Comments on Draft 1
Traulsen
4/18/08

Below is the DRAFT 1 Version 2.0 product specification for ENERGY STAR qualified commercial refrigerators and freezers. A product must meet all of the identified criteria if it is to earn the ENERGY STAR.

This document contains additional recommended specifications, changes to current or proposed specifications and identified errors in the Energy Star database as it currently exists. Traulsen believes Energy Star has an important and vibrant role to play in providing accurate and meaningful information to End User Customers. The requirements governing the collection and reporting of this data need to be fair and appropriate in order to provide potential buyers realistic expectations of equipment performance. Our hope is that the Energy Star database be populated with products properly categorized and representing their true energy usage levels as experienced by the customer.

1) Definitions: Provided below are definitions of the relevant terms in this document.

A. Commercial Food-grade Refrigerator: A cabinet designed for storing food products at temperatures above 32 degrees Fahrenheit (F) but no greater than 40 degrees F which is intended for commercial use.

Currently many product variations from competing vendors are grouped together into this single category. This single grouping oversimplifies the accurate representation of the true "Energy Efficient Performance" levels of many product types and could soon lead to the De-Listing of numerous well designed models from various OEMs. It is important to note that DOE - "10CFR, Part 430.32, (a) Refrigerators/refrigerator-freezers/freezer" has eighteen categories for calculating and reporting the energy consumption levels of domestic refrigerators and freezers. This is six times the number of categories available in the current Energy Star criteria for a product type with a significantly less divers mix.

As an example of this "Oversimplified Grouping" consider the Delfield, SCM-74 Energy Star Listed at only 0.98 KW-hrs / day, the Nor-Lake, AR124 Energy Star Listed at 2.58 KW-hrs / day, the Arctic Air, R22CW Energy Star Listed at 1.301 KW-hrs / day and the Traulsen, G10000 Energy Star Listed at 3.18 KW-hrs / day. All four models are grouped into this single category, but have considerably different end uses. The Delfield and Nor-Lake units are horizontal cabinets with differing applications but designed for the storage of milk type products. As designed, they provide little utility as general purpose storage refrigerators, but are grouped with the Arctic Air and Traulsen models. Now while the Arctic Air and Traulsen cabinets are both general purpose vertical storage refrigerators, only the Traulsen model has a refrigeration system designed to hold proper cavity temperatures under the harsh conditions encountered on a commercial kitchen cook line.

None of the above modes are equivalent in utility or features, but are being treated as if they were the same. This is misleading to prospective buyers and provides a distorted view of attainable energy efficiency levels for products covered by this broad class or designation. If today's Energy Star Version 2 Draft 1 proposal where executed without modification, many application specific and energy efficient appliances would be De-Listed.

The above example of "In Equivalent Utility" and "Product Oversimplification" is based on sound science and physics, the discussion of which is beyond the scope of this report. Further, it is only a small representation of other similar perceived flaws which exist in the current E-Star database. Finally, the recommendations that follow try to take into account the unchangeable realities of a user's application and a product's fundamental design based again on sound science and physics.

Traulsen believes at a minimum the following subcategories should be added to differentiate products with respect to their intended end use / customer application. We do not believe this list to be exhaustive, but requiring further refinement by all interested parties.

1. *Cabinets with vertically hinged or sliding doors, opened only to access product stored, employing automatic defrost, forced convection cooling and forced convection heat rejection systems.*
2. *Cabinets with vertically hinged doors opened only to access product stored, employing a manual defrost, passive convection / conduction cooling and/or passive convection / conduction heat rejection system/s.*
3. *Cabinets with horizontally hinged or sliding doors or lids opened only to access product stored, employing automatic defrost and a forced convection heat rejection system.*
4. *Cabinets with horizontally hinged or sliding doors or lids opened only to access product stored, employing a manual defrost, or a passive convection / conduction heat rejection system.*

Considering the examples of Delfield and Nor-Lake above, does Energy Star wish to restrict the definition of a "Commercial Food-Grade Refrigerator" to just vertically hinged or sliding door cabinets? It would be Traulsen's opinion that this was the original intent of the California Energy Commission and Energy-Star when regulations were first introduced. Having Energy Star Listed products gives manufactures a marketing advantage when selling against competitors, and may have led to the submittal of some models that did not meet the original intent of the standard.

B. Commercial Food-grade Freezer: A cabinet designed for storing food products at temperatures of 0 degrees F or below which is intended for commercial use.

The comments outlined in "1 – A. Commercial Food-grade Refrigerator" above apply to this category as well.

C. Commercial Food-grade Refrigerator-Freezer: A cabinet with two or more compartments, at least one of which is designed for storing food products at temperatures above 32 degrees F but no greater than 40 degrees F and at least one of which is designed for storing food products at temperatures of 0 degrees F or below which is intended for commercial use.

Currently this category treats all commercial refrigerator-freezer cabinets as a single type or class. DOE segregates domestic appliances with this description into twelve different categories. (See "10CFR, Part 430.32, (a) Refrigerators/refrigerator-freezers/freezer") Traulsen does not believe twelve categories are necessary, but more than one is required.

Traulsen believes at a minimum the following subcategories should be added to differentiate products with respect to their intended end use, customer application or design strategy. We do not believe this list to be exhaustive, but requiring further refinement by all interested parties.

