



ENERGY STAR®

Laboratory Grade Refrigerators and Freezers

U.S. Environmental Protection Agency

December 17, 2014





Introductions

- Christopher Kent – EPA Lab Grade R/F Product Lead
- John Clinger – ICF International



Agenda

- Overview of ENERGY STAR Program
- Overview of Draft 1 Specification
- Review of previous data set analysis
- Next steps



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Established in 1992



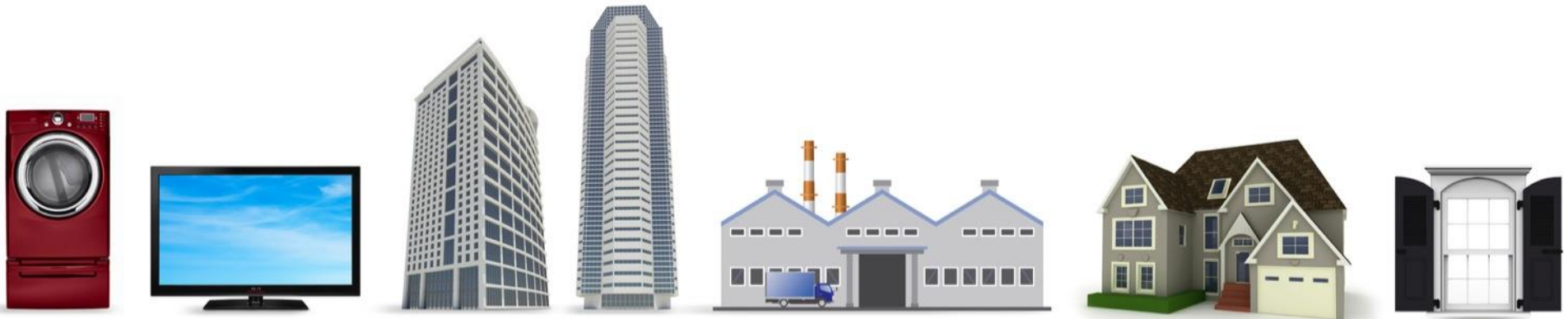
Voluntary climate protection partnership with the U.S. Environmental Protection Agency (EPA)

Strategic approach to energy management, promoting energy efficient products and practices

Tools and resources to help save money and protect the environment

For more than **20 years**, EPA's ENERGY STAR program has identified the most energy-efficient **products**, **buildings**, **plants**, and **new homes** – all based on the latest government-backed standards.

Today, every ENERGY STAR label is verified by a rigorous third-party certification process.





To date,
the **ENERGY STAR**
program has:



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program has:

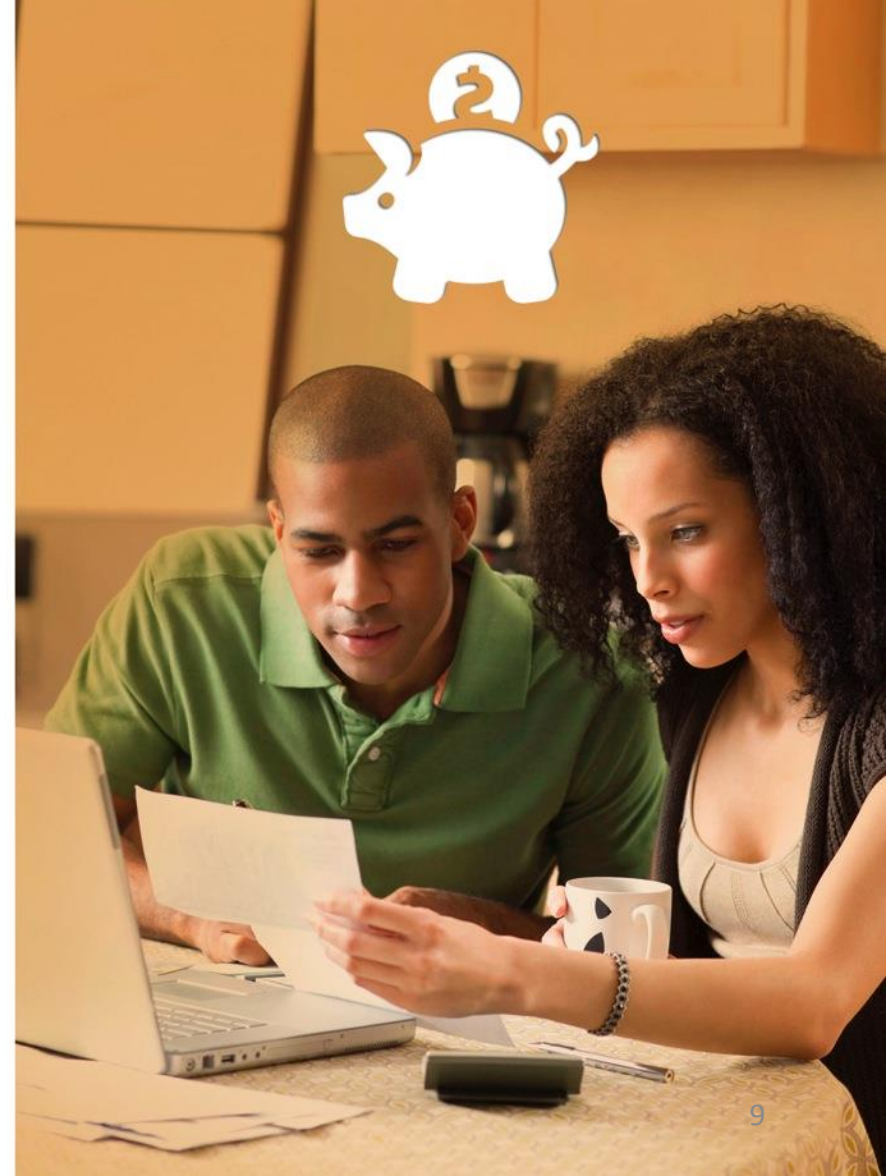
- Prevented 2 billion metric tons of greenhouse gas emissions





