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June 21, 2021

PRESENTATION TO HOUSE OF COMMONS STANDING COMMITTEE ON NATURAL RESOURCES
Ottawa, Ontario – by videolink

Regarding:

> That, pursuant to Standing Order 108(2), the committee undertake a study of the low-carbon and renewable fuels industry, including, but not limited to: biofuels, biogas, hydrogen, and biodiesel and, (a) opportunities to advance these industries in Canada, (b) a full analysis of the costs and benefits, and the required steps to facilitate a potential pathway for these industries to play a significant role in helping Canada for the transition to net-zero; and (c) an examination of the potential for job creation and reduction of Canada's net greenhouse gas emissions; that the committee meet for no less than eight meetings in relation to the study; that each party send a list of witnesses, by priority, including their contact information to the clerk of the committee; and that the committee report its findings to the House.

5-Minute Introductory Comments

I hold a Ph.D. in Economics from the University of British Columbia where I specialized in natural resource and environmental economics. At the University of Guelph I have, for 25 years, taught courses in environmental economics and policy, econometrics and microeconomic analysis.

Canada is a world leader in finding ways to protect the environment while maintaining growth in economic opportunities and living standards. I hope that the information learned through your hearings will assist your Committee as you aim to continue doing so.

While most of my research is aimed at peer-reviewed academic publications I have also written extensively in the public domain, including think tank reports and media op-eds. Anyone familiar with my writings will know that I have certain biases, which I can summarize very simply. I believe that policies should be critically analyzed to ensure the benefits exceed the costs. Not every environmental goal is sufficiently valuable to be worth the cost of achieving it, and when a goal has been chosen it is incumbent on policy makers to try to achieve it at the lowest possible cost. The disaster regarding Ontario's electricity restructuring is a cautionary tale of what happens to an economy when this lesson is ignored.

I have done research for the MacDonald-Laurier Institute on the costs and benefits of Canadian biofuels policy (Auld and McKitrick 2014), for LFX Associates on the costs of the proposed Clean Fuels Standard (Lee and McKitrick 2020) and for the Fraser Institute (McKitrick and Aliakbari 2021) as part of a study on the costs of the proposed carbon tax in Canada.

The biofuels report I coauthored with my colleague Professor Doug Auld at the University of Guelph showed that, over the 2008-2012 interval, Canadians paid about $3 in costs for every $1 in environmental benefits attained through biofuels. In arriving at this conclusion we made assumptions as favourable as possible to the biofuels case. But the expert literature has shown that switching to corn ethanol does not necessarily lower GHG emissions compared to using gasoline. The rapid expansion of the biofuels sector after 2006 was driven by government support, not by the underlying economics.

My research for the Fraser Institute showed that the costs of blending ethanol goes up in a convex fashion, meaning the costs go up nonlinearly as the carbon intensity target gets lower. Because ethanol has less energy per litre than gasoline, consumers have to fill up the tank more often to go the same distance. Based on elasticity estimates in the economics literature and parameter values from other published sources, I estimate that a 5 percent cut in carbon intensity below the current baseline will increase the price of gasoline by about 17 percent, while a 10 percent cut will increase it by 48 percent and a 20 percent cut will increase it by 156 percent.

My work for LFX Associates involved macroeconomic modeling of the proposed Clean Fuels Standard (CFS). We modeled a policy package that would achieve 30 MT emission reduction and we estimated that, even using a relatively high Social Cost of Carbon metric, the policy would cost the Canadian economy $6 for every $1 in environmental benefits, with net costs averaging $440 per employed person. We also estimated it would cause a permanent loss of 30,000 jobs nationally (even after taking account of expanded employment in the biofuels sector) and would put $22 billion in capital at risk of exiting the domestic economy.

We also noted that in the context of population and income growth, the total emission reductions would be offset by a 7% increase in the size of the labour force, meaning the actual emission reductions as of 2030 would be far smaller than 30 MT, and would likely be zero or less.

