Rossmeissl noted that industry has not significantly invested in co-gasification in the U.S.

Mr. Rossmeissl gave a presentation regarding the Committee's overall purpose, history, and goals (Attachment B).

The Committee broke for ten minutes.

C. Update on Biomass Initiative and Energy Council at the U.S. Department of Agriculture

Bill Hagy from the USDA Office of Rural Development gave a presentation regarding Biomass Initiative administration at the agency, including the establishment of an Energy Council led by Committee point of contact Under Secretary for Rural Development Thomas C. Dorr (Attachment C).

Ralph Cavalieri asked whether funding provided by section 9008 of the 2002 Farm Bill was part of the $14 million in annual awards made under the Biomass Initiative joint solicitation. Bill Hagy answered that $12 million was provided by the USDA in 2005. In addition, there was some carryover of USDA funds from 2004. Neil Rossmeissl added that the USDA has funds appropriated by the Farm Bill specifically for the Initiative awards, whereas the DOE allocation depends on the types of proposals received each year. Dr. Cavalieri noted that EPAct authorizes $200 million in funding for the Initiative. Bill Hagy added that 2007 is currently set as the last year for mandatory Initiative funding via the Farm Bill. Carolyn Fritz clarified that DOE can provide award money from its general research funding, on top of the USDA appropriation each year. She noted that DOE had been able to give more than $2 million in the early years of the Initiative. Mr. Rossmeissl agreed that if DOE money is not appropriated to the Initiative, some can be approved for this use by the DOE Budget Office. Bob Dinneen asked Mr. Hagy whether he can provide a statement of USDA funding broken down by use. Mr. Hagy answered that there are statutory limits for grant percentage funding of certain projects, as well as loan-funded projects. He will work with Committee support staff to provide a breakdown document to members.

Eric Larson asked what the criteria for biomass research joint solicitation awards under section 9006 of the Farm Bill were, and whether they required a catalytic effect from proposed projects. Bill Hagy affirmed that catalytic effect is a key criterion for project replication. Dr. Larson further inquired whether research and development at both agencies is directly coordinated with some of the appropriated Initiative funds. Mr. Hagy stated that the Energy Council is established for this purpose. Jim Martin asked whether renewable biomass loan guarantee programs have been funded. Mr. Hagy answered that a few have been, but that these types of projects will receive more emphasis in the future.

D. Update on Action Items from the Designated Federal Officer

Neil Rossmeissl gave a presentation as DFO (Attachment D) providing updates on action items from the last meeting. John Hickman asked when the new Multi-Year Program Plan (MYPP) will be sent out for Committee review. Mr. Rossmeissl anticipated its release in mid-summer, dependent on OBP format and revision timelines. Jim Martin asked whether the current MYPP is available online. Mr. Rossmeissl affirmed that it is available on the OBP website: http://www1.eere.energy.gov/biomass/pdfs/mypp.pdf .

E. Review of *Vision* Update Process

Interim Committee member Tom Binder of Archer Daniels Midland (ADM), *Vision* and *Roadmap* subcommittee chairman, gave a presentation on the *Vision* document update status (Attachment E). Since the November 29-30, 2005 Committee meeting, the *Vision* has been drafted, sent to the Committee and independent peer reviewers for comment, and revised accordingly (Attachment F). Mike Manella of BCS, Incorporated announced he will accept further Committee comment through March 10, 2006. A final draft of the new *Vision* will be provided to the Interagency Biomass Research and Development Board (Board) for comment before final revision publication.

Neil Rossmeissl stated that the Committee requested an industry survey on biobased production data. Melissa Klembara of OBP has worked on cooperation with SRI Consulting for uniform reporting. In addition, she is working with Helena Chum from NREL to benchmark this data, because full SRI reporting can take up to two years. Once the data is benchmarked, it is possible that a formal statistical office, such as the Energy Information Administration (EIA) could take over data tracking.

Bob Dinneen noted that $11 natural gas pricing has moved some companies to adopt co-gasification technologies. He asked whether biofuels goals would be stated in barrels as well as BTUs. Dr. Binder responded that the new *Vision* goals provided both units. Charles Kinoshita asked whether the subcommittee had compared these goals with other initiatives' renewable goals. Neil Rossmeissl answered that the new *Vision* goals are more aggressive than most others. Dr. Binder added that the *Vision's* biofuels goals match those of the new Presidential Biofuels Initiative. Doug Hawkins asked if the seventy-five to eighty billion gallons goal for 2025 was for ethanol only. Mr. Rossmeissl answered that this 2025 goal is for all biofuels. Jim Martin asked what the list of targeted

chemicals for bioproduct replacement includes. Tom Binder directed him to slide fourteen of his presentation, titled “Petroleum Replacement”. Mr. Martin considered that the document may need to focus target research and development with a good definition. Dr. Binder explained that the document seeks to avoid competition within products, and include all natural materials as biobased products. Eric Larson asked if carbon value had been factored into the goals for emissions data. Dr. Binder replied that petroleum replacement was considered the highest priority when setting *Vision* goals. The *Roadmap* document update may consider policy options such as carbon dioxide emissions. Mr. Martin added that not a lot of petroleum is replaced with biopower production. Dr. Binder answered that the *Vision* goals target fossil fuel replacement in general, including natural gas. With peak oil generally recognized for 2044, natural gas use for obtaining shale and tar sand oil, as well as refining operations, will increase as well. Larry Pearce asked whether the Committee might consider it more helpful to identify ethanol and biodiesel goals separately. Dr. Binder answered that it could be useful, but that biodiesel production is always a very low percentage of the overall biofuels goal. Mr. Pearce argued that separate goals and data for major fuel types would still have value. Mr. Rossmeissl explained that other green fuels from pyrolysis oils could affect future biofuel percentages. Mr. Pearce asked whether these fuels were near-term enough for inclusion in this draft of the *Vision*. Mr. Rossmeissl believes the technology will be available within twelve months. Dr. Binder noted that percentages for the major biofuel types are discussed in the *Vision* text. Carolyn Fritz answered that these percentages are not projected out for the goal years.

Charles Kinoshita said that with very little excess U.S. vegetable oil production, but enough ethanol feedstocks, the *Vision* document may be counting on a price increase in petroleum fuels. Dr. Binder answered that achievement of biofuel goals will require use of residue feedstocks and dedicated energy crops with high yield development. Dr. Kinoshita asked whether bio-oil production did not profit farmers. Dr. Binder replied that with better yields, profit potential increases. Jerrel Branson stated that the biodiesel tax incentive will end in 2008. Dr. Binder believes that chemical production will increase in the interim. Mr. Branson believes a bioproducts production increase will be based on added value, not incentives. Dr. Binder answered that biochemical incentives should be considered. Terry Jaffoni clarified that the *Vision* document does not include any policy changes in its set goals. Dr. Binder affirmed that the *Roadmap* will consider policy measures to achieve the goals. Jim Barber noted that some bio-oils have a high profit margin, and stated he believes biodiesel production will survive without the subsidy after 2008.

John Hickman asked how the revised R&D Act, with language no longer mentioning biopower, will affect this *Vision* goal. Neil Rossmeissl responded that the *Vision* provides goals for all three categories. He added that though ethanol from energy crops can benefit from co-products, there is no such companion production from bio-oils. Dr. Binder agreed that protein co-products from oilseed crops will create value. Doug Hawkins asked whether an incentive for co-products should be advocated. Jim Barber stated that definite policy incentives for vegetable oil or animal fat bioproducts do not exist. Eric Larson noted that the energy security advantage of these bioproducts, as suggested by Dr.

Barber, adds further value. Dr. Barber added that five to ten percent of crude oil, and a higher percentage of natural gas, is used in chemical production. Dr. Larson felt that a Department of Commerce incentive might better effect transition to bioproducts. Jim Barber asked that energy security policy be discussed in the revised *Roadmap.*

Committee Chairwoman Terry Jaffoni reiterated that the biofuels *Vision* goal assumes static incentives, which can then be discussed in the *Roadmap.* Dr. Binder concluded that the new *Vision* goals are achievable, and the *Roadmap* will provide the "how" for achievement. Larry Pearce asked that the term "gasohol" be removed from the current draft of the *Vision*, as it is no longer in common industry use. E10 is the more accurate term.

Neil Rossmeissl told the Committee the revised *Vision* would be sent to the Board for comment after the current meeting. Dr. Binder asked that further comments be submitted to Michael Manella of BCS, Incorporated as soon as possible.

Ralph Cavalieri stated that page twelve of the draft would require Committee guidance regarding the definition of bioproducts. Previous Committee discussion had added the phrase "any material of recent biological origin" to the definition. Dr. Binder explained that this phrase sought to avoid inclusion of coal as a bioproduct. Jim Barber asked that the document use fossil feedstocks instead of exclusively petroleum throughout.

The Committee broke for lunch.

F. Review of Energy Policy Act of 2005 Impacts on Committee

Paul Agyropolous, an Environmental Protection Agency (EPA) Senior Policy Advisor, gave a presentation regarding the agency's approach to biomass issues, including section 1514 of EPAct (Attachment G). Mr. Agyropolous explained that acronyms included in the presentation include RVP for Re-Vapor Pressure and CG for Conventional Gasoline.

Eric Larson asked what the definition of boutique fuels includes. Mr. Agyropolous explained that among the 17 or 18 brands of gasoline, each different blend is considered a boutique fuel, which includes certain fuels designed to meet air quality standards. Dr. Larson asked whether these brands included renewable fuels targeted at reducing harmful emissions. Mr. Agyropolous believed that the Federal Clean Air Act does more to reduce harmful emissions during winter months.

Neil Rossmeissl asked whether the Federal or state government is responsible for implementation of Renewable Fuels Standards (RFS). Mr. Agyropolous stated the Federal government is. Mr. Rossmeissl asked whether 60 billion gallons of ethanol, when produced, will be compatible with vehicles at that time. Mr. Agyropolous said this is technically possible, and that Brazil has implemented both full ethanol-use vehicles, and high blend vehicles. This need can be best addressed by the vehicle manufacturers. Mr. Rossmeissl asked whether there is any policy the Committee should advocate accelerating clean-fuel vehicle production. Bob Dinneen stated that biofuels are

manufactured according to Federal regulations, but that some municipalities had developed their own varieties prior to EPAct. The law eliminates the need for many types of biofuels, both diesel and ethanol, and implements the standard over time. Larry Pearce asked how a cellulosic ethanol credit should or would be formulated. Bob Dinneen knew that EPAct was specific regarding ethanol credits, but that biodiesel manufacturers have no restrictions or guidelines for any manufacturing credits. Mr. Agyropolous added that this has not yet been decided, and that there is not yet a penalty for non-compliance with either fuel.

Neil Rossmeissl asked how the new Biofuels Initiative should be tied to E-85 production. Mr. Agyropolous answered that a rule passing requires that rules be designed for simplicity. Mr. Rossmeissl asked what happened to the original data regarding ETBE from the 1990s. Mr. Agryopolous did not have the answer. He noted that credit allocations in general have not been decided upon, but that much of industry has potential to qualify. Ed White asked whether the credits will apply to biofuel manufacturers using hemicellulose. Mr. Agryopolous said they would. Ralph Cavalieri asked wither a sugar cane ethanol program exists within EPA grants programs. Mr. Agyropolous was not sure whether sugar cane ethanol programs are even required by EPA. Eric Larson said there is a need for demonstration projects with varying technologies, and asked why the RFS did not provide for demonstrations of all biofuels. Mr. Agyropolous answered that he is not aware of any restriction on the type of biofuel, and that EPA has very little information on current biomass funding. Bob Dinneen asked whether any funding for its grant program yet exists, to which Mr. Agryopolous answered that it will be available at a later time.

Neil Rossmeissl discussed the recently-announced integrated biorefinery solicitation called for in section 932 of EPAct. This solicitation is intended to fund a commercial cellulosic ethanol biorefinery. No interpretation has been allowed in the language of the solicitation, which is explicitly required for EPAct compliance at DOE. Some intellectual property definitions delayed the announcement. The biorefinery must be commercially-viable within three years. No funding for the solicitation is yet appropriated, but the solicitation is released in anticipation of this. Cost-sharing requires sixty percent of funding from the industry awardee. Proposals are due in the summer of 2006, and will be reviewed by the end of August. There is not yet any estimate or knowledge of the numbers of proposals which will be received. By January 2007, an agreement with the three awardees will allow the projects to begin. Larry Pearce asked whether any funding will be left after the biorefinery solicitation to fund the ten percent technology validation solicitation discussed earlier by Mr. Rossmeissl. Mr. Rossmeissl noted that it is hoped that proposals received under section 932 will build on and apply technology already researched and found successful by DOE. He could not predict how much funding in the current DOE budget would be diverted to Congressionally-directed projects. Mr. Rossmeissl explained that all funding would go to projects funded under section 932 if enough proposals merited the funding. Thereafter, funding could go to the ten percent technology validation solicitation. Bill Hagy asked whether EPAct defined commercialization. Mr. Rossmeissl responded that the solicitation does delineate a 700 dry ton per day production capacity, which is not a pilot-scale project, but that

commercialization was not defined in EPAct section 932. Jim Martin asked for confirmation that the projects would be lignocellulosic refineries on a commercial scale with sixty percent cost-share funding. Mr. Rossmeissl agreed, and stated that the biorefineries would not be limited to specific products. Mr. Martin asked whether facilities could apply to retrofit an existing facility. Mr. Rossmeissl answered that only standalone facilities could apply, but that a procurement specialist could address certain applicants' concerns if they were submitted in writing prior to proposals. Eric Larson asked whether the section 1514 ethanol demonstration requirement of EPAct could be satisfied via a simultaneous solicitation from another requirement. Mr. Rossmeissl reiterated that no budget or appropriation was allocated for section 1514 work, whereas section 932 has been funded. The two sections may be addressed through one program in the future. Bob Dinneen asked what the estimates on cost for a 50 million gallon plant would be. Mr. Rossmeissl replied that a plant of that size would cost approximately $220 million. Doug Hawkins recalled that section 932 biorefinery projects would receive a maximum of one hundred million dollars, and asked what the required time frame is for proven commercialization. Mr. Rossmeissl stated the time limit is three years. Mr. Pearce asked whether many demonstration projects with targeted technology would be more worthwhile than just three large projects. Mr. Rossmeissl answered that the projects are limited to lignocellulosic biorefining, to achieve large-scale acceleration of technology in this area, and facilitate market access.

G. Discussion of *Roadmap* Workshop Organization

Tom Binder elaborated on the *Vision* revision update and continued the discussion by giving a presentation regarding the upcoming *Roadmap* workshops (Attachment H). Eric Larson asked whether there would be a regional workshop for the South-eastern United States. Dr. Binder explained that the fall workshop for the entire East Coast would include this region. He then asked for Committee members' suggestions for experts to invite to future workshops. Ralph Cavalieri asked for the members to consider the *Roadmap* subject areas when suggesting people with expertise. Ed White suggested that the 25 x 25 group be asked for contacts in the products area. Jim Barber asked that the "Midwest" workshop in Chicago undergo a title change to "Central" to include southern states. Jim Martin asked that appropriate commodity group representatives for each region be included in the list of invited experts. Eric Larson suggested that Ken Keller from the University of Minnesota Humphrey School be invited.

Neil Rossmeissl asked how the outcome information from each workshop would be communicated to the public. Doug Hawkins said he had understood that results of each workshop would be reported at the next Committee meeting. Neil Rossmeissl asked if the Committee would give press contacts information at the same time, to make its work more visible. Tom Binder believed the *Vision* and *Roadmap* update will have an impact after they are published. Ralph Cavalieri asked whether the regional workshops would also lead to separate reports, which would need to be released sequentially. Mr. Rossmeissl believed the information would be released at one time. Dr. Cavalieri suggested including primary information from each *Roadmap* subject area into one final

document. Mr. Rossmeissl noted that only the general final decisions and major discussion areas would need to be outlined for the public report.

The Committee broke for ten minutes.

H. Policy and Analysis Subcommittee Work Session

Policy

Neil Rossmeissl discussed the goals of the Policy subcommittee as already undertaken in a January conference call. He elaborated that the subcommittee hoped to create a report card to highlight effective renewable energy incentives, asked the subcommittee members to consider which solar program would be an ideal model for biomass incentives, and noted that a current E85 incentive is lacking. Bob Dinneen responded that the U.S. Department of Transportation has removed any East Coast E85 infrastructure incentives. However, a thirty percent tax incentive may increase to fifty percent. Mr. Rossmeissl hoped that more incentives could be applied. Mr. Dinneen believed that infrastructure would follow the market, and that ethanol has its highest current value as a gasoline blend. Jim Barber wondered what Brazil's incentives include. Mr. Dinneen answered that Brazil recently had to reduce its ethanol fuel to a twenty percent blend due to a shortage in sugar crop production, and corresponding high sugar prices. Jim Barber wants the Policy subcommittee to also consider flex-fuel vehicle tax incentives. Mr. Rossmeissl stated that current Japanese policy will only allow a five percent ethanol blend, which affects a large segment of vehicles manufactured. Bob Dinneen asked whether he can report to EPA representatives that DOE supports E20 production and use. Mr. Rossmeissl answered that the new Biofuels Initiative is also structured for E20 blends.

Doug Hawkins asked whether there has been any effort to deal with the ten percent validation scale plant Notice Of Program Intent (NOPI) questions. Neil Rossmeissl answered that it has been difficult to achieve consensus on the usefulness of the information, and that an answer may be possible in seven or eight months.

Jim Barber volunteered to chair the Policy subcommittee, dependent on further discussion with the subcommittee members. Ed White volunteered to contribute information from SUNY policy representatives. Jerrel Branson volunteered for the subcommittee. Doug Hawkins asked that his name be removed from the Policy subcommittee membership list, due to time constraints.

Bob Dinneen stated that upcoming Farm Bill discussions anticipate a focus on energy, WTO considerations, and farmer concerns about energy crops. He suggested that Committee Chairman Tom Ewing could testify with specific recommendations generated by the Policy subcommittee and the Committee. Though EPAct will not be revised in the near future, the Farm Bill hearings will provide a major opportunity for policy advice.

Tom Binder stated that the *Roadmap* update workshops will bring output ideas to the Policy subcommittee throughout 2006.

Eric Larson asked whether the public relations (PR) discussion scheduled on the Committee agenda would combine Policy PR with overall Committee PR. Neil Rossmeissl stated that the Policy subcommittee will only clarify or focus the Committee position. Dr. Larson further asked that policy modeling not be limited to the solar and coal programs' work. Committee Chairwoman Terry Jaffoni recognized Bryan Jenkins of the California Energy Commission, who asked from the audience whether the subcommittee would consider state biomass policies. Bob Dinneen in turn requested that the subcommittee investigate state incentives. Jim Barber asked that the subcommittee identify effective goals. Committee Chairwoman Jaffoni stated that all Committee subcommittees should:

1. Identify and analyze current policies for best practices.
2. Form internal goals accordingly.
3. Communicate their goals externally.

Bryan Jenkins further noted that the subcommittee could research current European policies for promoting bioenergy and bioproducts. Carolyn Fritz suggested the subcommittee could analyze policy for its first year, then provide recommendations in the second. Bob Dinneen considered that a two-year timeframe would minimize the impact of any recommendations. Jim Martin recommended that the subcommittee remember to include bioproduct incentives. Doug Hawkins asked whether the policy subcommittee would undertake to fix the Biobased Product Procurement Preference Program definitions. Mr. Rossmeissl explained that this recommendation is already included in the FY 2005 Annual Report Committee recommendations. Doug Hawkins moved that the Committee approve the Policy subcommittee goals as stated in Attachment I. Ralph Cavalieri asked that the language be altered to provide a "charge to…" the subcommittee. Tom Binder seconded the motion. The Committee unanimously approved the Policy subcommittee charge.

Analysis

Committee Chairwoman Terry Jaffoni stated that the Analysis subcommittee provides value to both USDA and DOE and the Committee with its ability to review documents in process. Bob Dinneen provided a background document from the Renewable Fuels Association regarding the current state of ethanol and biofuels in the U.S. Jim Martin asked whether the subcommittee should respond to RFA or report out to the Committee. Mr. Dinneen answered that a timely response might come directly from the subcommittee to RFA. Tom Binder asked that the Committee be provided energy balance information for all current feedstocks, and recommended analysis in this area for industry benefit. Mr. Rossmeissl explained that the Committee has asked for information and presentations on the net energy balance of ethanol in the past, but has not in turn made any strong external statements based on the information. Eric Larson asked how the Analysis subcommittee's work will fit with Policy subcommittee goals. Ralph Cavalieri asked what the subcommittee's needs are, and how they will be managed. Mr. Rossmeissl answered that the subcommittee chairs can report to the Policy subcommittee on issues which need Committee support and focus. Dr. Larson suggested that the Analysis subcommittee would therefore request information and analysis to recommend current issues. John Hickman believed that the scope of the Analysis subcommittee would be different from the Policy subcommittee. Doug Hawkins stated that the Analysis subcommittee's work would provide a solid base and direction for external recommendations by the Policy subcommittee. Mr. Rossmeissl stated that the subcommittee itself will not perform analysis, but rather review current analysis and make recommendations based on that review.

Eric Larson volunteered for the Analysis subcommittee. Committee Chairwoman Terry Jaffoni nominated Ralph Cavalieri to be Analysis subcommittee Chairman. Dr. Cavalieri acquiesced to be Chairman. Mr. Rossmeissl explained that with support from Leslie Pezzullo of BCS, Incorporated, the subcommittee will decide when to hold meetings and conference calls.

Attachment J provides the charge to the Analysis subcommittee. Eric Larson moved that the statement of work be approved. Jim Martin seconded the motion. The Committee unanimously approved the goals of the Analysis subcommittee.

I. Discussion of Public Relations (PR) Efforts

Ken Green of BCS, Incorporated stated that the Committee has access to outreach tools, including the DOE Biomass Program website (http://www1.eere.energy.gov/biomass/), the Biomass Initiative newsletter (http://www.biomass.govtools.us/newsletters/Apr_2006/default.html), and the Biomass Initiative website (http://www.biomass.govtools.us/).

Committee Chairwoman Terry Jaffoni asked the Committee whether they would prefer a PR spokesperson or a subcommittee to manage PR efforts. Larry Pearce asked whether the Committee already has media contacts. Terry Jaffoni answered that the Committee

uses the website and newsletter, and can provide information to contacts at Renewable Fuels News, or press releases to DOE. Mr. Rossmeissl noted that no individual on the Committee can represent the Committee or Department. Eric Larson asked whether it will be acceptable to have a Policy subcommittee interacting with decision makers. Mr. Rossmeissl answered that the *Vision* and *Roadmap* documents will need their own outreach activities. Dr. Larson believed that an individual could be responsible for Committee communications. Mr. Rossmeissl said that the Committee cannot be overtly involved in DOE initiatives. Ken Green of BCS, Incorporated recalled that Committee Chairman Tom Ewing has testified before Congress, but in order to widely distribute the updated *Vision* and *Roadmap*, it will be necessary to provide further outreach.

J. Public Comment

Chairwoman Terry Jaffoni asked for any public comment. There was none.

K. Adjournment of Day One

Tom Binder moved to adjourn the meeting. Doug Hawkins seconded the motion. Chairwoman Terry Jaffoni adjourned the first day of the meeting.

Day Two: March 3, 2006

L. Presentation from the Western Governors' Association

Chairwoman Terry Jaffoni welcomed the Committee back into session. She recognized Gayle Gordon of the Western Governors' Association (WGA), who gave a presentation regarding her organization's efforts for biomass energy among western states (Attachment K). She hoped that WGA can facilitate outreach among states with biomass work.

Eric Larson asked what the main focus of the Clean and Diversified Energy Advisory Committee (CDEAC) is. Bryan Jenkins responded that it is carbon capture and storage. Gayle Gordon added that it is primarily co-gasification. She provided a handout of the CDEAC Biomass Task Force Report Executive Summary (Attachment L). Ralph Cavalieri asked whether WGA promotes the use of woody biomass for electricity generation instead of liquid fuels. Ms. Gordon responded that the CDEAC primarily studied electricity generation, and that under this the member states are working to use various biomass resources to produce 10,000 megawatt hours of power. The report details which feedstocks are in use. Dr. Larson asked what forest restoration projects are in practice. Ms. Gordon answered that fire-resistant plantings and re-growth projects are underway. She noted that DOE has asked for WGA input on its regional feedstocks centers partnerships. Ms. Gordon is involved in the central region center in South Dakota, and in the Southeastern region center in Tennessee. A meeting to organize the latter will be held in May. WGA is itself working to provide a grant for more work in fuel

technologies. Ms. Gordon also discussed current WGA initiatives, which are kept updated online at: http://www.westgov.org/wga_working_groups.htm. Bill Hagy asked whether the Nebraska study is in progress. She answered that it had just begun, and will be published when complete. Mr. Hagy asked whether the project had only partial funding. Ms. Gordon answered that the funding has not been defined. Mr. Hagy clarified whether the funding source was at all restricted. Ms. Gordon replied that funding could come from Federal, state, and industry sources. The WGA is working to summarize available grants. Mr. Hagy further asked whether any feedstocks work would be funded at WGA. Ms. Gordon stated that the WGA supports cooperation on feedstocks development, and supports the advancement of bioenergy and bioproducts. A woody biomass meeting will be held in Denver later in the month of March, and the WGA biomass initiative will be discussed there. Dr. Larson asked whether all initiative funding came from one $1.8 billion source. Ms. Gordon responded affirmatively.

M. Presentation from the National Conference of State Legislatures

Jennifer DeCesaro of the National Conference of State Legislatures (NCSL) gave a presentation regarding the organization's work with biomass-related policies (Attachment M). She noted that the U.S. states comprise much geographic diversity, affecting biomass energy production.

Eric Larson asked what the presentation defined as "bioenergy". Jennifer DeCesaro answered that the term refers to electric power generation.

Ms. DeCesaro noted that production tax credits throughout all states are affected greatly by system size.

Bryan Jenkins asked why states create product-specific policies instead of policies for biofuels in general. Ms. DeCesaro replied that the policies may target each state's feedstock resources. Mr. Jenkins noted that it is hard to apply the California Vision to certain products, or a wide range of products. Ms. DeCesaro agreed that many states must avoid the use of narrowly defined incentives, or must broaden them over time.

In addition, Jennifer DeCesaro discussed how definitions have a major effect on Renewable Portfolio Standards (RPS) programs. For example, a broad definition of biomass can be different to work with than "non-chemically treated wood". There has been a high level of activity in renewable fuel legislation among states. Colorado is working to mandate twenty percent blends of biodiesel, Illinois is working to mandate a ten percent blend of ethanol after 2007, Mississippi is working on a biodiesel blend mandate, and Washington State is working towards fuel mandates for both ethanol and biodiesel, including equipment subsidies to farmers for use in implementing the mandate.

Eric Larson noted that state carbon emissions regulations have also had increased activity, and asked whether this had any connection with biomass initiatives. Ms. DeCesaro answered that carbon is not a driver for biomass sequestration questions, and that R&D is instead the major push. Neil Rossmeissl asked whether any of the mandates

were not enforced due to RVP issues. Ms. DeCesaro did not know. Jim Martin stated that tax incentives should be used more than production incentives, and hoped that with tax incentives used to cell cars, more activity in biofuel markets would result. Ms. DeCesaro noted that car producers would lobby nationwide for those types of incentives, and that states have not shown much activity in setting tax incentives for bioproducts either. Mr. Martin asked whether the states are waiting for an example from the Federal government. Ms. DeCesaro replied that the states instead have no interest, and are usually more advanced with initiatives for which they do. Mr. Martin asked whether Iowa's purchase incentives are popular with other states. Ms. DeCesaro said they have not yet been adopted by any other state. Gayle Gordon stated that the recommendations listed by WGA are going to all governors in June 2006, and that they have been reviewed by NCSL. Neil Rossmeissl asked whether the twenty-five percent RFS in Iowa is waiting on Minnesota for implementation synchronization. Ms. DeCesaro responded that she did not know specifically. Mr. Rossmeissl asked whether NCSL communicates with vehicle manufacturers. Ms. DeCesaro answered that communication varies by state according to interest. Chairwoman Terry Jaffoni asked what the utility of incentives is in renewable power incentive states. Ms. DeCesaro answered that some states do not take advantage of incentives, and that New Mexico rewrote legislation to provide less stringent guidelines for system size. Some states' incentive programs are oversubscribed at inception.

Jennifer DeCesaro asked whether NCSL could provide a draft of its Biomass Primer to the Committee for comment in the near future. Chairwoman Jaffoni agreed.

Ralph Cavalieri asked why high-value woody biomass is recommended for burning instead of conversion to biofuels. Gayle Gordon responded that the WGA has addressed electric generation in general, using all resources available. The real barrier is access to woody biomass. Once accessed, the material is available for all processes. Bryan Jenkins noted that incentives can be provided outside of the market base. Fire, conservation, and energy security incentives exist in biomass energy. Ms. Gordon asked how the incentives can transfer from infrastructure to industry with R&D. Ed White noted that cellulose to ethanol will work with eastern woody feedstocks, not western conifers. R&D for technology in that area is necessary. Ms. Gordon hopes the regional feedstock centers will address that. Chairwoman Terry Jaffoni believed it is too expensive to access woody biomass, unless it is used for lucrative biofuel production. Mr. Jenkins noted that the WGA report recommended system beneficiaries assist with feedstock costs. Dr. White asked if this includes forestry costs. Mr. Jenkins affirmed this included forest use and forest products fees. Jim Martin noted that biodiesel and ethanol producers have a good safety record. He hopes farmer subsidies don't encourage individual production. Standards should be adhered to, and policed by industry associations. Chairwoman Jaffoni stated that the discussion may contain research questions which lead to Committee recommendations. John Hickman stated that engine emissions requirements may still create biofuel issues in individual states. Dr. Cavalieri stated that with no income tax in Washington State, biofuels incentives include a sales tax rebate on equipment for farming oilseed.

Neil Rossmeissl noted that with no ANSI or API standard for biofuels, DOE would require a recommendation to implement one. Jim Martin stated that an ASTM biodiesel standard is in place, and that though quality problems with biodiesel exist, they mirror those of petroleum. He was not sure what DOE could do to ensure standards are correctly implemented in both industries. Mr. Rossmeissl asked whether the barrier could be the need for an international standard. Mr. Martin answered that the issue could be addressed before there is a barrier. Chairwoman Jaffoni noted that the ethanol situation is more settled, due to products like E85 or E10. International product trading will require ASTM specifications. Standards are important in the market.

The Committee broke for fifteen minutes.

N. Discussion of Committee Recommendations for the 2005 annual report to Congress on the Biomass Initiative

Chairwoman Terry Jaffoni directed the Committee's attention to the 2005 recommendations to the Secretaries of Agriculture and Energy (Attachment N). She asked for any questions or comments on the final document. Doug Hawkins questioned the language of recommendation C. 3. Neil Rossmeissl answered that the most effective use of Committee recommendations is to request the Secretaries to act, in this case, to clarify some language.

Ed White asked how Congressionally-directed projects are held accountable. Mr. Rossmeissl answered that the Biomass Program Peer Review does provide a venue for projects to be independently assessed. If certain projects do not comply with Biomass Program objectives, that information can be relayed to Congress, but otherwise, they are not accountable.

Jim Barber asked about recommendation B. 1., for clarification of life-cycle documentation. He noted that recommendation B. 2. contained a typo, and asked about recommendation B.3., whether any specific incentive programs were under consideration. Chairwoman Jaffoni responded about the latter that impact research is necessary for certain types. Dr. Barber asked whether econometric analysis was considered. Ralph Cavalieri answered that with this information, legislators can make correct recommendations. Dr. Barber stated that with limited specific targeted demonstrations, examples would exist for lawmakers. He was also interested in B.6., and asked what funding history the thermochemical platform has at OBP. John Hickman stated that program emphasis has been on biorefinery approaches. Cindy Riley of the National Renewable Energy Laboratory (NREL) stated that DOE previously merged three programs to target petroleum displacement and that biochemical remained the strongest thereafter. Thermochemical is now part of that. Dr. Hickman agreed that some Committee members have had a high interest in funding certain program areas. Jim Martin noted that both members refer to biorefinery research, but that bio is not defined as a material or process. He prefers defining biomass as the material, and using a combination process to maximize production and efficient use. Ms. Riley agreed. Eric Larson asked why the thermochemical recommendation did not request a funding

increase or parity. Chairwoman Jaffoni answered that the Committee preferred to continue emphasizing the importance of this funding. Dr. Larson asked whether thermochemical funding was ever removed. Chairwoman Jaffoni replied that it was for a year, but is currently funded.

Eric Larson asked whether the Committee is restricted to advice on the joint solicitation, or whether it can provide broader recommendations for 2006. Chairwoman Terry Jaffoni stated that the Committee had moved beyond just the joint solicitation as early as 2005. She asked whether paragraph four of the introduction to the Committee's recommendations should be changed to broaden the Committee's scope. Doug Hawkins asked whether it is wise to state the Committee's mission in broader terms than are stated in the Biomass R&D Act of 2000. Neil Rossmeissl answered that DOE would like the Committee to be more involved, not just in funding. Ralph Cavalieri considered that providing Committee advice solely on the $40 million biomass R&D portfolio is a waste of funding.

Eric Larson asked about recommendation C.3., regarding a letter from Committee member David Morris of the Institute for Local Self-Reliance. Chairwoman Terry Jaffoni answered that the recommendation could be amended to remove the mention of David Morris, as the full Committee did endorse the recommendation.

Chairwoman Jaffoni suggested that the Committee would benefit by collecting recommendations throughout the fiscal year. Ken Green of BCS, Incorporated agreed to provide an agenda item for each meeting. Chairwoman Jaffoni requested that time be allowed at the end of each meeting for collection of recommendations.

The Committee broke for ten minutes.

