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An Economic Analysis of the *Fuel Delivery Temperature Study*

**California Energy Commission Staff Report
(CEC-600-2008-012-SF, November 2008)**

Michael A. Flynn

Principal, LECG

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Overview of the *CEC Staff Report*

- ❑ The *CEC Staff Report* is to be commended for showing how difficult it is – even after adopting unsubstantiated and one-sided assumptions – to demonstrate that mandating ATC in California makes economic sense.
- ❑ As I will show, competition in retail fuel markets *already* adjusts retail prices to compensate for the temperature-induced expansion and contraction of fuel volumes.
- ❑ There is no problem with the current performance of California retail fuel markets that requires the imposition of an ATC mandate as the solution.
- ❑ Net and gross systems of measurement are equally valid, alternative methods used to account for the same objective reality. As long as these systems are not mixed, they can coexist without any problem
- ❑ The *CEC Staff Report* relies on the unsupported – and unsupportable – assumption that retailers would be willing and able to dispense fuel in net gallons at their unchanged retail prices per gross gallon.

Overview of the *CEC Staff Report* (continued)

- ❑ The consumer benefits contemplated by the *CEC Staff Report* would be derived from a significant reduction in retailer margins that are no more than competitively normal to begin with.
- ❑ It is likely that the *CEC Staff Report* has significantly underestimated the actual total cost of its proposed *ATC Retrofit*.
- ❑ The \$438 million annual “benefit” that the *CEC Staff Report* proposes to extract from retailers likely exceeds the total pre-tax profits of California retailers.
- ❑ This \$438 million “saving” by consumers requires that retailers be unable to raise their street prices following the ATC Retrofit.

Net and gross systems of measurement are two *alternative* methods used to account for the *same* objective reality. They can coexist without issue.

In "Cold" Climate (gasoline at 45° F.)								
	Total "gallons" delivered [a]	Total "gallons" available for resale [b]	Size of "gallon" (in cubic inches) [c]	Dealer's cost of delivered fuel [d]	Dealer's Implicit cost per "gallon" [e]	Dealer's target gross margin [f]	Dealer's target sales revenue [g]	Dealer's target street price per "gallon" [h]
Measured in NET Gallons	8,082.8	8,082.8	228.61		\$2.846			\$2.969
Measured in GROSS Gallons	8,000.0	8,000.0	231.00	\$23,000	\$2.875	\$1,000	\$24,000	\$3.000

In "Hot" Climate (gasoline at 75° F.)								
	Total "gallons" delivered [a]	Total "gallons" available for resale [b]	Size of "gallon" (in cubic inches) [c]	Dealer's cost of delivered fuel [d]	Dealer's Implicit cost per "gallon" [e]	Dealer's target gross margin [f]	Dealer's target sales revenue [g]	Dealer's target street price per "gallon" [h]
Measured in NET Gallons	7,917.2	7,917.2	233.39		\$2.905			\$3.031
Measured in GROSS Gallons	8,000.0	8,000.0	231.00	\$23,000	\$2.875	\$1,000	\$24,000	\$3.000

There is a problem only if one tries to use one system (gross or net) to measure quantities while at the same time insisting on the other system to measure prices.

The consumer benefits anticipated by the *CEC Staff Report* would come through a significant reduction in retailer margins.

In "Hot" Climate									
(gasoline delivered, stored and dispensed at 75° F.)									
	Size of "gallon" (in cubic inches) [a]	Total "gallons" available for resale [b]	Dealer's cost of delivered fuel [c]	Dealer's target gross margin [d]	Dealer's target sales revenue [e]	Dealer's target street price per "gallon" [f]	Actual sales revenue [g]	Resulting dealer gross margin [h]	Reduction in dealer's gross margin [i]
<i>What the CEC Staff Report proposes ...</i>	233.39	7,917.2	\$23,000.00	\$1,000.00	\$24,000.00	\$3.000 ↑	\$23,751.60	\$751.60	-\$245.86
...compared to current transactions using GROSS quantities and prices	231.00	8,000.0	\$23,000.00	\$1,000.00	\$24,000.00	\$3.000	\$24,000.00	\$1,000.00	

In this example, if retailers sold larger net gallons at the same price they currently sell gross gallons, their margins would be decreased by about 25 percent.