I also note that a larger problem with climate policy generally is that emission reductions in Canada often lead to "carbon leakage", in which the emitting activity does not disappear it simply moves to China or India, taking the jobs with it. The common catchphrase about the "costs of climate inaction" leads to a muddled argument. The relevant comparison is between global carbon emissions with the policy and without, and if they are about the same, costs we incur are largely for nought.

FULL SUBMISSION

Introduction

I hold a Ph.D. in Economics from the University of British Columbia where I specialized in natural resource and environmental economics. At the University of Guelph I have, for 25 years, taught courses in environmental economics and policy, econometrics and microeconomic analysis.

Canada is a world leader in finding ways to protect the environment while maintaining growth in economic opportunities and living standards. Over my lifetime we have achieved impressive gains in air quality and resource management, reductions in water pollution and preservation of wilderness; while simultaneously supporting a growing population and attaining steadily-increasing real income levels. Achieving such outcomes depends upon making sound policy choices, and I hope that the information learned through these hearings will assist your Committee as you aim to do so.

While most of my research is aimed at peer-reviewed academic publications I have also written extensively in the public domain, including think tank reports and media op-eds. Anyone familiar with my writings will know that I have certain biases, which I can summarized very simply. I believe that policies should be evaluated in an economic framework that identifies options where the benefits exceed the costs. As much as possible, we should try to avoid imposing cures that are worse than the disease. In this regard it needs to be emphasized that not every environmental goal is sufficiently valuable to be worth the cost of achieving it, and when a goal has been chosen it is incumbent on policy makers to try to achieve it at the lowest possible cost. Because we live at a time when there is a great deal of enthusiasm for setting ambitious goals around greenhouse gas reductions, yet most climate policies cost more than mainstream estimates of the benefits of reducing greenhouse gas emissions, it tends to fall to someone like me to point out that most climate policies under current technology do not pass cost-benefit tests. Although I often find myself in settings in which I am the only person pointing this out, I don't want you to think it is an unusual position for someone in my field to hold. As one climate researcher recently pointed out:

> Mainstream climate economics takes global warming seriously, but perplexingly concludes that the optimal economic policy is to almost do nothing about it… The contrast is striking. While climate science is sending out loud-and-clear messages that fossil-fuel disinvestment must start now, letting go of coal and oil and diverting resources into renewable energy technology systems, to keep warming below the 2°C limit (IPCC 2014), mainstream climate economics claims that overly ambitious climate targets will unnecessarily hurt the economy and immediate de-carbonization is too expensive. Most climate economists thus recommend humanity to just wait-and-see. (Storm, 2017)

At times the economic message is unpopular but let me give you an example of the costs of ignoring it.

In Ontario we are living with the consequences of a series of bad policy decisions made between 2004 and 2014 concerning the electricity sector. Enthusiasm for phasing out coal power and adding large amounts of wind and solar capacity, combined with uncritical acceptance of claims that doing so would create jobs without raising costs, put us on a path of rapidly rising electricity commodity prices relative to competing jurisdictions. The Province of Ontario began subsidizing electricity to stem an exodus of manufacturing and relieve hardships on households. A new report[1] from the CD Howe Institute estimates that these measures now cost the province $6.5 billion annually. *This is $700 million more than Ontario spends annually on Long Term Care facilities*.

Think about that. The cost of a few bad energy policy decisions is not simply abstract dollar amounts on paper, it is the lost opportunity to expand and improve Long Term Care for seniors and severely disabled individuals in Ontario. This trade off was not necessary and could have been avoided.