O. Discussion of Minority Reports

Chairwoman Terry Jaffoni stated that a Minority Report for FY2005 will be submitted to the whole Committee by March 15, 2006. She and Chairman Tom Ewing have granted a Committee member's request to submit the document, which will be sent to all 2005 members for approval. Doug Hawkins asked whether a process exists for examination of the minority report. Neil Rossmeissl answered that the Committee can approve or disapprove the minority report as part of their recommendations. Chairwoman Jaffoni asked the Committee whether a majority or consensus approval would be appropriate, or whether the minority opinion should be voiced in the recommendations section of the annual report. Eric Larson answered that the process is not yet sufficient. Mr. Rossmeissl stated that DOE and USDA do not have to respond to minority reports, and that Congress may not read the full report. If minority recommendations are not incorporated outright, all the recommendations will have a decreased effect. Ed White requested further discussion of the Committee's report and what is required. Chairwoman Jaffoni agreed it is difficult to include a minority report in the full annual report to Congress. Ralph Cavalieri suggested that language be included to state that the Committee majority or minority feels the Secretaries should be aware of the minority opinion. Chairwoman

Jaffoni believed the note could be confusing. Eric Larson believed that the issue would affect the Committee's approach. Charles Kinoshita asked whether contentious issues without a clear majority would become recommendations. Chairwoman Jaffoni noted that 2005 recommendations will not be changed at this point. Neil Rossmeissl agreed that comments on the recommendations' value should be captured, and suggested providing a future appendix to the annual report to note who suggested each, and the vote percentage for each.

Chairwoman Terry Jaffoni suggested developing a policy for inclusion of minority reports going forward. Doug Hawkins asked whether the Committee had any quorum requirement. Neil Rossmeissl responded it has not. Chairwoman Jaffoni stated that participation is noted. Mr. Rossmeissl stated that, as DFO, he has the ability to remove non-participating Committee members. Eric Larson asked whether participation is measured within meetings, or in overall attendance. Mr. Rossmeissl clarified that overall participation is considered.

P. Discussion of 2006 Work Plan and Meeting Schedule

Chairwoman Terry Jaffoni directed the Committee to consider its 2006 deliverables and meeting schedule on the draft 2006 Work Plan (Attachment O).

Ralph Cavalieri announced that a Committee meeting will be held Thursday, August 10th, after the August 8-9th Western Region *Roadmap* Update Workshop in Sacramento, California. Jim Martin asked whether a New York workshop would be held prior to this. Doug Hawkins, the Eastern Region *Roadmap* Update Workshop Chairman, stated the meeting would be held in the fall.

Eric Larson asked whether the Committee will have joint solicitation selection information available by the time of the August meeting. Neil Rossmeissl said yes, and that the joint solicitation review process has been accelerated. The awardee information, if not yet public, can also be made available to the Committee during a private administrative session.

A June conference call was suggested to evaluate annual recommendations. The call will last two hours on June 6, 2006, from 1:00 – 3:00 p.m. EST. Jim Barber asked that recommendations be sent to the members ahead of time. Neil Rossmeissl agreed to have the information sent out, and suggested subcommittee reports be included in the annual report. Jim clarified the purpose of the conference call: to report on subcommittee activities, to deliberate on submitted recommendations, and to provide more recommendations. Neil Rossmeissl further suggested the *Vision* press release be discussed.

Q. Public Comment

Chairwoman Terry Jaffoni recognized Bryan Jenkins of the California Energy Commission for public comment. He offered California's help in promoting the updated *Vision* document and running the western Region *Roadmap* Update Workshop.

R. Adjournment of Day Two

John Hickman made a motion to adjourn. Jim Barber seconded the motion. Chairwoman Terry Jaffoni thanked the Committee for being present and adjourned the second day of the meeting.

ADDENDUM A

Biomass Research and Development Technical Advisory Committee Meeting
October 3-4, 2005

ATTENDEES

Committee Members Present

Jim Barber
Jerrel Branson
Ralph Cavalieri
Bob Dinneen
Carolyn Fritz
Doug Hawkins
John Hickman
Terry Jaffoni, Chairwoman
Charles Kinoshita
Eric Larson
Jim Martin
Larry Pearce
Ed White

Interim (Non-Voting) Committee Members Present

Tom Binder

Committee Members Not Present

Arthur Blazer
Tom Ewing
Jack Huttner
Scott Mason
Delmar Raymond

Federal Employees Present

William Hagy III - USDA
Paul Agyropolous – EPA
Cindy Riley – DOE
Neil Rossmeissl – DOE
Michael Pacheco – DOE

Total Public Attendees – 7

Total Attendees – 26

Designated Federal Officer – Neil Rossmeissl

ADDENDUM B - AGENDA

Agenda

Public Meeting of the
Biomass R&D Technical Advisory Committee
March 2-3, 2006

National Renewable Energy Laboratory
Building 17 – Room 4B
1617 Cole Boulevard
Golden, CO 80401

Description of subjects for this meeting:

- New Member Orientation
- Receive update on USDA – DOE Collaboration
- Review status of *Vision* update
- Review Energy Policy Act of 2005 (EPAct) impact on biomass research and development
- Review organizational process for 2006 regional *Roadmap* workshops
- Discuss Analysis, Policy, and other subcommittee business
- Discuss Committee public relations efforts
- Meet with representatives from NCSL and WGA
- Discuss Committee Recommendations for the 2005 annual report to Congress on the Biomass Initiative
- Review 2006 Work Plan

Agenda – DAY 1 **March 2, 2006**

8:00 – 8:30 Continental Breakfast

8:30 – 9:45 Incoming Committee Member Orientation

8:30 – 8:40 Welcome and Introduction – *Terry Jaffoni, Acting Committee Chair*

8:40 – 9:00 Overview of Office of the Biomass Program Work and the Biofuels Initiative – *Neil Rossmeissl, Designated Federal Officer, DOE*

9:00 – 9:25 Overview of Committee Purpose, History, and Goals – *Neil Rossmeissl, Designated Federal Officer, DOE*

9:25 – 9:45 Q & A for Incoming Members

9:45 – 10:00	Break
10:00 – 10:10	Overview of Meeting Agenda – *Terry Jaffoni, Acting Committee Chair*
10:10 – 10:30	Update on Biomass Initiative administration and new Energy Council at the U.S. Department of Agriculture – *William Hagy III, Deputy Administrator, Rural Business – Cooperative Programs, USDA*
10:30 – 10:50	Update on Action Items from last meeting and other Committee business – *Neil Rossmeissl, Designated Federal Officer, DOE* ▪ Membership Update ▪ Annual Report Progress ▪ Joint Solicitation Progress ▪ EPAct 2005
10:50 – 11:45	Review results of *Vision* update process – *Tom Binder, Vision and Roadmap Subcommittee Chair*
11:45 – 12:45	Lunch
12:45 – 1:45	Review Energy Policy Act of 2005, discuss impact on Committee policy and goals ▪ Section 932 Biorefinery Solicitation Update – *Neil Rossmeissl, Designated Federal Officer* ▪ Section 941 of EPAct – *Neil Rossmeissl, Designated Federal Officer* ▪ Presentation regarding section 1514 of EPAct – *Paul Agyropoulos, Senior Policy Advisor, Environmental Protection Agency*
1:45 – 2:30	Discussion of *Roadmap* Workshop and subcommittee organization – *Tom Binder, Vision and Roadmap Subcommittee Chair*
2:30 – 2:45	Break
2:45 – 3:30	Policy and Analysis Subcommittee Work Session ▪ Discussion of Purpose and Goals ▪ Prioritize Goals for 2006 ▪ Select Subcommittee Chairs
3:30 – 4:30	Discussion of Public Relations efforts and future goals
4:30 – 4:45	Public Comment

4:45	Adjourn

Agenda- DAY 2 **March 3, 2006**

8:00 – 8:30	Continental Breakfast
8:30 – 8:45	Presentation: Gayle Gordon, Western Governors' Association
8:45 – 9:00	Presentation: Jennifer DeCesaro, Policy Specialist, National Conference of State Legislatures
9:00 – 9:30	Discussion
9:30 – 10:30	Discussion of 2005 Annual Recommendations – *Terry Jaffoni, Acting Committee Chair*
10:30 – 10:45	Break
10:45 – 11:15	Discussion of Minority Report in 2005 Committee Recommendations – *Terry Jaffoni, Acting Committee Chair*
11:15 – 11:45	Discussion of 2006 Work Plan and 2006 meeting schedule – *Terry Jaffoni, Acting Committee Chair*
11:45 – 12:00	Public Comment
12:00	Adjourn

Attachment A

U.S. Department of Energy
Energy Efficiency and Renewable Energy

The Biomass Program




Office of the Biomass Program

Energy Efficiency and Renewable Energy

March 2, 2006

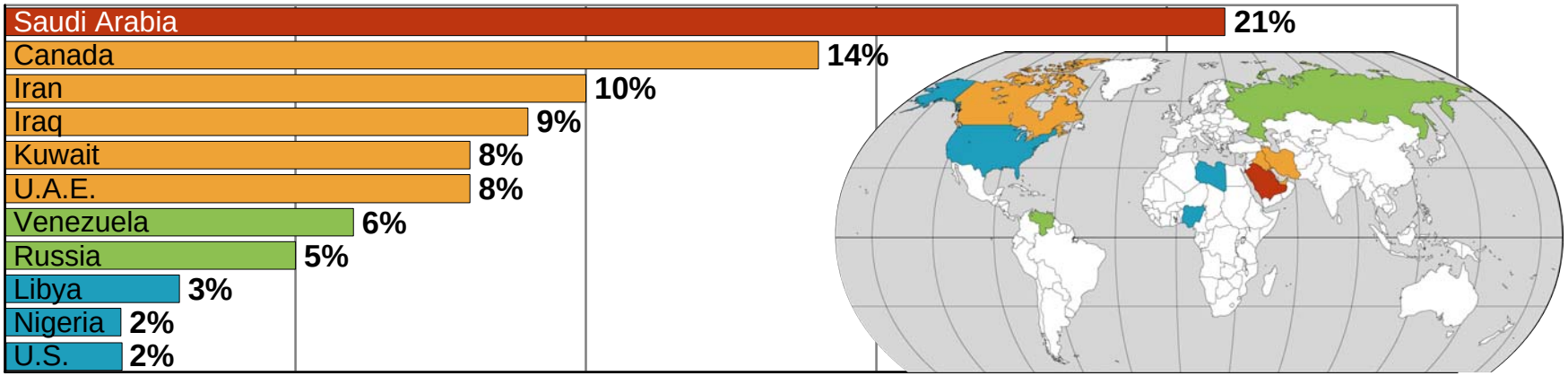
Source: Production and end-use data from Energy Information Administration, *Annual Energy Review 2001*
*Net fossil-fuel electrical imports
**Includes 0.2 quads of imported hydro
***Biomass/other includes wood, waste, alcohol, geothermal, solar, and wind.

August 2003
Lawrence Livermore
National Laboratory
http://eed.llnl.gov/flow

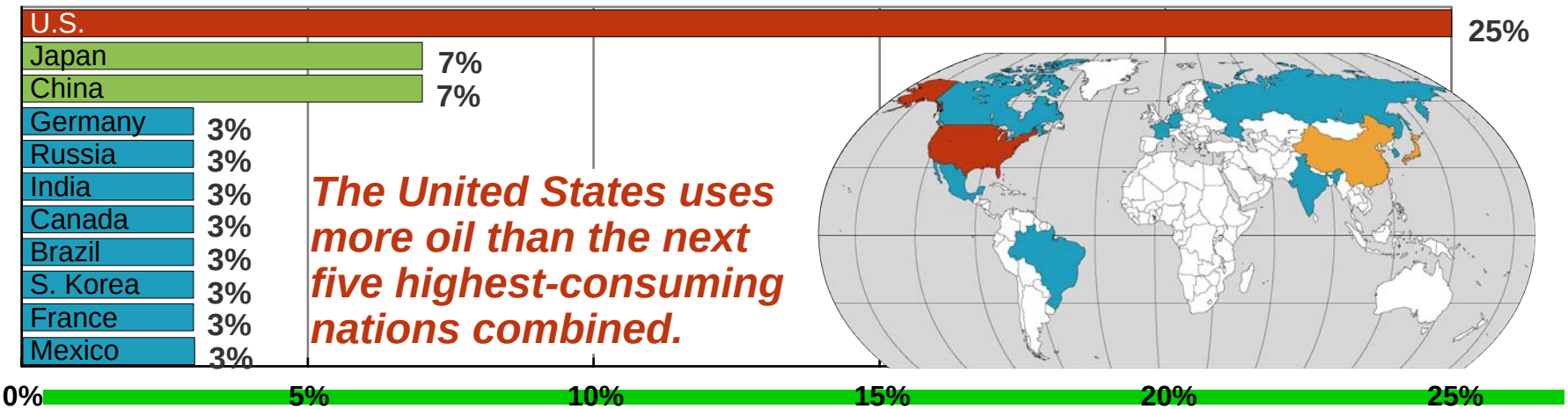
- Where are we heading?
- Why this direction?
- How will we get there?
- What has been accomplished?
- Funding

U.S. Dependence on Foreign Oil

Oil Reserves



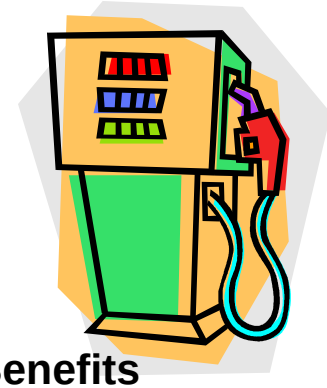
Rate of Use



The United States uses more oil than the next five highest-consuming nations combined.

Updated July 2005. Source: International Energy Annual 2003 (EIA), Tables 1.2 and 8.1-O&GJ. Canada's reserves include tar sands.

EERE Biofuels Initiative



What can be done and When?

- 3.4 Billion from corn now will Increase to 12.8-17.8 Billion by 2015
- 30% of our current gasoline use met with biofuels by 2030

The Market Exist

- 25 States have some MTBE Ban
- 4.5+ Million FFV on the road
- 7.5 BGY by 2012 Epact 2005
- 139.6 BGY Gasoline and 37.1 BGY On-Highway Diesel

Environment Benefits

Reformulated gasoline vs. ethanol (E85)

- 18% to 72% less GHG
- 32% to 81% less carbon dioxide (CO2)
- Up to 58% less methane (CH4)

National Benefit

The Biofuels Initiative, together with the fuels use reduction and future hydrogen fuels production projected from the Vehicles and Hydrogen programs within EERE, provides a strong energy security portfolio

Strong Support

- Bipartisan Support
- Legislation set up high level Interagency collaboration
- Incentives at State and Federal level
- Strong Industry Support and Interest

Rural Economy

In 2004, the ethanol industry:

- Supported the creation of more than 147,000 jobs
- Boosted U.S. household income by $4.4 billion
- Added $1.3 billion and $1.2 billion of tax revenue for Federal and State/Local governments, respectively

Infrastructure

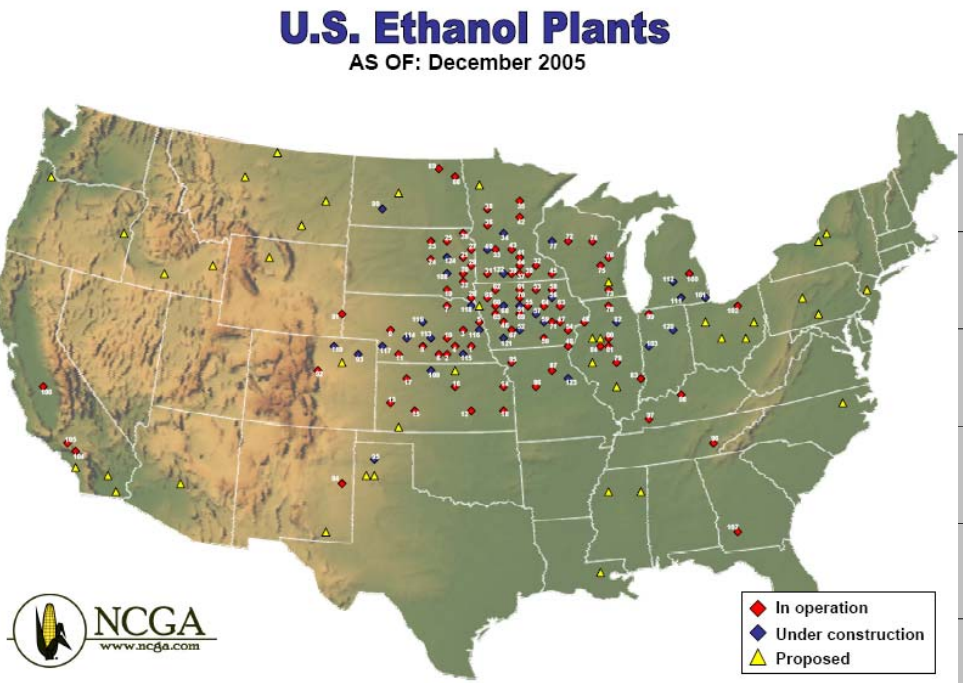
FFV's on the road today and available at dealers

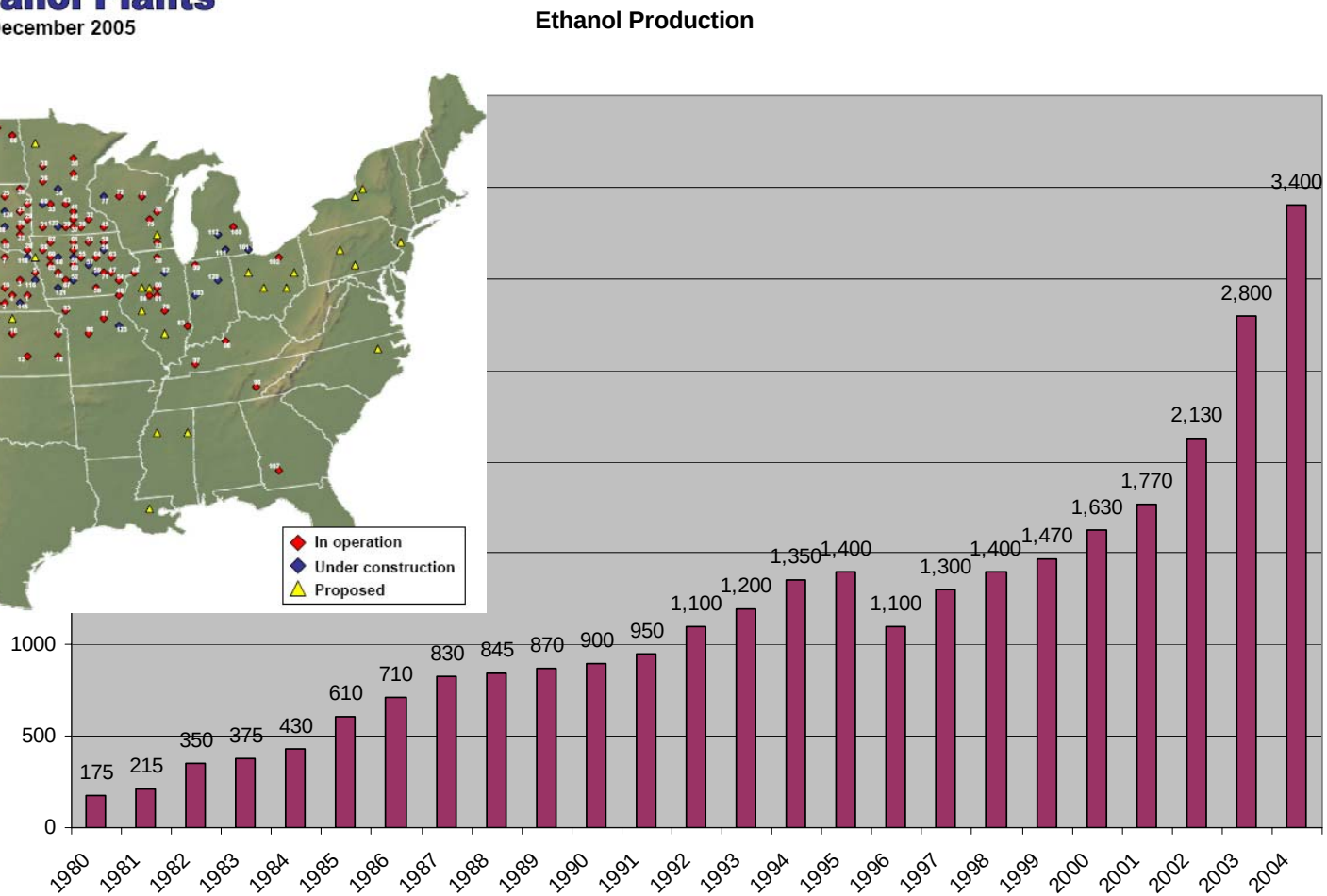
Presently used by blenders and sold in stations

Biofuels: Best Choice Today

- Biomass is the only renewable fuel available that can displace liquid transportation fuels.
- Ethanol and Biodiesel production and markets exist now.
- The use of biomass to produce hydrogen or hydrogen carriers provides long-term value to a diverse future energy supply.
- Collectively, the production of biofuels, improvements in vehicle technologies, and the future hydrogen economy form a strong energy security portfolio.

Ethanol Production From Starch





http://www.ethanolrfa.org/industry/statistics/#A

Existing Fuels Market

Current Transportation Fuels Demand

- 2004 gasoline consumption: 139.6 B gal per year
- 2004 On-Highway Diesel consumption: 37.1 B gal per year

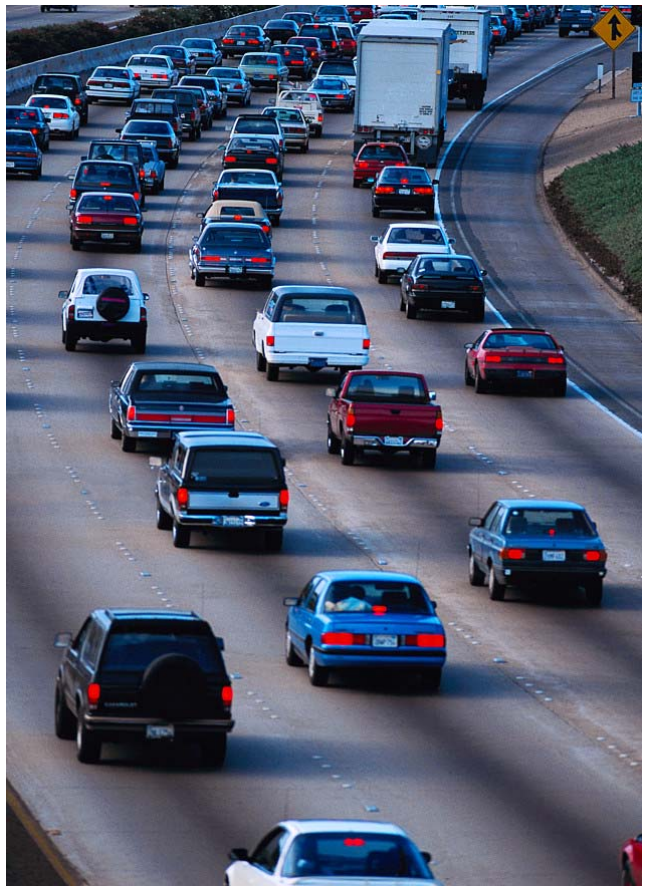
Key Drivers Behind Future Biofuel Demand

- 2005 EPAct mandates the use of 7.5 B gal of renewable fuels per year in U.S. gasoline by 2012
- State MTBE Bans
  - 17 currently in effect, 1 begins in 2007, 2 pending Federal action this accounts for approximately 45 percent of the Nation's MTBE Consumption
  - 2002 MTBE demand was 3.2 B gal per year
  - Flexible fuel vehicles (FFVs)
    - Approximately 4.5 million FFVs are on the road that are capable of consuming more than 3.5 B gal per year of ethanol[1]

[1] Assumes use of E85 as the primary fuel.

National and Economic Security Benefits

- Biofuels could meet up to 30 percent of our present fuel needs
- Biofuels produced from domestic resources will reduce our dependence on foreign sources of energy
- Energy supply diversity makes us less vulnerable to geopolitical uncertainties, price volatilities, and supply disruptions



Environmental Benefits

Reduction in greenhouse gas (GHG) and criteria pollutant emissions

Compared to reformulated gasoline, ethanol (E85) generates approximately[1,2,3]:

- 15% to 68% less GHG
  - 30% to 77% less carbon dioxide (CO_2)
  - Up to 58% less methane (CH_4)

- Compared to fossil diesel, biodiesel (B100) generates[4]:
  - 67% less unburned hydrocarbons (HC)
  - 48% less carbon monoxide (CO)
  - 47% less particulate matter (PM)
  - ~10% more nitrogen oxides (NO_x)

[1] Low end of the range represents corn ethanol; high end represents cellulosic ethanol.

[2] These are well-to-wheel numbers.

[3] Cellulosic ethanol emissions include credits from the sale of electricity generated from biomass residues.

[4] These are tank-to-wheel numbers.

Rural Development

- **In 2004, the ethanol industry[1]:**
  - Supported creation of more than 147,000 jobs in all economic sectors
  - Boosted U.S. household income by $4.4 billion through increased economic activity and new jobs
  - Added $1.3 billion and $1.2 billion of tax revenue for federal and state/local governments, respectively
- **A 40 million gallon per year dry mill ethanol plant can[1]:**
  - Expand the local economic base by $110 million annually
  - Create approximately 41 new jobs at the plant
  - Add nearly $20 million to annual household income in the surrounding community
  - Contribute approximately $1.2 million annually to state and local tax revenue
- According to the USDA, ethanol production increases the price a farmer receives for corn by 25-50 cents per bushel

[1] Estimated by applying RIMS II multipliers (U.S. Department of Commerce, Bureau of Economic Analysis) to plant expenditures.

Strong Guidance

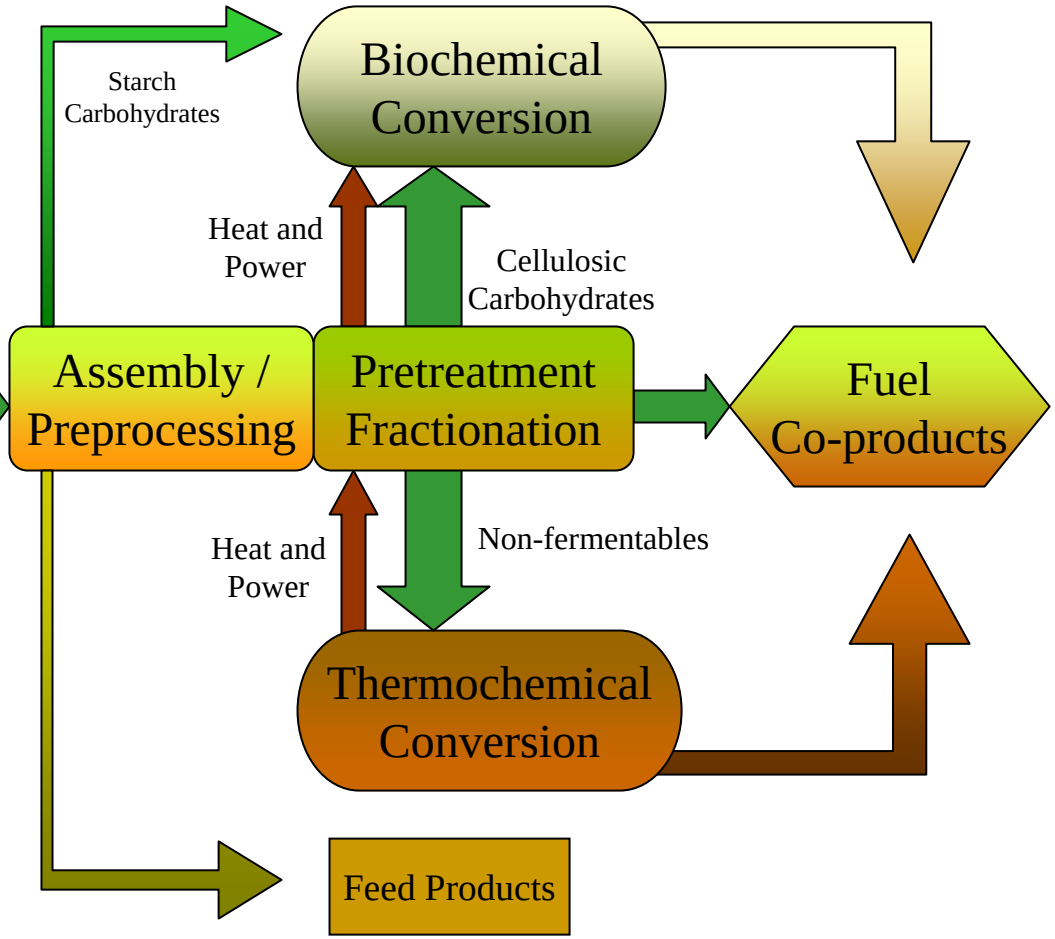
- The Secretary's Biomass Initiative looks to make a real difference in his lifetime.
- The Energy Policy Act of 2005 provides direction on program content as well as loan guarantee authorization for commercial scale demonstrations.
- The President's National Energy Policy includes multiple recommendations that support bioenergy.
- The Biomass R&D Act of 2000 directs DOE and USDA to enhance and coordinate biomass R&D efforts.
- The only Renewable Energy Source available now to help EERE Realize two of it's Portfolio Priorities (oil dependency reduction and the establishment of a sustainable domestic biomass industry)
- The Energy Title (Title IX) of the Farm Bill provides support for increased use of biomass energy and products and for R&D.
- Federal Advisory Committee & Federal R&D Board

How Do We Get There?

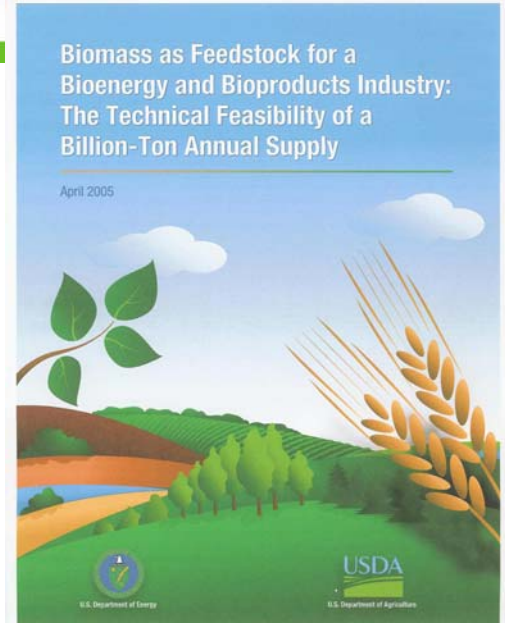
- Provide the fundamental R&D and capability needed for future developments
- Use public policy directives and incentives to drive development and markets
- Implement strategy during 2007 – 2012
  - Help industry build the first unit
  - Cost share industrial-scale validation of multiple pathways to the integrated biorefinery
  - Expand feedstock development efforts

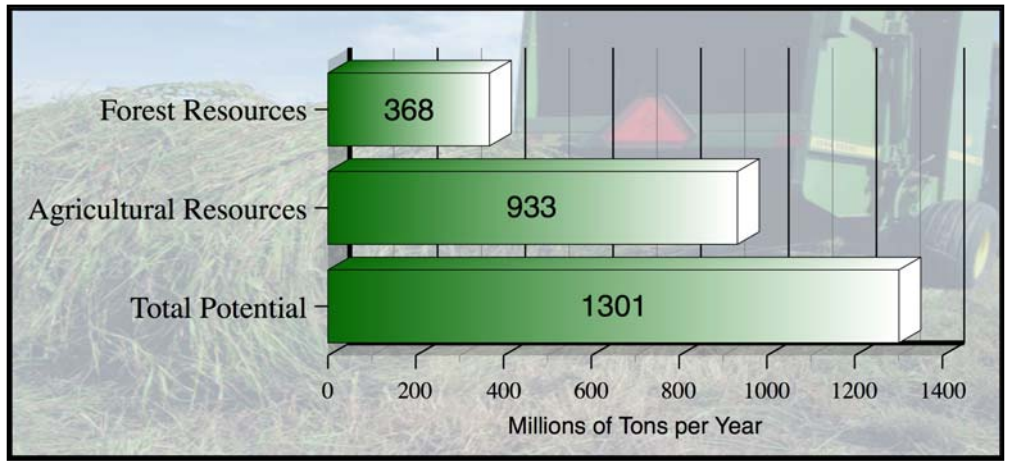
Whole Crop Integrated Biorefinery

The Hub of the Integrated Biorefinery is Feedstock Assembly/Preprocessing, and Pretreatment



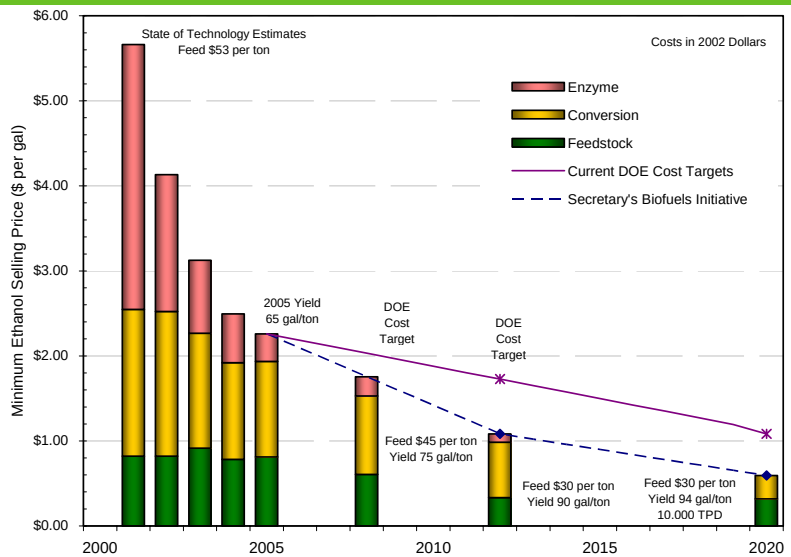
Conversion of Available Feedstocks





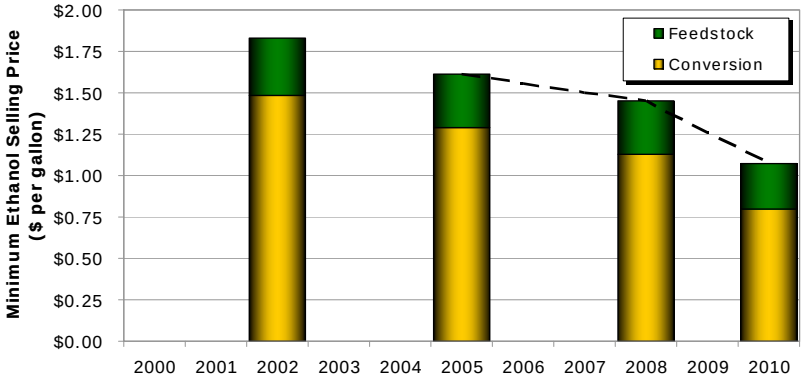
- "Billion Ton" study indicates that enough biomass is potentially available to displace > 30% of current U.S. petroleum consumption
- But it requires variety of biomass types
  - Agricultural lands
    - Corn stover, wheat straw, soybean residue, manure, switchgrass, poplar/willow energy crops, etc.
  - Forest lands
    - Forest thinnings, fuelwoods, logging residues, wood processing and paper mill residues, urban wood wastes, etc.

