Advanced Transportation Fuels Advisory Group Recommendations and Supporting Fact Sheets

As part of Illinois Gov. Pat Quinn's agenda as Chair of the Midwestern Governors Association (MGA), governors appointed members to the Advanced Transportation Fuels Advisory Group to: develop a set of recommendations for MGA states to support and grow the existing biofuels industry by increasing exports and energy productivity, determine how to support the next generation of biofuel development, and to put in place the infrastructure and vehicle technology necessary to use more biofuels in the region.

This advisory group examined strategies to commercialize next generation biofuels, deploy infrastructure to meet market demand and achieve state and national renewable fuel goals and improve the production of biofuels at existing facilities with technology, innovation and renewable resources.

This advisory group deliberated for approximately one year. It held two in-person meetings and many conference calls and Webinars to finalize these recommendations and supporting fact sheets.

The final set of recommendations and supporting fact sheets were developed through a stakeholder process that represented many diverse Midwestern interests and perspectives. Specific policies, principles and recommendations in this document reflect the opinions of the majority of participants in the process, but should not be interpreted as the positions of any individual participant, state, governor or company.

Fact Sheet Guide

Midwestern Governors Association

Advanced Transportation Fuels Advisory Group

Doug Berven
POET

Kenneth Brown
Minnesota Department of Commerce

Mark Calmes
Archer Daniels Midland

Geoff Cooper
Renewable Fuels Association

Bill Couser
Couser Cattle Company

Mary Culler
Ford Motor Company

Mike Doherty
Illinois Farm Bureau

Bob Elvert
Exxon Mobil

Scott Hedderich
Renewable Energy Group

Gary Herwick
Minnesota Corn Growers

Joseph Hoch
Wisconsin DNR

Paritosh Kasotia
Iowa Department of Economic Development

Nancy Lange
Izaak Walton League

Shelby Neal
National Biodiesel Board

Bill Northey
Iowa Department of Agriculture & Land Stewardship

Randy Olson
Iowa Biodiesel Board

Hunter Roberts
State of South Dakota

Martha Schlicher
Monsanto

Doug Scott
Illinois Commerce Commission

Monte Shaw
Iowa Renewable Fuels Association

Fred Walas
Marathon

Sara Walling
Wisconsin Department of Agriculture, Trade and Consumer Protection

Dan Weiss
Duke Energy

Additional Regional Members

Michael Kandravy
Suncor Energy, Inc.

Bob Leidich
BP North America

Gary Schoonveld
ConocoPhilips

Recommendations to Midwestern Governors I

Following a year-long facilitated stakeholder consensus process, the Midwestern Governors Association Advanced Transportation Fuels Advisory Group provides the recommendations listed below to the Midwestern Governors.

The recommendations address the following three areas:

- **Support commercialization of next generation biofuels;**
- **Deploy infrastructure to meet market demand and achieve state and national renewable fuel goals; and**
- **Improve production efficiency at existing facilities with technology, innovation and renewable resources.**

The Midwest is the nation's leader in biofuel production and use, and Midwestern leadership in biofuel development has resulted in a net economic benefit to the region. In the Midwest alone, the ethanol industry's success has resulted in more than 68,000 jobs, a total economic output estimated at over $26 billion and approximately $651 million in state tax revenue.[1] The region's successful biodiesel industry is estimated to have created nearly 14,000 jobs and has contributed a total economic output of almost $5 billion.[2]

Continuing to support and expand the Midwestern biofuels industry contributes to a national strategy of fuel diversity and domestic energy production. One of the Midwest's greatest competitive advantages is its existing fleet of production facilities. The commercialization of next generation biofuels presents a number of significant opportunities, such as co-locating next generation projects with the region's existing production facilities. This can increase efficiency, utilize an existing network of feedstock suppliers and provide economic benefits to local communities.

Existing Midwestern biofuel facilities have already begun to adopt innovative technology practices and production efficiencies to reduce energy use, manufacture multiple products from the same raw material and improve the environmental performance of the production system. Tremendous opportunities exist to replicate the success of these facilities across the region.

State and local governments, along with private interests, have made significant investments in refueling infrastructure and flex-fuel vehicle manufacturing to give consumers better access to biofuels. The Midwest has more biofuel infrastructure and flex-fuel vehicle use than any other region. By building on existing efforts and expanding biofuel infrastructure, the Midwest can continue to lead the rest of the county in biofuel use, even as production and exports increase.

RECOMMENDATIONS TO

COMMERCIALIZE NEXT GENERATION FUELS

Reference supporting documents II - V

1. **Conduct a review of state regulatory processes for production of next generation biofuel projects**, identify opportunities for a streamlined regulatory process and make necessary changes.

2. **Encourage existing and create new partnerships with state universities** in feedstock supply logistics, utilizing extension services. Utilize tools to help feedstock providers purchase specialized biomass harvesting and processing equipment. Support distributed and centralized biomass distribution centers, where needed.

3. **Consider state purchase agreements for next generation biofuels**, also known as offtake agreements, for use in state vehicle fleets in order to aid in securing private sector financing of next generation biofuel facilities.

4. **Recommend creation of state/regional funding sources for commercialization of near-term next generation biofuels,** such as a regional bond pool, with funding conditional on building facilities in the region.

5. **Work collaboratively to engage Congress** (possibly through writing a letter or making a public statement), expressing support for continuation of the Renewable Fuel Standard (RFS2) and establishing annual volumetric requirements for advanced and cellulosic fuels at realistic levels. Communicate the importance of other programs, such as loan guarantees and the Biomass Crop Assistance Program, in achieving RFS2 goals. Engage with other policymakers and other stakeholders to encourage similar statements.

[1-2] Estimates based on internal review of a number of economic reports from individual state agencies and trade associations.

RECOMMENDATIONS TO
ENHANCE THE IMPLEMENTATION OF THE RENEWABLE FUEL STANDARD Reference supporting documents VI - X

1. **Write a letter to the Coordinating Research Council and U.S. Department of Energy,** urgently recommending additional vehicle and retail fuel infrastructure testing on E10 baseline fuel that compares to the E15 test fuel and test conditions.

2. **Support coordination of state and federal fuel regulations** to overcome barriers to adoption and use of E15 in approved engines and infrastructure. Support similar efforts for other biofuels and blends, such as mid-level ethanol blends, E85, B20, biobutanol, etc.

3. **Support national efforts and complementary state programs** to establish best practices, safety standards and other technical guidance for the installation and use of ethanol blends above E10, E85 and blender pumps.

4. **Make a statement to vehicle and engine manufacturers** requesting that companies endorse B20-capability for all new diesel engine/vehicle platforms and warranty statements.

5. **Write a letter to Congress** expressing support for federal policy proposals that will increase the production and rapid deployment of flex-fuel vehicles (FFVs).

6. **Support state and local education efforts directed at FFV owners, consumers and auto dealers** promoting the capabilities of FFVs and access to ethanol blends above E10.

7. **Support local, state and federal education efforts that will educate consumers about the use of blends above E10** in vehicles older than model year 2001 and non-road engines. Coordinate with existing industry education efforts.

8. **In order to propel Midwestern leadership in biofuels, provide support for new and existing state and local incentive programs** for biodiesel, E85, blender pump and terminal infrastructure at fuel retailing stations. Encourage the sharing of policies and best practices across Midwestern states.

9. **In order to propel Midwestern leadership in biofuels, provide support for biofuel production at the state level** for economic development.

10. **Work with federal agencies to reconcile the Corporate Average Fuel Economy (CAFE) and greenhouse gas regulations with RFS2**. Include a role for biofuels in CAFE and greenhouse gas regulations. Create a level playing field for FFVs and other fuel options.

RECOMMENDATIONS TO
INCREASE MIDWESTERN EXPORTS OF BIOFUELS Reference supporting document XI

1. **Create state technical assistance programs to assist biofuel producers** by advising on technological innovations that could be adopted at an individual plant to lower the overall carbon intensity (CI). This information can be useful for biofuel producers to determine the export potential of their product to U.S. states/regions, European or Canadian markets that have a low carbon fuel policy. Midwestern states could collaborate by sharing information or creating a regional resource pool for project funding.

2. If technical assistance programs exist, **make necessary language or executive branch changes in order to provide energy efficiency audits**, which include economic benefits of energy-related production practices, and identify additional carbon reduction pathways to individual biofuel plants. Offer assistance to implement identified practices.

3. **Expand existing or create new state policies** to support energy efficiency at individual biofuel plants, recognize combined heat and power implemenation potential and increase the use of renewable energy resources. Engage in effective cross-state collaboration to share successful models.