The key concept to bear in mind is *opportunity cost*: the value of what you will give up to obtain the benefit you are after. Your committee is studying policy options that could potentially do to Canadians' transportation costs what Ontario did to its citizens' electricity costs. In an atmosphere of high enthusiasm for declaring ambitious greenhouse gas reduction targets without regard to costs, it

[1] Benjamin Dachis and Joel Balyk (2021) "Power Surge: The Causes of (and Solutions to) Ontario's Electricity Price Rise Since 2006" CD Howe E-Brief June 15, 2021 available at https://www.cdhowe.org/public-policy-research/power-surge-causes-and-solutions-ontario%E2%80%99s-electricity-price-rise-2006

can be unpopular to point out that not every goal is worth pursuing, sometimes the price is too high, and even climate policy has opportunity costs. Ontario is living with the consequences of policy makers being unwilling to acknowledge these things fifteen years ago.

Costs of Renewable Fuels

I have done research for the MacDonald-Laurier Institute on the costs and benefits of Canadian biofuels policy (Auld and McKitrick 2014), for LFX Associates on the costs of the proposed Clean Fuels Standard (Lee and McKitrick 2020) and for the Fraser Institute (McKitrick and Aliakbari 2021) as part of a study on the costs of the proposed carbon tax in Canada.

My work with coauthor Professor Douglas Auld on Canada's biofuels policy led us to the following conclusions.

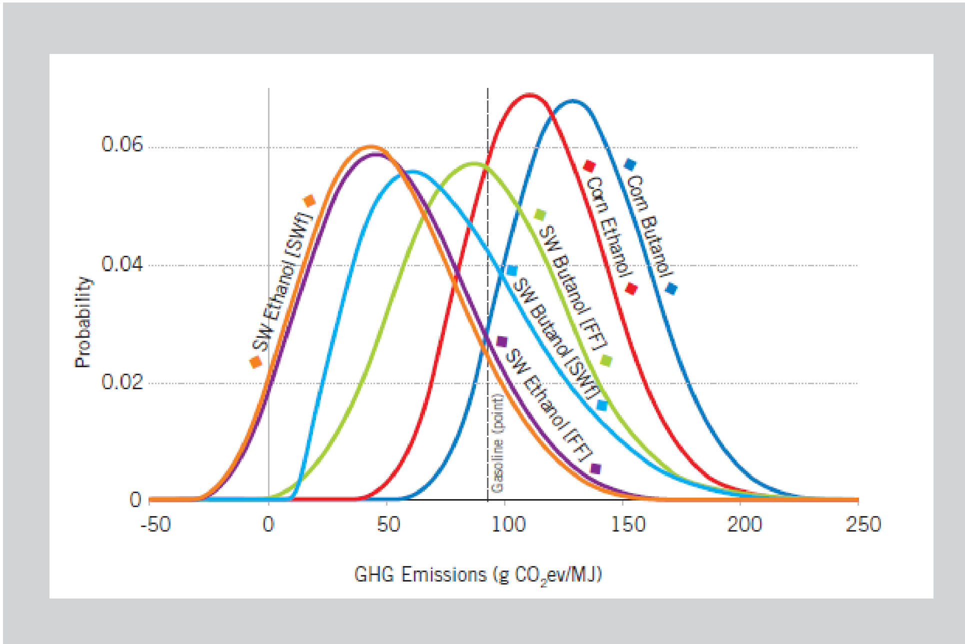
- The rapid expansion of the biofuels sector in Canada after 2006 was a direct result of favourable government support policies, not the underlying economics of the sector. The expansion of biofuels production has been found by economists to lead directly to food price increases (e.g. Wright 2014). Be cautious therefore about assuming this is a rapidly-growing sector and that Canada ought to jump on board or risk being "left behind." As a general rule if a sector only exists because of government support, it is a net drain on a nation's wealth.

- It is difficult to be confident that use of biofuels reduces GHG emissions because of the energy-intensity of the production process. US-produced ethanol has a higher emissions intensity than Canadian ethanol. If more aggressive biofuels mandates simply leads to greater imports of ethanol we will pay more for fuel without necessarily reducing emissions.

- Professor Auld and I used the most favourable assumptions possible to evaluate the emission reductions attributable to ethanol policy and concluded that the biofuel mandates over the 2008-2012 interval cost Canadians over $3.00 for every $1.00 of environmental benefits achieved.