Fermentation Technology Platform



	2001 Early Enzyme-Subcontract	2005 Post Enzyme-Subcontract	2010	2012 Market Target
Minimum Ethanol Selling Price	$5.66	$2.26		$1.07
Installed Capital per Annual Gallon		$3.04		1.85
Yield (Gallon/dry ton)		65		90
Feedstock				
Feedstock Cost ($/dry ton)	$53	$53		*$30/35
Pretreatment				
Solids Loading (wt%)	19%	30%	30%	30%
Xylan to Xylose	68%	63%	81%	90%
Xylan to Degradation Products	16%	13%	8%	5%
Conditioning				
Xylose Sugar Loss	13%	13%	4%	0%
Glucose Sugar Loss	12%	12%	4%	0%
Enzymes				
**Enzyme Contribution ($/gal EtOH)	$3.11	$0.32	$0.16	$0.10
Saccharification & Fermentation				
Total Solids Loading (wt%)	13%	20%	20%	20%
Combined Saccharification & Fermentation Time (d)	10	7	5	3
Overall Cellulose to Ethanol	86%	86%	86%	86%
Xylose to Ethanol	76%	76%	80%	85%
Minor Sugars to Ethanol	0%	0%	80%	85%
*$35 per dry ton loose feedstock is equivalent to $30 per dry ton baled feedstock				
**Model value, slightly lower than metric value				

Gasification Technology Platform



	2002	2005	2008	2010 (FY06 Budget Target)
Process Description	Tar Removal & Disposal	Sequential Tar & Light Hydrocarbon Reforming	Sequential Tar & Light Hydrocarbon Reforming — Increased Hydrocarbon Conversion	Consolidated Tar & Light Hydrocarbon Reforming
Minimum Ethanol Selling Price ($/gal ethanol)	$1.83	$1.61	$1.45	$1.07
Higher Alcohol Co-Product Value (% market value)	85%	85%	85%	85%
Installed capital cost ($/annual gal MA)	$3.01	$2.71	$2.69	$2.36
Operating cost ($/annual gal MA)	$0.87	$0.81	$0.75	$0.50
Ethanol Yield (gal/dry ton)	55	56	56	55
Mixed Alcohol Yield (gal/dry ton)	75	77	77	76
Feedstock				
Feedstock Type	Woods Chips	Woods Chips	Biorefinery residues	Biorefinery residues
Feedstock cost ($/dry ton)	$30	$30	$30	$30
Thermochemical conversion				
Process type	Low Pressure Indirect Gasification	Low Pressure Indirect Gasification	Low Pressure Indirect Gasification	Low Pressure Indirect Gasification
Syngas yield (lb/lb dry feed)	0.78	0.78	0.78	0.78
Benzene & Tar yield (lb/lb dry feed)	0.014	0.014	0.014	0.014
Raw syngas methane (mol% - dry basis)	15.36	15.36	15.36	15.36
Cleanup and Conditioning				
Methane out of tar reformer (mol% - dry basis)	N/A	8.25	4.6	1.73
Tar reformer performance:				
Light HC reforming - % CH4 conversion	N/A	20%	50%	80%
Heavy HC reforming - % benzene	N/A	70%	90%	99%
Heavy HC reforming - %tar conversion	N/A	95%	97%	99.9%
Light HC reforming - % CH4 conversion	79%	79%	79%	NA
Sulfur removal	1 ppmv (SMR)	1 ppmv (SMR)	1 ppmv (SMR)	50 ppmv (MA)
H2/CO ratio for fuel synthesis	1.2	1.2	1.2	1.2
CO2 recycle (lb/lb dry feed)	1.99	1.72	1.69	0.51
Compression for fuel synthesis (psia)	2,000	2,000	2,000	2,000
Catalytic Fuel Synthesis				
Single pass CO conversion	38.5	38.5	38.5	38.5
Overall CO conversion	96.9	96.9	96.9	96.9
CO selectivity to alcohols	80	80	80	80

Pathways to Success

Fundamental R&D → **Development and Demonstration** → **Deployment**

- Feedstock R&D
- Biochemical R&D
- Thermochemical R&D
- Products R&D
- Balance of Plant

Today:
- Existing Wet & Dry Mill Improvements
- Oil Seed Mill Improvements

Accelerated 3 to 10 Years:
- Agricultural Residue Processing
- Pulp and Paper Mill Improvements
- Forest Residue Processing
- Perennial Energy Crops Processing

Integrated Biorefineries

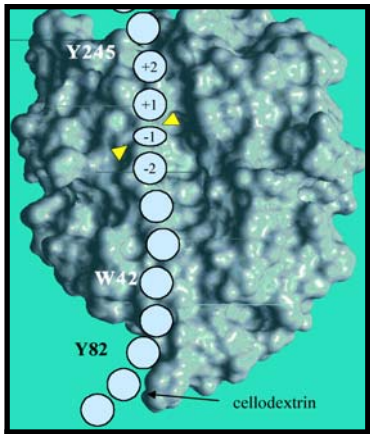
Increasing Industry Participation

Enzymatic Hydrolysis Research

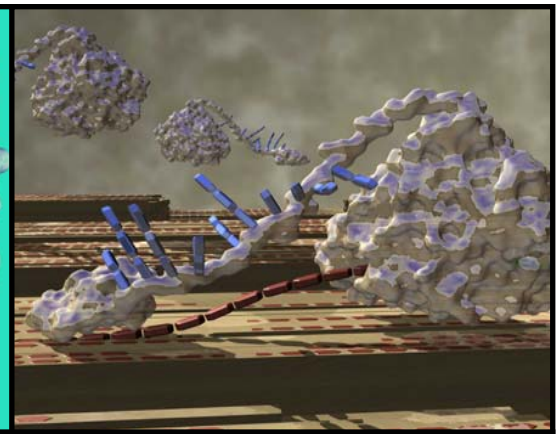
- NREL worked with *Genencor* and *Novozymes* for 4 years
  - Focusing on enzyme biochemistry, cost, and specific activity
  - Investigating the interaction of biomass pre-treatment and enzymatic hydrolysis
- Result:
  - G.T. 30-fold reduction in cost contributions of enzymes ($/gal Ethanol)

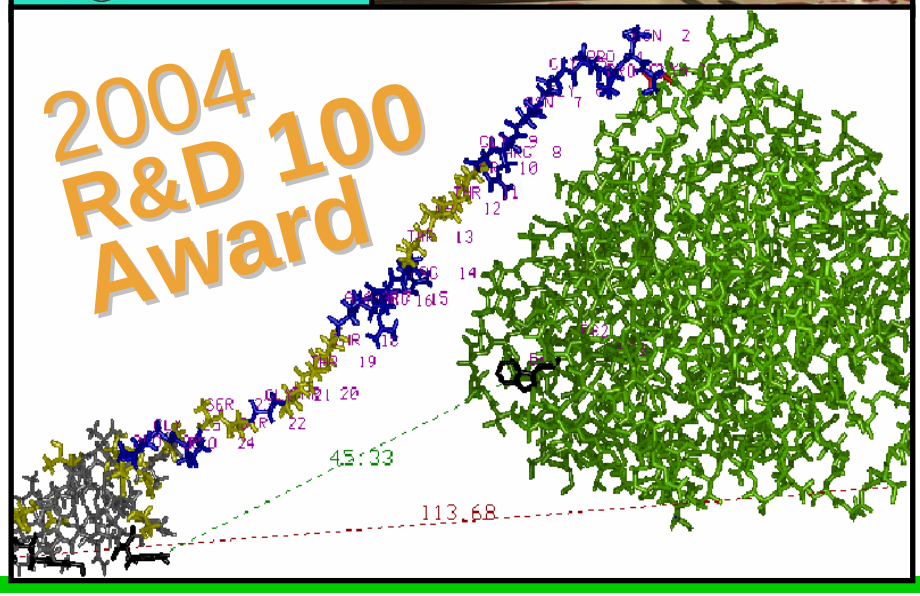
$40 million R&D effort cost-shared by the Office of the Biomass Program and the enzyme manufacturers

E1 from *A. cellulotiticus*

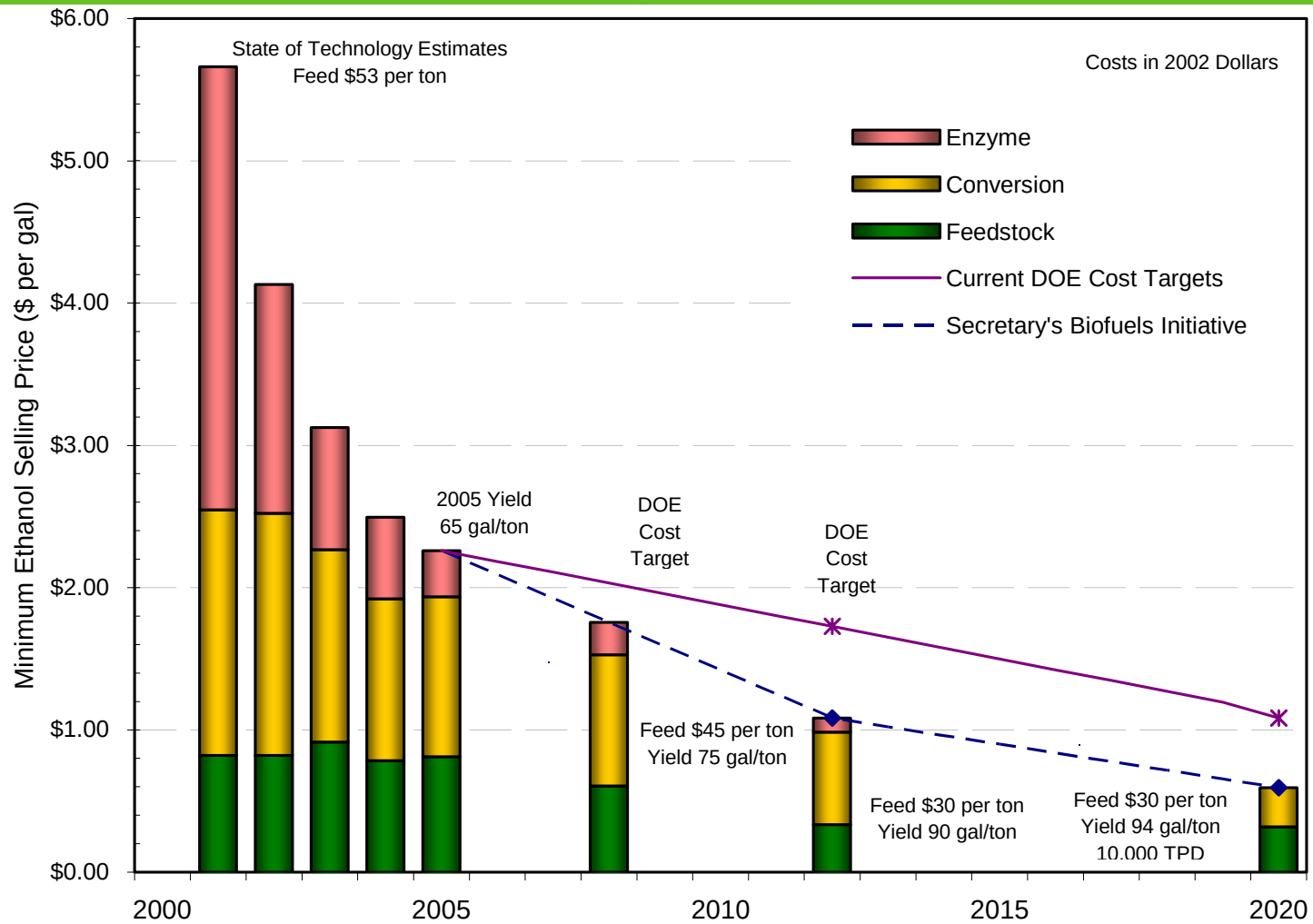


CBH1 from *T. reesei*

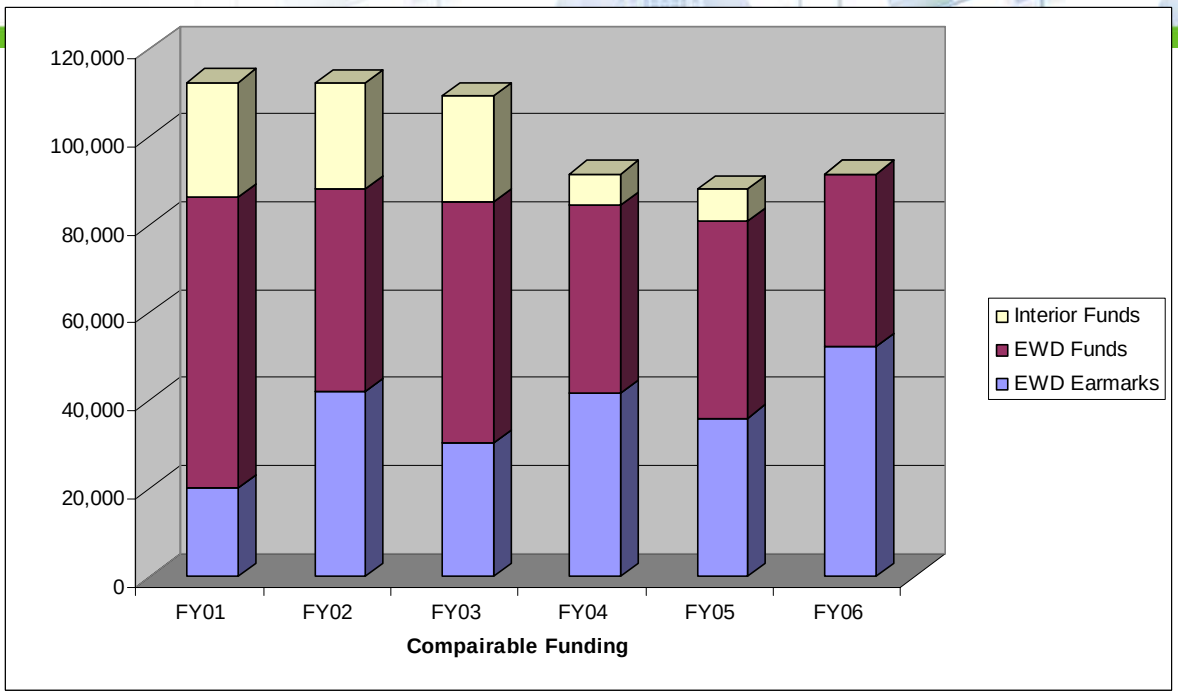


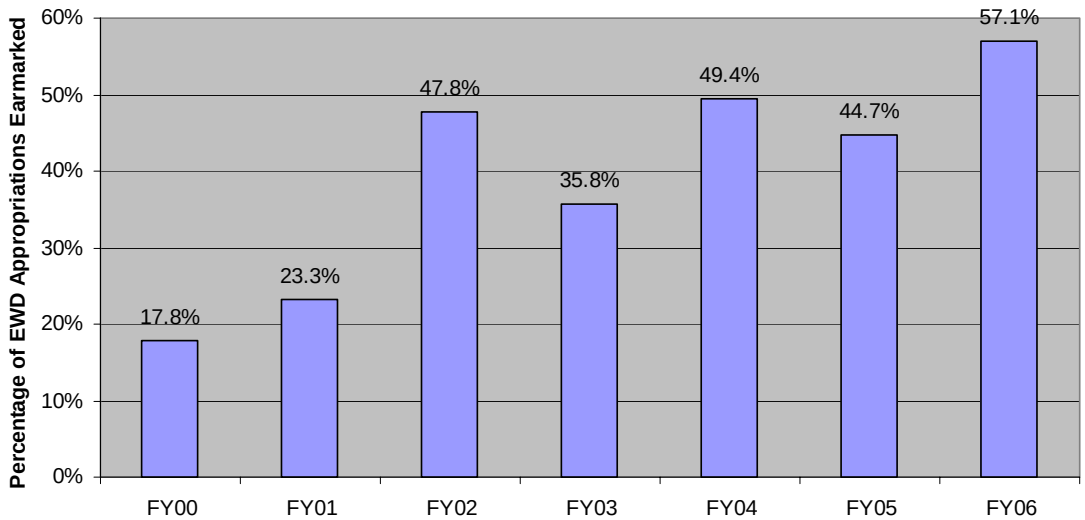


Cost Target Acceleration



Funding & Earmark History





Biofuels Summary & Conclusions

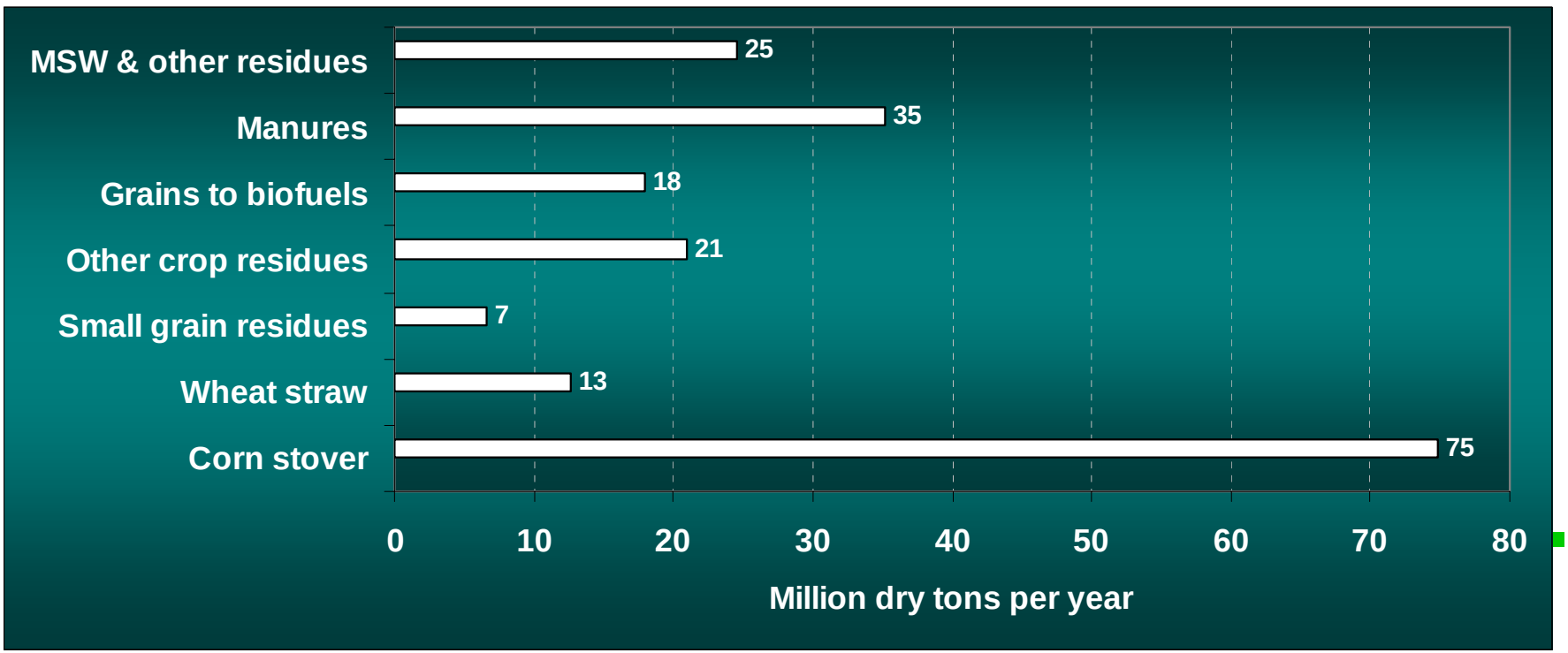
- ✓ The only domestic & renewable option for liquid transportation fuels.
- ✓ Resource base sufficient to supply a large fraction of U.S. needs
- ✓ The “net” energy balance is very good.
- ✓ A sustainable solution to meet the near-term “gap” caused by Peak Oil
- ✓ Science & Technology will create many other opportunities that extend beyond today’s ethanol & biodiesel

- Supporting Information

Agricultural Resource Scenarios

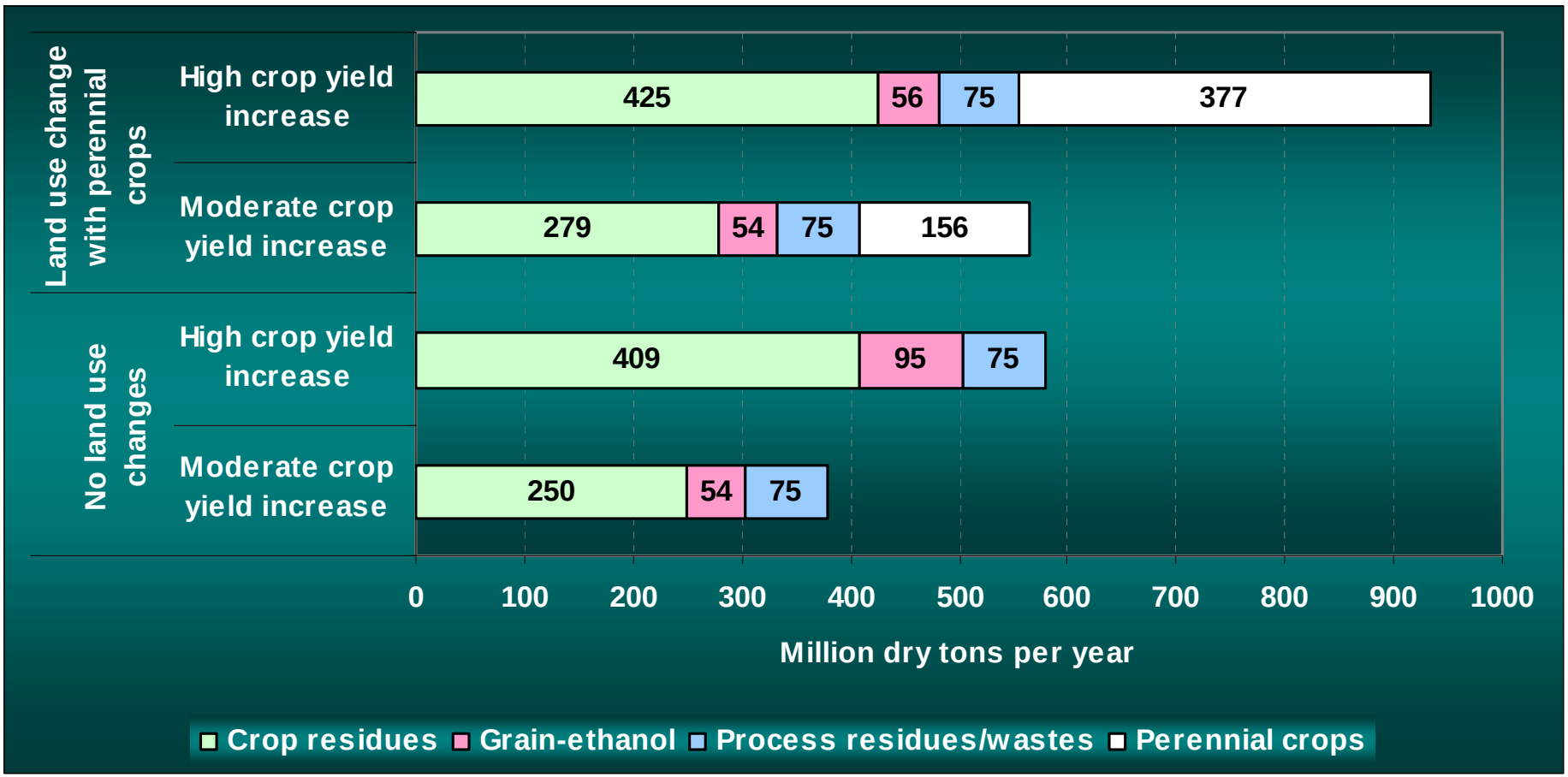
Current availability of biomass from agricultural lands is based on data and analysis

- Total current availability of biomass is ~ 193 million dry tons/year
- Slightly more than one-fifth is currently used
- Corn stover is largest source of agriculture-derived biomass



Agricultural Resource Summary

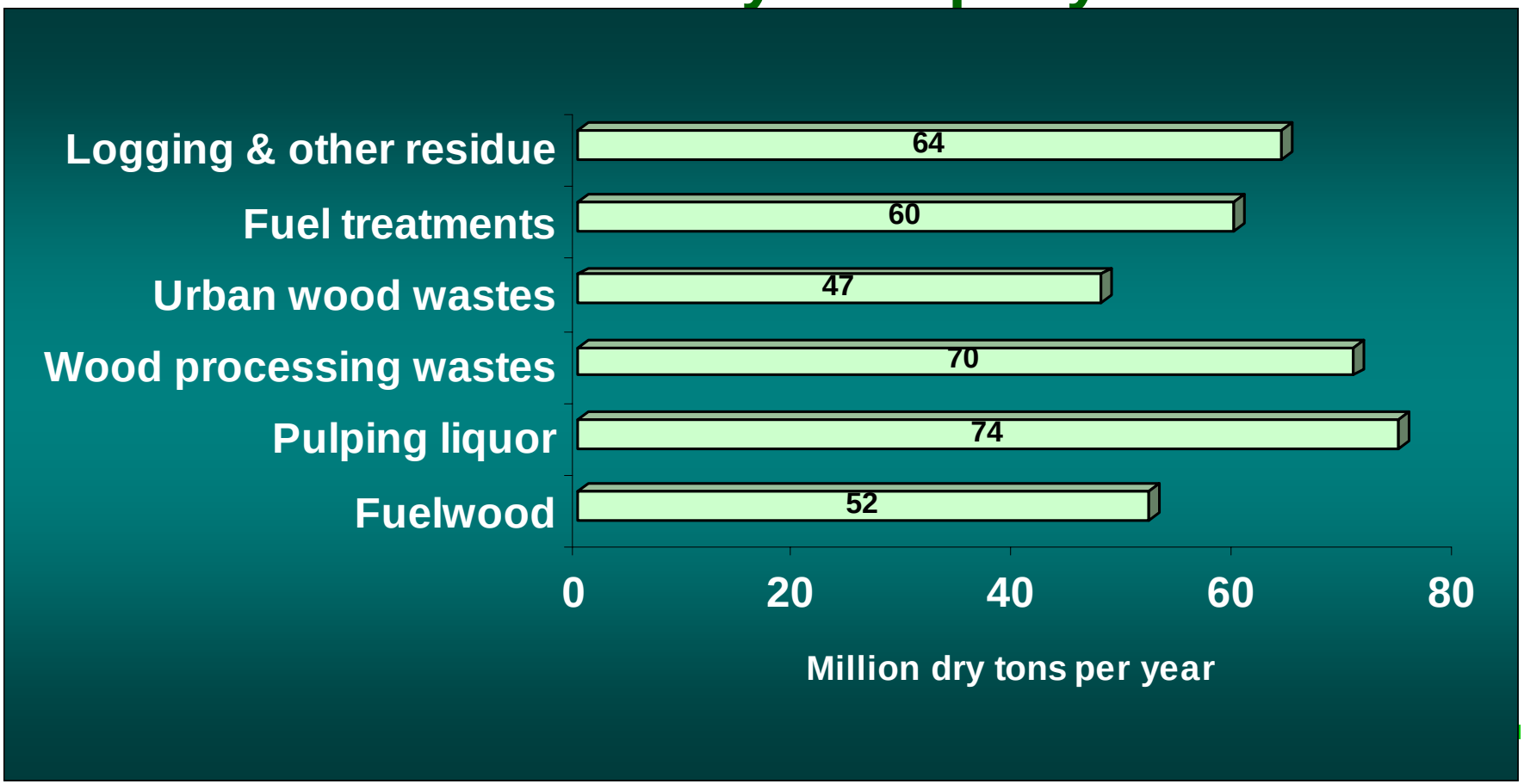
Sustainable agricultural resource potential exceeds 930 million dry tons



Forest Resource Summary

The sustainable forest resource potential

~ 370 million dry tons per year



Attachment B

The Biomass R&D Technical Advisory Committee

New Member Orientation

March 2, 2006

Neil Rossmeissl
Department of Energy

Committee Origins

- The Committee was established by the Biomass Research and Development Act of 2000 (Biomass Act). This has since been amended by the Energy Policy Act of 2005 (EPAct). The revised Biomass Act outlines the Committee's objectives, membership requirements, and duties.

- The Biomass Act also established the Interagency Biomass R&D Board and the Biomass R&D Initiative.

USDA and DOE Leadership

- Under Secretary for Rural Development Thomas Dorr is the Committee point of contact for the U.S. Department of Agriculture

- Acting Assistant Secretary Douglas Faulkner is the Committee point of contact for the Department of Energy

Committee Membership Basics

- **Committee members are selected by the points of contact to fill the membership requirements of section 306(b) of the Biomass Act.**
- **Committee members are appointed by the points of contact for three-year terms. The points of contact prefer to appoint with a two-term limit.**
- **Nominees selected for their expertise undergo conflict of interest screening before being sworn in as “special Government employees” (sGe’s). All sGe’s are contacted regarding these requirements prior to their formal nomination.**

Committee Membership Basics

- **The General Services Administration (GSA) Federal Advisory Committee Act (FACA) Final Rule provides ethical guidelines for FACA managers and members. Part 102-3 is the most relevant to this Committee.**

- **Committee management must follow DOE Executive Secretariat guidelines as well.**

- **The Designated Federal Officer for the Committee is responsible for Committee adherence to both sets of guidelines, and can obtain decisions on legal questions should they arise.**

Interagency Biomass R&D Board (Board)

- **The Board is a panel consisting of senior-level representatives from these agencies:**
  - U.S. Department of Agriculture
  - Department of Energy
  - National Science Foundation
  - Environmental Protection Agency
  - Department of Interior
  - Office of Science and Technology Policy
  - Office of the Federal Environmental Executive
  - Department of Transportation (new)

Duties of the Board

- To coordinate R&D efforts among Agencies
- To ensure the USDA-DOE solicitation for biomass R&D is
  - Open
  - Competitive
  - Offered Annually
- To ensure the solicitation provides clear, minimally prescriptive, objectives and evaluation criteria
- To ensure that proposals received for each solicitation are independently reviewed

Duties of the Committee

- To advise the Secretaries of Energy and Agriculture through the points of contact with respect to the R&D Initiative.
- To evaluate whether, and make recommendations in writing to the Board to ensure that -

(A) funds authorized for the Initiative are distributed and used in a manner that is consistent with the objectives, purposes, and considerations of the Initiative;

(B) solicitations are open and competitive with awards made annually and that objectives and evaluation criteria of the solicitations are clearly stated and minimally prescriptive, with no areas of special interest;

(C) the points of contact are funding proposals under this title that are selected on the basis of merit, as determined by an independent panel of scientific and technical peers predominantly from outside the Department of Agriculture and Energy; and

(D) activities under this title are carried out in accordance with this title.

Annual Recommendations

- The Act requires the Secretaries of Energy and Agriculture to submit an annual report on the Biomass Initiative to Congress. This report “takes into account any recommendations that are made by the Committee”. Past annual reports can be viewed on the Initiative website: **www.bioproducts-bioenergy.gov**

Committee Timeline

2000	• Committee formed.
2001	• First recommendations provided to the Secretaries on the potential of biomass research and development in the United States
2002	• *Vision for Bioproducts and Bioenergy in the U.S.* document released. The *Vision* set market and energy goals for 2020.
2003	• *Roadmap for Biomass Technologies in the U.S*. released. The *Roadmap* outlines policy measures and research strategies for achievement of the Vision goals. • The Committee reviewed the joint solicitation process, and current USDA and DOE biomass R&D portfolios
2004	• Point of contact Assistant Secretary David Garman and Committee Chair and former Congressman Tom Ewing provided testimony to Congress regarding Committee activities and biomass research developments. • The Committee formulated a statement on Hydrogen power.

Committee Timeline

2005

- Energy Policy Act of 2005 signed into law.
- The Committee formulated a statement on the Net Energy Balance of Ethanol.
- The Committee began updates to its *Vision* and *Roadmap* documents to provide them some context in the current policy and research environment.

2006

- Subcommittees for the *Vision* and *Roadmap,* Policy, and Analysis will provide focus and direct the Committee's advisory message to public awareness.
- $14 million in awards will be distributed via the DOE-USDA joint solicitation.

New Committee Members

Process

- Member terms expire November each year.
- Renewal is not automatic
- Process takes 4 months to complete

Renewed Members

- **Thomas Ewing**, Of Counsel, Davis & Harman LLP – **Committee Chairman**
- **John Hickman**, Principal Scientist – John Deere Technology Center

New Committee Members

New Members

Jim Barber, CEO – Metabolix, Inc.
Arthur Blazer, Division Director – New Mexico State Forestry
Bob Dinneen, President – Renewable Fuels Association
Douglas Hawkins, Program Director, Green Chemistry – Rohm & Haas Company
Charles Kinoshita, Interim Associate Dean, Academic and Student Affairs – University of Hawaii
Eric Larson, Research Engineer – Princeton University
Jim Martin, Senior Associate – OmniTech International, Ltd.
Scott Mason, Director, Business Development – Conoco-Phillips
Larry Pearce, Assistant Director, Planning and Research, Nebraska Energy Commission – Governors' Ethanol Coalition
Edwin White, Dean of Research, College of Environmental Science and Forestry – State University of New York

Biomass Research and Development Initiative:

Harriet Foster 202-586-4541
harriet.foster@ee.doe.gov

– Questions?

Attachment C

Committed to the future of rural communities.

Biomass R&D Technical Advisory Committee Meeting

Golden, Colorado

March 2, 2006

William F. Hagy III

Deputy Administrator, Business Programs

USDA Rural Development

USDA

Rural Development

Committed to the future of rural communities.

