

Report on the Feasibility of an Energy Content-Based Fuel Tax Rate on Alternative Fuels



Department of
Taxation

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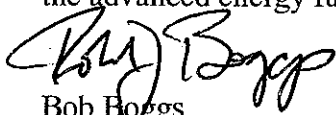
PREFACE

Energy ranks among the best opportunities we have to *Turn Around Ohio*. Transportation fuels, in particular, literally drive our state's economy as a critical input for moving goods and people across and through Ohio. Managed wisely, this sector holds tremendous promise to spur technological innovation, attract financial investment, mitigate environmental impacts, and bolster national security. Without leadership, we risk foregoing Ohio's many inherent advantages in the advanced energy economy.

This report, required by House Bill 245 from the 126th General Assembly, assesses the proposal of taxing alternative fuels by energy content, rather than by volume. The Department of Taxation describes some concerns associated with this proposition, and identifies possible approaches that are consistent with the development and utilization of alternative fuels, from a taxation perspective. We recognize this document deals with only a fairly narrow aspect of the much wider and crucial subject of alternative energy. For this reason, we think it important to emphasize the Strickland Administration's commitment to leveraging Ohio's strengths to capitalize upon advanced energy opportunities.

Work is underway, but gaps remain to be filled. The current budget, proposed by the Governor and passed with strong bipartisan support by the General Assembly, includes alternative fuel tax credits that provide benefits exceeding those expected under the energy content taxation approach assessed in this report. As the authors note, clear Administration authority is required for the State to gather timely and relevant information on alternative fuel distribution and utilization across Ohio, in order to facilitate accurate evaluation of current and future tax incentives for alternative fuels.

It is our hope that this report addresses the questions posed by the legislature in HB 245, and also informs the larger discussion about what we can – and must – do to capitalize upon the unique opportunity to put Ohio in a leadership position in alternative fuels for the advanced energy future.



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EXECUTIVE SUMMARY

Sub. House Bill 245 (126th General Assembly) requires the Ohio Department of Taxation to study “the feasibility of encouraging the use of alternative fuels by reducing the motor fuel tax rate on those fuels ... to reflect their lower energy content.” The study is to determine the Ohio motor vehicle fuel tax rate that would be applied to each alternative fuel if the rate were based on the relative British Thermal Units (BTUs) of each fuel, equalized to the fuel tax rate currently applied to conventional fuels, such as gasoline and diesel. Only fuels referenced in Ohio Revised Code section 125.831(A) are considered “alternative fuels” for purposes of this study. This includes: E85 blend fuel, blended biodiesel, natural gas, liquefied petroleum gas, hydrogen, any power source (including electricity); and other “alternative fuels” as defined by federal rule.

It should be noted that the study does not discuss or evaluate the state’s transportation energy policy, including the various policy choices that are available to incentivize the use of alternative fuels (some of which are currently being used by this state, by other states, and by the federal government). Instead, the study deals only with the feasibility of changing the existing motor vehicle fuel tax so that alternative fuels are taxed based on BTU content, and it considers the issue of whether such a tax structure appears to be a viable means of encouraging the use of alternative fuels.

Below is a summary of the findings contained in this report:

- Given the numerous fuels and blending options, alternative fuels have widely varying energy content levels. Assigning specific energy tax rates to alternative fuel blends would involve a tradeoff between precision (i.e., allowing the rate to closely reflect actual energy content) and simplicity (i.e., avoiding a long list of tax rates for a particular type of alternative fuel). If a BTU-based structure were adopted, it might be better to have tax rates that cover a range of blends (e.g., a single tax rate for E70 through E85 ethanol blends).
- Some alternative fuels do not have noticeably lower energy content than conventional fuels. This means that, for some alternative fuel blends, a BTU-based tax would provide little or no tax reduction. The difference in energy content between diesel fuel and B20 (which is a blended product containing 80% regular diesel and 20% biodiesel) is not substantial enough to result in a reduced tax rate for B20. Of the more common biodiesel fuel blends, B50 is the lowest biodiesel blend at which the difference between its energy content and that of conventional diesel fuel would be large enough to result in a reduced tax rate. Of the more commonly used alternative fuels, the product with the lowest energy content – and thus the product to receive the largest reduction under an energy content based tax structure – would be E85, whose rate would be reduced by 8 cents per gallon (down to 20 cents per gallon from the current 28 cents per gallon).
- Very few states have adopted a tax on alternative fuel based on relative energy content. Furthermore, no state currently taxes biodiesel on an energy content basis. The most instructive case studies for varying rates were found in Maine and Minnesota (states that

enacted lower tax rates for alternative fuels without basing that reduction strictly on energy content). In none of the states with lower tax rates for alternative fuel was it demonstrated that those lower rates resulted in any notable increase in alternative fuel usage. In fact, Maine chose to let its reduced rate for biodiesel expire after one year.

- Major administrative complications would ensue from setting tax rates on alternative fuels based on their relative energy content. First, a BTU-based tax on alternative fuel would increase tax administration burdens on the fuel distribution industry. There would be a notable increase in the amount of information that fuel taxpayers would need to track and report to the Department of Taxation. Second, the Department of Taxation's excise tax division would require additional resources. Finally, substantial administrative complexities would hinder the fuel use tax if biodiesel were taxed at a different rate (or several different rates) than the current 28 cents per gallon rate. Differing product-based tax rates would significantly complicate the computation of the Ohio fuel use tax by interstate commercial truckers (with a corresponding increase in errors). Due to greatly complicated International Fuel Tax Agreement (IFTA) administration, it is the opinion of experienced tax administrators in Maine and Michigan, as well as the Federation of Tax Administrators (FTA), that a differential tax rate based on fuel type is not recommended.
- Economic behavior in the fuel distribution market would have a direct impact on the form and potential effectiveness of a BTU-based tax. There is a strong possibility that the reduced tax charged on certain alternative fuels under an energy content-based tax structure would not be fully passed on to consumers in the form of a lower retail price. Little could be done to compel alternative fuel wholesalers to pass the lower tax charge on to the retailers, and then ultimately to the consumers, in the form of a lower price.
- Whether or not the reduced tax from a BTU-based rate were actually reflected in the retail price, the likely impact of such a rate – that is, whether it would spur any notable increase in alternative fuel use – is uncertain. For example, based on December 2007 average national regular-grade gasoline prices and E85 prices, and after adjusting E85 prices to reflect the energy content of that product relative to gasoline (i.e., the fact that it takes 1.4 gallons of E85 to cover the same miles as a gallon of gasoline), the price of E85 would go from \$3.41 per gallon to \$3.30 per gallon, a drop of about 3 percent; it would still remain about 10 percent more expensive than gasoline. Even if the price of gasoline were to increase to a point where it would exceed the gasoline gallon equivalent price of E85, would a 3 percent drop in the price of E85 be sufficient to leverage a notable increase in demand for that product? And if the tax reduction were *not* passed on to consumers in the form of a lower price, would the subsidy realized by fuel distributors be large enough to cause them to aggressively market E85? Given other compelling factors that continue to hamper the marketability of ethanol-based fuels - such as the need to control and reduce production costs, the current lack of an efficient distribution infrastructure, an undeveloped retail structure, and engrained customer behaviors and preferences - it is not evident that the adoption of a BTU-based tax rate would stimulate a meaningful increase in the demand for and supply of alternative fuel.
- Other available policy choices are likely to have a greater positive impact on alternative fuel consumption with considerably fewer administrative complications. In fact, as part

of the fiscal year 2008-2009 state operating budget, Ohio legislators put one such choice into law. The General Assembly enacted a nonrefundable corporate franchise and individual income tax credit for retailers of E85 and eligible biodiesel (for B20 blends and higher). The credit, which is scheduled to last for two years, is equal to 15 cents per gallon of E85 and eligible biodiesel dispensed during the taxpayer's first year, and 13 cents per gallon during the second year.¹ In comparison to this enacted credit, a BTU-based tax would provide a subsidy of approximately 8 cents per gallon for E85 and 2 cents per gallon for biodiesel blends of B50 and above (with essentially no subsidy for the B20 blend due to its near energy equivalence with diesel). The enacted tax credit provides a greater financial incentive than a BTU-based tax (subject to the limitation discussed in the first footnote), and also avoids the administrative complications associated with a multiple tax rate structure.²

- No matter the form of tax adjustment or preference that might be enacted to foster alternative fuel consumption – be it a BTU-based tax rate, a per-gallon tax credit based on gallons dispensed (as was recently enacted by the General Assembly), or some other concept – a meaningful data collection requirement should be adopted. Sellers of alternative fuels should be required to provide appropriate information about their alternative fuel sales to a centralized unit (presumably a state governmental agency) which can then report and analyze that data. Such a requirement is necessary for policymakers to be able to informatively evaluate the effectiveness of the enacted tax preference.

In conclusion, we did not discover any evidence demonstrating that a BTU-based tax rate would have much effect in stimulating alternative fuel use, but we did discover significant administrative complications and burdens posed by such a tax structure. Other approaches - such as the recently-enacted Ohio tax credit for alternative fuel dispensed by retailers – are available that would provide a greater financial inducement to increase alternative fuel sales, with a much lower administrative burden.