But it is difficult to comprehend the “logic” that underpins the “benefits” of ATC that the *CEC Staff Report* anticipates.

- ❑ The *CEC Staff Report* assumes that retailers currently price and conduct their fuel sales in terms of uncompensated *gross* gallons. (This in contrast to the “hot fuel” activists who claim that retail prices are set in *net* terms, thus depriving consumers of the fuel “they paid for.”)
- ❑ That *CEC Staff Report* also acknowledges that these retailers’ prices are determined in a “highly competitive” market.
- ❑ Because their prices are for *gross* – rather than *net* – gallons and are determined by competitive forces, this means that these retailers have *not* been reaping the alleged “hot fuel” profits that have so exercised the “hot fuel” activists.
- ❑ Nevertheless, the *CEC Staff Report* expects that retailers would accept an *ATC Retrofit* crusade that will increase their wholesale costs by *more* than their average total pre-tax profits, while seeking to recover those increased costs only in “the long term”.

It is likely that the “ATC Retrofit Costs” shown in the *CEC Staff Report* are greatly understated.

- ❑ First, the cost estimates for the hardware needed to retrofit dispensers appear to have been accepted uncritically from the would-be vendors of such equipment without any requirement that their pricing be guaranteed. It is reasonable to expect that these vendors would find an opportunity to increase their actual prices should they receive simultaneous orders for nearly 50,000 such retrofit kits.
- ❑ Second, no provision has been made for the incremental cost to *replace* the first generation of ATC-retrofitted dispensers with new ATC-capable dispensers when they reach the end of their economic lives in about ten years time.
- ❑ Third, the *CEC Staff Report* takes no notice of the much more costly estimate – \$341 million for approximately 4,300 retail stores – by the State of Missouri in 2006 and reported by the GAO in 2008. This Missouri estimate suggests that the total cost in California could approach \$700 million, dwarfing the *CEC* estimate of \$110 million.

The \$438 million annual “benefit” from the *ATC Retrofit* likely exceeds the total pre-tax profits of California retailers.

- ❑ The *CEC Staff Report* notes that U.S. convenience stores now account for over 80 percent of retail gasoline sales.
- ❑ That *Report* also reports that from 1998 through 2007, convenience store *pre-tax* profits averaged less than \$33,000 annually per store.
- ❑ At the same time, the *CEC Staff Report* estimates that California consumers would enjoy an annual benefit of \$438 million from the proposed *ATC Retrofit*. That *Report* expects that \$438 million to be derived from the profits of the approximately 9,700 California retailers.
- ❑ This means that the consumer “benefit” contemplated by the *CEC Staff Report* would be gotten by transferring an average of over \$45,000 a year from each retailer to his customers.
- ❑ **This annual transfer of over \$45,000 exceeds the \$33,000 that is the total average pre-tax profit of U.S. convenience stores.**

The claimed \$438 million annual “saving” requires that retailers not raise their prices following the *ATC Retrofit*.

- ❑ The claimed \$438 million annual “saving” would require retailers to dispense temperature-compensated *net* gallons:

A mandated implementation of ATC...would force retailers to price gasoline and diesel products in net gallons. (CEC Staff Report at p. 77, emphasis added)

- ❑ But what the *CEC Staff Report* really has in mind is that retailers would be expected to dispense these larger “gallons” at *no* increase in their retail prices.
- ❑ In other words, the *CEC Staff Report* assumes that any retail price increases would occur *only in the long term*.

