



State of New York
Department of Agriculture and Markets
10B Airline Drive
Albany, New York 12235

DOCKET	
07-HFS-1	
DATE	JAN 23 2008
RECD.	FEB 04 2008

Bureau of Weights and Measures
518-457-3146
FAX: 518-457-5693

January 23, 2008

California Energy Commission
Dockets Office, MS-4
Re: Docket No. 07-HFS-01
1516 Ninth Street
Sacramento, CA 95814-5512

The following documents are submitted from Ross Andersen, Director of Weights and Measures for inclusion in the Commission Docket No. 07-HFS-01.

1. Comments on Fuel Delivery Temperature Study dated January 23, 2008, 7 pages
2. An evaluation of the "Hot Fuel" Fraud Claim dated December 31, 2007, 5 pages
3. Hot Fuel Economics – Will ATC Pay? Dated January 3, 2007, 6 pages
4. The Great Temperature Compensation Debate (slides and notes) dated January 2007, 33 pages
5. The Great Temperature Compensation Debate (slides and notes) dated July 2007, 45 pages

As requested by the Commission, I have also submitting electronic copies to Mr. Nick Janusch, via email at Njanusch@energy.state.ca.us.



State of New York
Department of Agriculture and Markets
10B Airline Drive
Albany, New York 12235

Bureau of Weights and Measures
518-457-3146
FAX: 518-457-5693

January 23, 2008

California Energy Commission
Dockets Office, MS-4
Re: Docket No. 07-HFS-01
1516 Ninth Street
Sacramento, CA 95814-5512

Comments on Fuel Delivery Temperature Study
By
Ross J Andersen, Director of Weights and Measures

Thank you for the opportunity to comment on the impending study of temperature impact on fuel delivery. By way of introduction, I hold a Bachelor of Science Degree in Chemistry from the University at Albany. My public service career spans over 34 years and has essentially been in the field of quality control, working for the Department of Health and the Department of Agriculture and Markets in my state. I have over 30 years experience in weights and measures and worked my way up through the ranks to my present position. I have many years of service to my profession, including service on all three technical committees of the National Conference on Weights and Measures (NCWM) and service as the Chairman of that organization in 2003. I have also participated in numerous international weights and measures activities, technical committees, and was part of US delegations to international events.

My experience with the effects of temperature on measurement goes back many years. I participated in public policy debates on the issue back in the late 70's and early 80's, when the item was being discussed at the NCWM. In those days, automatic temperature compensation (ATC) was done using mechanical devices, essentially variable transmissions on mechanical registers. The NCWM decided at that time not to implement them on devices used in retail trade. In one of my previous positions I examined the first generation of electronic temperature compensators. I made the connection based on those tests that electronic technology was going to slowly replace the older mechanical technology. In addition, I foresaw that temperature would rise again as a national issue and I have taken a leadership role on the issue at the NCWM since 1999. I most recently made formal presentations to the NCWM at meetings in January and July 2007. I also serve on the NCWM ATC Steering Committee formed last year to assist the NCWM Laws and Regulations Committee.

In addition to this statement, I am including in my submission to the Commission:

- A Power Point presentation, "The Great Temperature Compensation Debate," with presenter notes from NCWM Interim Meetings January 2007 (file: NCWMJan2007.pdf)
- A Power Point presentation, titled "The Great Temperature Compensation Debate," with presenter notes from NCWM Annual Meeting July 2007 (file: NCWMJuly2007.pdf)
- A paper, "An Evaluation of the "Hot Fuel" Fraud Claim" dated December 31, 2007 (file: HotFuelAnalysis.doc)
- A paper, "Hot Fuel Economics – Determining if ATC Will Really Pay?" dated January 3, 2008 (file: HotFuelEconomics.doc)

I will focus briefly on four main areas that significantly impact this issue.

Market Corrections for Temperature

The claims of a temperature fraud and estimates of large consumer losses that have dominated the media on this issue are perfect examples of one-dimensional thinking. Someone learns a little about one variable in a complex system and focuses only on that variable. In analyzing the impact of potential change to that variable they constrain all other variables to remain constant. They ignore the possibility of dependency with other variables. Much of my public comment on the fraud has been directed at this fault.

Judging from the presentations made on this subject by the Commission, it appears that there is an assumption that petroleum retailers buy on the basis of net gallons and sell on the basis of gross gallons. It would follow from this assumption that they buy at 60 °F and sell at the current temperature. I believe that assumption is false. When the tanker delivers 10,000 net gallons of product to a retailer at 45 °F, the documents also show that 9,900 gross gallons were delivered. The critical issue is which of these two values get entered into the inventory ledger, net or gross. From testimony by the National Association of Convenience Stores to Congress and my own investigations, I predict that most retailers will enter the gross value. They can use the net but it makes the accounting process far more difficult. The retailer that uses the gross value is buying at the current temperature and selling at the current temperature. This dramatically changes the baseline of any cost-benefit analysis.

The Commission can verify which is true by looking at the inventory accounting at the retail stations. I would recommend however, that you start with a visit to the underground tank experts at your state environmental agency. These regulators inspect underground tank installations and audit required inventory accountings as a normal part of their work. They look equally for loss and gain in inventory as possible signs of system leaks. They can verify that gross gallon accounting is the most commonly used method at the retail station. I further suggest that the Commission actually visit retail stations to see first hand how it is done.

The temperature of petroleum products is just one of a multitude of factors that go into deciding the advertised or offered selling price. I cite the example of changing from gallons to liters in fuel deliveries. Because the liter is only about ¼ of a gallon, a change will result in a price per liter about ¼ of the price per gallon. Measurement scientists who work in the commercial marketplace understand the dependency of price on measurement unit. If we make the

measurement unit bigger the selling price per unit goes up. If we make it smaller the selling price goes down.

Those claiming fraud have not credited the marketplace with even the slightest capacity to make this basic value adjustment in regard to temperature. Weights and measures has ensured in regulations that the seller that buys his inventory on a net basis is provided with the necessary information to accept that inventory on a gross basis. This permits the retailer to correct his pricing calculations for temperature. For example, at 90 °F a 10,000 gallon net delivery of gasoline results in about 10,200 gallons of gross inventory being delivered to the retailer. If the tanker costs \$30,500 then there are two inventory prices, a net price of \$3.050/gal ($\$30,500/10,000 \text{ gal}$) and a gross price of \$2.990/gal ($\$30,500/10,200 \text{ gal}$). The \$3.050 net and \$2.990 gross are exactly equivalent for this tanker of fuel.

Sprague Energy, a major heating fuel marketer on the east coast, has made a corporate change to offer all wholesale transactions on a net basis (see spragueenergy.com). Sales in the cold climates where I live have traditionally been made on a gross basis, so this is a significant change. In their examples they clearly state that sellers that bought net and sold gross always had a shrinkage factor built in to their selling price. With net billing, that shrinkage factor will no longer be applied. They state that with net billing, the customer receiving product at temperatures below 60 F will be billed for proportionally more product at a proportionally lower price. They provide examples that demonstrate that the total cost for the purchase remains the same regardless of the billing method.

I note that the Commission will study the option of changing the reference temperature from the present 60 °F value by potentially breaking the state into temperature zones. Texas and Missouri also are considering this option. Hawaii already uses this approach and went to 80 °F. This essentially increases the size of the gross gallon of gasoline in Hawaii from 231 cubic inches to 234 cubic inches. In testimony to Congress, Tim Columbus, representing the National Association of Convenience Stores, noted that the citizens of Hawaii may get a larger gallon but challenged the panel to recognize that those citizens are just paying more per gallon for the extra product.

I suggest that a good part of your study should be directed to the evaluation of the efficiency of this temperature correction. My belief is that you will find that the market is very powerful in its ability to adjust for value changes, including those due to temperature. In my other documents I note that retail dealers make pricing changes daily, and sometimes even more often, based on their frequent inventory reconciliations and a constant eye on their competition.

In my meetings with retailers in my state, I learned a great deal about their daily efforts to be competitive and maintain profitability. They universally reported inventory losses under the present gross gallon accounting system. I have proposed a temperature model to help us understand why retailers lose inventory even when they have no tank leaks and the dispenser measurements are accurate. I have deduced that the losses are due to temperature. This phenomenon, known as phantom gallons, seems to occur everywhere underground tanks are used. Inventory losses occur to a greater degree in some parts of the year and gains occur to a lesser degree in others. The only tool retailers presently have to recover inventory lost to “phantom” gallons is to raise their price. I submit they make this correction on a daily basis as they set their selling price.

A temperature compensator is essentially an asset protection tool, not unlike the shoplifting prevention programs in every general merchandise store. It seeks to assure that every unit of inventory purchased is made available for sale. Each retailer makes a decision on the level of asset protection necessary and it is paid for by the consumer in the price of the units purchased. Even in the absence of asset protection the consumer ends up paying for the shrinkage losses. Those costs do not benefit the consumer as they add nothing to the value of the commodity purchased. Retailers want to keep this cost to a minimum to be competitive.

The Equalizing Effects of Competition

The Federal Trade Commission in its 2006 report to Congress on the price spikes that occurred after Hurricane Katrina looked for collusion and fraud. They attributed the price spikes to normal market factors and found no evidence of any collusion. They concluded that competition had produced a price that was the “right” price. Unless we can show some collusion with regard to temperature, we have no reason to suggest the market is flawed, i.e. that the gross price per gallon is not corrected for the impact of temperature. When challenged on this point, those supporting the fraud claims have no counter arguments. They steadfastly believe that the entire retail petroleum industry is engaged in a massive fraud and manipulates prices. The problem with this belief is that it describes a conspiracy consisting of some 160,000+ retail business across this country. In addition, the theory has dealers in the colder climates losing money with this fraud. If it were true in any respect, all it would take is one or two dealers in any market area to break away, and price fairly, for it to be very visible. That’s not happening because the market is reasonably fair. Are we to assume that the conspirators have “muscle,” like organized crime, to punish anyone who dares to charge a fair price?

We in the weights and measures profession have experience uncovering and dealing with frauds. One of the most common sources to help us detect fraud is whistle blowers. With the huge numbers of managers in these companies, wouldn’t someone have come forth to expose this fraud? So far no one has. The stories in the media have been around for a year and a half. In addition, the weights and measures officials in this country have had their eyes on the petroleum retailers for over a year looking for any hint of a fraud and/or collusion. No one has reported any evidence of collusion anywhere or any hint of a fraud.

I believe the marketplace is busy getting consumers the “right” price for the fuel they purchase. In the absence of any fraud, the only improvement offered by ATC will be a minor increase in asset protection efficiency.

Finding Appropriate Temperature Data

I believe the data being collected from California retail stations will fall far short of providing the information needed to understand the real effects of temperature. It appears that they only collected data on the delivery temperature to the retail customer, perhaps because they assumed that all retailers bought inventory at 60 °F. The NCWM temperature data collection program on the other hand was a properly designed experiment geared to describe the entire system and not just the outcome. It asked for other important information and particularly the temperature of the fuel at the point it was sold to the retailer. That data collection continues and I will work within the NCWM to see that the data collected and any analysis is provided to the Commission.

Because the retailer makes the correction for the temperature of the net purchase by using the gross inventory value, what we need to know is how temperature changes affect the gross volume from that point on. After the tanker is loaded, the transportation provides some opportunity for temperature change. Next, the fuel is mixed with existing inventory in the storage tank. The mixture will equilibrate rather quickly to the weighted average temperature of the two volumes. After that, the fuel will be impacted by the storage tank surroundings as limited by the insulating factor of the storage tank. Finally the fuel will pass through underground piping near the surface and the dispenser on its way to the consumer. The NCWM temperature study will capture these effects.

If the fuel always remained at the same temperature from point of purchase to point of retail sale there is no loss or gain to either party. We know it does not remain constant from many sources. If the temperature drops, the seller takes the loss and if it rises, the seller gets a benefit. I believe that the evidence will show that predominantly there is a drop in temperature when stored in underground tanks. A key element of the economic cost-benefit study is to understand how these temperature changes occur in the real world and to what extent the seller makes minor changes in his gross selling price to correct for the resulting inventory losses.

The March of Technology, Regulatory Costs, and Diminishing Returns

The decisions regarding implementation of new technology are never ending. In my presentations to the NCWM, I drew parallels between the temperature issue and the FCC handling of the conversion to digital television. That conversion was required to replace outdated technology and bridge the gap to the future of high-definition TV. The FCC understood that the technological improvement would force significant changes in television broadcasting. They worked with the broadcasting industry to find a solution. Beginning eight years ago, I also tried to be proactive in getting the regulatory community and the industry prepared for ATC, since I considered it an impending technological revolution in our field. Unlike digital TV, ATC is not immediately seen as a stepping stone to some further development in fuel measurement. With all the uncertainty with regard to where energy will come from in the future and what form of measurement it will require, is this a good time to be shoring up older technology? I have also questioned how much of an improvement we will see with ATC in light of the wide variety of alternative fuels now entering the marketplace. My research tells me that net volume is only marginally better than gross volume at predicting market value, particularly when the energy content is considered.

The retail petroleum industry views ATC solely as an asset protection technology improvement. It will require significant changes in the equipment they use and minor changes in the way they do business. Retailer trade associations are saying they don't want to implement it until it provides a solid return on investment (ROI) or it is mandated by regulatory fiat. My sources suggest that industry in general wants to see a payoff in perhaps three to four years. Retailers thus far see no ROI at all for this technology as indicated in the testimony heard at the NCWM. I suggest that at best we are at a break even point on the cost-benefit side.

I am concerned about regulatory costs if we impose by fiat. Economists understand that the consumer pays the retailer's cost to comply, plus some markup. If the consumer gets no improvement in quality or quantity, as I have predicted, he/she will pay a regulatory premium for absolutely no measurable benefit. That is not only my concern, it is crucial to all those regulators that will have to justify making the regulations this change will require.

There is also the issue of diminishing returns. The small retailer that tends to be the price leader is by nature strapped for cash. Will the capital costs force them out of the market to the benefit of the larger retailers and to the detriment of the consumer? At present, with a few exceptions, the use of ATC is limited to wholesale where the annual throughput per meter is perhaps 1,000 times larger than retail. In addition, wholesale transactions may occur over distances of thousands of miles and there may be significant temperature change in the product before it arrives in the wholesaler's storage tank. Will there be enough throughput and enough temperature change at the retail level to make ATC pay?

In my outreach to retailers, some are willing to brave the investment, but I believe there is not enough information available on the benefits to sell this generally within the industry. I am doing my part to educate everyone and it is my hope that a sound economic analysis will only serve to help.

Permissive vs Mandatory Implementation

If the NCWM decides to act to use ATC at retail, it will be faced with the crucial question of permissive vs mandatory implementation. Besides bringing confusion to the marketplace, I have suggested that permissive implementation would also create a boundary between markets. The Commission was asked to evaluate the possible solution of creating temperature zones. I suggest that anything that creates a boundary is bad for both business and consumer.

Those promoting the fraud understood that the temperature situation in the cold states (with average fuel temperature below the 60 °F reference) is somehow different from the hot states. They seem to support permissive use of the ATC technology as a solution for everyone. What they failed to see is that permissive use of ATC would divide the marketplace along the boundary of the reference temperature. I have suggested that there would be some incentive for a retailer to choose to use ATC in cold climates and virtually none to use it in hot climates.

There are many of us in the weights and measures community that see the benefit of having one method of sale. The retail trade associations have also made this a primary issue. Both groups agree that confusion will result from having two units of measure in the marketplace. In addition, the relative positions of those units changes with the seasons. This means the differential between advertised selling prices net and gross will change in reaction. How can a consumer possibly make good value judgments in that type of environment?

