



Date: October 7, 2020

To: Governor's Council on Biofuels

From: Bob Patton (Bob.Patton@state.mn.us, 651-201-6226)
Jordyn Bucholtz (Jordyn.Bucholtz@state.mn.us, 651-201-6685)

RE: Packet for Friday, October 9, 2020 meeting

The purpose of this meeting is to continue considering draft recommendations developed by Minnesota Department of Agriculture staff. During this shortened meeting, we will cover the placeholder recommendations that have not yet been discussed as a council. Additionally, MDA staff will introduce an updated recommendation on a low carbon fuel standard to gauge interest and/or concerns. By introducing and discussing these topics, we hope that we can reach consensus at our next meeting on October 23, 2020, or at the final meeting on October 30, 2020.

The packet includes:

- A. Agenda
- B. Memo with plan for remaining meetings and status report on current recommendations (first agenda item)
- C. Governor's Council on Biofuels adopted principles
- D. Governor's Council on Biofuels adopted vision
- E. White paper: *Woody Feedstocks for Advanced Biofuels Production in Minnesota*
- F. Presentation: Wood-Based Advanced Biofuels (Rick Horton)

Slides for the presentation by Chris Hanson on the topic of benzene will be sent separately from this packet.

We have decided to shorten this meeting by one hour since we will be discussing only the placeholder recommendations while we wait for both the infrastructure subcommittee to finalize its recommendations and for the Department of Administration to review and comment on the state fleet recommendation. The intent is to be ready to reach consensus on the whole package of recommendations during the October 23 and October 30 meetings.

Please let us know if you have any questions.

Governor's Council on Biofuels

October 9, 2020 Meeting

9:00 a.m. to 11:00 p.m.
Webex Video Conference

Agenda

9:00 a.m.

Welcome and Introductions

Commissioner Thom Petersen

9:10 a.m.

Update on process and plan going forward

Bob Patton and Jordyn Bucholtz

9:40 a.m.

Consideration of placeholder recommendations: advanced biofuels, woody biomass, benzene

Presentations by Rick Horton and Chris Hanson

10:30 a.m.

Introduction to updated recommendation on Clean Fuels Policy/Low Carbon Fuel Standard

Jordyn Bucholtz

10:45 a.m.

Public Comment

11:00 a.m.

Adjourn



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RE: Status Report on Staff-Suggested GCB Recommendations

Staff is continuing to gather information in order to draft a letter of comment for rulemaking on data sources and analytical approaches on which to base an EPA determination of an updated weighting factor (F-factor) for E85 flexible fuel vehicles for model years 2021 and later (see <https://www.epa.gov/regulations-emissions-vehicles-and-engines/e85-flexible-fuel-vehicle-weighting-factor-f-factor-model#rule-summary>). Comments are due October 26th.

Work remains to be done on a number of the suggested recommendations; in particular, E15/mid-level blends, biodiesel, biofuels fueling infrastructure, and biofuels use in the state fleet. We have a revised suggested recommendation regarding a clean fuels/low carbon fuel standard, and we believe the recommendation on public understanding and marketing is done or close to done. We have yet to discuss recommendations on advanced biofuels/technology research and development (including wood-based advanced biofuels) and benzene, and we plan to begin discussion at this meeting.

E15/Mid-Level Blends, Biodiesel, and Biofuels Fueling Infrastructure

We had suggested minimum content standards for ethanol in gasoline patterned after the biodiesel mandate statute (M.S. 239.77). The content standards would go into effect on specified implementation dates only after meeting conditions as determined by agency commissioners, and with safeguards ("offramps") spelled out in the statute. The implementation dates and conditions would be set according to a "Roadmap for Biofuels Infrastructure", which is the desired product of the Infrastructure Subcommittee.

We had also proposed amending the biodiesel mandate statute (M.S. 239.77) to set additional conditional implementation dates for blends of biodiesel higher than B2, with a criterion added regarding compatibility of retail infrastructure.

We propose that we continue discussion of recommendations for E15 and higher blends, biodiesel recommendations, and biofuels fueling infrastructure after the Infrastructure Subcommittee has completed its recommendations to the Council. The Infrastructure Subcommittee is scheduled to meet briefly on Tuesday, October 13th, and is scheduled to have its final meeting on Thursday, October 15th.