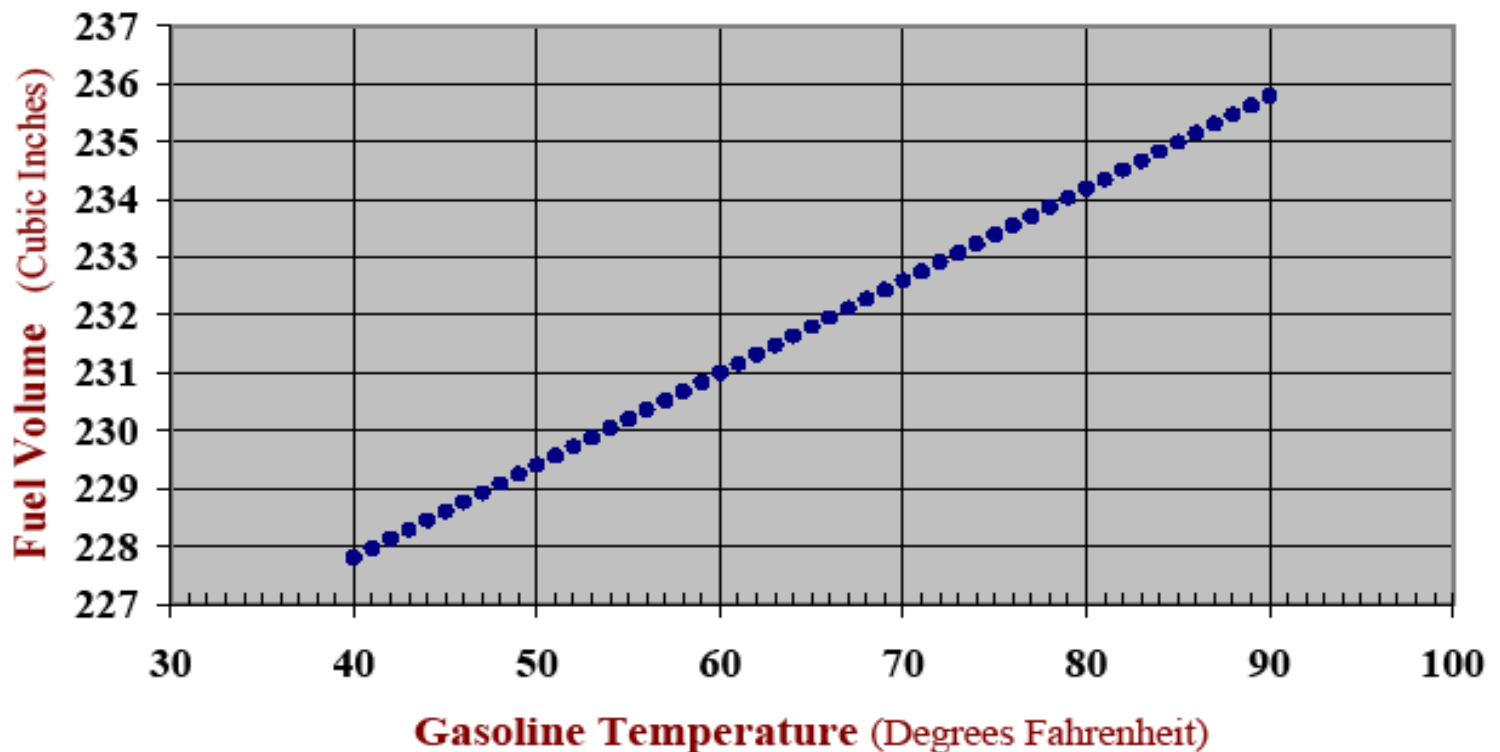
The claim that retailers would “recapture” some or all of the *ATC Retrofit* benefit *only in the long term* is pure fantasy.

- ❑ Even apart from the direct cost of ATC associated with retrofitting a dealer’s dispensers, the proposed *ATC Retrofit* would *immediately* increase his cost per “gallon” for the fuel he sells at retail at temperatures above 60 degrees Fahrenheit.
- ❑ A dealer faced with such an increase in his cost per gallon would need to raise his retail price by a commensurate amount, if he hopes to remain economically viable in a competitive environment. Indeed, his long-term survival would be at stake.
- ❑ The idea that *only in the long term* will retailers attempt to “recapture” the revenue lost due to the *ATC Retrofit* is nonsensical as a matter of economics.
- ❑ For proof, one need only look at the recent history of retail gasoline prices in California, and to notice how quickly retailers have been forced to respond to increases in their wholesale cost per gallon.