¹ We should also mention that retailers organized as regular corporations, and thus subject to the corporate franchise tax, will not realize the full tax credit in tax years 2008 and 2009. This is due to the five-year phaseout of the corporate franchise tax, implemented via 20 percentage point annual increments. In tax year 2008, the credit will effectively be 6 cents per gallon (15 cents x 40%) and in tax year 2009 the credit will effectively be 2.6 cents per gallon (13 cents x 20%). ODT does not know what share of retailers is organized as regular corporations vs. what share is organized as pass-through entities.

² The enacted tax credit creates different incentives than the BTU-based rate structure. The BTU-based structure would result in slightly lower rates at the pump, if the retailers passed the savings through to consumers, and thus might act as a demand-side incentive. The income and corporate franchise tax credit is taken well after the alternative fuel sales occur. While it may be the case that the credit will be passed along to consumers, the time lag in claiming the credit makes that uncertain. Thus, the enacted tax credit seems to be more clearly designed as a supply-side incentive.

Report on the Feasibility of an Energy Content-Based Fuel Tax Rate on Alternative Fuels

Introduction

Under Sub. House Bill 245 of the 126th General Assembly, the Department of Taxation is required to study the feasibility of encouraging the use of alternative fuels by reducing the motor fuel tax rate applied to those fuels (to the extent they are taxed under Chapter 5735 of the Ohio Revised Code) to reflect their lower energy content and the need to use more gallons of an alternative fuel to travel the same distance. This study is to examine the relative energy content of alternative fuels that may be used in motor vehicles, and determine a tax rate for each alternative fuel which is equalized to that of conventional fuel, (gasoline or diesel) based on relative energy content. Furthermore, this study will consider the experience of other states that have encouraged the use of alternative fuels by reducing their tax rates.

The following report constitutes the Ohio Department of Taxation's alternative fuel study mandated by Sub. H.B. 245. The study is to examine the concept of changing the current state motor vehicle fuel tax from a tax which is applied at a uniform 28 cents per gallon on all taxable fuels, to a tax rate that (1) remains at 28 cents per gallon for "conventional" gasoline and diesel but (2) for alternative fuels varies from 28 cents per gallon based on the degree by which the energy content for each such fuel varies from that of conventional fuel. The mandated study is therefore relatively narrow in scope, and the report provided below adheres to that relatively narrow scope. The report does *not* consider overall state energy policy, nor does it consider the rationale for increasing the use of alternative motor vehicle fuels, the inherent strengths and weaknesses or viability of various alternative fuels, or the numerous potential approaches available for stimulating the use of alternative fuels (including some of the approaches currently being used in the U.S. and other nations).

The report provides basic pertinent information about the various alternative fuels subject to the state motor vehicle fuel tax, particularly the reported energy content of such fuels. The report also discusses important administrative aspects related to taxing alternative fuels based on their energy content. Furthermore, the report considers whether or not an energy-based tax on alternative fuels could be expected to have any notable impact on the use of alternative fuels in this state. Included in the report is information provided from the relatively few states that have adopted a motor fuel tax that subjects at least some alternative fuels to a tax rate based on relative energy content.

Part One: Description of Alternative Fuels

As required by Sub. H.B. 245, for purposes of this study "alternative fuel" has the same meaning as in Ohio Revised Code section 125.831. Therefore "alternative fuel" means any of the following used in a motor vehicle: E85 blend fuel, blended biodiesel (i.e., with 20 percent or more biodiesel content), natural gas, liquefied petroleum gas, hydrogen, any power source (including electricity), and any fuel not described above which the United States Department of

Energy determines to be substantially not petroleum and that would yield substantial energy security and environmental benefits.

The federal Energy Policy Act of 1992 (EPAAct) was passed to reduce reliance on foreign petroleum and improve air quality. EPAAct includes provisions that address all aspects of energy supply and demand; several provisions were designed to increase use of alternative fuels. EPAAct defines alternative fuels and sets forth the process for sanctioning new alternative fuels. The act recognizes the following as alternative fuels: blends of at least 85 percent methanol, ethanol, and other alcohols; natural gas and liquid fuels domestically produced from natural gas; liquid petroleum gas; coal-derived liquid fuels; hydrogen; electricity; biodiesel (B100); fuels (other than alcohol) derived from biological materials; and P-Series fuels.¹

Provided below is a description of alternative fuels considered in this study.

E85 Blend Fuel

Ethanol is also known as ethyl alcohol or grain alcohol; it is an alcohol fuel made from sugars and starch found in plants. In the U.S., ethanol is mainly produced from the starch in grains such as corn, grain sorghum, and wheat. New technologies are currently in development to make ethanol from cellulosic energy crops including corn stover (stalks and residues left over after harvest), grain straw, switch grass, municipal waste and quick growing trees.

Ethanol is the most widely used biofuel today; it is employed as an alternative fuel and as an octane-boosting, pollution-reducing additive to gasoline. Increasingly, ethanol is used as an additive for standard gasoline and as a replacement of methyl tertiary-butyl ether (MTBE), which has been linked to groundwater and soil contamination. The majority of commercially available vehicles can run on blends of E10 or lower; E10 is the most common blend.

E85 blend fuel is defined in Ohio law (Revised Code section 125.831) as fuel that: contains 85 percent or more ethanol (with “ethanol” defined in Revised Code section 5733.46), or at least 70 percent if the United States Department of Energy determines that a lower percentage is necessary to provide for cold start, safety, or vehicle functions; meets American Society for Testing and Materials specifications for E85 blend fuel; and meets other standards the Ohio Director of Administrative Services adopts by rule. E85 is a substitute for regular gasoline and has approximately 70 percent of the energy content; 1.4 gallons of E85 enable a FFV to travel the same distance as one gallon of traditional petroleum gasoline.

Certain chemical features about ethanol have a direct impact on fuel distribution and consumption. Ethanol attracts the small amounts of water in current U.S. pipelines and the water has the effect of contaminating the fuel (gasoline is immune from this corruptive effect). Therefore, ethanol must be shipped by truck or barge and then is usually blended with gasoline as the gasoline is loaded into tank trucks for delivery to the retail service station. Due to the corrosive effects of E85 relative to regular gasoline, traditional vehicles cannot use E85 fuel. Flex fuel vehicles (FFVs) have engines and other necessary components modified to accept higher concentrations of ethanol; FFVs are designed to run on any mixture of gasoline or ethanol with up to 85 percent ethanol by volume.

E85 consumption in the United States has grown significantly over time. For example, in 2000, 12 million gallons of E85 were consumed, triple the level of 1999 consumption.² In 2003,

reported E85 consumption in the U.S. was 20 million gallons. Data regarding Ohio sale and consumption of E85 is not collected. Ohio is home to 26 public and private E85 refueling sites. According to a 2006 analysis by Clean Fuels Ohio, there are more than 199,000 FFVs on the road in Ohio.

Blended Biodiesel

Biodiesel is a biodegradable fuel derived from soy bean oil, waste cooking oil, animal fats or rapeseed oil. Pure biodiesel is produced through a refining process, transesterification, which removes glycerin. Biodiesel is a substitute for diesel and has approximately 90 percent of the energy content of diesel fuel. Biodiesel is blended, to varying degrees, with petroleum diesel. The most common biodiesel-petroleum diesel blends are B2, B5, B10, B20, and B50 (the number indicates the biodiesel percentage share of the overall blended product).³ For purposes of this study, “biodiesel” refers to both pure biodiesel and biodiesel-petroleum blends. While only 100 percent biodiesel is recognized as an alternative fuel under EPA Act, Ohio law considers blends of at least 20 percent biodiesel to be alternative fuel. Blends of 20 percent biodiesel and 80 percent petroleum diesel can generally be used in unmodified diesel engines; biodiesel in its pure form (B100) may require engine modifications. Biodiesel is often used in heavy trucks, construction equipment, and buses. For example, Cincinnati Metro buses are fueled with B50 fuel April through October, and B20 is used in colder months.

Natural Gas

Natural gas is a mixture of hydrocarbons, mainly methane. Natural gas is extracted from gas and oil wells. Because of the gaseous nature of this fuel, it must be stored onboard a vehicle in either a compressed gaseous state (compressed natural gas, or CNG) or in a liquefied state (liquid natural gas, or LNG). While LNG is an alternative fuel, CNG is outside the scope of this study as it is not subject to the Ohio motor vehicle fuel tax (i.e., it is not taxable pursuant to Revised Code section 5735.01). The energy content of LNG is 74,720 BTUs per gasoline gallon equivalent, 64 percent of the energy content of regular gasoline.

Liquefied Petroleum Gas (LPG)

Liquid petroleum gas, LPG, is an alternative fuel produced from natural gas processing and crude oil refining. LPG has an energy content of 84,950 BTU per gallon, 73 percent of the energy content of regular gasoline.⁴ As of September, 2007 there were 43 LPG refueling stations in Ohio.⁵ LPG is most commonly used in fleet vehicles. In 2004, estimated LPG consumption in the United States was 242.4 million gallons.

Hydrogen

Hydrogen is the simplest and lightest element with the potential to provide virtually pollution free transportation. Hydrogen is being explored for use in combustion engines and fuel cell electric vehicles. As a gas, hydrogen is not taxed under Revised Code section 5735.01 and is therefore outside the scope of this study.