Clean Fuels/Low Carbon Fuel Standard

The discussion around LCFS at our last meeting focused primarily on the implementation process. After reconsideration, we have determined that the process by which an LCFS is implemented does not need to be settled by the Council. As the experts on biofuels, we believe the GCB can make the greatest impact on an LCFS program by specifically detailing the role and importance of successfully incorporating biofuels into a policy.

We suggest the Council consider the following language for a recommendation:

Propose and advocate for a Low Carbon Fuel Standard (LCFS)/Clean Fuels Policy (CFP) that adheres to the vision, principles, and considerations of the white paper from the Midwestern Clean Fuels Policy Initiative, and to the vision and principles of the Governor's Council on Biofuels.

Ensure that the process of adoption and policy design includes advice from a broad spectrum of stakeholders and interests, including those of agriculture and biofuels, such as through a task force.

For conciseness, the vision, principles, and considerations of the white paper, and the vision and principles of the Governor's Council, are "adopted by reference" in the recommendation, rather than spelled out in the recommendation. We encourage councilmembers to review the white paper (www.betterenergy.org/wp-content/uploads/2020/01/Clean-Fuels-White-Paper-Final-2.pdf), and the GCB vision and principles (included in the packet).

Biofuels Use in the State Fleet

A draft recommendation is out for review by the Department of Administration's Office of Enterprise Sustainability and Director of Fleet and Surplus. Following this review, the Fleet Council will review and comment on the recommendation. We plan to bring the recommendation to the Council at its October 23rd meeting and adopt the recommendation during the October 30th meeting.

Public Understanding & Marketing

We believe that, except for perhaps specifying stakeholder groups, the following recommendation is ready for inclusion in the GCB's package of recommendations:

1. Create a standing Council on Biofuels Education and Promotion comprised of representatives of stakeholder groups [who?] responsible for developing and directing a coordinated program of education and promotion of biofuels among consumers and auto-industry professionals in Minnesota.
2. Establish a regular source of funding for education and promotion of biofuels administered by the MDA with guidance from the Council on Biofuels Education and Promotion.

Placeholders

We will discuss the following items at this meeting:

Advanced Biofuels/Technology R & D

A white paper, *Woody Feedstocks for Advanced Biofuels Production in Minnesota*, was provided by Rick Horton and distributed to the Council in May. The memo (enclosed in the packet) provides background and discusses

barriers to success and recommendations. Councilmember Horton will make a presentation about the white paper and possible recommendations.

Benzene

This topic was briefly introduced to the Council at the June 21st meeting. At the October 9th meeting, Chris Hanson will be present on the topic and possible recommendations.

Report

Because of the short timeframe between the final meetings of the Council (October 23rd and October 30th) and the report deadline in the Executive Order (November 1st), we propose the “report” consists of the recommendations of the Council accompanied by a short cover memo. A report to the legislature is due January 15, 2021. That report can be more complete, including background information and discussion. The longer timeframe to prepare the legislative report will also allow us to obtain feedback on drafts from councilmembers.



Governor's Council on Biofuels Principles

Tentatively adopted at GCB Meeting #7 (6/11/2020)

Recommendations will:

- Advise the Governor, and the Commissioners of the Department of Agriculture, the Department of Transportation, the Department of Commerce, and the Pollution Control Agency on policies and programs that increase the production and utilization of biofuels in an effort to reduce greenhouse gas emissions in the transportation sector
- Include policies and programs that:
 - Foster growth and use of biofuels including higher blends and supporting policies
 - Accelerate achievement of the petroleum replacement goals outlined in Minnesota Statutes 2018, section 239.7911
 - Advance and invest in carbon efficiency improvements of biofuels plants and sources of biofuels feedstock
 - Utilize biofuels to help Minnesota achieve its greenhouse gas reduction goals under the 2007 Next Generation Energy Act
 - Identify the biofuels infrastructure required to achieve the petroleum replacement goals
 - Recommend cost-effective incentives necessary to expedite the use of greater biofuel blends in this state, including but not limited to incentives for retailers to install equipment necessary to dispense biofuels to the public
- Consider the relation of biofuels production to the impacts to, and opportunities for, farmers, forest landowners, rural communities, the natural environment, and economically disadvantaged populations
- Consider the feasibility and cost of increasing biofuels infrastructure throughout Minnesota



Governor's Council on Biofuels Vision

Tentatively adopted at GCB Meeting #7 (6/11/2020)

The state will adopt policies and programs to decarbonize the transportation sector and reduce greenhouse gas emissions through the increased use of low-carbon biofuels over the coming decades. This will be done in ways that:

- The State moves rapidly to establish E15 as a base fuel and provisions for higher mid-level blends in the near term;
- Create pathways for advanced biofuels development;
- Protect and enhance air quality and public health, water quality, wildlife habitat, biodiversity, soil productivity and other associated ecological services, and ensure healthy and vibrant forest-reliant communities;
- Improve the economic vitality of the state, particularly in rural Minnesota and in the renewable energy, agricultural, and forest sectors;
- Offer value and benefits for consumers;
- Create financial incentives for farmers for environmental stewardship, particularly for agronomic practices that lower carbon intensity of biofuels feedstock and have other environmental and public health benefits;
- Ensure infrastructure is ready for adoption of mid-level blends
- Increase public awareness, acceptance, and utilization of biofuels.

Woody Feedstocks for Advanced Biofuels Production in Minnesota

A White Paper for the Minnesota Governor's Council on Biofuels

Governor's Executive Order 19-35 established the Governor's Council on Biofuels and charged us with developing "ideas for policy and investment in biofuels development and utilization that are bold, practical, and broadly supported by a range of interests". One charge was to make recommendations on, "Policies and programs to advance and invest in carbon efficiency improvements of biofuels plants and sources of biofuels feedstock"). And we are to consider, "Impacts to, and opportunities for, farmers, rural communities, the natural environment, and economically disadvantaged populations as it relates to biofuels production".

The Energy Independence and Security Act of 2007 mandated that a percent of biofuels production volume would come from advanced biofuels, and that volume requirement increased over time in order to promote investments in the technology. However, federal and state policies have impeded development of advanced biofuels derived from woody feedstocks.

The International Renewable Energy Agency (IRENA) states that advanced biofuels (including cellulosic biofuels) offer emission reductions as high as 80% compared to fossil fuels, and that advanced biofuels are crucial for reducing emissions in heavy-freight, shipping and aviation. They contend that technology commercialization and lack of investment in production capacity are the main barriers to be overcome, stating, "Investment in advanced biofuel plants will need to be significantly accelerated to reverse recent trends", and "Production must be substantially increased, mainly for advanced biofuels".

Developing advanced biofuels production facilities in Minnesota would meet the Governor's directive by creating new opportunities using wood as a renewable sustainable feedstock, thereby assisting rural communities, improving the natural environment, benefitting economically disadvantaged populations, and dramatically reducing greenhouse gas emissions in Minnesota's transportation sector.

Technology

The technology to make fuels from woody feedstocks has been available for a long time, and in fact the Germans used wood fuel extensively during World War 2 (Zerbe 2006). It can produce a renewable diesel that is chemically identical to petroleum diesel, as well as jet fuel and ethanol. Despite the technical and operational hurdles encountered in the past, today there are several commercial-sized lignocellulosic ethanol refineries operating, including 2 in Brazil, 3 in China, and 5 in Europe. Currently [Red Rock Biofuels](https://www.redrockbio.com/) (<https://www.redrockbio.com/>) is building a woody feedstock facility in Lakeview Oregon that uses the Fischer-Tropsch process. [Attis Industries](https://attisind.com/) (<https://attisind.com/>) has advanced technology in using enzymatic catalysts to separate lignin from cellulose before fermentation into ethanol. In 2017 they announced their intent to develop a 60,000 ton per year cellulosic biomass fuel facility in Minnesota, but never

moved forward with the project. Attis is now developing a biomass facility near their New York corn ethanol plant.

Benefits of Using Woody Feedstocks

Advanced biofuels are considered a renewable energy source by IRENA because the raw materials can be managed sustainably. Unlike fossil fuels, the combustion of biofuels emits carbon that is a part of the biogenic carbon cycle. They state that the long-term benefits of utilizing biofuels as a substitute for fossil fuels may even surpass those of carbon sequestration in forests. The Intergovernmental Panel on Climate Change (IPCC) is the United Nations body for assessing the science related to climate change. The IPCC also considers biomass from sustainably managed forests to be either carbon-neutral or a low-carbon fuel at the point of combustion (after accounting for emissions linked to harvest and transport).

Minnesota Department of Natural Resources (2019b) shows that creating markets for biomass-based fuel and energy has many potential benefits including: “reduced dependence on foreign energy sources, improved bottom lines for logging and processing operations, increased opportunities for forest management through timber stand improvement, pre-commercial thinning, sanitation or salvage operations, wildlife management through brush land clearing, invasive species control, and potential complementary value-added products for the forest products industry. In fact, increased utilization of wood for bioenergy can, on some sites, improve ease and success of regeneration. It can also reduce fuel loading and fire risk directly impacting the cost of fighting forest fire and forest reestablishment costs.”