Biomass Initiative Update

- *Section 9008 Delegation*
- *Section 9006*
- *Secretary's Energy Council*

Secretary's 9008 Delegation

- *Secretary's Memorandum 1030-061*
- *Funding History:*
  - *FY 2002 $5 Million*
  - *FY 2003 $16.0 Million*
  - *FY 2004 $13.2 Million*
  - *Status of FY 2005 Awards - $12.6 Million*

USDA

Rural Development

Committed to the future of rural communities.

Secretary's 9008 Delegation Con't

- *FY 2006 Funding Outlook:*
  - *$12 Million Appropriation*
  - *1.4 Million Carryover*
  - *Measuring Benefits of Awards*
  - *FY 2007 President's Budget*

Committed to the future of rural communities.

Farm Bill – Energy Title

Section 9006 – Renewable Energy Systems and Energy Efficiency Improvements Program

- *Establishes a grant, loan, and loan guarantee program to assist eligible farmers, ranchers, and rural small businesses in purchasing renewable energy systems and for making energy efficiency improvements.*

USDA

Rural Development

Committed to the future of rural communities.

Section 9006 – FY 2006 Funding:

- *$11.385 Million of Grant Funding*
- *$176.5 Million of Guaranteed Loan Funding*
- *Notice of Funding Availability (NOFA) Published on 2/13/06*
- *Grant Application Window Closes 5/12/06*
- *Guaranteed Loan Applications Processed as received*

Section 9006 Funding Activity FY 03 thru 05
Renewable Energy

	No.	Amount	Leveraged Funds
Biomass	119	$29,747,021	$197,116,700
Wind	121	27,809,516	446,418,325
Solar	17	1,442,243	3,559,375
Geothermal	4	380,283	1,140,872
Hybrid	9	2,439,832	185,455,600
Totals	270	$61,828,895	$833,690,872

Energy Efficiency Improvements: 165 - $4,927,655

Guaranteed Loans (Biomass): 2 - $10,100,000

Leveraged Funds $13,134,000

USDA'S Energy Council

- *Purpose: Coordinate Department Collaboration and Leveraging of Resources for Renewable Energy/Energy Efficiency Development.*

- *Under Secretary Tom Dorr – Chair*

- *Co-Vice Chairs:*
  - *Keith Collins – Chief Economist*
  - *Mark Rey – Under Secretary for National Resources and Environment*

USDA

Rural Development

Committed to the future of rural communities.

Questions

Committed to the future
of rural communities.

THE END

Attachment D

The Biomass R&D Technical Advisory Committee

Update on Action Items

March 2, 2006

Neil Rossmeissl

Membership

- Department of Energy
  - Revised Charter was signed February 17
  - 5 Nominees were forwarded to POC for consideration
  - Nomination package was drafted
- Department of Agriculture
  - Responsibility of Committee transferred to Rural Dev.
  - USDA Nominees were reviewed
  - 5 Nominees were forwarded to Secretary for review
  - 1 Candidate has been nominated for Co-Chair

Annual Report

- Report is now due to Congress in December.
- Draft report has been circulated to Committee members, DOE and USDA POC's, General Council, Chief Financial Officer and Policy for review and concurrence.
- Secretaries of Energy and Agriculture will provide final comments later this year.

Joint Solicitation

- 85 Pre-applications in 4 topic areas
  - 60 Feedstock Production
  - 54 Recalcitrance
  - 135 Product Diversification
  - 36 Analysis
- Review meeting February 7-10
- 27 Reviewers, only 1 reviewer was Federal

Joint Solicitation

- 18% of Pre-applicants will be requested to send in full proposals
- Number of Pre-proposals asked to submit will not match Epact.
  - Based on number of applicants, precentage would result in proposals being included outside of competitive range.
  - Funding in Epact is based on FY07 start
- Pre-proposal breakdown (EPACT)
  - 20% Feedstock Production (20%)
  - 25% Recalcitrance (45%)
  - 39% Production Diversification (30%)
  - 16% Analysis (5%)

Subcommittees

- Subcommittees have been populated with new and existing members.
- Committee should vote and agree on purpose and goals.
- Role has a greater significance due to President’s initiative.

Review MYPP

- MYPP will be revised due to the “Initiative.”
- Committee will be asked to provide feedback.
- A summary of the new MYPP will be provided electronically as soon as possible.

Attachment E

Biomass Vision and Roadmap Update

Current status of process

What was the Vision Statement

- *- The Vision for Bioenergy and Biobased Products in the United States was created in 2002*
- *It established far-reaching goals to increase the role of biobased energy and products in our nation's economy.*
- *It represented the collective vision of the Biomass Research and Development Technical Advisory Committee established by the Biomass R&D Act of 2000.*

Vision Update

- Purpose: To revisit and update the 2002 Vision
  - Track progress towards goals
  - Update language
  - Incorporate new federal/state activities
  - Required by EPAct 2005

Vision Timeline

- Workshop: 11/05
  - 22 experts from industry, government, academia
  - Held at Argonne National Lab
  - Round table discussion to update goals & major challenges
- Peer Review: 1/06
  - 25 experts – 19 responses
  - Electronic submission of comments/edits
- Board Review: 4/06
  - EPA, DOE, USDA, NSI, DOI, DOT, OSTP, OFEE
- Final Vision: 6/06

Vision Workshop Experts

- Tom Binder, ADM
- David Canavera, MeadWestvaco
- Ralph Cavalieri, WSU
- Shulin Chen, Washington State University
- Roger Conway, USDA - OCE – OE
- Mark Downing, Oak Ridge National Laboratory
- Larry Drumm, Biotechnology Group
- Vernon R. Eidman, University of Minnesota - St. Paul
- Tom Johnson, Southern Company
- Douglas Kaempf, Program Manager, Office of the Biomass Program – DOE
- Melissa Klembara, Office of the Biomass Program – DOE
- Lori Perine, AF&PA
- Edan Prabhu, Flex Energy
- Cindy Riley, National Renewable Energy Laboratory
- Neil Rossmeissl, Office of the Biomass Program – DOE
- Phil Shane, Illinois Corn
- Hossein Shapouri, USDA - OCE – OE
- Bryce Stokes, USDA – Forest Service
- Larry Walker, Cornell University
- Michael Wang, ANL
- Gary Welch, Aventine Renewable Energy, Inc.
- Todd Werpy, Pacific Northwest National Laboratory

Vision Peer Reviewers

- Ron Buckhalt, ARS
- Ralph Cavalieri, Washington State University
- Rob Fireovid, ARS
- Emory Ford, MTI Technology Corporation
- Michael Foster, BP
- John Hanby, Washington Pulp and Paper Foundation
- John Hickman, John Deere
- Melissa Klembara, Office of the Biomass Program – DOE
- Al Lucier, National Council for Air and Stream Improvement, Inc (NCASI)
- Jim Martin, Omni Tech International
- Scott Mason, Phillips Petroleum Company
- Bill McKean, University of Washington
- Bill Nicholson, Potlatch Corporation (retired)
- Lori Perine, AF&PA
- Edan Prahbu, Flex Energy
- Housein Shapouri, USDA OCE
- Jim Simnick, BP
- Bryce Stokes, USDA FS
- Larry Walker, Cornell University
- OBPA
- NRCS

Interagency Biomass R&D Board

- Thomas C. Dorr, Under Secretary for Rural Development, USDA
- Douglas L. Faulkner, Acting Assistant Secretary, Energy Efficiency and Renewable Energy, DOE
- Bruce Hamilton, Director, Bioengineering and Environmental Systems Division, NSF
  In transition, EPA
- Johnnie Burton, Assistant Secretary, Land and Minerals Management, DOI
- Dr. Sharon Hays, Chief of Staff, OSTP
  Dana Arnold, Chief of Staff, OFEE

Vision workshop process

- Information provided prior to meeting
  - Status of Vision goals
  - State level incentives and mandates
  - Direction of R&D activities
- Workshop Discussion Points
  - Verified goal categories – fuels, power & products
  - Updated target years – added 2015 and 2050
  - Updated quantitative goals – minor changes from existing goals
  - Discussed whether targets will be met. Why or why not?
  - Discussed what needs to occur to reach these goals

Post workshop agenda

- Obtained Technical Advisory Committee input on Vision Executive Summary.
- Follow-up analysis and peer review carried out to ensure targets were valid in relation to available feedstocks, conversion technologies, etc.
- Developed draft Vision by December 31, 2005.
- Final Vision will be submitted by April 2006.

- The updated *Vision* does not change the original 2010 goals but recognizes that in some cases the U.S. is not on track to meet them.
- The *Vision* makes minor changes to its 2020 and 2030 goals and establishes 2015 goals which describe the types of activities that must occur to reach that goal and move down the path to the aggressive targets for 2020 and 2030.
- Finally, the updated *Vision* sets a long-term target for 2050 and the role that biomass can play in energy and product markets at that time.

- Transportation fuels produced from biomass include but are not limited to, ethanol (E-100, -85, -20), biodiesel (B-100, -20,-5), butanol, and any derivative.
- The Energy Policy Act of 2005 mandates a target of 7.5 billion gallons by 2012 or a doubling of our current ethanol for fuels use. If current trends are an indication of future demand for biofuels, there is a chance that the original 2010 target can be met.

- Biomass consumed to produce heat and electric power produced in industry and utilities. This includes biomass used in co-firing, waste-to-energy, and gasification of biomass. It does not include residential and commercial sector use of wood energy.
- The U.S. is not currently on track to meet original *Vision* goals. In order to meet biopower goals, strong incentives and policies need to put into place. A good example in which state and local governments are leading the way is through renewable portfolio standards.

- The original *Vision* defined biobased products as biobased textile fibers, polymers, adhesives, lubricants, soy-based inks, and other products at an estimated 12.4 billion pounds per year.
- The *Vision* update defines biobased products as any product generated from biomass that would otherwise by produced using petroleum feedstocks.
- Lack of data on biobased products makes it difficult to measure progress in achieving *Vision* goals and further research is needed to benchmark and track the role of biobased products in the U.S. economy. Opportunities for biobased products will no doubt increase with new legislation such as that guiding the Federal Biobased Products Preferred Purchasing Program (FB4P).

Original Vision Goals

	2001	2010	2020	2030
BioPower Biomass share of electricity & heat demand in utilities and industry	**3%** **(2.7 quads)**	**4%** **(3.3 quads)**	**5%** **(4.0 quads)**	**5%** **(5.0 quads)**
BioFuels Biomass share of demand for transportation fuels.	**0.5%** **(0.15 quads)**	**4%** **(1.3 quads)**	**10%** **(4.0 quads)**	**20%** **(9.5 quads)**
BioProducts Share of target chemicals that are biobased.	**5%**	**12%**	**18%**	**25%**

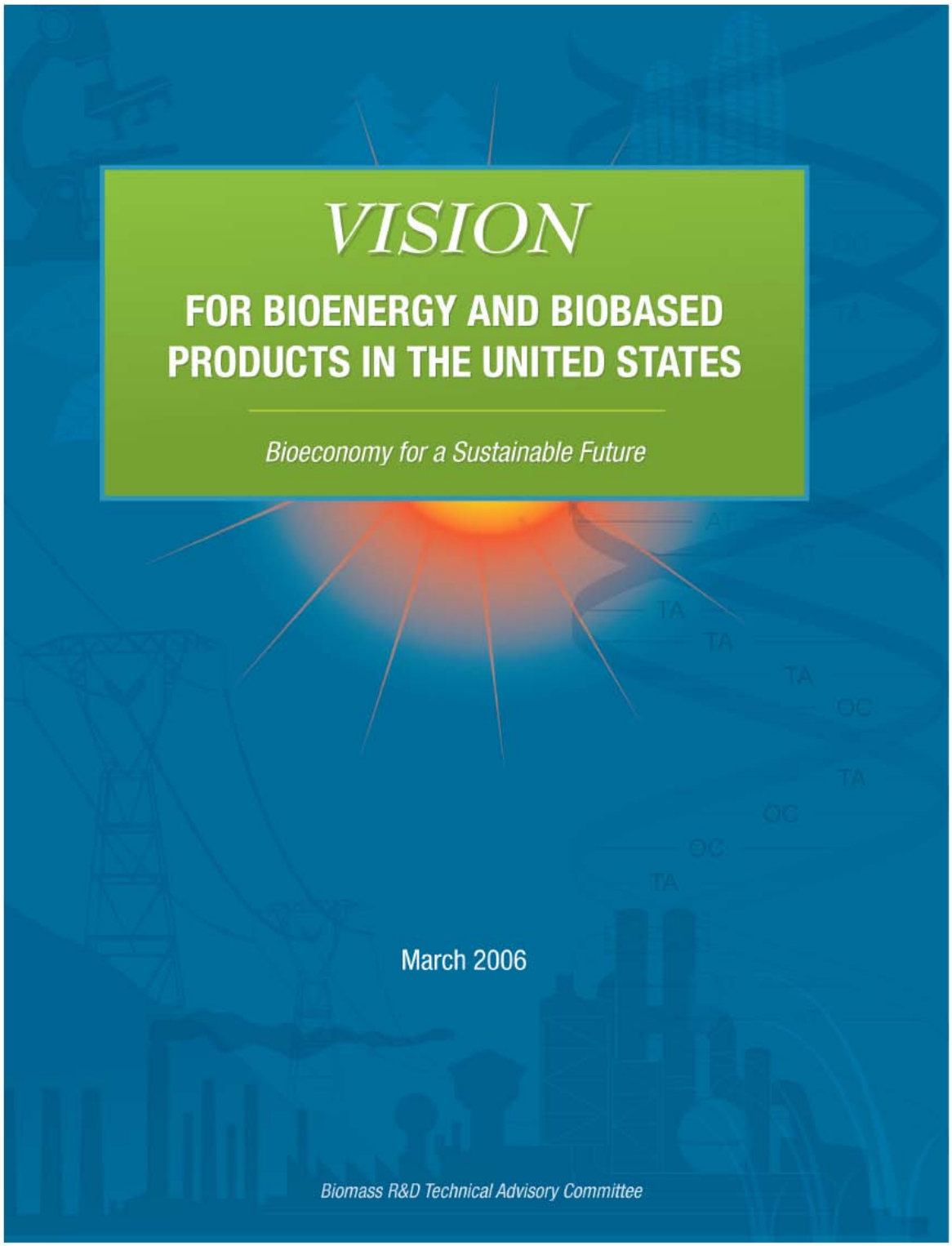
Updated Vision Goals

Vision Goals							
	Units	**2000**	**2004**	**2010**	**2015**	**2020**	**2030**
Biopower	**Market share (%)**	4	4	4	5.5	7	7
	Consumption (Quadrillion Btu)	2.2	2.1	3.1	3.2	3.4	3.8
Biofuels	**Market share (%)**	0.7	1.2	4	6	10	20
	Consumption (1000 gasoline-equivalent gallons)	1,100	2,100	8,016	12,852	22,725	50,994
Bioproducts	**Production (billion lbs)**	12.4	17.6	23.7	26.4	35.6	55.3

Vision Comments

- If you would like to submit comments on the Vision draft please submit them by 3/10/06 via email to: mmanella@bcs-hq.com
- If you would like a copy of the Vision draft in Microsoft Word format please contact Mike Manella

Attachment F


VISION
FOR BIOENERGY AND BIOBASED PRODUCTS IN THE UNITED STATES
Bioeconomy for a Sustainable Future
March 2006
Biomass R&D Technical Advisory Committee

Foreword - *The Vision for Bioenergy and Biobased Products in the United States was created in 2002 to establish far-reaching goals to increase the role of biobased energy and products in our nation's economy. It represented the collective vision of the Biomass Research and Development Technical Advisory Committee established by the Biomass R&D Act of 2000.*

This Vision update is an appraisal of our nation's progress toward the original Vision targets and is a mandate from Congress under the U.S. Energy Policy Act of 2005 (P.L. 109-58). The process for updating the Vision began with a one-day workshop in November 2005 (see Appendix A for a list of participants). Twenty individuals from industry, academia, and government were invited to provide their expertise. The workshop participants evaluated progress toward the original goals, if and how they should be updated, and what is needed to achieve these goals. This was followed by an independent peer review and final approval by the Biomass R&D Technical Advisory Committee. The long-term goals in the Vision are intentionally aggressive and challenging because the Vision is intended to represent where the nation can and should be in achieving a biobased economy. In addition, to complement the Vision, the Committee recommends the U.S. Departments of Agriculture and Energy to conduct a longer-term analysis to benchmark current markets for biomass and opportunities for these markets under various market and policy scenarios.

For more information on the Biomass R&D Act of 2000 and the Technical Advisory Committee, visit www.bioproducts-bioenergy.gov.

Biomass Research and Development Technical Advisory Committee Members, 2006

Name	***Organization***
James Barber	Metabolix, Inc.
Arthur Blazer	New Mexico State Forestry
Jerrel Branson	Biocrude, LLC
William Carlson	Carlson Small Power Consultants
Ralph P. Cavalieri	Washington State University
Bob Dinneen	Renewable Fuels Association
Thomas Ewing	Davis & Harman, LLP
Carolyn Fritz	Allylix Inc.
Douglas Hawkins	Rohm and Haas Company
John Hickman	John Deere
Jack Huttner	Genencor International, Inc.
F. Terry Jaffoni	Clean Transportation Fuels
Charles Kinoshita	University of Hawaii at Manoa
Eric Larson	Princeton University
Jim Martin	Omni Tech International, LTD.
Scott Mason	Phillips Petroleum Company
Larry Pearce	Governors' Ethanol Coalition
Delmar R. Raymond	Weyerhaeuser Company
Edwin White	SUNY

Vision Statement - "By 2030, a well established, economically viable, bioenergy and biobased products industry will create new economic opportunities for the United States, protect and enhance our environment, strengthen U.S. energy independence, provide economic security, and deliver improved products to consumers ."

Executive Summary

The United States is at a critical point in determining its energy future. One path will lead to continued dependence on petroleum for energy needs, the other toward a more balanced diverse energy portfolio using biomass. A continued dependence on petroleum will increase our vulnerability to oil price fluctuations as well as increase our reliance on foreign nations to fuel our economy. Currently, 58.4 percent of U.S. oil consumption comes from imports. In 2004, the United States imported 878,510 thousand barrels from the Persian Gulf region, representing 24 percent of the total U.S. oil imports.[1]

A more diverse portfolio of feedstocks for our nation's energy supply must be found. Biomass resources are naturally occurring, sustainable, and often an environmentally friendly feedstock which can contribute significantly in creating this diverse portfolio. Biomass technologies can help to reduce the principal environmental impact of petroleum consumption, global warming. Achieving this shift from petroleum-based energy supply to bioenergy will infuse dollars back into the domestic economy creating new markets and jobs.

In order to realize this opportunity, the Biomass R&D Technical Advisory Committee established a *Vision* in 2002 for bioenergy and biobased products in the United States.[2] This *Vision* established aggressive goals for biopower, biofuels and biobased products, defining each one's market share targets for 2010, 2020, and 2030. These targets were set to benchmark the progress toward achieving the 2030 *Vision* of a "well established, economically viable, bioenergy and biobased products industry." An assessment of the current status on the nation's progress toward these targets revealed that in some cases the U.S. is not on track to meet them. This document updates the 2002 *Vision*. While recognizing the current shortfalls, it does not change the original 2010 goals and makes minor changes to its 2020 and 2030 goals. Additionally, the document establishes 2015 goals to define milestones that must be achieved to reach the aggressive targets set for 2020 and 2030. Updated *Vision* goals are shown below.

Vision Goals

	Units	2000	2004	2010	2015	2020	2030
Biofuels	**Market share (%)**	0.7	1.2	4.0	6.0	10.0	20.0
	Consumption (1000 gasoline-equivalent gallons)	1,100	2,100	8,016	12,852	22,725	50,994
Biopower	**Market share (%)**	4.0	4.0	4.0	5.5	7.0	7.0
	Consumption (Quadrillion Btu)	2.2	2.1	3.1	3.2	3.4	3.8
Bioproducts	**Production (million lbs)**	12.4	17.6	23.7	26.4	35.6	55.3

[1] U.S. Department of Energy, Energy Information Administration, http://tonto.eia.doe.gov/dnav/pet/pet_move_impcus_a2_nus_ep00_im0_mbbl_m.htm

[2] *Vision for Bioenergy and Biobased Products in the United States*, http://www.bioproducts-bioenergy.gov/pdfs/BioVision_03_Web.pdf

Achieving this *Vision* will require a blend of research and policy measures, as well as efforts to educate future scientists and engineers on biomass feedstocks for the biobased economy. A number of common misconceptions have hindered positive public perception of biomass. In order to realize the *Vision,* it is important to educate the public and the biomass community on the real costs associated with using petroleum, including negative environmental externalities, negative balance of trade, and the sustainability benefits of biomass.

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1. Introduction: Benefits of Achieving the *Vision*

The United States' reliance on petroleum is testing the limits of its economic, environmental, and national security. Worldwide, demand for petroleum and natural gas are escalating putting increased pressure on world energy markets and prices. The U.S. is increasingly dependent on imports to meet its petroleum needs. Currently 58.4 percent of the U.S. petroleum is imported. Volatile prices of petroleum and natural gas are exacting high costs for consumers, industry, and the nation.

A more diverse portfolio of feedstocks for our nation's energy supply must be found. Biomass resources are naturally occurring, sustainable, and often an environmentally friendly feedstock which can contribute to this diverse portfolio. Energy, transportation fuels, chemicals, and materials currently produced from petroleum can instead be produced from biomass resources such as crops, trees, and agricultural, industrial, municipal, and forestry residuals. This prospect holds great promise for our nation as we transition to a renewable-based energy economy.

Biomass – Any plant or plant-derived material, including animal manure and waste materials, which can be converted into biobased fuels, products, and power through various conversion processes.

The *Vision* established by the Biomass R&D Technical Advisory Committee for bioenergy and biobased products in the United States defines a set of achievable quantitative goals that must be realized in order to transition from a petroleum-based economy to a biobased economy. These goals will help achieve greater economic and resource sustainability, economic security, and a healthier environment. Looking to the future, the *Vision* can be used by policy makers, educators, government, and industry as a tool to guide the U.S. toward a healthy and viable biomass-based economy.

Realizing the *Vision* of a viable bioenergy and biobased products industry will result in important benefits in each of the areas discussed in the remainder of this section.

1.1 Balance of Trade

In 2004, the United States relied on imported oil to meet 58.4 percent of its crude oil needs, up from 47 percent in 1990. This trend will continue unless a concerted effort is made to increase energy production from domestic resources and/or reduce energy consumption. The U.S. balance of trade for petroleum was at a deficit of $166 billion in 2004 – representing 24 percent of the total U.S. trade deficit.[1] Increasing demand combined with petroleum price spikes suggests that U.S. petroleum imports will further exacerbate the U.S. trade deficit. More critical to the deficit is the price inelasticity of oil. Even small changes in the price of oil have a large impact on the deficit. According to The Economic Policy Institute, the dramatic increases in the cost of petroleum products and volume of imports were responsible for more than one-third of the increase in trade deficit in 2004.[2] If domestically produced biobased products and bioenergy can begin to replace a portion of petroleum products, those dollars could remain in the U.S. and provide an opportunity to fuel domestic economic growth.

1.2 Economic Growth

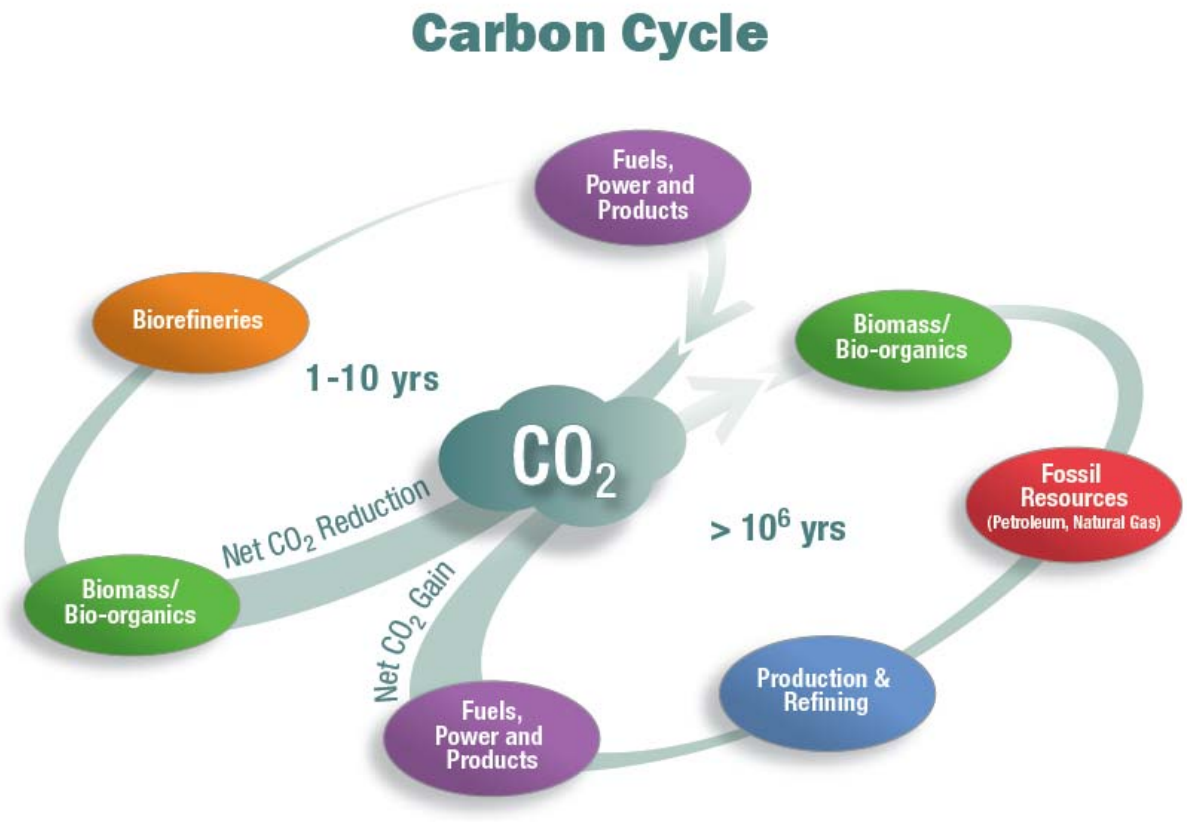
Biomass resources are diverse ranging from agricultural crops and residues to forest resources and energy crops, and are available in every region of the United States. Achieving the *Vision* will infuse dollars back into the domestic economy creating a market for business output, creating income and encouraging increases in consumer spending, which in-turn will further increase the demand for business output – the "multiplier effect." In 2004, the ethanol industry alone supported creation of 147,000 jobs in all sectors of the economy, boosted U.S. household income by $4.4 billion through increased economic activity and new jobs, and added $1.3 billion in federal tax revenue and $1.2 billion in state and local government tax revenues.[3] The doubling of ethanol production since 2000 that was supported by federal and state subsidies, a protective import tariff, and federal and state requirements to blend ethanol in certain gasoline products has boosted corn prices by 25-50 cents per bushel.[4] These jobs will provide security and product diversification to farmers, ensuring economic vitality for years to come.

1.3 Environmental Issues

Biomass technologies can help to reduce the principal environmental impact of petroleum consumption, global warming. Biofuels and biobased products are typically lower in toxicity and many biodegrade more rapidly than their petroleum-based counterparts. Moreover, biomass' short carbon cycle compared to petroleum's long carbon cycle greatly reduces the amount of CO_2 in the atmosphere (see **Exhibit 1**). Biomass has the biggest potential impact in the transportation sector, the largest single source of air pollution in the United States. The transportation sector produced 1,770 teragrams of CO_2 in 2003, accounting for 32 percent of the total U.S. CO_2 emissions and was responsible for as much as 90 percent of carbon monoxide in the air in urban areas[5] – both pollutants contribute to global warming.[6] With respect to greenhouse gases and conversion efficiency, biomass could have an important impact on stationary power generation. For example, using biomass as a feedstock for integrated gasification combined cycle (IGCC) to generate electrical power is a more efficient use of biomass energy than converting it to liquid fuels for transportation. The Clean Air Act has established emission standards for CO_2, NOx, and other pollutants. Due to the potential effects of CO_2 as a greenhouse gas, additional standards could be put in place to reduce emissions. The biorefinery can help industry meet new requirements under these policies by producing a suite of fuels, power, and biobased products. Reducing the amount of petroleum fuels we use and replacing them with cleaner-burning biofuels will decrease air pollution and related public health costs.[7]

Net Carbon Benefits - Since biofuels are made from crops that absorb carbon dioxide and give off oxygen, it helps reduce greenhouse gas emissions. This carbon cycle maintains the balance of carbon dioxide in the atmosphere when using biofuels. The carbon-cycle is much shorter for biomass than that of fossil fuels. It takes from 1-20 years for biomass whereas for fossil fuels it is >1 million years.

Exhibit 1: Carbon Cycle: Benefits of Biomass



There are other environmental benefits associated with biomass utilization. If we can develop markets for large-scale amounts of biomass, we could remove excessive levels of biomass on our forest lands and reduce the potential of wildfires that contribute to greenhouse gases and air pollutants as well as personal property damage. Active management of our forests with biomass recovery systems provides healthier forests and benefits to the environment. Conservation activities can be completed using fast-growing crops and wood plantations, and agro-forestry that provide clean water and protect the soil from water and wind erosion.

1.4 Energy Diversity and Security

A serious disruption in the supply of oil creates the possibility of a major economic shock with potential political unrest ensuing. The United States has only 4 percent of the world's population but consumes about 25 percent of the world's produced oil.[8] The nation is also dependent on foreign sources of oil, with 58.4 percent of its annual oil consumption coming from imports and approximately 24 percent coming from the Persian Gulf Region.[9]

The United States government and industry must begin to make significant investments to diversify its portfolio of energy resources. The U.S. needs to build greater resiliency in its energy sector to lessen the impact of natural disasters, external attacks, industry downturns, or other factors that may impact energy supply. Geographically dispersed biorefineries could produce an alternative and additional flow of domestically produced products to the U.S. economy, partly reducing the economic insecurity inherent in increased dependence on fossil fuels. Moreover, if energy derived from hydrogen becomes a reality in the long term, biomass may be the most feasible renewable resource for producing hydrogen. The United States can use biomass feedstocks instead of fossil fuels to support the hydrogen economy, limiting greenhouse gas emissions and the reliance on foreign petroleum suppliers. As with any energy resource, biomass resources will face similar uncertainties which could occur due to drought or other severe weather. This further strengthens the argument for a diverse U.S. energy portfolio.

1.5 Oil Production Expected to Peak This Century

World oil demand continues to increase with the U.S. leading the way. Continued economic expansion in populous countries such as China and India is further fueling demand for world oil supplies. Within this century, we will reach a point or "peak" beyond which worldwide production of oil will begin to decrease. Analyses published over the past three decades have varied widely in their estimate of when the world oil production will peak. Although peak year predictions have ranged from as early as 1989 to 2050,[10] all these analyses predict world oil production to peak in this century. The Energy Information Administration's (EIA) most recent study estimates world oil production to peak in 2044.[11] This date is calculated using the mean expected value, with ultimate recovery estimated at 3,338 billion barrels using a (standard) 2 percent economic growth rate.[12]

The basic counter argument to an early "peak oil" prediction is that new technologies and increased investment can overcome any production barrier. The International Energy Agency (IEA) estimated that the total necessary investment cost for worldwide upstream operations and transport of oil by 2030 would amount to $16 trillion – or roughly $568 billion a year, between 2003 and 2030.[13] A study by the Center for Strategic and International Studies suggests that this estimate may actually be too conservative.

U.S. reliance on oil imports is also dependent upon indirect oil imports in the form of manufactured goods. This includes the energy used to produce the goods along with the petroleum-based materials that comprise products such as plastics. Often countries which manufacture these goods are also reliant on imported oil further exacerbating U.S. and global energy security issues. Although EIA and IEA do not make estimates of these indirect imports, analysts speculate it would add at least 1.0 million to the current 20.7 million barrels per day (MMBD) to total U.S. oil imports.[14]

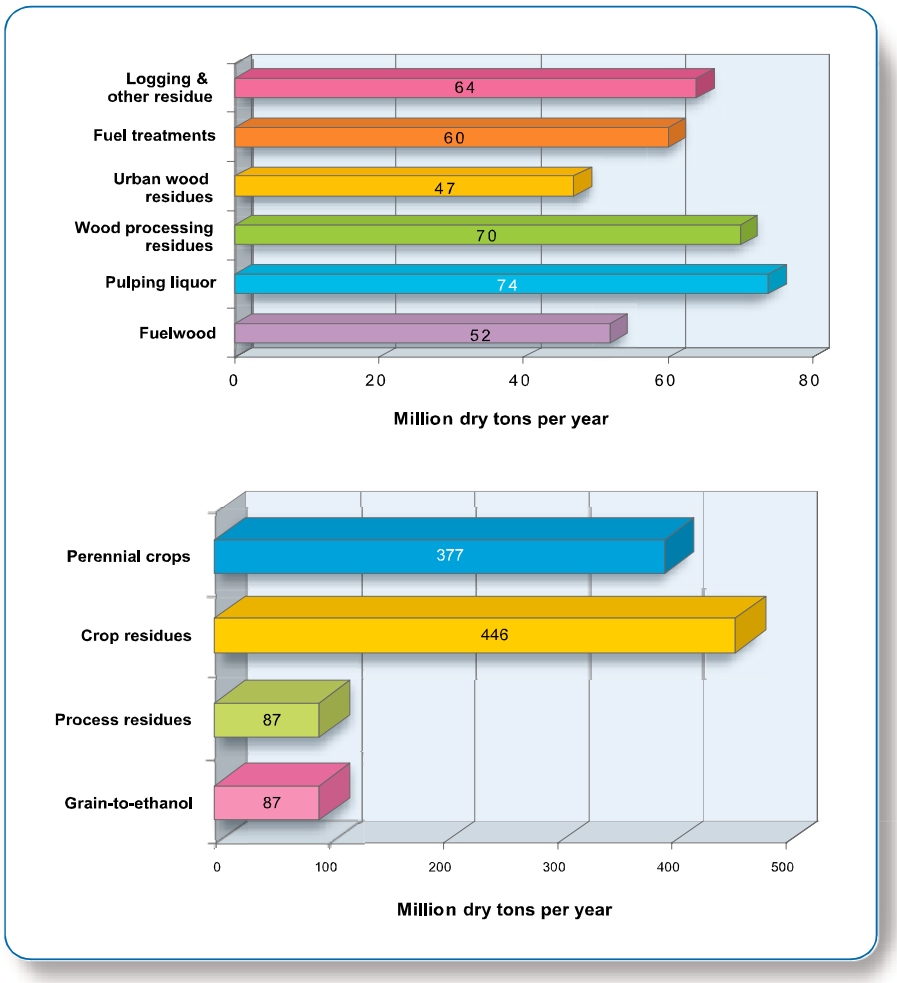
The point is that no matter what the exact date for "peak oil" is, the United States must begin to prepare for a transition now. To start with, the U.S. must begin to make significant investments to diversify its portfolio of energy resources. Geographically distributed biorefineries could

produce a steady flow of bioenergy and bioproducts into the U.S. economy, reducing some of our reliance on petroleum imports and reducing economic insecurity from threats both domestic and abroad. Regardless of when peak year production is reached, the cost of crude oil and natural gas will likely continue to increase at a more rapid rate than biomass and agricultural commodities.

