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

Thank you for the opportunity to comment on the final draft of the study of temperature impact on fuel delivery. I wish to commend the Commission on the detail in the report but wish to note a few items where I see technical errors and some other items where I think the presentation of information could be improved.

Technical Issues

1. I see an incongruity in the figures calculated for ATC equipment for new or refurbished stations. As I read the report and evaluated the numbers, I found that the estimated number of 550 new dispensers installed each year (page 69) to be unreasonably small. If it were an accurate number then the population of dispensers in California would be up to 75 years old. I calculated that from the reported 41,700 dispensers at 9,000 retail stations in the state. Dividing 41,700 dispensers by 550 replaced per year comes to 75 years. I suspect this is a simple error of units conversion. The footnote on that page shows that county officials reported 6,671 new meters installed in the last two years. The W&M community has long had disparate methods of counting devices and this kind of error is common. If the units are actually "dispensers" instead of "meters", the approximate 3,300 new dispensers installed each year results in a population turnover about every 12.6 years, which I find much more reasonable than 75 years. The impact of this minor adjustment is a 6 fold increase in recurring costs to replace ATC equipment as stations are refurbished or new stations added. This substantially increases the recurring industry costs in Column 3 in Tables 7 and 8 (page 79), this in turn drives the costs to implement ATC up and drives the benefit figures even more negative in the last column. I do recognize that these figures were not available for review at the previous work session in September.

From testimony at today's Workshop it appears there may be an expected anomaly in the refurbishing cycle to meet the mandate to have encryption on credit card readers. This may result in even higher replacement rates in the first few years should California decide to implement the CEC plan of ATC implementation as stations try to catch up. In either case, I recommend that the Commission carefully review the data to find the most appropriate number so the recurring costs are realistic. I expect them to rise about \$4 million a year.

2. With regard to tables 7 and 8, I also suggest that these be adjusted to reflect the proposed implementation schedule proposed on page 100. Since new equipment will be being installed several years before the ATC is system is turned on, the cost pattern portrayed in the tables is not in sequence and thus not reflective of the actual situation. It will be upwards of 3 to 4 years before the deadweight loss correction can actually be added as a benefit, even though the initial and recurring costs are already accruing. In addition, I anticipate retailers in a hot state will wait till the very last minute to turn on the ATC equipment since the change will drive the retail price higher for net gallons as compared to gross gallons. Those retailers that wait till the last minute will be able to advertise a lower price than competitors that activate the ATC equipment. This will further delay the benefits. There are also incorrect units in Tables 7 and 8 as the dollar values are labeled in \$ millions but expressed in \$.
3. I believe the statement regarding retailer monitoring of temperature on page 76 is not valid. I quote two sentences from the third paragraph on that page:

“But revenue recapture will be neither precise not consistent, because station operators will not monitor temperature continuously and adjust prices accordingly to compensate absent any other competitive factors. However, staff believes that the retail station owners, in aggregate, will be successful in recovering this revenue shift over the long term assuming the industry remains profitable as it has been over the last several years.”

The two sentences I believe are incongruous. If the industry has remained profitable and competitive with tight margins as evidenced by other statements in your report, then I interpret that to mean they closely monitor important effects like temperature. The statement seems to imply that retailers are working in the dark and have no clue what effects temperature have on their business. I have shown in my written works and presentations that retailers are provided clear temperature information on every bill of lading/invoice they get. I am not referring to the actual temperature but the difference in gross and net gallons on the invoice that they receive with each new load about every 1.8 days according to your analysis.

I contend that retailers are correcting for temperature effects in the retail price with every load. Essentially I contend that the retailer does not even get the price per net gallon but rather individual price extensions for each component of the total price. That includes the wholesale price of the fuel, each of the state and federal taxes, transportation costs, and supplier discounts. There is no need to compute a wholesale net price per gallon (dividing the total invoice price by the net gallons), since the unit price he needs is the gross price per gallon computed as total invoice price divided by gross gallons available for sale. By this I mean the value of the product can be fairly described either as \$/net gallon times net gallons or the equivalent \$/gross gallon times gross gallons. For example: if the retailer buys 9,900 net gallons @ \$2.525/gallon that equals \$25000 total cost. If he sells 10,000 gallons @ 75 F (a 1 % increase) @ \$2.500/gallon (a 1 % decrease) and recovers \$25,000 there is symmetry and fairness.