1. *Cabinets with vertically hinged or sliding doors, opened only to access product stored, employing automatic defrost, forced convection cooling and forced convection heat rejection systems. Where one cooling system services both the refrigerated and freezer compartments.*
2. *Cabinets with vertically hinged or sliding doors, opened only to access product stored, employing automatic defrost, forced convection cooling and forced convection heat rejection systems. With two cooling systems each servicing a compartment of the refrigerator-freezer.*
3. *Cabinets with vertically hinged doors opened only to access product stored, employing a manual defrost, passive convection / conduction cooling and/or passive convection / conduction heat rejection system/s. Where the freezer compartment is located within the refrigerated space of the outer cabinet.*
4. *Cabinets with vertically hinged doors opened only to access product stored, employing a manual defrost, passive convection / conduction cooling and/or passive convection / conduction heat rejection system/s. Where the freezer compartment is located in a space separate from that of the refrigerated space of the outer cabinet.*

D. Commercial Ice Cream Freezer: A cabinet designed for storing food products at temperatures of –15 degrees F or below which is intended for commercial use.

*Again, this category does not provide adequate classifications or the proper temperature ranges to subdivide these products into meaningful sets. Take for example the following four Kelvinator (Brand Name) products manufactured by National Refrigeration of Honea Path, SC. (**Note:** Kelvinator has been providing Commercial Ice Cream Freezers to end users such as Baskin-Robbins for over sixty years.)*

CMCT-4:
Temperature Range – 0°F to -20°F
Defrost Type – Automatic / Electric
Cooling Technology – Passive Convection / Conduction
Heat Rejection Technology – Forced Air
Door / Lid Type – Horizontal Sliding Glass Lids
Cabinet Style - Horizontal

CKDC47:
Temperature Range – +10°F to -10°F
Defrost Type – Manual
Cooling Technology – Passive Convection / Conduction
Heat Rejection Technology – Forced Air
Door / Lid Type – Horizontal Hinged Glass Lids
Cabinet Style – Horizontal Dipping Cabinet / Merchandiser

4SF:
Temperature Range – 0°F to -20°F
Defrost Type – Manual
Cooling Technology – Passive Convection / Conduction
Heat Rejection Technology – Passive Convection / Conduction
Door / Lid Type – Horizontal Hinged Solid Lids
Cabinet Style – Horizontal Dipping Cabinet

T30HSP: *Temperature Range – 0°F to -30°F*
Defrost Type – Automatic / Electric
Cooling Technology – Forced Air
Heat Rejection Technology – Forced Air
Door / Lid Type – Vertical Hinged Solid Doors
Cabinet Style – Vertical Storage / Ice Cream Hardening

Each of these models meets a particular end user need, and no one model can provide total customer satisfaction or utility in ALL these varied applications. In addition, after careful study, it can be reasonablely determined that these cabinets have no chance of using similar amounts of energy in fulfilling their respective applications. (A technological discussion of the physics and science controlling this determination is beyond the scope of this report commentary.) Traulsen believes this category should be subdivided into a minimum of four separate groups.

E. Commercial Refrigeration Cabinet: A refrigerator, freezer, or refrigerator-freezer for storing food products at specified temperatures and designed for use by commercial or institutional facilities, other than laboratory settings.

Traulsen believes that a refrigerator classified (Listed) as a "Commercial Refrigerated Cabinet" must ALSO conform and/or be evaluated to the following standards.

> *ANSI/UL 471, "Commercial Refrigerators and Freezers", Category: SGKW. (Manufactures)*

> *ANSI/NSF Standard 7, "Commercial Refrigerators and Storage Freezers", (Manufactures)*

> *ANSI/NFPA 70, "NEC 2008", Section 210.8 (B) (2), GFCIs for Commercial Kitchens*

1. *All "Commercial Refrigerated Cabinets" sold in the United State should be evaluated to safety standard ANSI/UL 471. This standard provides a level of assurance that a refrigerated appliance will perform safety in a commercial environment.*

   Two Manufacturers or Providers (Biomedical Solutions, Inc. and Labrepco, Inc.) of refrigeration equipment listed with Energy Star do not have any products Listed with UL in category SGKW. One Manufacture or Provider (Sci-Cool, Inc.) of refrigeration equipment listed with Energy Star has its UL Listing in category SOVQ, "Refrigerators and Freezers, Special Purpose". This category is generally reserved for laboratory type refrigeration equipment that may store flammable materials or other special / non-food type items.

2. *All "Commercial Refrigerated Cabinets" sold in the United State should be evaluated to product performance standard ANSI/NSF Standard 7. This standard provides a level of assurance that a refrigerated appliance will maintain safe food / product temperatures in a commercial kitchen environment.*

   Three Manufacturers or Providers (Biomedical Solutions, Inc., Labrepco, Inc., and Sci-Cool, Inc.) of refrigeration equipment listed with Energy Star do not have any products Listed with NSF International under the category of "Standard 7".

3. *UL requires in "General Information for Commercial Refrigerators and Freezers", SGKW.GuideInfo that the installation of a Listed appliance be in accordance with ANSI/NFPA 70. This requirement provides a level of assurance that the installation of a Listed appliance at the End Users location is safe and presents no known risk to the operator. Section 210.8 (B) (2) of the 2008 National Electric Code requires all 15 and 20 ampere, 125 volt receptacles in non-dwelling type kitchens to be GFCI protected. This requirement applies to all 15 and 20 ampere, 125 volt receptacles, whether or not the receptacle serves countertop areas.*

One manufacturer or Provider (Arctic Air models R22CW & F22CW) of refrigeration equipment listed with Energy Star clearly states in their product brochure / literature that "Grounded outlet required, GFI circuit not allowable". This statement would clearly disqualify this appliance for use in a commercial kitchen environment.

***Note:** If the above requirements were applied to today's list of Energy Star qualified products, the following would result. 1) Four Manufacturers or Providers and sixty-nine models would be removed from the "2/1/2008" Energy Star database. 2) Fifty models meeting the new Energy Star, Version 2 specification would be disqualified. 3) The "2/1/2008" Energy Star database of models and their respective 24hr energy consumption rates would be corrupt and provided an inaccurate calculation for the Version 2 standard.*

Note: EPA is considering revising the integrated average product temperature for ice cream freezers to be consistent with Federal regulations (10 CAR 431.64) which require a temperature of -15 degrees F. The existing requirement for ENERGY STAR qualification is -5 degrees F. Therefore, -15 degrees F is added to the ice cream freezer definition above. Details regarding the new test conditions are provided in Section 4, below.