I often note that consumers are more intimately involved in gasoline purchases than virtually any other commodity, since most consumers operate the dispenser for themselves. Most consumers may complain about the price but I sense they understand the implications of \$100 a barrel crude oil. Our present system of measurement in this country is borderless and consumer satisfaction is generally high, despite what some consumer groups might say. In that marketplace retailers compete in very localized markets of probably only a few miles radius. Retailers in southern California are clearly not in competition with retailers in Minnesota. While some instances of bad fuel and/or pump inaccuracy are found every year, consumers are getting a consistent, high-quality product every time they fill their tank. In addition the market provides a fairly uniform, competitively determined selling price for that fuel.

Weights and Measures officials in the United States, like many other modern industrial countries, are in the midst of a national public policy debate on the subject of temperature compensation. A series of articles in the *Kansas City Star* newspaper has brought the issue into the public eye with assertions that temperature is being used by the oil industry to defraud the American consumer. I disputed the validity of the fraud claim in presentations to the National Conference on Weights and Measures (NCWM) at the Interim Meeting in January and most recently at the Annual Meeting in July. What follows is a brief discussion of my analysis.

The methodology used by the *Star* focuses on the difference between the total gross gallons sold today in a state and the net gallons (corrected for temperature) that would be sold if an equipment change was made. That difference is based on an average underground product temperature from data provided by NIST. The computed loss/gain to the consumers in each state was obtained by multiplying the current price per gallon times the gallons difference. They published their analysis as a map of the US with corresponding loss/gain figures for the states[1]. A representation of the analysis for California and Minnesota, the two states with the largest projected consumer loss and gain respectively, is presented in Figure 1. Based on the analysis they claim consumers annually were losing \$509 million in California and gaining \$37 million in Minnesota.

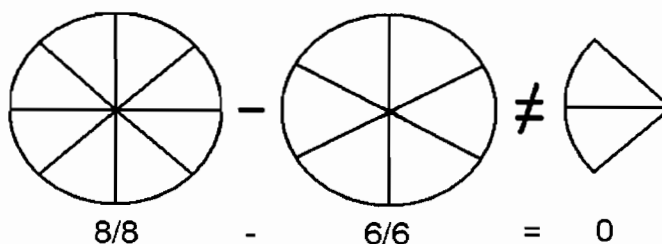
Figure 1. Illustration of the *Kansas City Star* Analysis for California and Minnesota (Aug 06)

State	Avg Temp °F	Gross/Net	Annual Consumption (Million gal)	Avg price \$/gal[a]	Consumer Loss \$Millions
California	75	Gross	15,800	3.221	\$509
		Net	15,642		
		Difference	158		
Minnesota	53	Gross	2,600	2.846	\$37
		Net	2,613		
		Difference	-13		

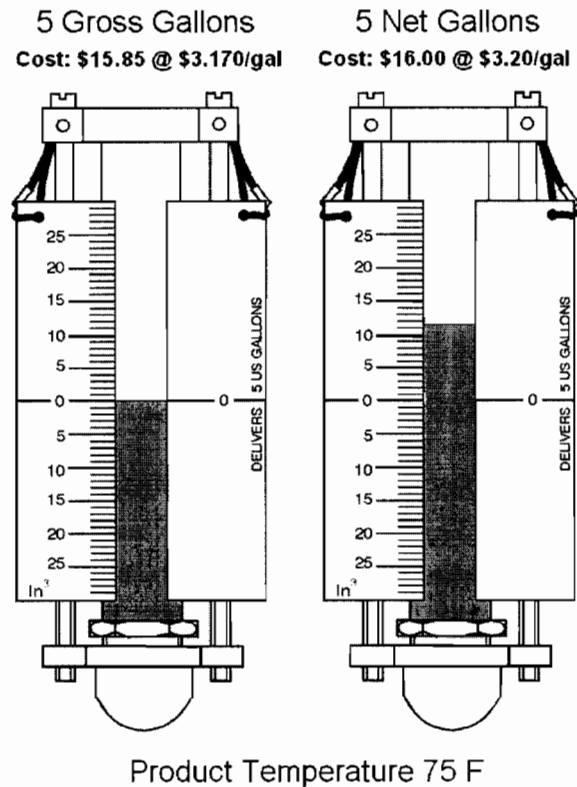
[a] Derived by reverse calculation from the *Star* data.

While I have not actually seen the supporting data prepared by the *Star*, I have carefully reviewed the sections in their articles describing their methodology[2]. A subtle, but critical, part of their methodology involves the incorrect assumption that you can relate gross and net gallons as compatible units. Science tells us that gross and net units will only be equal at 60 F. At all other temperatures the two units represent very different amounts of product.

The fraud claim comparison of gross and net is like comparing an eight slice pizza to a six slice pizza. Those claiming a fraud see two missing slices ($8 - 6 = 2$). However, the two pizzas represent exactly the same quantity and mathematically there is no difference whatsoever ($8/8 - 6/6 = 0$). The six slice pizza has fewer but larger slices.

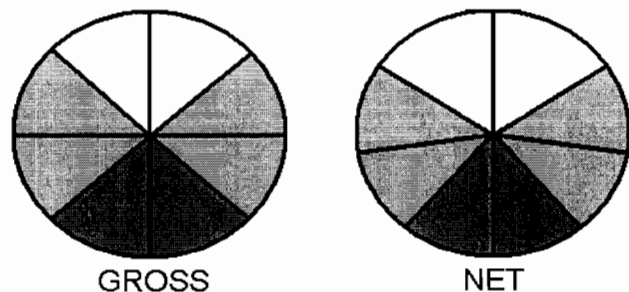


To illustrate, compare the physical quantities delivered from a gas pump before and after activating the temperature compensator at the 75 °F, the average fuel temperature in California. At 75 °F (graphic at right), the liquid for 5.000 gallon gross delivery in our tests will be at the zero mark of its measure while the 5.000 gal net delivery will be 11.55 cubic inches above the zero mark in its measure. In every respect the product is identical in each measure except for the quantity. Assuming the product is 62 API density, the consumer gets 0.05 gallons more gasoline at the same 75 °F temperature with a net purchase, just like the larger slice of pizza. Yet that consumer buying net will also pay 15 cents (1%) more for that extra fuel. If the comparison is repeated in Minnesota at their average temperature, we see the reverse, but with somewhat smaller impact. At 53 °F with 62 API gasoline the gross measure will again be at zero while the net measure will be approximately 5.78 cubic inches below the zero indication. The gross cost is \$16.08 @ \$3.215/gal as compared to the same \$16 net price. You get 5.78 fewer cubic inches of fuel net and you pay 8 cents less than the gross customer.



Since each net gallon at 75 °F will be 1% or 2.31 cubic inches bigger than the gross gallon, the 15,642 M net gallons calculated by the *Star* are exactly equal to the 15,800 M gross gallons sold each year in California today. This is just like the two pizzas. The difference between two equal things is always zero and this means the consumers in California will not purchase or receive any more or any less fuel with a change to net gallons although the number of units will be different. As a consequence, all of the values on the map prepared by the *Star* showing impact on gas “consumption” should be ZERO.

There is an obvious follow-up question whether consumers are really paying too much for the fuel on a gross basis, particularly in hot states where the fuel has expanded. To make this claim the *Star* assumes that the values in the impact column of their map (e.g. 158 million gallons in California) somehow indicate some loss to the consumer due to overpayment for the quantities actually received. This argument also fails close scrutiny since it requires the price per gallon gross and net to be equal. Revisiting the pizza analogy, assume that the energy/monetary value of each slice is tied to the amount of cheese on the slice and this varies with temperature. When fuel is above 60 °F it has less energy content and is less dense, i.e. less cheese (white slice). At 60 °F it has the standard energy content and density, i.e. the right amount of cheese (light gray slice). When the fuel is below 60 °F there is more energy value and higher density, i.e. more cheese (dark gray slice). When selling gross, each slice is exactly the same size so clearly the white slices are worth less than the dark gray slices since they have less cheese or less energy. The market presently corrects for this by charging less for the white slices and more for the dark gray slices. When selling net, the dispenser changes the size of the slice to ensure each slice has equal amounts of cheese and costs the same. So, we assume the price will remain constant. *Both methods result in equal consumer costs for their purchases.*



The visual example of the test measures demonstrates the economic value difference between the two different gallons, gross and net. It seems irrefutable that there should be a market price differential that is related directly to the change in temperature from the reference. After activating the net feature on the dispenser, can we not expect the dealer at 75 °F to charge more since he is delivering 1% more net than he was delivering gross? In the real world, he already corrects the gross price, hot or cold. The evidence for this is on the bill of lading (BOL) and/or invoice provided with each transfer of fuel.

A critical element of the fraud claim is that the industry uses net sales at wholesale and gross sales at retail to their advantage. You need only examine the BOL where the seller buys net and sells gross, see the difference between gross and net gallons, and you can evaluate the resulting impact on price. The invoice for inventory purchases provides gross gallons, API gravity at 60 °F, product temperature at time of the measurement, net gallons, and total cost.

The base price per gross gallon of inventory is computed as the total cost/gross gallons. To this the seller adds a mark-up, let's say 15 cents to cover his costs and profit, to find his gross gallon selling price. At 75 °F delivery temperature, the BOL for 10,000 net gallons and \$30,500 total cost will show 10,100 gross gallons. This results in a base price \$3.020/gal and a retail price of \$3.170/gal gross. At 53 °F delivery temperature, the BOL for 10,000 net gallons and \$30,500 total cost will show 9,952 gross gallons. This results in a base price of \$3.065/gal and a retail price of \$3.215 gross. It is critical to see that a \$3.170/gal gross selling price at 75 °F represents exactly the same value in the consumer purchase as the \$3.215/gal gross at 53 °F. Both are equivalent to a consumer price of \$3.200/gal net.

The seller that buys net and sells gross today is forced to correct for the temperature with each load of fuel received in inventory based on the graph at right. When fuel is received below the 60 °F industry reference the gross cost per gallon rises and when received above the 60 °F reference the gross cost falls. This happens automatically and is driven by market competition. In Figure 2, I have revised and reorganized the calculations in the fraud analysis to reflect this necessary adjustment in the selling price per gallon. As a result, the total consumer cost to purchase their fuel remains constant, gross or net, and any annual gain/loss to the consumer becomes zero in all states on the fraud map!

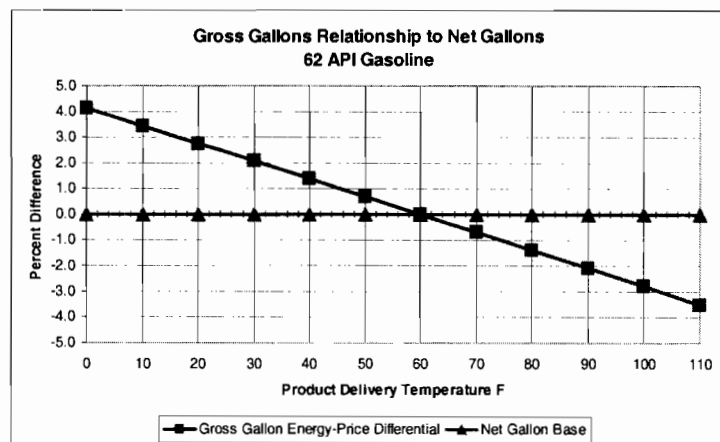


Figure 2. Fraud Analysis with Temperature Variable Price per Gallon for California and Minnesota (08/06)

State	Avg Temp °F	Gross/Net	Annual Consumption (Million gal)	Price \$/gal	Consumer Cost \$Millions
California	75	Gross	15,800	\$3.221	\$50,892
		Net	15,642	\$3.254*	\$50,892
		Consumer Loss			\$0
Minnesota	53	Gross	2,600	\$2.846	\$7,400
		Net	2,613	\$2,832*	\$7,400
		Consumer Gain			\$0

* Equivalent Net price relative to gross price at the average temperature

Measurement scientists and economists know that any time the measurement unit is changed there must be a readjustment in the market selling price. Consider the extreme of changing measurement units from gallons to liters. A liter is just over $\frac{1}{4}$ gallon. Would consumers want to pay the same \$3.20 for a liter of gasoline that they now pay for a gallon? I think not. They would expect to pay 73.6% less or an equivalent price of \$0.845/liter. The change from gross to net is just smaller.

Some will ask if dealers actually make those market corrections to the unit price. In cold states if gross and net sales are in competition, the net price will mostly be lower than the gross price. At current prices in the peak cold of winter in Minnesota this should mean net prices about 10 cents per gallon lower than gross prices. This is one reason Canada's oil industry supported a change. The possibility that the dealer might not lower his price by the entire amount will challenge the industry and weights and measures to provide education to consumers so they can make good value comparisons. However, after a significant portion of the market converts to net in cold states, market competition will force the net price down to appropriate levels.

In hot states if gross and net sales are in competition, rising street prices will be a matter of survival with net sales, because the dealer will have to actually deliver more fuel. The retail dealer that sells on a net basis will either raise his selling price or lose a lot of money. At current prices in the heat of summer in Arizona this could mean net prices about 10 cents per gallon higher than gross prices. At 100 °F product delivery temperature, the liquid level in that test measure at 5 gallons net delivery (earlier graphic) will be above the gage at over +33 cubic inches. That's almost 3% more than a gross delivery or about 50 cents on a 5 gallon purchase at \$3.20/gal net. That price will make the dealer that sells net gallons less attractive in hot climates. The dealer will actually be offering equal value, *yet many consumers will never truly look beyond the price on the street-side sign.*

Fuel composition is another aspect of the debate that was not addressed in the *Star's* methodology. In my NCWM presentation in July, I discussed the impact of summer/winter changes to gasoline that have a significant impact on energy value. This was also addressed by testimony to the NCWM Laws and Regulations Committee from Ron Hayes, Fuel Quality Manager for the Missouri Department of Agriculture. He testified that winter fuel contains low-boiling, volatile components to provide good cold weather performance in your car's engine. These components are cheap and contain relatively less energy per gallon than the higher boiling components. These volatile components are removed in the summer to provide good hot weather performance in your engine and meet environmental standards. Thus summer gasoline, i.e. hot gas, will typically contain more energy value than winter gas. He concluded that summer gas will contain about 2.2% more energy than winter gas. I showed that temperature may have a summer/winter impact in the range up to about 3% to 4% depending on geography. Since the effects of gasoline composition work somewhat in opposition to the temperature, it may partially offset any loss/gain in energy due to temperature cycles each year without a temperature compensating device. Mr. Hayes further suggested that temperature compensation would result in larger summer/winter price differentials than we see now. Hence greater price increases in May as summer gas replaces winter gas.

Very few people outside of the oil industry or weights and measures would readily recognize that gross and net gallons are not equivalent or that the gross gallon unit price will float with temperature relative to the net price. Those things are not immediately obvious. Nor would outsiders know that energy content varies with the summer/winter gasoline composition changes. I believe it is clear to most weights and measures officials that there is no fraud relating to temperature. Where other measurement frauds flared up in Detroit, New York City and Los Angeles, they were detected and stopped.

At the request of Congress, the Federal Trade Commission looked at possible fraud in its report "Investigation of Gasoline Price Manipulation and Post-Katrina Gasoline Price Increase"[3] published in the Spring of 2006. That report found no evidence of industry collusion in the price spikes occurring after Hurricane Katrina in September 2005. The FTC concluded in that report, "if there is a "right" price for a

Hot Fuel Economics – Determining if ATC will Really Pay?
Ross Andersen, Director of Weights and Measures
New York State Department of Agriculture and Markets
Jan 3, 2008

Temperature compensation has a fairly long history at the NCWM and was a “hot” issue even back at the first NCWM meeting I attended back in 1978. Interest began anew in 1999 with the VTM item in S&T. It’s been a year and a half since the Hot Fuel stories started appearing in the newspapers. Last July at the Annual Meeting, 13 states petitioned the L&R to not push its item to a vote until there was a valid cost/benefit analysis to support any action. Now six months later, we approach the 2008 Interim Meetings with a little hope on the horizon of getting some economic analysis. The PMAA group offered to commission a study, but was hesitant if that study would be immediately ignored because they commissioned it. The California Energy Commission is also now poised to conduct a study. It may be very valuable to have two points of view so I encourage the PMAA to move forward. I would also like to offer a few things that both groups might consider including in their studies of the subject.