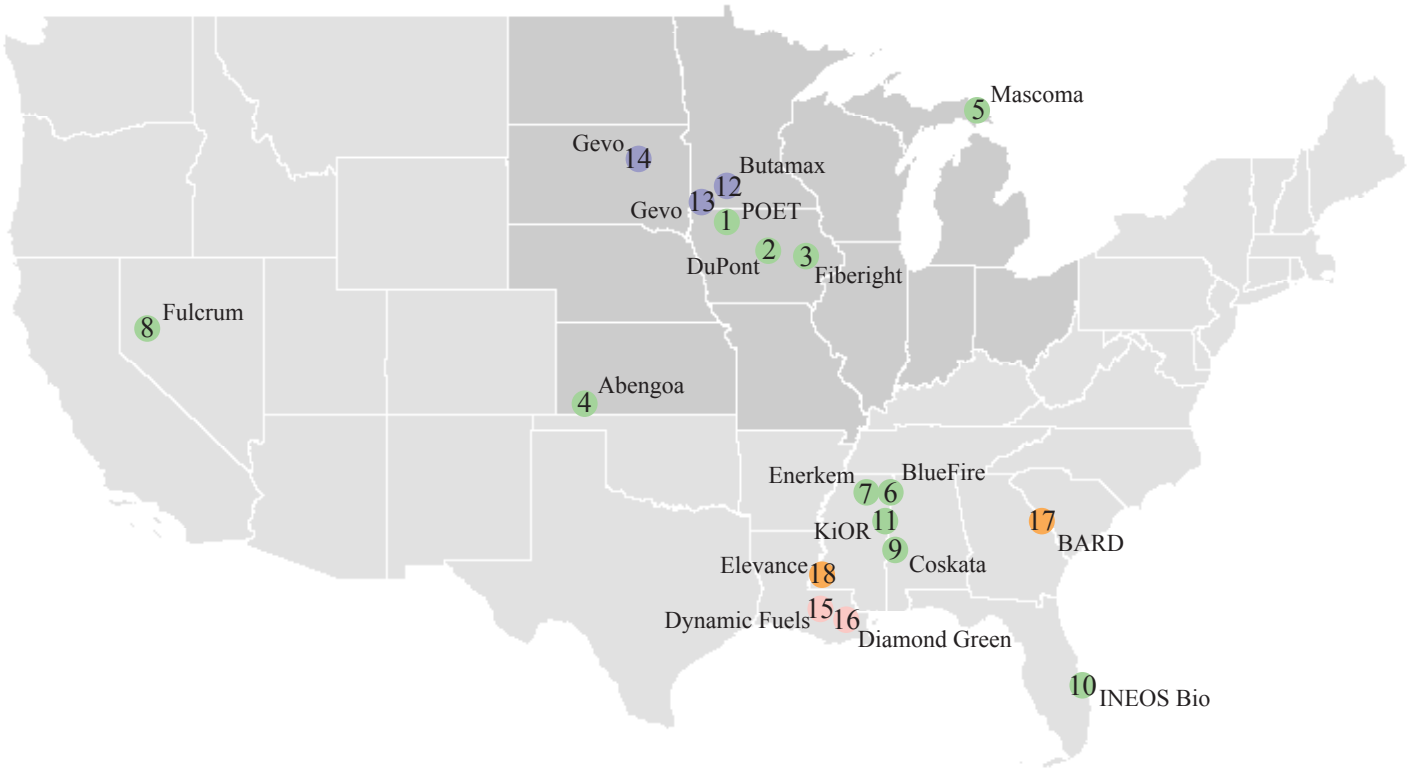
4. **Utilize existing or support new initiatives**, such as grants, tax credits or loans, to provide incentives for technology adoption at existing biofuel plants that will lower the CI of the fuel. Express support for existing federal industrial energy efficiency programs to include renewable fuels as a targeted industry.

5. **Submit an inquiry to the California Air Resources Board and the California Energy Commission** about how to best engage state departments of agriculture in energy and environmental regulatory processes. State departments of agriculture could provide essential information about Midwestern agriculture practices and production methods.

Advanced and Near-Term Commercial-Scale

Next Generation Fuel Facilities II

This map displays next generation fuel facilities that are scheduled to come online in the next two years. The map focuses on near-term technologies, including cellulosic ethanol, renewable diesel and biobased hydrocarbons. It excludes new facilities utilizing technology that is already commercially available. These facilities are clearly concentrated in two areas of the U.S.: the Midwest and the Southeast. Although the Midwest has traditionally been a leader in biofuel production, the Southeast is set to become a major player in the next generation biofuels industry.



Renewable Fuel Standard Classification:

Cellulosic Biofuel Renewable Fuel Advanced Biofuel Biomass-based Diesel

1	POET	Emmetsburg	IA
2	DuPont Danisco Cellulosic Ethanol	Nevada	IA
3	Fiberight	Blairstown	IA
4	Abengoa	Hugoton	KS
5	Mascoma	Kinross	MI
6	BlueFire Renewables	Fulton	MS
7	Enerkem	Pontotoc	MS
8	Fulcrum	McCarran	NV
9	Coskata	Boligee	AL
10	INEOS Bio	Vero Beach	FL
11	KiOR	Columbus	MS
12	Butamax	Lamberton	MN
13	Gevo	Luverne	MN
14	Gevo	Redfield	SD
15	Dynamic Fuels	Geismar	LA
16	Diamond Green	Norco	LA
17	BARD	Augusta	GA
18	Elevance Renewable Sciences	Natchez	MS

#	Name	RFS2 Category	City	State	Capacity*	Opening	Fuel / Chemical	Technology	Feedstock(s)
1	POET	Cellulosic Biofuel	Emmetsburg	IA	25	2013	Ethanol	Ezymatic Hydrolysis	Corn stover, switchgrass, MSW, wheat straw
2	DuPont Danisco Cellulosic Ethanol	Cellulosic Biofuel	Nevada	IA	25	2013	Ethanol	Ezymatic Hydrolysis	Corn cob
3	Fiberight	Cellulosic Biofuel	Blairstown	IA	6	2012	Ethanol	Ezymatic Hydrolysis	Municipal solid waste (MSW)
4	Abengoa	Cellulosic Biofuel	Hugoton	KS	26	2013	Ethanol	Ezymatic Hydrolysis	Corn stover
5	Mascoma	Cellulosic Biofuel	Kinross	MI	40	2013	Ethanol	Consolidated Bioprocessing	Hardwood
6	BlueFire Renewables	Cellulosic Biofuel	Fulton	MS	19	2013	Ethanol	Acid Hydrolysis	Wood and wood-waste
7	Enerkem	Cellulosic Biofuel	Pontotoc	MS	10	2013	Ethanol	Gasification	MSW and wood-waste
8	Fulcrum	Cellulosic Biofuel	McCarran	NV	11	2013	Ethanol	Gasification	MSW
9	Coskata	Cellulosic Biofuel	Boligee	AL	55	2013	Ethanol	Gasification	Multi-feedstock
10	INEOS Bio	Cellulosic Biofuel	Vero Beach	FL	8	2012	Ethanol	Gasification-Fermentation	Yard, wood and vegetative wastes
11	KiOR	Cellulosic Biofuel	Columbus	MS	63	2012	Bio-based hydrocarbon	Pyrolysis	Woodchips
12	Butamax	Renewable Fuel	Lamberton	MN	50	2013	Biobutanol	Fermentation	Corn
13	Gevo	Renewable Fuel	Luverne	MN	18	2012	Biobutanol	Fermentation	Corn
14	Gevo	Renewable Fuel	Redfield	SD	38	2013	Biobutanol	Fermentation	Corn
15	Dynamic Fuels	Advanced Biofuel	Geismar	LA	75	2011	Renewable Diesel	Fischer-Tropsch	Animal wastes
16	Diamond Green	Advanced Biofuel	Norco	LA	137	2013	Renewable Diesel	Hydroprocessing	Animal residue
17	BARD	Biomass-based Diesel	Augusta	GA	10	2012	Biodiesel	Algae transesterification	Algae
18	Elevance Renewable Sciences	Biomass-based Diesel	Natchez	MS	80	2013	Biobutanol	Transesterification/catalysis	Oils

*Capacity: million gallons per year (MGPY)

Notes:

1. Although conventional biodiesel facilities qualify as “advanced biofuels” under U.S. EPA’s Renewable Fuel Standard (RFS2), they are not included on this map because this technology is already operating at commercial-scale and has been for many years.
2. Commercial-scale is defined as larger than 5 million gallons per year. Numerous pilot and demonstration-scale facilities are excluded from this map.
3. Data is derived from the November 2011 version of the Biofuels Digest Advanced and Cellulosic Biofuels Project list. Information about all U.S. projects was verified by reviewing news items and company websites or media, and some revisions were made.
4. As part of RFS2, the U.S. EPA has required that 8.65 million gallons of cellulosic ethanol be blended into gasoline in 2012 (a reduction from the 500 million gallons originally required by the Energy Independence and Security Act of 2007), as well as 1 billion gallons of biomass-based diesel, and 2 billion gallons of advanced biofuel.