Woody feedstocks for fuels could come from four primary sources – sawdust and bark left over from milling operations, slash left over from logging operations, tree species without adequate markets, and trees impacted by insects, disease, fire and blowdown. Every effort should be made to ensure that roundwood with existing markets within the forest products industry are not used for fuels.

The benefits of wood-based biofuels include:

- A new market for sawdust, shavings and bark left over from milling operations would make Minnesota mills more competitive by not having the added expense of paying for disposal. It also would keep this material out of landfills and prevent CO₂ release from the decomposition process.
- Utilizing logging slash (tops, limbs and cull logs) would create additional employment opportunities for Minnesota’s loggers and truckers, while removing waste material that often has to be burned, piled or crushed to allow for forest regeneration.
- New markets for wood damaged by insects, disease, fire and windstorms will help us address current forest health crises. The Governor’s Executive Order 19-35 asked the Council to consider the natural environment. The Minnesota Department of Natural Resources (2019a) shows that we are in the 20th year of an eastern larch beetle outbreak that has impacts over half of tamarack in the state (666,000 acres) and

continues to expand. The emerald ash borer is killing millions of ash trees in urban areas of southern Minnesota and has the potential to kill billions more when it reaches the north. This will have negative impacts on forest cover, water quality and carbon sequestration. We are also in the 13th year of a spruce budworm outbreak that has impacted 201,711 acres of balsam fir in the Arrowhead region. These species have poor market conditions making it difficult to dispose of dead wood, manage the pests, and ensure that these forests remain forested.

- The Governor's Executive Order 19-35 also asked the Council to consider "economically disadvantaged populations as it relates to biofuels production". Three of the top five counties in terms of population living in poverty are in heavily forested rural counties (St. Louis, Koochiching and Beltrami) (US Census Bureau 2018). Growth in the forest sector would create meaningful jobs and support economically disadvantaged communities in northern Minnesota.

Minnesota's Forest Resources

Refinery investors often reference concern about availability of cellulosic feedstock, but typically they are referring to agricultural residues and planted feedstocks. As referenced earlier the sources of woody feedstocks in Minnesota include:

- Mill residuals – Bark, sawdust and shavings.
- Logging slash – Tops, limbs and cull logs not suitable for industrial use.
- Underutilized species – Ash, tamarack, birch, red maple, balsam fir, etc.
- Damaged material from wildfire, windstorms, insects, and diseases (e.g., ash, balsam fir and tamarack).

There is currently an abundance of these materials in Minnesota. TSS Consultants (2013) determined that there was 402,750 green tons (179,000 cords) of the above-referenced underutilized species available annually within a 75-mile radius of Grand Rapids, MN. Using them would help address wood utilization and forest health issues. They also showed 612,627 green tons of biomass available, despite the study being conducted at a time when there were strong biomass markets for energy production in the region. In 2018 Xcel terminated power purchase agreements with three wood biomass facilities under the Laurentian Energy Authority and Benson Power, and Minnesota Power converted the Rapids Energy plant in Grand Rapids from biomass to natural gas. The loss of these facilities has resulted in an even greater amount of biomass available each year.

The infrastructure required to harvest and transport raw materials is also a concern for cellulosic biorefineries. Thanks in large part to the existing forest products industry, and to the now defunct biomass energy sector, we are uniquely poised to perform those functions. Minnesota has one of the most highly trained logging and trucking workforces in the country. They can cut and haul underutilized wood exactly like they currently haul desirable species to

the primary wood consuming mills. Many of them also invested in biomass grinders and trailers so they could haul logging slash to energy plants prior to 2018.

Safeguards have been put in place to address the commonly cited concern that using forest products for fuel production would be harmful to the forests and interfere with the ecosystem benefits forests provide for citizens (e.g., clear air, biodiversity, water quality, etc.). The Minnesota Forest Resources Council has established [Biomass Harvesting Guidelines](#) to protect the sustainable forest resource (http://www.frc.state.mn.us/initiatives_sitelevel_management.html). Loggers are [trained](#) to implement those guidelines (www.mlep.org). In addition, the Minnesota DNR, several forested counties and most industrial landowners belong to the Sustainable Forestry Initiative or the Forest Stewardship Council. These are third-party forest certification entities that set Standards to ensure that forests are managed sustainably. Their annual audits would reveal potential sustainability issues.