2. Current Status of Bioenergy and Biobased Products

Currently, biomass accounts for about 4 percent of the total U.S. energy consumption but has the potential to contribute much more. According to a 2005 report by USDA and DOE, "Biomass as a Feedstock for a Bioenergy and Bioproducts Industry: The Technical Feasibility of a Billion-Ton Annual Supply," there are approximately 1.3 billion tons of biomass available in the U.S. for conversion to fuels, power and products (**Exhibit 2**). Biomass is used to produce heat and power in industry, to produce electric power for sale to the electrical grid, and to produce biobased fuels such as ethanol and biodiesel. Biomass is also used to produce a range of chemical and material products that are otherwise produced from petroleum-based feedstocks.

Exhibit 2: Summary of Potential Forest and Agriculture Resources



Source: USDA, DOE, Biomass as a Feedstock for a Bioenergy and Bioproducts Industry: The Technical Feasibility of a Billion-Ton Annual Supply. Fig 26. 2005

Heat and power produced by biomass was estimated at 2.1 quadrillion Btu (quads) in 2004, and accounted for about 3 percent of the market share for power production. Consumption of

biofuels in the transportation sector was approximately 2.1 billion gasoline-equivalent gallons in 2004, about 1.2 percent of the market share for transportation fuels.[15]

In its original *Vision*, the Committee set aggressive goals for biofuels, biopower and biobased products in 2010, 2020, and 2030. In updating its *Vision*, the Committee evaluated the current status of biofuels, biopower, and bioproducts in the United States to track the progress toward achieving the original goals stated in the *Vision*. It found that the U.S. is on track to meet the Committee's original biofuels goals for 2010, but is not on track to meet its 2010 goals for biopower. It is difficult to assess progress in achieving its goals for biobased products due to lack of data.

What's a Quad? - A Quad is one quadrillion (10^{15}) British thermal units (Btu). A Btu is the amount of heat required to raise the temperature of one pound of water by one degree Fahrenheit and is equal to 252 calories. For example: a gallon of gasoline contains 124,000 Btu; a kilowatt of electricity contains 3,412 Btu; and in 2004, U.S. energy consumption was 100 quads (including all residential, commercial, transportation, industrial and electric power sector energy consumption).

2.1 Biofuels

Exhibit 3 illustrates the U.S. biofuels production capacity as of December 2005. Currently, there exists over 4,336 million gallons per year of ethanol production capacity with over 1,743 million gallons per year in new planned capacity.[16] Current dedicated biodiesel and oleochemical production capacity is estimated to be 354 million gallons per year with 278 million gallons per year in planned capacity.[17]

Demand for overall transportation fuels has increased 27 percent in the past ten years with the vast majority of this growth reliant on imported petroleum.[3] Increased use of domestically produced biofuels in the transportation sector represents a near-term opportunity to help offset petroleum demand and rising oil imports. Biofuels include ethanol blended with gasoline, E85 and biodiesel.[4] Consumption of biofuels in 2004 was 2.1 billion gasoline-gallon equivalents and there has been growth in virtually every category of biofuels as shown in **Exhibit 4**. If biofuel growth continues at this rate, the original *Vision* goal of 8,016 million gasoline-equivalent gallons or 4 percent of market

Biofuels

Fuel ethanol (C_2H_5OH): An anhydrous denatured aliphatic alcohol intended for gasoline blending.

Oxygenated gasoline (includes Gasohol): Finished motor gasoline, other than reformulated gasoline, having an oxygen content of 2.7 percent or higher by weight.

E85: A fuel containing a mixture of 85 percent ethanol and 15 percent gasoline.

E95: A fuel containing a mixture of 95 percent ethanol and 5 percent gasoline.

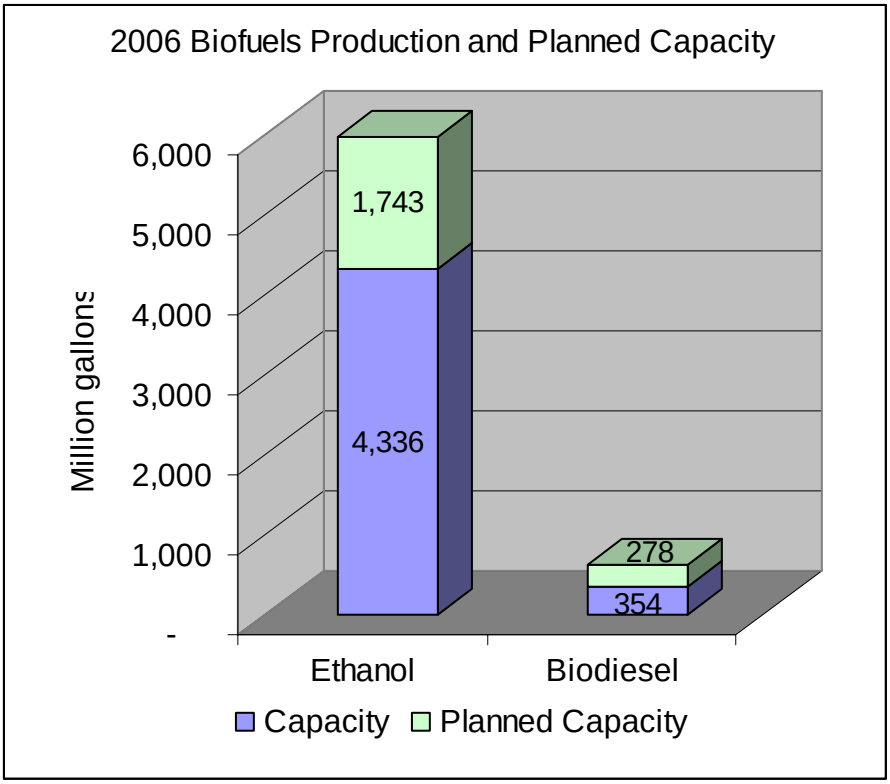
Biodiesel: Produced through transesterification, a process in which organically derived oils are combined with alcohol (ethanol or methanol) in the presence of a catalyst to form ethyl or methyl ester. Biodiesel can be made from soybean or rapeseed oil, animal fats, waste vegetable oils, or microalgae oils.

[3] Based on EIA Annual Consumption. Table 10. available at http://www.eia.doe.gov/cneaf/alternate/page/datatables/aft1-13_03.html

[4] Ethanol does not have the same heat content or Btu value as petroleum gasoline; therefore converting ethanol gallons to gasoline-equivalent gallons gives a better comparison in terms of vehicle fuels.

share by 2010 may be met. The Committee's goals are more aggressive than the Renewable Fuels Standard (RFS) established by EPAct 2005, which aims to double the amount of ethanol and biodiesel in our fuel supply over the next seven years. The RFS requires 7.5 million gallons (4.95 gasoline-equivalent gallons) of ethanol production by 2012.

Exhibit 3: Biofuels Production Capacity, December 2005



Sources: Renewable Fuels Association. Ethanol Industry Overview. National Biodiesel Board. U.S. Biodiesel Production Capacity. January 2006

Exhibit 4: Estimated Consumption of Biobased Vehicle Fuels in the United States, 2001-2004 (Thousand Gasoline-Equivalent Gallons)

	2001	2002	2003	2004
E-85	14,623	17,783	20,092	22,405
Gasohol	1,143,300	1,413,600	1,792,900	2,052,000
Biodiesel	7,076	16,917	26,758	36,599
Total	**1,164,999**	**1,448,300**	**1,839,750**	**2,111,004**

Source: EIA [18]

2.2 Biopower

The U.S. is not on track to reach the 2010 *Vision* goal for biopower of 3.3 quads or 4 percent of market share. Biopower includes biomass resources used to produce heat and power in the

industrial sector for both onsite use and sale to the grid. Biopower also includes biomass used for electric power production by the utility sector. As shown in **Exhibit 5,** biopower production has been relatively unchanged since 2001, increasing marginally from 2.04 quads in 2001 to 2.13 quads in 2004. The Committee recognizes that although biopower is important to the overall objectives of achieving the *Vision*, the value-added nature of biofuels, biochemicals and other bioproducts will have a more significant economic impact in displacing petroleum.

Exhibit 5: Biomass Share of Electricity and Heat Demand in Utilities & Industry (Quadrillion Btu)

	Biomass Consumption for Heat & Power (Industrial Sector)*	Biomass Consumption for Electric Power (Electric Utility Sector)	Total	Total Energy Consumption (Industrial & Electric Utility Sectors)**+	Biomass Share of Electricity & Heat Demand in Utilities & Industry*+
2001	1.59	0.45	2.04	70.03	2.92 %
2002	1.56	0.52	2.08	70.86	2.94 %
2003	1.53	0.52	2.05	70.61	2.91 %
2004	1.62	†0.51	2.13	71.93	2.96 %

* DOE/EIA. U. S. Energy Consumption by Energy Source. Tables 5a & b. Historical Renewable Energy Consumption by Energy Use Sector and Energy Source, 1989-1999

** DOE/EIA 2004 Annual Energy Review. Table 2.1a Energy Consumption by Sector, 1949-2004

+ DOE/EIA Annual Energy Outlook 2006, Year-by-Year Reference Case Tables, Table 2. Energy Consumption by Sector and Source

2.3 Bioproducts

As it has since the early 1900s, the United States continues as the world's leader in chemicals production. In 2005, the U.S. chemicals industry produced 23 percent of the world's total chemicals shipments. The chemicals industry is energy intensive relying on energy not only as input for fuel and power but also using petroleum as feedstock for the manufacture of many of its products. In 2004, the energy equivalent consumed by the U.S. chemicals industry for both these purposes amounted to 6.39 quads or 6.4 percent of the total U.S. energy consumption.[19] Energy consumption used for fuel, power and electricity accounted for 3.00 quads of this total, with the remaining 3.39 quads (or 53 percent) used for hydrocarbon feedstocks.[20] These hydrocarbon feedstocks are sourced primarily (99 percent) from petroleum and natural gas, with the remaining (1 percent) from coal and biomass.[21]

The Biomass R&D Technical Advisory Committee defines targeted biobased products as any product generated from biomass that would otherwise be produced using fossil fuel feedstocks. When the original *Vision* document was published in 2002, the production of biobased textile fibers, polymers, adhesives, lubricants, soy-based inks, and other products was estimated at 12.4 billion pounds per year or roughly 4 percent of the market share (**see Exhibit 6**). Based on the 2005 estimate shown in **Exhibit 6**, biobased products now constitute about 17.6 billion pounds per year, or about 5 percent of the total target market share.[22] Due to lack of publicly available data on production of biobased products, it is uncertain how close U.S. industry is to achieving the original *Vision* goal of capturing 12 percent market share of products by 2010. In its updated

Vision, the Committee has refined the list of key biobased products which it will include in its slate of biobased products. New biobased products which are projected to have an impact in this market are: polylactic acid from lactic acid, succinic acid, 1.3 Propanediol (PDO), polyhydroxy-alkonoate (PHA), and 3 hydroxyropionic acid (3-HP). An estimated 2005 benchmark for this slate is also shown in **Exhibit 6**. However, note that some of the references used to track the volume of bioproducts are not updated annually. Therefore, some data has not changed from the 2002 baseline, not because the market has not grown, but rather because reference tools do not have the capability to reflect the current market.

Exhibit 6: Estimated Production of Biobased Products

	Million lbs	
	2002	**2004-2005**
Organic Acids	*208*	*987*
lactic acid (2)	*114*	*600*
*(Polylactic acid from lactic acid)**	*15*	*280*
citric acid	*462*	*387*
Ethanol for Industrial Use	**1757**	**1971**
Starch (3)	**3000**	**6684**
Sorbitol (10)	**515**	**697**
Glycerol/Glycerine (7)	**410**	**432**
Alkyd resins (10)	**550**	**682**
Soy-based Products (1)	**654**	**934**
Specialty Oils (8)*	**9**	**8.9**
Spearmint		*1.7*
Peppermint		*7.1*
Forest Chemicals*	**2826**	**2740**
Crude Sulfate Turpentine (6)		*1202*
Tall Oil (5)		*1094*
Pine Rosin (4)		*444.6*
Cellulose Polymers	**2500**	**2500**
Cellulose fibers	*360*	*** NA*
Cellulose derivatives (11)	*2140*	*696*
TOTAL	**12,429**	**17,635**
% Market share	**4%**	**5%**

Sources:

(1) de Guzman, Doris, "Interest in Soy-Based Materials Grows", Chemical Market Reporter, 14 March, 2005.
(2) de Guzman, Doris, "Purac expands global lactic acid capacilities", Chemical Market Reporter, 24 October, 2005.
(3) Corn Refiners Association, "Shipments of Products of the Corn Refining Industry -- 2004", www.corn.org/web/shipprod.htm, updated August 24, 2005.
(4) de Guzman, Dorin, "Oils, Fats & Waxes in Brief", Chemical Market Reporter, 17 January, 2005.
(5) "Chemical Profile: Tall Oil", Chemical Market Reporter, 24 October 2005.
(6) de Guzman, Doris, "CST prices are creeping upward", Chemical Market Reporter, 26 September, 2005.
(7) "Chemical Profile: Glycerine", Chemical Market Reporter, 24 January, 2005.
(8) National Agricultural Statistics Service at www.nass.usda.gov
(9) based on public announcements or Nexant report
(10) Kirkotthmer Encyclopedia of Chemical Technology, 2005
(11) includes only 640 million lbs. for organic esters, and 56 million lbs for organic ethers.
* 2002 estimates for Specialty Oils and Forest Chemicals do not include detailed breakdown of subcomponent quantities.
** The 2005 estimate for cellulosic polymers uses 2002 totals because no new public information was available.

The American Chemical Society estimated that as a technology platform, biotechnology has currently reached 8 percent of total chemical shipments, up from 3 percent in 1992.[23] Although there are many unknowns with respect to current bioproduct production capacity, the outlook is very promising for bioproducts. The availability and allocation of traditional hydrocarbon feedstocks (i.e., petroleum and natural gas) are key issues for the chemicals industry. As these supplies become increasingly strained and expensive, the price of chemicals used in a variety of industries will also increase.

3. Revising the *Vision* Goals

The original *Vision* established aggressive goals for biopower, biofuels and biobased products defining each one's market share targets for 2010, 2020, and 2030. These targets were set to benchmark the progress toward achieving the 2030 *Vision* of a "well established, economically viable, bioenergy and biobased products industry."[24]

The updated *Vision* does not change the original 2010 goals but recognizes that in some cases the U.S. is not on track to meet them. The *Vision* makes minor changes to its 2020 and 2030 goals and establishes 2015 goals to define milestones that must be achieved to reach the aggressive targets set for 2020 and 2030. Finally, the updated *Vision* makes a qualitative and quantitative statement on the role that biomass can play in our nation's energy product markets by 2050. Vision goals are shown in **Exhibit 7**.

3.1 BioFuels

The Committee strongly supports efforts to improve transportation fuel economy. However, the Committee also believes that it is critical to diversify our portfolio of transportation fuels. The Committee believes that biofuels should account for 4 percent of transportation fuels demand by 2010, 10 percent by 2020, and 20 percent by 2030. Transportation fuels produced from biomass include ethanol, biodiesel and blends thereof. Biofuels consumption in 2004 is 2.1 million gasoline-equivalent gallons or 1.2 percent of the market share of motor gasoline and diesel fuel consumed. If current trends are an indication of future demand for biofuels, the original 2010 target can be met. The President's Biofuels Initiative includes aggressive goals projecting 40 million gasoline-equivalent gallons of ethanol consumption in 2030 in the transportation sector. The Committee's goals actually exceed this target.

3.2 Biopower

Biopower constitutes biomass-derived heat and electric power produced in industry and utilities (see **Exhibit 5**). It includes power produced from biomass used in co-firing, waste-to-energy, and gasification of biomass. It does not include residential and commercial sector use of wood energy. The U.S. is not currently on track to meet original *Vision* goals for biopower. The Committee will continue to maintain its challenging goals for biopower, believing that it should represent 4 percent of energy use in industry and utilities by 2010, 5.5 percent by 2015, and level off to 7 percent by 2020. In order to meet its biopower goals, strong incentives and policies are needed. A good example in which state and local governments are leading the way is through implementing the Renewable Portfolio Standards (RPS) policy. RPS requires a certain percent of a total energy portfolio to come from renewable sources of energy such as wind, solar, and biomass.

3.3 Biobased Products

The Committee believes that production of biobased products should increase from its current estimated baseline of 17.6 billion lbs to 23.7 lbs by 2010, 26.4 billion lbs by 2015, 35.6 billion lbs by 2020, and 55.3 billion lbs by 2030. The original *Vision* defined biobased products as biobased textile fibers, polymers, adhesives, lubricants, soy-based inks, and other products. The *Vision* update defines biobased products as any product generated from biomass that would otherwise be produced using petroleum feedstocks or any material of recent biological origin. The Committee adopted this change to highlight the important role that biomass can play in diversifying chemical industry feedstocks.

Exhibit 7: Vision Goals

	Units	2000	2004	2010	2015	2020	2030
Biofuels	**Market share (%)**	0.7	1.2	4.0	6.0	10.0	20.0
	Consumption (1000 gasoline-equivalent gallons)	1,100	2,100	8,016	12,852	22,725	50,994
Biopower	**Market share (%)**	4.0	4.0	4.0	5.5	7.0	7.0
	Consumption (Quadrillion Btu)	2.2	2.1	3.1	3.2	3.4	3.8
Bioproducts	**Production (billion lbs)**	12.4	17.6	23.7	26.4	35.6	55.3

Notes:

1. Biofuels – Baseline data from Table A11. Petroleum Supply and Disposition Balance: Motor Gasoline (Includes ethanol and ethers blended into gasoline) and Distillate Fuel (Includes distillate and kerosene). Diesel is calculated to be 68% of Distillate Fuels. Volume goals calculated by multiplying Committee market share goal against DOE/EIA AEO projected consumption of transportation fuels for outyears. Source: EIA/AEO 2006. Early Release. Available at: http://www.eia.doe.gov/oiaf/aeo/excel/aeotab_11.xls
2. Biopower - Biomass for production of heat and power in Industrial, and Electric Power Sectors. Sources: DOE/EIA September 2005 Monthly Energy Review, Sum of "Table 10.2b Estimated Renewable Energy Consumption: Industrial and Transportation Sectors" Industrial Wood Consumption and Industrial Waste Consumption and "Table 10.2c Renewable Energy Consumption: Electric Power Sector" Electric Power Sector Wood Consumption and Electric Power Sector Waster Consumption. AEO 2006. Early Release. Table 2. Energy Consumption by Sector and Source. Available at: http://www.eia.doe.gov/oiaf/aeo/aeoref_tab.html
3. Biobased Products - Chemicals and materials that would otherwise be petroleum based. [25]

Source: Vision goals assumed that the 2002 number for biobased products was estimated 12 billion pounds. Using the independent study, the basis for target years should be as follows: 2010-150 percent of base; 2015-167 percent; 2020-225 percent; 2030-350 percent.

4. Achieving the *Vision* Goals

The *Vision* will provide the framework for action to achieve our goals. However, major progress is needed in several areas. A critical component is the need for a biomass champion. Industry has been hesitant to shift from petroleum to biomass, citing the huge cost to do so. A well organized movement led by an industry champion must, therefore, be launched to encourage lawmakers to implement policies and provide the significant funding needed to begin the transition to a bioeconomy. Further, long-term public policies are needed to create an environment which reduces the risk to investors. This would enable funding and deployment of demonstration projects to prove the technical and commercial feasibility of existing biomass technologies and begin the catalysis to the bioeconomy. Public and private sector R&D is working toward decreasing the cost of harvesting, storage handling and conversion of feedstocks, and deployment and commercialization of biomass technologies. The updated *Roadmap for Biomass Technologies in the United States* will further outline the strategies needed in each of these areas.

Recommended Areas of Focus:

4.1 Research and Development

Research and development needs to focus on priority biological and thermochemical pathways, reducing the cost of fermentation; basic plant science (increasing biomass production rates); lignocellulosic conversion; and development of more robust enzymes and catalysts. R&D should also focus on developing new and improved feedstocks, sustainable management systems, less expensive harvesting systems, and improved transportation systems. R&D activities should seek to develop new uses for biomass, reduce conversion and manufacturing costs, and improve the competitiveness of biomass products in chemical markets. They should also identify the effects on land management if agriculture and forestry were to transition from their historical production role to providing for energy, fuels, and a wider variety of biobased products. Sustainability of biomass feedstocks is critical to the bio-economic revolution. Additional science is needed to ensure that our agricultural and forest lands can supply enormous volumes of biomass in a perpetually reliable manner without degradation of our resources and environment. Furthermore there should be sufficient funding and supportive policies for federal, industry, and state R&D partnerships for collaborative research and deployment.

4.2 Agricultural Production

Agricultural production for food and forest production could be transformed to include additional bioenergy, bioproducts, and fuels. The critical sectors of agriculture and forest products need to be a future source of sustainable jobs, ensuring an improved standard of living. It will be important for R&D to improve feedstock production efficiencies, provide the technologies for sustainable, reliable biomass resources, and develop required infrastructures in local communities. However, agricultural and forest-based commodities need to continue to generate income necessary to generate a profit for farmers and foresters. It is vital that they remain in the economic chain and enable them to benefit from the biobased economy.

4.3 Policy

Long-term policies and financial incentives should be developed to promote biomass applications across all sectors of the economy. This must include effective tax incentives, green purchasing requirements, emission taxes or regulations, or tax credits for research and investments in renewable energy. The Committee believes that market-based mechanisms should credit the environmental, energy, and security advantages of bioenergy and biobased products. Moreover, state and federal agencies should create a preference for biobased products except in situations where there is no alternative to petrochemicals. Bioproducts equivalence testing and preferred purchase of bioproducts should be a priority. Opportunities for biobased products will no doubt increase with new legislation such as that guiding the Federal Biobased Products Preferred Purchasing Program (FB4P). The federal government should help to educate states on federal standards for purchasing biobased products and encourage states to adopt similar standards. Lack of data on biobased products makes it difficult to measure progress in achieving *Vision* goals and further research is needed to benchmark and track the role of biobased products in the U.S. economy.

4.4 Demonstrations

Commercial-scale demonstration projects are needed to help prove the techno-economic viability of biomass technologies and biorefineries to potential investors, decision makers and others and will act as a catalyst for opening credit markets. Greater investment is needed on prototyping and education to address this important gap in realizing the benefits of biomass technology advances.

4.5 Partnership/Champion

The industries which comprise the bioeconomy are diverse and not coalesced. This has hindered progress. An association or industry-led coalition is needed to represent one voice for the biomass industries. The *Vision* should help farmers, foresters, developers, and other members of the biomass industries to come together in their efforts toward achieving a bioeconomy.

4.6 Financing

Realizing the *Vision* will require significant increases over the current federal investments. The *Vision* and *Roadmap* should help other federal agencies to identify sources of sustained unencumbered financing (e.g., public/private partnerships) to invest in biomass research & development and deployment. In addition, greater investment should be sought from the automotive, chemicals, fuels, and other industries.

4.7 Public Education and Outreach

A number of common misconceptions have hindered positive public perception of biomass. These include, but are not limited to, issues of biomass availability and net energy benefits. A report produced by the U.S. Departments of Agriculture and Energy, and Oak Ridge National Laboratory titled *A Billion-Ton Feedstock Supply for a Bioenergy and Bioproducts Industry: Technical Feasibility of Annually Supplying One Billion Dry Tons of Biomass* showed that there

are enough resources currently available to offset 30 percent of current petroleum demand. In terms of energy benefits, a July 2005 report by the Center for Transportation Research, Argonne National Laboratory compares the net energy balance of corn ethanol with that of petroleum. The report states that ethanol requires 0.74 Btu of input compared to 1.23 Btu of input for petroleum to produce the same output of energy.[26] It is important for the *Vision* to help educate the public and the biomass community on the real costs associated with using petroleum, including negative environmental externalities, balance of trade, and the sustainability benefits of biomass. The biomass community should disseminate success stories such as the benefits of biobased products. The biomass community needs to educate consumers that biomass is available nationwide and benefits local economies throughout the country.

4.8 Workforce Education

Academic research centers should develop full-time departments in biomass R&D. This should include undergraduate and graduate education to prepare future scientists in a carbohydrate economy. Another component of public education is the education of the workforce to use biomass as an alternative to petroleum. The U.S. workforce has traditionally been trained to use petrochemicals and is not inclined to transition to a bioeconomy. Multi-disciplinary projects need to occur in order for the bioeconomy to be successful. This includes forest, agriculture, chemicals, finance, and other industries to develop a working familiarity with biomass. The capacity to transition is an important step highlighted in the *Vision* and future scientists and engineers need to train with biomass feedstocks, supply systems, conversion processes, and applications.

Lessons learned from the original 2002 *Vision* show that without effective policies and well-planned R&D, efforts to achieve the *Vision* goals will be futile. The updated *Vision* will be the basis for future regional *Roadmap* workshops to chart the technical research, development, and demonstration activities needed to achieve a biobased economy. These *Roadmap* workshops will also outline the institutional and policy changes needed to remove the barriers to economically and environmentally sound development of sustainable biomass systems.

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[5] Environmental Health Center. "What You Can do About Car Emissions." Website visited January 5, 2006. http://www.nsc.org/ehc/mobile/mse_fs.htm
[6] EPA. Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2003. Table ES-3: CO2 Emissions from Fossil Fuel Combustion by End-Use Sector (Tg CO2 Eq.). http://yosemite.epa.gov/OAR/globalwarming.nsf/UniqueKeyLookup/RAMR69V528/$File/05executivesummary.pdf
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[10] Guy Caruso, "When Will World Oil Production Peak?" Administrator, Energy Information Administration, U.S. Department of Energy, for 10th Annual Asia Oil and Gas Conference, Kuala Lumpur, Malaysia June 13, 2005, website: http://www.eia.doe.gov/neic/speeches/Caruso061305.pdf
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[12] Caruso. *Ibid*
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[14] Cordesman and AlRodham: *The Changing Risks in Global Oil Supply and Demand*, Center for Strategic and International Studies, October 2005, Page 14. U.S. consumption of oil from EIA. Energy Basics 101. Available at: http://www.eia.doe.gov/basics/energybasics101.html
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[18] Sources: 1993-2002 Oxygenate Consumption: Energy Information Administration, Petroleum Supply Monthly. 1993-2004 Traditional Fuel Consumption: Energy Information Administration, Petroleum Supply Annual, Volume 1 (June 2000). Highway use of gasoline was estimated as 97.1 percent of consumption, based on data in the Transportation Energy Data Book: Edition 16, prepared by Oak Ridge National Laboratory for the U.S. Department of Energy (July 1996). Diesel consumption was adjusted for highway use by multiplying by .568 derived from Energy Information Administration, Fuel Oil and Kerosene Sales 1999. 2002-2004 Oxygenate and Traditional Fuel Consumption: Energy Information Administration, Short Term Energy Outlook, September 2002. Alternative Fuel Consumption: Science Applications International Corporation 1992-1995, "Alternative Transportation Fuels and Vehicles Data Development." unpublished final report prepared for the Energy Information Administration (McLean, VA, July 1996) and Energy Information Administration, Office of Coal, Nuclear, Electric and Alternate Fuels for 1996-2004.
[19] Guide to the Business of Chemistry, 2005
[20] Guide to the Business of Chemistry, 2005
[21] Guide to the Business of Chemistry, 2005
[22] Lack of data on biobased products makes it difficult to measure progress in achieving *Vision* goals. Further research is needed to benchmark and track the role of biobased products in the U.S. economy. To this end, the U.S. Department of Energy is in the process of conducting data research to gain better data on current production levels of bioproducts and also to solicit the industry's input on the Committee's revised *Vision* targets for bioproducts.
[23] Guide to the Business of Chemistry, 2005
[24] Refer to original *Vision*. 2002.

[25] Vision goals assumed that the 2002 number for biobased products was 12 billion pounds. Using the independent study, the basis for target years should be as follows: 2010-150percent of base; 2015-167percent; 2020-225percent; 230-350percent.

[26] Michael Wang. Updated Energy and Greenhouse Gas Emissions Results of Fuel Ethanol. Center for Transportation Research. Energy Systems Division. Argonne National Laboratory. September 2005. website visited January 5, 2006. http://www.transportation.anl.gov/pdfs/TA/354.pdf

APPENDIX A - **Vision Workshop Participants**

NAME	COMPANY
Tom Binder	ADM
David Canavera	MeadWestvaco
Ralph Cavalieri	WSU
Shulin Chen	Washington State University
Roger Conway	USDA - OCE – OE
Mark Downing	Oak Ridge National Laboratory
Larry Drumm	Biotechnology Group
Vernon R. Eidman	University of Minnesota - St. Paul
Tom Johnson	Southern Company
Douglas Kaempf	Program Manager
Melissa Klembara	Office of the Biomass Program – DOE
Lori Perine	AF&PA
Edan Prabhu	Flex Energy
Cindy Riley	National Renewable Energy Laboratory
Neil Rossmeissl	Office of the Biomass Program – DOE
Phil Shane	Illinois Corn
Hossein Shapouri	USDA - OCE – OE
Bryce Stokes	USDA – Forest Service
Larry Walker	Cornell University
Michael Wang	ANL
Gary Welch	Aventine Renewable Energy
Todd Werpy	Pacific Northwest National Laboratory

APPENDIX B - **Vision Peer Reviewers**

NAME	COMPANY
Ron Buckhalt	ARS
Ralph Cavalieri	Washington State University
Rob Fireovid	ARS
Emory Ford	MTI Technology Corporation
Michael Foster	BP
John Hanby	Washington Pulp and Paper Foundation
John Hickman	John Deere
Melissa Klembara	Office of the Biomass Program – DOE
Al Lucier	National Council for Air and Stream Improvement
Jim Martin	Omni Tech International
Scott Mason	Phillips Petroleum Company
Bill McKean	University of Washington
Bill Nicholson	Potlatch Corporation (retired)
Lori Perine	AF&PA
Edan Prahbu	Flex Energy
Housein Shapouri	USDA OCE
Jim Simnick	BP
Bryce Stokes	USDA FS
Larry Walker	Cornell University

Attachment G

-The Energy Policy Act & Fuels– What Lies Ahead

Biomass R & D Technical Advisory Committee Meeting

March 2, 2006

Paul Argyropoulos, Senior Policy Advisor

EPA's Office of Transportation and Air Quality

Energy Policy Act of 2005 (EPAct) and EPA

- Congress has tasked EPA with a great deal.
- Key Priority Provisions for EPA and OTAQ
  - Establish a Renewable Fuel Program
    - Renewable Fuel Standard (RFS) – requires a specific volume of renewable fuel in US market (based on previous years volume of gasoline consumption [as reported by DOE/EIA]
    - Remove the oxygenate standard in Reformulated Gasoline program (RFG)
    - Mobile Source Air Toxics Rule
- Requires a host of other Provisions as well--including conducting research programs & studies, establishing grants, and completing multiple other regulatory actions to amend existing programs.

Short -Term Timeline for Fuels -Regs, Studies, Grants, Other-

0-3 months	6 months	9 months	1 year
▪ RFG PADD toxics study Report (Annual) ▪ If a report finds PADDs don't meet their average – rule to require ▪ Eliminate RFG oxygen mandate immediately for California. ▪ Commence study with FAA on impact of aircraft emissions on a/q in nonattainment areas ▪SIP-approved boutique fuels listing	▪ RFG opt-in provisions for Ozone Transport Region ▪ Consolidate VOC std for RFG North and South ▪ Study/report on experience with mobile source trading ▪ Rule to rescind ethanol RVP waiver for states that request it (EPA must act on such requests within 90 days of receipt of them) ▪ Rule for waiver for Acts of God	▪ Eliminate RFG oxygen mandate (nationwide) ▪ Rule to revise MSAT baselines to 01-02 levels ▪ Based on DOE's recommendation, EPA must waive in whole or in part the RFS program for 2006	▪ RFS program Regulations ▪ Regulations to allow commingling for limited time ▪Permeation study , report to Congress. ▪Boutique fuels study I by EPA and DOE (Report to Congress); must include legislative recommendations. ▪Air craft report w/ FAA to be completed and submitted to Congress.

Key: Rule Noted in Yellow Reports, Studies, Other in Green

Long-Term Timeline for Fuels -Regs, Studies, Grants, Other-

2006	2007	2008	2009
▪ Process State waiver requests from RFS ▪ EPA to waive in whole or part RFS program if DOE finds necessary ▪ Begin annual state by state survey to determine market shares of CG and RFG containing ethanol and submit report to Congress ▪ Administer grants: ▪ $4M/yr for Center for Biomass Based Energy (3 years) ▪ $25M/yr for renewable fuel production R&D (5 years) ▪ $110M/yr for advanced biofuel tech program (over 5 years) ▪ $36M for sugar cane ethanol program	▪ Study of health and environmental effects of substituting ETBE, other ethers and ethanol ▪ Study of boutique fuels and options (II)- with DOE ▪ Final MSAT2 rule must be promulgated no later than July 1, 2007. ▪ Rule to ensure min 25% renewable use seasonally	▪Boutique fuels study II: Fuel system harmonization study: Study/Report that EPA and DOE must produce on emissions and air quality changes due to the bill as well as update on boutique fuels. Due June 1, 2008. ▪ Small refiner extension of RFS if DOE determines hardship	▪ Anti-backsliding analysis: Study/report on emissions and air quality changes due to the bill. Draft report due in 2009; final in 2010) ▪Develop emissions model for 2007 fleet

Key: Rule Noted in Yellow Reports, Studies, Other in Green Grants in Red

Grant Programs

- Resource Center for Biomass-Based Energy ($12M – over a 3 year period)
- Renewable Fuel Production R&D grants ($125M – over a 5 year period)
- Advanced Biofuels Technology Program ($550M- over a 5 year period)
- Sugar Cane Ethanol Program ($36M)

Section 1514 of EPAct 2005

-Advanced Biomass R & D – Task Overview-

- Section 1514

(a) IN GENERAL -- **Subject to availability of appropriations** under subsection (d), the **Administrator of the EPA shall, in consultation with the Secretary of Agriculture and the Biomass Research and Development Technical Advisory Committee**, establish a program, to be know as the "Advanced Biofuel Technologies Program", to demonstrate advanced technologies for the production of alternative transportation fuels.