Announced Commercial-Scale

Next Generation Fuels and Chemical Facilities in the Midwest

III

Eight next generation biofuel facilities are expected to come online in the Midwest in the next two years, and 18 nationwide. Five Midwestern states have planned facilities in this timeframe. *This document highlights four companies with projects in four Midwestern states: POET in Iowa, Mascoma in Michigan, Gevo in Minnesota and Abengoa in Kansas.*

POET

Project Liberty
Emmetsburg, Iowa

A 20 million gallon per year (MGPY) cellulosic ethanol plant, using corn stover as a feedstock.

Status
Construction began in 2010, will be operational in 2013. Currently gathering feedstock with 61,000 tons gathered in 2011 harvest.

Project Cost $250 million

State and Federal Assistance
$20 million from the State of Iowa. Partnership with Iowa State University to evaluate soil impacts of crop residue removal.

Private Financing $40 million in research and development by POET; 50-50 joint venture with Royal DSM

Economic Impact

40-50 direct permanent jobs
180 indirect jobs
200 construction jobs
$13 million in local spending on corn stover

ABENGOA BIOENERGY

Hugoton, Kansas

A 26 MGPY cellulosic ethanol plant, using corn stover and wheat straw.

Status
Under construction. Estimated to be completed in late 2013 and operational in 2014. Currently gathering feedstock, with 60,000 tons by Spring 2012 and another 60,000 tons expected by Fall 2012.

State and Federal Assistance
$132.4 million loan guarantee from U.S. Department of Energy, support to growers from the Biomass Crop Assistance Program.

Private Financing Abengoa

Economic Impact

65 permanent jobs
300 construction jobs

Luverne, Minnesota
Redfield, South Dakota

An 18 million gallon per year (MGPY) project in Luverne and a 38 MGPY project in Redfield. Both projects are corn ethanol plants retrofitted to produce isobutanol from corn.

Status
Luverne project operating in 2012.
Redfield project operating in 2013.

State and Federal Assistance
$5 million grant to develop cellulosic jet fuel from U.S. Department of Agriculture.

Private Financing
Khosla Ventures, Total, Lanxess. Raised $107 million in its 2011 initial public offering (IPO). Offtake agreements with Sasol and Mansfield.

Kinross, Michigan

A 40 MGPY cellulosic ethanol facility utilizing wood feedstocks.

Status
Construction expected to begin in early 2012 and be completed by 2013.

Project Cost $232 million

State and Federal Assistance
$100 million in funding from U.S. Department of Energy; $23.5 million dollar grant from the State of Michigan

Private Financing
Valero providing majority of financing for first commercial-scale facility. Filed for a $100 million IPO in September 2011.

Economic Impact

50-75 new jobs in 2012


Luverne, MN

Summary of Interviews:

Midwestern Next Generation Biofuel IV

Project Developers

Interviews were conducted with senior-level management from seven companies to identify ways federal and state governments can help achieve commercial-scale next generation biofuel production. Interviewed companies include POET, Abengoa, ADM, Gevo, INEOS Bio, Virent and Quad County Corn Processors, most of which are Midwest-based companies planning projects within the region. Gevo is a Colorado-based company building a project in Minnesota, while Illinois-based INEOS Bio is building a project in Florida. Four of the seven companies plan to have commercial-scale facilities complete by 2013, with others having longer timeframes.

Top Hurdles to Commercialization

Interviewees listed their top hurdles to commercializing next generation biofuels. This is a list of the topics that were most frequently mentioned as hurdles. They are listed in order of how many interviewees mentioned that particular issue.

Long-term Federal Policy Certainty

All interviewees felt a lack of confidence in the continued existence of federal policies such as the renewable fuel standard (RFS2) and tax credits, which can "keep investors on the sidelines." This is related to financing. One participant noted that the recent debate over the ethanol blenders credit (VEETC) has cast doubt on the long-term durability of other biofuel policies. All interviewees indicated that long term policy certainty was a hurdle.

Project Financing

Some interviewees mentioned financing as a top hurdle. Interviewees emphasized that lenders are reluctant to invest in these projects because they are capital-intensive and often the first of their kind. One interviewee felt that banks are more likely to invest in proven technologies, such as wind power, because they have high returns and proven business models. Notably, some interviewees noted that financing was NOT a concern for them, so this is not a universal problem.

Feedstock Logistics and Pricing

Some interviewees mentioned feedstock access, supply and pricing as a challenge.

Federal Regulation

Some interviewees mentioned regulation as a top hurdle, in particular the challenge of certifying new fuels that are not already in the fuel supply (like biobutanol and jet fuel).

Market Demand for Ethanol

Because cellulosic ethanol will still be a product of many of these facilities, the blend wall, which is the maximum amount of ethanol that be blended into the gasoline supply for use in non-flex-fuel vehicles (FFVs), is a concern for some interviewees. Notably, some companies plan to produce a non-ethanol product (e.g. biobutanol, biogasoline, etc.), and thus this issue is not of concern to them.

Making State and Federal Programs More Helpful

Interviewees were asked how state and federal programs could be more helpful than they are now.

State Permitting

Although no interviewees indicated that state permitting was preventing projects from going forward, some suggested that state permitting could be streamlined. If a technology has been proven and has been built elsewhere, the permitting process should be simpler. One company suggested that it should be feasible for project siting and permitting to be completed within one year. Some interviewees noted that speeding up permitting can save time and money for companies, while attracting financing through increased certainty about construction costs.

State Incentives

More states should consider offering a package of incentives in order to attract advanced and cellulosic biofuel facilities. Offering incentives that pair with federal programs could increase the odds that a project lands within the state.

Loan Guarantees

The loan guarantee process is very labor-intensive and requires multiple staff to manage program requirements. Some reporting seems duplicative and there may be ways to eliminate redundancy.

Market Demand for Ethanol

Some interviewees suggested a coordinated regional effort to sell biofuels in the Midwest at levels higher than 10 percent. This could be done in three ways: by selling E15 in the region as regular gasoline, by encouraging higher level blends in FFVs, and by selling biobutanol and biobased hydrocarbons. This helps to create a market for second generation fuels. Using more ethanol in the Midwest also saves money on shipping costs to export the fuel. A successful Midwestern program could serve as a model for other regions.

What IS Working?

Interviewees were asked to indicate what IS working in developing next generation biofuel projects. The following issues emerged as areas of success.

EPA's RFS2

RFS2 should work in theory to create a market for cellulosic and advanced biofuels, but there is uncertainty about its future, which keeps investors on the sidelines.

Bolt-on Projects and Retrofits

Some interviewees observed that the Midwest has a comparative advantage over other regions in its existing fleet of first generation biofuel plants. This provides the opportunity to co-locate, or bolt-on, next generation biofuel projects to existing facilities. Many Midwestern next generation biofuel facilities are actually retrofits of existing plants. It is less expensive to add a next generation biofuel component to an existing facility and benefit from the existing infrastructure and feedstock provider relationships than to build a "green field" plant.

Bioproducts

Many next generation biofuel facilities are selling higher value non-fuel products in addition to fuels. This helps overall project finances.

Technology

Many investors have taken risks to develop technology, and many technologies are on the cusp of commercialization. The challenge now is to scale-up to commercial size.

Federal Investment

Many facilities have benefited from federal programs (loan guarantees and grants), and this has made it much more likely that these projects will be built.

State Investment

Many planned commercial-scale next generation biofuel facilities are locating in states that provide a financial package of some kind. Types of incentives have included tax breaks, grants, state loans, state industrial bonds and workforce development grants.

Southeastern States

States in the Southeast are attracting a significant number of new next generation biofuel facilities. Southeastern states use a combination of revenue bonds, tax abatement and conditional tax credits. Companies like KPMG and Ernst & Young offer "site selection optimization" services to help companies get the best deal from state programs when building new facilities. Louisiana and Mississippi in particular have been successful at attracting commercial-scale next generation biofuel facilities, and between them expect to have six commercial-scale facilities operating by the end of 2013. Mississippi and Louisiana are highlighted as case studies on supporting document V, *State Strategies for Attracting Next Generation Biofuels.*

This document summarizes broad findings from interviews with next generation biofuel companies. Interviews were conducted on a non-attribution basis: while this publication reports general trends, it does not directly attribute remarks to individuals or companies.

State Strategies For

Attracting Next Generation Biofuels: V

Louisiana and Mississippi Case Studies

Louisiana

Louisiana has been very successful at attracting commercial-scale next generation biofuels projects. Three companies - Sundrop, Dynamic Fuels and Diamond Green - are planning facilities in the state. Louisiana has a host of state programs aimed at attracting projects, including an active Louisiana Economic Development Group that has authority to allocate funding to attract companies and award a range of performance-based tax credits when new jobs are created. One unique program is a private activity bond program, which allows the Louisiana Public Facilities Authority to issue bonds in order to award financing for certain private sector capital projects, such as new manufacturing facilities.