Please refer to the above comments concerning "Ice Cream Cabinets" and the need for specific definitions, categories and operating conditions. The complexity of this market is not totally represented by this single product category.

As currently written, this draft specification is intended for commercial food-grade refrigeration equipment only. EPA is currently exploring energy efficiency levels for laboratory-grade refrigeration equipment that will reflect testing at temperatures representative of use in laboratory settings. Manufacturers that sell laboratory grade units are encouraged to participate in this development process. Once these levels are determined, they will be incorporated into the final version of this specification, resulting in a single document that addresses both food-grade and lab-grade equipment with separate energy efficiency criteria for each. Therefore, at this time, laboratory-grade refrigeration equipment cannot qualify for ENERGY STAR.

Sixty seven laboratory grade refrigerated cabinets from three Manufacturers or Providers have found their way in to the current "2/1/2008" Energy Star database. Most of these models are upgraded domestic appliances, and because of their inherent design consume modest amounts of power. The problem with their power consumption arises with the fact that this type of equipment is not suited for the commercial kitchen environment.

Stakeholders are encouraged to provide comments as to whether the definitions in Section 1 accurately describe commercial refrigerators and freezers.

F. Self-contained Refrigeration Cabinet: A refrigerator, freezer, or refrigerator-freezer which has the condensing unit built into the cabinet.

This definition should also include, "For the purposes of this standard, the cabinet may not be connected to a floor drain". Some Manufacturers or Providers, in an effort to escape the penalty for large amounts of energy consumed by electric condensate pans, may make the claim "Floor Drain Required" when submitting their data to Energy Star. The problem with this scenario is simple, if a floor drain is require for disposing of condensate water collected on the evaporator coil, then the cabinet is truly not "Self- Contained".

One Manufacturer or Provider (Continental 1R, 2R and 3R) has several models listed with Energy Star that ship with an Electric Condensate Pan (Component Hardware Group, Inc. T12-0370) as

standard. This information or statement is provided in both their product literature and installation manual "page-8". It appears the energy consumption data reported in the "2/1/2008" Energy Star database does not include the energy used by the heated pan for these models.

Traulsen has tested both the Continental 2R model refrigerator and the Electric Condensate Pan that ship with the cabinet. Laboratory data would suggest that the heated pan alone consumes more energy in a twenty-four hour period than what was listed in the E-Star database for the 1R cabinet supplied with the heated pan.

Again, because of this and other inaccuracy in the Energy Star database, the formulas calculated for Version 2 of the standard are flawed. This problem raises an important question, should new energy limits be set by a "Percentage Increase in the Current Energy Efficiency Level" driven by realizable technology advances or calculating a "Formula" base on the flawed energy consumption data reported by some Manufactures or Providers? It is also unfortunate, that some customers where potentially misinformed about the actual energy consumption of E-Star Listed products.

G. Closed Refrigerator: A display or holding refrigerator where product is accessible for removal by opening or moving doors or panels.[1]

H. Energy Consumption: The energy required to maintain the contents at a specified temperature for a 24-hour period.

I. Integrated Average Product Temperature: The integrated average of all test package temperatures, recorded at 15-minute intervals, as determined using the test method prescribed in Section 4, Test Criteria.

A. J. ASHRAE: American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc.

K. ARI: Air-Conditioning and Refrigeration Institute.

L. ANSI: American National Standards Institute.

M. AHAM: Association of Home Appliance Manufacturers.

N. Worktop Surface: A solid working surface and backsplash. The working surface may be a cutting board, a stainless steel work surface, or a stone slab. This surface may not add to the total energy consumption of the unit.

O. AHAM Volume: The interior volume of a refrigerator as calculated by AHAM Standard Household Refrigerators/Household Freezers (ANSI/AHAM HRF-1-2004).[1]

P. UL: Underwriters Laboratories, Inc..

Q. NSF: NSF International, aka "National Sanitation Foundation".

R. NFPA: National Fire Protection Association

Note: The ANSI/ASHRAE Standard 72 test procedure references several different approaches to measuring interior cabinet volume including: AHAM volume, load-limit volume, and net useable volume. Under the existing Qualified Product Information (QPI) form, EPA requires interior volume to be measured using ANSI/AHAM HRF-1-2004 (i.e., the AHAM volume). EPA has confirmed with several ENERGY STAR partners that this is the typical way of determining volume. Furthermore, the data, which the

proposed requirements in Section 4 below is based on, used the AHAM volume in the calculations. To ensure consistency, EPA is adding the definition for volume above.

The ANSI/AHAM HRF-1-2007 standard for calculating the "Total Refrigerated Volume" for cabinets with drawers is not totally clear. See section "2c" and the written explanation below.

2) Qualifying Products: For the purposes of ENERGY STAR, the following types of commercial refrigerators, freezers, and refrigerator-freezers may qualify. **Note:** This specification is intended for commercial food-grade refrigeration equipment only. At this time, laboratory-grade refrigeration equipment cannot qualify for ENERGY STAR.

See above section for detailed response.

A. Solid Door Cabinet: An upright commercial, self-contained, food-grade refrigeration cabinet with hinged or sliding, solid doors with or without a worktop surface.

