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Re:LD226

Dear ENR committee members,

I thought it would be good to give you an example of well-intended legislation gone bad before you finish your deliberation on LD226.

I believe you'll find the following two-parts I pulled out of a large report I prepared for Governor LePage when I was his Technical Advisor on Energy for him.

The first part demonstrates how bad government can screw up with their power to legislate complex matters. The below issue deal with the gold-plated Energy Star Legislation that was intended to accomplish great things.

The second part is an analysis of an Energy Star rated home refrigerators. The conclusion of this second part demonstrates how important a NEI (Net Environmental Impact) analysis is in determining the true outcome of any legislative decision.

I'm concern that LD226 may fall in the same traps as Energy Star especially when dealing with anything like self-certification or self-regulating such as the EPA has promulgated for systems exceeding a refrigerant charge of > 50Lbs. As a life long technician in this field, I know how what I can get away with at 3 o'clock in the morning when all the refrigerant chemical police are sleeping.

I think this writing should be an interesting read for any Legislator, or consumer because we all enjoy home refrigerators that use 7% of our nation's electricity, and we all enjoy watching shows like 60 Minutes that aired the Energy Star rated high efficiency gas powered alarm clock.

Enjoy

Jim LaBrecque

Review

Energy Star Fraud, Abuse and Inadequacies

From

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Abstract

The history of the Energy Star program has done more for the false hopes of Americans than it has in reducing energy demand for America. State and Federal officials lack the knowledge, experience and understanding of the diverse technologies to adequately assure the public of a quality program.

James C. LaBrecque

Halon's Razor: Never attribute to malice that which can be adequately explained away by stupidity.

GAO United States Government Accountability Office March 5, 2010 report to the Honorable United States Senator Susan M. Collins Ranking Committee Member on Homeland Security and Governmental Affairs regarding the Energy Star Program states:

Covert Testing Shows the Energy Star Program Certification Process

Is Vulnerable to Fraud and Abuse

Numerous investigations and reports have recently identified Energy Star program successes and weaknesses. As noted by the Consortium for Energy Efficiency, the EPA Office of the Inspector General (OIG) Consumer Reports, DOE OIG, and a prior GAO report there is currently no requirement for independent third-party verification of energy performance reporting for most product categories prior to gaining access to Energy Star logos and promotional materials.

A GAO investigation shows that Energy Star is for the most part a self-certification program vulnerable to fraud and abuse. GAO obtained Energy Star certifications for 15 bogus products, including a gas-powered alarm clock, geothermal heat pump and a refrigerator.

When I was recently at Sears looking into Energy Star refrigerators for my report the sales manager told me that Sears recently had a deep \$150.00 discount on LG refrigerators, twice the energy star rebate of \$75.00 because Sears was informed that the LG refrigerator did not meet the Energy Star mandates according to DOE. Following is a paragraph from the GAO report on the LG issue. *DOE ordered LG to remove the "Energy Star" energy-efficiency label from some of its refrigerators by January 20, 2010. DOE is currently involved in litigation in federal district court with LG Electronics over a dispute as to the methods that may be employed in testing for energy efficiency of some of its LG refrigerators.*

A refrigerator manufacturer is only required to submit a QPI (Qualified Product Information) form stating minimal energy efficiency specifications without any third-party test results.

A recent settlement between DOE and an Energy Star partner has highlighted the potential for noncompliance of products in the program. In January 2010, DOE and Haier America entered into a Consent Decree over an investigation into whether Haier violated DOE's energy-efficiency standards and Energy Star program requirements for certain freezers. DOE's investigation led Haier to determine that a parts defect might have caused four standalone upright freezer models to consume more energy than the manufacturer had reported.

Additionally, following complaints raised by competitors, LG Electronics and DOE entered into an agreement in 2008 to clarify appropriate energy-efficiency testing methods for certain LG refrigerators. The agreement has led to litigation in federal district court over whether both parties are complying with its terms regarding testing methods.