Methanol

Methanol, also known as wood alcohol, is fuel from natural gas, coal, or woody biomass. Methanol is not frequently used as automakers are no longer manufacturing methanol-powered vehicles. Methanol (M-100) consumption in the United States ended in 2000; in 2004 estimated

M-85 consumption was 257,000 gallons.⁶ Methanol has an energy content of 57,250 BTU per gallon.

P-Series

P-Series was added to the list of EPA alternative fuels in 1999. It is an alternative fuel from a unique blend of natural gas liquids, ethanol, and biomass-derived co-solvent methyltetrahydrofuran (MeTHF). P-Series fuels are meant to be used alone or mixed with gasoline in any proportion inside the tank of a FFV. These fuels are not currently produced in large quantities and are not widely used.⁷ There is a pilot study project in place in Philadelphia. Energy content data on P-Series fuel is currently not available.

Potential New Fuels

In addition to P-Series fuel, there are a number of new alternative fuels in design. For example, Dupont and BP are working on blending petroleum fuel with biobutanol. Enzyme and biocrude fuels are also in development.

Energy Content of Alternative Fuels

The table below summarizes the BTU (British Thermal Unit) content of each alternative fuel that is subject to (or potentially subject to) the existing state motor vehicle fuel tax. The energy content-based rate, also known as the BTU-based rate, is the ratio of the energy content of alternative fuel to the energy content of traditional fuel multiplied by the 28 cents per gallon tax rate, rounded to the nearest cent.

Energy-Content-Based Tax Rate Conversion Factors of Most Commonly Used Fuels

(Tax rate rounded to nearest cent)

Fuel Type	Unit of Measure	BTUs per Unit (LHV)	BTU based rate (compared to gasoline)	BTU based rate (compared to diesel)
Gasoline - typical	gal	116,090	\$0.28	
Diesel - U.S. typical	gal	128,450		\$0.28
Ethanol - E85	gal	82,294	\$0.20	
Biodiesel - B100	gal	119,550		\$0.26
Biodiesel - B50	gal	117,820		\$0.26
Biodiesel - B20	gal	126,670		\$0.28

The concept of “gasoline gallon equivalent” underlies the BTU-based rate calculations shown in the table above. The gasoline gallon equivalent relates the energy content of a motor fuel to that of a gallon of gasoline. (Note, however, that for biodiesel the relevant measure is “diesel gallon equivalent” rather than gasoline gallon equivalent.) Gasoline (or diesel) gallon equivalents for an alternative fuel may be computed by dividing the energy content of the gasoline (or diesel) - as measured in BTUs per gallon - by the energy content of the alternative fuel. The resulting figure indicates the number of gallons of alternative fuel necessary to produce the energy content of a gallon of gasoline (or diesel). For example, to derive the gasoline gallon equivalent for E85 fuel, the energy content of gasoline (116,090 BTUs) is divided by the energy

content of E85 (82,294 BTUs) to yield 1.41 gallons. This means that 1.41 gallons of E85 are required to travel a distance equal to one gallon of traditional petroleum gasoline. For each alternative fuel shown above, the 28 cents per gallon tax rate was divided by the gasoline (or diesel) gallon equivalent of the alternative fuel in order to yield the BTU-based rate for that fuel. To extend our example, then, 28 cents was divided by the 1.41 gasoline gallon equivalent for E85 to produce the 20 cents per gallon BTU-based rate shown in the above table (rounded to the nearest cent).

The energy content provided above comes from the Energy Information Administration (EIA) and is derived from “Alternative to Traditional Transportation Fuels 1996”. Original heating values per native unit of fuel, as measured in BTUs, were provided by the Science Applications International Corporation based upon the emissions model prepared by EIA.

Furthermore, the energy content provided above is based on lower heating values (LHV) as used by the EIA. There are two energy values for every fuel: lower and high heating values (LHV and HHV). The LHV is the energy produced without condensing the water out of the exhaust. For cars, and all other internal combustion engines, LHV is the relevant value. When considering an energy content-based tax rate, a single measure of fuel energy content must be determined. However, it should be noted that pure gasoline can be measured and recorded with varying energy content. That is, pure gasoline does not have single, uniformly measured energy content. Various factors, such as variations in petroleum chemical composition and in climatic conditions, result in modest energy measurement variations. To further complicate matters, traditional petroleum gasoline dispensed at the pumps often includes additives which alter its energy content. Note again that the above numbers reflect the energy content of pure petroleum gasoline, as tested by the Science Applications International Corporation under the aegis of the EIA.

It is important to realize that there are a large number of fuel blending variations not listed in the table above. In structuring an energy content-based tax rate structure, it would be necessary to recognize the wide variety of fuel blends. For instance, in the case of biodiesel blends, various energy content-based rates could apply to the blends with greater than 20 percent biodiesel. Because of this potential wide variety of blends using a different tax rate for every blend percentage would create a byzantine rate structure, creating tremendous administrative complication. Should an energy content-based set of tax rates be considered, a better idea would be to limit the number of tax rates, where the rates would cover a specific range of blends.

Special mention should be made of E85, the most common of the ethanol blends that constitute alternative fuel. The energy content-based tax rate structure for E85 would need to be established with consideration for the fact that the product termed “E85” actually has an ethanol-gasoline blend of 70 percent and above. During winter months, E85 may more closely approximate a 70 percent blend. A determination would be necessary as to whether over-70 percent blends would all be treated as equivalent to an 85 percent blend rate, or whether the tax rates would be based on another approach. Examples of other approaches would be setting a tax rate for each blend (a very complex approach), or setting a single E85 rate based on an “average” blend (a simpler approach).⁸

Finding #1. Given the numerous blending variations, alternative fuels have widely varying energy content levels. Assigning specific energy tax rates to alternative fuel blends would involve

a tradeoff between precision (i.e., allowing the rate to closely reflect actual energy content) and simplicity (i.e., avoiding a long list of tax rates for a particular type of alternative fuel).

Finding #2. The difference in energy content between B20 and diesel fuel is not substantial enough to result in a reduced tax rate for B20. Of the more common biodiesel fuel blends, B50 is the lowest biodiesel blend at which the difference between its energy content and that of conventional diesel fuel would be large enough to result in a reduced tax rate.

Part Two: States with Alternative Fuel Tax Rates Based on Energy Content

To examine whether the experience of other states in taxing alternative fuels based on energy content can provide lessons to consider in this report, information was compiled on other states. We found that only Maine and Pennsylvania have alternative fuel tax rates based on relative energy content. Hawaii, Kansas, Minnesota, and Wisconsin have alternative fuel tax rates that are at least partially based on energy content.

Because of the limited degree to which energy-content based taxes have been adopted across the states, we were not able to obtain much information on how this concept would work. The major exception is Minnesota. This state has differential rates on fuel and has undertaken other initiatives to stimulate usage of alternative fuel. Because Minnesota's experience is very illustrative of the challenges involved with administering differential rates and information on its experience was available, we have provided a relatively extended discussion about Minnesota.

Hawaii

Hawaii imposes an alternative fuel tax and a license tax. Distributors of alternative fuels are required to pay a license tax of 0.025 cents per gallon. The alternative fuel tax rates vary for ethanol, methanol, biodiesel, and LPG. An energy-content-based tax applies to all other alternative fuels. Because this study does not consider license taxes and because Hawaii's alternative fuel use tax does not apply to fuels Ohio is interested in encouraging, this study does not further explore Hawaii.

Kansas

The Kansas excise tax on gasoline is 24 cents per gallon. According to Senate Bill 544, effective January 1, 2007 the rate on E85 is 17 cents per gallon. This reduction makes the rate of taxation on E85 equivalent to that of gasoline on an energy content basis. Beginning July 2020, the Kansas tax rate on E85 will be 11 cents per gallon. The Kansas experience is not further explored in this study because only the rate on E85 was changed and the planned rate reduction will move the rate further from an energy content base.

Maine

In Maine, an excise tax is levied on each gallon of fuel sold or used in the state. The rate is annually indexed for inflation; in fiscal year 2008 the excise tax rate on regular gasoline is 27.6 cents per gallon. Since 1983, Maine has applied a special fuels excise tax on distillates (biodiesel and diesel) and low-energy fuels. The excise tax on distillates is 23 cents per gallon. Low-energy fuels are those with energy content less than or equal to 90 percent of the energy content of petroleum gasoline, and consist of propane, natural gas, and alcohol fuels. The excise tax on low energy fuel is based on the energy content of each fuel. Maine law prescribes the

energy content per gallon of low-energy fuels and the applicable formula for determining the tax rate.

The nature of the alternative fuel determines who is responsible for remitting the Maine tax. For distillates, the supplier pays the tax, and for low-energy fuel, retailers pay the tax. Licensed suppliers and low-energy fuel retailers are required to file a monthly report listing receipts and disbursements in the prior month. Returns are supported by a variety of schedules and are considered incomplete if the schedules are not included.

The Maine excise tax on low-energy fuels is not purely based on energy content. When fuel is blended, the tax rate applied to the predominant fuel type prevails.⁹ Therefore, E85 is taxed as a low-energy fuel while E49 is taxed as gasoline. The classification of biodiesel as a distillate and the predominant fuel rule effectively limit the Maine energy content-based rate to the following fuels: M85, E85, LPG and CNG. As of September, 2007, there were only eight alternative refueling sites in Maine subject to the special fuels tax; one station carried CNG while the others carried LPG. The small scale of the Maine alternative fuel market greatly simplifies administration of the special fuels tax.