Elements of State Success

- Active Louisiana Economic Development Group working to attract companies to the state.
- Louisiana FastStart, ranked by *Business Facilities Magazine* as the top workforce development program in the country.
- Private Activity Bond Program is able to issue bonds on behalf of certain private sector capital projects, including manufacturing.
- Sundrop facility attracted to the state because its process requires natural gas, which Louisana has in abundance.
- Multiple state-level tax incentives (angel credit, Quality Jobs program, research and development (R&D) tax credits, industrial tax exemption).
- Many tax credits are performance-based and can only be received if permanent jobs are created.
- State has articulated a strategy to diversify their energy mix.

> “When I ran for governor, I told you that it was for one main reason - I was tired of seeing friends and family move away from Louisiana to pursue their dreams in other states because they couldn’t find opportunities here at home. Four years later, our state’s economy is not just growing: we are competing and winning in the national and global economy. Louisiana’s innovation in the energy industry has always been part of our state’s economy and our heritage. Today, I am proud to announce that we are here to again build on our state’s legacy in the energy industry, while also continuing our winning streak of job creation projects. We are turning our economy around and making Louisiana the best place in the world to pursue a rewarding career.”
>
> **Bobby Jindal**
> Governor of Louisana

Projects

Sundrop *Alexandria, La.*

Status:	Has secured 1,200 acres for the facility, construction starting in 2012, facility expected to be in operation by 2014.
Facility:	50 million gallons per year (MGPY) facility will gasify wood waste and combine with hydrogen extracted from natural gas to produce “green gasoline.”
Public Funding:	$18.5 million from the Louisiana Economic Development Group in performance-based grants as well as grants for relocation of R&D facilities and employees. $330 million in private activity bonds.
Financing:	$175 million in private sector investment, including $155 million (a 50 percent stake) from Chesapeake Energy.

Dynamic Fuels *Geismar, La.*

Status:	In operation since in November 2011.
Facility:	Produces renewable diesel from animal fats and greases. Currently producing 2,500 barrels per day will produce 5,000 barrels per day or 75 MGPY.
Public Funding:	Received $100 million in Gulf Opportunity Bonds (program created by the U.S. Congress to benefit states impacted by Hurricane Katrina).
Financing:	Joint venture of Tyson Foods and Syntroleum, $150 million invested in project. Under contract with U.S. Navy to provide renewable jet fuel and marine distillate fuel.

Diamond Green *Norco, La.*

Status:	Began construction in 2011, complete in 2013.
Facility:	137 MGPY renewable diesel facility planned for Norco, La., producing diesel from animal fats.
Financing:	Joint Venture of Valero and Darling International, Inc.

Mississippi

Mississippi has been very successful at attracting next generation biofuel projects. Four companies - KiOR, Enerkem, Bluefire and Elevance - are planning to build commercial-scale facilities in Mississippi. KiOR has committed to building five facilities in the state. One element of Mississippi's success has been the willingness of former Gov. Haley Barbour and the legislature to spend state dollars to attract facilities, in the hopes of a future return on investment in jobs and economic development.

Elements of State Success

- Active recruitment by Mississippi Development Authority.
- Mississippi Industry Incentive Financing Revolving Fund.
- Willingness by former Gov. Barbour and state legislature to provide project financing.
- University partnerships for feedstock characterization and development.
- Governor and legislature show a willingness to take high short-term risk in order to possibly gain in the future. This can reduce risk in the long term by diversifying.
- State has articulated a strategy to diversify its energy mix.

Projects

KiOR *Columbus, Newton, and Bude, Miss. 2 additional locations planned*

Status:	Columbus facility under construction and projected online by 2013.
Facility:	Wood feedstock, pyrolysis technology, biomass-based hydrocarbon product. Columbus facility 11 million gallons per year (MGPY); Newton facility 33 MGPY.
Public Funding:	$75 million loan from the State of Mississippi.
Financing:	$150 million Initial Public Offering (IPO), additional $350 million in private funding.

Enerkem *Pontotoc, Miss.*

Status:	Facility projected online by 2013.
Facility:	Municipal solid waste to ethanol. 10 MGPY.
Public Funding:	$130 million in federal funding, negotiating state funding.
Financing:	Valero, Waste Management are investors.

Bluefire *Fulton, Miss.*

Status:	Facility projected online by 2013.
Facility:	19 MGPY ethanol plant, wood feedstock, concentrated acid hydrolysis process.
Public Funding:	Seeking $250 million U.S. Department of Energy loan guarantee.
Financing:	China Huadian Corp. providing commercialization funding.

"

I am pleased this innovative new company has committed to locating five production facilities in the state and will be providing 1,000 high-quality jobs for Mississippi residents and economic opportunities in rural communities around the state. KiOR's revolutionary technology will allow the company to use Mississippi's abundant, renewable natural resources to produce a crude oil substitute that will help meet our nation's energy needs while reducing our dependence on foreign oil.

[The KiOR project may be] one that we may look back on and say it's the most important change that has done the most good for the people of Mississippi than any other. And I don't say that lightly.

"

Haley Barbour
Former Governor of Mississippi

Elevance *Natchez, Miss.*

Status:	Facility projected online by 2013.
Facility:	Acquired existing Delta Biofuels facility. Investing $225 million to upgrade facility to produce specialty chemicals and fuels from natural oils using a patented process; Elevance is headquartered in Woodridge, Ill.
Public Funding:	$25 million loan from Mississippi Industry Incentive Financing Revolving Fund, as well as upgrades to Natchez/Adams County port.
Financing:	Filed for $100 million IPO in September 2011 other private sector financing from Total Energy Ventures, Naxos Capital Partners, Cargill Inc., TPG and Materia.

The document is intended as a general guide to issues that states will need to address before implementing sale of 15 percent ethanol blends (E15). There are also federal and marketplace issues that will impact the implementation of E15 in individual states that are identified on the second page of this document. Complete E15 implementation will require resolution of issues at both the state and federal levels. An individual state may have unique laws or regulations that must also be addressed in addition to the issues outlined below. The intent of this document is to outline the issues impacting E15 implementation at the state and federal level and to provide guidance to states. It is up to each individual state to determine what specific actions to take to address the identified issues.

□ **Liability Concerns**

Issue summary: Since the U.S. Environmental Protection Agency (EPA) has granted a conditional waiver for use of E15 for vehicle model years 2001 and newer vehicles, there are liability concerns.

Recommended action: States may wish to provide retailers with some liability protection for offering E15 and should consider liability relief for other parties across the entire supply chain. Iowa has legislation that provides retail liability protection.

□ **Fuel Specifications**

Issue summary: Fuel specifications (code and regulatory) should be reviewed to allow the sale of E15. American Society for Testing and Materials (ASTM) and National Institute of Standards and Technology (NIST) standards for ethanol blends between 11 percent and 51 percent do not exist. ASTM is seeking data to establish such a standard.

Recommended action: A state may wish to adopt "input" specifications for the ethanol and gasoline to be blended instead. This would provide quality specifications without preventing the sale of E15.

□ **Ensuring safety**

Issue summary: In some cases, current fire codes do not account for approval of ethanol blends above 10 percent. In addition, regulators and government officials should be aware of existing and evolving federal Occupational Safety and Health Administration (OSHA) requirements for listed equipment.

Recommended action: States will need to determine which regulatory entity has "above ground" dispenser jurisdiction and access their rules to determine which existing E10 dispensers, if any, would be approved to dispense E15. Iowa's Fire Marshall has completed an evaluation process for existing dispensers. Encourage conversations between state fire marshalls and OSHA officials.

□ **Underground Storage Tank (UST) Issues**

Issue summary: EPA issued compatibility guidance for UST systems in July 2011.

Recommended action: States will need to identify which regulatory agency has UST system jurisdiction for determining UST compatibility with E15, based on EPA guidance. Iowa's approach for USTs is recognized by EPA.

□ **Pump Labeling Issues**

Issue summary: The EPA has mandated a federal E15 pump decal, which is under litigation. The Federal Trade Commission (FTC) requires that a minimum octane be posted at the pump. ASTM-certified test methods for determining octane are being modified to accommodate E15. This may take until June 2012.

Recommended action: States will want to determine how any state labeling laws interact with the federal requirements.

- Any state "Flex-Fuel Vehicle Only" pump labels would need to apply to only E16 and higher blends.
- States could evaluate alternative means of determining octane rating for E15, within FTC guidelines, such as the method described in the recent National Renewable Energy Laboratory report.

□ **Consumer Education**

Issue summary: To ensure product is handled properly, customer education programs to prevent misfueling and supply chain communication will be needed. Vehicle and equipment manufacturer information for applicability should be communicated to consumers. Vehicle and equipment manufacturers have raised concerns of warranty issues when using E15 in engines not designed for its use. EPA's misfueling mitigation final rule provides guidance on the desired elements of a consumer education campaign.

Recommended action: States should coordinate with existing industry consumer education efforts.

□ **State Implementation Plans (SIPs)**

Issue summary: States with non-attainment areas have SIPS approved by the EPA that outline specific fuel requirements.

Recommended action: States with Clean Air Act SIPs will need to review them for compatibility with E15 introduction and obtain EPA approval for any necessary changes before allowing E15 to be introduced into that state's market.