Potential Minnesota Investors

Developing cellulosic renewable transportation fuel production in Minnesota would make the entire biofuels sector more robust and diversified, which would benefit all producers by expanding markets and creating more opportunities. Both the Minnesota Department of Employment and Economic Development (DEED) and Iron Range Resources & Rehabilitation (IRRRB) have been approached by entities interested in siting facilities in Minnesota. They seem pleased with the incentives Minnesota provides, like the AGRI BioIncentive Program; Minnesota Investment Fund (MIF); Job Creation Fund (JCF); and Job Training Incentive Program (JTIP); as well as the financing and programming available through the IRRRB. They feel that they simply need a pathway to the market.

Barriers to Success/Recommendations

Barriers to investment in wood-based advanced biofuels production include an array of infrastructure-related, environmental, social and political issues.

IRENA (2019) completed a survey of industry executives and decision makers, capturing the perspective of project developers aiming to nurture the market and scale up actual usage in competition with fossil fuels. Among the findings:

- Regulatory uncertainty was the most important impediment to investment in advanced biofuels.
- Transport sector decarbonization calls for accepting several fuel alternatives simultaneously rather than resorting to a single, all-encompassing solution.
- Low subsidy levels, high financing costs and limited availability of finance are barriers in the current market.
- Industry executives question the accuracy and reliability of common methods for estimating GHG emissions, land-use change and indirect land-use change.

Jones et al. (2017) identify the blend wall (technical constraints that limit increased ethanol use in gasoline), flexible mandates, and feedstock security as the main issues for US advanced ethanol producers. Miller, Christensen and Park (2013) found that commercialization barriers are complex and specific to each company, but list the blend wall, Renewable Identification Number (RIN) pricing, oil prices and political uncertainty as common barriers contributing to the slow commercialization and elevated risk levels of advanced biofuel companies. Withers (2016) surveyed those involved in advanced biofuels and found that barriers to project development in order of importance were funding, Renewable Volume Obligation (RVO), the EPA pathway approval process, RFS and RINs.

While many of the cited barriers are related to technology, yields, costs and other internal factors, there are also several significant policy-related issues. This is where the Council could advise the Minnesota Governor, legislature and Congressional delegation on ways to engage and create an environment for investment in advanced biofuels in Minnesota. There are two primary policy initiatives that could accomplish this objective. The first requires a federal legislative change to the US Renewable Fuel Standard and clarification of EPA definitions. The second will take more time and effort by creating a Midwest Low Carbon Fuel Standard.

The US Renewable Fuel Standard (RFS) under the Energy Independence and Security Act of 2007 (EISA) has created the pathway for first generation biofuel development. However, there is specific language in the RFS that is making it nearly impossible to use woody feedstocks in advanced biofuels. These include:

- Feedstocks from federal sources (e.g., National Forests) are not allowed. Federal timber sales also include non-merchantable species, need biomass removed to meet management objectives, and have forest health issues that require timber management to address. Excluding federal lands prevents them from benefitting from this management tool. **Policy Recommendation: Modify the RFS to allow feedstocks from Federal Lands to be used in biofuels.**
- Feedstocks from non-plantation sources (e.g., naturally regenerated forests) are not allowed. Most forests in Minnesota regenerate from natural seed or re-sprouting post-harvest, and are therefore not classified as plantations. **Policy Recommendation: Modify the RFS to allow woody feedstocks from all forest types and establishment regimes to be used in biofuels.**
- The RFS allows biomass from “slash” and “pre-commercial thinnings” to be used as biofuel feedstock, but has poor definitions of these terms, leading to uncertainty for potential developers. It should be made abundantly clear that “slash” means not only tops and limbs after timber harvest, but also unmerchantable and sub-merchantable trees, insect and diseased trees, and damaged/cull trees not suitable for traditional fiber markets. Material from “pre-commercial thinnings” should be any unmerchantable or sub-merchantable material removed during any forest thinning operation. **Policy Recommendation: Clarify the definitions of slash and pre-commercial thinnings in the RFS.**