There needs to be a distinction between vertically hinged or sliding door and horizontally hinged or sliding lid / door cabinets. Horizontal or chest type cabinets are inherently more energy efficient than vertical cabinets. This reality is due mostly to the physics (Science in what causes air to move.) of the box. When you open the lid of a horizontal cabinet, No cold air falls out. Vertically hinged cabinets loose most of their cold air within just a few seconds of a door opening. The cabinet is then forced to re-cool the new air entering the refrigerated space.

In addition, sliding door cabinets consume more energy than hinged door cabinets of identical design. This difference in energy consumption is due to the inefficiencies associated with trying to seal sliding doors. As proof of the difficulty associated with sealing doors of this design, you will never see a vertical freezer door that slides open. Traulsen believes sliding door cabinets need a category of their own or a method of applying an inefficiency factor to the base "Formula".

Note: Sliding doors were added to this definition so partners may be able to qualify units with both hinged and sliding doors. It is EPA understanding that sliding door units are tested to the same test procedure and perform the same as hinged door units. Therefore, requirements for sliding, solid door units will be the same as hinged, solid door units. Stakeholders are encouraged to provide feedback on the inclusion of sliding door units.

B. Glass Door Cabinet: An upright commercial, self-contained, food-grade refrigeration cabinet with hinged or sliding, glass doors with or without a worktop surface.

Glass door cabinets present a new dimension of complexity for categorizing market available products and their diverse applications. Two new areas associated with classifying for energy consumption are "Lighting Options" and "The Amount or Percentage of Glass Coverage on the Door." The last parameter may be taken even further than doors, with glass panels being used for cabinet sidewalls as well

Let us examine the "Lighting Options" of four different cabinet models; all comply and are Listed with ANSI/UL-471 and ANSI/NSF Standard 7. Although two Manufactures or Providers are not current Energy Star Partners, they do make applicable products sold in the marketplace.

- *Traulsen, G32010 has full height glass doors and incandescent lighting operated by a manual switch.*

- *Beverage Air, MT72 has full height glass doors and a fluorescent sign light with a horizontally hung interior fluorescent light across the door opening of the cabinet.*
- *Master-Bilt, BMG-74 has full height glass doors with two vertically hung interior fluorescent lights between the three door openings.*
- *Kelvinator, T80MGP has full height glass doors with four vertically hung interior fluorescent lights on both sides of all door openings.*

Consider first the Traulsen model, although the interior light is manually operated some manufacturers have an incandescent light which is operated by opening and closing a cabinet door. This type of light operation is seldom ON (only when door is open) and the interior light has little or no effect on total cabinet energy consumption. This does assume for cabinets with a manually operated light that the test was conducted with the switch in the ON position. Next consider all the variations of florescent lighting for the task of displaying product and attracting customers. All consume differing amounts of energy fulfilling the end application, if all "Lighting Options" for glass doors cabinets are grouped into a single category, consumers will find themselves with few real choices. The most brightly lit models will find themselves De-Listed or simply not qualifying and the models making the grade will have door operated incandescent lights that are seldom ON.

In order to level the playing field and provide the most reliable data to potential buyers, Traulsen believes the Energy Star criteria should treat glass door cabinets as follows:

- *Cabinets may have vertical doors only. (Upright or Under / Above Counter Cabinets)*
- *Hinged and Sliding door models should have separate categories.*
- *Glass doors must cover one full side of the cabinet.*
- *Each glass panel of a glass door must make up 85% or more of the door surface area.*
- *Interior lighting designed to be ON during all normal business / operating hours must be fluorescent, LED or another energy saving technology.*
- *Fluorescent light fixtures must use electronic ballasts.*
- *Cabinets are to be tested with lights OFF for the purpose of E-Star Listing.*
- *Cabinets are to be tested with lights ON for customer information.*

With respect to the last two items above, both 24hr KWHr energy consumption rates should be published in the Energy Star database. Publishing data in this fashion will allow consumers a fair and accurate choice when selecting energy efficient cabinets while driving realistic future energy or technology innovations in the marketplace.

[1] Definitions from ANSI/ASHRAE. Standard 72-2005, *Method of Testing Commercial Refrigerators and Freezers*, American Society of Health, Refrigerating, and Air-Conditioning Engineers, Inc., 2005.

Note: EPA is proposing to add glass door cabinets to this specification for two reasons: (1) many of these products are sold with solid and glass door options causing confusion in the marketplace if only one option is labeled ENERGY STAR and (2) performance data is available on the California Energy Commission and Consortium for Energy Efficiency product lists to base a specification. Stakeholders are encouraged to comment on whether the definition above is sufficient in describing this product type.

It is Traulsen's opinion that the California Energy Commission and Consortium for Energy Efficiency databases contain the same errors that are outlined throughout this report commentary. CEC and CEE share nearly identical data, with Manufacturers or Provider

submitting the information. It is Traulsen's opinion that all glass door data be submitted by Manufacturers or Providers and not taken from either of the above agency databases. It is also Traulsen's opinion that minimum efficiency standards generated from data taken from either of the above databases be carefully considered as potentially flawed.

C. Drawer Cabinet: An upright, self-contained, food-grade refrigeration cabinet with one or more sliding drawer compartments with or without a worktop surface.

Until the deficiencies encountered with the current Energy Star database for Solid Door Cabinets are corrected, Traulsen does not believe it wise to include any more variations of the products. When this category is added, we believe it should be handled as outlined below.

Note: EPA is proposing to add drawer cabinets to this specification based on increasing manufacturer interest and indications that these products are gaining market share. Please note that the drawer units must have solid door exteriors. Stakeholders are encouraged to provide comments on this description.