To date,
the **ENERGY STAR**
program has:

- Prevented 2 billion metric tons of greenhouse gas emissions
- Saved \$300 billion on utility bills



ENERGY STAR = Energy Efficiency

ENERGY STAR has become synonymous with energy efficiency.



ENERGY STAR is also the most comprehensive resource available for proven energy efficiency guidance.

At **energystar.gov**:





ENERGY STAR is also the most comprehensive resource available for proven energy efficiency guidance.

At **energystar.gov**:

- Consumers can find a broad range of tools to help them save more
- Homeowners can assess and find help improving their homes' efficiency
- Businesses can find tools and resources to help unlock greater energy performance





Reducing
the complexity
of energy
efficiency to a
simple choice.



ENERGY STAR. The simple choice for energy efficiency.



Today,
this little blue label
does all the hard work
of certifying outstanding
energy efficiency in:



ENERGY STAR. The simple choice for energy efficiency.



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70

**Product
Categories**





Lighting

CFLs
SSL
Integral LED lamps
Residential light fixtures

Home Envelope

Roof products
Windows/Doors

Heating & Cooling

Central AC
Heat pumps
Boilers
Furnaces
Ceiling fans
Room AC
Ventilating fans
Water Heaters

Office Equipment

Computers*
Monitors*
Printers*
Copiers*
Scanners*
Fax machines*
Multi-function Devices*
Servers*
UPS

Commercial Food Service

Dishwashers
Refrigerators
Freezers
Ice Machines
Fryers
Steamers
Hot Cabinets
Griddles
Ovens
Vending machines