The GAO investigation found that companies can easily submit fictitious energy-efficiency claims in order to obtain Energy Star qualification for a broad range of consumer products. The GAO states *“based on our investigative results, we found that the current process for becoming an Energy Star partner and certifying specific products as Energy Star compliant provides little assurance that products with the Energy Star label are some of the most efficient on the market”*.

Specifically, in 2007 the EPA OIG stated that there was no evidence that the self-certification process was effective and noted that the Energy Star program lacked in both quality assurance and sufficient oversight. Moreover, the EPA OIG identified that there was no methodology in place to verify manufacturers' claims of energy efficiency and that products may be labeled with the Energy Star logo and sold prior to submitting certification results to the agency. In addition, an October 2008 issue of *Consumer Reports* detailed further problems, including lax qualifying standards, federal testing procedures that were outpaced by current technology and reliance on industry self-policing—manufacturers testing competitors' appliances and reporting misconduct—without evidence of the effectiveness of that approach. The GAO report mentioned above found that products may qualify for Energy Star status based on criteria other than the estimated total energy consumption. In addition, *Consumer Reports* and DOE OIG officials found that manufacturers may use computer controls to manipulate energy consumption testing results, and for some categories Energy Star no longer highlighted only the most energy-efficient products in those categories.

A Brewer Maine company Nyle Corporation, manufacture of domestic hot water heat pumps sent me the following e-mail.

In a conference call a couple of weeks ago, DOE said they are suspending any new Energy Star approvals until they write a set of regulations requiring third party approval. They said that would take a year. (Year in government time). The DOE and EPA should unload the Energy Star program to an industry sponsored group. Then it could be more responsive and accurate.

The current system is a farce and because government cannot correct errors or react to technology changes fast enough, it will always be so.

Independent organizations have worked for years such as UL, ASME, NEC etc etc.

Don

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If DOE takes a year to write a set of regulations requiring third party approvals;

1. how many more years will it take to fully implement an adequate number of testing agencies around the country;

2. how many years will it take for testing agencies to play catch up with new products that companies like Nyle have ready for production and sales today;

3. how backed up will future testing agencies be in a few years from now;

4. how will citizens feel about Efficiency Maine handing out money for questionable products over the next few years

5. how will citizens feel about Efficiency Maine

Refrigerator Products
Energy Star Compared to a Standard Refrigerator

From

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Abstract

All technical and economic factors considered in the life cycle of an Energy Star refrigerator over a standard model, the standard model cost less, uses less energy, require less maintenance, and last years longer.

James C. LaBrecque

In theory there's no difference between theory and practice, but in practice there is.



Energy Star Model

Frigidaire 17 Cu. FT. Model 89002

Price: \$479.88

kWh/Yr.: 368

Estimated Cost/Yr. @ 17 Cents/kWh =
\$62.56

Yearly Cost/Cu. FT. = \$3.68

Standard Model

Kenmore 18.2 Cu. FT. Model 65802

Price \$388.00

kWh/Yr.: 479

kWh/Yr. adjusted for 17 Cu. Ft. 447.4

Est. Cost/Yr. @ 17 Cents/kWh = \$81.43

kWh/Yr. or \$76.06

Yearly Cost/Cu. FT. = \$4.47

Comparing Sears Data

Price kWh/Yr. Cost/Yr. Rebate

Energy Star \$479.88 368 \$62.56 \$75.00

Non-Energy Star \$388.00 447 \$76.06 \$00.00

Difference \$91.88 79 \$13.50 \$75.00

Three-year service plan cost \$139.99 or \$46.66/Month on the Energy Star model 89002 and \$119.99 or \$39.99/Month on the standard model 65802.

The Laws of Thermodynamics Simplified

First Law: Energy can be changed from one form to another, but it cannot be created or destroyed. When you convert electrical energy to mechanical energy to run your refrigerator compressor all the mechanical energy ends up as heat. Heat blowing out the bottom or back of a refrigerator is useful heat for your home most of the time, except the days you feel it is too warm.