Before beginning any study, you need to have a paradigm that forms the basis for analysis. That paradigm must be broad enough and detailed enough to include the majority of the significant variables that need to be examined in the study. It also needs to lead the researchers to ask the right questions. Get the paradigm wrong and you end up studying the wrong issues and making faulty conclusions. I would recommend the following paradigm for anyone wishing to examine the impact of a temperature compensator.

In every commercial transaction there are two engines at work. The first engine we use to measure the quantity of the commodity being transferred, sold, etc. In this study that quantity engine is the fuel dispenser. The second engine is the value engine that decides how much one quantity unit of the commodity will be worth. This engine is usually referred to as the “Market” and the output of this engine is an advertised price per unit for the commodity. There are a good number of variables for the value engine to process as it determines the selling price of the commodity. For liquid fuels, a short list, not in any particular order, might include crude oil prices, refining costs/efficiency, transportation from refinery to terminal and from terminal to retail station, property costs and taxes, salary levels and employee benefits, cost of living, cost of credit, spot market and commodity hedge prices, equipment maintenance and replacement, summer/winter formulation differences, and of course, fuel temperature. For any transaction, the final customer cost is the product of the two engines, i.e quantity x price.

It is absolutely crucial to understand that the value engine is directly dependent on the unit of measure for which the quantity engine is designed. The two engines cannot reasonably be separated. For a gross example, consider a change in units from gallons to liters. Can anyone reasonably suggest that the price of gas sold on a liter basis would not drop from the present \$3.20 a gallon here in New York State to about \$0.845 per liter? Thus I suggest that any economic study of the benefits of ATC must include an analysis of the interaction of the two engines, quantity and value, as you ask your questions.

The proposal to put an ATC device on the retail pump will essentially take temperature out of the list of variables evaluated by the value engine and move it into the measurement engine at a cost of about \$1,400-\$2,000 per dispenser/meter. That comes to somewhere between \$2 and \$3 Billion to convert the entire country’s dispensers. The “billion” dollar question is, “Is it worth it?”

The first question that I think should be examined in an economic analysis relates to how the present system treats the issue of fuel temperature. The follow-up question is whether either the buyer or seller is significantly harmed under our present system, and if so, what is the dollar value of that harm?

The hot fuel fraud advocates would have us believe that the market is highly inefficient and makes no correction for temperature. The *Star's* figures in its fraud analysis would indicate that they believe the market to be 0% efficient in correcting for temperature. They made no allowance whatsoever for possible marketplace adjustments to the price to correct for temperature differences. In my other paper analyzing the hot fuel fraud, I showed why I believe their assumptions were very unsound and how those assumptions would lead them to false conclusions. Of particular interest is the assumption that dealers in cold states lose money on temperature.

In addition to the arguments in my other paper I'd like to put forth another idea, suggested by Mike Sikula, my Assistant Director. He notes that every petroleum business performs daily inventory reconciliations. These are required by law and are subject to audit by tax and environmental agencies at both the federal and state level and also by state weights and measures programs that do fuel quality inspections. That reconciliation matches deliveries, sales and current inventory. This clearly allows the business to manage its inventory but also to validate its economic position by moving one column over in their spreadsheet to follow the cash flow. The analysis by the hot fuel fraud advocates suggest that a dealer in a cold climate like Minnesota sees losses day after day, week after week, particularly as the temperature drops in the winter months. They suggest that the dealer makes no adjustments to the price to recoup his losses. I suggest that is pure foolishness. In the first place, the BOL provided with every load gives the dealer critical knowledge to correct for temperature and second, I give that dealer reasonable credit to be able to follow the cash flow. If they can't, they won't be in business long.

Price competition is also important in the hot states where the fraud advocates suggest the dealers are in cahoots to jack up the price. A retailer from Michigan testified to the Southern Association in November and asked a very crucial question, "If you don't believe that retail dealers have to compete on price, then what good does a temperature compensator do you?" He was suggesting that even if dealers are forced to use ATC devices on the pumps, they can very easily continue to conspire together and just increase their markup to continue making the same profit levels. The pretext of temperature is totally immaterial to any conspiracy and ATC is not a solution. If they are in cahoots to jack up the price, they will continue to do it, one way or the other, short of government price controls. I see little possibility of anyone stopping them without being able to prove there is collusion. The advocates of this fraud have not yet brought one shred of proof of collusion, and will need to do so on a very grand scale, as their assumptions suggest that every one of the 160,000+ gas stations in the country is part of that conspiracy.

If the retailer does compete in the market on price, then temperature correction will be made in that price, along with all those other variables. It may be hard to see because of the noise from all the other variables, but it will be there. I note that people on Capitol Hill in Washington as well as state legislatures are cooling (forgive the pun) to the idea of a hot fuel fraud. That's probably why there have not been any additional hearings or bills introduced. Bills that were introduced have been moved to back burners or have died. None of those state Attorney Generals that promised to look into the fraud ever prosecuted anyone. Some took the bait initially but spit it out when they found there was no case to be made.

If the cost/benefit study does not reveal significant harm, as I suspect it won't, there is still the question of reducing uncertainty in the transaction and possibly ascribing economic value to that improvement. Even if other entities have dropped the issue, ATC remains on the W&M agenda and most of us truly understand that it belongs there. Why? Because ATC can be an improvement and it will fly once the cost/benefit numbers are right. In my presentations on the subject I have suggested that we were nearing the break-even point for cost/benefit for ATC. Even when doing outreach with the oil industry in my state, I suggest that ATC soon will represent a valuable business tool for the retailer. I base that on a number of points.

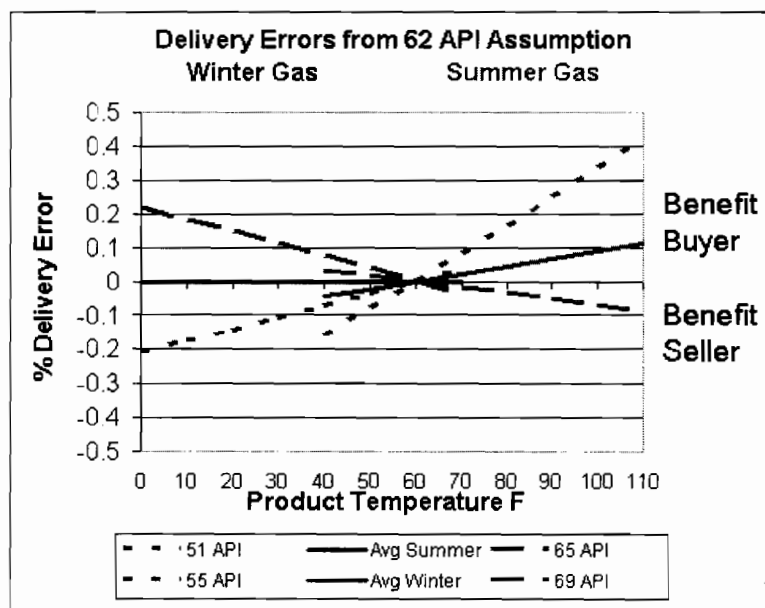
ATC would be unnecessary if the product always remained at the same temperature as it was delivered. I've shown that when a business buys net and sells gross, the invoice provides the information to correct the price for temperature at that point. Gasoline received at 90 °F has about 2% more gross gallons than net gallons and naturally its gross gallon price drops by an equivalent 2% relative to the net gallon price. At current prices of \$3.20 a gallon that 2% is about 6.4 cents per gallon. The problem is that most fuel at retail stations is stored in underground tanks where the ground temperature is about 55 °F all year round. The double-wall tanks today do provide some thermal insulation, but there is still significant temperature change going on. It is clear that retail dealers see product losses due to shrinkage with the drop in temperature underground for most of the year. The worst case is actually in the summer months when the temperature differential between above ground and below ground is at its maximum. This shrinkage is well recognized and tax departments grant credits to retailers on prepaid taxes to compensate for those losses. While the retailer might get back a small amount of prepaid taxes in those rebates, there is no way to recover the lost sales from this shrinkage without adjusting the selling price!

We also know from the Nebraska study on dispenser performance over a year that the temperature of the fuel changes between the storage tank and the dispenser. In the summer, that can mean increases in temperature and consumer losses. In the winter it can alternatively mean temperature drops and consumer gains. Like the hot water to your shower, after a short period the temperature of the delivery equilibrates with the underground storage temperature. This effect is difficult to analyze since it is fairly short lived and doesn't affect all sales equally. Hence you will often get advice in hot climates to buy your fuel early in the morning or late at night to avoid the heating effect in the piping at the hottest part of the day.

ATC would level the playing field when dealers with below ground tanks compete with dealers with above ground tanks. Solar heating and no loss to the ground temperature give the dealer with an above ground storage tank a pricing advantage with hotter fuel for most of the year. The same is true of "hot spots" where the retailer can purchase fuel hot from the refining process and sell it at significantly higher temperatures than his competitors. An ATC device would essentially eliminate the advantage of the above ground storage and the hot spot.

Another question that should be evaluated is the efficiency of the proposed ATC device. The ATC Steering Committee recognized that the ATC device is not going to be perfect. The Committee deliberations focused in on issues like temperature probe accuracy and response time as well as impact of product density changes. The devices used in Canada and those being proposed for the US can only be programmed for one product density, yet we know that fuels will vary batch to batch and seasonally. If the fuel has a different density than that set in the dispenser, the dispenser either overcompensates or under-compensates. The recommendation to use 62 API for

gasoline is fairly representative of the average winter gasoline. It will result in about equal spread of these errors plus and minus during the winter months. However, when the average summer fuel is 58 API, the 62 API setting will create an average bias in the summer months that reaches over 0.1% in favor of the



consumer, about 20% of the current tolerances. As a result, the ATC device may only have efficiencies in the mid 90% range. I like to use 95% as my ballpark estimate.

The compensators used at wholesale are set to the actual density of the product as determined by the wholesaler. Thus the values on the invoice to the retailer have smaller uncertainties in getting the gross gallons right. I estimate the market is at least 85% efficient in getting consumers the right price for gross sales and perhaps much better than that. Taking the conservative estimate, you can see that ATC might raise efficiency from 85% based on market pricing correction to the 95% of the ATC device mentioned earlier. That's a 11.8% increase in efficiency and may sound pretty good. However, an economist must consider ROI or return on investment. An 11.8% increase in efficiency pays off in 8.4 years. Our problem is that major retailers, that buy the new dispensers, replace them every 8-10 years. Thus at this ROI you never really see any benefit because just at the time it's going to pay off, that dealer is buying a new set of dispensers and you are now paying the upgrade cost again on the new ones. You are just starting another pay-off period. That is not good economic sense for either business or consumer. The ROI clearly has to be much better than 11 % for ATC to pay. Perhaps the economic analysis will also provide an estimate of where that payoff point might be, maybe 20% or even as high as 40% ROI?

I would also consider the impact of sales volume in an economic analysis. With any benefit there is always a concern about diminishing returns. The cost of a temperature compensator is about the same whether the meter delivers 1 billion gallons a year (e.g. a pipeline meter) or only 100,000 gallons a year (more representative of a retail meter). This means the higher the volume the sooner you pay it off. This is why many are considering it appropriate for truck stops where volumes are much higher than a typical retail gas station. Yet it may also have significant impact on smaller retailers who can't compete on volume. Many believe the smaller dealers tend to be price leaders, but they don't have large capital resources. Retail dealers in my state have made it very clear to me that they don't want the high volume dealers to get an advantage over them in a change to ATC, just because the higher volume dealer can pay off the upgrade in a shorter time. We can reasonably predict that expensive upgrades might drive out another 5%-10% of the smaller/marginal dealers, just as the underground tank requirements did.

Another critical question relates to the impact of a permissive ATC program on market efficiency? In a nutshell, I believe a permissive implementation results in interference in the market. In saying that, you must consider that even if you implement ATC on some dispensers, the price engine must continue to function on all the other variables and must differentiate between gross and net gallons. As people study this situation, they will see there are many drawbacks, not the least of these is that permissive implementation splits the country, pitting the hot states against the cold states.

In my discussions with retailers in both the motor fuel and heating fuel businesses, some have indicated interest in converting to ATC. I try to understand their motives for desiring to implement ATC and suggest that with ATC in a cold climate, you will need to drop your price to be competitive. The response is almost universally, "Not if I'm the first to do it!" They are right and I propose that this is why dealers tried to be first to convert in Canada when it was made legal. In a cold climate the first guy in does not have to drop his price commensurate with the value change. In fact, he can stay comfortably equal to or a penny below the competitor who is still selling gross and make a higher profit margin. They claim, without guilt, that they paid to buy the upgrade, so why shouldn't they use the profits from it to pay off the investment. The last ones in have to do it just to stay competitive, but they don't get to make the extra profits the way first ones did. By then the market will have driven the price down to more competitive levels.

A careful look at Canada's implementation shows that they are nearly 100% converted to ATC in the populated areas along the US border east of the Canadian Rockies. These areas are all relatively cold and average product temperatures are well below 15 °C, the Canadian reference temperature. The rural areas

remained mostly gross gallons regardless of temperature. The other major area that remained with gross sales is the moderate climate area in British Columbia, west of the Canadian Rockies. ATC never gained a foothold there and it provides an ominous message for those pushing the permissive proposal.

I am suggesting that when there are two different gallons in the marketplace, the higher priced gallon will drive the market initially until there are an appreciable number of marketers using the other method. An increased number of stations selling the cheaper gallon will allow competition to drive the price down. For the cold states the higher price will mostly be the gross price. For the hot states, it is just the opposite. The net price will be higher than the gross price for most of the year and so it will pay to be the last to convert to ATC in hot climates, if you convert at all. Thus I was confused by the impassioned pleas of those from the hot states who pushed so hard for permissive ATC last July. If they had carried the day, the only ones appreciably affected would be the cold states like mine, as those are the only places where the economics favor the permissive use of ATC today.

I project you could literally draw an isotherm across the US map at perhaps 55 °F average fuel temperature as a dividing line. North of that there is incentive to be the first to convert under a permissive program and south of that there is just no incentive. Below that line I am convinced that dealers will not be able to make a go of it selling net gallons and trying to compete with the dealers selling gross. As I pointed out in my hot fuel fraud analysis, the dealer in a hot state selling gas in the summer at 105 °F would actually have to deliver about 6 cubic inches more of his inventory per gallon sold than his competitor. To compete with a \$3.20 /gal gross price that net dealer has to post a price of \$3.30 /gal, just to be on an equal footing. Regardless of how they advertise, they will fail to convince a good part of the public that they are being competitive. If they try to compete at the same price with the dealers selling gross, they will lose perhaps \$1.50 on each 15 gallon fill-up.

I think this is an important part of the ATC Steering Committee recommendation to keep the permissive period during any transition to the bare minimum. That permissive period is necessary only to allow all dealers time to convert and for weights and measures to do their tests. I also believe that the industry has made the issue of a single method of sale a priority. Thus, if ATC pays, then let's make all dealers do it and let's find a reasonable path to make it mandatory. If it doesn't pay, then no one should get to do it. I personally support that position as best for the industry and certainly best for consumers.

I need to add one more parting shot about transparency, a term used very often by those advocating ATC. By transparency, they mean that buyers can be assured that they can use price to make value comparisons between sellers. ATC holds the promise of leveling the playing field, but I believe that is true only if it is the only game in town. The use of two methods of sale, with gallons having different relative values that constantly change with the seasons, results in confusion and not transparency. Even an expert can't compare gross and net pricing without reasonable knowledge of the temperature. I have yet to see one permissive ATC proposal that includes declaration of the selling temperature. Certainly the average consumer is going to make his/her decision based on the price on that roadside sign and that can be very misleading with two methods of sale.