A move from gross to net gallons would be the same as any other change in the size of the unit used to measure quantity.

- ❑ The *CEC Staff Report* insists that – because temperature somehow is “different” – switching to temperature-compensated units for measuring retail quantities “would not be similar to a conversion to the metric system...because the cubic inches dispensed to retail motorists would *vary* according to temperature.”
- ❑ In fact, temperature-compensated measures of fuel quantities are no different than any other unit of volume that can be stated in terms of cubic inches. The *variation* in temperature is a red herring.
- ❑ There is a perfectly linear relationship between temperature and the size of a net gallon of fuel (measured in cubic inches) at that temperature.
- ❑ So, at any particular temperature, there is one and only one “size” of a net gallon of gasoline or diesel fuel, and knowing the fuel temperature is the same as knowing the size of a net gallon in cubic inches.

**There is an exact linear relationship
between fuel temperature and fuel volume**



Because of competition, switching to a 232.72 cubic inch "California gallon" for retail gasoline sales will lead to increased target retail prices.

Change from U.S. Gallon to 232.72 cubic inch "California Gasoline Gallon"						
	Unit of measurement for quantities	Size of "gallon" (cubic inches)	Total "gallons" available for sale	Dealer's target total sales revenue	Resulting dealer target street price per "gallon"	Increase in dealer's target price per "gallon"
<i>Before</i>	U.S. Gallon	231.00	8,000.0	\$24,000	\$3.000	
<i>After</i>	<i>CA Gasoline Gallon</i>	<i>232.72</i>	<i>7,940.9</i>		<i>\$3.022</i>	<i>2.2 ¢</i>

As in other cases, the retailer's target price per "gallon" will adjust by the amount necessary to keep his target total sales revenue unchanged, if his business is to remain viable.

Retail competition already leads to adjustments in pump prices that offset the effects of seasonal temperature variation.