I reproduce here a chart from that study (itself a reproduction from the underlying journal article) which shows estimated GHG emissions (in grams of CO2-equivalent per megajoule) relative to that from gasoline for different ethanol sources.

CHART 4: Estimates of GHG emissions from different forms of biofuels relative to that from gasoline



The vertical line at 100 is the gasoline benchmark. You can see that on average corn-based ethanol has worse GHG intensity than switchgrass and the centre of the distribution is at a higher emissions intensity point than gasoline. This implies that, on average, switching from gasoline to corn-based ethanol yields increased GHG emissions, not decreased.

My work for the Fraser Institute involved, among other things, calculating a cost adjustment factor for consumers from seeking a lower carbon intensity rate of motor fuels. I have attached the calculations as an Appendix to this submission. The calculations involve the following elements.

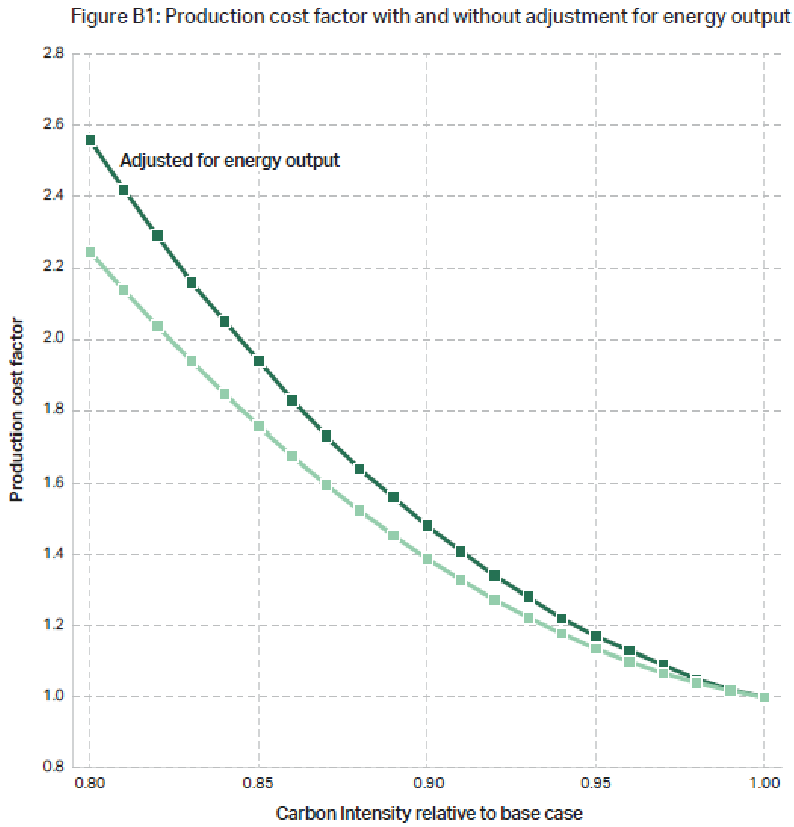
- On the assumption that Canada will try to expand domestic ethanol production rather than relying entirely on imports there will be a positive supply elasticity. Based on the peer-reviewed economics literature the own-price elasticity of supply of ethanol was taken to be 0.227.

- Ethanol has a lower energy content than gasoline. The cost to consumers should be measured per kilometer not per litre since a litre of ethanol-blended gasoline won't take you as far.

- According to the Canadian Energy Research Institute (CERI) the wholesale price of ethanol is currently about 52% higher than that of gasoline. This is not constant over time but is the ratio used for our calculations. Also according to CERI ethanol has a carbon intensity per megajoule of 46.5% that of gasoline.

- The base case in our analysis is that Canadians use a blend of 95% gasoline and 5% ethanol. That is associated with a Carbon Intensity Index of 1.00.

Putting these factors together yields the following chart showing the price adjustment factor facing consumers associated with a reduction in Carbon Intensity.