Another question I would ask is if the implementation of ATC will mean higher prices for consumers. The answer will come in two parts. The first part deals with paying for the equipment upgrade. The process of setting tolerances in weights and measures has always been a balancing act, trying to prevent harm to either buyer or seller, yet always being mindful that the cost of the measurement is included in the selling price of the commodity. Thus the ultimate buyer, i.e. the consumer, pays to have the product measured. Most of us in weights and measures wear two hats at the NCWM meetings, one as a consumer advocate and the other as the independent arbitrator. We generally recognize the industry has enough representation to take care of its interests. Thus I, and it appears other state directors, want to be sure that the consumer will get his/her money's worth if we decide to make a change.

I have heard estimates of the upgrade cost only resulting in about \$0.02 per gallon increase over one year's sales to pay for the conversion. That's still a lot of money out of consumer's pockets. I keep in mind that we are doing this at a time when crude oil is pushing \$100 per barrel and when consumers are cutting their food budgets to pay for gas to get to work and energy to heat and cool their homes. Forgive me if I want some defensible reasons for adding another 2 cents a gallon to an already troubling burden on consumers.

The other part of the answer involves the nature of uncertainty and it is a little more subtle. Those advocating ATC have, I believe, made a bold assumption that all the risk over temperature today is born by the consumer. Weights and measures folks are generally respectful of uncertainty and recognize that the risks exist in both directions. For me, the critical indicator of risk with temperature is the phantom gallons that disappear from all retailers with underground tanks, regardless of climate. Even after the retailer corrects for the temperature at time of delivery using the information on the BOL, product shrinkage due to temperature drops in the underground tank represents an uncertainty that very well might go against the retailer and favor the consumer. By reducing that uncertainty using an ATC device, there is a good risk that the consumer may lose a benefit of temperature he now enjoys.

In conclusion, I believe a factual, well prepared economic analysis that supports the need for ATC is essential. Without it I believe the L&R Committee should keep this item informational. It would be wrong for the NCWM to change the measurement system without reasonable justification and without a consensus of support from the stakeholders. Many of us asked the L&R Committee to provide more technical justification for a change and suggested that the Committee report read more like a regulatory impact statement with facts, figures, and defensible analysis. That's what we at the state level will need to justify implementing the regulation, if it is adopted by the NCWM. The phrase "the Committee believes" really doesn't carry much weight when I have to place something in my State Register. The New York body that reviews every proposed regulation wants to see \$dollars of costs and benefits, and factual, well thought out analysis. Platitudes do not carry any weight. After several careful readings of the L&R final report from last July, I still have nothing to put down as justification for spending perhaps \$200 million to convert New York's 90,000+ dispensers while allowing consumers to be confused and allowing some parts of the industry to mask unearned profits by taking advantage of the two methods of sale. In addition, how will I respond to the expected objections of industry suggesting that they don't want choice of two methods of sale and that two methods of sale will confuse consumers?

I believe that the consumer groups need to go back and rethink their arguments, since they have failed to make a real connection between temperature and any gain/loss to consumers. It is one thing to accuse and another to provide evidence. It's been a year since I challenged some of their premises and suggested those weak premises lead them to false conclusions. There have been no counter arguments provided to this point. If you intend to convince objective, knowledgeable arbitrators, you better come armed with stronger arguments. More important, neither they nor any of the regulatory officials has found any evidence of the collusion required to make the massive fraud work.

Finally, I think that we should follow the normal practice of the NCWM and try to build a consensus. Most NCWM issues get approved by overwhelming margins in our voting system and get full support of the stakeholders on both sides of each issue. That's a sign we did our jobs well. I personally have been out pitching the benefits of ATC to retail associations and trade groups, and directly to retailers in my state. I'm now expanding to neighboring states. I believe they are listening to what I have to say and thinking hard about this issue. If we work to educate people on the true costs and benefits of ATC, I believe we will be able to convince the retail industry that the time is soon approaching when ATC will make sense both for them and their customers. When we have built that consensus and when we can show the cost/benefit relationship is right, we will know that is the right time to implement ATC.

The Great Temperature Compensation Debate

Ross Andersen
NCWM Interim Meetings
January 2007

Debates are the Hallmark of a Free Society

Great debates on issues like Social Security funding and Health Care are critical to a society that is always reinventing and improving itself.

This is a Weights and Measures version.

Great debates are complicated, they have multiple variables, and they DEFY simple solutions!

It's not easy and it will take time!

Why me? Because I wanted to ensure that the NCWM looked at the important issues that might get lost in an emotional debate.

I won't be making the decision in New York since it is in statute and only the Legislature can do that.

A Delicate Balance

HB44 Fundamental Considerations

- **2.2. Theory of Tolerances.** - Tolerance values are so fixed that the permissible errors are sufficiently small that there is no serious injury to either the buyer or the seller of commodities, yet not so small as to make manufacturing or maintenance costs of equipment disproportionately high.
- We need technically defensible reasons for regulations

Most important slide in my presentation! I looked for a source and immediately considered this one.

W&M serves to protect both buyer and seller but must consider the cost benefit of making tolerances (and performance requirements) more stringent. This is a delicate balance that evolves over time.

Important to view all laws and regulations as lines in the sand. Our right and our responsibility to evaluate if those lines are right. But wrong to question our predecessors with 20/20 hindsight. Best to try to do our jobs as best we can based on what we know today.

Legislators enact strict rules on the executive branch that prevent us from enacting rules on emotional basis. Administrative rules require me to do outreach to affected industry and consumers before proposing rules, create a proposal that stands up to technical scrutiny, publish a proposal, and respond to public comment before acting. It is not easy, on purpose.

Most of the time, W&M rulemakings fly well below the radar. This one issue is not one of them.

The Great Temperature “Fraud”

- Articles in the *Kansas City Star* suggest that the oil industry uses temperature to defraud the US consumer.
- Their argument: The average US purchase of gasoline and diesel fuel at the pump is at temperatures above the 60° F industry standard and contains less energy value estimated at \$1.9 billion a year.

The obvious solution: put ATC devices on every gas pump in the US.

Does this upset that delicate balance in the previous slide? Let's explore it and some other issues.

Plain Language Definitions

- Gross Volume – The volume a given fluid occupies at any particular temperature
- Reference Temperature – An arbitrary reference chosen in the middle of the operating range
- Net Volume – A prediction of the volume the fluid would occupy if heated or cooled to the reference temperature (e.g. 60 F)
- Automatic Temperature Compensator (ATC) – A gadget that automatically converts gross gallon measurements to net gallon readings

Reference temperature is always arbitrary and only forms a common reference point for us to characterize the product we are measuring.

ATC's can be mechanical or electronic.

How does it work?

- Given Density API @ 60 F (pass through)
- Measurements Prediction
- Gross Volume Net Volume
- Temperature

- Why go to all this trouble?
- Net Volume x Density = MASS (Weight)
 gal lb/gal lb

Refiner measures API and generally that does not change unless the fuel is mixed with other fuel.

Everyone in the industry knows that the volume at 60 F is not the issue. They are really thinking about Mass (weight) that allows real communication between buyer and seller.

Importance of Weight

- Allows well informed buyers and sellers to communicate effectively
- In New York the local tank farm buys by weight (net gallons) and sells by gross volume to retail dealers
- If there is a “fraud,” it would most likely occur at that point!
- Retailer may buy net and sell gross in other states

Fraud won't/can't happen at any point where product is bought and sold on the same basis.

The Fraud Claim

a crude depiction



- Consumer wins big
- Consumer wins
- Break Even
- Industry wins
- Industry wins big
- Is it that simple?

Make it clear that this is a crude depiction. The lines are not to identify specific states but rather show a general idea.

The fraud claim works basically from geography. The oil business in cold states loses but wins in hot states. Of course the three most populous states, California, Texas, and Florida are all in the hot group.

Can it possibly be just that simple?

Why aren't the business in the cold states going broke? The Star estimated that businesses were losing \$37 million a year in Minnesota. I can't believe that business can absorb those kinds of losses every year and survive.

Audience Participation Quiz

Where do you want to buy gas?

- A. Brand X station at 78 F
- B. Brand X station at 60 F
- C. Brand X station at 42 F
- D. Insufficient information provided

Bring the temperature issue right into your neighborhood. Hot station has hot spring under the storage tank. Cold station has a cold spring. As an inspector you notice this during your inspections.

Get participation. Most will raise hands for C. But offer a D for those that did not respond.

Could there be something more here?

Could the Fraud Claim be true?

- Where are the whistle blowers?
- Most frauds are tipped to regulators by disgruntled ex-employees and competitors
- Fraud implies someone KNEW!
- For this fraud to work, everyone in the business has to be in on it!

Big conspiracies are the hardest to keep quiet?

We should have a long line of industry folks lining up to cry foul if there really was a fraud.

Questions?

- The methodology attempts to be balanced and includes predicted losses incurred by the industry when it sells products below the 60° F standard.
- If the oil industry is defrauding and knows when it is losing, why take losses?
- Is the industry really losing in cold states and gaining in hot states?

In my experience, the oil industry never takes losses lying down. They are not in business to take losses.

Led me to question the assumptions.

Temperature Effect is Documented when switching net to gross

- Bill of Lading provides significant information on temperature effects including:
 - Gross Volume
 - API Gravity @ 60° F
 - Product Temperature
 - Net Volume
- Value changes are clearly evident
- 58 API Gasoline
- Summer
 - 100,000 gal Net
 - Temp 80 F
 - 101,555 gal Gross
- Winter
 - 100,000 gal Net
 - Temp 35 F
 - 98,357 gal Gross

The industry clearly knows and understands the effect of temperature when the method of sale changes from net to gross.

When product is hot they have more gross gallons to sell. When it is cold they have less.

Do consumers lose in “hot” sales?

- The articles claim that sales at high temperatures force consumers to “consume more and pay more.”
- The “consume more” is basic Physics
- Did the researchers verify that people actually “pay more?”
- Are they assuming the selling price is the same whether gross, net, hot or cold?
- Basic Economics suggests this is not true.

The price per gallon is the market equalizer. Can we realistically assume that it never changes.

Basic economic theory of free markets starting with Adam Smith’s Wealth of Nations published in 1776 states markets use price to establish value. Measurement is just a tool to make that easier.

Can’t possibly judge “value” based on measurement alone!

Price Compensation

- Every trader in commodities, wholesale or retail, has to deal with “shrinkage.”
- Shrinkage due to damage, loss, theft, etc is figured into pricing structures.
- Can the oil industry be somehow immune?

OR

- Can pricing variations possibly correct for the temperature changes over time and are these are just invisible to us?

After second bullet:

Consider the shirt buyer for JC Penny. The price set for 100,000 shirts has to recognize that only a certain fraction will be sold at full retail, some at sale prices, some on the clearance rack, and some will be unsellable. The price set has to recover the inventory price, employee salaries, rents, taxes, and maybe a few bucks profit.

Price Compensation Example

Value Comparison for 58 API Gasoline

100,000 gal at 60 F @ par=\$2.000/gal = \$200,000

			Fraud Assumption		Price Compensation	
gal @ 60	Actual Temp F	gross gal	gross \$/gal	gross \$ cost	gross \$/gal	gross \$ cost
100,000	30	98033	2.000	\$196,067	2.040	\$200,000
100,000	60	100000	2.000	\$200,000	2.000	\$200,000
100,000	90	102073	2.000	\$204,146	1.959	\$200,000

Explain the basis of gross sales set to recover costs and make desired profit margin.

Show how the Star calculated its fraud claim based on a flat \$2 a gallon assumption.

Also note that expansion of petroleum is not linear, hence the numbers are not equal on either side of 60F

Price Compensation

Show that the seller at 30 F just has to add a few pennies to be whole again and make the \$200,000 he needs to make from that batch of product.

The seller at 90 F will drop his price a few cents to come to the same \$200K figure.

Audience Participation Quiz

Where do you want to buy gas?

- A. Brand X station at 78 F
gross \$2.469 /gal
- B. Brand X station at 60 F
gross \$2.499 /gal
- C. Brand X station at 42 F
gross \$2.529 /gal
- D. Need to do calculations

Revisit the original question. Offer to do the calculations in D

Audience Participation Quiz

Where do you want to buy gas?

- A. Brand X station at 78 F
gross \$2.469 /gal ~ net \$2.499
- B. Brand X station at 60 F
gross/net \$2.499 /gal
- C. Brand X station at 42 F
gross \$2.529 /gal ~ net \$2.499
- D. Doesn't matter! Note: Can't normally
see 18 F difference in one market area!

Show that it is pretty simple to have equity through price compensation.

Focus on the fact that competition between local stations can't really provide those kinds of temperature differentials. From Albany to perhaps Richmond, VA to get a 18 F differential. Gas stations in Albany are not in competition with those in Richmond!

The Price Compensation Model

a crude depiction



Survival forces prices up
in cold states!

Price goes up a lot

Price goes up

Price even

Price drops

Price drops a lot

Market competition forces
prices down in hot states!

Revisit the base assumption with price compensation in play. Review the 5 areas starting from cold to hot.

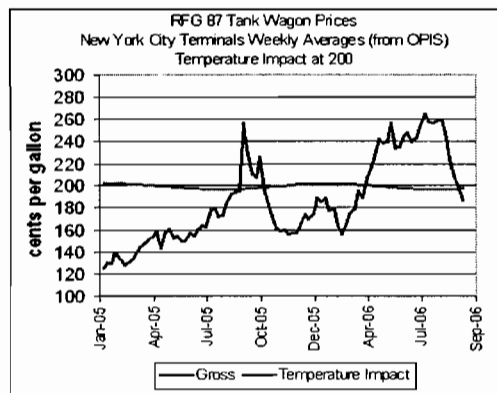
Survival is necessary in cold states. Remind them of the \$37 million in MN.

Why would price drop in hot states. COMPETITION!

If you don't believe me, just read the paper about the price drop with large screen TVs. Retailers everywhere are complaining that the profit margin is dropping through the floor because of the heated competition.

Pricing Questions?

- Can we measure fraud or price compensation?
or
- Is temperature just one of many market factors?



Is temperature
ignored or do
these prices
include correction
for temperature?

Ask who is right, those claiming fraud or maybe price compensation? We don't know for sure

Review the chart:

Data from NY City RFG terminals: price paid by retail dealers for their inventory. Blue line represents average of 14 terminals. Price rises or falls \$0.60 in just a few days.

Explain that the red line is based on holding every other factor other than temperature constant. You quickly see that temperature effects are way down in the noise.

Can we really tell who is right without extensive pricing analysis to verify if cold gas is more expensive than hot gas?

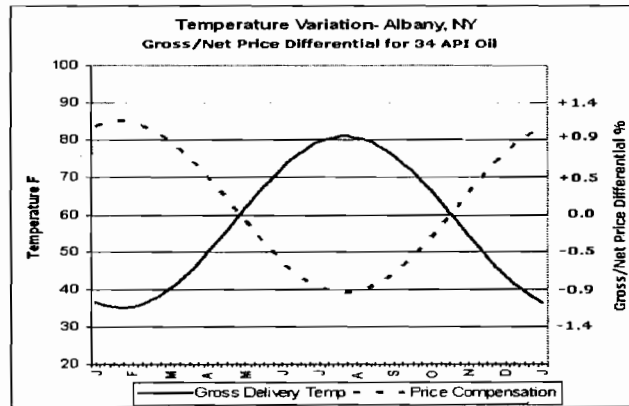
Does the Market Compensate?

- Historically when crude prices were stable we saw annual pricing cycles:
 - Heating oil prices: rising in winter and dropping in summer
 - Gasoline prices: rising in summer and dropping in winter
- Were these just timing for high demand?
OR
- Were these price adjustments compensating for temperature?

We do have anecdotal evidence that the market does compensate for temperature with price.

