



**RELIEF:  
IMPACT OF AN ETHANOL MANDATE  
ON RETAIL LEVEL GASOLINE PRICES IN ONTARIO**

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During the last election campaign, Premier Dalton McGuinty committed to requiring that all motor gasoline sold in Ontario would contain 5 percent ethanol by 2007 and 10 percent by 2010. Meeting this commitment will more than triple the market for renewable fuels in Ontario to 793 million litres by 2007 and 1,658 million litres by 2010. Implementing an ethanol mandate in Ontario would increase the supply of motor fuel and reduce the retail price of gasoline. In the near term (2005-2007) an ethanol mandate in Ontario would lower prices at the pump 8.3 percent. At current prices this amounts to a savings for consumers of 6.7 cents per litre.

Gasoline and diesel fuel are refined from crude oil. Canada imports crude oil and exports finished petroleum products. Ethanol is produced from grain and other agricultural products. Ontario currently produces about 170 million litres of ethanol and new capacity is under construction. Ethanol is blended with gasoline to improve octane and performance, and to add oxygen so that motor fuel burns cleaner and reduces emissions of carbon monoxide and ozone-forming compounds. Biodiesel use reduces particulate matter (PM) and nitrogen oxide (NOx) emissions and enhances lubricity.

Since ethanol is blended with gasoline and biodiesel with distillate fuel, renewable fuels actually increases the quantity of motor fuel available to consumers. For Canada this translates into smaller import requirements or larger amount available for export. The marginal supply of crude oil is controlled by the OPEC cartel. At least one member – Saudi Arabia – has recently indicated a willingness to increase oil production. However recent terrorist attacks aimed at the oil industry have increased fears about possible disruptions in the flow of oil from the Gulf region. These events have added a risk premium to world oil prices.

Blending renewable fuels with gasoline and diesel literally makes the same amount of gasoline and diesel go farther. In addition to reducing the amount of crude oil required to make gasoline, increased use of renewable fuels reduces pressure on already stressed refineries that are operating very near full capacity. Finally, the additional fuel supplies provided by an ethanol mandate will reduce the need to build new refineries to supply an ever-growing demand for motor fuel. A mandate that requires 5 percent ethanol in all gasoline sold in Ontario by 2007 and 10 percent by 2010 will increase the quantity of motor fuel available to Ontario consumers 2.1 percent between 2005 and 2007 and an additional 6.4 percent between 2008 and 2010. **At current Toronto gasoline prices, this translates into a decline in gasoline prices at the pump of 6.7 cents per litre (8.3 percent) between 2005 and 2007 and 6 cents per litre (7.4 percent) between 2008 and 2010.**

Demand elasticities describe the change in demand that results from a change in price. If the change in demand of a good is smaller than the change in price, demand is considered inelastic. Gasoline is such a good, particularly in the short term. The reason for this is that in the short term consumers can make only small adjustments to consumption when prices change. As the adjustment time becomes longer, consumers can adjust consumption patterns. Reflecting this, the short-term elasticity used in this analysis for gasoline is  $-0.24$  and the long-term elasticity is  $-0.8$ .<sup>1</sup> However, for this study we are concerned with the impact on the price of gasoline resulting from a change in demand that would be supplied by ethanol produced to meet mandated levels. This impact can be measured by applying the inverse of the price elasticity of demand to the anticipated change in demand. The impact of the change in the supply of gasoline resulting from additional ethanol and its impact on price is summarized in Table 1 and the calculation is detailed in Appendix 1.

Table 1  
Impact of Ontario RFS on Retail Gasoline Prices

	Ontario Gasoline Use (Mil l) /1	Gasoline Demand Growth (Pct)	Ethanol Mandate Share (Pct)	Ontario Ethanol Supply (Mil l)	Ontario Gasoline w/Mandate (Mil l)	Increased Gas DD w/Mandate (Pct)	Price Elasticity of Demand	Inverse of Elasticity	Effective Price Change (Pct)
2002	14,342	3.4%							
2003	14,943	4.2%							
2004	15,167	1.5%	1%	173	15,167	0.0%	-0.24	-4.17	0.0%
2005	15,395	1.5%	2%	308	15,512	0.8%	-0.24	-4.17	-3.2%
2006	15,626	1.5%	4%	547	15,952	2.1%	-0.24	-4.17	-8.3%
2007	15,860	1.5%	5%	793	16,401	3.4%	-0.80	-1.25	-4.1%
2008	16,098	1.5%	7%	1,046	16,859	4.7%	-0.80	-1.25	-5.6%
2009	16,339	1.5%	9%	1,389	17,399	6.5%	-0.80	-1.25	-7.6%
2010	16,585	1.5%	10%	1,658	17,880	7.8%	-0.80	-1.25	-9.0%
2005-2007	46,881				47,865	2.1%	-0.24	-4.17	-8.3%
2008-2010	49,022				52,138	6.4%	-0.80	-1.25	-7.4%

Sources:

1. Statistics Canada, CANSIM, table 405-0002.

Canadian gasoline demand growth 2005-10 Canada's Emissions Outlook 1997-2000. Energy Sector

2. Elasticities from Dahl and Sterner (1991)

3. Regular gasoline price, Toronto 6/22/04 reported by *Fuel Facts Price Monitor, Vol 5, Issue 12, June 22, 2004*

<sup>1</sup> The magnitude of the change in demand caused by a change in price and in price caused by a change in supply depends on the elasticity. The short-term demand elasticity for gasoline used in this study is  $-0.24$  and the long-term elasticity is  $-0.8$ . The inverse of the demand elasticities can be used to calculate the impact of a change in demand met by additional supply on price. The calculation for this is shown in Appendix 1. These elasticities imply that an increase in gasoline demand met by additional ethanol production of 2.1 percent would result in a short-term (2005-2007) drop in prices of 8.3 percent while a longer-term supply increase of 6.4 percent would result in a price decline of 7.4 percent between 2007 and 2010. See Carol Dahl and Thomas Sterner, "Analyzing gasoline demand elasticities: a survey". *Energy Economics*, July 1991. pp 203-210.