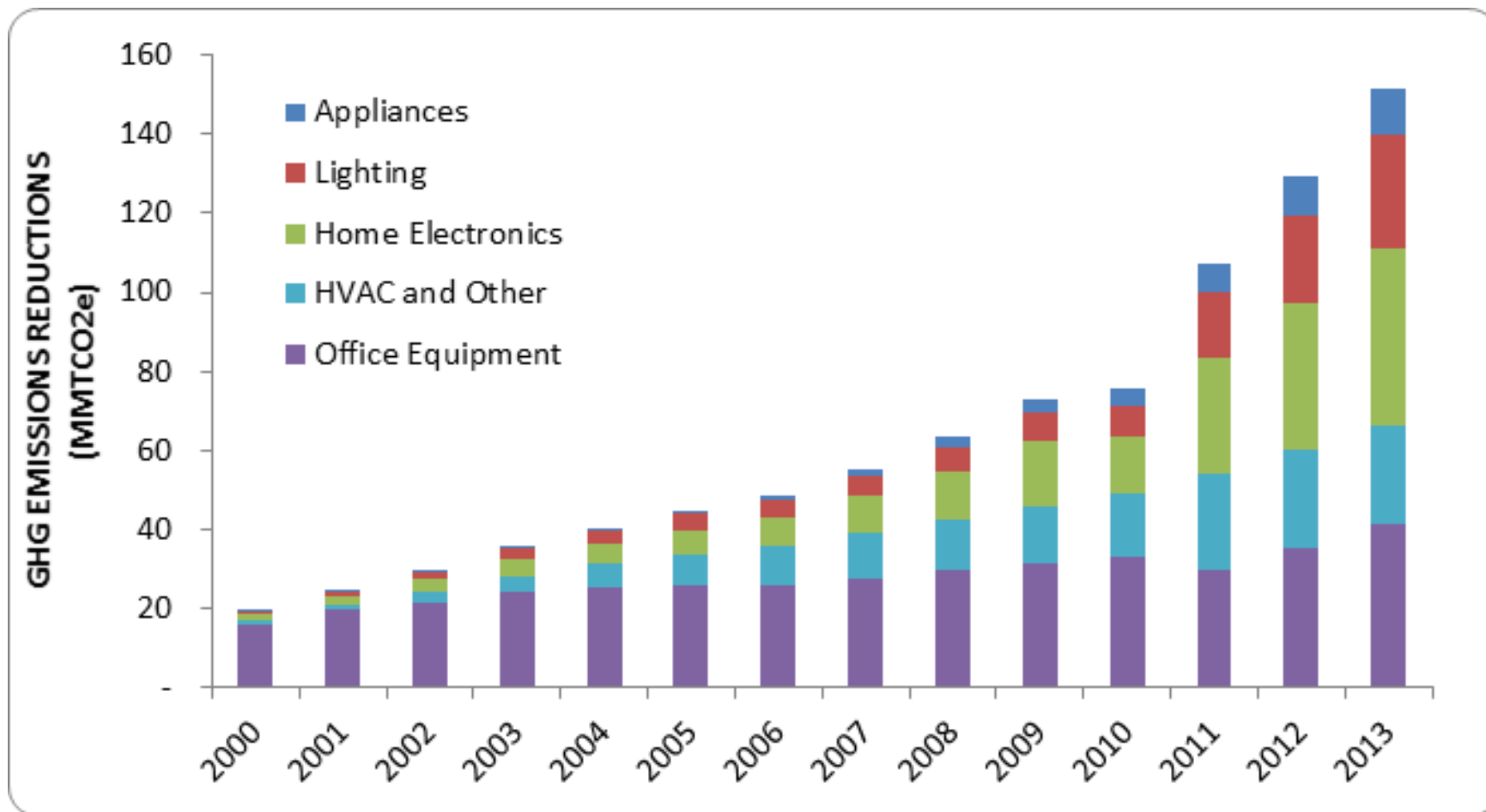
Appliances

Clothes washers
Dishwashers
Refrigerators
Dehumidifiers
Air cleaners
Water coolers

Home Electronics

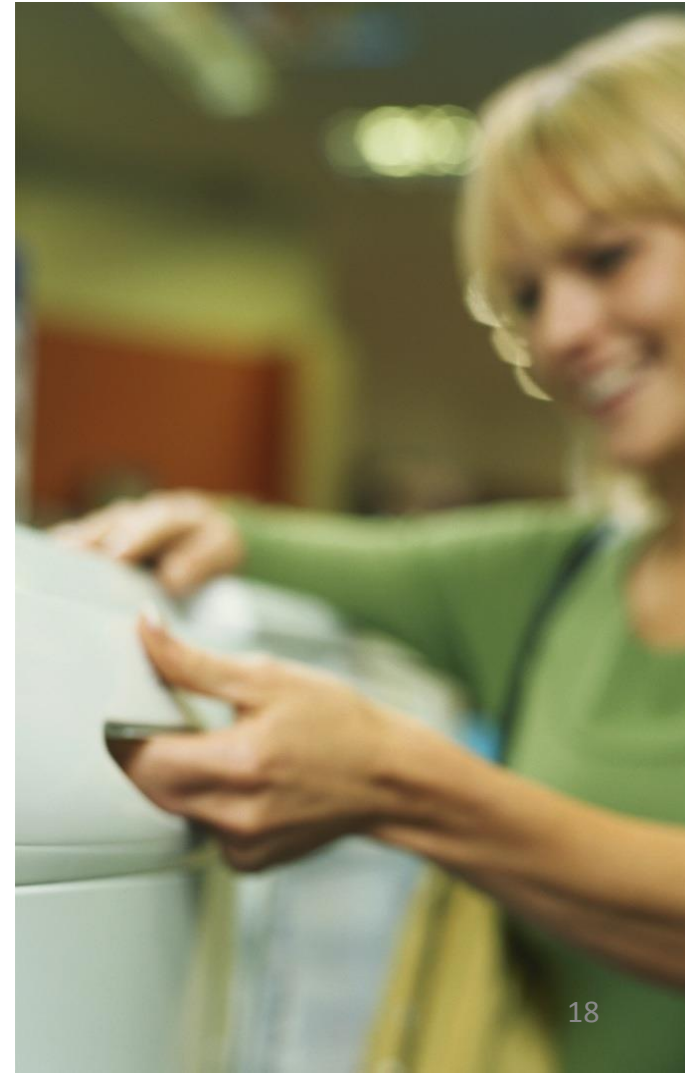
Battery chargers
Cordless phones
TV
Set Top boxes
Home audio

Greenhouse savings by product category



Benefits of an ENERGY STAR certified product

- Consume less energy
 - Reduced kWh – reduced CO2 emissions
- Equivalent or better quality
- Annual and life cycle cost savings
- Publicly demonstrate commitment to environment
- Third-party certification procedures bolster the integrity of the program and ensure energy-efficient performance