Federal Implementation Issues

There are a number of outstanding issues at the federal level, in addition to the issues listed below, that states need to be cognizant of as they consider E15. These issues include ongoing engine testing by the Coordinating Research Council (CRC) to determine compatibility with E15, current litigation which will clarify EPA's legal authority to issue a partial waiver and a variety of ongoing issues related to equipment and infrastructure for various parts of the fuel supply chain.

- **Fuel waiver**
  - EPA has granted a partial E15 waiver, allowing E15 use in model year 2001 and newer automobiles but not for use in off-road, marine or smaller engines.
  - The partial waiver is conditional, and any party engaged in E15 will need to meet the additional provisions of the waiver with EPA approval.

- **Detergent certification**
  - At this time, EPA has not specified any additional detergent-related certification issues aside from E10.
  - EPA has not indicated any plan to revise regulations for certifying E15 detergents.

- **Fuel registration and health effects testing**
  - On February 17, 2012 the EPA approved health effects data submitted by renewable fuel trade associations, therefore fuel and fuel additive manufacturers are able to apply for fuel registration with EPA. Registration is not complete until the application is approved by EPA.

- **Reformulated gasoline (RFG) certification**
  - Current regulations for RFG do not allow fuel manufactures to certify batches of gasoline containing greater than 10 percent ethanol by volume.
  - EPA has a rulemaking process pending to allow fuel manufacturers to certify batches of E15 for RFG.

- **Occupational Safety and Health Administration**
  - Applicability of OSHA regulations to E15 is a gray area that may need to be clarified for individual retailers to obtain insurance prior to retailers offering E15. OSHA is engaged in a process to determine how to apply their regulations to E15.
  - Many insurers of retailers require listing by an independent testing laboratory of infrastructure including fuel pumps and dispensers that will be used to dispense E15.

- **Reid Vapor Pressure (RVP) Waiver for E15**
  - E15 does not receive the same 1-pound RVP exemption as E10.
  - Therefore, in many areas, the summer season gasoline blendstock for E15 would need to be a lower vapor pressure than that which is commonly used for E10.

- **Ongoing research**
  - The CRC is examining a range of issues relating to different vehicle component durability and emissions and air quality impacts from the use of mid-level ethanol blends in non-FFVs. Tests will be completed in 2012. Additional engine durability testing is recommended to address uncertainties and concerns regarding the impact of E15 and the efficacy of the testing protocols.
  - U.S. Department of Energy (DOE) has examined issues related to compatibility of higher ethanol blends in storage and dispensing infrastructure. Additional national testing is recommended to address uncertainties presented in the DOE research.

Additional Implementation Issues for E15 and Higher Ethanol Blends VII

This document is intended to serve as a companion document to the "Pathway to E15 Implementation" and identifies additional issues that may create barriers to the implementation of E15 and higher ethanol blends, including cellulosic ethanol.

□ **Coordinating Research Council (CRC)**

CRC is examining a range of issues relating to different vehicle component durability and emissions and air quality impacts from the use of the mid-level ethanol blends in non-flex fuel vehicles (FFVs). Tests will be completed in 2012.

- Vehicle and retail infrastructure testing on E15 by CRC and the U.S. Department of Energy (DOE) is raising safety and reliability concerns among vehicle manufacturers and the petroleum industry regarding the use of E15 in all non-FFV vehicles and in existing retail infrastructure.
- CRC engine durability testing did not include testing on an E10 fuel, even though more than 90 percent of U.S. gasoline is currently blended with 10 percent ethanol.
- Representatives of the ethanol industry are concerned that making conclusions about the effects of E15 on vehicles and fueling infrastructure without an E10 testing baseline might not be accurate.
- In order to further assess the effects of E15 on existing retail infrastructure and on vehicle performance and durability, CRC and DOE are encouraged to conduct additional testing with an equivalent E10 fuel and testing protocol.
- Funding to complete this additional testing should be made available from DOE, the U.S. Environmental Protection Agency (EPA) and/or other appropriate partners.

□ **Infrastructure Issues**

- DOE and API research results on the compatibility of underground storage tanks (UST) with E15 show uncertainties. Use of incompatible equipment can lead to safety and environmental concerns.
  - If incompatible seals and gaskets are part of fueling systems, they should be replaced prior to the introduction of E15.
- Stage II vapor recovery equipment is not certified for use with E15.

□ **Infrastructure Issues continued**

- EPA needs to provide clarity on leak detection equipment and its applicability to ethanol blends greater than 10 percent (E10+). Testing was expected to be completed by Battelle, under contract with EPA, in summer of 2011, but results have not yet been released.
- Underwriters Laboratory released a new pressure/vacuum (P/V) valve standard for E10+ blends in June 2011, but as of October 2011, no vendor has submitted equipment for testing.
- Storing and blending denatured ethanol (E97 or E98) at the retail level can create a flammable head space in USTs.
- The National Renewable Energy Laboratory (NREL) is currently scoping an analysis of the safety implications of introducing E85 and above blends at the retail service station. NREL will be examining the effectiveness of P/V valves in the analysis.
- Currently, there is no third party approval for dispensers and /or hardware for E97.

□ **Litigation challenging E15 waivers**

A lawsuit has been filed by some automobile, oil, grocers, environmental non-governmental organizations and other groups in the U.S. Court of Appeals for the District of Columbia Circuit challenging EPA's E15 waiver decision. Another lawsuit has been filed on the misfueling mitigation rule.

- Oral arguments on the E15 waiver are scheduled for April 2012.
- Arguments for the labeling litigation have been deferred until partial waiver litigation is completed.

□ **Additional Issues**

- EPA should clarify uncertainty surrounding hydrocarbon fraction of higher ethanol blends to all interested parties.
- Regulations in some states might prohibit the storage or sale of unfiinished fuel components.

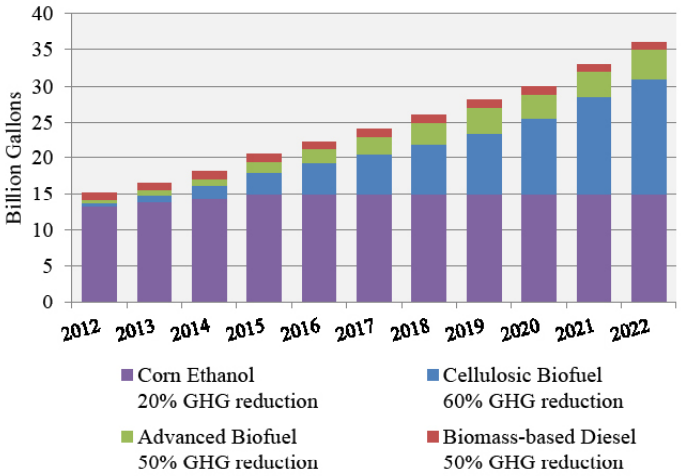
Biofuel Infrastructure Needs VIII

The ambitious targets set by the federal Renewable Fuel Standard (RFS2) for ethanol consumption cannot be met by blending ethanol with gasoline for the non flex-fuel vehicle (FFV) fleet. Additional investment in retail infrastructure and increased production and sale of FFVs will be required.

Renewable Fuel Standard: Goals for 2022

The 2007 Energy Independence and Security Act (EISA) expanded the original 2005 Renewable Fuel Standard (RFS) to increase the volume of renewable fuel required to be blended into transportation fuel from 9 billion gallons in 2008 to **36 billion gallons of renewable fuel by 2022**. In addition to increasing the renewable fuel mandate, EISA also expanded the RFS to include diesel, divided renewable fuel types into categories and set a volume mandate for each type and set greenhouse gas (GHG) reduction standards for each renewable fuel type.

RFS2 Volume Requirements



Source: U.S. EPA

"Enhanced" RFS2 for the Midwest

The Midwest already leads the rest of the nation in renewable fuel production and consumption. Implementing an "Enhanced" RFS2 strategy would utilize existing regional strengths in automobile manufacturing, biofuel production and retail infrastructure to consume greater volumes of biofuels within in the Midwest.

Biofuel Pump Needs to Reach RFS2 Goals

Several studies and regulatory actions have examined infrastructure needs to meet the mandated volumes in RFS2. According to Air Improvement Resource, Inc., under an Enhanced RFS2 scenario, a blend of 10 percent ethanol (E10) in gasoline would require FFVs to consume an average of 79 percent ethanol by volume. When a blend of 15 percent ethanol (E15) is considered, average consumption by FFVs declines to 67 percent ethanol by volume. Both scenarios require a deployment strategy of increased FFV production and refueling infrastructure to accommodate intermediate and high ethanol blends.

In its Regulatory Impact Analysis (RIA), the U.S. Environmental Protection Agency (EPA) developed a low-, mid- and high-volume case for RFS2 and estimated the number of stations with ethanol blends up to 85 percent (E85) needed to fullfil its requirements (see table to the right).