The lower (light green) line shows the consumer cost factor on a per-litre basis and the upper (dark green) line shows the cost factor adjusted for energy output, thus expressed on a per-km basis. The lines show that to reduce Carbon Intensity (CI) by 5% below the baseline raises consumer fuel costs by about 17%. Reducing CI by 10% below baseline raises consumer fuel costs by 48% and reducing it to 20% below baseline reduces consumer fuel costs by 156%.

My work for LFX Associates involved macroeconomic modeling of the proposed Clean Fuels Standard (CFS). The CFS has been revised since this report was prepared but the study still serves as an estimate of the costs of pursuing a CFS-type approach for liquids and gaseous fuels. It is important to understand that regulatory costs may not be explicitly accounted for in all types of economic models. The essence of a regulatory cost is that it imposes a productivity loss: it requires agents use a production method that costs more to achieve the same output as before. In standard economic theory this must be costly. It should not be assumed that process changes imposed by regulation can make households or firms better off, because they had the option of adopting the process prior to the rule change and did not do so. If they decided against adoption, it is likely because there are costs involved not known by the regulator or the quality of the output is reduced, or both. Regulatory mandates to reduce the CI of fuels requires households and firms to pay more to get the same energy from fuels as before. That cost increment needs to be measured in a modeling exercize, which also tracks the indirect costs as the effects of increased fuel costs propagate through the rest of the economy.

We estimated that the CFS as proposed was not consistent with the burden-sharing arrangement between liquids and gaseous fuels) also being proposed. We considered a revised approach that would achieve the 30 MT reduction and we estimated that, even using a relatively high Social Cost of Carbon metric, the policy would cost the Canadian economy $6 for every $1 in environmental benefits, with net costs averaging $440 per employed person. We also estimated it would cause a permanent loss of 30,000 jobs nationally (even after taking account of expanded employment in the biofuels sector) and would put $22 billion in capital at risk of exiting the domestic economy. By shrinking the indirect tax base we also estimated that the policy would increase combined federal and provincial budget deficits by $7 billion annually.

We also noted that in the context of population and income growth, the total emission reductions would be offset by a 7% increase in the size of the labour force, meaning the actual emission reductions as of 2030 would be far smaller than 30 MT, and would likely be zero or less.

Conclusion: The Costs of Inaction

People who want to circumvent cost-benefit analysis often appeal to the "costs of inaction" and they say something like "we can't afford not to." They might cite estimated costs of extreme weather or climate damages over the coming century as a contrast to the costs of the policy. Let's suppose the amount is very large and indeed is far higher than the costs of the proposed biofuels policy. The problem is the comparison is irrelevant. The proper comparison is this:

[The costs of climate change over the coming century *without* the policy]

versus

[The cost of climate change over the coming century *with* the policy]
+
[The cost of the policy]

These are the kinds of cost comparisons economists like William Nordhaus undertake and the results inevitably argue against aggressive mitigation policy. The problem is that the policies we are talking about, up to and including full compliance with Paris (or Kyoto before it) have such small effects on the climate that when standard climate models are run with and without the policies, the accumulation of CO_2 in the atmosphere and the resulting costs of climate change come out about the same (Wigley 1998, Lomborg 2016).

Don't forget that as we pile costs upon ourselves from these aggressive climate policies, our geopolitical rivals, chiefly Russia and China, are rapidly expanding their fossil fuel-based infrastructure and more than offsetting the small effects of our actions. We incur all the costs of our climate policies, and the world sees no change in emissions. Russia and China are also financing fossil fuel-based capacity investments in developing and developed countries alike, occupying the role abandoned by the west in its pursuit of fossil fuel "divestment" and thereby acquiring a considerable amount of international geopolitical dominance. It strikes me as very unwise to squelch our own domestic oil and gas industry and weaken ourselves economically while hostile foreign entities use their own energy assets to secure a position of dominance over the global economy.

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APPENDIX
Note: Taken from Appendix B of McKitrick and Aliakbari 2020.