Pennsylvania

Pennsylvania imposes an excise tax on alternative fuels. In Pennsylvania, alternative fuels are those other than “liquid fuels” (gasoline or gasohol), “fuels” (undyed diesel or kerosene), or “aviation fuel”, as those terms are defined in Pennsylvania law. Recognized alternative fuels include CNG, LPG, ethanol, E85, methanol, M-85, LNG, and electricity.¹⁰ Note that biodiesel is not a recognized alternative fuel. This means that Pennsylvania does not encounter the kinds of fuel use tax issues that affect Michigan or affected Maine. As of September 2007, Pennsylvania had 112 recognized alternative refueling sites: 72 LPG sites, 11 E85 sites, and 29 CNG sites.

Since October of 1997, alternative fuels have been taxed on a gasoline gallon-equivalent basis. Chapter 90 of the Pennsylvania Vehicle Code defines gasoline gallon-equivalent basis as any amount of alternative fuel containing 114,500 BTUs. The rate on alternative fuel is the same as the rate on other fuels; however it is adjusted to reflect relative energy content.

Alternative fuel dealers are responsible for reporting and paying the tax. Reports and payments are due monthly. However, the Department of Revenue may permit dealer-users to report tax due for reporting periods greater than one month, provided tax is prepaid on an estimated basis.

Pennsylvania revenue department officials did not respond to requests for further information about their state’s experience in taxing alternative fuels.

Wisconsin

Wisconsin imposes an energy content-based alternative fuel tax on a limited number of products such as LPG and CNG. The Wisconsin alternative fuel tax does not apply to E85 or biodiesel, therefore the Wisconsin experience is not further explored in this study.

Minnesota

Minnesota was a participant in a 1998 U.S. Department of Energy Clean Cities pilot program. The Clean Cities pilot program intended to expand awareness and use of E85 fuel; the goal of this project was to make E85 a viable alternative in local markets and spread it across the nation. After selection for the Clean Cities program, legislative action altered Minnesota's motor fuel tax to reflect the energy content of various alternative fuels. Minnesota law does not refer to energy content, however the prescribed rates are reflective of the energy content of a specific set of fuels.

Minnesota defines alternative fuel as natural gas, LPG, hydrogen, coal-derived liquefied fuels, electricity, methanol, denatured ethanol, and other alcohol and mixtures as defined by EPAct. Minnesota law imposes a reduced tax rate on a very limited number of alternative fuel blends. LPG, LNG, and CNG are taxed under the Minnesota Special Fuel Tax. LPG is taxed at 15 cents per gallon, LNG is taxed at 23 cents per gallon, and CNG is taxed at 20 cents per gasoline gallon equivalent. E85 and M85 blends are taxed at reduced rates relative to all other gasoline, which is taxed at 20 cents per gallon. E85 is taxed at a rate of 14.2 cents per gallon and M85 is taxed at a rate of 11.4 cents per gallon. Under Minnesota law, blends of 60 to 85 percent ethanol are defined and taxed as E85. The Minnesota excise tax is imposed on the first licensed distributor who receives E85 fuel products in the state and on distributors, special fuel dealers, or bulk purchasers of other alternative fuels.

Minnesota was the most successful of three Clean Cities pilot programs. Both the number of E85 stations and E85 gallons dispensed have increased substantially since the program began.¹¹ The Holiday chain of service stations is the largest retailer of E85 in the U.S and is headquartered in Minnesota. Holiday was an early adopter of E85 with 34 of its 432 stations offering E85. Ed Hoffman, Holiday's vice president of petroleum marketing, ascribes a significant portion of sales volume to pricing E85 30 to 40 cents per gallon lower than regular fuel. To provide some perspective, only 5.8 cents per gallon of the total price difference can be attributed to the reduced tax rate on E85. Thus, the lower prices are mostly attributable to factors other than the reduced tax rate. Hoffman further attributes Minnesota's success to its location close to ethanol production facilities and suppliers who are willing to work with station operators to keep E85 prices competitive.

The Clean Cities Program reached out to all residents to promote E85 usage. Clean Cities activities included educating buyers of FFVs about E85, offering reduced price coupons for E85, and a season-long FFV promotion with the local NBA team.

According to Brian Rauscher of the Minnesota Department of Revenue, Petroleum Division, Minnesota has not received taxpayer complaints on the alternative fuels tax. The Minnesota Department of Revenue put forth an effort to educate taxpayers about the reduced fuel tax rate for alternative fuels. A pre-existing mandated electronic filing requirement in Minnesota enabled taxpayers to submit data for fuels at multiple tax rates without incurring a large additional administrative burden.

A final word should be offered about biodiesel. Effective July 1, 2007, Minnesota defines biodiesel fuel as a petroleum product. All B100 and B99 is now taxed as undyed diesel fuel upon receipt. Under prior law, biodiesel was not taxed until blended and then it was taxed at the rate of the fuel into which it was blended. Uniform Minnesota excise tax rates on diesel and biodiesel shields taxpayers (as well as the Minnesota Department of Revenue) from the potentially significant burden of administering multiple tax rates under International Fuel Tax Agreement (IFTA), which we shall discuss further in the following section.

Finding #3. Very few states have adopted a tax on a wide variety of alternative fuels based solely on relative energy content. Furthermore, no states currently tax biodiesel on an energy content basis.

Part Three: Administrative Issues

The following section explores the administrative issues associated with an energy content-based fuel tax. A brief explanation of Ohio's motor vehicle fuel tax is necessary before exploring the administrative issues posed by transitioning to an energy content-based motor fuel tax.

Ohio's 28 cents per gallon motor vehicle fuel tax is imposed on licensed motor fuel dealers upon the use, distribution, or sale of fuel in Ohio. Licensed motor fuel dealers are wholesalers and blenders who: import or acquire motor fuel into an Ohio terminal, or bulk lot vehicle, for subsequent in-state sale and distribution; or acquire motor fuel from a motor fuel dealer for subsequent sale and distribution in Ohio from bulk lot vehicles. Licensed wholesale dealers may claim a deduction on motor fuel sold to other wholesale dealers, therefore the motor fuel tax is imposed on wholesalers who sell to retailers or other end users. It is the responsibility of the licensed wholesaler, not the retailer or end user, to report and remit the tax.

An adjunct to the motor vehicle fuel tax is the "motor fuel use tax." This tax is mainly levied on diesel fuel purchases by operators of motor vehicles with three or more axles or with more than 26,000 pounds gross vehicle weight, which means the tax is basically levied on commercial motor carriers. The tax is essentially imposed on fuel used in Ohio but purchased outside Ohio (a credit mechanism exists when the amount of fuel purchased in Ohio exceeds the amount of fuel used in Ohio). The motor fuel use tax is administered via the International Fuel Tax Agreement (IFTA). IFTA is a multi-state/provincial program under which a motor carrier can submit a single IFTA tax report with the base (home) state. The base state is responsible for collecting fuel taxes owed to other IFTA states and provinces and disbursing appropriate revenues to those IFTA member jurisdictions.

We will now examine several ways in which an energy content-based tax on alternative fuels may impede the efficient administration of motor fuel excise taxes. The major issues involve: added administrative burdens for taxpayers and state tax administrators; compliance burdens related to the fuel use tax (IFTA); difficulty in verifying claims about alternative fuel usage for reduced taxation; and the need for testing of fuel blends to prevent tax evasion. Also

included is a discussion of how Maine and Michigan have dealt with differential tax rates from an administrative standpoint.

Administrative Burdens on Fuel Distribution Industry

Currently, almost all motor fuel in Ohio is reported as either gasoline or diesel, with the same tax applied to both fuel types. A new BTU-based tax on alternative fuel would increase administrative burdens on the fuel distribution industry. A large number of Ohio motor fuel taxpayers prepare and file paper returns; such filers would experience an increased reporting burden. In addition, some taxpayers do file electronically and thus may require new or modified software.

Under a BTU-based tax, motor fuel taxpayers would be required to submit data for multiple motor fuels at varying rates. There are approximately 500 motor fuel taxpayers in Ohio; the filing and reporting effort depends largely on sales volume and software. Taxpayers are required to report sales volumes, by fuel type, on various documents: tax returns, receipt schedules, and disbursement schedules. Other entities such as common carriers, terminal operators, and exporters also file documents by fuel type. The licensed dealer's "Schedule of Receipts" is a detailed report, in which the taxpayers report data on gallonage received and disbursed, for each fuel type. Each report can amount to hundreds of pages (or more) per month. Reporting on multiple fuels, as would be necessary with differential rates, could be expected to roughly double the effort required by taxpayers to file such reports.

IFTA

Different tax rates applied to diesel and biodiesel would present significant administrative challenges for interstate trucking companies subject to the Ohio fuel use tax, administered under the International Fuel Tax Agreement (IFTA). Under IFTA, tax is paid at the rate of the jurisdiction where the fuel is consumed. In most states, the tax on diesel and biodiesel is the same, so those fuels are now reported on a combined basis in the IFTA report. There simply is no tax-related need for breaking out diesel from biodiesel.