(b) PRIORITY – In carrying out the program under subsection (a), the Administrator shall give priority to projects that enhance the geographical diversity of alternative fuels production and utilize feedstock that represent 10 percent or less of ethanol or biodiesel fuel production in the United States during the previous fiscal year.

Section 1514 of EPAct 2005
-Advanced Biomass R & D: EPA's Tasks Continued-

- (c) DEMONSTRATION PROJECTS –

  (1) IN GENERAL – As part of the program under subsection (a), the Administrator shall fund demonstration projects –

  (A) to develop no less than 4 different conversion technologies for producing cellulosic biomass ethanol; and

  (B) to develop not less than 5 technologies for co-producing value-added bio-products (such as fertilizers, herbicides and pesticides) resulting from the production of biodiesel fuel.

  (2) ADMINISTRATION – Demonstration projects under this subsection shall be ---

  (A) conducted based on a merit-reviewed, competitive process; and

  (B) subject to the cost-sharing requirements of section 988.

- (d) AUTHORIZATION OF APPROPRIATIONS – There are authorized **to be appropriated** to carry out this section $110, 000, 000 for each of fiscal years 2005 through 2009.

Section 1514 of EPAct 2005
-Advanced Biomass R & D: OTAQ/Agency Actions-

- The OTAQs mission is to reconcile the transportation sector with the environment by advancing clean fuels and technology, and working to promote more livable communities. OTAQ is continuously investigating other fuels and technologies in accordance with this mission.

- To date, no specific funds have been appropriated. However, OTAQ is conducting general outreach and research with stakeholders to identify existing and potential technologies in the biomass industry and is entertaining a current proposal to coordinate a forum (or series of forums) to bring together industry and scientific stakeholders to gather additional technical, logistical and economic data.

- RTP/ORD Sustainability Division has ongoing work with CRADAs for using waste biomass to produce ethanol. The work is focused on the costly step of separating the EtOH after fermentation. This is under the Green Chemistry program, which loses its extramural funding in FY07.

WORK WILL CONTINUE

Key Regulatory Early Action -Removal of Oxygen Mandate in RFG-

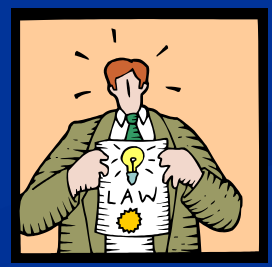
- EPAct amends the Clean Air Act to remove the oxygen mandate for RFG by May, 2006 in all federal program areas except California.
  - For California, EPAct authorized immediate revocation of the standard.

- On February 15, EPA announced action to revoke the Federal RFG oxygen requirement. That action takes effect nationwide on May 6.
  - California's is effective 60 days after the regulation's publication in the Federal Register.

On-Going Fuel-Related Implementation Actions Impacting Agency

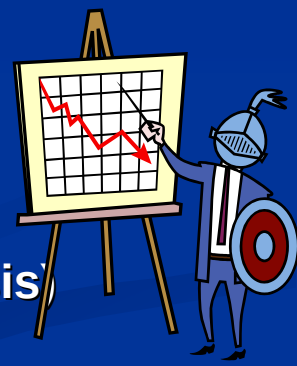
- There are several ongoing implementation actions required of EPA

- These have resource implications immediately and indefinitely into the future
  - Periodic processing of RFS waiver requests from states
  - Annual RFS evaluation/revisions
  - Process state RVP waiver rescission requests
  - State by state survey of renewable fuel use in RFG and CG



Studies, Reports, Assessments

- Fuel-related
  - Annual surveys of renewable fuel use (starts in 2006)
  - Study of permeation emissions due to the use of ethanol (within 1 year)
  - SIP-approved state boutique fuels listing (within 90 days)
  - Two separate boutique fuels studies (by 2006 and 2008)
  - Study of health effects of oxygenates (within 2 years)
  - Effect of energy bill on air quality (anti-backsliding analysis) (within 4 years)



- Not fuel-related
  - Mobile-to-stationary source credit trading assessment (within 6 months)
  - Impacts of aircraft on air quality (within 1 year)

Key Statutory Elements of the "RFS"

- **By Aug 8, 2006 EPA must promulgate regulations that ensure that gasoline (interpreted more broadly) sold in US contains applicable volume of renewable fuel**
  - 4.0 billion gallons in 2006 increasing to 7.5 billion gallons in 2012
  - EPA is required to convert the volumes into annual standards representing the percent of gasoline production using annual EIA predictions of gasoline consumption

- **The RFS standard must account for…**
  - Small refiner exemptions and participation
  - State waivers if any
  - Carryover from one year to the next (deficits and credits)

The RFS – The Basics

- EPA must promulgate regulations that ensure the use of renewable fuels
  - 2006: 4.0 billion gallons/yr
  - 2007: 4.7
  - 2008: 5.4
  - 2009: 6.1
  - 2010: 6.8
  - 2011: 7.4
  - 2012: 7.5
  - 2013+: Same percent of renewables for 2012 (0.25 billion gal of which must be cellulosic ethanol)

- Converted into percent of gasoline production
  - Based on annual EIA predictions of gasoline consumption given to EPA each Oct 31

RFS Rule Must Also…..

- Define who are the liable parties
  - Refiners/blenders/importers as appropriate
- Establish a credit trading program
  - Not every gallon of gasoline has to contain renewables
  - Not every refiner's production has to contain renewables
- Establish "appropriate" credit for different renewables
- Establish compliance assurance provisions
- Account for…
  - Deficit carryover from one year to the next
  - Small refiner exemptions and participation
  - State waivers if any

Existing RFS Compliance for 2006 -Summary of "Default Rule"-

- EPA published as a direct final rule on December 28, 2005 that Applies to 2006 only
  - Refiners, importers, and gasoline blenders held responsible collectively; no individual liability
- 2.78% of all gasoline (interpreted more broadly) nationwide must contain renewable
  - ~4.0 billion gallons of which both Ethanol and biodiesel count
- If 2.78% is not met, the deficit would carry over to the RFS requirement for 2007
  - However, expect far greater than 4.0 billion in 2006
    - >4.0 billion gallons was already used in 2005
- Since no adverse comments were received, it went into effect on February 28, 2006

2007+ RFS Rule
-Under Development-

- Normally a 2+ year process for a major rule – Proposal to Final
- Planning to accelerate the process for RFS
  - Proposal in late summer/early fall 2006
  - Final rule in early 2007
- Only possible if broad stakeholder consensus on the proposal
- Key effort is the design of the credit program
  - What is a credit?
  - Who can generate credits and how are they generated?
  - How are credits traded (how will the market work)?
  - What are the “appropriate” credits for non-ethanol renewables?
- Rule development also requires regulatory impact analyses
  - Economic impacts
  - Environmental impacts
  - Energy impacts

Potentially Qualifying Renewable Fuels

- Ethanol
  - Corn
  - Other Starches
  - Cellulose
  - Sugar
- Biodiesel (ester) and Renewable Diesel
  - Veg Oils and Animal Fats
- Biocrude
  - Veg Oils and Animal Fats
- ETBE
- CNG, Fischer-Tropsch diesel/gasoline, MTBE, Methanol
  - Biogas
  - Biomass gasification
  - Sewage plant
- Others…

Stakeholder Input Ongoing

- Gathering input from all key stakeholders
  - Refiners
  - Renewable producers
    - Ethanol
    - Biodiesel / Renewable Diesel
    - Other possible renewables
  - Distributors and Marketers
  - Agricultural interests
  - DOE
  - Environmentalists
  - Others…….

- Working to develop a program with broad based consensus

Guiding Principles for the RFS Program Structure

- All qualified renewable fuels must be able to participate
- Not require changes to the current business practices for production, distribution, trading, and use of ethanol/biodiesel
- Every gallon of renewable is counted, with no double-counting
- Credit generation, ownership, and trading mechanisms are clear and consistent year to year
- Simple in design and implementation
- No new grades of gasoline
- Minimize economic and other impacts on consumers

Thank You

For More Information...

Web pages:

www.epa.gov/otaq/renewablefuels/index.htm

Paul Argyropoulos
(202) 564-1123
argyropoulos.paul@epa.gov

Attachment H

What is the roadmap

- The Biomass R&D Act of 2000 called for the USDA and DOE to jointly carry out a biomass research and development initiative in the areas of biofuels and bioproducts.
- It also established the Biomass R&D Technical Advisory Committee to advise on the technical program.

Roadmap continued

- In 2001 the USDA and DOE requested that the TAC develop a vision and roadmap
- In October of 2002 the committee released its vision statement
- By December of 2002 the roadmap was released to outline the R&D and policies needed to meet the vision goals
- These documents have been used as guidance for R&D by the DOE and USDA

Roadmap Update Process

- Roadmaps will be planned by Regional Chairs with BCS/DOE support
- Roadmaps will incorporate regional experts pertaining to the Roadmap categories: Feedstocks, Processing and Conversion, Product Uses and Distribution, Public Policy
- Workshops will be facilitated by BCS

Regional Roadmap Workshops

- Update Roadmap language
- Incorporate New federal/state activities
  - Renewable Fuels Standards
    - Produce 7.5 million gallons of ethanol by 2012
  - Biofuels Initiative
    - Decrease cost to $1.04 per gallon of ethanol by 2010
    - Displace 40 million gasoline equivalent gallons by 2030
- Revisit path towards achieving Vision Goals
- Invitation only with regional experts

Roadmap Timeline

- Midwest Regional Roadmap
  - Chair: Tom Binder, ADM
  - Chicago, IL, April 11-12, 2006
- West Regional Roadmap
  - Ralph Cavalieri, Washington State
  - Sacramento, CA, August 8-9, 2006
- East Regional Roadmap
  - Douglas Hawkins, Rohm & Haas
  - New York, Fall 2006

Roadmap Process

- Roadmaps will be planned by Regional Chairs with BCS/DOE support
- Roadmaps will incorporate regional experts pertaining to the Roadmap categories: Feedstocks, Processing and Conversion, Product Uses and Distribution, Public Policy
- Workshops will be facilitated by BCS

Midwest Roadmap process

- Midwest Roadmap for Biomass Technologies in the United States will be held April 11-12, 2006 in at Argonne National Labs in Chicago, Illinois
- Thomas P. Binder will chair this session
- Experts in the areas of feedstock production, processing & conversion, product uses and policy will be present

Roadmap update cont.

- Experts will be call from government, academia, and industry
- Format will be: A Facilitated brainstorming session leading to a structured discussion to organize paths forward
- Several of the experts present will keep track of the discussion to make sure no nuances are missed

Roadmap update cont.

Feedstocks

- Where are we today? Current status of Feedstocks and related technologies and practices.
- Where do we want to be? Long-term objectives ...
- How do we get there? Near, mid, and long-term strategies

Roadmap update cont.

- Session II: Processing and Conversion
  - Where are we today? Current status of Processing and Conversion and related technologies and practices.
  - Where do we want to be? Long-term objectives …
  - How do we get there? Near, mid, and long-term strategies.

Roadmap update cont.

- Session III: Products Uses and Distribution
  - Where are we today? Current status of Products Uses and Distribution and related technologies and practices.
  - Where do we want to be? Long-term objectives …
  - How do we get there? Near, mid, and long-term strategies.

Roadmap update cont.

- Session IV: Public Policy Measures to Support Biomass Development
  - Where are we today? Current status of Public Policy and related technologies and practices.
  - Where do we want to be? Long-term objectives …
  - How do we get there? Near, mid, and long-term strategies.

Midwest Roadmap Attendees thus far

- Dr. Don Riemenschneider, USDA Forest Service
- Wally Wilhelm, USDA-ARS/U of Nebraska
- Oliver Peoples, Metabolix
- Dr. Rod Bothast, SIUE Corn to Ethanol Facility
- Tom Jeffries, UW/USDA FPL
- Glenn Kimball, ADM
- Jill Euken, Iowa State Univ.
- Darwin Brewster, ADM
- Steve Heilmann, 3M
- Erin O'Driscoll, Dow or substitute
- Seth Snyder, ANL
- Bala Subramaniam, CEBC, KU
- Kimberly Magin, Monsanto
- Neil Rossmeissl, DOE
- Al Vasys, Sentec
- Ken Green, BCS
- Mike Manella, BCS
- Harriet Foster, BCS

Attachment I

BIOMASS RESEARCH & DEVELOPMENT INITIATIVE

Biomass R&D Technical Advisory Committee

Policy Subcommittee

March 2-3, 2006

BIOMASS RESEARCH & DEVELOPMENT INITIATIVE

Policy Subcommittee Members

- Jim Barber, CEO of Metabolix
- Ralph Cavalieri, Director of the College of Agricultural Research at Washington State University
- Bob Dinneen, President of the Renewable Fuels Association (RFA), represented by Larry Schafer
- Carolyn Fritz, CEO of Allylix, an early-stage biotechnical firm
- Doug Hawkins, Program Director of Green Chemistry at Rohm and Haas.
- Terry Jaffoni, formerly of Cargill, now of Clean Fuel Technology
- Scott Mason, Director of Business Development at Conoco-Phillips, a petroleum firm
- Dr. Edwin White, Dean of Research at the Environmental Science and Forestry Department at the State University of New York at Syracuse
- Larry Pearce, Assistant Director, Planning and Research, Governors' Ethanol Coalition
- Jack Huttner, Vice President, Commercial & Public Affairs, Danisco/Genencor

BIOMASS RESEARCH & DEVELOPMENT INITIATIVE

Policy Subcommittee Goals

- Identify & Analyze Effective Policies
  - What has worked?
- Communicate Committee's Policy Goals
  - Media, Capitol Hill, reports, etc.
- Model Biomass Policies after other successful Policy efforts
  - Solar and Clean Coal

BIOMASS RESEARCH & DEVELOPMENT INITIATIVE

Identify Policies

- 2002 Farm Bill
  - Biobased Products
  - Grants and Loans

- Energy Policy Act of 2005 (EPAct 2005)
  - Incentives
  - Renewable Portfolio Standards
  - Biofuels Production/ Fueling stations
  - Renewable Electricity Standards

BIOMASS RESEARCH & DEVELOPMENT INITIATIVE

2002 Farm Bill

- Federal procurement of biobased products
  - Establishes a new program for purchase of biobased products by Federal agencies, modeled on the existing program for purchase of recycled materials. A voluntary biobased labeling program is included. Mandates funding of $1 million annually through the Commodity Credit Corporation (CCC) for fiscal years (FY) 2002-07 for testing biobased products.

- Biorefinery grants
  - Establishes a competitive grant program to support development of biorefineries to convert biomass into multiple products such as fuels, chemicals, and electricity.

BIOMASS RESEARCH & DEVELOPMENT INITIATIVE

2002 Farm Bill

- Biodiesel Fuel Education Program
  - Establishes a competitive grant program to educate government and private entities with vehicle fleets, as well as the public, about the benefits of biodiesel fuel use. Program is funded at $1 million annually through the CCC for FY 2003-07.

- Energy Audit and Renewable Energy Development Program
  - Authorizes a competitive grant program for entities to administer energy audits and renewable energy development assessments for farmers, ranchers, and rural small businesses.

BIOMASS RESEARCH & DEVELOPMENT INITIATIVE

2002 Farm Bill

- Renewable energy systems and energy efficiency improvements
  - Establishes a loan, loan guarantee, and grant program to assist eligible farmers, ranchers, and rural small businesses in purchasing renewable energy systems and making energy efficiency improvements. Provides CCC funding of $23 million annually for FY 2003-07.

- Hydrogen and fuel cell technologies
  - The Secretaries of Agriculture and Energy are directed to enter into a memorandum of understanding regarding hydrogen and fuel cell technology applications for agricultural producers and rural communities. The Secretary of Agriculture is required to disseminate information on these technologies to agricultural producers and rural communities.

BIOMASS RESEARCH & DEVELOPMENT INITIATIVE

2002 Farm Bill

- Biomass Research and Development Act
  - Extends the termination date to September 30, 2006. Provides $5 million of CCC funds for FY 2002 and $14 million annually for FY 2003-07. (Sunset eliminated by EPAct 2005 and funds reauthorized)

- Bioenergy Program
  - Reauthorizes program and broadens the list of eligible feedstocks to include animal byproducts and fat, oils, and greases (including recycled fats, oils, and greases). The Secretary is required to use up to $150 million annually for FY 2003-06.

BIOMASS RESEARCH & DEVELOPMENT INITIATIVE

2002 Farm Bill

- Renewable Energy Development Loan and Grant Program
  - Business and industry loans and guarantees will be allowed for more types of renewable energy systems, such as wind energy systems and anaerobic digesters.
  - Business and industry loan provisions are covered in Title VI.

BIOMASS RESEARCH & DEVELOPMENT INITIATIVE

EPAct 2005

Incentives: Power

- The Energy Production Tax Credit (PTC)
  - $0.19/kWh (Includes Biomass)

Incentives: Fuels

- Biodiesel VEETEC Tax Credit
  - Agri-biodiesel - $1.00/gal
  - Biodiesel – $0.50/gal
  - Renewable Diesel - $1.00/gal

BR&Di
BIOMASS RESEARCH & DEVELOPMENT INITIATIVE

EPAct 2005

Incentives: Fuels

- Federal Excise Tax Exemption
  - Ethanol: $0.06/gal
- Small Ethanol/Biodiesel Producer Credit
  - Production income tax credit - $0.10/gal
  - Raised eligibility up to 60 million gallons/yr
    Capped at $1.5 million

BIOMASS RESEARCH & DEVELOPMENT INITIATIVE

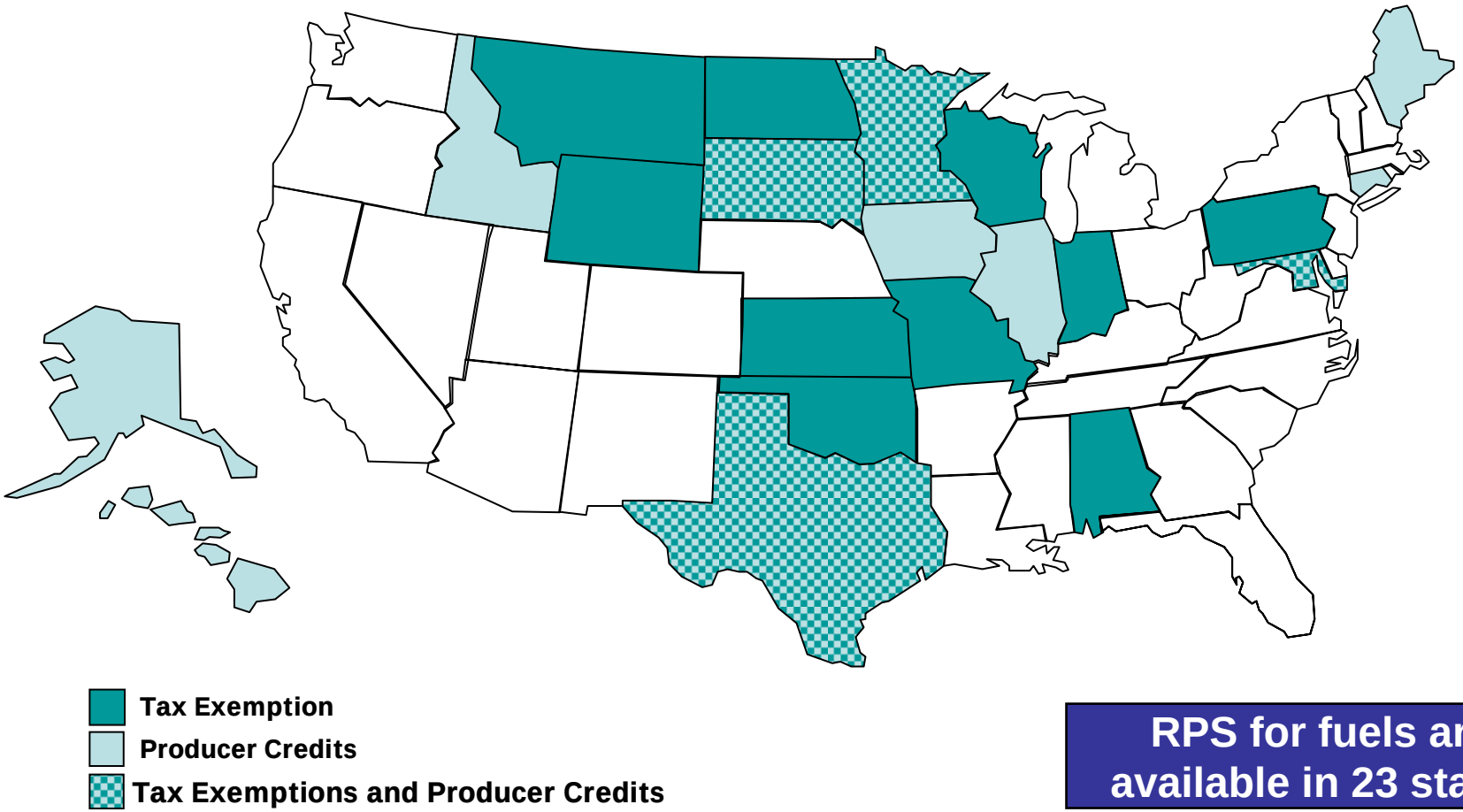
EPAct 2005

Incentives: Fuels

- Income Tax Credit for E85 and B20 Infrastructure
  - Claim a 30% (up to $30,000) credit for the cost of installing clean-fuel vehicle refueling property to be used in a business or trade of the taxpayer or installed at the principle residence of the taxpayer.
- Provisions
  - Increases the amount of biofuel(usually ethanol) that must be mixed with gasoline sold in the United States to TRIPLE the requirement (*7.5 billion gallons by 2012*).

BIOMASS RESEARCH & DEVELOPMENT INITIATIVE

Renewable Portfolio Standards - Fuels

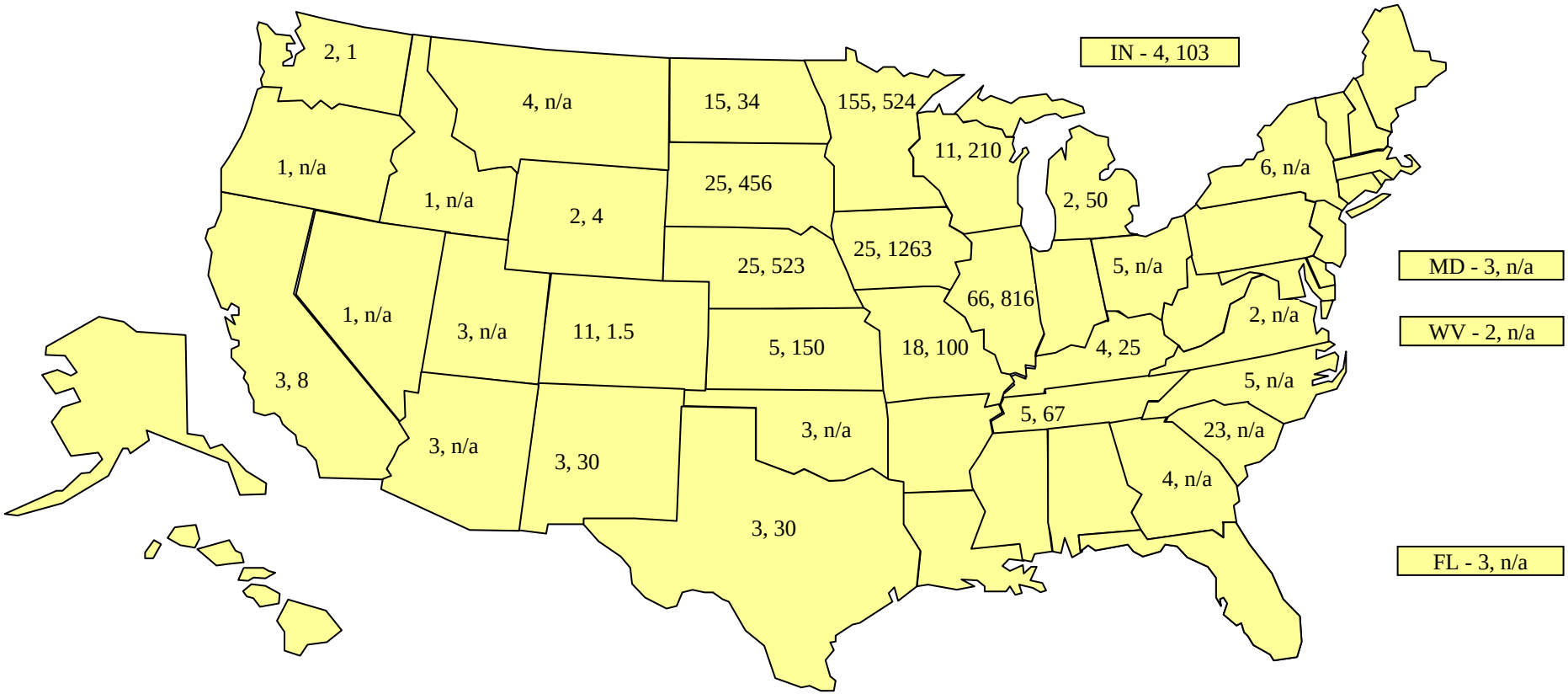


RPS for fuels are available in 23 states

National Conference of State Legislatures: http://www.ncsl.org/programs/energy/ethinc.htm

BIOMASS RESEARCH & DEVELOPMENT INITIATIVE

Ethanol Renewable Fueling Stations



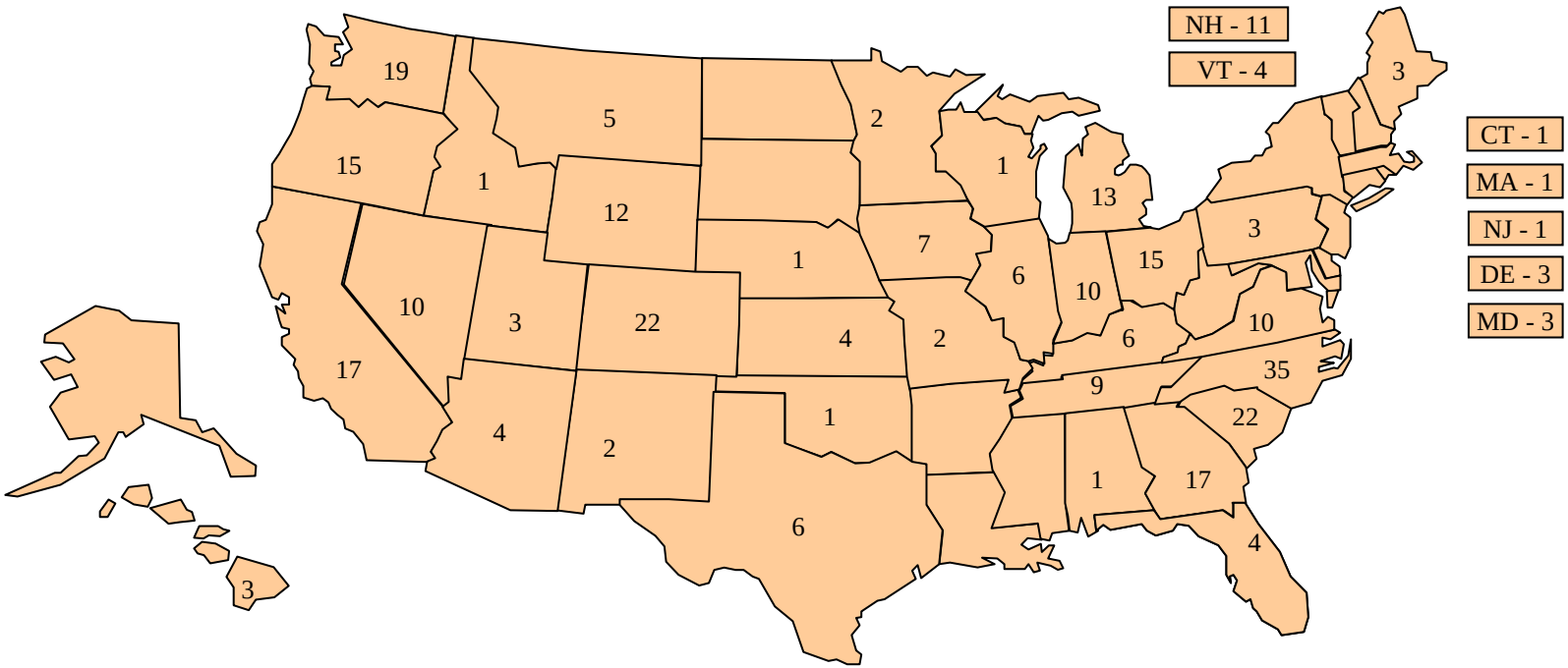
453 Ethanol Fueling Stations

Number of E-85 fueling stations, Million gallons of ethanol produced/year

EERE Alternative Fuels Data Center: http://www.eere.energy.gov/afdc/infrastructure/station_counts.html
RFA Ethanol Industry Outlook 2005: http://www.ethanolrfa.org/objects/pdf/outlook2005.pdf

BIOMASS RESEARCH & DEVELOPMENT INITIATIVE

Biodiesel – Renewable Fueling Stations

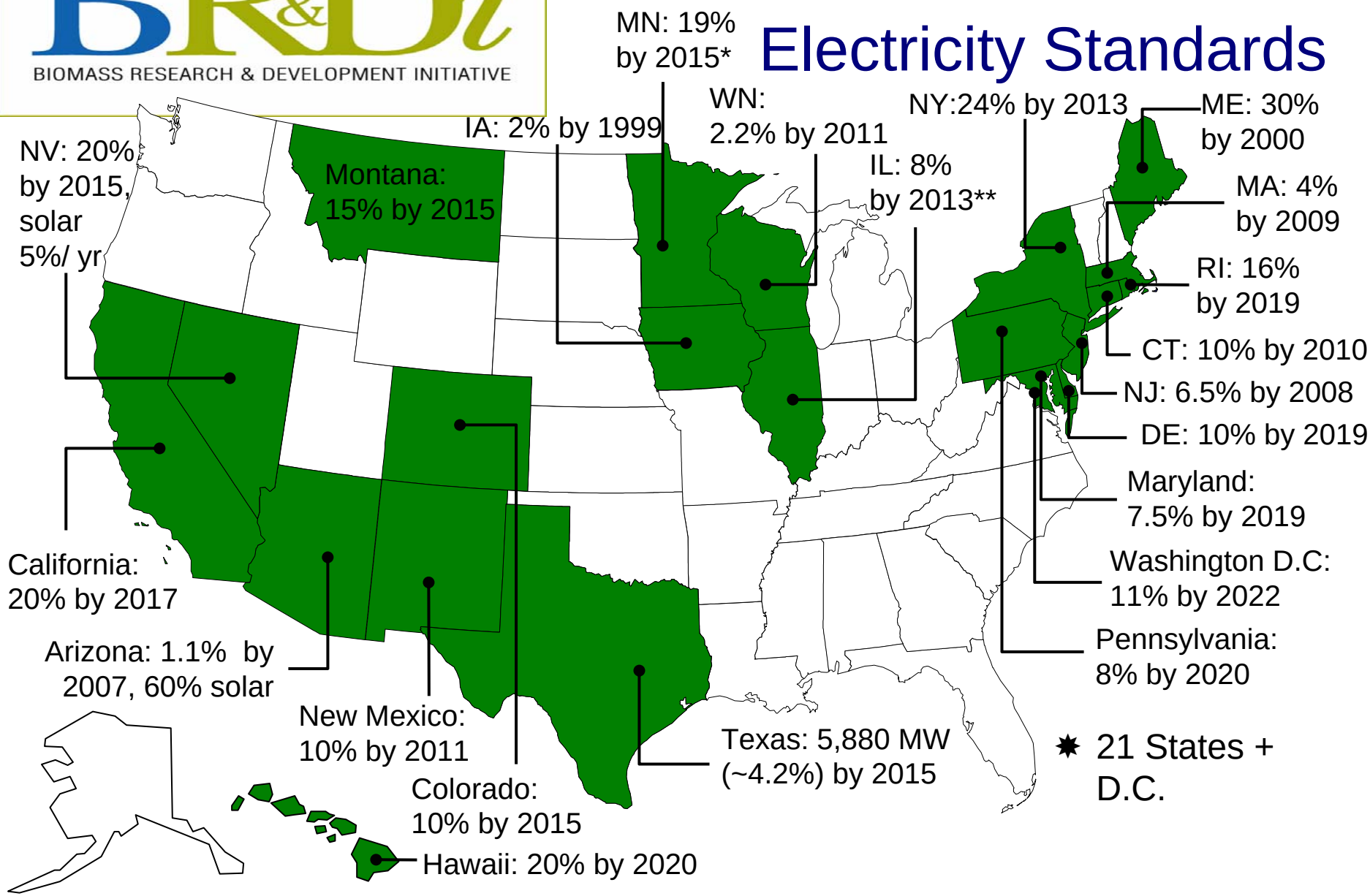


315 Biodiesel Fueling Stations

EERE Alternative Fuels Data Center: http://www.eere.energy.gov/afdc/infrastructure/station_counts.html

BIOMASS RESEARCH & DEVELOPMENT INITIATIVE

Renewable Electricity Standards



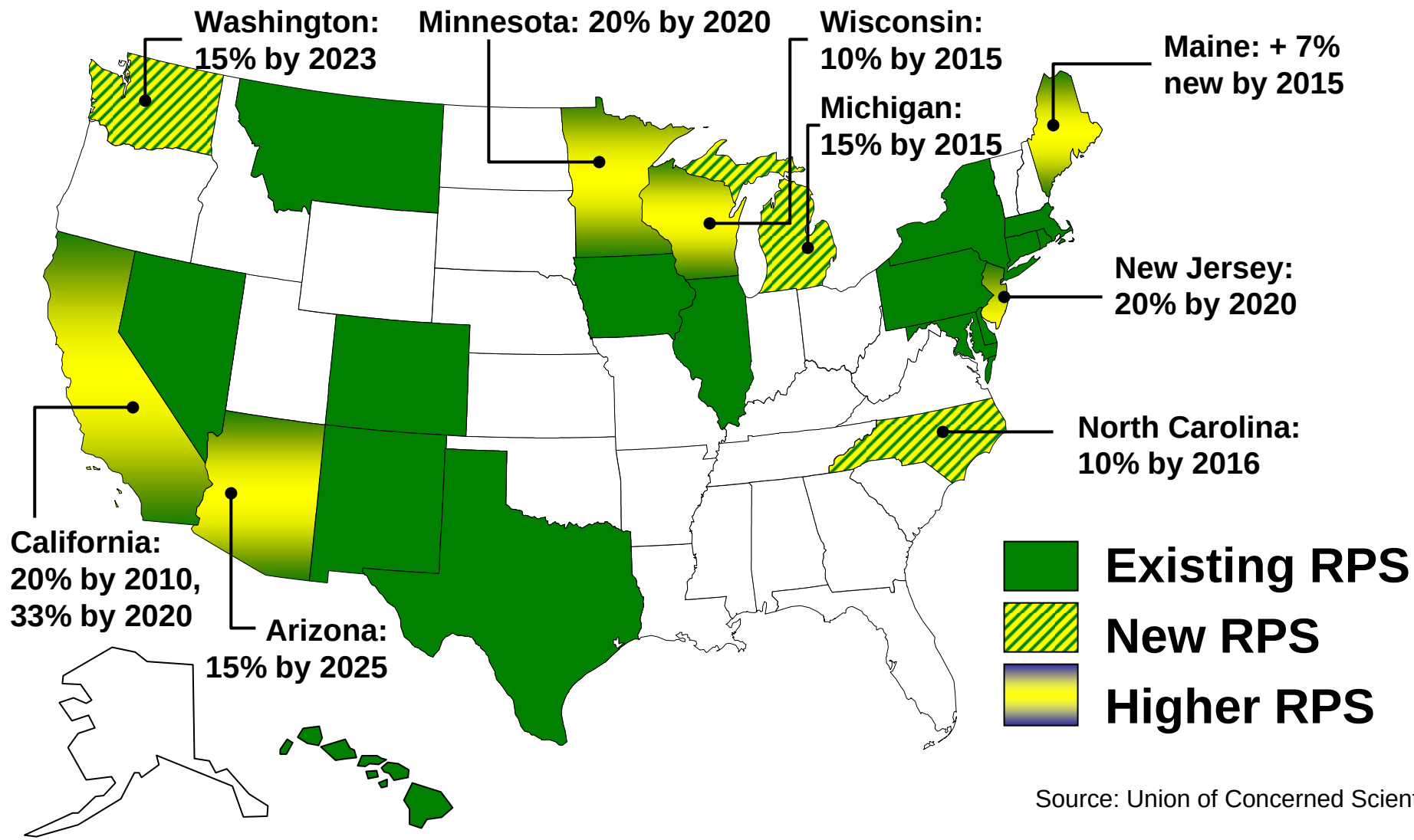
Source: Union of Concerned Scientists

*Includes requirements adopted in 1994 and 2003 for one utility, Xcel Energy.