Fuel Adjustment Cost Factor for Clean Fuel Standard and Ethanol Blending

Based on Hosseini et al. (2019) page 35 we assume that the wholesale price of petroleum fuel (P_f) is \$0.59 per litre and for ethanol (P_e) it is \$0.90 per litre. In the base case, Canadians are assumed to use a blend in which the fuel fraction (θ_f) is 95 percent and the ethanol fraction ($1-\theta_f$) is 5 percent. The per-litre blend cost is

$$P_b = \theta_f P_f + \left(1-\theta_f\right) P_e.$$

In the base case this works out to \$0.6055.

We assume that the P_f is fixed by the world supply price, but the price of ethanol follows an upward-sloping supply curve with an elasticity of $\sigma = 0.237$ based on Luchansky and Monks (2009).

The percent change in the ethanol fraction compared to the base case is $(0.95-\theta_f)/0.05$. A one percent change in the blend requirement may represent substantially more than a one percent increase in the Canadian supply requirement but we will assume the percent change in required supply corresponds to the percent change in the blend requirement. The new cost of ethanol production as a result of a new content requirement is therefore

$$P_e = 0.9 \times \left(1 + \sigma \frac{\left(0.95-\theta_f\right)}{0.05}\right).$$

The price adjustment factor resulting from the new blending requirement is therefore

$$A_p = \frac{P_b}{0.6055} = \frac{\left(\theta_f \times 0.59 + \left(1-\theta_f\right) \times 0.9 \times \left(1 + \sigma \frac{\left(0.95-\theta_f\right)}{0.05}\right)\right)}{0.6055}$$

Ethanol contains only 67 percent of the energy in petroleum fuel. Therefore the energy output of the blend is $E_b = (\theta_f + 0.67 \times (1-\theta_f))$. In the base case $E_b = 0.95 + 0.67 \times 0.05 = 0.9835$. Therefore the adjustment factor for the energy output of the blend will be

$$A_b = \frac{E_b}{0.9835} = \frac{\left(\theta_f + 0.67 \times \left(1-\theta_f\right)\right)}{0.9835}.$$

The combined adjustment factor for the cost of fuel will therefore be

$$AF = \frac{A_p}{A_b}.$$

Based on Hosseini et al. (2019) we assume gasoline has a carbon intensity (CI) of 88.14 g/MJ and ethanol has a CI of 41.0 g/MJ. The CI of the blend is therefore