As we will see for Maine and Michigan, those states with differential rates for diesel products create complications for interstate motor carriers attempting to understand and comply with their IFTA reporting responsibilities. For travel in differential rate states, carriers are to track miles traveled using *biodiesel* relative to their *biodiesel* purchases; they are to do the same for *diesel* usage and purchases. However, an accurate measure of miles traveled in each state using biodiesel fuel versus diesel fuel is considered to be nearly impossible when the carrier uses multiple fuels. How is the carrier to accurately determine how much of each product is used in, for example, Michigan when the carrier might have used some regular diesel and some biodiesel during the same trip through that state?

The Ohio Department of Taxation currently has a diesel schedule available for motor carriers completing IFTA returns. This schedule is for diesel fuel and biodiesel; under current law, biodiesel is reported as diesel fuel. IFTA license holders must maintain proper records of all reported fuel purchases. Separate totals must be compiled for each fuel type. Additional schedules and record keeping would be necessary for an energy-content based rate on alternative fuels.

Before proceeding further, we should recognize and respond to a potential argument that an energy-based tax on alternative fuels does not inherently lead to IFTA complications. The argument is predicated on the contention that B20 would continue to be subject to the current 28 cents per gallon rate under a BTU-based tax system. We respond by pointing to the many different ways that tax rates on alternative fuels generally, and biodiesel in particular, could be structured under a BTU-based tax structure. For example, it is quite possible that a single biodiesel tax rate could be established, perhaps using B50 (the midpoint blend) as the basis for the rate. In such a case, B20 would be subject to a different tax rate than regular diesel, so the IFTA complications would indeed be relevant. In contrast, if all biodiesel blends from B20 to B100 were assigned their own separate BTU-based rates or if fairly narrow blending ranges were each assigned different BTU-based tax rates, taxpayers would have to record and submit data on consumption of each blend or blending range. And even though B20 would not be subject to a rate different from the current 28 cents per gallon rate on conventional fuel, this arrangement would create tremendous administrative hardship, including (but not limited to) the fact that biodiesel blends of B50 and greater would be subject to a lower tax rate and thus the IFTA complications discussed herein would be relevant. There seems to be no way around notable IFTA-related (and other) administrative complexities if alternative fuel tax rates are structured based on energy content.

Maine Experience

Between September 2006 and September 2007, Maine had differential rates on diesel and biodiesel. During this period, the diesel rate was 27.9 cents per gallon and the reduced biodiesel rate was 20.0 cents per gallon. The reduced rate applied to blended fuel with at least 2 percent biodiesel. (Note that this is a considerably more expansive threshold for fuel subject to a lower tax rate as compared to the 20 percent biodiesel alternative fuel definition in Ohio law.) The reduced rate was allowed to sunset for several reasons, one being that it did not lead to a significant increase in biodiesel usage.

Maine had notable IFTA-related challenges as a result of its enacted biodiesel tax incentive. Maine-based IFTA taxpayers received a 7.9 cent per gallon credit on each gallon of qualifying biodiesel purchased in another state and consumed in Maine. Taxpayers purchasing biodiesel in Maine received the 7.9 cent benefit when they bought such fuel at the pump; therefore, a credit was not provided on those purchases. In fact, to the extent that biodiesel purchased in Maine was used out-of-state (i.e., in states where the tax rate was higher than 20.0 cents per gallon), Maine would need Maine-based taxpayers to pay fuel use tax. This was necessary so Maine could collect the amount of revenue it was required to transmit to the states where Maine-purchased biodiesel was consumed. But only one Maine tax rate – the 27.9 cents per gallon diesel tax rate – was included on the IFTA return to cover both diesel *and* biodiesel gallonage. This means taxpayers were given credit for having paid a 27.9 cents per gallon tax on Maine purchases when, in actuality, biodiesel purchases in Maine had been taxed at the reduced 20.0 cents per gallon tax rate. As a result, Maine had to develop a special supplemental tax return for carriers to report their biodiesel usage and pay the tax due on out-of-state travel; carriers were supposed to use this supplemental return to pay tax on the difference between the 20.0 cents Maine biodiesel tax rate and the higher tax rate in effect in other states.¹² The supplemental return was also used as the mechanism by which a non-Maine-based IFTA taxpayer who purchased biodiesel out-of-state and used it in Maine, could receive a refund. In such cases, Maine received its regular tax (27.9 cents per gallon) from the carrier's base jurisdiction and the taxpayer then applied for a refund.¹³

Maine had great difficulty in getting taxpayers to report and pay the proper tax due on the supplemental reports. A major problem was that many carriers simply did not distinguish between, and thus did not keep records on, diesel versus biodiesel purchases. Another problem was that carriers simply did not know about, or understand, the supplemental return.¹⁴ This meant that Maine did not collect enough revenue to defray the amounts it was required to transmit to other states under IFTA.

Maine had considerable trouble determining the validity of claims when a taxpayer using blended fuels traveled into multiple jurisdictions and purchased fuel from multiple locations. Maine officials described proper fuel use tax administration as “essentially impossible” as many taxpayers were underpaying or overpaying by not filing the supplemental report for additional tax or refund.¹⁵

Furthermore, Maine officials indicated they believe that most of any increase in biodiesel consumption was primarily due to taxpayers with large storage facilities who blended diesel fuel with the minimum amount of biodiesel required to receive the reduced tax rate (i.e., a 2 percent biodiesel blend). For such taxpayers, it was worth having to buy slightly more fuel (since B2 has slightly less energy content than regular diesel) in order to realize a 7.9 cent per gallon reduction in price.

The conclusion of the Maine Biodiesel Study Group was that the use of biodiesel is likely to grow significantly regardless of any ongoing fuel tax reduction. It was recommended that a differential rate be periodically reviewed and should continue only so long as necessary to encourage the development of biodiesel infrastructure.¹⁶ As a result, the Maine biodiesel tax rate returned to 27.9 cents per gallon.

Michigan Experience

Michigan is the only state currently charging different rates on diesel and biodiesel. The rate on blended fuel with at least 5 percent biodiesel (B5) is 3.0 cents less than the petroleum diesel rate of 30.3 cents per gallon for the second quarter of 2007. The reduced tax rate applies to biodiesel consumed in Michigan. In order to take advantage of the reduced tax rate, taxpayers must submit invoices showing where the fuel was purchased, the fuel type, and the tax that was paid with the purchase. They follow a method Michigan developed to calculate diesel and biodiesel consumption in Michigan and in other jurisdictions. Biodiesel purchased and consumed in Michigan is reported on the IFTA biodiesel schedule, as is biodiesel purchased in another jurisdiction and consumed in Michigan. Biodiesel purchased inside Michigan but consumed outside Michigan is also reported on the schedule. Tax is calculated using the tax rate for the jurisdiction where the biodiesel was consumed.

Michigan tax administrators receive data that is considered accurate on total gallonage; however there are doubts that the mileage breakdown by fuel type is accurate.

At this point, we should reiterate that that there does not appear to be an exact method for tracking where biodiesel is consumed when a motor carrier travels through multiple jurisdictions using both diesel and biodiesel fuels. Michigan’s method is likely one of the few administratively viable approaches available to approximate the amount of relative diesel and biodiesel consumption within each state.

Michigan puts forth significant effort to administer the reduced biodiesel rate. Tax administrators underwent approximately three months of development and training to deal with the new reporting and questions. There was some confusion among Michigan taxpayers upon implementation of the reduced rate. Advance filing instructions were mailed out to taxpayers, and staff was available for questions. IFTA reporting continues to challenge taxpayers and is the subject of frequent questions. Manual adjustments to return data are frequently required.

The reduction in the biodiesel tax rate is scheduled to sunset in September 2016, or when the revenue impact of the rate differential reaches \$2.5 million.¹⁷ As of October 2007, the total revenue impact of the rate differential was estimated at \$1.75 million. Renewal of the reduced biodiesel rate is anticipated. If the Michigan statute were reopened to modification, tax administrators would recommend a refund system because it would be easier to implement and audit while also increasing accuracy.

Administrative Burden on the Ohio Department of Taxation

The implementation of energy content-based motor fuel taxes would require considerable administrative effort. At least five reporting forms would require modification; special care would be necessary to ensure motor fuel use tax forms meet IFTA standards. Modifications to excise tax division software would also be necessary. Current motor fuel use tax software is leased and it is assumed that modifications are possible; however costs of such a change are unknown. The Ohio Department of Taxation owns the software necessary to administer the motor fuel tax; this software would need to be rewritten to accommodate differential rates. The necessary new or rewritten software could pose a large cost to the State of Ohio.

It is estimated that the amount of resources devoted to entering data from tax returns and reports could double if an energy content-based tax rates were enacted. There are currently six excise tax division employees focused on keying; that number would need to be increased with the application of additional tax rates. Absent mandated electronic filing, this could only be accomplished by either adding new personnel, with associated increased costs, or redeploying personnel from elsewhere in the department, at the cost of current work production.

Enforcement and Compliance Issues

An energy content-based tax rate on alternative fuels would be very difficult to enforce. Testing would be required to ensure that blends are correct. Lack of such testing would create opportunities for tax evasion; according to Michigan tax officials, it would be impossible to detect fraud associated with differential tax rates unless on audit. To administer and enforce a BTU-based tax would at least require the state to invest in testing kits and additional staffing.