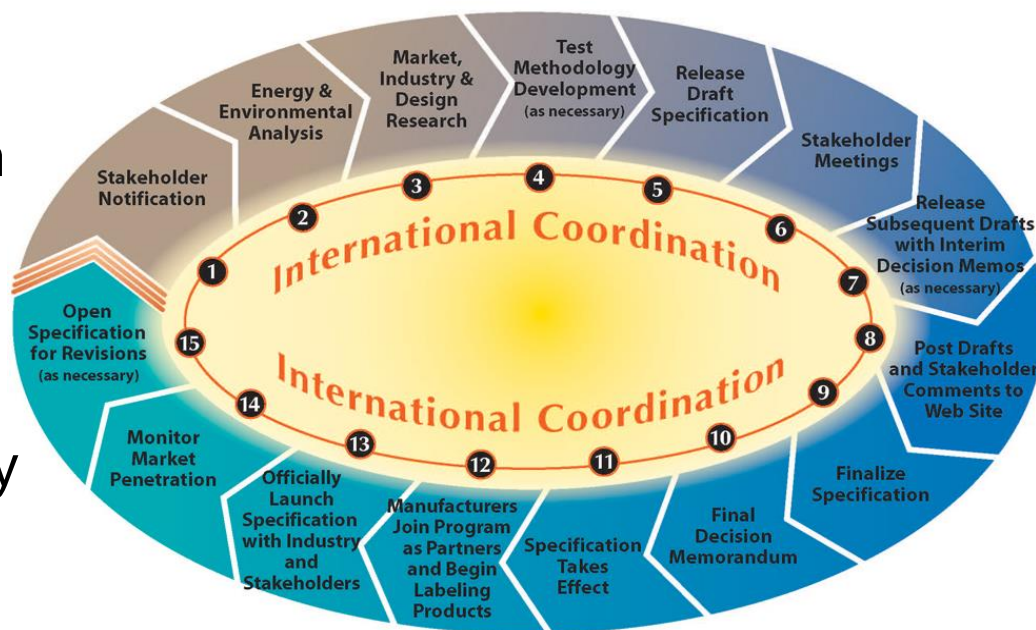


Maintaining Relevancy

Specifications are updated in response to market changes:

- High market share
- Change in Federal minimum efficiency standards
- Availability, performance, or quality concerns
- Advancements in technology
- Changes in test procedures

Specification Development Cycle





Guiding Principles

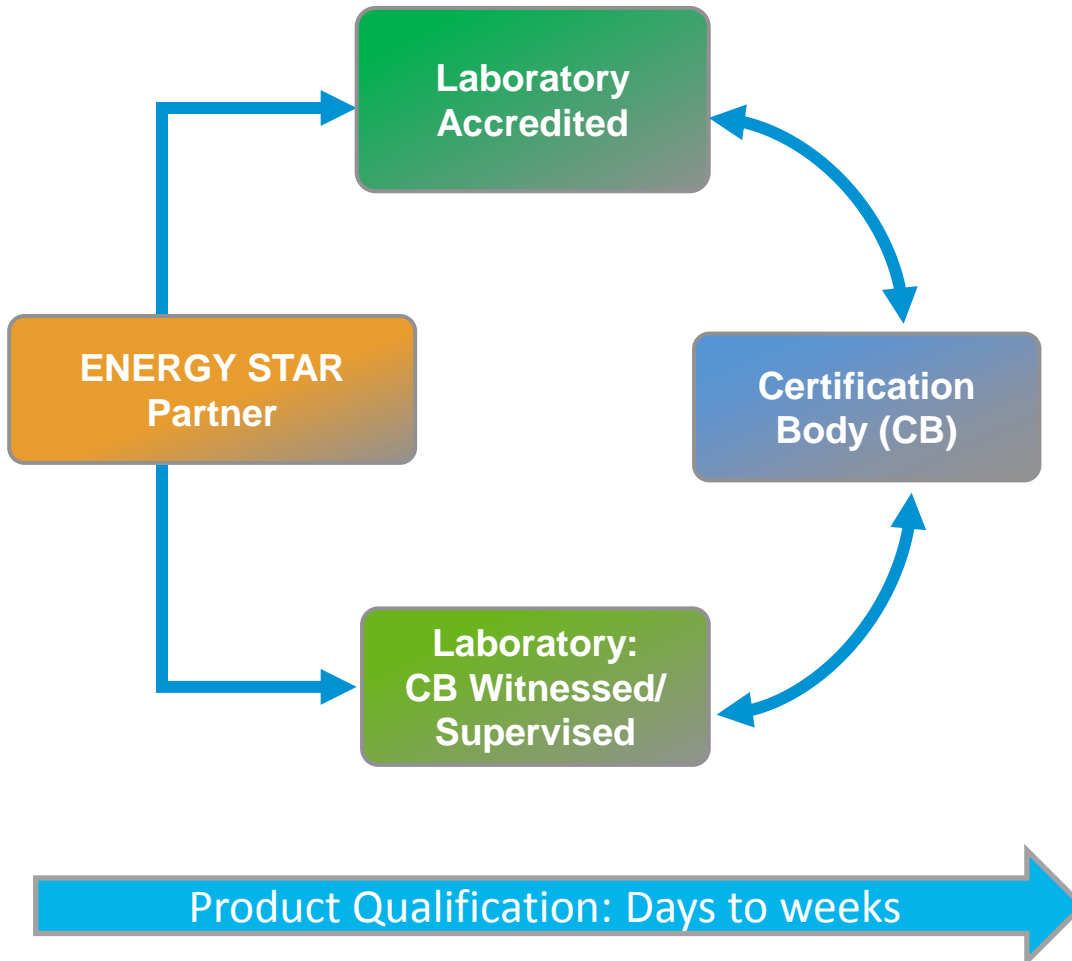
- Significant energy savings on a national basis
- Product performance maintained or enhanced with increased efficiency
- Consumers recover investment in efficiency within a reasonable period of time
- Efficiency can be achieved with one or more technologies and are available from more than one manufacturer
- Energy consumption and performance can be measured and verified with testing
- Labeling would effectively differentiate products and be visible to purchasers