- Due to the above, the RFS requires that biomass from allowed and non-allowed sources be kept separate. It is operationally difficult to sort and separate mill residues and biomass by source at a facility. **Policy Recommendation: Modify the RFS as noted above and remove all references to keeping materials separate. If the modifications above cannot be implemented, allow co-mingling of eligible wood, using mass with weight conversion balance to determine the eligible volumes of RFS biofuel.**
- The RFS registration, reporting, recordkeeping and product transfer document (PTD) requirements were designed with the general expectation that renewable biomass would be converted into renewable fuel at a single facility. Due to the inefficiencies in transporting bulky low value raw materials, it would be helpful to have several smaller refineries making intermediate products which would then be shipped to a central location for completion and blending. For example, biomass biocrude could be made at multiple sites and transported to existing petroleum refineries. This is a technically proven process, and some refineries have run trials to validate the method. **Policy Recommendation: Pass the EPA's Renewable Enhancement and Growth Support rule which would allow intermediate products to be transported to another site for final processing into biofuels and bioproducts.**
- Wood-based biofuel is not identified by the EPA as carbon neutral. As noted above several international bodies already deem wood-based biofuels carbon neutral. While there is little doubt that the Carbon Intensity of woody feedstock is lower than fossil fuels, there are those who oppose it based on a misplaced fear that it will lead to increased deforestation (Science 2018). A provision in the Further Consolidated Appropriations Act of 2020 directs the EPA to establish clear policies that reflect the carbon neutrality of biomass. The EPA is hoping to publish the proposed rule on the carbon neutrality of biomass in June. **Policy Recommendation: Publicly support the EPA's proposed rule that defines biomass as carbon neutral.**

While the Governor of Minnesota and the state legislature do not set federal policy, there is an opportunity to implement the above policy recommendations through our Congressional delegation. Other states have been working on this issue for years, including Maine, Oregon and Arkansas. Teaming with them as part of a broader coalition of forested states may build enough momentum to affect a change in federal policy.

On April 29, 2020 the Governor's Council on Biofuels heard a presentation on a Midwest Clean Fuels Policy. The proposal is to develop a "performance-based incentive program that supports the commercial deployment of fuels with lower lifecycle carbon intensity" (Midwestern Clean Fuels Initiative 2020). As proposed this policy would "assign each fuel production method a unique carbon intensity (CI) score that is the complete well-to-wheels carbon equivalent emissions normalized for the energy content of the fuel". Such a system is purported to be both technology and feedstock neutral. This policy would be in addition to the federal RFS and it would reward reductions in carbon emissions, rather than setting volume targets.

Negotiating a Midwest Clean Fuels Policy is a heavy lift and will require significant time and effort to pass. While it would create a fair and stable pathway for development of woody biofuel production, it may be years before it comes to fruition. We encourage decision makers to design a policy that is truly technology and feedstock neutral; does not result in higher consumer pricing for fuels; reduces (or at a minimum does not increase) industrial energy rates for energy-intensive industries; and does not allow utilization of roundwood feedstocks with full market utilization by existing forest products industries. Great Plains Institute (2020) does a commendable job of pointing out the need to support the existing forest products industry while creating a pathway for industrial development to utilize other woody products.

Potential investors are pleased with the financial support opportunities in Minnesota. However, in recent years the demand for the AGRI BioIncentive has exceeded the available funding because the legislature has not appropriated the full amount into the fund. **Policy Recommendation: Fully fund the AGRI BioIncentive Program.**

SUMMARY

Creating an environment favorable to development of wood-based advanced biofuels production facilities in Minnesota would meet the Governor's Executive Order in that it would advance sources of biofuels feedstocks, assist rural communities, improve the natural environment, benefit economically disadvantaged populations, and dramatically reduce greenhouse gas emissions in the transportation sector.

The technology to manufacture ethanol, renewable diesel and jet fuel from woody feedstocks is mature and ready for commercialization. Investors stand ready to build in Minnesota. Incentive programs are in place but need full funding. The facilities could utilize wood feedstocks that are available as diseased, damaged, under merchandized and manufacturing residual byproducts. This would create new economic opportunities while benefiting forest health and maintaining forest productivity. Safeguards are in place to protect the environment and ensure sustainability. Infrastructure is available to handle and transport the raw materials.

However, federal legislation and policies create uncertainty for investors on feedstocks, product demand, and pathways to the marketplace. Minnesota's Governor, legislature, and Congressional delegation can work together on near-term federal policy changes and long-term state policy plans that will create an environment for investment in wood-based advanced biofuels which will reduce greenhouse gas emissions in the transportation sector in Minnesota and combat global climate change.