In June, 2007, the Motor Fuel Uniformity Committee of the highly respected Federation of Tax Administrators (FTA) added recommendations to the alternative fuels section of their "Uniformity Booklet". According to the FTA, when considering rate reductions for specific fuels or uses, the following should be considered:

"1. There is an increased potential for evasion if: (a) fuel may be purchased at a specific blend to receive a reduced tax rate. The reduced tax rate is remitted, then the fuel may be further blended and sold at the higher rate, or (b) fuel may be purchased at a reduced tax rate based on a specified use, then later used for a different purpose, which should be taxed at a higher rate.

2. Consider a credit or refund to allow for ease in fuel taxation. This will further ensure accuracy of reduced tax rates/ credits situations for specific fuel blends and uses.”

Finding #4. Major administrative complications would result from taxing alternative fuels based on their relative energy content. Taxpayers would experience an increased burden in their tax collection and administration responsibilities, and additional resources would be needed by the Department of Taxation’s excise tax division. It is the opinion of experienced tax administrators in Maine and Michigan, as well as the Federation of Tax Administrators, that a differential rate based on fuel type is not recommended, particularly as it greatly complicates IFTA administration.

Part Four: Expected Effects of an Energy Content-Based Tax on Alternative Fuel Use

This report would probably be incomplete if we did not at least address whether or not an energy content-based tax rate could be expected to stimulate the use of alternative fuels in Ohio. As stated earlier, it is not our intention to examine the expected relative efficacy of the full gamut of policy tools intended to increase alternative fuel consumption. We limit our remarks to the expected effects caused by adjusting the tax rate to reflect relative energy content and a brief discussion of current alternative fuel incentives.

The alternative fuels industry is in its relative infancy. Despite substantial growth rates in certain alternative fuels (like E85) over the last several years, such growth still does not translate into many gallons when compared to regular gasoline and diesel. For example, in Minnesota, which is a state that probably has above-average sales of E85, E85 sales in 2006 were 18.2 million gallons, which is less than 1 percent of gasoline sales that year. A major challenge has been in finding the proper combination of policy tools and market conditions at which time the industry will “lift off” and finally establish a substantial presence in the motor fuel market.

Few people would probably dispute the claim that no measure of (reasonable) government-issued incentives or subsidies will stimulate alternative fuel consumption if the price of gasoline does not reach and remain at a level where alternative fuels can be competitively marketed. But the notional “tipping point” that would make alternative fuels a viable long-term substitute for petroleum-based fuels – that is, the specific mix of required elements that would make alternative fuel a dependable and competitively priced substitute - remains elusive. Even if gasoline prices do not fall below current levels (i.e., stay at roughly \$3.00 per gallon or above), this alone is probably not enough to move alternative fuels out of the “boutique” category and into the mainstream consumer market, due to the assorted risks and ongoing challenges facing the industry. Some important factors affecting the viability of E85 in particular include (but are not limited to): advancements in production technology and consequent investments in such technology that will control and reduce ethanol production costs; development of the distribution infrastructure and of end use facilities; growth in the number of retail outlets offering alternative fuel; and consumer perceptions and behavior.¹⁸

Given these considerations, what type of impact might a BTU-based tax have on alternative fuel consumption? First, we must consider the fact that there is very little that could be done to ensure that wholesalers paying the lower BTU-based tax on the sale of alternative fuel would pass those savings on to retailers. Will lower prices even materialize? It is not

inconceivable that only a portion of the reduced tax will be realized in the form of lower retail prices.

Maine temporarily reduced the tax rate on biodiesel by 7.9 cents per gallon. When the rate reduction went into effect, the two stations making commercial sales of biodiesel were selling at essentially the same price before and after the rate reduction.¹⁹ An energy-content-based tax would reduce tax rates much less than the Maine rate change did. So, the question still remains whether a tax rate change in Ohio would reduce consumer prices by a discernible degree.

Furthermore, even if there is a direct and full reduction in retail prices as a result of an energy content-based tax, will consumers respond in any material way to those price reductions? We need to put the impact of an energy content-based tax into pricing perspective. For E85, the tax per gallon would move from the current 28 cents, down to 20 cents. However, an equally important point to consider is that when making purchases consumers compare the gasoline gallon equivalent price of E85 to the price of gasoline. The gasoline gallon equivalent price of E85 is determined after the relative energy content of gasoline and E85 is accounted for: in flex-fuel vehicles, 1.41 gallons of E85 is the equivalent of one gallon of gasoline. Using December 2007 national prices reported by AAA and at the current Ohio fuel tax rate of 28 cents per gallon, the price of a gasoline-equivalent gallon of E85 is 114 percent the price of gasoline (\$3.41 for E85 and \$2.99 for gasoline). Under an energy content-based tax rate, the price of a gasoline gallon equivalent of E85 is 110 percent the price of a gallon of gasoline (\$3.30 for E85 and \$2.99 for gasoline).²⁰ Note that the price of E85 would drop by three percent (from \$3.41 to \$3.30) under this scenario. The question is, under these E85 and gasoline price assumptions, will lessening the relative price difference between E85 and gasoline by approximately four percentage points be a sufficient incentive to significantly stimulate E85 use? And even if the price of gasoline were to increase to a point where it would exceed the gasoline gallon equivalent price of E85, would a three percent drop in the price of E85 be sufficient to leverage a notable increase in demand for that product? The limited empirical evidence on this particular topic suggests that, by itself, an energy content based tax rate will not notably increase E85 use.

If the energy-based tax rate were *not* passed on to consumers, might it still serve as an inducement to petroleum distributors (wholesalers and retailers) to begin offering E-85? That is, if petroleum distributors were to increase their revenues by the amount of the reduced tax – by maintaining the price charged per gallon at the same level it would have charged without the tax reduction – might more of them choose to market E-85? Although some distributors, particularly those already strongly considering adding E-85 to their product mix, might indeed be induced to sell E-85, the chances of a BTU-based tax triggering a widespread movement toward offering E-85 seem rather unlikely. Numerous obstacles, some of which (such as infrastructure development) we have cited above, need to be overcome for the transportation fuel industry to seriously consider adopting E-85 as a widely marketed product. We have not conducted the type of analysis that would be necessary to draw decisive conclusions about the prospects of a BTU-based tax as an effective stimulus for E85 consumption and supply. However, we can say that other incentives currently exist that appear to have a better chance at stimulating alternative fuels.

In fact, a tax incentive has already been enacted in Ohio for the purpose of encouraging the alternative fuels industry.²¹ The fiscal year 2008-2009 biennium budget bill (Am. Sub. H.B.

119, 127th General Assembly) created a temporary nonrefundable tax credit against the corporate franchise tax or income tax for Ohio retail service station operators who sell alternative fuel to the general public through a metered pump.²² “Alternative fuel” for purposes of the credit is limited to E85 fuel, and to blended diesel fuel containing at least 20 percent biodiesel. For corporate franchise taxpayers, the credit may be claimed for tax years 2008 and 2009. The credit is 15 cents per gallon of alternative fuel sold in 2007 and 13 cents per gallon sold in 2008. If the dealer is a pass-through entity (such as a partnership, limited liability company, or S corporation), the credit is passed through to the owners or shareholders on their Ohio income tax return. For pass-through entities, the tax credit is also 15 cents and 13 cents, respectively, in taxable years 2008 and 2009. The impact of this credit on such factors as alternative fuel retail prices, aggregate alternate fuel consumption, and the number of alternate fuel retailers is not yet known and will not be known at least for the foreseeable future due a variety of reasons, most apparently because alternative fuel data reporting requirements do not currently exist.²³ However, one would expect a tax credit of 13 cents per gallon or 15 cents per gallon would provide a greater stimulative effect on alternative fuel availability and consumption than would an energy content-based tax rate whose maximum financial impact (for E85 fuel) is 8 cents per gallon and whose financial impact for some other alternative fuels (such as B20 fuel) is practically nonexistent.²⁴

Before turning from our discussion of current Ohio alternative fuel financial incentives, we should mention the Alternative Fuel Transportation Grant Program. This program offers grants up to \$20,000 per station per fuel for the new installation of E85 or B20 pumps. This grant also provides up to \$2,500 in marketing funds for new or existing ethanol and biodiesel locations. In April, 2007 the Department of Development awarded grants to twelve alternative fuel retailers and two biodiesel blending facilities. Data is not available on the impact of such grants on alternative fuel sales.

The experience of Minnesota – one of the most successful states in terms of ethanol consumption - might give a better indication as to whether such alternative fuel tax incentives have had a material impact on the consumption of such products.

First, we should address the issue of whether retail prices in Minnesota have reflected the financial incentives. Retail station owners have discretion in setting prices, and the price of E85 can vary by station. For example, a study of the Minnesota pilot project found the maximum station monthly price average for E85 in May 2004 was \$1.98, and the minimum station monthly price average was \$1.21. The Volumetric Ethanol Excise Tax Credit, VEETC, is a federal tax credit of 51 cents per gallon of pure ethanol blended into gasoline.²⁵ Only registered blenders can take this credit which is intended to keep the pricing of ethanol-blended fuels below regular gasoline. The considerable variation in E85 pricing could signify that there is a great deal of variation in how much federal subsidy ends up with whom, and there is not complete pass-through of the subsidy.²⁶ The variation in E85 price could indicate that the subsidy benefits may be accruing upstream.