When determining "Total Refrigerated Volume" for fixed projections located within the refrigerated compartment (drawers and drawer slides), the procedures and calculations outline in ANSI/AHAM HRF-1-2007 are unclear. Paragraph 4.2.1.2 (e1) and (e2) ("Collective volume occupied by fixed projections in a fresh food / freezer compartment as defined in paragraph 3.17 / 3.18, such as control knobs, shelf hangers, shelf and pan rails, and escutcheons. If the total of these volumes equals or exceeds 0.05 cu. ft. (1.4 L), deduct the total. If the total does not exceed 0.05 cu. ft. (1.4 L), do not deduct the total.") clearly deducts the volume occupied by the drawer slides themselves, but fails to fully address un-useable or inaccessible areas adjacent to the slides. In many examples cited within the standard, open areas with height or width dimension less than four inches would also be deducted from the "Total Refrigerated Volume". An example of a questionable area would exist between the drawer slide and interior cabinet sidewalls.

The ambiguity sited here could lead to great differences in the calculated volumes for refrigerators with drawers. Potential customers may find it difficult choosing the truly energy efficient model between different manufactures.

In constructing cabinets with drawers, most manufacturers will simply add optional drawer assemblies to their standard cabinet line without any changes to the refrigeration system. Solid drawer fronts increase the heat load to the cabinet. This is due mostly to the increased "Door Gasket" area surrounding each drawer. The increased load will require more energy to cool a representative box than a cabinet of identical "Gross" volume fitted with solid doors.

Finally we are faced with cabinet that have both drawers and doors. How would these be categorized?

Traulsen suggests that all cabinets with drawers or drawers and doors be tested as they were outfitted with only doors. This will eliminate the difficulties associated with interior volume calculations outlined above, and allow door or drawer cabinets to be evaluated to the same energy efficiency standard. This suggestion is consistent with the design strategy behind most "Commercial Food-Grade Refrigerator" with drawers. ("Drawers Are Simply a Covered Option")

3) Energy-Efficiency Specifications for Qualifying Products: Only those products listed in Section 2 that also meet the specifications listed in Table 1 below, may qualify as ENERGY STAR. **Note: Products which can operate both as a refrigerator and a freezer must meet all applicable requirements for both product types.**

- Purchase of high efficiency product will be cost effective
- Energy efficiency can be achieved through several technology options

• Energy consumption and performance can be measured and verified with testing
• Labeling would effectively differentiate products and be visible for purchasers.

Major revisions to the current specification have not been made since it was finalized in 2001. Currently, ENERGY STAR qualified refrigerators and freezers represent 35-44% of the marketplace. EPA expects that this percentage will continue to increase as a result of new federal and state regulations. As of January 1, 2010, current ENERGY STAR levels will be mandatory for all commercial refrigerators and freezers.

Below is a Graphical representation of the "Daily Energy Consumption for Solid Door Freezers". It contains all Energy Star Listed models as of 2/1/2008. Models listed in the graph legend as "Models Conforming" are all units listed with ANSI/UL 471, ANSI/NSF Standard 7 and most likely conforming to ANSI/NFPA 70 Section 210.8 (B)(2). Models listed as "Laboratory Grade" are those models Traulsen determined during its research not to conform to the above listed standards. (See explanation above.) (Time constraints did not allow Traulsen to review all models from this category, but units under ten cubic feet were analysis.)The graph also contains the old "Version 1" and proposed "Version 2" energy efficiency levels set by EPA. It also contains a recommended energy efficiency level developed by Traulsen. The Traulsen recommendation was generated from the availability of real technology solutions, attainable efficiency levels and based on sound engineering and scientific principles.

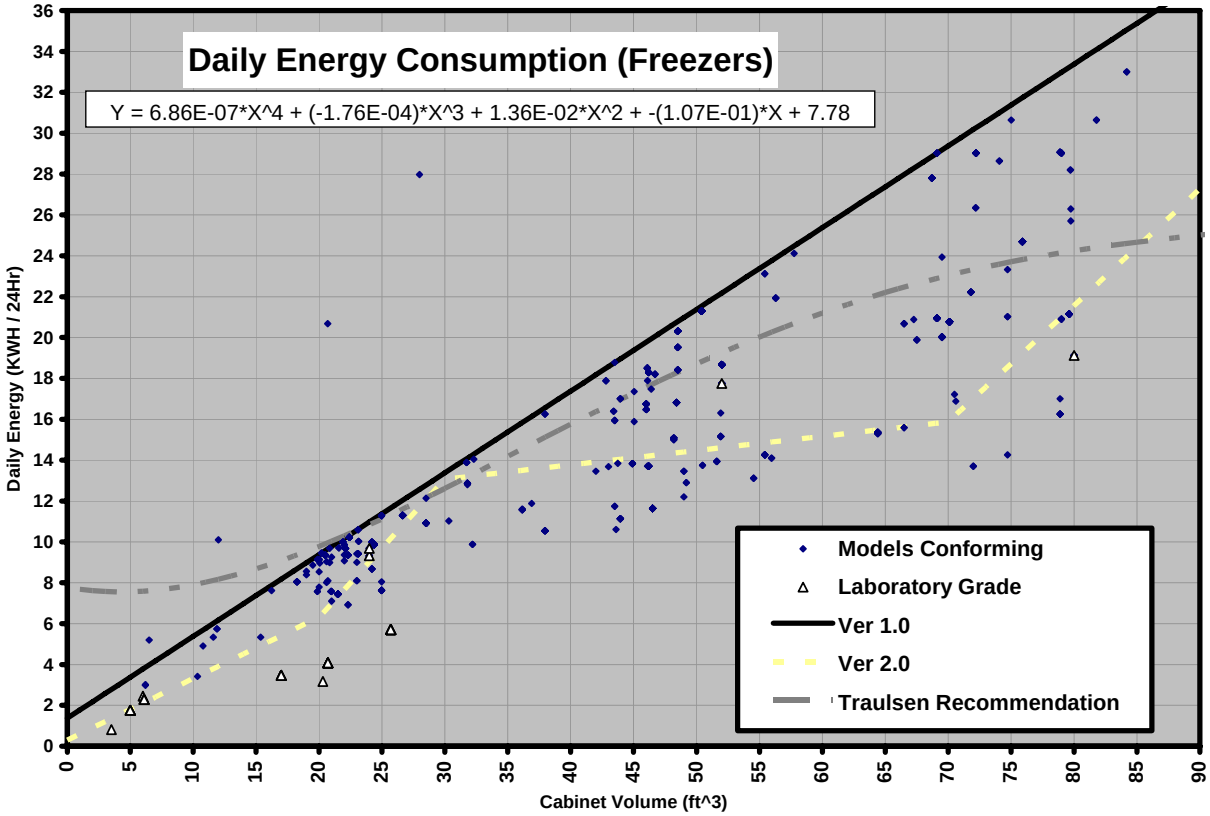
The proposed Traulsen curve corrects the error in the original E-Star "Version 1" standard for Freezers less than twenty cubic feet by raising the energy efficiency limit to realistically attainable value. It also shows an energy efficiency increase of 25% or more for cabinets with interior volumes greater than seventy-six cubic feet. The curve itself is a forth order polynomial which accurately represents a realistic energy efficiency level based on today's technology. (Please note: the current 2/1/2008" Energy Star database contains many questionable data points as outlined throughout this report commentary.)