Second Law: Anytime you convert energy from heat to work you lose some of that energy as waste heat. When a natural gas power plant converts its energy to electricity it loses about half of its energy as waste heat that you see rising in the form of water vapor out of the electric power plant cooling towers.

Assumptions

- The 79 kWh Energy Star national estimated savings/yr. is adjusted by 20% to reflect Maine's cooler climate = 63.2 kWh adjusted savings/yr.
- 63.2 kWh @ 17 cents/kWh = \$10.74 annual electrical cost savings/year
- Therefore, the Energy Star national estimated energy savings of \$13.50 is adjusted by \$2.76 to more closely reflect the actual electric savings of \$10.74.
- 63.2 kWh is equal to 215,701.6Btu
 $Btu/kWh = 63.2 \times 3412.14163 = 215,701.6$
- 215,701.6Btu's = 1.54 gallons of #2 oil @ (140,000Btu's/gal)
 $gal/Btu = 215,701.6 / 140,000 = 1.54$
- Annual average "system" home heating efficiency: 70%
- National average auto = 20MPG
- Refrigeration service truck = 14MPG
- 1st law useful heat factor: 80%
- 2nd law multiplier = 2 (gas/electric generation system 50% efficient)
- Electricity cost 17cents/kWh

- #2 home heating oil cost \$2.50/gal
- Regular gasoline cost \$2.80/gal
- Regular Gasoline 125,000 Btu's/gal
- #2 home heating oil 140,000 Btu's/gal

First Law Applications

- 2.2 gallons of additional oil is needed to replace the useful heat no longer supplied by the 63.2 kWh reduction in electric heat from the Energy Star refrigerator.

$$\text{gal} = \frac{20.270.054.1}{1} =$$

- 2.2-gals 80% useful heat factor = 1.76 gal

- An oil penalty of \$4.40 is subtracted from the Energy Star refrigerator's annual electric savings of \$10.74.

$$40.4\$50.2\$76.1 = \text{gal}.$$

- Net home energy savings (\$10.74 - \$4.40) = \$6.34/yr. or 53 cents/month

Second Law Applications

- 63.2 kWh annual reduction in home electricity use reduces the power plant fuel use equal to 3.45 gallons of regular gasoline per year.

$$\text{year gal} = \frac{\text{Btu} \times \text{gal}}{\text{kWh} \times \text{Btu} \times \text{year} \times \text{kWh}} = \frac{45.35.0000,12534132.63}{1} =$$

The Real World: Actual vs. Theoretical

Thermodynamic Considerations

- Standard refrigerators have a static condenser coil on the back of the cabinet (left Photo) whereas Energy Star refrigerators pack the coil under the cabinet.



Standard back of the cabinet condenser Energy Star condenser packed under cabinet

- Standard condensers are easier to see, access, and clean than Energy Star condensers which require a professional service company.
- Energy Star condenser fans draw air across dirty floors and through the condenser coil accumulating debris more aggressively than static coils typically on the back of standard efficiency refrigerators.
- The problem with debris accumulating on the coil grows exponentially (the cumulative debris enhances the dirt filtering process while complicating the efficiency of the refrigeration cycle) causing an inefficient increase in electrical wattage and therefore an increase in superheated discharge gas temperature.
- When debris in the condenser coil raises the saturated condensing temperature about 12 degrees, the Energy Star refrigerator will equal the efficiency of the standard refrigerator.
- It can be reasonably assumed that after the first year of operation the condenser debris issue can bring the Energy Star refrigerator into parity or worse with the standard refrigerator.
- During the second year the Energy Star refrigerator will continue to lose efficiency as the condenser continues to accumulate debris.
- By the end of the second year both refrigerators can roughly end up with the same accumulated two-year energy use.