Take note that the effects for oil and gasoline work in opposite directions.

Heating Oil Price Compensation Prediction Buying Net and Selling Gross



Selling price probably compensates for shrinkage and expansion and is driven by market forces.

Explain source of data from terminal delivery tickets over a year.

Red line comes from temperature impact for 34 API heating oil i.e. the work done by ATC.

I was a oil customer for many years and saw the annual cycle of price changes with time during a time when oil prices were fairly stable at about \$1.30 a gallon.

The curve reflects about a 3 cent cycle and that corresponds to what we saw every year.

Was this price compensation? Not sure but the correlation is very high.

Lead in to next slide by noting that Star put lot of stock in the fact that Canada's retailers endorsed ATC because they lost money in the winter (cold months)

My retailers asked to meet with me shortly after the August article hit the local paper. They all told me they lost money in the summer. Exact opposite of the oil dealers. How can that be?

Canadian Retailers and ATC

buying gross selling gross

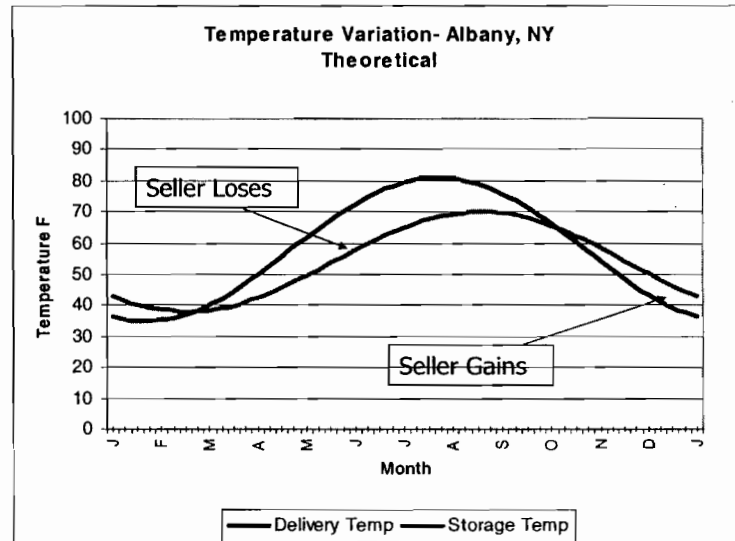
- Retailers in New York (cold state) lose gallons in the summer and gain in the winter!
- With below ground storage, the temperature differential between the delivery and the underground tank causes “shrinkage”.
- They price compensate because they lose inventory and pay taxes in the summer on phantom gallons they can’t sell.
- Convincing evidence indicates this is the real reason Canada’s retailers wanted to upgrade to ATC and not that they were giving away energy.

Explain the inventory losses due to temperature.

Explain that dealer has to pay taxes and inventory losses based on sale of remaining product, i.e. price compensation.

Suggest this is the real reason that Canadian dealers went for ATC. Also note Canada has higher taxes.

Product Shrinkage Model

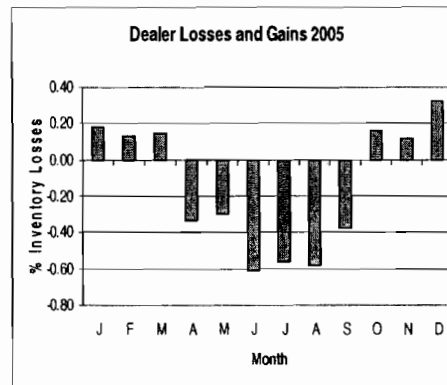
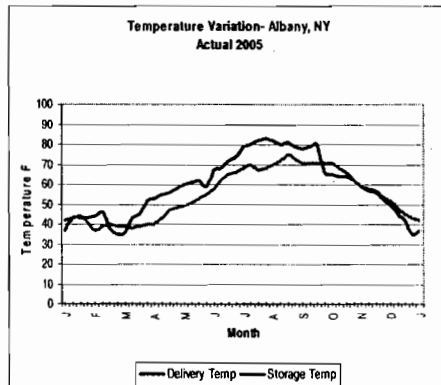


Explain source of the curve data: blue from temperature on terminal rack meter tickets and purple from temperature sensor on underground monitoring system.

Point out the lag for the underground temperature. It takes 3-4 weeks longer for the ground to warm up to peak temperature.

Show the large differential in June and July of almost 15F. That's about 1% loss in a very short time. May be different for high volume where product doesn't hang around long enough to cool down.

Actual Product Temperature Cycle



Here is actual data from a local retailer. These show actual temperature curves that led me to understand the shrinkage issue.

Comment on the monthly losses of almost 600 gallons a month max.

Retail dealers have seen this effect for generations!

Reported Inventory Losses/Gains Albany, NY Retailer - 5 years

- Gross Gallons: average -0.17%/yr
~ -1,700 gal for 1,000,000 gal in sales
– Higher losses in summer & gains in winter
- Net Gallons: average +0.03%
~ +300 gal for 1,000,000 gal in sales
– No discernable pattern
- Retailers must correct by raising the price
- Shrinkage underground occurs everywhere!

Shrinkage occurs in hot states like Arizona and Florida as well as cold states like Minnesota and Maine.

Strong evidence that the industry uses price to make the fine adjustments in the market.

Clear that this is an effective way to manage temperature that doesn't cost anything.

Australian Scientific Study

- 1998 Australian Institute of Petroleum \$A2 million scientific study on ATC
- Sampled 127 stations in the country
- Covers 25° latitude (Continental US 22°)
- Did not find justification for a mandate
- Australian W&M used study extensively in their decision not to implement ATC
- Apparently no pricing analysis

Mike Sikula found this link in the last few days. Explain the geographical similarities in latitude differential.

A scientific study that concluded ATC is not cost effective, yet.

Show that another industrial country has looked at this situation and still decided against.

We should get a copy and study this report before making rash actions.

The Bottom Line

- Temperature effects may be dwarfed by other market factors and hard to measure.
- Market factors may force the industry to price compensate, at no cost to the consumer.
- The fraud analysis included no analysis of the equalizing forces of price.
- If we force ATC on retailers, the consumer will pay the cost with great uncertainty whether there will be any reduced price payoff (\$1.9 billion)
- How will change affect taxes and environment?

Emphasize the 4th bullet. Not saying it won't be there but that there is great uncertainty.

Without the payoff will the consumer really benefit? He will pay for something that only benefits the retailer.

Serious issues may come up with regard to taxes and the environment. Remember that the Tax Departments get from 35 to 45 cents per gallon off the top. We are only talking about perhaps 5 cents due to temperature. Who will have the final say. I think Tax will win out. Maybe we need to check with them before acting.

Also check with environmental agencies regarding leak detection regulations.

The REAL Issues Supporting ATC

- Inequity: Above Ground vs Below Ground
 - Above ground hotter than below ground in summer and reverse in the winter.
- Inequity: Hot Spots
 - Markets where some dealers can purchase and sell hotter product than their competitors.
- Verifiable adjustment for temperature effects
 - Consumer gets uniform gallon in all seasons
 - Reduce shrinkage and taxes on Phantom gallons
- More sensitive leak detection (environmental)

Once we get past the fraud claim, there are still important reasons to look at ATC.

Those temperature curves showing retail shrinkage also show inequity of above vs below ground storage. The stations with above ground storage can price below those with below ground storage in the summer yet still be making money.

Hot spots- define as direct from refiner still hot from the distillation tower. Perhaps at temperatures above 100 F. Diesel fuel at truck stop selling several tanker loads a day. Product can't cool down! Huge price advantage over dealer with underground tanks.

Make note of 5 times better leak detection based on the retail dealer data.

What's Driving this Discussion?

- It's not the "fraud", it's TECHNOLOGY!
- Manufacturers of electronic dispensers now have temperature compensation systems available for every new dispenser and can offer upgrades for some older models.
- Thanks to Canada's experience there are ATC upgrades for mechanical dispensers.
- The price of ATC will continue to drop.

The NCWM Dilemma

Roadblock to Technology Innovation

- We presently block ATC technology at retail (1969 codes) - limit Method of Sale
- Are we in restraint of trade?
- If we were to allow ATC at retail in 2008, we have no devices approved to do it!
- It would not be until Spring 2009 at the very earliest that our first ATC approved dispenser can hit the market!

When enacting the present rule in HB44 in 1969, the NCWM thought it made sense then. Decision not to put in method of sale regulation now hurts us and makes it difficult to move forward.

How can the marketplace ever push this when the technology is forbidden?

Make point about NTEP approvals limiting sale of dispensers with ATC technology for gas pumps. Point out that other meter register manufacturers have approval for registers with ATC for VTM and stationary use. Why can't the gas pump manufacturers get the same thing?

Note it will take over a year more since NTEP finalizes Pub 14 checklists at Interim Meetings. Manufacturers now have to get into the queue to get equipment evaluated. Perhaps May of 2009 at the earliest for the first ATC approval.

What about significant number of after market upgrades? How long will it take to complete the approval process with present NTEP resources?

The FCC Plan for HDTV

- Late 1980's - FCC solicits proposals on HDTV
- 1993 - Formation of Grand Alliance to set HDTV standards
- 1998 - HDTV sets available and digital broadcasts commence
- 2007 - TV broadcasts mandated to be digital, provided 85% of receivers capable of receiving signal
- 2009 – All analog broadcasts cease and frequencies return to FCC
- Virtually seamless for Viewers

Want to see how another regulatory agency made a technology transition?

Review steps taken and emphasize that viewers were almost not aware that a revolution was going on around them.

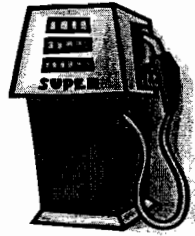
Note that it took 5 years from formation of the work group till first digital TV sets and broadcasts hit the market.

We should be able to work much faster since we are already familiar with the technology.

Note Canada still has 25% not converted although much higher % of the actual volume is ATC.

Differences: W&M vs FCC

In the transition from old to new



HB44 blocks this
with ATC



FCC did not block
this with HDTV
even if no signal

FCC allowed TVs to be sold even though there may not have been any digital signal to receive. Consumers bought in as they made normal upgrade over lifetime of their TV sets.

Critical Elements of a Plan

- Unless fraud is proven, the marketplace should determine when it is best to implement ATC use at retail (driven by cost benefit)
- Weights and Measures should remain neutral – evaluating proven benefits vs real costs
- In the interim, retailers should be able to upgrade their equipment to anticipate ATC
- A reasonable lead time might:
 - Ensure most retailers have ATC capability
 - Minimize disruption/confusion in marketplace
 - Allow resolution of Tax and Environment issues

Emphasize that I neither support nor oppose ATC and have not even though I have been outspoken on the issue for several years.

Existing rule is in opposition since it prohibits the sale of the technology.

Disruption in the marketplace caused by price differentials between those dispensers with ATC vs those without.

Important Items for Debate

- ATC at Retail: Not “IF” but rather “WHEN”?
 - Does the Marketplace really want it NOW?
 - Do consumers want to pay the upgrade price, even if there will be no big payoff?
 - How much marketplace confusion do we want, i.e. do we wait until most retailers have ATC capability?
 - How do we resolve conflicts with other regulations?
- Addressing HB44 and NTEP issues
 - Do we use emergency clause to act this year?
 - Do we wait to act until next year?
 - What is impact on our ability to test dispensers?

Critical issues for consumers.

Will they want to spend the money if there is no payoff in lower prices?

Upgrade serves only to help retailer keep better control of inventory.

Do consumers want to face difficult decisions about which dealer is giving the best price when one dealer has ATC and the other doesn't.

Remind them of the potential conflicts with TAX and Environment.

Can we act on the L&R issue if we don't have corresponding S&T item to vote on.

We have a lot to learn about how we will test the new technology. Measurement Canada warns of serious investment in inspector time to get temperature equilibrium. Also supported by Nebraska Study.

Close with warning that this is a complicated issue. Turn over to the other part of the panel to discuss the cost part of the equation.

Disclaimer

- The slides in this file were used in a presentation to the NCWM at its Annual Meeting on July 10, 2007. The presentation was abridged to fit into the time permitted and the notes that appear with the slide were not necessarily all discussed in the actual presentation. They are provided only to assist others that may wish to use the information.

The Great Temperature Compensation Debate

Ross Andersen
NCWM Annual Meeting
July 2007

Revision 7/6 – 4PM

Public policy debates are the Hallmark of a Free Society. Great debates on issues like Social Security funding and Health Care are critical to a society that is always reinventing and improving itself.

Great debates are complicated, they have multiple variables, and they DEFY simple solutions! It's not easy and it will take time!

Like you, I am searching for the right answer to this important question. I have known for some time that the NCWM would have to deal with this issue. That is why I championed this issue in the NCWM since the VTM issue went to the S&T in 1999.

I am abridging the presentation to fit in the allotted time. I will make a version available to the NCWM with my notes for all slides following the meeting. I did make a few minor changes to the slides I submitted about a month ago.

I am pleased to note that some of our members testified at recent Congressional hearings. I hope most of you have viewed the video of the testimony. The political drama is certainly interesting. My compliments to Chairman Mike Cleary who steadfastly defended the honor and integrity of our process, and expressed our desire to do the right thing.

Where do we start? Why not look at who we are and why we are here?

A Delicate Balance

HB44 Fundamental Considerations

- 2.2. Theory of Tolerances - Tolerance values are so fixed that the permissible errors are sufficiently small that there is no serious injury to either the buyer or the seller of commodities, yet not so small as to make manufacturing or maintenance costs of equipment disproportionately high.

Most important slide in my presentation! I looked for a source and immediately considered this one. W&M serves to protect both buyer and seller but must consider the cost benefit of making tolerances (and performance requirements) more stringent. This is a delicate balance that evolves over time, often driven by technology.

Remember that technology moves in incremental steps. My State W&M Association celebrated 100 years three weeks ago and I found a newsletter article from the 1955 that addressed the history of petroleum measurements, noting steps from hand pumps with hand poured measures, to pumps with dials or glass cylinders, where changing from pints and quarts to tenths of gallons was a big step, to meters by 1920, to meters w/vapor eliminators, eventually in 1933 to meters w/price computers. Electronics was the next change in modern times but the measurement today uses the same type of meter. Each of those steps was significant and each was debated, not unlike step to ATC we are now discussing.

Measurements need not seek perfection, but rather must be "good enough" to satisfy commercial needs without making the measurement costly, complicated, or delicate.

The buyer seller relationship in a free market is a symbiosis. Everyone benefits from the fairness we seek here at NCWM. Inequities hurt the buyer and affect other businesses.

From regulatory side it is important to view all laws and regulations as lines in the sand. Our right and our responsibility to evaluate if those lines are right. But it is wrong to question our predecessors with 20/20 hindsight. Best to try to do our jobs as best we can based on what we know today.

Remember that regulation is hard. We are not permitted to react emotionally to issues as those in the political realm do (legislators and attorney generals). We have to jump through hoops to make rules including Regulatory, Environmental, regulatory flexibility, Job Impact statements. We must encourage public comment and respond to that comment before proceeding.

Enforcement is even harder. We have to have objective evidence to satisfy a burden of proof of either a preponderance of the evidence (civil) or beyond a reasonable doubt (criminal).

The Great Temperature “Fraud”

- Articles in the *Kansas City Star* suggest that the oil industry uses temperature to defraud the US consumer.
- Their argument: The average US purchase of gasoline and diesel fuel at the pump is at temperatures above the 60° F industry standard and contains less energy value estimated at \$1.9 billion a year (Dec 06 estimate, higher now).

We know why this room is full. Also give credit John Siebert from the independent owner operators who has also taken a lead role.

The obvious conclusion, Fraud and the obvious solution, put ATC devices on every gas pump in the US.

What is the burden of proof for the fraud claim? Only that it is plausible.

I wonder why none of those AG's that said they are looking into this “Fraud” have not prosecuted? Where do they, or we, find proof or wrongdoing?