The "Traulsen Recommendation" showing an increase in the allowable energy consumption for freezers under twenty cubic feet was base on the following analysis. (For expediency, the analysis focused on cabinets under ten cubic feet.)

1. *Of the nineteen models, under ten cubic feet, Listed in the Energy Star database, thirteen from a combination of Biomedical Solutions, Inc. and Sci-Cool, Inc. have no ANSI/NSF Standard 7 Listing. (Neither company has any cabinets Listed to Standard 7. (See above.)*
2. *One manufacturer, Nor-Lake has several models Listed with NSF for commercial food service applications, and another set of models marketed as "Scientific" or "Laboratory Grade" products. The Nor-Lake, LF041 ((NSF File–1), (NSF File–2) and (NSF File–3)) at 3.5 cubic feet, is a freezer intended for the scientific market, and has no Standard 7 Listing.*
3. *The 6.5 cubic foot freezer from Turbo Air, Inc., TUF-28 has a current Energy Star Listing of 5.2 KW-hrs / day. This rating is above the allowable energy efficiency limit set in "Version 1" of the E-Star specification.*
4. *In Traulsen's review of Energy Star Listed freezers, the six cubic foot Silver King, SKUCF7F was obtained for laboratory testing. The interest revolved around the amazingly low energy consumption rate of 2.45 KW-hrs / day reported in the Energy Star database. After careful laboratory testing (ASHRAE 72-2005, Turbo Air Inc, TUF-28.pdf) the resultant data would suggest that the actual twenty-four hour energy usage rate is approximately 5.79 KW-hrs / day. If true, this model would not qualify under the current "Version 1" E-Star specification. Again, a gross error of this type contributes to the corruption of the E-Star database and adds to error of the "Version 2" specification.*

5. *Now, after a very careful study at best only one freezer model under ten cubic feet (Three Listed in E-Star database, but all are exact same base cabinet and rating.) from a single manufacturer is available in the market. The 6.2 cubic foot Beverage Air, UCF-27 model rated at 3.0 KW-hrs / day seams to conform at all requirements covered in this report commentary, but Traulsen is actively in the process of acquiring one to confirm the amazing low claimed energy consumption rate. Based on the Turbo Air. Inc. and Silver King models from above, one would expect the energy consumption rate to be in the rage of 5 to 6 KW-hrs / day.*

There are countless numbers of compact style freezers from many Energy Star Partner manufacturers not presently listed under "Version 1" of the E-Star specification. It would be a rational conclusion that after a six year program life and only one model Listing that the standard is out of compliance with the realities of currently available technology. It is Traulsen's professional opinion that the minimum efficiency level be raised high enough in order to collect sufficient data to make realistic future calculation on a technologically attainable goal.



Each of the other categories covered by "Revision 2" (Ice Cream Freezers, Solid Door Refrigerators, Refrigerators Freezers, etc…) should receive the same careful data analysis and "Proposal" for a smooth flowing "Energy Efficacy Limit" based on sound science and physics, as presented above. Currently, it is beyond the time constraint of this report for Traulsen to accomplish this task. Traulsen hopes that all involved agree, with the analysis, and we would like to offer our expertise, testing facility, etc... to accomplish this analysis project.

It is not EPA's intention to design a specification that will allow every model to qualify. When revising a specification, EPA aims to represent the top 25% of performers in the marketplace. The performance levels proposed in Table 1 represent approximately 25% of models currently available on the market and are based on the following sources: California Energy Commission Appliance Efficiency Database, Consortium for Energy Efficiency Qualified List, and ENERGY STAR Qualifying Product List.
The existing specification established a performance requirement that varied as a function of volume but was based on a single line fit to the efficiency data such that approximately 25% of models overall would qualify. Analysis of our current data set indicates that far fewer than 25% of smaller (and most popular) volume models would qualify under an extension of this approach. Accordingly, in the revised specification, we have divided up the dataset based on volume and are proposing to set efficiency requirements such that roughly 25% of models in each size category qualify. In all cases, this new approach is more stringent than the Version 1.0 ENERGY STAR specification. Please also note that in order for products which can operate both as a refrigerator or a freezer to qualify, they must meet all applicable requirements for both product types. Stakeholders are encouraged to provide comments on these volume guidelines as well as the proposed new levels.
Currently, EPA has little or no data on solid and glass door refrigerator-freezer units, drawer cabinet units, glass door freezers, and ice cream freezers (under the new -15 degree F testing conditions). As a result, performance levels are noted as **TBD**. In order for EPA to be able to include these product types in this specification, a robust data set is needed in order to draw the appropriate specification lines. Stakeholders are encouraged to review ANSI/ASHRAE Standard 72 for these product types and to the extent feasible for this review to include product testing, we encourage manufacturers to submit test results to EPA.