E85 Stations needed to fulfill RFS2 by 2022

Biofuel Volume gallons	Stations Needed	
	US	Midwest
High-Level Case 33.2 billion	28 thousand	5.9 thousand
Mid-Level Case 22.2 billion	24 thousand	5 thousand

Source: U.S. EPA

Midwestern states have already made tremendous strides in providing access to renewable fuel dispensing and FFV purchases, but additional deployment is needed. Currently, there are 2,515 refueling stations nationwide capable of offering E85. Sixty percent - or 1,502 stations - are located in MGA states.

Midwestern Biofuel Pumps

State	E85 Pumps		Blender Pumps
	Existing	Needed*	
Illinois	220	788 - 956	1
Indiana	153	357 - 442	1
Iowa	171	68 - 108	31
Kansas	39	185 - 223	14
Michigan	125	652 - 781	6
Minnesota	366	51 - 120	51
Missouri	105	366 - 444	4
Ohio	88	819 - 970	2
South Dakota	100	-	43
Wisconsin	135	312 - 386	23
Total	1,502	3,598 - 4,431	176

*Internal estimates for year 2012 mid-level and high-level EPA fuel use cases, January 2012

Sources: U.S. Department of Energy (DOE) Alternative and Advanced Fuels; American Coalition for Ethanol

MGA states also have the greatest concentration of blender pumps. These pumps allow consumers to choose ethanol blend levels between E10 and E85. See the table at left for the current numbers of E85 and blender in MGA states. The table at left also estimates the number of additional E85 pumps needed in individual states to meet the high- and mid-cases from the EPA RIA (estimate based on state population).

Flex-Fuel Vehicle Needs to Meet RFS2

According to U.S. Department of Agriculture (USDA), there are currently between 8 million and 8.5 million FFVs on the road, with the largest concentration of FFVs in Midwestern states. Ford, General Motors and Chrysler have committed to convert 50 percent of their vehicles to FFVs by 2012. Analysis from Air Improvement Resource, Inc., determined that if the entire automotive fleet was FFV-capable by 2015, the maximum average of ethanol consumption would need to be slightly above 30 percent by 2022 to meet RFS2. FFV production and consumption of biofuels in these vehicles is integral to meeting RFS2.

Costs of Upgrading to E15 and Beyond

Pump Modification

Modifying dispenser hose, wetted fuel dispenser components, and installation

E15	$ 1,000 or less
E85	$ 11,000

or

Pump Replacement

Purchasing a new fuel dispenser

E10	$ 14,000
Intermediate Blends	$ 20,000
E85	$ 23,000

+

Underground Storage Tank (UST)

New UST for intermediate blends	$ 100,000
Modification of existing UST	$ 25,000

Source: DOE, Government Accountability Office, USDA

Retail Fueling Infrastructure Costs

Implementing the RFS2 will require investment in the refueling infrastructure of individual retailers. There are several examples of successful infrastructure incentive programs from individual states within the Midwest. The figure at left outlines costs associated with upgrading the retail fueling infrastructure (as the figure is based on mid-point costs, actual costs may be higher or lower than shown). Building on existing state programs and leveraging federal programs and non-governmental incentives can assist individual retailers and achieve renewable fuel consumption goals.

Sources: Air Improvement Resource, Inc.; American Coaltion for Ethanol; DOE; EPA; Growth Energy; USDA

Biofuel Infrastructure Incentives IX

The Midwest has an opportunity to lead the nation in fulfilling ethanol volume requirements in the U.S. Environmental Protection Agency's (EPA) Renewable Fuel Standard (RFS2). Previous support for refueling infrastructure has contributed to the region's leadership in biofuel production and use, but new infrastructure will likely be needed. Individual states can play an important role in providing incentives for these retail infrastructure investments.

This fact sheet provides a general inventory of current and recently expired state-level infrastructure incentives and is supports the Advisory Group Recommendations #8 and #9 under Enhance the Implementation of Renewable Fuel Standard.

Federal Incentive Programs

USDA REAP Flex-Fuel Blender Pumps
The U.S. Department of Agriculture's (USDA) Rural Energy for America Program (REAP) assists with the cost of flexible fuel pumps for mid-range ethanol blends (including E85). The maximum loan guarantee is $25 million, and the maximum grant funding is 25 percent of project costs. At least 20 percent of grants awarded are $20,000 or less.

EXPIRED
Alternative Fuel Vehicle Refueling Property Tax Credit
A 30 percent federal income tax credit for the cost of establishing alternative fueling infrastructure, including E85, ethanol blender pumps, natural gas, compressed natural gas, liquefied natural gas, liquefied petroleum gas, hydrogen, or biodiesel blends of at least 20 percent (B20). The credit amount cannot exceed $30,000 for equipment placed into service in 2011.

Existing State Biofuel Incentives

	Ethanol Tax Credit	Biodiesel Tax Credit	Infrastructure Support
Illinois	X	X	X
Indiana	X	X	
Iowa	X	X	X
Kansas	X	X	ON HOLD / EXPIRED
Michigan			X
Minnesota			X
Missouri			X
Ohio	X	X	X
South Dakota		X	X
Wisconsin			X

State Incentive Programs

Illinois

Biodiesel Tax Exemption
Until December 31, 2018, biodiesel blends above 10 percent are exempt from the state's 6.25 percent sales and use tax.

Alternative Fuel Infrastructure Grant
The Illinois Department of Commerce and Economic Opportunity is directed to establish a grant program to provide fueling infrastructure funding for E85 and biodiesel blends of 20 percent and above. The program is subject to legislative appropriation.

Ethanol Tax Exemption
Until December 31, 2013, sales and use taxes apply to 80 percent of the proceeds from the sale of E10. These taxes do not apply to E70 –E90 blends during this time period.

Indiana

Biodiesel Blending Tax Credit
There is a $0.02 per gallon blender tax credit for biodiesel produced at facilities in Indiana. A maximum of $3 million in total credits for each recipient is availalbe for all taxable years. No funds had been appropriated as of March 2011.

E85 Fuel Retailer Tax Credit
There is a $0.18 per gallon sales tax credit for E85 until July 1, 2020. It is partially funded by the Indiana Corn Marketing Council as a portion of the Retail Merchant E85 Deduction Reimbursement Fund.

Iowa

Biodiesel Blended Fuel Tax Credit
There is a $0.02 per gallon tax credit for blends of 2 percent biodiesel and $0.045 for 5 percent biodiesel blends. This tax credit expires on December 31, 2017.

E15 Retailer Tax Credit
There is a $0.03 per gallon tax credit for E15 through the year 2014. The credit reduces to $0.02 per gallon in 2015, and expires after 2017. Retailers may simultaneously be eligible to claim the above $0.08 retailer tax credit for each gallon of fuel.

E85 Retailer Tax Credit
This is a $0.16 per gallon tax credit for E85. The tax creditexpires after December 31, 2017. Taxpayers may simultaneously be eligible to claim the $0.08 retailer tax credit for each gallon of fuel.

Ethanol Blend Retailer Tax Credit
There is a $0.08 per gallon tax credit for ethanol blends that meet a state mandated minimum (up to 23 percent in 2018). Certain restrictions and exemptions apply.

Infrastructure Fund
This fund provides $3 million per year over three years to the Renewable Fuels Infrastructure Board to help offset the cost of installing infrastructure components.

Renewable Fuel Infrastructure Program
This program provides financial assistance for E85 and biodiesel retailers. It incorporates cost-share grants for up to $50,000 to upgrade or install new E85 or biodiesel infrastructure. A supplemental incentive of up to $30,000 to upgrade or replace an E85 fueling dispenser is also available. Grants of up to $50,000 are available for retailers of biodiesel blends between B2 and B98, while grants of up to $100,000 are available for B99 or B100 blends. Some exemptions apply.

Kansas

Alternative Fueling Infrastructure Tax Credit
An income tax credit is offered for up to $100,000 or 40 percent, whichever is less, of the cost to install alternative fueling infrastructure. Alternative fuels are defined as combustible liquids derived from grain starch, oil seed, animal fat, or other biomass, or produced from a biogas source.

Biofuel Blending Equipment Tax Exemption
Qualified equipment used for storing and blending petroleum-based fuel and biodiesel, ethanol or other biofuel is exempt from state property taxes for 10 years.

Renewable Fuel Retailer Tax Incentive – ON HOLD
A quarterly incentive of up to $0.065 per gallon of renewable fuel sold and up to $0.03 per gallon of biodiesel sold is available to qualified motor fuel dealers if the required threshold percentage is met. The threshold percentage will increase annually from 10 percent for renewable fuel and 2 percent for biodiesel in 2009 up to 25 percent for each, beginning on January 1, 2024. As of June 2011, this incentive is on hold until further notice.