The problem I see is confusion between micro changes in temperature as described in Figures 7 and 8 and macro changes in temperature during the yearly cycle in Figure 3.

Systematically, I submit that the retailer gets new temperature information every two days with each new load during the annual cycle. Thus he is constantly tracking that slow temperature sine curve in the annual cycle. Even in the fall and spring when temperature change is the quickest, the rate of change for the daily average temperature is still not more than one degree a day for most of California and it takes several degrees to really impact the price at the pump. The variation in Figures 7 and 8 are somewhat random effects and each customer has equal chance of getting warmer or colder fuel. As explained by Mr. Flynn's Monte Carlo analysis, the variations around the daily average for the annual cycle are mostly symmetric and appear to be normal distributions. In fact the consumer is likely to only see only a little over 50% of that the benefit of removing the deadweight since the temperature varies on both sides of that daily average. He demonstrated that these variations are likely to have little if any impact on the aggregate. I believe your overall conclusion that station owners are successful in cost recovery is the direct result of the ability of the retailers to be highly efficient in monitoring and adapting to temperature changes during the annual cycle and in aggregate getting to the right price per gallon when selling on a gross basis. I also think this is reflected in the inventory balance at the station where neither the tax nor the environmental agencies seem to find problems. If retailers were buying net and selling gross in California they would be amassing inventory surpluses.

### Presentation of Report

Although I reread the report several times, the last time I read it trying to ignore what I know as a technical expert on the subject and think and read it as a legislative staffer being asked to review and digest this lengthy and complex report. That staffer is not necessarily schooled in measurement issues or in economics. He/she is not really interested in all the technical details that interest us, rather in easily finding the right conclusions and the supporting data. Thus the report has to provide a direct path to the important facts and figures and the connections between them and the conclusions. To this end, I offer the following suggestions.

1. In the Abstract, the options that the Commission considered are written in the terms of the authorizing bill. I am not sure the reader will understand how the Commission interpreted the meaning of the first option, i.e. retaining the 60 F reference. The Commission, in the staff workshops, presented that option as maintaining the status quo, and I suggest that be made clear right from the start in the abstract and at any other point they are referenced in the report.
2. I agree with the Commission that the question of why ATC never made it down to the retail level is critical. This is the first question asked in the Executive Summary. However, after reading the report several times, I can't find that the Commission ever satisfactorily or openly answered that question. John Siebert of OOIDA also mentioned this in his comments. Certainly that answer should have a prominent place in the analysis. Perhaps an expert in the field may be able to glean it from the many pages of facts, figures and analysis, but I suggest that it should be easy for the reader to find. The answer should reflect the some of the economic relationships between wholesale and retail. For example, shouldn't the report show that costs to implement ATC at retail may be significantly higher than wholesale since there are more devices at retail and they dispense far less product? In New York we estimate about

90,000 meters in use at retail and about 1,800 at wholesale. This is about a 50:1 ratio. Thus for every ATC conversion at wholesale, there will need to be about 50 ATC conversions at retail and each retail meter converted will do about  $1/50^{\text{th}}$  the sales volume of a wholesale meter. This relationship highlights the simple principle of diminishing returns. Thus what works at wholesale does not always make economic sense at retail. I believe the report has to clearly bring this out and not hide it. I see no bullet point in either the analysis or the findings making any statement to that effect.

3. The handling of temperature information at the retail business is glossed over in one sentence. On page 7, there is reference to the Commissions finding that retailers in California purchase their inventory in a net gallon basis, without providing any explanation of what that entails or what it means.