Even without the proof it is reasonable to ask: Does this upset that delicate balance in previous slides? Let's explore it briefly.

The Fraud Claim

a crude depiction



- Consumer wins big
- Consumer wins
- Break Even
- Industry wins
- Industry wins big
- Is it that simple?
- Will retail ATC solve all problems?

Make it clear that this is a crude depiction. The lines are not to identify specific states or temperature but rather show a general idea.

The fraud claim works basically from geography. The oil business in cold states loses but wins in hot states. Of course the three most populous states, California, Texas, and Florida are all in the hot group.

Can it possibly be just that simple?

The Star estimated that businesses were losing \$27 million a year in Minnesota. Can anyone believe that business that knows about temperature is taking no steps to stop the bleeding?

Price Compensation

- Every trader in commodities, wholesale or retail, has to deal with “shrinkage.”
- Shrinkage due to damage, loss, theft, etc is figured into pricing structures.
- Can the oil industry be somehow immune?

OR

- Can pricing variations possibly correct for the temperature changes over time and are these just invisible to us?

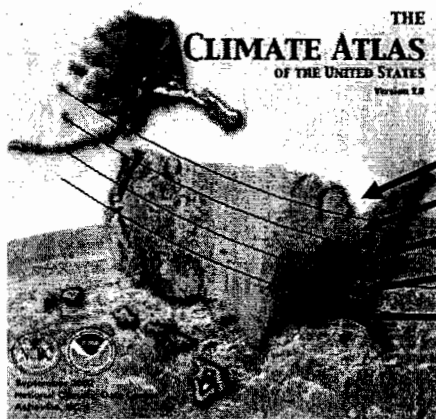
After second bullet:

Consider the shirt buyer for JC Penny. The price set for 100,000 shirts has to recognize that only a certain fraction will be sold at full retail, some at sale prices, some on the clearance rack, and some will be unsellable. The price set has to recover the inventory price, employee salaries, rents, taxes, and maybe a few bucks profit.

For the gasoline retailer, that inventory should be thought of as a 10,000 gallon tanker of product that will be gone in a day or two. Remember that that retailer has to make enough to pay for the next load to the tune of \$25,000+ at today's prices.

The Price Compensation Model

a crude depiction



Survival forces prices up
in cold states!

• Price goes up a lot

• Price goes up

• Price even

• Price drops

• Price drops a lot

Market competition forces
prices down in hot states!

Revisit the base assumption with price compensation in play. Review the 5 areas starting from cold to hot.

Survival is necessary in cold states. Remind them of the \$37 million in MN.

Why would price drop in hot states. COMPETITION!

If you don't believe me, just read the paper about the price drop with large screen TVs. Retailers everywhere are complaining that the profit margin is dropping through the floor because of the heated competition.

Price Compensation Example

Value Comparison for Wholesale Gasoline @ 58 API

100,000 gal at 60 F @ par=\$2.300/gal = \$230,000

			Fraud Assumption		Price Compensation	
gal @ 60	Actual Temp F	gross gal	gross \$/gal	gross \$ cost	gross \$/gal	gross \$ cost
100,000	30	98033	2.300	\$225,477	2.346	\$230,000
100,000	60	100000	2.300	\$230,000	2.300	\$230,000
100,000	90	102073	2.300	\$234,768	2.253	\$230,000

Explain the basis of gross sales set to recover costs and make desired profit margin.

Show how the Star calculated its fraud claim based on a flat \$2.30 a gallon assumption.

Also note that expansion of petroleum is not linear, hence the numbers are not equal on either side of 60F

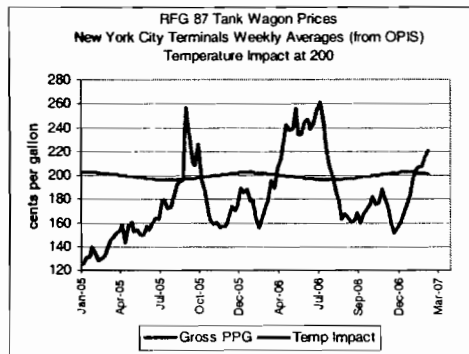
Price Compensation

Show that the seller at 30 F just has to add a few pennies to be whole again and make the \$230,000 he needs to make from that batch of product.

The seller at 90 F will drop his price a few cents to come to the same \$230K figure.

Pricing Questions?

- Can we measure fraud or price compensation?
or
- Is temperature just one of many market factors?



Is temperature ignored or do these prices include correction for temperature?

What brings the price down after a spike?

Ask who is right, those claiming fraud or maybe price compensation? We don't know for sure

Review the chart: Data from NY City RFG terminals: i.e. price paid by retail dealers for their inventory. Blue line represents average of 14 terminals. Price rises or falls +/- \$1.00 in just a few days.

Explain that the red line is based on holding every other factor other than temperature constant at \$2.00 a gallon. You quickly see that temperature effects are way down in the noise.

Can we really tell who is right without extensive pricing analysis to verify if cold gas is more expensive than hot gas?

Why does price come down just as fast? Why doesn't it stay high once it gets there.

What's the Problem?

- Buyers and sellers are primarily interested in energy value
- While we can measure gross volume “accurately”, there may now be price competitive technologies more representative of the energy value!
- Will consumers accept anything but volumetric measurement?

Temperature compensation is essentially a change of our thought patterns to terms of energy contained in a fuel.

Consumers, Like those independent truck operators that John represents already do. People beginning to perceive their dollars spent for units of energy rather than a unit of volume.

Yet: The deepest fiber of our consciousness will never permit most of us to think in other than volumetric terms for hydrocarbon measurement.

A real change will require: at total reorientation of the thought processes of some 200 million people.

While those word are prophetic and eloquent, I don't want to claim credit. They were spoken here on the floor of this Conference in 1984 by Richard Trask of the PEI. I was one of only a handful of those here today that might remember that speech.

Measurement is Uni-Dimensional Value is not!

- Transaction Measurement only quantifies a single physical attribute of a commodity
- GASOLINE: We now measure gross volume but adjust for octane, ethanol content, additives, etc
- Can we come up with measurement improvements that are cost effective?
- Will ATC best measure energy value?

It is very important to note that the articles focus on energy value. The oil industry never made any claim other than delivering accurate volume.

Value is a very complicated concept and difficult to pin down. One measurement of a single physical attribute is very often not going to fully represent "Value".

In a market economy it is the price that equalizes and the measurement is only a tool to provide standard frame of reference.

Grain is a good example. Also consider that season to season there are very significant variations in the value of a ton of grain. The old supply and demand issue. They still quote prices per bushel by the way, even though they sell by weight.

Gasoline is not really different! There are a lot of variables that won't show up in the gallons, gross or net!

Our great grandchildren may see the day when all forms of energy are measured in Joules: gasoline, fuel oil, electricity, steam, hydrogen, etc.

Will it be better to use ATC? This is the issue and if it is "better" or perhaps "more representative", will the benefit be worth the cost to change from gross volume?

Can we make that case?

Correcting for Temperature

- Seasonal variation (geography)
 - Mean and range changes with location
- Local variation (between stations)
- Above ground vs below ground storage
- Station effects (piping, etc)
- Hot spots (refiner supplied stations)
 - Significantly higher temperature from supplier
- Heated product (deliberate actions)

Temperature has so far been the primary focus in this debate. Look at the sources of the temperature variations.

Seasonal – note that the average and peak to peak swing varies e.g. HI only about 9F Miami 16 F, while other parts of country can be up to 45 F

Local – just small differences station to station

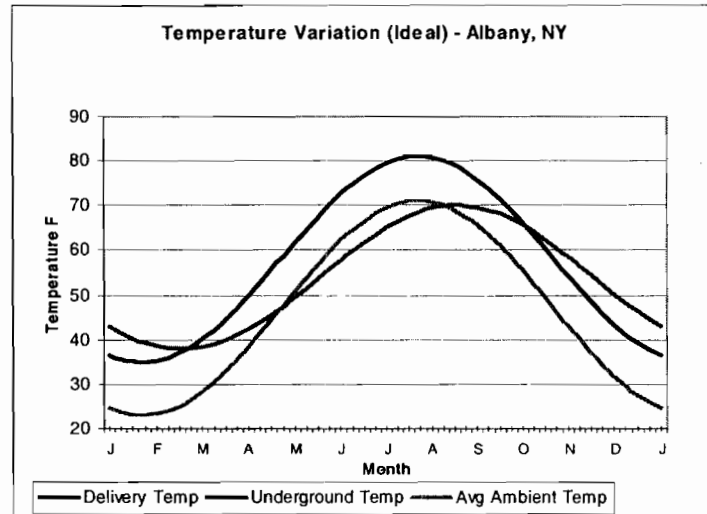
AST's vs UST's – we'll see that this relationship changes with the seasons

Station Effects – relate to Nebraska study – temperature coming out the pump nozzle can be very different from the tank temp.

Hot Spots – define as refiner supplied stations getting fuel hot from refining tower Example Omaha truck stop that may have been the start of the Independent truckers interest

Heated products – running lines through heat exchangers for #6 oil – Is this fraud?

Temperature Variation – Albany, NY



Critical Elements review NY retail station data – Product curves derived from data from a 1 million gallon a year dealer (~3 loads a week)

Amber line from Weather service data, Blue from terminal delivery tickets, Violet from underground tank monitoring

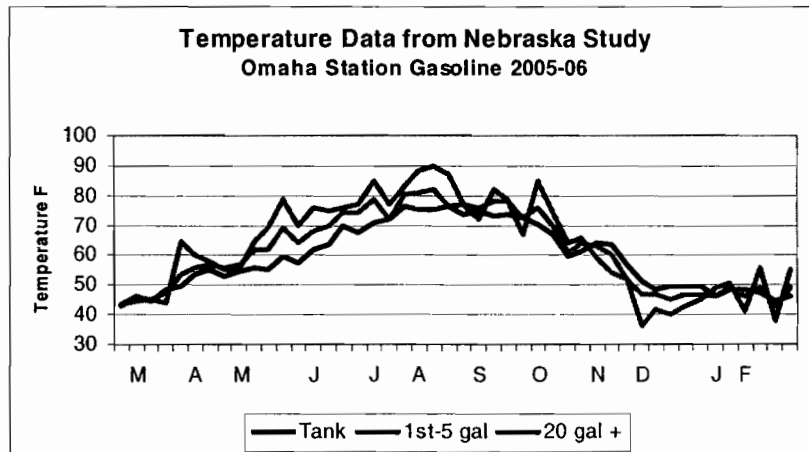
Above ground is much hotter than ambient (I predict due to solar heating)

Above ground vs below ground has seasonal variation

Below ground is apparently affected more by supply temp than by underground temp typically 55 F all year.

These curves typical of every underground tank situation, move average up or down and shrink or expand peak to peak variation

Temperature Variation – Omaha, NE



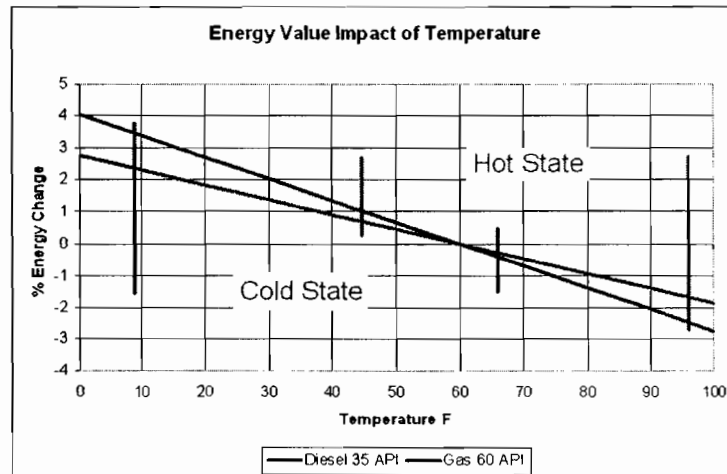
Compliment NE W&M for this important study.

Show how the tank temperature is very similar to NY data

Focus on station effects showing differences between what comes out of the nozzle and what is underground.

Note +20 F differences in mid May and -15 F difference in early Dec

Energy Value vs Temperature Gross Volume



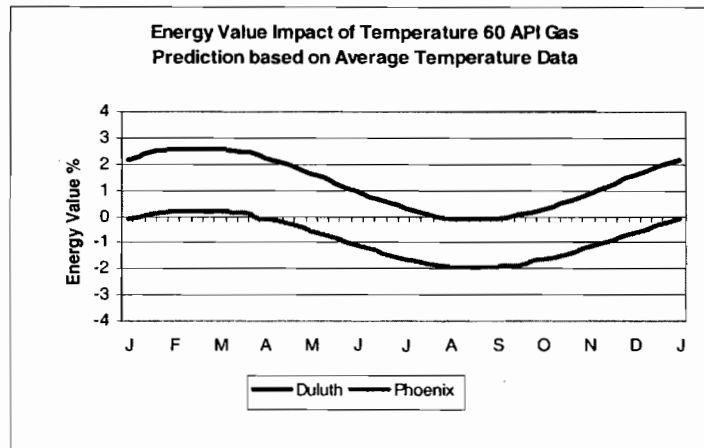
Very important graphic of the impact of temperature.

Show Diesel curve and gasoline curve. Show national scale of differences.

Then focus in on regional/local variation, comparing cold state and hot state.

Point out that linear relationships can often be corrected. But let's look from a different angle.

Energy Value vs Temperature Gross Volume - Gasoline

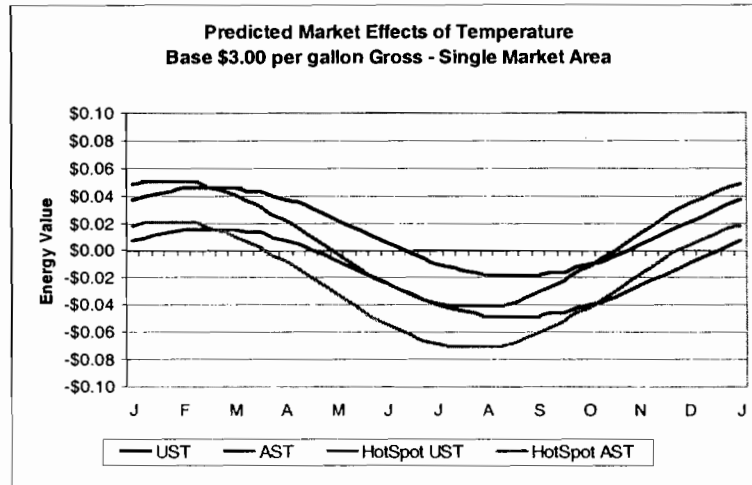


Climate information from NCDC Hydrocarbon values from API Table 6b

Seasonable representation for two different stations with underground tanks and extreme climates

1. Does not include station effects
2. They really don't compete against each other!
3. Advantages and disadvantages only a few % and they have been with us for 4-5 generations

Energy Value vs Temperature Gross Volume Gasoline & 25F Hot Spot



Confusion and variation make real comparisons difficult

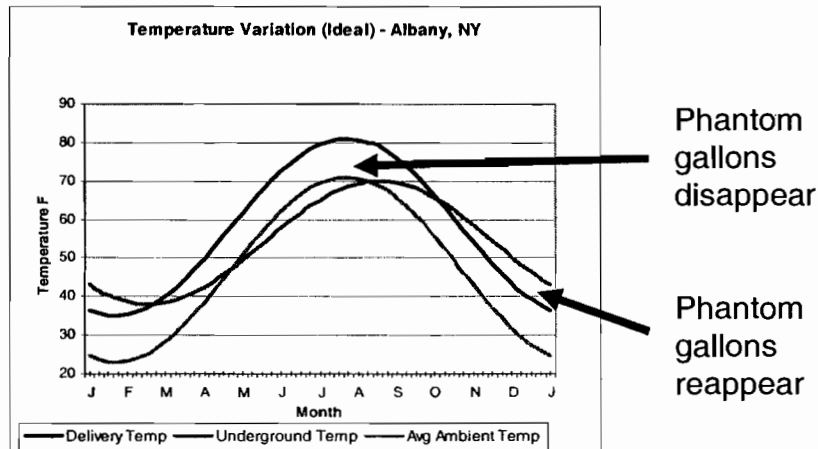
Explain how a hot spot works and what we know about differences between above (AST) and below ground (UST) storage

Explain that a hot spot can be more than 25F different.