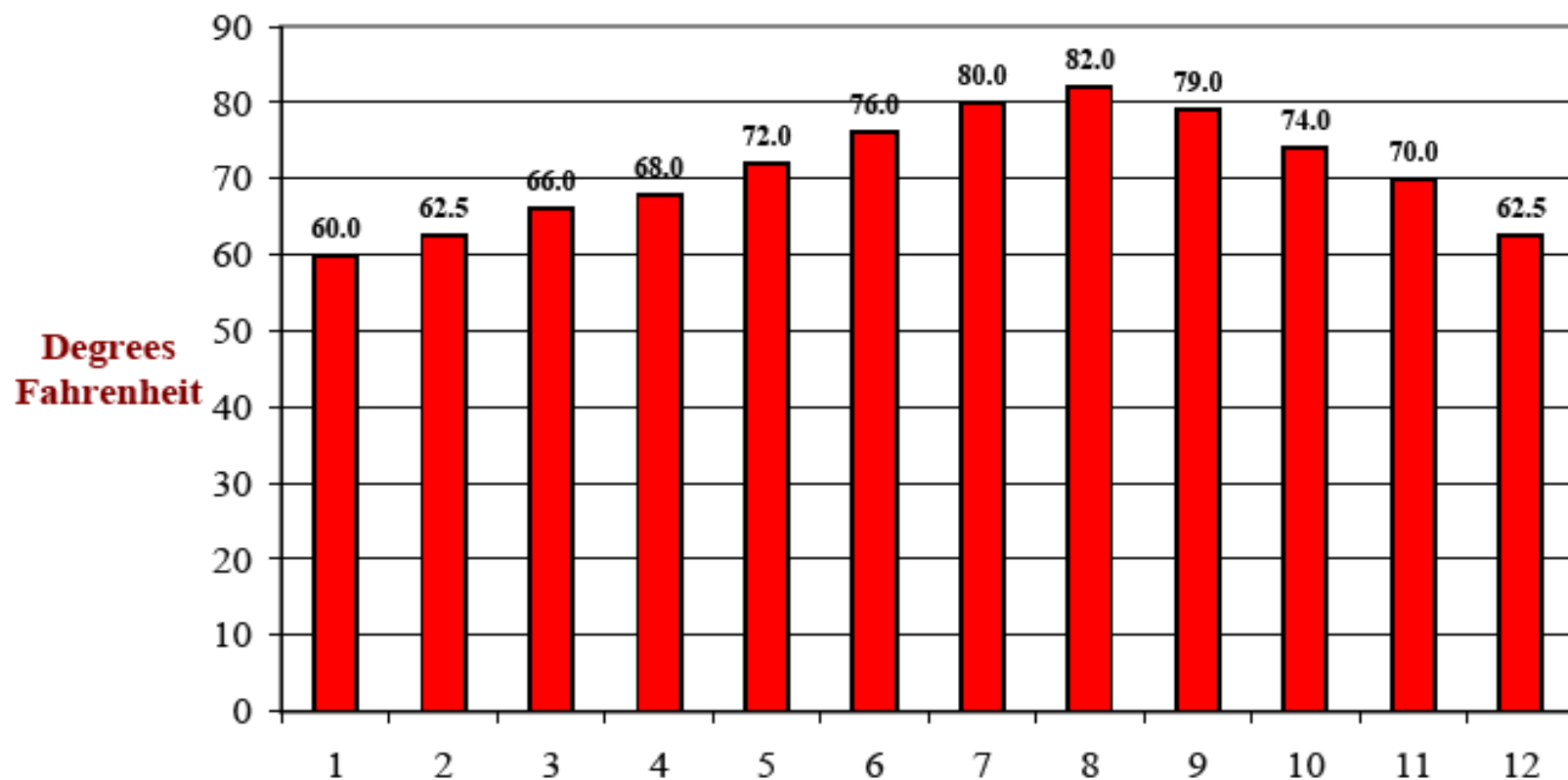
- ❑ Retail competition leads a retailer to set a target price per gallon of inventory that covers its acquisition cost and allows him to earn a competitive return.
- ❑ If a retailer persists in trying to charge a higher price than is consistent with prevailing competition, he will have difficulty making any sales.
- ❑ If a retailer persists in charging a lower price, his continued competitive viability would be jeopardized.
- ❑ The key insight is that seasonal variation in fuel temperature – coupled with the force of retail competition – induces changes in a retailer's target pump price per gallon that exactly offsets the effect of temperature expansion.

If a retailer knows how many gross gallons he has available for sale and his target sales revenue, he can calculate his target retail price per gross gallon.