Storage and Blending Equipment Credit – EXPIRED
A Storage and Blending Equipment Credit is available for the purchase, construction or installation of qualified equipment used for storing and blending conventional fuels and biofuel at a terminal, refinery, or production facility. The credit is equal to 10 percent of the qualified investment for the first $10,000,000 invested and 5 percent of the investment above $10,000,000. The credit expires January 1, 2012. Biofuel blenders may also be eligible for an income tax deduction based on the depreciation of storage and blending equipment.

Michigan

Alternative Fueling Infrastructure Tax Credit

The Michigan Department of Energy, Labor and Economic Growth offers an income tax credit to fueling station owners who convert existing fuel delivery systems or install new systems to provide E85 or biodiesel blends. There is a maximum of $20,000 per applicant. This credit expires December 31, 2012.

Ethanol Infrastructure & Marketing Incentive

The Clean Energy Coalition offers grants of up to $10,000 per facility for the cost of purchasing and installing new fueling infrastructure or conversions for ethanol blends between E15 and E85. Infrastructure must be in place and available for use by December 31, 2012.

Minnesota

Biodiesel Fueling Infrastructure Grants

Funding is offered to assist retailers with the installation and conversion of equipment to dispense biodiesel blends between 10 and 20 percent. Funding is limited and not guaranteed. This incentive is currently authorized but not funded.

E85 Fueling Infrastructure Grants

Funding is offered to assist fuel retailers with the installation or conversion of equipment to dispense E85 and intermediate ethanol blends. The funding covers up to 75 percent of project costs, or a maximum of $15,000, if program guidelines are met. Funding is limited and not guaranteed.

Missouri

Alternative Fueling Infrastructure Tax Credit

An income tax credit of up to $20,000 is available towards the cost of constructing a qualified alternative fueling station. Eligible fuels include those containing at least 70 percent of the following alternative fuels: ethanol, compressed natural gas, liquefied natural gas, liquefied petroleum gas or propane, any mixture of biodiesel and diesel fuel, and hydrogen. Some restrictions apply.

Ohio

Alternative Fuel and Fueling Infrastructure Grant Program

This program provides funding for up to 80 percent of the cost of purchasing and installing fueling facilities that offer E85 and biodiesel blends of at least B20. The following fuels qualify: natural gas, liquefied petroleum gas or propane, hydrogen, electricity and any fuel that the U.S. Department of Energy determines by final rule to be substantially not petroleum.

Biofuels Retail Tax Credit - EXPIRED

A $0.13 per gallon tax credit was offered for E85 or biodiesel blends sold in 2011. A tax credit of $0.075 per gallon sold of blends of at least B10 and below B20 and $0.0375 per gallon of blends of at least B6 and below B10 was also available for fuel sold in 2010 and 2011.

South Dakota

Ethanol Infrastructure Incentive Program

South Dakota has allocated $3.5 million over the next five years to provide grants to retailers to cover part of the cost of installing ethanol blender pumps. A retailer can receive a grant of up to $25,000 for the first pump and $10,000 for each additional pump. In 2012, $950,000 is available in program funding.

Biodiesel Blend Tax Credit - EXPIRED

A tax credit was available for licensed biodiesel blenders for special fuel, including diesel blended with biodiesel. The credit is granted on a per-gallon basis in the amount that the rate for special fuel exceeds the rate for the biodiesel blend, in order to offset any tax liability resulting from the blending of previously untaxed biodiesel.

Wisconsin

Biodiesel and E85 Fuel Pump Credit

An income tax credit equal to 25 percent, with a maximum of $5,000 for each service station, is offered toward the installation or modification of existing pumps to dispense B20 and E85. Effective through December 31, 2017.

Renewable Fuel Infrastructure Tax Credit

A tax credit is available for 25 percent of the cost to install or retrofit fueling stations that dispense ethanol blends of E85 or higher, biodiesel blends of B20 or higher, or blender pumps. The maximum credit amount is $5,000 per taxable year. This credit expires December 31, 2017.

B20 in Diesel Engines and Vehicles X

This document provides an overview on previous B20 research, existing support by original equipment manufacturers (OEMs) and rationale for encouraging remaining OEMs to produce equipment compatible with B20. This document supports Advisory Group Recommendation #4 under Enhance the Implementation of the Renewable Fuel Standard.

As the nation works towards achieving the U.S. Environmental Protection Agency's (EPA) Renewable Fuel Standard (RFS2) targets, there are statutory requirements for broader use of biomass-based diesel. Biodiesel is one such fuel. As biodiesel becomes more widespread in the marketplace, there are advantages to making vehicles compatible with higher biodiesel blends. This will allow the flexibility to make higher blends available in certain regions of the country based on consumer demand. Making vehicles compatible with 20 percent biodiesel blends (B20) will result in eventually transitioning the diesel vehicle fleet to be compatible with 20 percent biodiesel blends. Initiatives are recommended to educate consumers on B20, and whether not their vehicle is compatible with the fuel. Various infrastructure hurdles must be overcome to distribute higher biodiesel blends. Despite additional issues, making new diesel vehicles compatible with B20 is one helpful step.

Background

Biodiesel is made from natural fats and oils that are minor by-products of producing high quality meats and seed oil meals - such as soybean meal - for human and animal consumption. Biodiesel is intended for use in equipment designed for conventional petrodiesel or heating oils, has high cetane and lubricity, and reduces harmful emissions of particulate matter, unburned hydrocarbons, and carbon monoxide. The EPA recently approved biodiesel as an "Advanced Biofuel" under RFS2, which means it reduces life cycle carbon emissions by more than 50 percent, compared to petrodiesel.

The biodiesel industry has been working in cooperation with OEMs for more than 20 years to address technical issues and concerns associated with the use of B20 and lower biodiesel blends. Early in the biodiesel industry's development, potential biodiesel customers and fleets stated that lack of data confirming compatibility with biodiesel blends by their OEM was a major barrier to consideration of biodiesel use.

Over the past 10 years, the biodiesel industry has had significant interaction with each OEM and has requested that each issue generate public support for use of B20 in the equipment they manufacture. The biodiesel industry has also requested that OEMs incorporate B20 support, testing and compatibility (both engine design and tailpipe emissions) into all their future engine and vehicle design considerations since it is much simpler to "design it in" than to "test it afterward."

Cooperative Research Efforts

The biodiesel industry has contributed more than $60 million dollars toward research, testing, and field demonstrations to address the needs of OEMs. Research and development efforts have resulted in B20 and lower blends receiving official American Society for Testing and Materials fuel specifications. The biodiesel industry continues to work cooperatively with the OEM community on research and confirmation testing on relatively new ultra-low sulfur diesel fuel and new engine after-treatment systems which make diesel engines as clean as their spark-ignited (i.e. gasoline or natural gas) counterparts.

Support for B20

At least 60 percent of OEMs support B20 in some or all 2012 model year engines and in some legacy engines. Recent B20 announcements by General Motors and Ford Motor Company, as well as by Japanese manufacturers Isuzu and Hino Trucks, have increased flexibility in the marketplace for B20.

The following table identifies OEMs that warrant some or all of their engines for higher blends of biodiesel.

Engine and vehicle manufacturers that...

Warrant B20 or higher	Do not warrant B20
Arctic Cat	Audi
Case IH	BMW
Caterpillar	Daimler Trucks
Chrysler - Dodge Ram	Kenworth
Cummins	Kubota
Fairbanks Morse	Mack
Ferris	Mercedes
Ford Motor Company	Mitsubishi
General Motors	Peterbilt
HDT USA Motorcycles	Sterling
Hino Trucks	UD Trucks
International / Navistar	Volkswagen
Isuzu Cm. Trucks	Volvo
John Deere	
New Holland	
Perkins	
Tomcar	
Toro	
Yanmar	

Note: All manufacturers support the use of B5 and lower blends. Links to OEM support statements are available on the National Biodiesel Board website: www.biodiesel.org

Biodiesel's Contribution to Meeting RFS2

Most recently, RFS2 has provided an opportunity for increased volumes of biodiesel. Studies show that there is sufficient production of existing oils and fats in the U.S. to produce 2.5 billion gallons of biodiesel per year, and currently, the biodiesel industry has an installed annual biodiesel production capacity of more than 2 billion gallons (IHS Global Insight, March, 2011). The industry has the capability to produce 2.5 billion gallons of biodiesel per year, which equates to approximately five percent of diesel fuel demand. Most biodiesel use is expected to occur in lower blends (B5 and less), but B20 use will be an important and visible part of the fuel mix in the U.S. Many government fleets, school bus fleets, other private fleets, as well as individual users, desire the use of blends higher than B5 due to mandates or local market conditions.

Across the board, OEM warranty for B20 addresses this need and also maximizes the flexibility of RFS2-obligated parties to determine how to best achieve these volumes, as some could choose to market biodiesel blends depending upon local economics and infrastructure, while providing options for customers who want to use blends higher than B5.

Power Stroke technology allowing a Ford 2011 F Series pickup to run on B20 blends. Photo courtesy of Ford Motor Company.