REFERENCES

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Wood-Based Advanced Biofuels

A component of Minnesota's
Biofuels Future

Governor's Directive

Governor's Executive Order 19-35 established the Governor's Council on Biofuels to:

- Provide ideas for policy and investment in biofuels development and utilization that are bold, practical, and broadly supported by a range of interests
- Make recommendations on, “Policies and programs to advance and invest in carbon efficiency improvements of biofuels plants and sources of biofuels feedstock”.
- Consider, “Impacts to, and opportunities for, farmers, rural communities, the natural environment, and economically disadvantaged populations as it relates to biofuels production”.

Definitions

- First-generation biofuels are made from the sugars and vegetable oils found in food crops using standard processing technologies.
- Second-generation biofuels (or Advanced Biofuels) are made from different feedstocks, including lignocellulosic biomass or woody crops, agricultural residues or waste, as well as dedicated non-food energy crops grown on marginal land unsuitable for food production.

“Advanced biofuels (including cellulosic biofuels) offer emission reductions as high as 80% compared to fossil fuels”

“Advanced biofuels are crucial for reducing emissions in heavy-freight, shipping and aviation”

“Production must be substantially increased, mainly for advanced biofuels”

-International Renewable Energy Agency (IRENA)



Global Support for Advanced Biofuels

- *Advanced biofuels are considered a renewable energy source*
- *Unlike fossil fuels, the combustion of biofuels emits carbon that is a part of the biogenic carbon cycle*
- *The long-term benefits of utilizing biofuels as a substitute for fossil fuels may even surpass those of carbon sequestration in forests.*

-IRENA

- *Biomass from sustainably managed forests is considered to be either carbon-neutral or a low-carbon fuel at the point of combustion*

-Intergovernmental Panel on Climate Change (IPCC)

Products

The following products can be produced from woody feedstocks depending on the processes used:

- Renewable diesel (chemically identical to petroleum diesel)
- Renewable jet fuel
- Bio-derived gasoline (chemically indistinguishable from petroleum-derived gasoline)
- Cellulosic ethanol
- Biohydrogen that can be used in fuel cells
- Naptha

Advanced biofuels technology is available but needs a reliable and sustainable pathway into the marketplace for products.

Barriers include:

- Regulatory uncertainty
- Low subsidy levels
- High financing costs
- Uncertainty in quantifying carbon budgets
- Woody feedstock qualifications
- Federal policy



“Attis Biofuels is well-positioned to expand its renewable fuel production footprint into other forms of advanced fuels like biodiesel, renewable diesel, renewable gasoline, and jet fuel.”

-Attis



Sources of Woody Feedstocks

- Mill residues – sawdust, shavings, cull and bark
- Logging slash – tops, limbs and cull material
- Salvage – wood damaged by fire, wind, insects and disease
- Species with inadequate markets

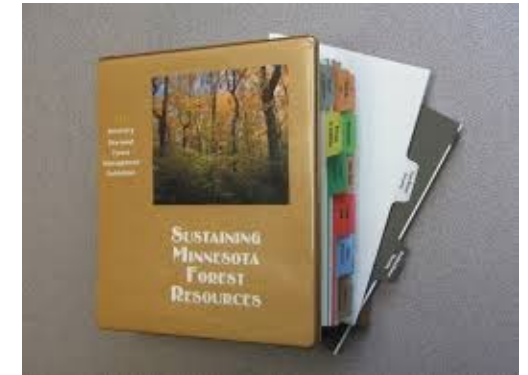


Note: All effort must be made to ensure that raw materials use do not negatively impact traditional forest products industries

Sustainability

Several mechanisms are in place to ensure that use of these materials is sustainable and won't harm the forest environment.

- MFRC Voluntary Site Level Guidelines, including biomass
- SFI/FSC Forest Certification
- USFS federal policies
- MLEP Logger Education



Biomass Harvesting on Forest Management Sites in Minnesota

Prepared by

The Minnesota Forest Resources Council
Biomass Harvesting Guideline Development Committee

Approved by

The Minnesota Forest Resources Council
May 16, 2007

Benefits of Using Wood

- New markets for woody material helps industry competitiveness
- Creates jobs in rural Minnesota's impoverished counties
- Keeps materials out of landfills
- Addresses unhealthy forest conditions
- Allows forest managers to meet conservation goals



Timber industry struggling after burst housing bubble

[Tom Robertson](#)

Bemidji, Minn.

September 1, 2011 9:00



Benefits of Using Wood

“...increased utilization of wood for bioenergy can, on some sites, improve ease and success of regeneration. It can also reduce fuel loading and fire risk directly impacting the cost of fighting forest fire and forest reestablishment costs.”