Minnesota is often considered a model for state policies that encourage ethanol production and consumption.²⁷ Minnesota provided a state gasoline-tax exemption for ethanol in 1980. To encourage in-state, small plant manufacturing, lawmakers converted half of the tax exemption into a 20-cent subsidy per gallon, payable to in-state ethanol producers with a

capacity of less than 30 million gallons per year.²⁸ This subsidy encouraged investment in small farmer-owned ethanol production facilities. To stimulate demand for ethanol, an oxygenated fuel statute was passed that requires all gasoline sold in Minnesota to contain at least 10 percent ethanol.²⁹ The combination of the subsidy and blending requirement has been credited with encouraging ethanol production in Minnesota, which rose from one million gallons in 1986 to 400 million gallons in 2004.³⁰

While Minnesota is a leading state in ethanol production and promotion, it should be noted the portion of ethanol used as E85 is minimal. While Minnesota ethanol production reached 550 million gallons in 2006, only 3 percent of that ethanol production was sold as E85 at retail in Minnesota during that year (approximately 18.2 million gallons). Although E85 consumption in Minnesota continues to grow at a considerable pace, in Minnesota – as well as the rest of the U.S. - the vast majority of ethanol is used as a fuel additive, not as independent alternative fuel. In 2005, retail sales of E85 in Minnesota were less than one-third of one percent (0.33%) of the state's gasoline consumption.

An analysis of Minnesota's E85 Pilot Project looked at seven years of station-level monthly data and found that a 1 cent per gallon decrease in the price of E85 would have a nearly negligible impact on E85 consumption.³¹ A study by Bromiley and Dobrovolny discovered that a change in the price of regular gasoline had a slightly greater impact on E85 consumption than a change in the price of E85 itself would have.

There is some evidence that many consumers have a willingness to purchase alternative fuel, despite its higher price relative to petroleum fuel. For example, compared to other states Minnesotans consume a relatively high amount of E85 even though its price was, on average, 32 cents higher than an energy-content equivalent gallon of gasoline between 2002 and 2006.³² This result may reflect the fact that Minnesotans place a high social premium on locally-produced ethanol. But some of the relatively high E85 consumption also may be attributable to consumers' inability or unwillingness to calculate mileage-equivalent cost.³³ To summarize, consumers may be unaware or unmotivated to make the necessary mathematical conversions to compare fuel prices on a mileage basis, or they may be motivated by additional personal factors (e.g., environmental, agricultural, or energy security concerns) besides price.

The analysis performed on the Minnesota experience implies the need for systematic collection of data. Only with full and accurate data is subsequent analysis of a fuel tax incentive program possible. Unfortunately, the current Ohio tax credit for the sale of alternative fuel does not specifically authorize or require any state agency to collect alternative fuel sales data from retailers. Ohio tax returns will not provide useful data for a variety of reasons. For instance, the type of alternative fuel sold and other desired detail will not be provided on the tax form. In addition, the limited data that could be garnered from tax returns will not become available in a very timely manner: there is a notable time lag between the sale of the fuel and the filing of the tax return, followed by the subsequent data capture from the returns. And for retailers operating as pass-through entities, the tax credit will be claimed by each investor/owner; we can expect there to be logistical difficulties in aggregating the tax credit data from the separate investors/owners, likely leaving significant gaps in the data collection effort. For these reasons, we do not expect much valuable information to be available on whether the credit will have had much impact on alternative fuel sales. So, regardless of whether the existing credit is renewed or some other form of tax incentive might be adopted to take its place after the existing credit

expires in 2009, we strongly urge Ohio lawmakers to include a data reporting requirement. This is the only viable way to ensure that lawmakers can draw informed conclusions about the effectiveness of the program and determine whether further changes in the program may be warranted.

Finding #5. There is a strong possibility that the reduced tax charged on certain alternative fuels under an energy content-based tax structure would not be fully passed down to consumers in the form of a lower retail price. Even if the reduced tax were reflected in the retail price, the likelihood that it would spur a substantial increase in alternative fuel consumption is questionable. If the reduced tax were not passed on to consumers and the BTU-based tax were to operate more as a “supply-based” incentive, the likelihood a BTU-based tax would induce many suppliers to begin selling alternative fuel (E-85) is also open to question.

Finding #6. There are other available policy choices that could be expected to have a greater positive impact on alternative fuel consumption, with fewer administrative complications. A prime example is the existing Ohio tax credit for E85 and biodiesel sales. This credit, amounting to 15 cents per gallon of E85 and eligible biodiesel dispensed by retailers during the first year, and 13 cents per gallon during the second year, provides a higher financial inducement for alternative fuel use than would a BTU-based tax rate. Retailers simply claim the tax credit on their income tax or corporate franchise tax return. The credit makes no changes to the motor vehicle fuel tax, thereby avoiding the administrative drawbacks discussed elsewhere in the report and preventing any loss in motor vehicle fuel tax revenues.

Finding #7. If an Ohio alternative fuel tax incentive is enacted in the future (whether it be renewal of the existing Ohio tax credit or a new tax incentive), an appropriate data reporting and collection requirement should also be adopted. This is the best way to ensure that useful and accurate information is available about the program and to ensure that lawmakers can evaluate the program’s effectiveness.

Conclusion

Shown below is a recapitulation of the various findings contained in this report:

- Given the numerous blending variations, alternative fuels have widely varying energy content levels. Assigning specific energy tax rates to alternative fuel blends would involve a tradeoff between precision (i.e., allowing the rate to closely reflect actual energy content) and simplicity (i.e., avoiding a long list of tax rates for a particular type of alternative fuel).
- The difference in energy content between B20 and diesel fuel is not substantial enough to result in a reduced tax rate for B20. Of the more common biodiesel fuel blends, B50 is the lowest biodiesel blend at which the difference between its energy content and that of conventional diesel fuel would be large enough to result in a reduced tax rate.

- Very few states have adopted a tax on a wide variety of alternative fuels based solely on relative energy content. Furthermore, no states currently tax biodiesel on an energy content basis.
- Major administrative complications would ensue from taxing alternative fuels based on their relative energy content. Taxpayers would experience an increased burden in their tax collection and administration responsibilities, and additional resources would be needed by the Department of Taxation's excise tax division. It is the opinion of experienced tax administrators in Maine and Michigan, as well as the FTA, that a differential rate based on fuel type is not recommended, particularly as it greatly complicates IFTA administration.
- There is a strong possibility that the reduced tax charged on certain alternative fuels under an energy content-based tax structure would not be passed on to consumers in the form of a lower retail price. Even if the reduced tax were reflected in the retail price, the likelihood that it would spur a substantial increase in alternative fuel consumption is questionable. If the reduced tax were not passed on to consumers and the BTU-based tax were to operate more as a "supply-based" incentive, the likelihood a BTU-based tax would induce many suppliers to begin selling alternative fuel (E-85) is also open to question.
- There are other available policy choices that could be expected to have a greater positive impact on alternative fuel consumption, with fewer administrative complications. A prime example is the existing Ohio tax credit for E85 and biodiesel sales. This credit, amounting to 15 cents per gallon of E85 and eligible biodiesel dispensed by retailers during the first year, and 13 cents per gallon during the second year, provides a higher financial inducement for alternative fuel use than would a BTU-based tax rate. Retailers simply claim the tax credit on their income tax or corporate franchise tax return. The credit makes no changes to the motor vehicle fuel tax, thereby avoiding the administrative drawbacks discussed elsewhere in the report and preventing any loss in motor vehicle fuel tax revenues.
- If an Ohio alternative fuel tax incentive is enacted in the future (whether it be renewal of the existing Ohio tax credit or a new tax incentive), an appropriate data reporting and collection requirement should also be adopted. This is the best way to ensure that useful and accurate information is available about the program and to ensure that lawmakers can evaluate the program's effectiveness.

In conclusion, we did not discover any evidence demonstrating that a BTU-based tax rate would have much effect in stimulating alternative fuel consumption, but we did discover significant administrative complications and burdens posed by such a tax structure. Other approaches - such as the recently-enacted Ohio tax credit for alternative fuel dispensed by retailers - are available that would provide a greater financial inducement to increase alternative fuel sales, with a much lower administrative burden.

¹ U.S. Department of Energy, Energy Efficiency and Renewable Energy. (1997). *Alternative and Advanced*. Retrieved From: <http://www.eere.energy.gov/afdc/fuels/index.html>

² U.S. Department of Energy, Energy Information Administration. (2004). *Estimated Consumption of Alternative Transportation Fuels in the United States, by Fuel and Vehicle Weight, 2000, 2002, and 2004*. Retrieved From: http://www.eia.gov/cneaf/alternate/archive/datatables/afvtable10_03.xls

³ Casady, William and Schumacher, L. (2007). *Biodiesel Blends for Fueling and Diesel Engines*. Retrieved From: <http://extension.missouri.edu/explore/agguides/agengin/g01991.htm>

⁴ U.S. Department of Energy, Energy Efficiency and Renewable Energy. (2007). *Alternative & Advanced Fuels*. Retrieved From: <http://www.eere.energy.gov/afdc/progs/ddown.cgi?afdc/FAQ/5/0/0>

⁵ This list includes public & private refuel sites; therefore, not all of these sites are available to the public. U.S. Department of Energy, Alternative Fuels Data Center. (2007). Retrieved From: www.eere.gov/afdc/infrastructure/station_counts.html

⁶ U.S. Department of Energy, Energy Information Administration. (2004). *Estimated Consumption of Alternative Transportation Fuels in the United States, by Fuel and Vehicle Weight, 2000, 2002, and 2004*. Retrieved From: http://www.eia.gov/cneaf/alternate/archive/datatables/afvtable10_03.xls

⁷ U.S. Department of Energy, Alternative Fuels & Advanced Vehicles Data Center. (2007). *P-Series*. U.S. Department of Energy, Energy Efficiency and Renewable Energy. Retrieved From: http://www.eere.energy.gov/afdc/fuels/emerging_pseries.html

⁸ Note that the BTU-based tax rate for E85 shown in the above table is based on a true 85% ethanol – 15% gasoline blend.