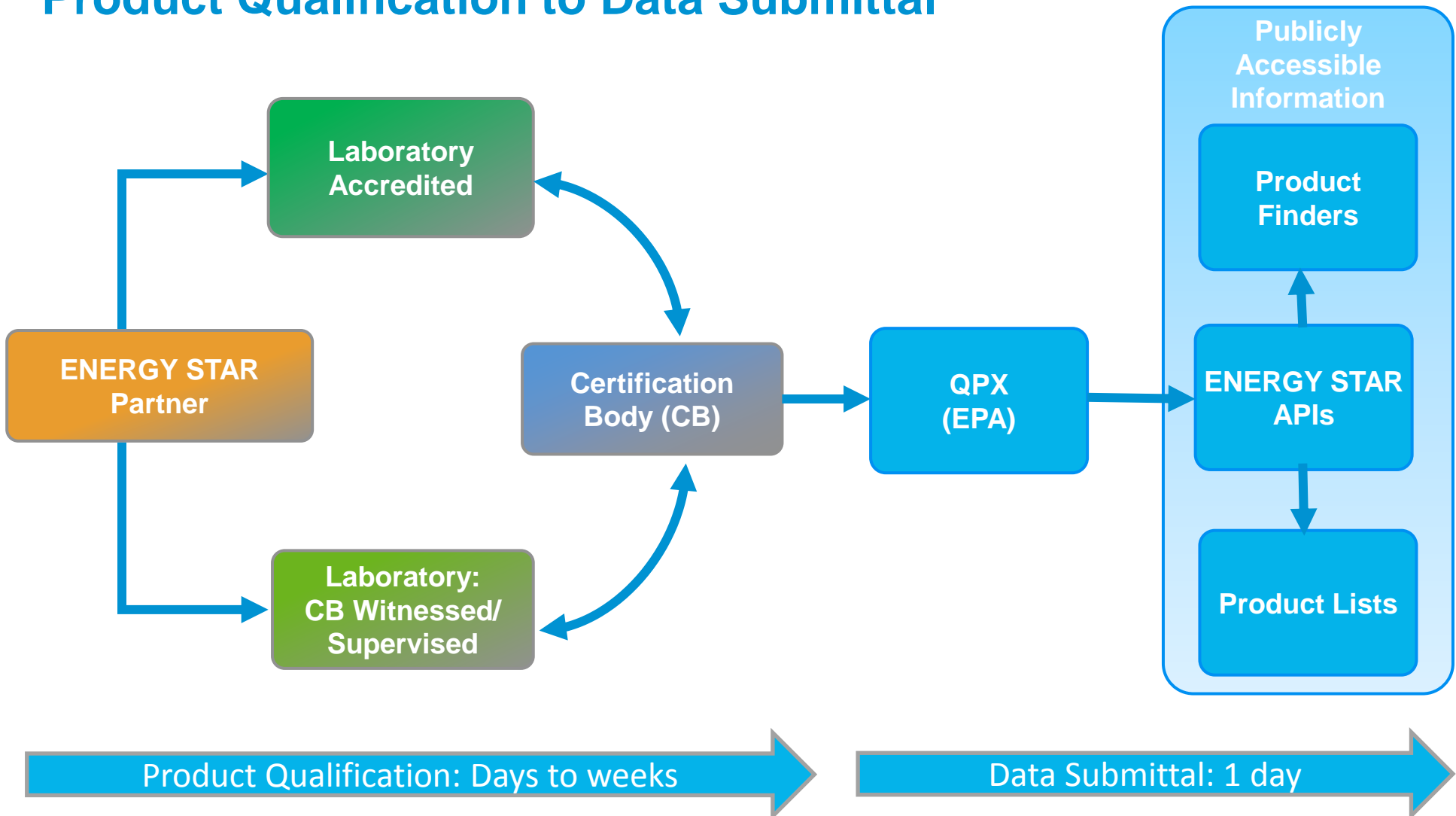
Program Integrity Certification Verification



Product Qualification to Data Submittal



Product Qualification to Data Submittal











Certified Product Lists

- Updated daily
- Custom filters and embed options for retailers, partners, media
- Export options including Excel, .csv, APIs
- One portal where stakeholders access certified products*