**No specific enforcement measures, but utility regulatory intent and authority appears sufficient

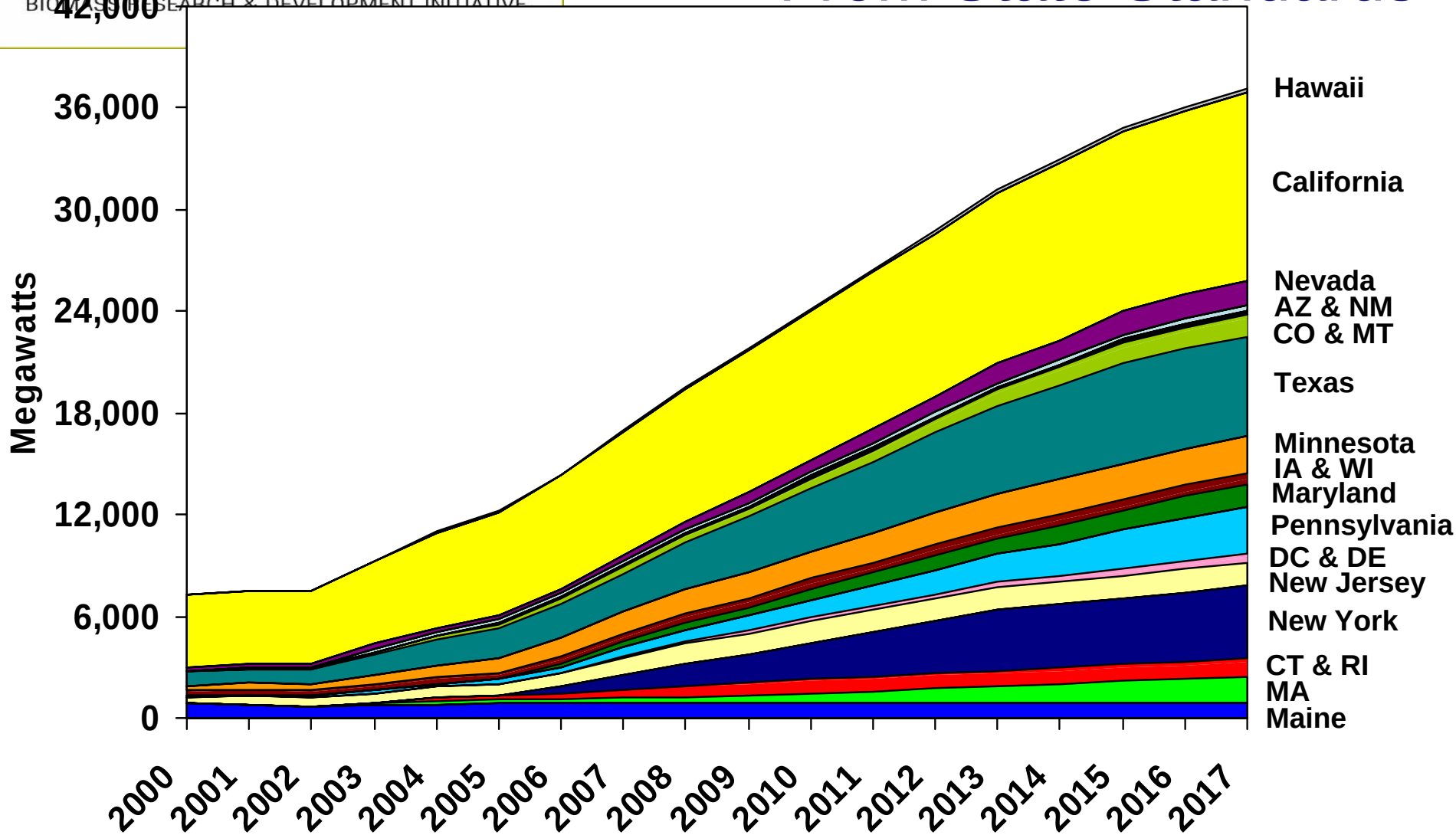
BR&Di
BIOMASS RESEARCH & DEVELOPMENT INITIATIVE

Renewable Electricity Standards



Source: Union of Concerned Scientists

Renewable Energy Expected From State Standards*

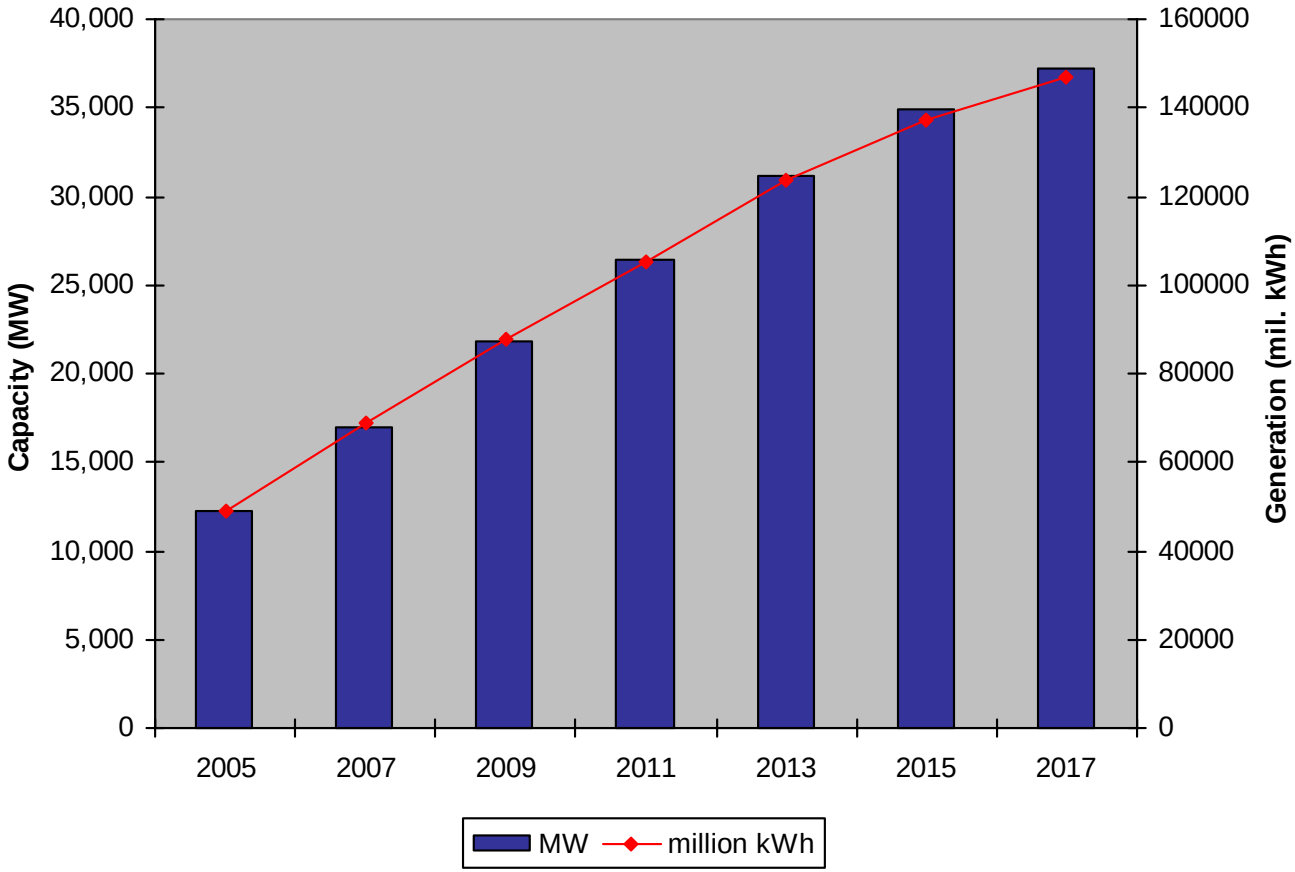


***Projected development assuming states achieve annual RES targets.**

Source: Union of Concerned Scientists

BIOMASS RESEARCH & DEVELOPMENT INITIATIVE

RPS Impact on Generation and Capacity



- **Represents 2% of AEO projected electricity generation in 2010, 3% in 2017.**
- **4 states account for 62% of RPS capacity & generation: California, Minnesota, New York, and Texas**

Source: based on Union of Concerned Scientists October 2005 data and analysis of individual state RPS

Attachment J

Analysis Subcommittee

March 2nd, 2006

NREL

Analysis Subcommittee – Members

- Ralph Cavalieri
- Doug Hawkins
- John Hickman
- Gary Pearl*
- Del Raymond
- Edwin White

*Pending membership renewal, November 2005 term

Analysis Subcommittee – Potential Goals

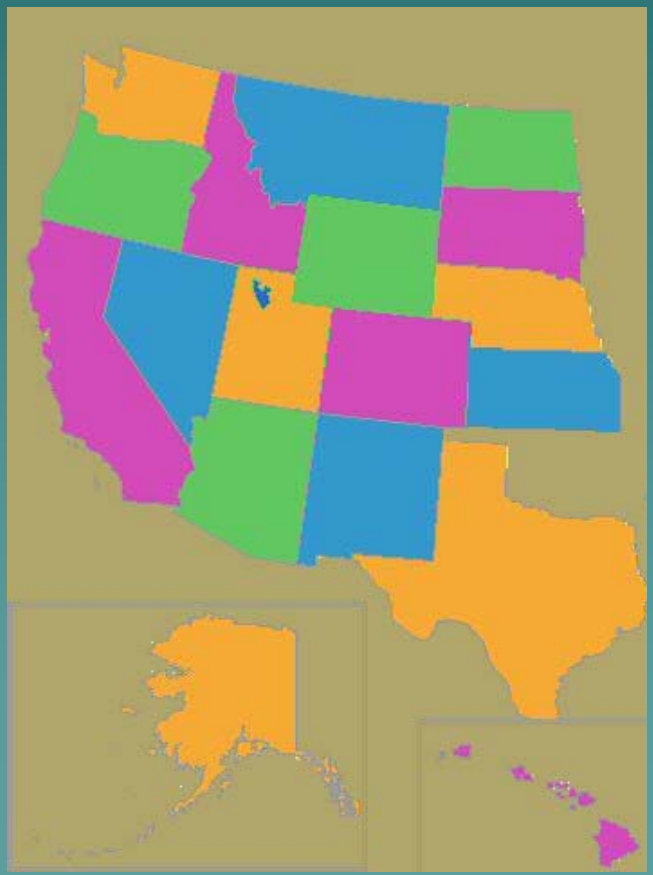
- Review the Analysis Plan
- Prioritize the list of analysis documents (for review)
- Identify out-dated assumptions that should be revisited
- Identify gaps in the existing analyses
- Participate where appropriate (to be defined on a personal basis) in the review of OBP analysis documents

Attachment K

Western Region Biomass Program

Gayle F. Gordon
Western Governors' Association
March 3, 2006

Western Governors' Association



Mission

- WGA addresses important policy and governance issues in the West, advances the role of the Western states in the federal system, and strengthens the social and economic fabric of the region.

- WGA develops policy and carries out programs in the areas of natural resources, the environment, human services, economic development, international relations and state governance.

- WGA acts as a center of innovation and promotes shared development of solutions to regional problems

Western Region Biomass Program

Increase Use of Bioenergy and Biobased Products In the West

Meeting Western Public Policy Goals:

Clean and Diversified Energy

Rural Economies

Healthy Forests

Transportation Energy

National Biomass Partnership

- Mission Statement: Facilitate the increased use of BioEnergy and BioBased Products through coordinated federal, regional and state technical assistance and educational outreach programs.
- Two primary components:
  - Five (5) regional programs serve as conduit to states
  - National coordination and information exchange
- Partnership “Principals Committee” established to better ensure coordination and communication among all participants.

Regional Organizations

- **Great Lakes**: Council of Great Lakes Governors (Chicago)
- **Northeast**: Coalition of Northeastern Governors- Policy Research Center (Washington, D.C.)
- **Pacific**: DOE Western Regional Office (Seattle)
- **Southeast**: Southern States Energy Board (Norcross, GA)
- **West**: Western Governors' Association (Denver)

Western Region Funding

FFY 2003:	$ 661,858
FFY 2004:	435,997
FFY 2005:	702,510
Total……	**$1,800,365**

Biomass Regional Partnership
Metrics Project

- Measure impact of the Regional Biomass Partnerships in terms of acceptance and deployment of biomass technologies

- Methodology: Four Metrics
  - State Policies Favorable to Biomass
  - Increased BioEnergy Awareness
    - University curricula
    - Private or public training programs
  - Leveraging Federal Funding and State Resources
  - Increased BioEnergy Development Intensity

- All 5 regions investigated – West, Northwest, Great Lakes States, Southeast, Northeast

Metrics Project – Western Region

From 2003 to 2004

Western Region Biomass Program

New Mexico:

Bioenergy for Public Buildings

- **Evaluate appropriate operations sizing**
- **Evaluate State policy and incentives**

Activity

Western Region Biomass Program

Colorado:

Biomass Utilization in Colorado

- **Biomass supply study**
- **Education, training, and outreach**
- **Technical assistance for facility heating projects**
- **Interest survey of potential co-firing industrial users**

Activity

Western Region Biomass Program

South Dakota:

Biomass Use as a Heating Source for Schools and Other Public Buildings

- **Contracting with Biomass Energy Resource Center**
- **Feasibility study of facilities in Black Hills**

Activity

Western Region Biomass Program

Arizona:
Facilities Wood Burner Feasibility Assessment

- **Studying feasibility of using pellets and/or chips for heating and/or cooling systems**
- **Use of biomass from healthy forest projects**

Activity

Western Region Biomass Program

California:

Biofuel Technology Development in CA: Charting an Effective Course

- **Evaluate current biofuels**
- **Identify candidate future technologies**
- **Develop a course for future development**

Feasibility of Biomass Energy Production to Support Local Water Self-Sufficiency

Activity

Western Region Biomass Program

California and Nevada:

Reno/Tahoe Biomass Supply/Demand

•Study barriers/constraints to "utility" scale and locally owned biomass power development

Activity

Western Region Biomass Program

Nevada:

Nevada Biomass Conservation Partners Strategic Plan, Public Education and Outreach Program and Statewide Workshops

Activity

Western Region Biomass Program

Nebraska:

Life cycle Bioenergy and Environmental Impact Software

Activity

Western Region Biomass Program

Utah:

Woody Biomass Utilization and Outreach

Activity

Western Region Biomass Program

North Dakota:

Outreach

State-wide Bioenergy Policy

Activity/Policy

Western Region Biomass Program

Wyoming:

Establishing the Wyoming Bioenergy Partnership

Policy

Western Region Biomass Program

Outreach:

- **Northern Rockies Regional Woody Biomass Conference**
- **National Bioenergy and Wood Products Conference**

Western Governors' Association - CDEAC

Clean and Diversified Energy Initiative

- Vision Statement:
  Identify ways to increase the contribution of renewable energy, energy efficiency, and clean energy technologies within the context of the overall energy needs of the West

- Key Goal:
  30,000 MW of clean energy in the West by 2015
  (from solar, wind, geothermal, **biomass**, clean coal, advanced natural gas)

WGA Policy Resolution 04-14

Biomass to Markets

Creating an Environment Conducive to Bioenergy Development

Feedstocks

Build infrastructure to move raw feedstocks to new bioenergy projects

Streamline interconnection for distributed biomass developers

Interconnection

BioPower, BioFuels, BioProducts

Create incentives to make the switch

Consistent permitting rules that recognize all biomass benefits

Permitting

Contracts

Power contracts that reflect distributed, long-term benefits

CDEAC - Biomass Task Force

- Determine biomass power generation cost and capacity achievable by 2015

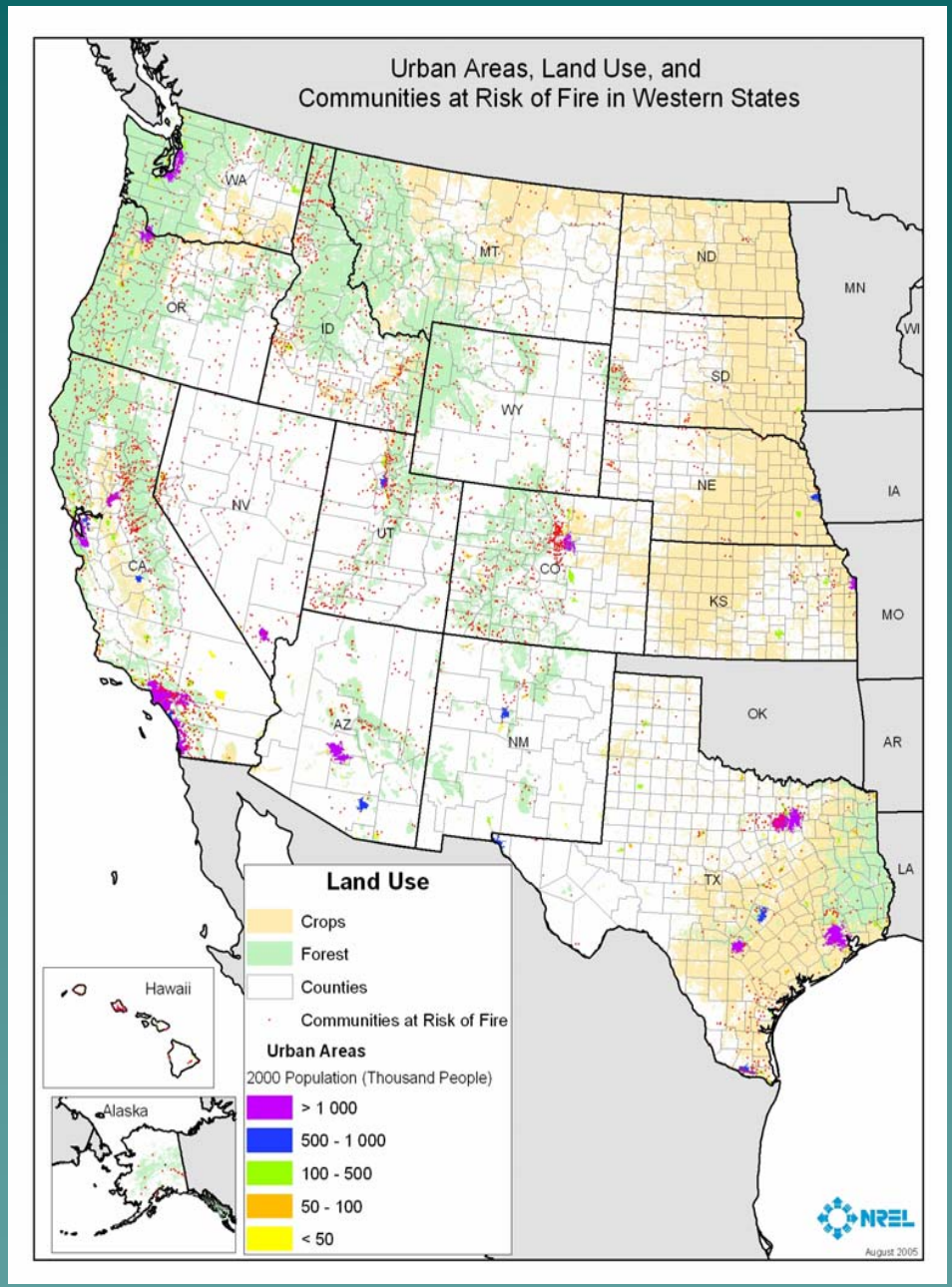
→ 10,000 MW/yr @ 8¢/kWh from biomass by 2015

- Estimate location of lowest cost biomass and transmission costs

→ biomass is a distributed resource – power generation near end of transmission line will provide grid support and relieve strain on grid capacity

- Identify associated benefits & risks

→ environmental benefits worth $8 billion/yr, plus additional economic and employment benefits



Synergies

Fire Risk Reduction

Rural Economic Growth And Preservation

Distributed Resources

Productive Use of Byproducts

Western Biomass Resources and Technologies

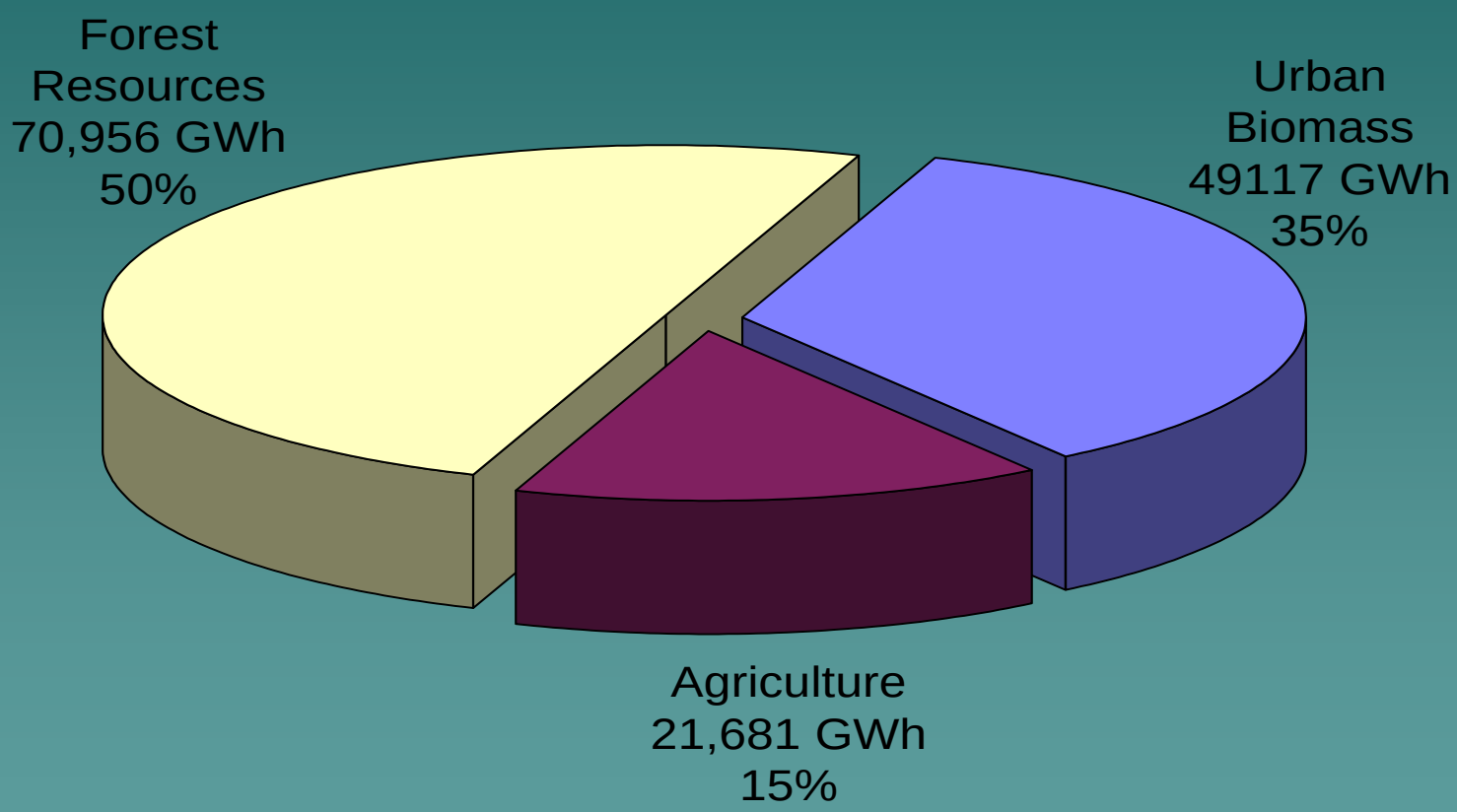
FEEDSTOCKS

- Forest Resources
  - Unused logging slash
  - Primary mill residues
  - Forest fuels treatment biomass
    - Timberland
    - Other forest land
- Agricultural Resources
  - Crop Residues
  - Manure Biogas
  - Energy Crops
- Urban Resources
  - Biomass recovered from solid wastes
  - Biosolids
  - Landfill gas
  - Biogas from waste-water treatment plants

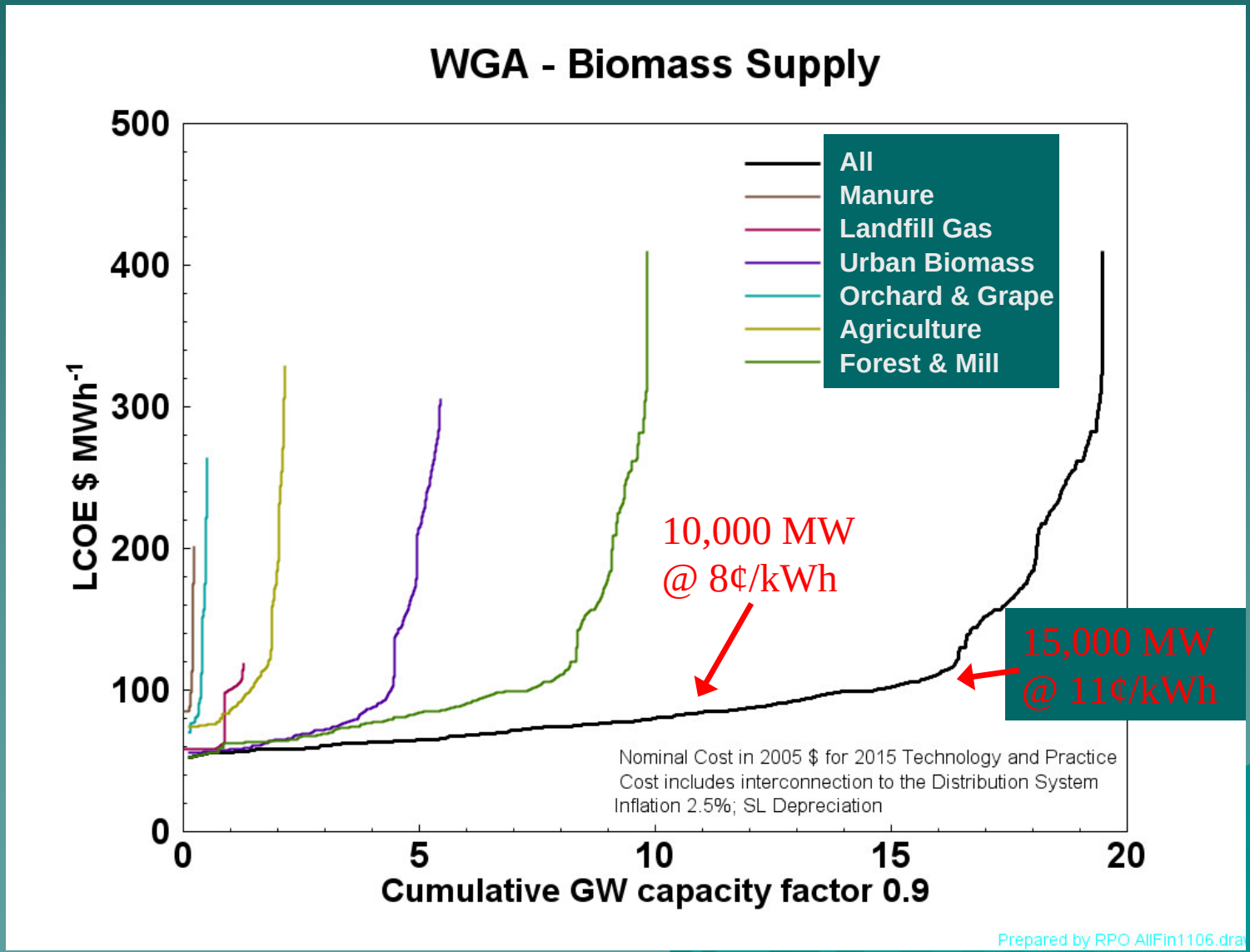
POWER Technologies

- Direct Fired/Steam Turbine
- Biomass Cofired in Fossil Fuel Power Plants
- Gasifier/IC Engine
- Gasifier/Combined Cycle
- Gasifier/Gas turbine and cogeneration
- Biogas IC Engines and Microturbines
- Biogas Fuel Cells

Biomass Resources by 2015



Biomass Fuel Supply – Cumulative



Recommendations

- Number 1: Achieve Tax Parity Among Renewable Technologies
- Number 2: Strengthen Federal Land Management Policies To Allow Larger, Longer Restoration Projects
- Number 3: Environmental Benefits Of Biomass Should Be Paid For By Beneficiaries
- Number 4: Demonstrate State Government Leadership By Purchasing Power/RECs from Biomass Projects and by Supporting Biomass RD&D
- Number 5: Recognize Value of Firm Capacity in Renewable Purchase Programs

Yellow Indicates Biomass Unique Recommendations

Recommendations

- Number 6: Renewable Energy Credits Should Not Include Ancillary Environmental Benefits
- Number 7: Establish a Single Definition of Biomass
- Number 8: Revise Utility Interconnection Policies
- Number 9: Provide Long-Term Certainty for Biomass Programs
- Number 10: Consider Avoided Fuel Based Emissions When Issuing Air Quality Permits

Unanswered Questions and Future Work

- What is the likely mix of products in 2015 and beyond
  - Power
  - Heat
  - Transportation fuels
  - Bio-based chemicals/products
- What integrated set of BioEnergy policies will achieve the greatest market penetration by 2015

Please visit the WGA website for more information:

www.westgov.org

Attachment L

Clean and Diversified Energy Initiative

WESTERN GOVERNORS' ASSOCIATION

Biomass Task Force Report

Executive Summary
January 2006

Western Governors' Association
Clean and Diversified Energy Initiative

Biomass Task Force Report

Executive Summary

The Western Governors' Association's Clean and Diversified Energy Advisory Committee (CDEAC) commissioned this task force report in February 2005. Members of the Task Force are listed below. This is one of several task force reports presented to the CDEAC on December 8, 2005 and accepted for further consideration as the CDEAC develops recommendations for the Governors. While this task force report represents the consensus views of the members, it does not represent the adopted policy of WGA or the CDEAC. At their Annual Meeting in June, 2006, Western Governors will consider and adopt a broad range of recommendations for increasing the development of clean and diverse energy, improving the efficient use of energy and ensuring adequate transmission. The CDEAC commends the Task Force for its thorough analysis and thoughtful recommendations.