$$CI_b = \theta_f \times 88.14 + \left(1 - \theta_f\right) \times 41.0.$$

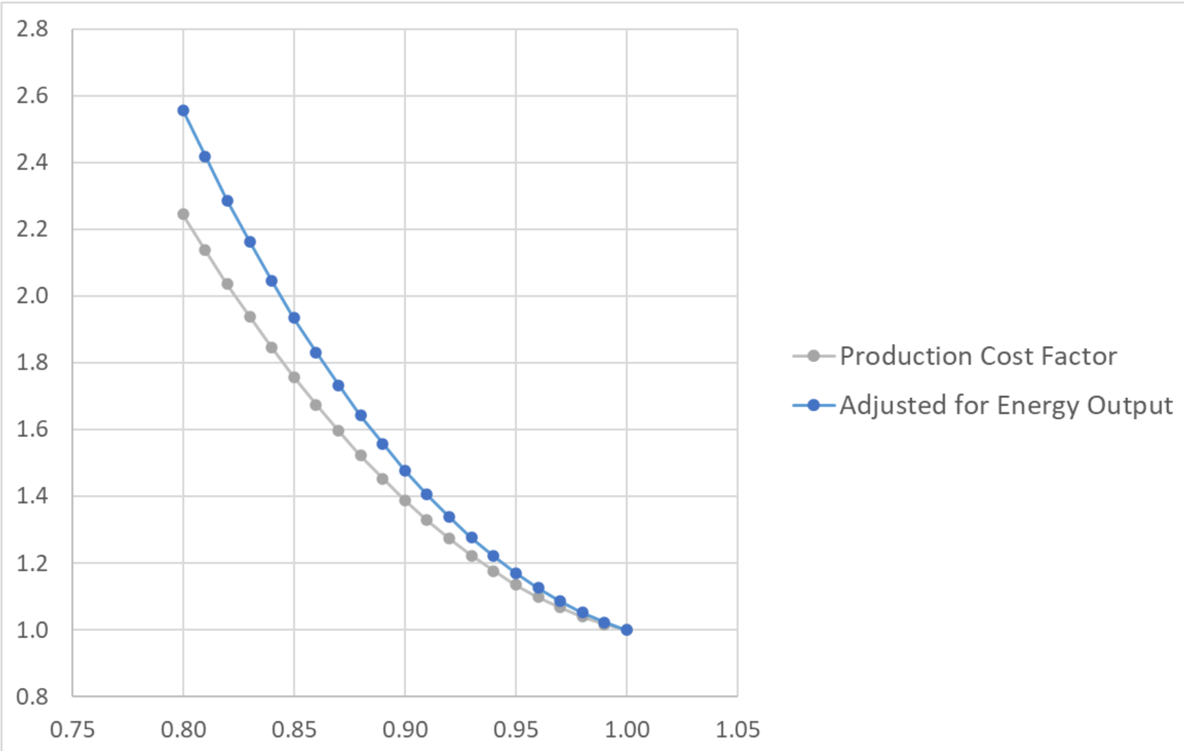
In the base case this is 85.783. The CI target T_{CI} is expressed as a fraction of the base case. For instance a 5 percent reduction in CI would be written $T_{CI} = CI_b/85.783$. Therefore $CI_b = \theta_f \times 1.027 + \left(1 - \theta_f\right) \times 0.478$. This rearranges to

$$\theta_f = \frac{T_{CI} - 0.478}{0.549}$$

which yields the required fuel blend fraction to achieve a given CI target. This can be substitute into the formula for AF to get the resulting fuel cost adjustment factor. The following Table presents sequential numbers based on the above parameters.

CI level	θ_f	P_e	A_p	A_b	AF
1.00	0.951	0.90	0.999	1.000	1.00
0.99	0.933	0.97	1.017	0.994	1.02
0.98	0.914	1.05	1.040	0.988	1.05
0.97	0.896	1.13	1.067	0.982	1.09
0.96	0.878	1.21	1.099	0.976	1.13
0.95	0.860	1.29	1.135	0.970	1.17
0.94	0.842	1.36	1.177	0.964	1.22
0.93	0.823	1.44	1.223	0.957	1.28
0.92	0.805	1.52	1.273	0.951	1.34
0.91	0.787	1.60	1.328	0.945	1.41
0.90	0.769	1.67	1.388	0.939	1.48
0.89	0.750	1.75	1.453	0.933	1.56
0.88	0.732	1.83	1.522	0.927	1.64
0.87	0.714	1.91	1.596	0.921	1.73
0.86	0.696	1.98	1.675	0.915	1.83
0.85	0.678	2.06	1.758	0.909	1.94
0.84	0.659	2.14	1.846	0.902	2.05
0.83	0.641	2.22	1.939	0.896	2.16
0.82	0.623	2.30	2.036	0.890	2.29
0.81	0.605	2.37	2.138	0.884	2.42
0.80	0.587	2.45	2.245	0.878	2.56

A_p and AF are plotted in the following chart:



A CI reduction of 5 percent against the base case results in a 17 percent increase in the energy-equivalent cost to consumers.

References:

Luchansky, Matthew and James Monks (2009) Supply and demand elasticities in the U.S. ethanol fuel market. *Energy Economics* 31(3) https://doi.org/10.1016/j.eneco.2008.12.005

Hosseini, Hossein, Andrei Romaniuk and Dinara Millington (2019) Economic and Emissions Impacts of Fuel Decarbonization. Calgary: Canadian Energy Research Institute.