4) Test Criteria: Manufacturers are required to perform tests to self-certify those product models that meet the ENERGY STAR guidelines. The test results must be reported to EPA using the Commercial Refrigerator and Freezer Version 2.0 QPI form. In addition to test results, product specification sheets are required for each submission. In performing the tests, manufacturers must use ANSI/ASHRAE Standard 72-2005, "Method of Testing Commercial Refrigerators and Freezers", to measure the daily energy consumption of commercial refrigerators and freezers with the following temperature specifications:

It has come to the attention of Traulsen that all Manufacturers or Providers are not testing their equipment in a fair and forthright manner. Many manufacturers either have or are adding switches to control the operation of electric condensate / perimeter heaters encompassing the door opening/s of their cabinets. (Refrigerators and Freezers) These switches are manually operated and generally on the face of the cabinet. During energy consumption testing these switches are placed in the OFF position, thus eliminating the energy consumed associated with this feature.

Traulsen has purchased several competitive models and evaluated them to the ANSI/ASHRAE 72-2005 standard. We found older models from a manufacturer (without a switch for the perimeter heaters, but with an identical refrigeration system) to consume an equal amount of energy as their new replacement model while the perimeter heater switch was in the ON position. When re-evaluated with the heater switch OFF, the cabinet consumed the Energy Star reported value.

During a separate evaluation, we found another manufacturer reporting energy consumption data to Energy Star with a manually operated heater switch not energized or OFF. This particular manufacturer was called and questioned about our findings, and they acknowledged the practice to be correct. They stated that the California Energy Commission allowed this switch to be placed in the OFF for energy data reported to them.

The perimeter / condensate heaters contribute to 25% of the electric load consumed by a refrigerated cabinet. This load is both direct and indirect. First the heaters consume energy directly, and in most cases 100% of the time for the full twenty-four hour test period. Secondly,

they add a heat load to the cabinet itself that must be removed by increased runtime of the refrigeration system.

Traulsen considers this practice to be deceptive and has never submitted data with condensate / perimeter heaters switched OFF. In the moist humid environments of commercial kitchens, users will always have these devises energized. Not reporting 25% of the load leaves consumers misinformed about the energy consumption rates of competitive models. It also greatly affects the integrity of the Energy Star database and the formals calculated for Version 2 of the standard.

Traulsen believes it is in the best interest of the consumer that ALL manually operated switches (perimeter heat, lights, etc...) be placed in the ON position when evaluating the energy consumption of "Commercial Refrigerated Food Grade Cabinets". Traulsen also believes that ALL accessories normally sold with a cabinet should be included when calculating the energy consumption rate for a particular model. (See the example of the "Heated Condensate Pan" above.)

Product Type:	**Integrated average product temperature:**
Commercial food-grade refrigerator cabinet	38 degrees ± 2 degrees F
Commercial food-grade freezer cabinet	0 degrees ± 2 degrees F
Commercial ice cream freezer cabinet	–15 degrees ± 2 degrees F

Only those test procedures in ANSI/ASHRAE 72-2005 relevant to closed refrigerators are applicable to this specification.

It is important to note that both ANSI/ASHRAE 72 and ANSI/ASHRAE 117 where originally developed for the evaluation of Super Market Display Cases. Over the course of time however, their procedures have been adopted by many agencies for the testing of Commercial Food Grade Cabinets. The procedures of both standards are principally adequate, but are deficient with respect to operating ambient and usage or cabinet door openings.

Super Market ambient design specifications have been roughly 75°F Dry Bulb and 50%RH for decades. (This is the approximate ambient specification outlined in both ASHRAE standards.) Now compare this to ASHREA's Commercial Kitchen specification of 70°F to 88°F Dry Bulb without any upper limit set for Relative Humidity. Next consider cabinet door openings, both ASHRAE standards above only open each door of a subject model forty-eight times during the test. Food service environments pose operating challenges with many more cabinet door openings or higher usage for the same time period. And finally, food stored in a Super Market Case is at temperature when place there. On the contrary, many kitchen operators will use their refrigeration equipment to cool warm product to a safe holding temperature. A much different challenge or application.

The inadequacies of ANSI/NSF Standard 7 and ANSI/ASHRAE 72-2005 to be sufficient guarantors of acceptable performance under demanding commercial kitchen conditions led many to develop their own proprietary test specifications. Chains like Chick-fil-A and Applebee's and manufactures like Traulsen develop proprietary test specifications for the evaluation of "True" top performing commercial refrigerated cabinets intended for high usage environments. (Traulsen - Commercial Refrigerated Cabinet, High Usage Test Specification)

Why is this important to EPA? In order to separate marginal product performers from more robust equipment and give customers the information they need to make informed buying decisions, products must be categorized by technology differences in construction.

- *Vertically hinged vs. sliding doors.*
- *Automatic vs. manual defrost.*
- *Forced convection cooling vs. passive convection / conduction cooling.*
- *Forced convection heat rejection systems vs. passive convection / conduction heat rejection systems.*

(See 1a above for an example of product categorization based on construction technology.)

Lastly, EPA is requiring product specification sheets to be attached to QPI forms due to past issues with ineligible products being submitted for qualification.

Traulsen believes this is an excellent idea, but would also like to know what measures EPA will be taking to correct the invalid products / models currently listed in the Energy Star database? What measures will EPA take to correct inaccurate data currently listed for a particular covered product as outlined in other sections of this report? And finally, what measures will EPA take to correct and otherwise guarantee the accuracy of ALL remaining data in the Energy Star database?