data.energystar.gov

*Excludes Windows, Non-AHRI CAC/ASHPs, and BCS

ABOUT ENERGY STAR PRODUCT FINDER HOME Sign Up Sign In Help

Name	Popularity	Type
1. ENERGY STAR Certified Audio Video Government Certified models meet all ENERGY STAR requirements as listed in the Version 3.0 ENERGY STAR Certified Product List	707 views	
2. ENERGY STAR Certified Boilers Government Certified models meet all ENERGY STAR requirements as listed in the Version 2.1 ENERGY STAR Certified Product List	3,345 views	
3. ENERGY STAR Certified Ceiling Fans Government Certified models meet all ENERGY STAR requirements as listed in the Version 3.0 ENERGY STAR Certified Product List	1,327 views	
4. ENERGY STAR Certified Commercial Clothes Washers Government Certified models meet all ENERGY STAR requirements as listed in the Version 6.1 ENERGY STAR Certified Product List	440 views	
5. ENERGY STAR Certified Commercial Dishwashers Government Certified models meet all ENERGY STAR requirements as listed in the Version 2.0 ENERGY STAR Certified Product List	742 views	
6. ENERGY STAR Certified Commercial Fryers Government Certified models meet all ENERGY STAR requirements as listed in the Version 2.0 ENERGY STAR Certified Product List	629 views	
7. ENERGY STAR Certified Commercial Griddles Government Certified models meet all ENERGY STAR requirements as listed in the Version 1.1 ENERGY STAR Certified Product List	337 views	
8. ENERGY STAR Certified Commercial Hot Food Holding Cabinet Government Certified models meet all ENERGY STAR requirements as listed in the Version 2.0 ENERGY STAR Certified Product List	407 views	



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History of the effort to date

- 2008 – Launch effort – separated from CFS CRE
- 2010 – Redefined CRE as food grade only, removed lab grade equipment from scope
- 2009 – Started on test method development
- 2010 – Final test procedure based on the ASHRAE supplemental
- 2010 – Framework document distributed
- 2011 – DOE tested equipment and validated lab grade test method
- 2012 – DOE drafts Test Method
- 2014 – DOE finalized Test Method
- November 2014 – Draft 1 Specification distributed



Definitions

- Draft 1 proposed definitions:
 - Consistent with definitions developed in the following three documents:
 - 2010 Laboratory Grade Refrigerators/Freezers Framework Document
 - Finalized Laboratory Grade Refrigerators/Freezers Test Method
 - Current Commercial Refrigerators and Freezers Program Requirements
- EPA welcomes feedback on all proposed definitions, but intends to harmonize with existing industry accepted terminology whenever possible



• Product Types:

- Laboratory Grade Refrigerator
- Laboratory Grade Freezer
- Ultra-Low-Temperature Laboratory Grade Freezer (ULT)
- Combination Laboratory Grade Refrigerator/Freezer:
- Portable Laboratory Grade Refrigerator/Freezer.
- Walk-in Laboratory Grade Refrigerator.
- Explosion Proof Refrigerator/Freezer.
- Incubators

• Defrost-related Terms

- Automatic Defrost.
- Variable Defrost
- Manual Defrost
- Semi-Automatic Defrost

• Additional Terms

- AHAM Volume
- Cabinet Temperature
- Peak Variance
- Refrigeration Cycle
- Stability
- Test
- Uniformity
- Solid Door
- Glass Door
- Solid Door Cabinet
- Glass Door Cabinet
- Mixed Solid/Glass Door Cabinet



Product Family

- EPA is proposing the following definition of a product family:
 - Made by the same manufacturer
 - Have the same measured interior volume
 - Have the same number of external doors
 - Use same basic engineering design
- Product models within a family can differ in aesthetic characteristics and interior configurability
- Consistent with how we address product families in other specifications, EPA proposed that the highest energy-consuming unit in a product family will serve as the Representative Model for testing purposes



Proposed Scope Inclusions

- Lab Grade Refrigerators
 - Set points between 0° C and 12 ° C
 - Storing of non volatile reagents and biological specimens
 - Usually marketed through lab equipment supply stores and distributors
- Lab Grade Freezers
 - Set points between - 40 ° C and 0 °C
 - Storing of non volatile reagents and biological specimens
 - Usually marketed through lab equipment supply stores and distributors
- Ultra-Low Temperature Freezers
 - Set points between - 70 °C and - 80 °C
 - Preserving bacteria, cells, spores, etc. and aid in the preservation of medicines and vaccines



Proposed Scope Exclusions

- Combination Laboratory Grade Refrigerators/Freezers
- Portable Laboratory Grade Refrigerators/Freezers
- Walk-in Laboratory Grade Refrigerators/Freezers
- Explosion Proof Refrigerators/Freezers
- Incubators
 - Or products that are capable of temperature control above 15 ° C
- Products designed specifically to store blood and plasma samples