⁹ Maine Revenue Services. *Sales, Fuel and Special Tax Division. Instructional Bulletin. Excise Tax Bulletin #2, Gasoline Excise Tax*. Retrieved From: <http://www.maine.gov/revenue/fueltax/gas/Excise%20Gasoline%20Bulletin%20issued%20200607.pdf>

¹⁰ Pennsylvania Department of Revenue. (2005). *Liquid Fuels & Fuel Taxes, Alternative Fuels*

¹¹ Hall, Larry E. *Cornfields vs. Oil Fields*. MSN Autos. Retrieved From: <http://autos.msn.com/advice/article.aspx?contentid=4024000>

¹² Maine Biodiesel Study Group for the Joint Standing Committee on Transportation, Joint Standing Committee on Utilities and Energy (Required by Public Law 2006, Chapter 677). (2007).

¹³ Hinkley, Garry. (Maine Director of Vehicle Services) Telephone Interview. (October, 2007).

¹⁴ A Maine tax official indicated that incorporating the 20.0 cents per gallon Maine biodiesel tax rate into the IFTA return would not have led to a much better result. Accurate tax collection under IFTA depends on high-quality reporting by carriers (as well as the ability of states to enforce the tax). The apparent inability of carriers to distinguish between diesel and biodiesel purchases would have been as much of a problem under IFTA as it was under the “supplemental return” approach actually used by Maine.

¹⁵ Hinkley, Garry. (Maine Director of Vehicle Services) Telephone Interview. (October, 2007).

¹⁶ Maine Biodiesel Study Group for the Joint Standing Committee on Transportation, Joint Standing Committee on Utilities and Energy (Required by Public Law 2006, Chapter 677). (2007).

¹⁷ Michigan Senate Staff. (2007). *Bill Analysis Michigan Senate Fiscal Agency*. Retrieved From: <http://www.legislature.mi.gov/documents/2005-2006/billanalysis/Senate/htm/2005-SFA-1074-E.htm>

¹⁸ We should reiterate that, for purposes of this report, ethanol produced for incorporation into products that are primarily comprised of petroleum (most notably, E10 gasoline) is not considered “alternative fuel.” Although there currently exist strong forces in favor of ethanol production - including the new renewable fuel standard mandated by the federal Energy Policy Act of 2005 - most ethanol continues to be used as a blend in products that remain petroleum-based in nature; ethanol is generally not used in producing ethanol-based fuels (like E85).

¹⁹ Biodiesel Study Group for the Joint Standing Committee on Transportation, Joint Standing Committee on Utilities and Energy (Required by Public Law 2006, Chapter 677). (January 2007).

²⁰ For December 18, 2007, AAA reported a national average E85 price of \$2.42 per gallon and an average regular-grade gasoline price of \$2.99 per gallon. On a gasoline-equivalent gallonage basis, however, the average per gallon price of E85 was about \$3.41, or 114 percent of the price of gasoline. A BTU-based tax rate would provide an 8 cents per gallon reduction in the price of E85, translating into about a 10 cent per gallon reduction after adjusting for relative energy content. Based on these specific price assumptions and after making this tax reduction, E85 would still be about 110 percent of the price of gasoline; stated another way, it would still be roughly 30 cents per gallon more expensive than gasoline. Note that because of price volatility, the relative prices of the two products at any given time may be quite different than the “snapshot” provided in this illustration. Retrieved from: <http://www.fuelgaugereport.com>

²¹ Note that the tax incentive was enacted after Sub. H.B. 245 – which mandated this report – went into law.

²² This tax credit will decrease state general revenue fund and local distribution fund revenues. In contrast, a BTU-based tax rate would affect motor vehicle fuel tax revenues, all of which are dedicated to transportation-related purposes.

²³ The enacted tax credit creates different incentives than the BTU-based rate structure. The BTU-based structure would result in slightly lower rates at the pump, if the retailers passed the savings through to consumers, and thus might act as a demand-side incentive. The income and corporate franchise tax credit is taken well after the alternative sales occur. While it may be the case that the credit will be passed along to consumers, the time lag in claiming the credit makes that uncertain. Thus, the enacted tax credit seems to be more clearly designed as a supply-side incentive.

²⁴ However, we should also mention that retailers organized as regular corporations, and thus subject to the corporate franchise tax, will not realize the full tax credit in tax years 2008 and 2009. This is due to the five-year phaseout of the corporate franchise tax, implemented via 20 percentage point annual increments. In tax year 2008, the credit will effectively be 6 cents per gallon (15 cents x 40%) and in tax year 2009 the credit will effectively be 2.6 cents per gallon (13 cents x 20%).

²⁵ The Kansas Corn Commission. *The Kansas Fuel Retailers' Ethanol Guide*. The Kansas Corn Commission. Retrieved From: <http://www.ksgrains.com/ethanol/regcredits.html>

²⁶ Dobrovolny, Lydia. (2006). *The Development of Alternative Fuel Markets: An Analysis of Minnesota's E85 Project*. Paper in Partial Fulfillment of the Master of Science, Technology and Environmental Policy Degree Requirements, The Hubert H. Humphrey Institute of Public Affairs, The University of Minnesota.

²⁷ P. Mazza. (2001). *Ethanol: Fueling Economic Rural Revival*. Climate Solutions. Retrieved From: http://www.harvestcleanenergy.org/documents/Ethanol_Report.pdf

²⁸ Payment is limited to the first 15 million gallons produced. S. Rankin, (2002). *The Ethanol Industry in Minnesota*. Minnesota House of Representatives, House Research. Retrieved From: www.house.leg.state.mn.us/hrd/issinfo/ssethnl.htm#E3

²⁹ An oxygenate is an additive in gasoline which reduces emissions of carbon monoxide and volatile organic compounds. Oxygenates may contribute to ozone formation. Methyl tertiary butyl ether (MTBE) is a widely used oxygenate which has been found to contaminate groundwater, which has led for calls to ban MTBE and either eliminate the oxygenate requirements, or replace MTBE with ethanol.

³⁰ T. Velner. (2004). Presentation to the National Governor's Association. Scottsdale, AZ. Retrieved From: www.nga.org/cda/files/0404GHGVelner.PPT Velner is policy advisor to Minnesota Governor Tim Pawlenty.

³¹ Bromiley, P. and Dobrovolny, L. (2005-06). *What Determines Ethanol 85 Use? Learning from Minnesota's E85 Pilot Project*.

³² Turner, Brian Thomas. (2005). *E85, Flex-Fuel Vehicles, and AB 1493: Integrating Biofuels into California's Vehicular Greenhouse Gas Regulations*. Berkeley, California: Masters of Science Thesis, Energy and Resources Group, University of California. Report to the California Air Resources Board.

³³ Ibid.

Appendix

Provided below is the section in Sub. H.B. 245 that requires the alternative fuel tax rate study.

126th General Assembly Substitute House Bill Number 245

AN ACT

To amend sections 122.075, 125.831, 125.832, and 4511.101, to enact sections 122.861, 125.834, 125.836, 125.837, 125.838, and 5735.40 of the Revised Code and to amend Section 203.99.45 of Am. Sub. H.B. 66 of the 126th General Assembly and to amend Section 203.99 of Am. Sub. H.B. 66 of the 126th General Assembly as amended by Am. Sub. S.B. 236 of the 126th General Assembly to create diesel emissions reduction grant and revolving loan programs, to revise the alternative fuel transportation grant program, to establish certain requirements related to the use of alternative fuels, and to make an appropriation.

Be it enacted by the General Assembly of the State of Ohio:

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SECTION 7. (A) As used in this section, "alternative fuel" has the same meaning as in section 125.831 of the Revised Code, as amended by this act.

(B) The Department of Taxation shall study the feasibility of encouraging the use of alternative fuels by reducing the motor fuel tax rate on those fuels, to the extent they are taxed under Chapter 5735. of the Revised Code, to reflect their lower energy content and the need to use more gallons of an alternative fuel to travel the same distance. The study shall examine the British thermal unit ("Btu") of each alternative fuel that may be used in motor vehicles and determine at what rate each alternative fuel may be taxed to result in an effective tax rate that is equalized to conventional fuels, such as gasoline and diesel, according to their relative Btu content by volume. Among any other matters the Department of Taxation determines to be pertinent to the study, the Department also shall consider the experience of other states that have encouraged the use of alternative fuels by reducing their fuel tax rates on those fuels. Not later than one year after the effective date of this section, the Department shall prepare a report regarding its findings and submit a copy of the report to the Governor, the Speaker and Minority Leader of the House of Representatives, and the President and Minority Leader of the Senate.