The impact of an ethanol mandate on prices resulting from increased demand of motor fuel supplied by additional ethanol production will not be compromised by blending more expensive ethanol with gasoline. Currently renewable fuels receive an exemption of 14.7 cents per litre from Provincial road taxes. This exemption offsets the current higher price of ethanol to make the blend cost competitive. As shown in Table 2 adding 5 percent ethanol to regular gasoline results in a blended price that is 0.3 percent below the regular price when the 14.7 cents/litre exemption is applied. Adding 10 percent ethanol reduces the pump price by 0.7 percent.

Table 2  
Impact of Blending Ethanol on Ontario Gasoline Prices  
(Regular Gasoline, Toronto)

	Toronto Regular Gasoline (cents/l)	Chicago Spot Ethanol (cents/l)	5% Ethanol Blend (cents/l)	10% Ethanol Blend (cents/l)
Wholesale Gasoline	50.8	60.3		
Federal Tax	10.0	10.0		
Ontario Tax	14.7			
Net before GST	75.5	70.3	75.2	75.0
GST (7%)	5.3		5.3	5.2
Retail (pump) price	80.8		80.5	80.2
Pct difference			-0.3%	-0.7%

Source: Fuel Facts Price Monitor, Vol.5, Issue 12, 6/22/04  
Chicago spot ethanol 6/22/04 from Platts in Canadian cents/l

This calculation understates the impact of adding ethanol to gasoline. Blending ethanol with gasoline improves octane. According to the Nebraska Ethanol Board, adding 10 percent ethanol boosts octane from 87 to 89.5. Consequently, when consumers buy regular grade gasoline blended with ethanol they actually get the equivalent of higher-octane midgrade. This represents a savings to gasoline refiners that, if passed along to consumers, amounts to an additional price reduction.

**Appendix 1:  
Derivation of Price Change Resulting from a Change in Demand Met by Additional Production**

(1)  $D = a P^{\beta}$

(2)  $(D)^{1/\beta} = (a)^{1/\beta} P$

(3)  $P = D^{1/\beta} / (a)^{1/\beta}$

(4)  $P = (D/a)^{1/\beta}$

Suppose

$D = 100$ ;  $P = 80.8$ ;  $\beta = -.24$ ;  $1/\beta = -4.167$

(5)  $a = D/P^{\beta}$   
 $= 100/(80.8)^{-24}$   
 $= 100/0.3485$   
 $= 286.93$

Assume demand increases 2.1% ( $D = 102.1$  instead of 100)

To solve for new price using (4) above:

$P^x = (102.1/286.93)^{-4.167}$   
 $= (0.3558)^{-4.167}$   
 $= 73.2$

Original price 80.8

New price 73.2

8.3% decline

## About the Author

LECG, LLC is a global consulting services firm that provides sophisticated economic and financial analyses, expert testimony, and litigation support to the world's leading law firms, Fortune 500 companies, private and public sector industries, and government agencies. Our core areas of expertise include antitrust, auctions, energy, environmental economics, finance and damages, intellectual property, international trade, healthcare, mergers and acquisitions, public policy, strategy, telecommunications, and transportation. Founded in 1988, LECG has professionals in offices around the world who provide a broad range of objective consulting services to effectively address today's diverse business and legal challenges.

John M. Urbanchuk, Director, LECG, is responsible for managing and providing a broad range of economic, planning, marketing, and policy analysis consulting services. John has extensive experience in the ethanol and biodiesel industry and has provided clients with expert economic analysis to support a wide range of agriculture and renewable fuels policy issues. He also has conducted economic feasibility studies for individual firms and trade groups interested in building and investing in ethanol and biodiesel plants. Some of his clients include the National Corn Growers Association, Renewable Fuels Association, American Soybean Association and United Soybean Board, Congressional Budget Office, The Energy Information Administration, NYSERDA, The New Jersey Farm Bureau, and Agri-Technology Corporation.

Prior to joining LECG, Mr. Urbanchuk was Executive Vice President for AUS Consultants, Senior Vice President and Chief Economist for Hill and Knowlton, Inc., Vice President with Wharton Econometrics, and Manager-Economic Research for Campbell Soup Company.

John has testified as an expert witness before numerous congressional committees, including the Senate Finance Committee, House Ways and Means Committee, Joint Economic Committee, the Senate and House Agriculture Committees, and the International Trade Commission. He has also testified as an expert witness before the Canadian Import Tribunal as well as committees of the general assemblies of Pennsylvania, California, Washington, Minnesota, New Mexico, and New Jersey, and as an expert before proceedings of the Federal Courts.

John is an adjunct professor of marketing at St. Joseph's University in Philadelphia where he teaches graduate courses in international marketing; marketing management, industrial policy; and the EU and Russia in the Global Marketplace. John also has lectured at Penn State University; the University of Missouri-Columbia; the University of Delaware; Purdue University; The JFK Center for Special Warfare; the Budapest University of Economic Sciences; and the Hungarian Academy of Science. Mr. Urbanchuk holds a B.S. in economics from Penn State University, an M.A. in economics from Temple University, and has completed all course requirements for the Ph.D. at Temple. John is a Vietnam veteran and graduate of the U.S. Army Foreign Area Officer Program as a specialist in Eurasia.