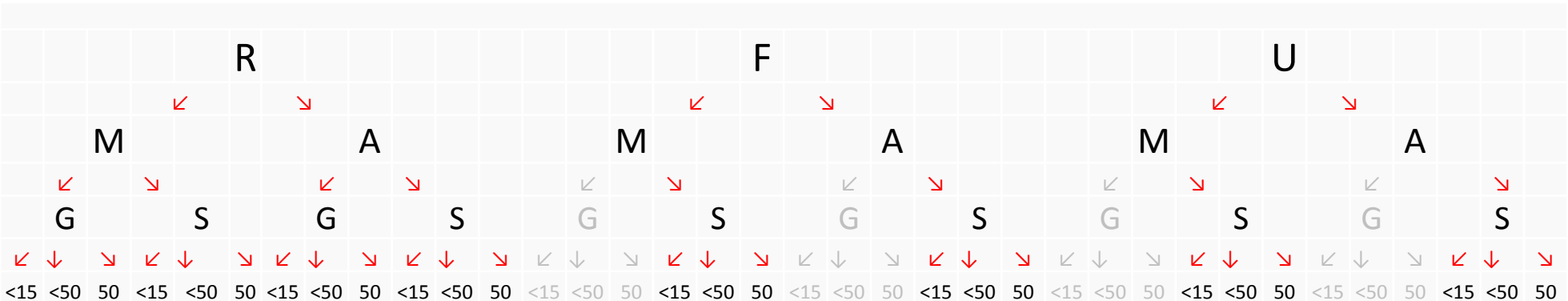


Efficiency Criteria

- Metric: Maximum Daily Energy Consumption (MDEC) in kWh/day
- EPA did not propose preliminary efficiency criteria in the Draft 1 Specification due a lack of product energy performance data
- Previously submitted product energy data from 2010 indicated that:
 - Products should be segregated based on intended application
 - Refrigerator, Freezer, Ultra Low Temperature Freezer
 - Door type impacted performance (for refrigerators only)
 - Defrost strategy impacted performance
 - The number of doors, both inner and outer doors, impact energy performance
- Following the current data assembly effort, EPA will create efficiency criteria that differentiate products in a fair and consistent manner while trying to avoid unnecessary complexity

Possible Efficiency Criteria Parameters

Equipment Type	Defrost Strategy	Door Type	Internal Capacity	Number of doors?
Refrigerator at 4° C	Automatic	Solid	Small	
Freezer at -20°C	Manual or Continuous	Glass	Medium	
Freezer at -70°C			Large	





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Existing Dataset from 2010

- Lab Grade Refrigerators – 16 (2010 data)
- Lab Grade Freezers – 13 (2010 data)
- Ultra-Low Freezers – 0 data (8 models from DOE 2013 test)

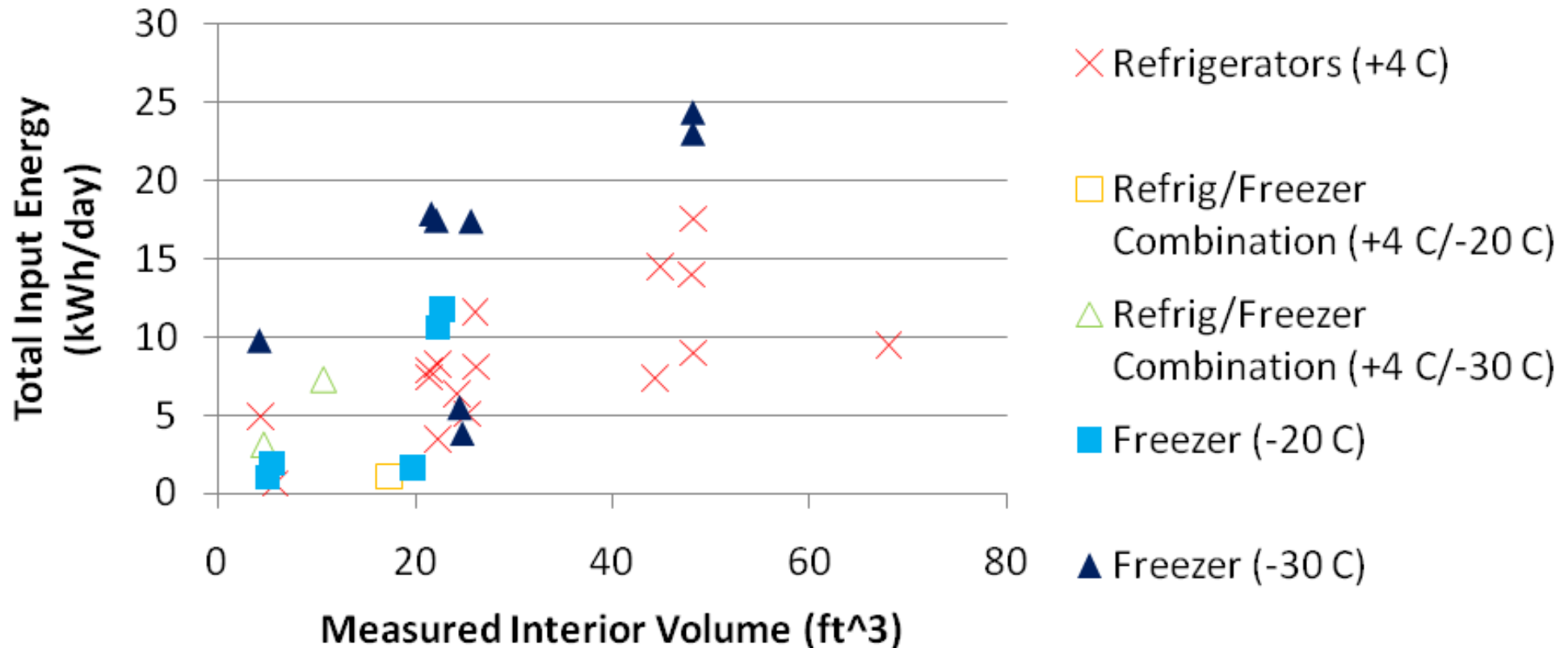
Note: EPA received additional product data prior to the start of the current data assembly effort and would like to thank those stakeholders for their contributions. This new data will be included with the data from the data assembly effort in upcoming development of the Draft 2 Specification.