- By the end of year three, the standard refrigerator will likely use less total energy than the Energy Star refrigerator due to its cleaner condenser.
- After year three the Energy Star refrigerator will continue to lose efficiency at a steep rate due to the exponential growth of debris on the condenser coil which will consistently raise its condensing temperature.
- By year 5 or 6, air flow on the Energy Star refrigerator can slow to the point where reduced air velocity in conjunction with increased heat from extra compressor watts (due to the inefficiency of high condensing temperatures) results in higher air stream temperature that tends to burn out or shorten the fan motor life, drastically compounding the efficiency problem.
- The excessive condensing temperature from an Energy Star refrigerator for a prolonged period of time drives the compressor oil temperature above its critical point where the oil breaks down and results in an expensive damaged/loss compressor prematurely ending the life of the refrigerator.
- High condensing temperatures (est. >30 degree increases condensing temperature to >140 deg Saturated Discharge Temperature) on the Energy Star refrigerator will drive consumer cost up and also drive the second law energy use at the power plant up 33%, increasing the electric power plant equivalent oil use from 3.45 to 4.6 gallons or a net increase of 1.14 gallons per year.

Economic Considerations

- A three-year service plan costs \$46.66 per year to assure a net energy savings of \$6.34. (net value to consumer -\$40.32/yr.)
- A refrigeration service truck traveling 24.15 miles to service an Energy Star Refrigerator can use up the equivalent 3.45-gallon second law electric power plant savings produced by the Energy Star refrigerator for the year.
- Sending a service truck out to maintain Energy Star efficiency is likely a net energy loser because the service truck may use most or all the Energy Star refrigerator energy savings for the year.
- The likelihood that the under-cabinet condenser will get cleaned without a service contract is low.
- The likelihood that the condenser fan motor burning out within six years is very high due to;
 1. End of condenser fan motor life;
 2. High condenser air stream temperature;
 3. Bad or dried up fan bearings;
 4. Debris getting caught in the low starting torque fan blade etc.;
- The likelihood of losing a compressor by year six is high and by year nine is very high because of excessive condensing pressures caused by excessive heat.

- It is not likely that the standard refrigerator condenser will accumulate dust and debris at the rate expected of an Energy Star refrigerator.
- The likelihood that the standard condenser will get cleaned by the consumer is high because the debris is visually obvious and easy to access.

Technical Summary

- The standard model 65802 refrigerator pictured above, which cost \$91.88 less than the Energy Star model 89002, will use less energy over its life, cost less for maintenance and have a longer life expectancy.
- The \$6.34 theoretical maximum net energy savings to the consumer from the Energy Star refrigerator provides a simple payback period of 14.5 years, a period longer than the life expectancy of the refrigerator's expensive compressor and fan motor replacement cost.
- Condenser maintenance complications can put the Energy Star refrigerator in a losing situation for the consumer at best:
 1. It will cost \$46.66 a year for service in order to maintain a net "theoretical" annual energy savings of only \$6.34.
 2. It will cost around \$200.00 to replace the fan motor in the Energy Star model; a cost not applicable to the standard refrigerator.
 3. Due to excessive cost a compressor loss will likely end the life of the Energy Star refrigerator if it is not under warranty.
 4. With the Energy Star refrigerator, if the rear compressor/condenser compartment cover tears, breaks off, or is not replaced properly when removed for cleaning, the refrigerator efficiency will immediately drop well below the standard model efficiency due to short circuited air flow.
- The benefits of Energy Star refrigerators are overstated in terms of the individual consumer and national energy policy. Consider the following:
 - o Driving 499 feet less per day saves the consumer the same amount of energy as the more efficient Energy Star refrigerator.
 - o Second law electric power plant savings is equal to an average automobile driving 998 feet less per day.

Driving an automobile 998 feet less per day has the same energy savings at the power plant that the Energy Star refrigerator can theoretically produce.

Conclusion

The highly touted energy savings of the Energy Star rating system, bolstered by multi-billion-dollar government bureaucracies and rebate schemes, do not stand the test of rigorous technical analysis. Analysis indicates a more green and taxpayer friendly solution might be to forbid parking within 500 feet of all federal and state office buildings.