Innovative Energy Efficiency Practices XI

Available to Midwestern Biofuel Producers

Midwestern corn ethanol producers have been making strides to reduce overall energy consumption and carbon intensity (CI) at existing ethanol plants. Efforts to reduce the CI of biofuel production provides an opportunity for Midwestern producers to increase exports to markets that have a low carbon fuel policy. Strategies involving corn oil extraction, combined heat and power systems, anaerobic digesters and waste heat recovery, to name just a few, have already been implemented at existing ethanol plants. A large opportunity still exists, however, for more ethanol plants to implement technology strategies that will improve the overall environmental footprint of ethanol production.

This fact sheet describes the technology strategies available to existing and planned facilities to lower energy inputs and reduce CI. Examples of plants in the Midwest already using various technology strategies are included, but are not intended to capture the entire picture of innovation occuring at Midwestern biofuel production facilities.

Increasing Efficiency

THERMAL OXIDIZER HEAT RECOVERY

Thermal oxidizer heat recovery is a process improvement that will recover waste heat from exhaust gases vented through a thermal oxidizer, and can be used at plants to help meet air emission standards. By capturing the heat and running it through a heat exchanger, plants can reduce burning natural gas to produce heat for other processes in the ethanol production process, resulting in energy savings and decreased fossil energy demand.

Midwestern Examples:	
The Andersons Marathon Ethanol	Ohio
Badger State Ethanol	Wisconsin
Chippewa Valley Ethanol	Minnesota

COMBINED HEAT AND POWER (CHP)

CHP, or cogeneration, produces both electricity and thermal energy from a fuel source like natural gas, coal or biomass. Thermal energy is used for the cooking, distillation and drying phases of production at an ethanol plant. Excess electricity not used by the plant can be sold back to the electric grid. Facilities using CHP can increase overall efficiency from 45 percent to 80 percent.

Midwestern Examples:	
Ace Ethanol	Wisconsin
East Kansas Agri-Energy	Kansas
Otter Creek Ethanol	Iowa

CHP WITH BIOMASS

Ethanol plants can use biomass as a source of thermal energy and electricity. CHP with biomass can reduce a facility's CI even further when compared to an ethanol plant with just CHP.

Midwestern Examples:	
Archer Daniels Midland (ADM)	Iowa

OPTIMIZING HEAT EXCHANGER

Heat exchangers provide the ability to recover heat from processes within the production system. Integration of heat sources in a plant utilize the energy instead of wasting it and can lower overall thermal energy requirements.

Midwestern Examples:	
Ace Ethanol	Wisconsin
ADM	Iowa, Illinois, Minnesota

WATER EFFICIENCY

Water efficiency can be measured as gallons of water used per gallon of ethanol produced at a single facility. Overall, the ethanol industry has been increasing water efficiency at individual plants over the last several years. In 2008, the average dry mill ethanol plant used 47 percent less water compared to plant data from 2001. Water efficiency gains can partially be attributed to water recycling methods, which can also reduce energy use since recycled water requires less heating. There are many instances of water recycling at ethanol plants; below are two specific examples in the Midwest.

Midwestern Examples:	
Didion Ethanol	Wisconsin
Guardian Energy	Minnesota

RAW STARCH HYDROLYSIS

Raw starch hydrolysis, or the cold cook process, uses enzymes instead of heat to convert uncooked starch to glucose. This reduces the thermal energy demands at the ethanol plant. Raw starch hydrolysis is a proprietary process developed by POET and is currently used at 24 of POET's 27 biorefineries. This process reduces energy use by an estimated eight to 15 percent and can reduce the need for cooling water.

Midwestern Examples:	
POET Biorefning	Iowa, Ind., Mich., Minn., Mo., Ohio, S.D.

Co-Products

COMBINING DISTILLERS GRAINS
Combining wet, dry and/or modified distillers grains can be done at ethanol plants, depending on the local market. Selling wet distillers grains to local livestock operations can reduce the amount of distillers grains that need to be dried, therefore reducing thermal energy use.

Midwestern Examples:

Hawkeye Renewables	Iowa
Louis Dreyfus Commodities	Iowa
White Energy	Kansas

CORN OIL EXTRACTION
Corn oil extraction can be performed before or after the ethanol distillation process. Corn oil extracted before distillation can be used as a food grade product, and after distillation can be used in the alternative fuel market as a biodiesel feedstock. Although additional energy is required to extract corn oil, the thermal energy required to dry the distillers grain is reduced as well, resulting in net energy savings.

Midwestern Examples:

The Andersons Albion Ethanol	Michigan
Iroquois Bio-Energy	Indiana
Little Sioux Corn Processors	Iowa

DRY MILL CORN FRACTIONATION
Corn fractionation splits the corn kernel apart into its basic elements: the pericarp, the endosperm, the germ and the tip cap prior to ethanol processing. Fractionation allows an ethanol plant to market multiple co-products, such as high protein animal feed, food grade corn oil or a bioenergy feedstock. Fractionation reduces the energy demand for drying, since the germ and bran are removed before fermentation. It is estimated that fractionation can reduce thermal energy demand by 31 percent.

Midwestern Examples:

Badger State Ethanol	Wisconsin
Didion Ethanol	Wisconsin
Illinois River Energy	Illinois

CARBON CAPTURE AND STORAGE (CCS)
CCS captures the carbon dioxide (CO_2) from plant fermentation and stores the gas underground in geologic formations.

Midwestern Examples:

ADM	Illinois

CCS WITH ENHANCED OIL RECOVERY
CCS with Enhanced Oil Recovery is an emerging strategy that holds potential for parts of the Midwest. CO_2 can be captured from an ethanol plant and pumped into an oil reservoir to push previously unrecovered oil closer to the surface. The depleted oil reservoir can also serve as a storage site for the CO_2.

Midwestern Examples:

Arkalon Energy	Kansas

Alternative Process Fuel

BIOMASS COMBUSTION OR GASIFICATION
Biomass combustion or gasification converts organic material into heat, syngas, biofuels and chemicals. Biomass combustion has the potential to reduce energy costs and lower the CI by replacing natural gas as process fuels.

Midwestern Examples:

Corn Plus Ethanol	Minnesota
POET Biorefining	South Dakota

BIOGAS RECOVERY SYSTEMS
Biogas recovery systems use anaerobic digestion to produce a mixture of methane and carbon dioxide. Any organic material can be used to produce biogas that can meet a portion of a plant's process fuel needs.

Midwestern Examples:

Adkins Energy	Illinois
ADM	Iowa, Illinois
Western Plains Energy	Kansas

LANDFILL GAS (LFG)
LFG recovery captures methane and carbon dioxide from landfill solid waste. Once LFG is captured, it can be converted to produce electricity or refined to replace fossil natural gas.

Midwestern Examples:

Abengoa Bioenergy	Kansas
Mid-Missouri Energy	Missouri
POET Biorefining	South Dakota

Energy Efficiency Opportunities for Midwestern Ethanol Plants

Technology	Carbon Reduction	Capital Cost
Biogas recovery *	10 - 20 g/MJ	$14 - 18 million
Biomass combustion or gasification **		
Stover	10 - 20 g/MJ	$34 million
Syrup and stover	1 - 10 g/MJ	$24 million
Stover with CHP	30 - 40 g/MJ	$69 million
Syrup and stover with CHP	20 - 30 g/MJ	$56 million
Carbon capture and storage (CCS)	25 - 35 g/MJ	
CHP with biomass**		
Syrup and stover	30 - 40 g/MJ	$71 million
Corn stover	40 - 50 g/MJ	$87 million
Combining distillers grains	11 - 29 g/MJ	Increased transportation cost for grains to livestock markets
Combined heat and power (CHP)	20 - 30 g/MJ	Capital: $3.5 million O&M*+: $100,000 3-5 year payback
Corn fractionation	Thermal decrease: 2,775 Btu/gal Electrical decrease: 0.07 kWh/gal	$25 - $30 million
Corn oil extraction	10 - 20 g/MJ	$7 - $12 million
Landfill gas (LFG) recovery+	1 - 10 g/MJ	Capital: $6.3 million for 10-mile pipeline w/ LFG system O&M: $410,000
Optimized heat exchanger++	Boiler decrease: 4,000 MMBTU Cooling tower decrease: 16,000 kWh	Increased steam cost: $23,000
Thermal oxidizer heat recovery++	Displacement of 950,000 therms of natural gas	Capital: $1.5 - $2.5 million

* A closed-loop biorefinery, with 56 percent of natural gas use offset by biogas produced on-site from cattle manure and co-product syrups

** Carbon reduction measured against a Midwest dry-grind 50 million gallon per year (MGY) plant with a CI score of 56.4 grams of CO_2 equivalent per megajoule (gCO_2e/MJ), average Midwest corn production and average grid electricity.

*+ O&M: Operation and Maintenance

\+ The carbon reduction estimate in this table is based on a 10 percent replacement of landfill gas at a 105 MGY ethanol plant.

++ Demonstrated carbon reduction and cost consideration based on a 50 MGY ethanol plant.

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