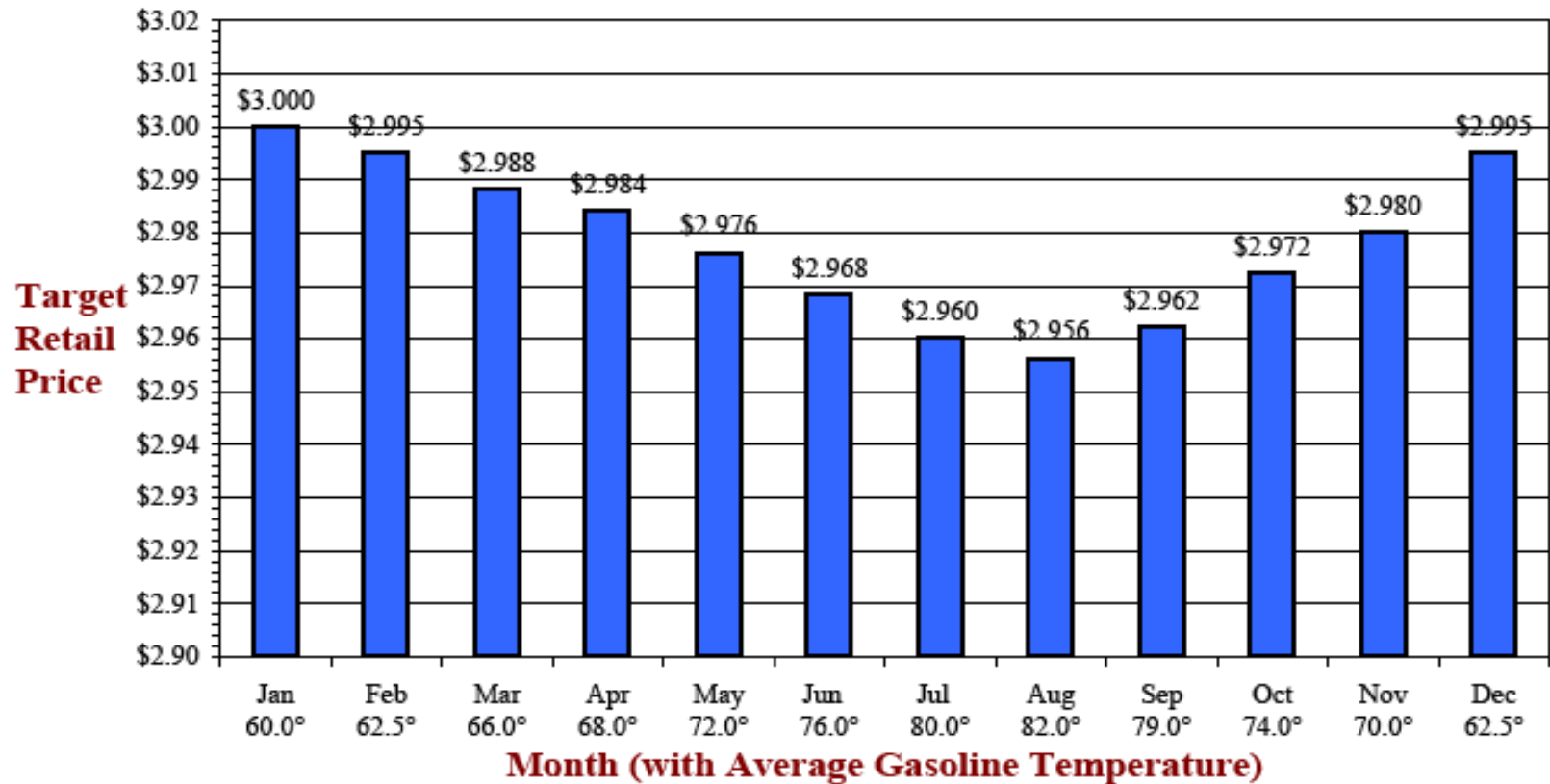
Month	Total GROSS gallons received	Fuel temp (degrees F.)	Total NET gallons available for resale	Wholesale price per NET gallon	Wholesale price per GROSS gallon	Target dealer margin	Target sales revenue	Target retail price per NET gallon	Target retail price per GROSS gallon	Difference in target GROSS price relative to January
January	8,000.0	60.0	8,000.0	\$2.875	\$2.875	\$1,000	\$24,000	\$3.000	\$3.000	
February	8,000.0	62.5	7,986.2	\$2.875	\$2.870	\$1,000	\$23,980	\$3.000	\$2.995	- 0.5 ¢
March	8,000.0	66.0	7,966.9	\$2.875	\$2.863	\$1,000	\$23,905	\$3.000	\$2.988	- 1.2 ¢
April	8,000.0	68.0	7,955.8	\$2.875	\$2.859	\$1,000	\$23,873	\$3.000	\$2.984	- 1.6 ¢
May	8,000.0	72.0	7,933.8	\$2.875	\$2.851	\$1,000	\$23,810	\$3.000	\$2.976	- 2.4 ¢
June	8,000.0	76.0	7,911.7	\$2.875	\$2.843	\$1,000	\$23,748	\$3.000	\$2.968	- 3.2 ¢
July	8,000.0	80.0	7,889.6	\$2.875	\$2.835	\$1,000	\$23,683	\$3.000	\$2.960	- 4.0 ¢
August	8,000.0	82.0	7,878.6	\$2.875	\$2.831	\$1,000	\$23,651	\$3.000	\$2.956	- 4.4 ¢
September	8,000.0	79.0	7,895.1	\$2.875	\$2.837	\$1,000	\$23,698	\$3.000	\$2.962	- 3.8 ¢
October	8,000.0	74.0	7,922.7	\$2.875	\$2.847	\$1,000	\$23,778	\$3.000	\$2.972	- 2.8 ¢
November	8,000.0	70.0	7,944.8	\$2.875	\$2.855	\$1,000	\$23,841	\$3.000	\$2.980	- 2.0 ¢
December	8,000.0	62.5	7,986.2	\$2.875	\$2.870	\$1,000	\$23,980	\$3.000	\$2.995	- 0.5 ¢