Traulsen believes Energy Star has a very important role to pay in the buying decisions of potential commercial refrigeration customers. Many turn to the E-Star database as a buying resource, and we are very concerned about its accuracy as it now exists.

Also, we are alarmed at EPA's desire to eliminate 75% of currently covered products as a way to drive energy efficiency levels lower. Traulsen believes consumers would be better served through the raising of the minimum energy efficiency level by a given percentage. Hopefully EPA realizes potential buyers do compare numbers ("energy consumption rates"), and for the database to be useful, it must give them a reasonable choice of available products. A good example of this type of reporting is the evaluations conducted in "Consumer Reports" magazine. EPA should raise the minimum efficiency levels, but without a significant loss in customer choice. ("A marginal Listing of products is useless to a potential customer.")

Note: For Draft 1 of this Version 2.0 specification, EPA is referencing the most recent ASHRAE Standard 72-2005. This ASHRAE Standard supersedes the old ASHRAE Standard (ANSI/ASHRAE 117-2002). Only those sections of the test procedure relevant to closed refrigerators are applicable to this specification. Closed refrigerators are defined in the test procedure as a display or holding refrigerator where product is accessible for removal by opening or moving doors or panels. ANSI/ASHRAE Standard 72-2005 is currently recognized and used by manufacturers. Based on discussions with industry stakeholders, EPA understands that the differences between ANSI/ASHRAE Standards 117-2002 and 72-2005 would not impact energy performance results. EPA would like stakeholder feedback on whether there are any concerns with comparing data between the two test procedures.

Traulsen does not believe there to be any significant difference between testing cabinets to either the ANSI/ASHRAE 117-2002 or the ANSI/ASHRAE 72-2005 standards. We do request that, "the liquid used in the test packages may be either a solution of salt and water (H_2O and 6% +/- 0.5% NaCl by mass) or a mixture that, by volume, is equal parts propylene glycol and distilled water;" This is an exception that "National Resources Canada" has made when performing tests to determine compliance with minimum energy efficiency requirements for products sold in Canada.

EPA is considering adopting the -15 degrees F integrated average product temperature for testing ice cream freezers for ENERGY STAR qualification. The Department of Energy set this -15 degrees F requirement in recent federal regulations (10 CFR 431.64) based on feedback from ARI and other industry stakeholders who state that it better reflects real-world operation of the various types of ice cream equipment. Stakeholders are encouraged to provide feedback on this proposal.

It is Traulsen's opinion that The Department of Energy did not consider the complexity of existing and available "Ice Cream Freezers" in the market when mandating 10 CFR 431.64(C). We hope to bring to DOE's attention these and other inequities in the 10 CFR 431 Subpart (C) standard as it is now written for 2010.

As a note, most if not all "Ice Cream Dipping Cabinets" are incapable of obtaining a product temperature of -15°F. See the CKDC47 from Kelivator above, the DD-46 from Master-Bilt or the DCCG-8 from Hussmann.

5) Effective Date: The date that manufacturers may begin to qualify products as ENERGY STAR will be defined as the *effective date* of the agreement. Any previously executed agreement on the subject of ENERGY STAR qualified commercial refrigerators and freezers shall be terminated effective **April 30, 2009**.

A. Qualifying and Labeling Products under Version 2.0: The ENERGY STAR for Commercial Refrigerators and Freezers Specification Version 2.0 shall go into effect on **May 1, 2009**. All products, including models originally qualified under the previous commercial refrigerator and freezer specification, with a date of manufacture on or after May 1, 2009, must meet the new Version 2.0 requirements in order to qualify for ENERGY STAR (including additional manufacturing runs of models originally qualified under the previous specification). The date of manufacture is specific to each unit and is the date (e.g., month and year) on which a unit is considered to be completely assembled.

Note: When revising ENERGY STAR specification, EPA typically allows manufacturers 9 months to transition to the new specification requirements. It is EPA's hope that this specification can be finalized prior to September 2008 so that the 2009 National Restaurant Association (NRA) Show may be used to announce this new ENERGY STAR specification. In the case where product categories are eligible for qualification for the first time, such as glass door and drawer cabinets, EPA may decide to allow manufacturers to qualify and promote ENERGY STAR units immediately upon finalization of the specification.

6) Future Specification Revisions: ENERGY STAR reserves the right to revise the specifications should technological and/or market changes affect its usefulness to purchasers, industry, or the environment. In keeping with current policy, revisions to the specification are arrived at through discussions with industry. In the event of a specification revision, please note that the ENERGY STAR qualification is not automatically granted for the life of a product model. To qualify with the energy efficiency criteria of ENERGY STAR, a product model must meet the ENERGY STAR specification in the effect on the date of manufacture.

*Traulsen would like to suggest to EPA that all "Future Specification Revisions" be developed in a manner similar to the Standards Development conducted by Underwriters Laboratories, Inc. (UL). There exists for each UL standards a **Standards Technical Panel (STP)** - a group of individuals representing a variety of interest categories formed to provide input on UL standards such as providing proposals, reviewing and balloting proposals. The group may also meet to discuss UL standards-related issues. It serves as the consensus body for ANSI/UL Standards.*

The commercial refrigeration market is very large and for the most part misunderstood. It consists of both large and small manufacturers, some with resources that don't allow them to

respond directly to DOE or other regulatory agencies. The industry is now faced with revised energy efficiency standards which are not based on good science, engineering or available technology, and is plagued with energy efficiency databases containing significant reporting errors. Therefore, Traulsen believes the best interest of consumers and manufacturers alike would be served by the establishment of such an oversight panel. It works for UL and it can work for EPA as well.