Add on top of this the station effects identified in the Nebraska study.

With ATC and conventional fuels all of these curves flatten out and end up at zero all year long.

The Cause of Phantom Gallons



Phantom gallons is a universal problem for the retailer with underground tanks. Inventory losses at some time of the year and gains in other parts of the year. They are somewhat predictable based on the temperature differential between the supply tank and the underground tank. More gallons disappear than appear since the differentials are different.

Talk to your retail dealer, hot state or cold state, and they will tell you this is so. How have they dealt with it? They raised the price accordingly.

Heating Oil and ATC

- Why was heating oil first to convert retail to ATC in ME, NH, OR, PA?
- Heating oil is stockpiled while most fuels are supplied just-in-time
- Oil dealers saw product shrinking long before they could sell it
- Vast proportion of the product is sold during cold seasons

Focus on the stockpiling and the resulting shrinkage.

Have gasoline or diesel fuel retailers used temperature to their advantage? Not likely. It does not hang around long enough between time purchased from distributor and sold to customer. If someone is taking advantage of temperature, it is probably not the retailer and that is who the ATC proposal is directed.

Where the fuel hangs around, people corrected accordingly. Price always went up during the winter and dropped during the summer. Did the people with big tanks that bought their winter supply of heating oil in the summer really get a bargain? I suspect not. They just got expanded gallons at a reduced but probably fair price.

Positives of Net Volume

- Temperature variables virtually eliminated
- Phantom gallons almost disappear
 - Impacts retailer inventory control
 - Impacts tax and environmental accounting
- Advantage of Hot Spots eliminated
- Consumers get assurance that correction has been made for temperature effects

Good for retailers and good for consumers.

A whole mess of uncertainty caused by temperature would essentially disappear.

Will Consumers See Lower Prices?

- Regulators have NO evidence to suggest that prices will drop after ATC installed
- If the market has corrected for temperature all along, there will be no lower prices, just verifiable correction
- Several Attorney Generals looked into the fraud charge, but none have prosecuted
- FTC says fair competition is the key!

This is the million dollar question. Remember my first slide about the delicate balance. What evidence do we have?

If the NCWM moves to ATC because we think it will lower prices and help those that are hurt by high price of energy, we are doing a disservice. That's not why we are here. We can only hope to foster fair measurement and allow the market competition to force prices down.

Don't take my work for it.

FTC Investigation Post Katrina Spring 2006

- Thus, if there is a “right” price for a commodity, it is not necessarily the low price; rather, it is the competitively determined market price. Relative to past prices, a competitive market price may sometimes be low, and it may sometimes be high; but it will send an accurate signal to producers to manufacture a sufficient amount of goods and services that consumers want to buy at that price, and an accurate signal to consumers to reallocate purchase decisions.

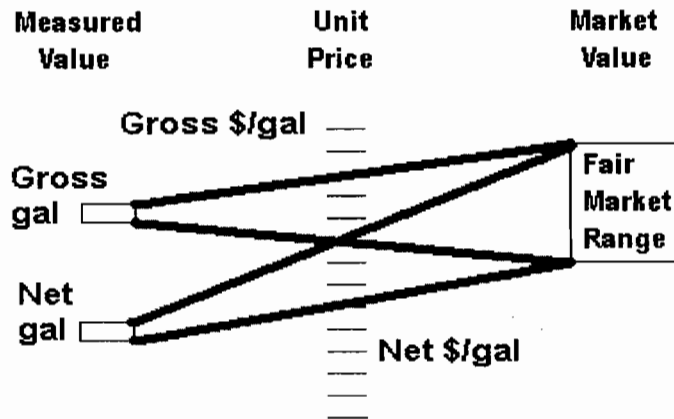
Consider the FTC report commissioned by Congress after the Katrina price spikes.

Conclusions, price gouging laws were generally ineffectual and only had value in supply disruptions due to state of emergency.

FTC found no evidence of collusion in forcing the price up. Also found that the price rises could be explained by reasonable market forces.

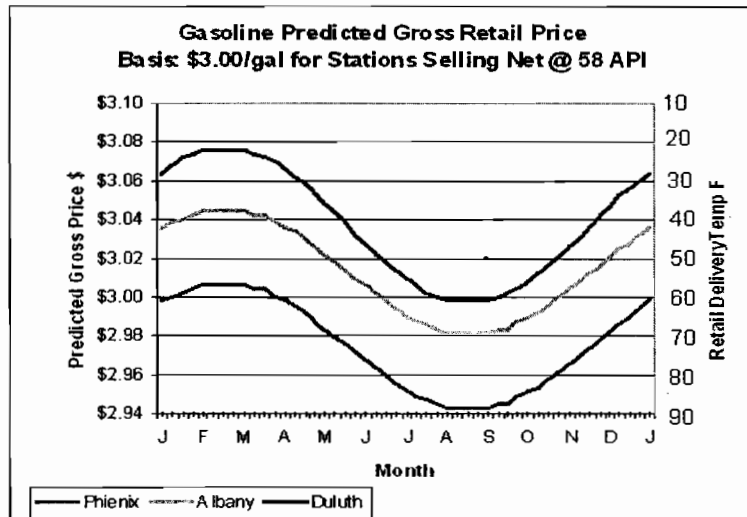
Concluded that the fair market is critical to keeping supply up and price down.

Market Pricing



Critical to understand that "value" is not dependent on the measurement method. Tim Columbus in his testimony to Congress pointed this out very clearly. Do not for a second think that fuel dealers in Hawaii, where the gasoline gallon is 234 in³ are not charging more to deliver the extra 3 in³. If we have both gross and net gallons competing side-by-side, the unit price may be different but the market value (total energy cost to the consumer) remains essentially the same.

Consumer Confusion Gross and Net Competing



Explain to those that saw presentation at CWMA and NEWMA that I reversed roles since the net should remain constant throughout the year. Net remains constant at \$3 a gallon

In cold state gross price will have to be upwards of 7.5 cents more than net dealer. There is your economic incentive.

In Hot states the gross price drops up to 6 cents giving gross retailer an advantage in lower price

Voluntary ATC Creates Inequity

- In cold states, where average product temperature is less than 60F, sale by net gallons forces seller to deliver less product with options to:
- Sell at same price and make more money
- Sell at corrected lower price to grab market share (profit in increased sales)
- Something in between

There was an observation that there was no observable increase in price to pay for the equipment as dealers converted in Canada.

Many Canadian dealers made the conversion in the fall just at the point where the benefit to the dealer kicks in. They continued to charge the same price as their competitors that were selling gross. Thus they used their price advantage to pay for the equipment and pocketed anything left over.

Voluntary ATC Creates Inequity

- In hot states, where average product temperature is greater than 60F, sale by net gallons forces seller to deliver more product with options to:
- Sell at same price and lose money
- Sell at corrected higher price to maintain profit margin yet lose market share (profit lost in decreased sales)
- Something in between

The dealer converting to net in hot states is already at a pricing disadvantage and will not be able to hide his losses and I predict we will clearly see the price of the equipment appear in hot areas as price increases.

Negatives of Net Volume

- \$ Cost to convert all US retail devices, the delivery and regulatory systems
- Necessary transition period changing gross to net with consumer confusion
- Under voluntary conversion, economics presently works only for cold states
- Ultimately net volume will prove ineffective in predicting energy value!

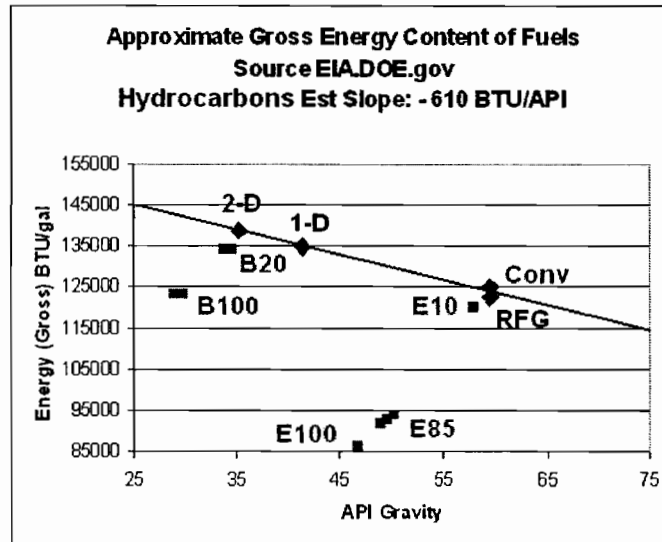
We have not really addressed the cost to change the wholesale chain. Remember that while large terminals may have equipment to compensate, the many dealers in between the terminal and the retailer, will also have to change.

Consumer confusion stems from being unable to choose effectively between advertised prices, gross and net, without a calculator, some temperature charts and some knowledge of the product temperature on that day.

A generation from now we, let me rephrase, YOU young guys will be right back here again talking about the fact that net volume is not predicting energy value effectively.

Allow me to digress for just a few minutes.

Energy Value vs Composition



If we were talking only about hydrocarbons, we see that energy tracks product density (lower API means higher density = higher energy). Consider that even #6 oil seems to fall on that line.

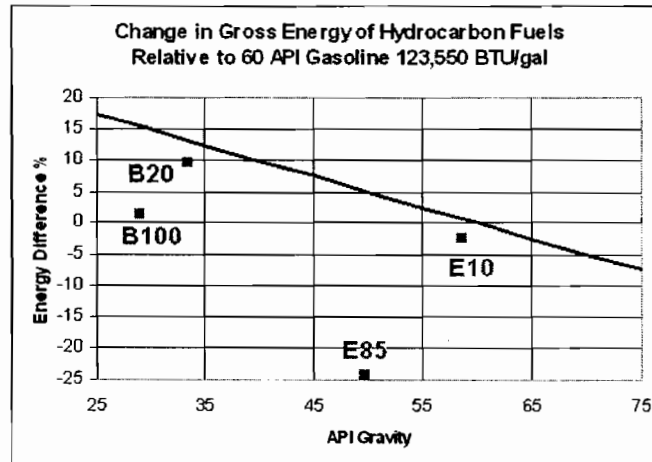
The addition of alternative fuels only compounds the confusion. B100 and E100 are significantly more dense than hydrocarbons yet have significantly less energy. The blends too make it difficult to make price comparisons.

Point out that we may see additional blends in between those presently on the market. Consider E30 or E50.

Let's look at this another way, remembering that we are talking about fixing temperature that has about a 3% range in any single market.

Energy Variation - Composition

Hydrocarbon & Bio-Fuels



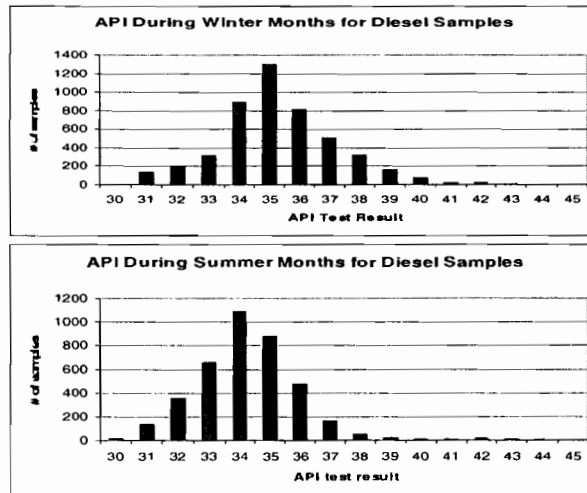
Essentially a Gasoline Gallon Equivalent @60F (like CNG)

Lets plot energy content difference of 1 gallon of other fuels relative to gasoline.

A compensated gallon of Diesel is about 12.5% more energy and E85 is about 24% less.

Where will Hydrogen fit? How do we get electricity on this graph?

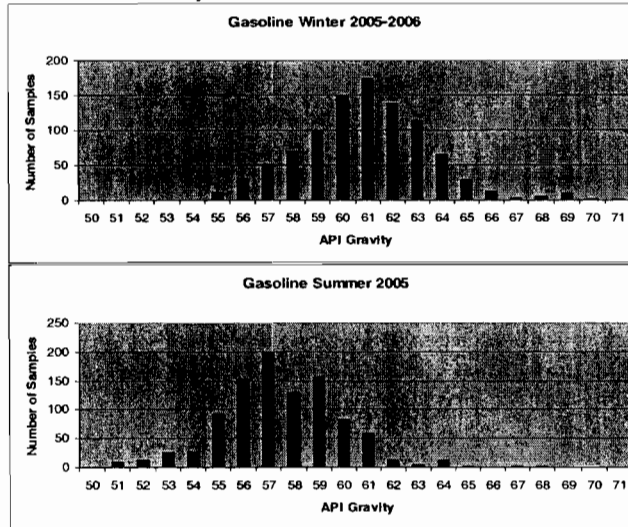
#2 Diesel Winter/Summer Variation NY 2001-2007



Are there seasonal changes to think about?

Not too much for diesel fuel. That tailing to higher API for the winter is due to "cutting" with D-1 to improve cold flow. With ULSD, that will be less and less important since most apparently will be using additives to avoid having to stock D-1 @ 15 ppm.

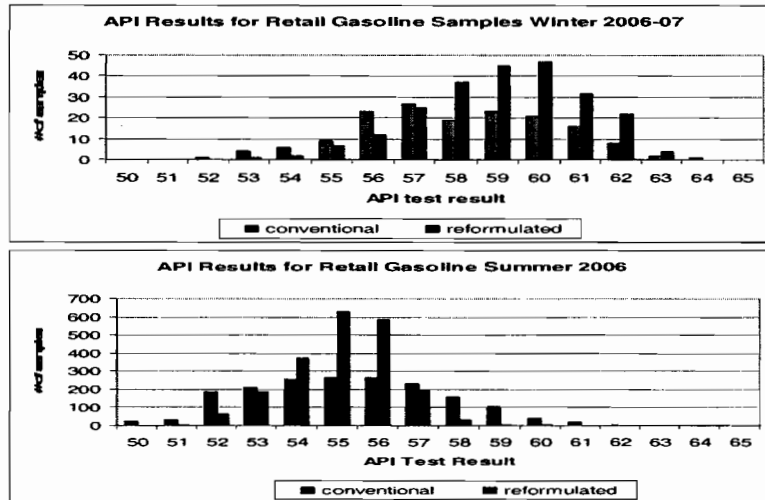
Gasoline Winter/Summer Variation Northrup Grumman 2005-6



Graphs: H. Oppermann

For gasoline there is a differential. As it turns out, those 4 API shift represents ~2% of energy value. That's 2/3 of whatever we are going to get from ATC. And it actually now almost works against the effects of temperature.

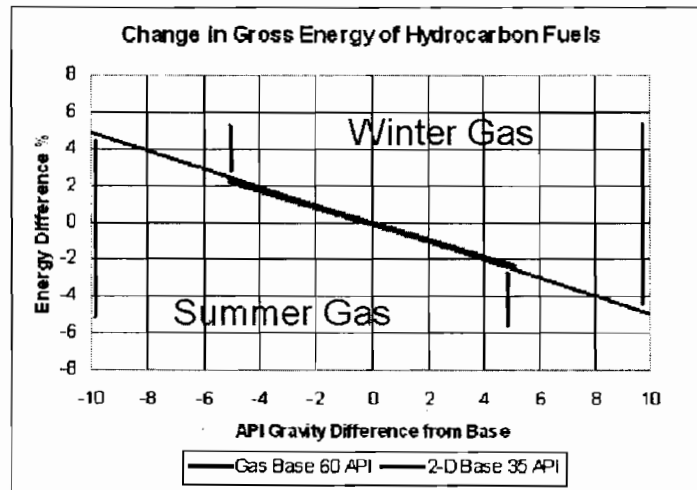
Gasoline Winter/Summer Variation Summer '06 and Winter '06/07



We are gathering data from other state quality programs to look at appropriate API values on which to base ATC.