I and others have tried hard to ensure that the retailer's handling of temperature information in setting price is properly explored and understood. Without that, that reader is going to think the hot fuel fraud is possible. It is vital that it be clear how the retailer makes the conversion from net gallon units under which he bought his product and the gross gallon units under which he sells his product. I also note that virtually many retailers have to do this as the terms of wholesale transactions are often in different units of measure than actually used by the retailer in dealing with their customers. For example, a retailer may buy by the gross (12 dozen or 144 count) and yet sell by dozen or by each. To evaluate his costs he is forced to make a units conversion. I provided this kind of analysis in my presentation to the Commission as did both of the economists that commented at the hearing today.

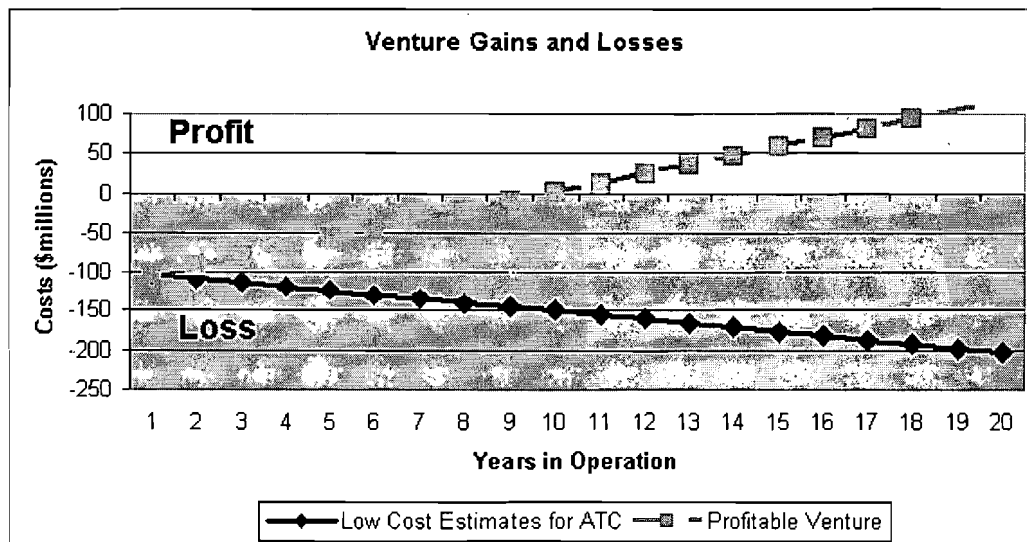
Another important fact is that the cost of goods sold is not handed to the retailer. I've never seen it in \$/gal units on an invoice and I've seen quite a few. Instead, each cost is itemized on the invoice. The retailer has to add his non-fuel costs to the total cost of the fuel purchase to calculate his target selling price as a function of total costs for inventory received divided by units taken in to inventory and available for sale. I find the report clearly explains the impact of temperature on the fuel and the effects of fuel density but find little or nothing about the competitive forces that drive the sales price to compensate for these variables when selling on a gross basis.

I supplied analysis of this units conversion and so did the other economists that testified at the workshop. I liked the analysis that included the markup to show that the cost of the fuel remained unchanged regardless of whether the fuel was sold on a net or gross basis. That analysis shows that a few degrees difference between delivery temperature to competing retailers does not really result in significantly different values for gross retail cost before markup, since pricing moves in whole cent increments.

4. On page 7 there is a conclusion stated as "...the transactions that occur throughout the entire distribution chain of transportation fuels do not use a standard unit of measure." I am confident that the Commission's use of the word "standard" is not inferring that the gross gallon units used at retail today are non-standard units. Thus that word may not be conveying the precise meaning desired. I might suggest changing the word "standard" to "consistent" or "the same." I believe either would better express the intent and not confuse the reader. The word standard is also used in the same context again in the first paragraph on page 78 and may appear elsewhere.