-Minnesota DNR



Biomass Supply

- *402,750 Green Tons available annually within 75 miles of Grand Rapids, MN*

-TSS Consultants

- Trucks, grinders, systems and infrastructure are all in place
- Highly trained logging workforce



The US Renewable Fuel Standard (RFS) under the Energy Independence and Security Act of 2007 (EISA) contains specific language that makes it nearly impossible to use woody feedstocks in advanced biofuels.

These include:

- Feedstocks from federal sources (e.g., National Forests) are not allowed.
- Feedstocks from non-plantation sources (e.g., naturally regenerated forests) are not allowed.
- Biomass from “slash” and “pre-commercial thinnings” can be used as biofuel feedstock but RFS has poor definitions of these terms.
- Biomass from allowed and non-allowed sources must be kept separate (rather than weight-scaling).
- Renewable fuel must be manufactured at a single facility.
- Wood-based biofuel is not identified by the EPA as “carbon neutral”.

Federal Policy Suggestions

While Minnesota's Governor and legislature do not make federal policy, they could send a strong message to Washington D.C. through our Congressional Delegation to work with partner states in support of the following:

- Publicly support the EPA's proposed rule that defines biomass as carbon neutral.
- Support passage of the EPA's Renewable Enhancement and Growth Support rule which would allow intermediate products to be transported to another site for final processing into biofuels and bioproducts.
- Support modifying the RFS to allow feedstocks from Federal Lands to be used in biofuels, allow woody feedstocks from all forest types and establishment regimes to be used in biofuels, clarify the definitions of slash and pre-commercial thinnings, and remove all references to keeping materials separate.

State Policy Suggestions

In lieu of Federal support for advanced biofuels, Minnesota's Governor and legislature could enact state policy that could create a stable market by doing the following:

- Fully funding the AGRI BioIncentive fund. Potential producers incur the full cost of developing bio-based facilities with the promise of production-based incentives from the state. But funding in the account is insufficient to cover demand.
- Create a Minnesota low carbon fuel standard that is feedstock and technology-neutral. It would reward low carbon fuel producers based on a standard carbon budgeting process. *Note: All effort must be made to not negatively impact prices at the pump!*

Summary Points

- Development of liquid transportation fuels production in Minnesota is a long-term vital part of the Governor's vision for reducing carbon emissions from the transportation sector in the state.
- Doing so will help improve forest health and other aspects of the natural environment, while bolstering economically disadvantaged populations.
- Some products are chemically indistinguishable from petroleum-derived products, thus requiring no new infrastructure.
- Slight changes to federal and state policy will provide a stable pathway for advanced biofuels development.

This effort would make the entire biofuels sector in Minnesota more robust and diversified, which would benefit all producers by expanding markets and creating more opportunities.



Benzene and Aromatics

Toxic gasoline components



What is benzene?

- Aromatic hydrocarbon existing in crude oil, gas, cigarettes
- Top 20 chemical by volume in US
- Raw material for other products (plastics, resins, etc)
- Component of gasoline added for octane
- Part of BTEX aromatic components: Benzene, Toluene, Ethylbenzene, Xylene (all in gasoline)

Benzene hazards

- Known **carcinogen, toxin, mutagen** (CDC, WHO)
- Primarily blood-related cancers
 - Childhood leukemia
 - Anemia (lack of red blood cells)
 - Lymphocytic leukemia (blood and bone marrow)
 - Multiple myeloma (white blood cells)
 - Non-Hodgkin lymphoma (white blood cells)
- Spina Bifida and low birth weight (pregnancy exposure)



Aromatics in the Environment

- In 2016, gasoline was 21.76% aromatics (EPA)
- Contributes to particulate matter (PM_{2.5}) pollution
 - Compounds COVID risk and severity (Harvard Med)
- Found in some groundwater/soils in MN (MDH)

Where is BTEX found?

- Benzene in MN is primarily from burning gasoline and from evaporation at gas stations (MPCA)
- Concentrated in cities and around gas stations (MPCA)
- Disproportionately affects inner-city communities, low-income, and Communities of Color (EPA)

When California cut the benzene in half in gasoline, ambient benzene in the air in cities was cut in half (CARB)

MN Opportunity

- Request MPCA study prominence of BTEX in our largest cities: Minneapolis, St. Paul, Rochester, Duluth
- Document effects of BTEX on human health and the environment
- Propose MN gasoline limits on BTEX based on findings