Members of the Biomass Task Force

Ed Gray (Co-chair)	Antares Group Inc.
David Hallberg (Co-chair)	E3 Bio Fuels LLC (CDEAC member)
Gayle Gordon	National Biomass State & Regional Partnership
Butch Blazer/Kim Kostelnik	New Mexico Forestry Division
Drew Bolin/Olga Erlich	CO Governor's Office of Energy Management and Conservation
Bill Carlson	USA Biomass Power Producers Alliance
Craig Cox	Western Business Coalition for New Energy Technologies
Rob Davis	Future Forests LLC
Scott Haase	McNeil Technologies
Dick Hayslip/Jerald Hunter	Salt River Project
Ward Huffman	U.S. Department of Energy
Bryan Jenkins	UC Davis / CA Biomass Collaborative
Jay Jensen	Western Forestry Leadership Coalition
Jim Kerstetter	NM Governor Clean Energy Dev. Council - Biomass Task Force
Ken Krich	California Institute for Energy and Environment
Ravi Malhotra	International Center for Appropriate and Sustainable Technology
Tad Mason	TSS Consultants
Gregg Morris	Green Power Institute
Richard Nelson	Kansas State University
Ralph Overend	National Renewable Energy Lab
Marcia Patton-Mallory	United States Department of Agriculture Forest Service

Marc Rappaport	Oregon State Senator Vicki Walker
Phil Reese	California Biomass Energy Alliance / Colmac Energy
John Stewart	U.S. Department of the Interior
Scott Q. Turn	Hawaii Natural Energy Institute University of Hawaii
Chris Wentz	NM Energy Conservation & Mgmt Division
Ed Wheeless	Sanitation District of Los Angeles County

Facilitator

Will Singleton	The Keystone Center

Quantitative Working Group

The quantitative working group was created by the CDEAC to compare the analysis of data among task forces in order to ensure consistency in assumptions across the reports. The following members contributed to this report:

Doug Arent	National Renewable Energy Laboratory
John Tschirhart	Department of Economics, University of Wyoming
Dick Watson	Quantitative Working Group

Biomass as an energy resource has the potential to supply 15,000 MW of electricity to the Western states by the year 2015. At a production cost of 8 cents per kWh, 10,000 MW could be provided. Biomass can supply a constant, distributed, and economic energy supply that is renewable, and that provides important and unique ancillary environmental benefits while the resource is being utilized productively. Examples of these benefits include reduced risks of destructive wildfires, reduced consumption of landfill capacity, and air quality benefits due to reductions in open burning of agricultural and forest residues. In addition, the use of biomass as an energy resource actually reduces greenhouse gas emissions associated with the other dispositions of the material, and contributes to improved public health and stable rural economies. This report's analysis shows that governors can have a tremendous positive impact on the region's energy supply, transmission capacity, and economic health by implementing a few realistic policy recommendations.

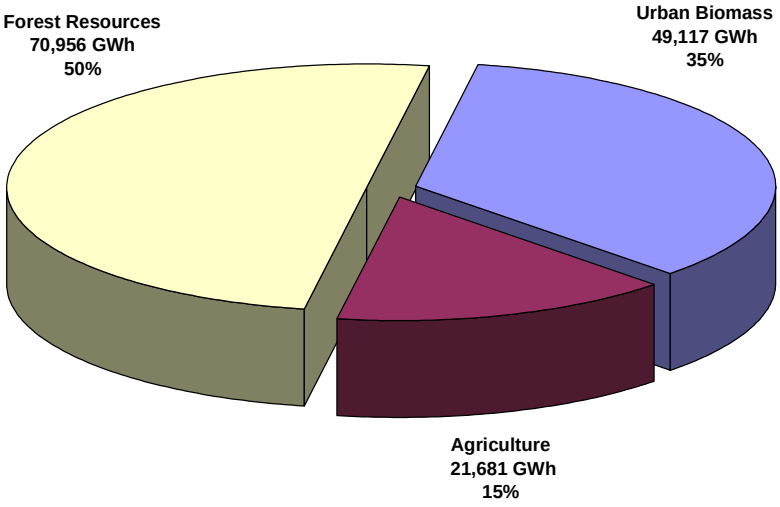
By providing a productive use for biomass residues that have no higher valued use, biomass energy production promotes environmental improvement, provides valuable rural employment and economic development opportunities, and contributes to creating healthier and more fire resilient forests. Biomass energy production makes substantial contributions to reducing greenhouse gas emissions by shifting the proportion of carbon emissions associated with biomass cycling away from more climate active forms, and by protecting forest biomass from destructive wildfires. The 10,000 MW biomass estimate by 2015 would provide for the diversion of roughly 72 million bdt per year of residues from landfill burial, open burning, and accumulation as forest overgrowth. These uncompensated benefits are worth more than $ 8 billion annually (base on 11 ¢ / kWh).

Supported analysis in this paper shows that substantial electrical power can be produced for the prescribed cost by the year 2015. Analysis also shows that if benefits are taken into account, the costs of using biomass energy (as opposed to fossil fuels) can be a *net positive.* While it is unlikely that all of those benefits can be fully compensated in abating the cost of biomass energy, this report's recommendations aim to turn those benefits into economic incentives enabling substantial amounts of increased biomass energy production to be introduced into the marketplace. These incentives will be very small when compared to the value of the ancillary societal benefits (> 11 ¢ / kWh).

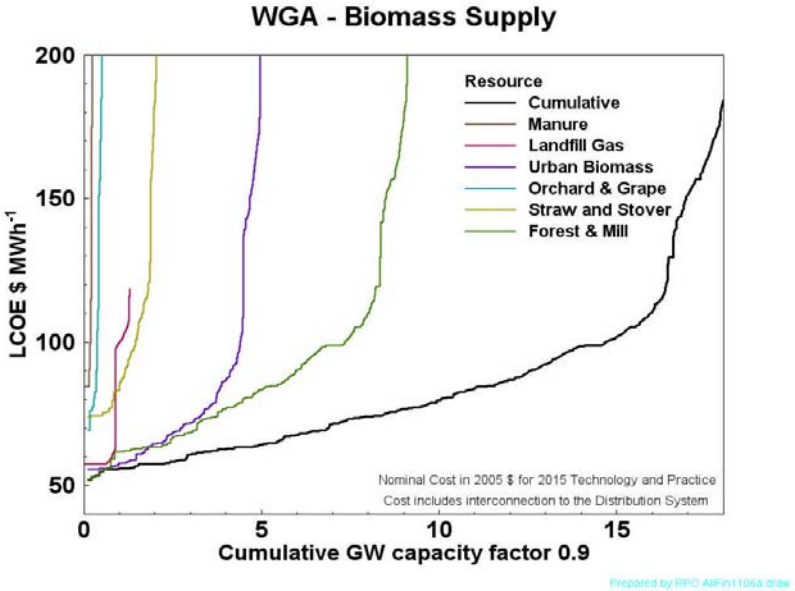
Biomass Supply

The analysis performed on behalf of the Task Force suggests that the potential supply of feedstocks can produce 15,000 MW of generating capacity, or half of the CDEAC target. Biomass feedstocks are extremely diverse. Technologies to utilize the different kinds of biomass fuels are also diverse. Feedstocks include forest resources, agricultural residues and products, and resources from the municipal waste stream including solid wastes, biosolids, sewage, and waste buried in landfills. Biomass is also an important energy source because it is distributed, easing transmission capacity stresses by promoting the production of power close to where it is used.

Figure 1: Biomass (GWh/y equivalent) in the WGA Region Available for Power Generation (Applying the conversion efficiencies suited to each component of the resource).



The Biomass Task Force has done extensive analysis of supply at the production cost of 8 cents / kWh. Our analysis, using the methodology put forward by the WGA Quantitative work group is that 10,000 MW of produced electricity would be available by 2015 at that price. The report highlights a number of different alternate case scenarios that can increase the understanding of the variables that contribute to overall production capacity predictions.



Due to the dispersed nature of biomass resources, there is no need to consider building major new transmission projects to open up resource-rich regions. Other renewable resources typically need major new transmission lines in order to open up areas of resource concentration that are remote from existing lines. Many rural biomass generators provide important voltage support services to the grid, while others may require transmission upgrades to accommodate their deliveries. But biomass facilities by their nature are dispersed, and can be located carefully with respect to the existing grid, rather requiring building out the grid to come to them.

Benefits

Biomass offers important benefits that stem directly from the use of biomass as fuel and thus productively utilizing materials that would otherwise be discarded. By providing a productive use benefit for biomass residues, biomass energy production promotes environmental improvement, provides rural employment and economic growth, and contributes to addressing the threat of forest fires in the Western forests. Biomass energy can also substantially reduce greenhouse gas emissions by shifting emissions from very climate active hydrocarbons such as methane to carbon dioxide, and by protecting forests from destructive wildfires and thus maintaining their ability to sequester carbon.

As the vast forests of the Western United States have become overgrown over the past century, dramatic wildfires have become more common, putting vital habitats, watersheds, and communities at risk. The biomass energy industry offers a low-environmental impact, productive use for dead wood that would otherwise require open burning or – more likely – serve as fuel for a future wildfire. Use of woody biomass for energy production provides an important economic incentive for fuel treatment.

This report features a methodology that a major national study used to demonstrate the net benefits of biomass power production from solid biomass fuels vs. conventional disposal of the same biomass and production of a like amount of energy from fossil fuels. The uncompensated societal benefit was estimated to be more than 11 cents / kWh—greater than the value of the income from electricity production alone. Approximately eighty percent of the total benefits are attributable to the productive use of biomass resources; the remainder is due to the displacement of fossil fuel use. The quantified impact included includes consideration of air pollutants, greenhouse gases, landfill consumption, and forest productivity improvements.

Uncompensated (Ancillary) Benefits of Biomass Energy Production

(from 1999 NREL Report)

US Biomass Fuel Mix

	thousand bdt/yr
Mill Residues	6,400
Forest Residues	1,800
Agricultural Residues	2,300
Urban Wood Residues	1,400
Total	11,900

Value of the Benefits

	¢ /kWh
Criteria Pollutants	4.3
Greenhouse Gases	5.9
Avoided Landfill	1.1
Timber Stand Improvement	0.1
Total Benefits, US Biomass fuel mix	11.4

An important benefit of biomass energy production is the reduction of greenhouse gas emissions relative to the non-productive use of biomass fuels. Agricultural and municipal biomass fuels shift the form of emissions from methane to carbon dioxide (methane is almost 25 times more detrimental as a greenhouse gas than CO2 on an instantaneous basis. Use of woody biomass for energy production lowers emissions relative to open burning because open burning emits unburned hydrocarbons that double or triple impacts on climate relative to controlled combustion in a biomass boiler.

There are significant policy barriers to realizing the integrated benefits of biomass energy and making the use of biomass resources more economic. The key problems are that the social and economic benefits are not compensated in the commercial market place. Air quality standards usually ignore the impacts of alternative disposal practices for the same resource. Permitting issues continue to pose challenges both in siting new production plants and in gaining access to the resources that could serve as fuel.

Recommendations

The Biomass Task Force developed the following ten recommendations to respond to challenges that biomass resource from meeting its true energy, environmental, and economic potential. The recommendations come from an analysis of the most important barriers to competitiveness of the resource relative to other fuel sources and barriers to realizing the benefits of the resource that come from avoiding the environmental costs of not using woody or wet biomass as an energy source.

The Task Force stresses in the report that each recommendation is an important step in realizing the full use of biomass. Selecting one or two of the recommendations will not have the same effect as if those same recommendations were implemented along with the others. The recommendations with brief descriptions follow:

1. Achieve Tax Parity Among Renewable Technologies.

Governors should work at the federal level with their congressional delegations to promote biomass as part of the Production Tax Credit contained in Section 45 of IRS Regulations. Parity should be achieved with wind and geothermal technologies in credit level and the credit should be permanent. Credit for existing facilities should be extended to ten years to match current provisions for new facilities. At the state level, Governors should advocate for parity in state tax incentives and they should be based on actual energy generation (both heat and power) as opposed to investment tax incentives. Again, programs should be at least for ten years. Parity continues to net metering for plants of less than 1 MW of production. Compensation should be provided for export of excess power. The western governors can play an important part in ensuring the widespread adoption of these policies across the region.

2. Strengthen Federal Land Management Policies to Allow Larger, Longer Restoration Projects.

Only long term, large-scale activities will attract infrastructure investment. Governors should work within their borders with federal land managers to ensure that they are using the most appropriate land management tool such as stewardship contracting or timber sale methods. Contracting tools are most helpful when they are long term (20 year minimum) and large scale (up to 150,000 acres or larger). Contracts should be based on the science-based needs of the resource to improve forest health. Project parameters should be collaboratively decided at the local level on a project-by-project basis. There should not be pre-determined artificial constraints on material use or tree diameter size. These should also be collaboratively determined based on the science-based needs of the resource. Arbitrary constraints hinder the commercial viability of the resource.

3. Environmental Benefits of Biomass Should Be Paid For by Beneficiaries.

Governors should advocate their legislatures and regulatory bodies on behalf of the ability of biomass projects to help solve problems such as waste disposal, air quality and forest land/ fire management. Solutions could include fuel subsidies and "biomass only" RFPs to address specific situations. Above-market costs should be borne by the primary beneficiaries of the environmental and waste management services. If utilities are the entities selected to provide supplemental support to biomass power, they should receive cost recovery for those activities.

4. Demonstrate Government Leadership by Purchasing Power/RECs from Biomass Projects and by Supporting Biomass R&D.

The state and federal governments should purchase biomass power directly, or an equivalent amount of RECs, to meet renewable purchase requirements. This would be a tangible demonstration that agencies realize the benefits biomass brings in addressing air quality, forest health, landfill space and rural economic growth. Programs should rely on incentives that are independent of annual budget and appropriations cycles.

The Governors should also take a leadership role in supporting cost shared R&D in partnership with the private sector to demonstrate the use of new biomass technologies and to conduct engineering development research that will lead to near-term commercialization of improved conversion and harvesting technology.

5. Recognize the Value of Firm Capacity in Renewable Purchase Programs.

The Governors should work with the state utility commissions to ensure that utility renewable purchase programs (RPS or otherwise) recognize the firming capacity of biomass by establishing the appropriate price structure. The ability of biomass to provide constant power is both a benefit in and of itself and it can also be used to address the intermittent nature of other resources.

6. Renewable Energy Credits Should Not Include Ancillary Environmental Benefits.

The many benefits of biomass may be accounted for in future credit schemes (such as air quality compliance) and can bring added value to the resource. Current RECs should be defined in a way that they only transfer the renewable nature of the power and only the environmental benefits that result directly from displacement of a like amount of fossil fueled generation.

7. Establish a Single Definition for Biomass.

Governors should work with their state public utility commissioners and green power certification groups to require that the FERC definition of biomass (18CFR Part 292.202) is used to determine the eligibility of the resources as renewable. This definition, "any organic material not derived from fossil fuels," affords biomass energy projects the greatest opportunity and flexibility to use technology innovation to create productive uses for all types of biomass materials. The ability of biomass facilities to choose from the wide array of biomass resources while conforming to all federal, state and community environmental standards will allow the technology to improve both on technical performance and on production economics.

8. Revise Utility Interconnection Policies.

Governors can work with their state public utility commissions to recognize the importance of recognizing that remote plants support local load and voltage support. This would help prevent artificial imposition of line losses and promote reliability in remote areas. An emphasis on centralized load centers falsely works from the assumption that all power is consumed from a centralized location.

9. Provide Long-Term Certainty for Biomass Programs.

Governors should require that long-term programs in support of biomass should be implemented. Long-term power purchase contracts, fuel supply incentives, tax credits

and other measures will help provide the investment environment needed for infrastructure growth.

10. Consider Fuel-Based Emissions When Issuing Air Quality Permits.

The avoided emissions of air pollutants from biomass plants' fuel, if that fuel is left to its alternate fate, should be recognized and credited to the biomass plants in the permitting process. True netting of the plant emissions should be done.

Further Task Force Work

Biomass Task Force Recommendation: In addition to the ten vital policy recommendations above, the Task Force believes that a follow-up effort building on the supply analysis performed for this report is needed to provide a clearer vision for the CDEAC and WGA of how the next era in the development of biomass resources would unfold. Teams comprised of task force members working on an integrated follow-on analysis can provide answers to key questions the task force could not address in the timeframe given and with readily available data used and generated. The crux of this analysis is to set forth the sequence for developing each of primary resources (with key improvements in resource estimates) in tandem with the conversion technologies and in response to the proposed policy measures. This analysis would directly consider the question of what is the likely mix of end uses by among heat, power, transportation fuels and Bio-based chemicals/products. Answering these key questions will provide the basis for crafting the implementation details of policy changes recommended by the Task Force.

Attachment M

State Legislatures and Biomass Development

Biomass Research and Development Technical Advisory Committee

Jennifer A. DeCesaro

National Conference of State Legislatures

jennifer.decesaro@ncsl.org - 303.856.1379

3 March 2006

Outline

- Overview of NCSL and work with legislatures on biomass issues.
- Overview of state incentive and mandate programs available for bioenergy and biofuels.
- Current session legislation.
- Lessons learned from enacted state legislation to date.

NCSL Overview

- Nonpartisan Organization
- Services Provided
- Voice for State Legislatures on Capitol Hill

NCSL's Biomass Program

- Project Started in 2005
- Written Materials
- NCSL Committee Sessions
- NCSL Biomass Energy Institute

Overview of State Incentives & Mandates

Incentives

o Production Tax Credit

o Sales Tax

o Property Tax

Mandates

o Renewable Portfolio Standard

o Renewable Fuel Standards

State Incentive Programs

Production Tax Credit (Bioenergy)

- o Iowa
- o Minnesota
- o New Mexico

State Incentive Programs

Production Tax Credits (Biofuels)

- o Maine
- o Michigan
- o Nebraska
- o Washington

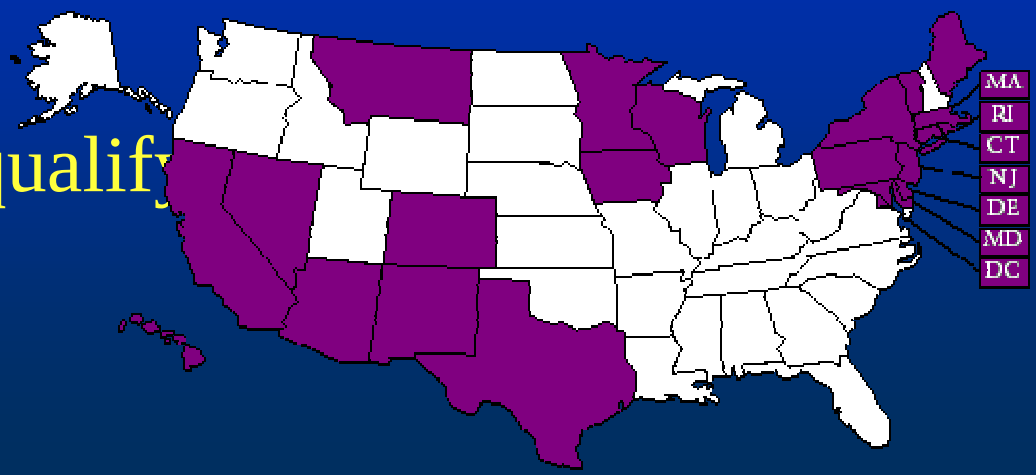
State Mandate Programs

Renewable Portfolio Standards (Bioenergy)

o 21 states and the District of Columbia;

o All include biomass in the definition of what qualifies as renewable;

o The technologies that qualify vary from state to state.



State Mandate Programs

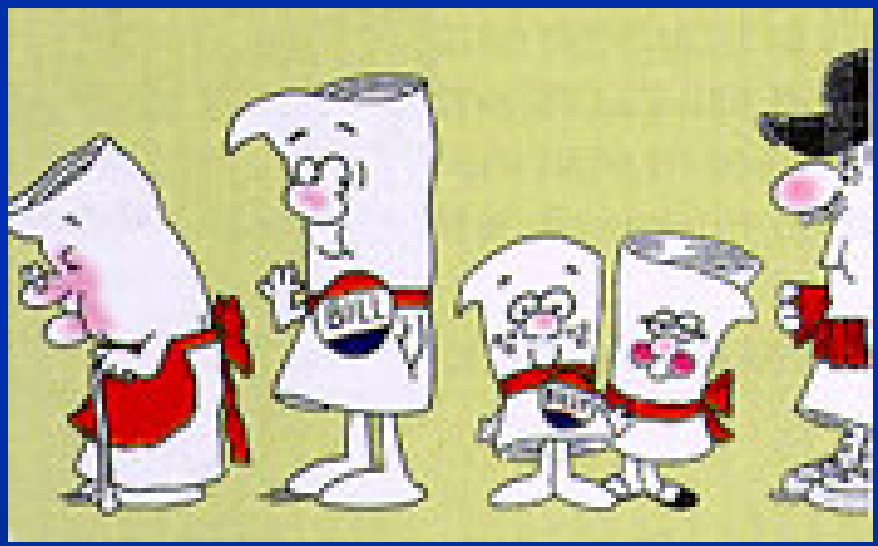
Renewable Fuel Standards (Biofuels)

o Indiana - Biodiesel

o Minnesota - Biodiesel and Ethanol

o North Dakota - Biodiesel

Current Session Legislation



- Colorado - SB 16
- Illinois - HB 5532
- Mississippi - HB 1043
- Washington - HB 2738 & SB 6508

Lessons Learned

Production Incentives

o Just because it's on the books does not mean it is being utilized.

Mandates

o The way an RPS is structured will influence whether or not bioenergy will benefit.

o Fuel mandates offer a sure thing.

Attachment N

IV. Report of the Biomass Research and Development Technical Advisory Committee & Departmental Response

The Biomass Act charges the Committee with advising the Secretary of Energy, the Secretary of Agriculture, and the points of contact concerning the "technical focus and direction of requests for proposals issued under the Initiative and procedures for reviewing and evaluating the proposals." In addition, it assigns the Committee the duty of evaluating awards made, making recommendations to the Board to ensure that "funds authorized for the Initiative are distributed and used in a manner that is consistent with the goals of the Initiative," and that the "points of contact are funding proposals under this title that are selected on the basis of merit, as determined by an independent panel of scientific and technical peers." The Initiative is described in section 307 of the Biomass Act.

As required by section 309 of the Biomass Act, the Committee is submitting this report to assess whether or not funds appropriated for the Initiative are being used in a manner that is consistent with the Biomass Act.

During Committee meetings held over the course of the year, DOE provided the Committee with updates on the status of the joint solicitation process. Following the announcement of the FY 2005 joint solicitation awards, the Committee was provided with a written overview of the joint solicitation process and a summary of the awards made.

The following are summary comments made by the Committee on the joint solicitation process and the awards made. The Committee recognizes the first four comments as high-priority recommendations to the Secretaries for 2005. Further comments are organized into three areas:

A. Recommendations on the FY 2005 Joint Solicitation Process
B. Recommendations to the Secretaries of Energy and Agriculture on the Departments R&D Portfolios in Relation to the Committee's *Vision* and *Roadmap*
C. Overall Recommendations to the Secretaries of Energy and Agriculture in 2005

<u>High-priority Recommendations to the Secretaries</u>

Increase funding to encourage achievement of *Vision* and *Roadmap* goals as outlined in future revised versions of the documents. The agencies are asked to detail consequences of under-funded research.

Funding for the Biomass Research and Development Initiative under the DOE-USDA joint solicitation has decreased annually since its establishment by the Biomass R&D Act of 2000. It is noted that funding for this Initiative comes from two Departments via two mechanisms – USDA funding via the 2002 Farm Bill, and DOE funding via annual Program budget requests, which are subject to Energy and Water Development Appropriations. While USDA funding does not have a history of Congressionally directed funds negatively impacting its ability to fund the joint solicitation, recent funding requests by the Department of Energy have been significantly impacted by funds set aside for Congressionally-directed projects. This has not left adequate discretionary funds for the Program to support the joint solicitation

in Fiscal Years 2005 and 2006. The Committee requests that Congress note that these Congressionally-directed funds are inhibiting the potential of the Initiative's joint solicitation, which aims to achieve the bioenergy goals set in the Committee's *Vision* and *Roadmap* documents. As required in the Energy Policy Act of 2005, the Committee is in the process of revising these documents. The new *Vision* and *Roadmap* will provide more detail for necessary research and development, in each of the *Roadmap* categories, to achieve each of the out year targets for biofuels, bioproducts, and biopower. The Committee will also estimate the amount of funding needed for each of these areas in the *Roadmap* to achieve the *Vision* goals. The Committee recommends increased funding to encourage achievement of *Vision* and *Roadmap* goals according to the specific amounts outlined in the revised versions of the documents.

Expedite the approval process for future Committee membership packages. The Committee has lost the benefit of having the 2004 members' participation.

The delays in the DOE membership approval process withheld membership from a significant portion of the Committee during 2005. The members recommend expedited approval in the future, as uncertainty in this area had a serious and irreparable negative impact on the Committee's focus and efficacy.

Channel R&D to address issues or new opportunities for the utility of biofuels.

EPAct 2005 mandates an increase in biofuels consumption. In order to ensure a smooth transition away from petroleum based fuels to biofuels, more research needs to be funded that is focused on practical applications in the marketplace, such as the use of existing infrastructure for distribution and storage of biofuels, the use of biodiesel in cold climates, and ethanol permeation.

A subcommittee should interact with the Congressional appropriations committee with the goal of having funding realigned with the *Vision* and *Roadmap* goals.

The revised *Vision* and *Roadmap* documents will be used as a valuable tool to evaluate R&D effectiveness in the future. The Committee is organizing subcommittees in the areas of Policy and Analysis, and will focus its message outwards to policymakers, fully highlighting any discrepancies with peer-approved guidelines in the two documents.

<u>Further Comments</u>

A. Recommended Changes to the FY 2005 Joint Solicitation Process

1. Reduce minimum award amount to $150,000 for individual projects, allowing a greater number of awards in a wider range of topics. Where appropriate, projects should be incrementally funded thereafter.

   Project performance should be evaluated at regular intervals over the course of each project, with results used to help determine decisions on continued funding. The Committee would

like the Secretaries to examine current funding practices, and where possible, move toward a higher number of awards, with monies distributed over the course of the project.

2. Announce the joint solicitation results earlier.

   Delay in announcing the official joint solicitation awards can make information leaks possible, and frustrate awardees with funding uncertainties. The Departments of Agriculture and Energy are urged to facilitate efficiency in the award approval process. Board affirmation meetings prior to the official announcement should be scheduled further in advance to avoid these delays.

3. Additional funding is needed for joint solicitation project reviewers from industry, academia, etc.

   The Committee is concerned that reviewers primarily consist of Federal employees (USDA and DOE). Additionally, Energy Policy Act (EPAct) requirements call for independent peer review of projects from outside of the Departments. Facilitating this requirement will be easier with compensation for experts' time in relevant technical areas.

B. **Recommendations to the Secretaries of Energy and Agriculture on the Departments' R&D Portfolios in Relation to the Committee's Vision and Roadmap**

1. Bidders should be asked to demonstrate commercial viability as part of their funding request.

   While the current joint solicitation process requires complete life cycle documentation in submitted proposals, the Committee encourages establishment of evaluation metrics for all funded projects along each step of its lifecycle. The Committee's joint solicitation project matrix, resulting from a previous recommendation, aligns current R&D investments with *Roadmap* objectives. Assessing the likelihood of proposal success will be easier with an early explanation of each project's practical timeline to commercialization.

2. Fund further research on the co-products of biofuel production, in order to improved the economics of biofuels manufacturing and enhance value. In grain-based biofuel production, these co-products include high-protein DDG and petroleum-replacing biochemicals.

3. Fund further research on incentive programs and other methods to stimulate biobased products growth.

   The Committee believes that huge market opportunity exists for biobased products, separate from biofuels, but that funding and incentives to support this potential market are lacking. The Committee finds that the definition of biobased products included in the Federal government's procurement program is too narrow and advocates further incentives to spur the market for biobased products, including the co-products of biofuels production.

4. Recognize and communicate to other Federal agencies the importance of basic sciences for the success of biomass research.

   Upon review of the USDA-DOE R&D portfolio, the Committee recognizes the need for basic science R&D. This basic science is needed in order to tackle some major technical barriers related to biomass fuels, power, and products. These needs should be communicated not only to USDA and DOE but also to other Federal agencies, such as the Department of the Interior, the Environmental Protection Agency, the Office of Science and Technology Policy, the National Science Foundation, the Office of the Environmental Executive, and the Department of Transportation. The Committee recommends that these Federal agencies coordinate basic science activities aimed at addressing our need for biomass fuels, power, and products.

5. Continue funding for the thermochemical R&D platform.

   Support for this area has fluctuated since the Committee's inception, and members strongly advocate its continued work, incorporating full use of all available biomass resources in future energy production.

C. Overall Recommendations to the Secretaries of Energy and Agriculture in 2005

1. The agencies should facilitate a renewed emphasis on public education and awareness, and help to educate policy makers, their staff, and the public, including increased focus on education within universities.

   The Committee feels that there is a need for a paradigm shift at the high school and university level on how organic chemistry and related engineering disciplines are taught to rely on petroleum-based feedstocks to process into various chemicals. The Committee commends prior hybrid science programs at select universities, which have pulled separate departments and disciplines together to encourage research and student opportunities in the bioenergy field. The Committee advises an increase in public education in the Northeast and California, where public awareness of the increased use of biofuels is low. A better informed public will help shape future policy. Policy can also focus on creating more support for biomass-related disciplines throughout the educational system. This could be done via more university grants to support graduate students in these research disciplines, or a change in some curriculum to involve biomass as a feedstock in chemical manufacturing, which will increase focus on studying the technical challenges and potential research areas for Ph.D. or graduate research. This could assist in communicating a thorough commitment to biomass technology that will influence future policy.

2. Increase the number of university faculty directly involved in Federally funded biomass research.

   Federal grants from National Science Foundation, National Institute of Health and other agencies do not target biomass work specifically. Moreover, Federal agencies that fund

biomass research do not adequately communicate with one another. Opportunities for biomass research have a very low award rate. Consequently, current students lack learning opportunities in the biomass field. These factors combine to hinder fulfillment of the actual personnel needs of the biomass industry. The Committee recommends providing funding for a top-down education of academia about the technological opportunities available in biomass, endorses the enhanced biomass professional community this will create, and advocate cooperation with industry to publicize education in biomass technology.

3. The Committee recommends that Congress clarify the statutory language in section 9001 of the 2002 Farm Bill. Specifically, the Committee requests a very inclusive (all bio-organic matter) definition of biobased products, concurrent with that of its *Vision* statement. Committee member David Morris of the Institute for Self-Reliance elucidated this position in a memorandum to Secretary Bodman during 2005.

   The Committee does not intend to alter the definition of bioproducts given in its *Vision* statement to exclude natural materials and fibers. Instead, the *Vision* definition focuses on tracking of petroleum-replacing biobased products for goal-setting, and will include natural material data in reporting when available. This definition is recommended for standard use when it is final.

Attachment O

2006 Work Plan (Dec 2005 - Dec 2006)
Biomass R&D Technical Advisory Committee

Background

The Biomass Technical Advisory Committee, in its advisory capacity, is chartered to provide the following to the Secretaries of Agriculture and Energy and their points-of-contact (the Under Secretary for Natural Resources and Environment, U.S. Department of Agriculture and the Assistant Secretary for Energy Efficiency and Renewable Energy, Department of Energy):

- Advice on the technical focus and direction of requests for proposals issued under the Biomass Research and Development Initiative (Initiative), and
- Advice on the procedures for reviewing and evaluating the proposals.

The Committee shall also:

- Facilitate consultations and partnerships among Federal and State agencies, agricultural producers, industry, consumers, the research community, and other interested groups to carry out program activities relating to the Initiative, and
- Evaluate and perform strategic planning on program activities relating to the Initiative.

Additionally, the Committee shall have the following duties:

- Advise the points-of-contact with respect to the Initiative;
- Make recommendations in writing to the Biomass Research and Development Board to ensure that:
    - Funds authorized for the Initiative are distributed and used in a manner that is consistent with the objectives, purposes, and considerations of the Initiative;
    - Solicitations are open and competitive with awards made annually and that objectives and evaluation criteria of the solicitations are clearly stated and minimally prescriptive, with no areas of special interest;
    - The points-of-contact are funding proposals under this title that are selected on the basis of merit, as determined by an independent panel of scientific and technical peers predominantly from outside the Department of Agriculture and Energy; and
    - Activities under the Initiative are carried out in accordance with the Biomass Research and Development Act of 2000.
- For each fiscal year for which funds are made available to carry out the Initiative, provide a report to the Secretaries of Energy and Agriculture on whether funds appropriated for the Initiative have been distributed and used in a manner that
    - Is consistent with the objectives, purposes, and additional considerations described in subsections (b) through (e) of section 307;
    - Uses the criteria established under subsection (a)(3),
    - Achieves the distribution of funds described in paragraphs (2) and (3) of section 307(g); and
    - Takes into account any recommendations that have been made by the Advisory Committee.

The following is provided to assist the Committee develop its 2006 Work Plan.

Required 2006 Activities

- Recommendations to Secretaries
  - Feedback on results of the FY 2006 Joint Solicitation and make recommendations for FY 2007 joint solicitation.
  - Progress of R&D funded under the joint solicitation in achieving the Committee's *Vision* goals, as revised after the Energy Policy Act of 2005 (EPAct).

Recommended 2006 Activities

- Update the Committee's *Vision* document.
- Organize regional *Roadmap* update workshops, according to the update requirement in EPAct. Report out to Board on update progress.
- Establish subject-specific subcommittees, to report on their progress in Policy and Analysis to the full Committee at quarterly meetings.
- Identify other Federal Advisory Committees relevant to biomass (e.g. climate change) and cooperate activities.
- Meet with the R&D Board.

Recommended Committee Meeting Schedule

In 2006, the full Committee will meet at least quarterly, as required by law.

Tentative Date	Purpose
March 2-3, 2006 2-Day Meeting	• Status of the FY06 Joint Solicitation • Discuss *Vision* Update • Plan Regional *Roadmap* workshops
April 12-13 , 2006 2-Day Meeting	• Conduct regional *Roadmap* workshop
Summer 2006 2-Day Meeting	• Conduct regional *Roadmap* workshop • Receive an update on the status and awardees of the FY 2006 joint solicitation • Receive an update on the status of the FY 2007 joint solicitation
November 28-29, 2006 2-Day Meeting	• Receive review of topics covered and materials received in 2006 • Develop Recommendations to Secretaries • Joint meeting with R&D Board • Develop topics for the 2007 Work Plan • Receive a presentation on the updated USDA/DOE Portfolio Analysis by *Roadmap* category document

2006 Deliverables

- Matrix tracking the progress of USDA and DOE biomass R&D portfolios.
- Revised *Vision* document.
- Recommendations to the Biomass R&D Board (required per section 309(b) of the Biomass R&D Act of 2000).

- Complete *Roadmap* Workshops.