Energy Variation - Composition

Hydrocarbon Gasoline and Diesel Fuel



Remember the temperature curve. This is essentially the same but shows what you have left even after correcting for temperature.

These are temperature corrected gallons. Impact is about 6-7% from lowest value fuel to highest for gasoline in the same season (winter 70 – 55 API and Summer 65-50 API) and almost 10% variation over the entire season and range of API (70 to 50 API).

Impact is about 5% for diesel fuel (40 to 30 API) because composition is more consistent.

Why is Energy Important?

- With Flex-Fuel vehicles, the energy content directly affects the miles per \$ spent on fuel
- Traditional fuels will be competing with alternative fuels, including electricity!

E85/Gasoline Vehicle

Alternative Fuel Vehicle Buyers Guide Manufacturer's Estimated Cruising Range Miles for One Tank	
Alternative Fuel	Gasoline
268 - 341	356 - 455

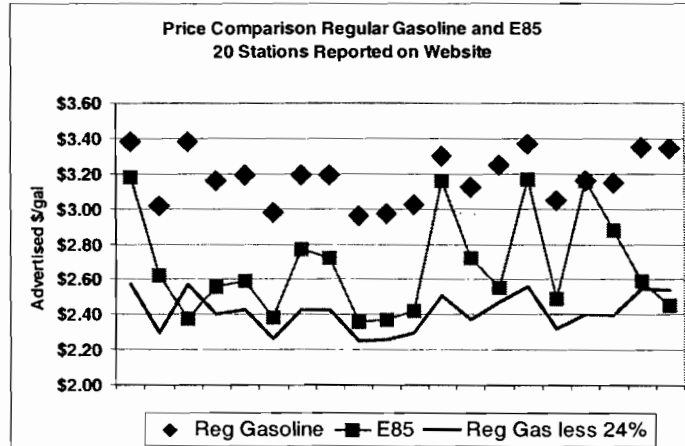
24% less miles with
E85 alternative fuel!

In the past, gasoline did not compete with diesel or other fuel so this was not an issue.

However, the future is going to be complicated for consumers because flex fuel vehicles are going to be everywhere. Choices will abound between gasoline and E10 or E85, gasoline and CNG, Gasoline and Electricity. With units of gallons, how will consumers make comparisons?

Shouldn't we at least recognize that fuels should be sold in units of energy even though we may not yet be able to do that?

Flex-Fuel Choices



Price Data from CleanAirChoice.com

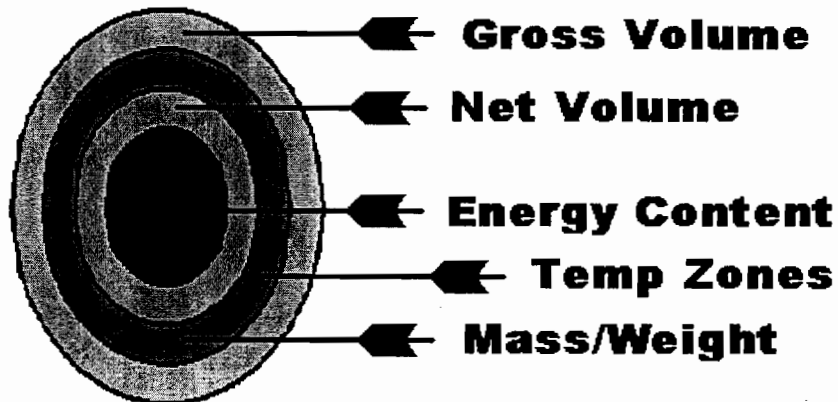
E85 Energy content ~24% less than regular gas!

To be competitive, E85 should be about 24% less expensive than gas, because it contains 24% less energy and takes you 24% less miles.

Market seems to be about 20% less with some cheaper and some more expensive.

Consumers ought to know that they are paying more to be green.

Measurement Options Not All May be Doable Today



A bulls eye is measuring energy, but technology is not readily available.

Other options:

ATC technology has the potential to infer mass (an equivalent of coriolis mass flow) and that might be better than gross volume. Problem is that the alternative fuel problem is actually exacerbated if we were to measure fuels in terms of net weight, since B100 and E100 are more dense, e.g. a kg of E85 is 34% less energy than a kg of gasoline,

A note about zones. It is elegant for Hawaii, where annual swing is only ~9F. But will it work effectively where temperature swing is larger and it doesn't deal with station effects or resolve hot spots.

Net volume gets us closer to energy value than gross volume or mass, and remedies some sticky problems.

ATC represents only one step, but an important step, closer to the bull's eye of energy measurement. We can do it now.

Uncertainty Issues

- Will ATC be more “accurate” or more “reproducible” as L&R has claimed?
- Can it possibly be more accurate, when you must add several new uncertainties to the equation for temperature?
- Where are the figures to support such an assertion?
- Better term for ATC “More Representative”

The Committee report states that ATC “could only improve the accuracy and repeatability of a volumetric measurement.”

Number of problems with that statement!

ATC can not possibly be more “accurate” because there are a significant number of additional uncertainties in the measurement. What about the Nebraska data showing very large temperature swings in the retail pump? How can we get accurate temperature readings in our prover for comparison.

Much of the experience is based on larger volumes in wholesale meters and LP where temperature is more stable. Great to say ATC works fine when you have a stable temperature. What will happen in real life situation at the dispenser on the island in the sun, under a canopy, long piping between tank and pump, etc.

We will have to sacrifice some accuracy to get a measurement that is more “representative” and we should be careful to state it that way.

Rough Uncertainty Estimates

Cubic inches for 5 gallon draft

Product	Gross	Net
Gasoline – Lab TE	1.1	1.9
Gasoline – Field	2.0	2.8

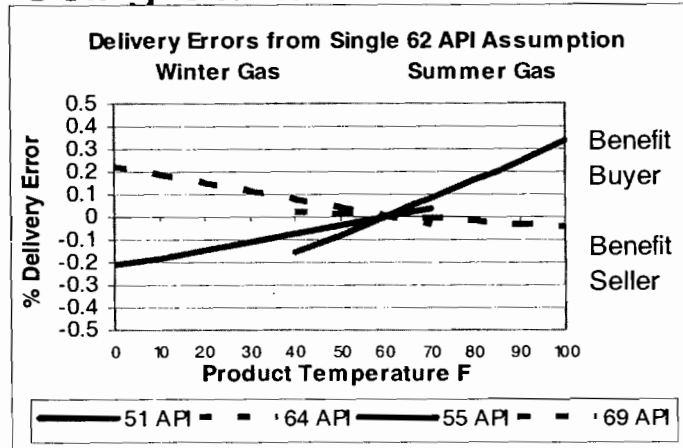
- Present Acceptance Tolerance is 3 cu in
- How does this impact both our tolerances and our 1/3 accuracy rule?

Every field inspector has seen the volume rise in his prover on a hot day and fall on a cold day.

My expectation is that we run a significant risk of lowering our compliance, and not because of any fault in the device. We will make mistakes because of our uncertainty in making the test. That is a scary reality.

Our experience with electronic ATC on LP meters tells us these devices work very well. As long as temperature probe is working correctly (close agreement with our thermometer) the ATC device will be more accurate than our ability to test it. The uncertainties due to the temperature effects on our 5 gallon test measures will make our jobs very difficult to avoid passing devices that should fail and failing devices that should pass.

The API Gravity Question Using Canada 62 API Value



Summer gasoline would put seller at a disadvantage.

One of the unresolved issues is the product density or the industry calls it the API gravity.

Canada uses a single API/density for each defined product, e.g. gasoline is 730 kg/m³ which corresponds close to 62 API. They selected those densities after careful consideration and put formally put them into regulation.

We in the US have just begun to look at this crucial issue. In this graphic you see how energy value changes with composition and temperature. The picture appears pretty good for the winter gas but we see an obvious bias against the seller for summer gas. In Canada we can predict that even with summer gas, at the temperatures they see, the impact is very small.

In contrast, the single API gravity puts retailers at a distinct disadvantage at about 1/3 of the applied tolerance for average fuel sold in the US. Should we be considering a two API standard based on seasons, i.e. 62 in winter and 58 in summer? What about other products? What about alternative fuels where we don't have established values?

What about TAXES?

- We know most state and federal taxes are collected at the terminal level
- We don't know on what basis, net/gross!
- Could changing from gross to net have significant impact on revenues? Potential for California \$70,000,000 shortfall/year
- Shouldn't we be sure the Tax Collectors are on board with a change?

We don't know on what basis taxes are collected. We do know that they are collected at the terminal level and passed down to the retailer and consumer. But are they gross or net. In NY they're gross.

Cold States, net will see more gallons sold making tax windfall.

Note: Canadian consumer group website making a claim that ATC was just a ruse to raise taxes.

Hot states see opposite and may see tax shortfalls. For California with 15 billion gallons of gas per year Using the KS Star's figures, this could be a very significant amount. Ballpark \$70 million a year if tax collected on gross.

Also increase in taxes in cold states means increases in highway funds as 90% of the federal tax goes back to the states. Losses to hot states.

Are there hidden consequences that we should try to avoid by contacting the Tax people before we act? NY uses gas tax in metropolitan area to support mass transit. ATC means less gallons sold in NYC and may mean less tax to support mass transit.

This is just to ensure that we are communicating with our tax counterparts to inform them of possible ramifications of this change to the method of measurement.

The REAL Issues Supporting ATC

- Inequity: Hot Spots
 - Markets where some dealers can purchase and sell hotter product than their competitors.
- Inequity: Above Ground vs Below Ground
 - Above ground hotter than below ground in summer and reverse in the winter.
- Verifiable adjustment for temperature effects
 - Reduce shrinkage and taxes on Phantom gallons
- More sensitive leak detection (environmental)

Once we get past the fraud claim, there are still important reasons to look at ATC. As measurement specialists we understand this.

Hot spots- define as direct from refiner still hot from the distillation tower. Perhaps at temperatures above 100 F. May have been the hook for the truckers. Diesel fuel at truck stop selling several tanker loads a day. Product can't cool down! One % or 3 cent price advantage over dealer with underground tanks in summer and more in winter.

Make note of 5 times better leak detection based on the retail dealer data from Albany NY dealer.

ATC Big Winner: The Retailer

- Will provide better inventory control, reduced shrinkage for underground tanks
- Associated costs are passed to buyer
- Fair competition will drive pricing
- Disruption to competition in interim period
- Upgrade cost may impact smaller dealers more than high volume dealers
- Fair Competition benefits everyone

After careful analysis, If anybody gains from ATC, I believe it is the retailer. But be careful of what we expect as "Big?"

Shrinkage has been a big issue for generations in the retail gasoline business.

Competing against vendor selling hot fuel is another issue (hot spots).

Remember, I believe this is what got the truckers interested.

Above vs below ground storage produces temperature differences and pricing advantages. Even with all of this the retailer is adamantly opposed at this time. How can we speak of consensus when the sellers we are charged to protect, do not want us to act?

I spoke to my retailers a couple of times already since the KC Star articles hit the papers. Some retailers are for it (we are cold state north of NY City) but they wanted to be able to convert as part of a business plan. Others felt this was just another ruse to give large volume dealers more advantage over small dealers. Larger volume allows them to recover upgrade costs more quickly with less interest costs.

I urge the retailers to get on board. Once you get it you will think it's the best thing since sliced bread.

Concerns with L&R Proposal

- Where was the consensus?
- What is the rush when we won't have any devices for almost 2 years?
- Technology exists but we don't have information to pick product densities
- Indefinite time with two methods of sale makes market correction difficult
- Where is the "Plan"?

Express appreciation to the committee members that are sitting in very hot seats. Those people on the Committee were not charged with solving this great big issue. Remember that they asked for a work group some time ago and they continue to search for the best solution. What about the steering Committee that just began its work a month ago? Let's consider that this proposal is a flag run up the pole. Here's why I can't salute yet!

At the interim meetings, after the presentations, they opened the floor for comments to the L&R Committee. We did not see a herd of folks from the Western and the Central running to the mike supporting their permissive proposals. I heard questions to the Committee asking where they were heading so we could react to their proposal, with no response. Those of us in the audience saw no consensus. Certainly a lot of political drama but not much consensus.

What about the adamant opposition of half of the marketplace we are bound to protect? There was no clear comment in the L&R discussion why they did not accept their comments. Will we face opposition in our adoption of the L&R proposal because we essentially ignored this opposition?

This transition from gross to net will be anything but seamless for consumers. In hot areas it will take very brave retailers to be the first to jump in to ATC use since they will be entering uncharted waters and may lose customers (jumping in even under permissive requires you swim for 12 mo).

Beyond the warm fuzzy that temperature will be accounted for, what can we promise consumers? How many of you state directors are prepared to put into a regulatory impact statement that you expect motor fuel prices to drop once ATC devices are in place?

What does the proposal really do? Without the device specs, nothing! How about the fact that it gives those that the KC Star said were losing the option to recover losses but puts absolutely no pressure on those that were gaining to make a change.

I have come to understand that Wes Diggs is right and we either have to stay with gross gallons or move entirely to net gallons. I'm pleased that Mike Cleary also made that point effectively at the congressional hearings.

My big problem with the L&R proposal is that it does not represent a "plan."

The FCC Plan for HDTV

- Late 1980's - FCC solicits proposals on HDTV
- 1993 - Formation of Grand Alliance to set HDTV standards – built voluntary CONSENSUS
- 1998 – Digital TV sets available and digital broadcasts commence
- 2007 - TV broadcasts mandated to be digital, provided 85% of receivers capable of receiving signal
- 2009 – All analog broadcasts cease and frequencies return to FCC
- Virtually seamless for Viewers

Review steps taken and emphasize that viewers were almost not aware that a revolution was going on around them.

Note that it took 5 years from formation of the work group till first digital TV sets and broadcasts hit the market.

We should be able to work much faster since we are already familiar with the technology from wholesale and LPG.

A Possible Plan of Action

- Make it clear the NCWM wants ATC
- Resolve Tax questions
- Prepare Method of Sale regulations
 - Build consensus on date for permissive ATC
 - Consider mandate for new equipment
 - Select a method to define a date for universal implementation of mandatory ATC
- Prepare HB44 specifications sections
- Update Pub 14 to permit NTEP approval

Without knowing the specifications, will manufacturer's venture to market devices that may have to be retrofit almost within the year that they are sold? Even if the L&R item was to pass, it's still 2 years before we see an NTEP approved devices appear in the marketplace. Waiting one year to do the S&T and L&R together will not hold that up even one day.

Difficult for the NCWM to deal with this issue and particularly to see the L&R implications separate from the S&T/NTEP implications. We also have to be sensitive to our impact on others like tax and environment regs (spill prevention) so as to not cause harm in other areas.

The more I study it, the more it becomes clear to me that we have to be thinking about mandatory down the road. If we make a plan, that can certainly be part of the discussion.

I believe this is really tough stuff and it will take perseverance and patience to get it done right. Don't rush just to look good. Doing the right thing takes careful planning and sticking to our basic principles. Isn't the idea of consensus standards central to our mission.

ATC now has a full head of steam and we are on schedule to take very important steps at our next annual meeting to make it happen. Let's pledge to do the work necessary over the next 6 months to bring proposals to the next Interim Meetings that can bring about consensus. Let's do the right thing and stick to our charter to serve both the buyers and sellers of fuels.