5. I am also concerned about using the word “standard” to describe 60F reference value used in the compensation tables and in the device software. This occurs at many points in the document. For clarity, I would recommend using only the technical term “reference” instead of the much misunderstood term of “standard” when referring to the 60F reference.
6. In Tables 7 and 8 on page 79 and in the conclusions in Chapter 8, I do not believe that expressing costs solely on a per year basis or per gallon basis conveys the full impact. In fact they make the cost appear to be quite small. It would be better to also to see an aggregate sum. I believe that an aggregate sum representation carries far more impact on the reader. The aggregate sum will show that the payoff or breakeven point never arrives. After 10 years, using the low-ball estimate in the draft, the aggregate sum of costs is over \$142 million and the sum of benefits only \$29 million. At 20 and 30 years those numbers grow to \$187 million cost for \$61 million benefit and \$231 million cost for \$93 million benefit, respectively.

We might expect some cost reduction in replacement ATC equipment to occur over time as companies recover their R&D costs. However, that is still going to have to be very significant to ever drive the cost benefit numbers out of the red ink. Essentially a profitable enterprise will eventually get out the negative numbers in a period of time that is shorter than the expected equipment replacement cycle, e.g. 12 years. This scenario obviously doesn't. In fact it never even starts to grow toward a payoff. Here too I would like the Commission to help the reader by explaining that positive numbers in the cost/benefit column are good for the consumer and society and negative numbers are not. The findings in Chapter 8 for Chapter 4 do not summarize the negative results of the CBA or the meaning. After you factor in the higher recurring costs discussed in the technical comments above, those costs will increase further. I think the reader is entitled to see that obvious conclusion stated for the record. In fact that conclusion should literally jump off the page for the reader. How about an aggregate sum graphic like the following based on Table 7 for the low cost estimate?



### Observations and Conclusions

I have been studying ATC off and on for my entire career of over 30 years in Weights and Measures. I listened to arguments on this subject going back to 1978 during the period when

Hawaii was promoting ATC to the NCWM. I correctly surmised that the Commission would arrive at the answer it did in its cost-benefit analysis. Of course there is a certain satisfaction when you see the technical economic proof of what you had discovered intuitively. I am pleased to have been part of the process and I hope that my contributions have helped the Commission. I am also proud that the NCWM did not rush in and make a poor decision on the issue. There is also satisfaction that I helped shape that decision.

As a Weights and Measures scientist, I know that variation is something that we can at best control but never eliminate. I know that the rule of diminishing returns is critical to measurement and that as we strive to make improvements in measurement to reduce variation, we see geometrically increasing costs with each incremental step. Thus we find ourselves always evaluating new technology to see if we can reduce variation at reasonable costs.

Some think that Weights and Measures regulators seek to ensure that the most accurate (tightest tolerance) measurements are used in commerce. That of course is false. Our code states it in the following section that I have always quoted in my presentations on ATC. It is taken from National Institute of Standards and Technology Handbook 44, 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. ....*

Thus our goal is better stated as setting the minimum standard, i.e. the least accurate device, that ensures that neither buyer or seller are significantly harmed in the transaction. You have shown that the harm due to temperature variation is very small and is almost equally spread between buyer and seller. You have further shown that the cost to eliminate this variation is quite large even though it might appear small on a per gallon basis. On the floor of the NCWM I stated that I felt there would come a day when ATC would pay and perhaps we were now approaching that day. An industry colleague countered claiming it won't ever pay. You have documented that at the present time under the present circumstances he was right and I was wrong.

The Commission has done a thorough job in evaluating the costs and benefits. Like the Weights and Measures regulators at the NCWM, I think the Commission has fulfilled its obligation to be objective in its deliberations. With the final release of the Commission's Report it will be appropriate to temporarily close the book on the subject until some of the parameters change to the extent that the final outcome changes significantly. That's not likely to happen in the immediate future and so it will be something for the next generation of Weights and Measures officials to wrestle with. Luckily, they will be able to plug those new numbers into the methodology you have developed to quickly do the analysis. Thus I believe that the State of California has provided an important service to everyone by commissioning the study. Thank you!