His resulting target retail price per gross gallon varies inversely with fuel temperature while keeping his target retail price per net gallon constant.

Average Gasoline Temperature by Month (California Fuel Temperature Survey, 2007-08)



Effect of Retail Competition and Temperature Variation on Retailer's Target Price per Gross Gallon



Any potential cost to consumers from cross-sectional temperature differences is minimized by repeated purchases.

- ❑ “Cross-sectional temperature differences” refer to the fact that – at any particular moment – there can be considerable variation in temperature of the fuel being sold by different retailers in the same local competitive area. Such differences have been documented by Henry Opperman in the vicinity of Topeka, Kansas. While such differences might appear alarming, they would have little or no effect on consumers who make repeated purchases in the market.
- ❑ This is demonstrated by use of the statistical technique known as “Monte Carlo sampling”. To use this technique, it is assumed that – over an entire year – 10,000 motorists each made weekly purchases of 20 gallons from randomly-selected retailers in the Topeka area.
- ❑ These 10,000 separate “samples” of 52 observations each were then analyzed to determine the likelihood that – over the entire year – the average temperature of an individual motorist’s purchases might significantly exceed the annual average fuel temperature for Topeka.

Distribution of Fuel Temperature Measurements – Topeka, Kansas

January 8-12, 2007 (mean = 50.6° F.)			April 16, 2007 (mean = 54.4° F.)			April 23, 2007 (mean = 59.0° F.)			December 4-8, 2007 (mean = 50.6° F.)		
Obs	Temp	Dev	Obs	Temp	Dev	Obs	Temp	Dev	Obs	Temp	Dev
1	58.8	8.2	20	59.5	5.1	26	66.0	7.0	32	55.9	5.3
2	55.4	4.8	21	58.8	4.4	27	61.2	2.2	33	54.9	4.3
3	54.7	4.1	22	54.5	0.1	28	59.9	0.9	34	54.9	4.3
4	54.1	3.5	23	53.6	-0.8	29	58.3	-2.7	35	54.9	4.3
5	53.2	2.6	24	52.2	-2.2	30	55.6	-3.4	36	54.1	3.5
6	53.1	2.5	25	48.0	-6.4	31	55.2	-3.8	37	53.8	3.2
7	52.3	1.7							38	52.5	1.9
8	52.0	1.4							39	51.6	1.0
9	51.3	0.7							40	51.4	0.8
10	51.1	0.5							41	50.5	-0.1
11	50.7	0.1							42	50.4	-0.2
12	50.2	-0.4							43	49.3	-1.3
13	48.7	-1.9							44	49.3	-1.3
14	46.8	-3.8							45	47.7	-2.9
15	46.6	-4.0							46	44.4	-6.2
16	46.4	-4.2							47	42.3	-8.3
17	46.4	-4.2							48	42.3	-8.3
18	45.9	-4.7									
19	43.3	-7.3									

Distribution of Monte Carlo Results **(10,000 Trials of 52 Weekly Purchases)**