Existing Dataset from 2010

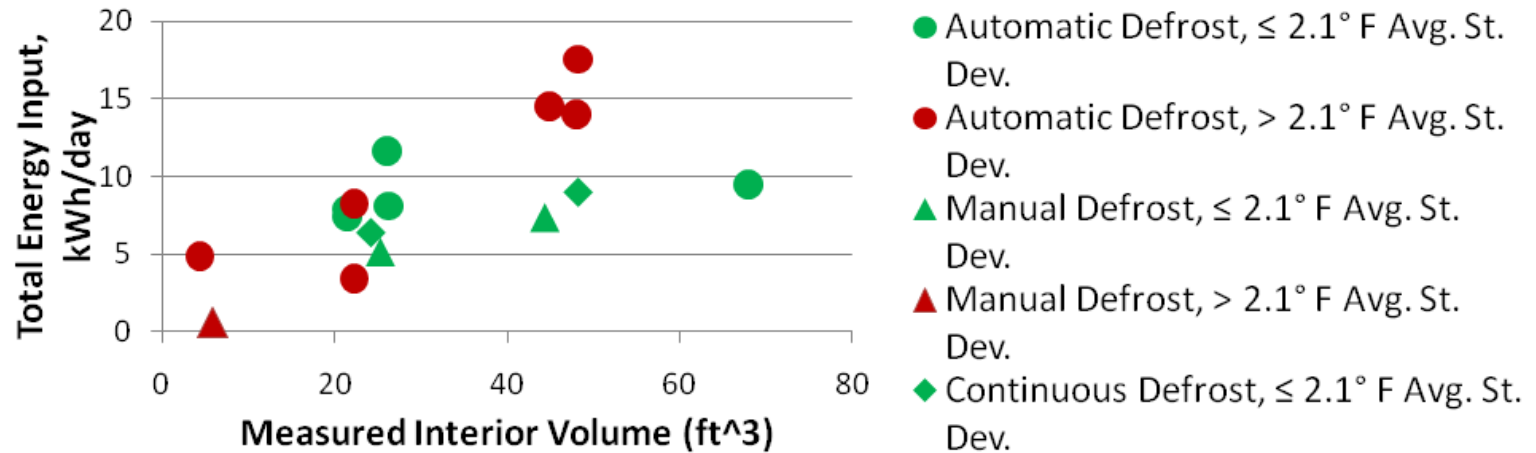
Equipment Type	Door Type	Defrost Strategy	Total
Refrigerator	Glass	Automatic	5
		Manual	2
		Continuous	2
	Solid	Automatic	6
		Manual	1
-20 ° Freezer	Solid	Automatic	1
		Manual	1
		Continuous	1
-30 ° Freezer	Solid	Automatic	7
		Manual	1
Total			29

2010 Data – Total Energy Input

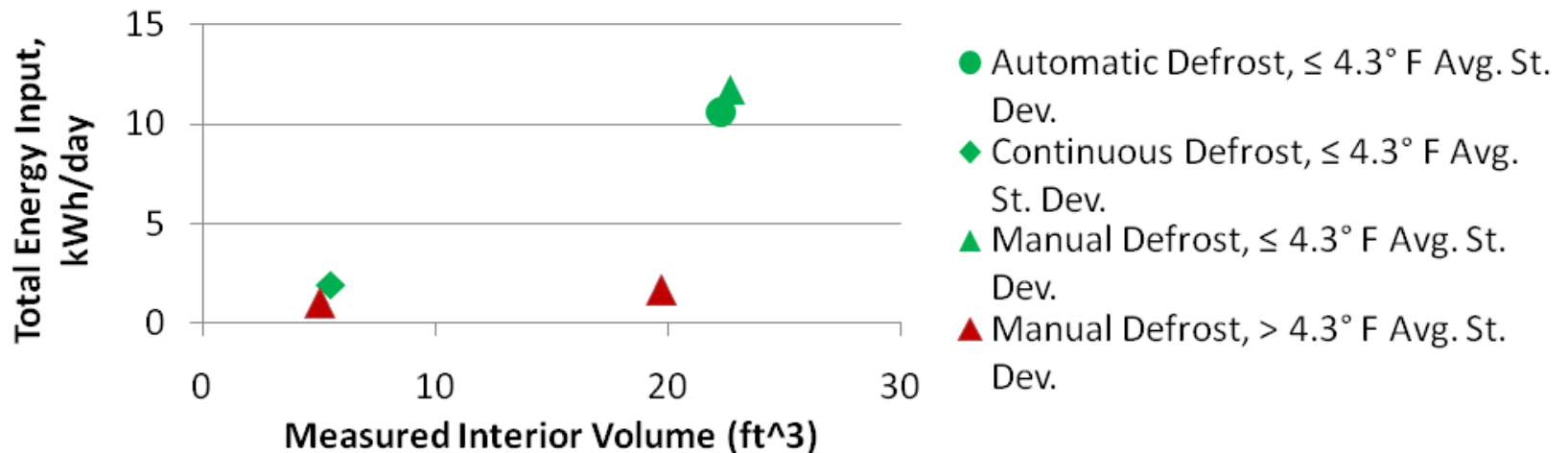


2010 Data - Impact of Defrost

Refrigerator

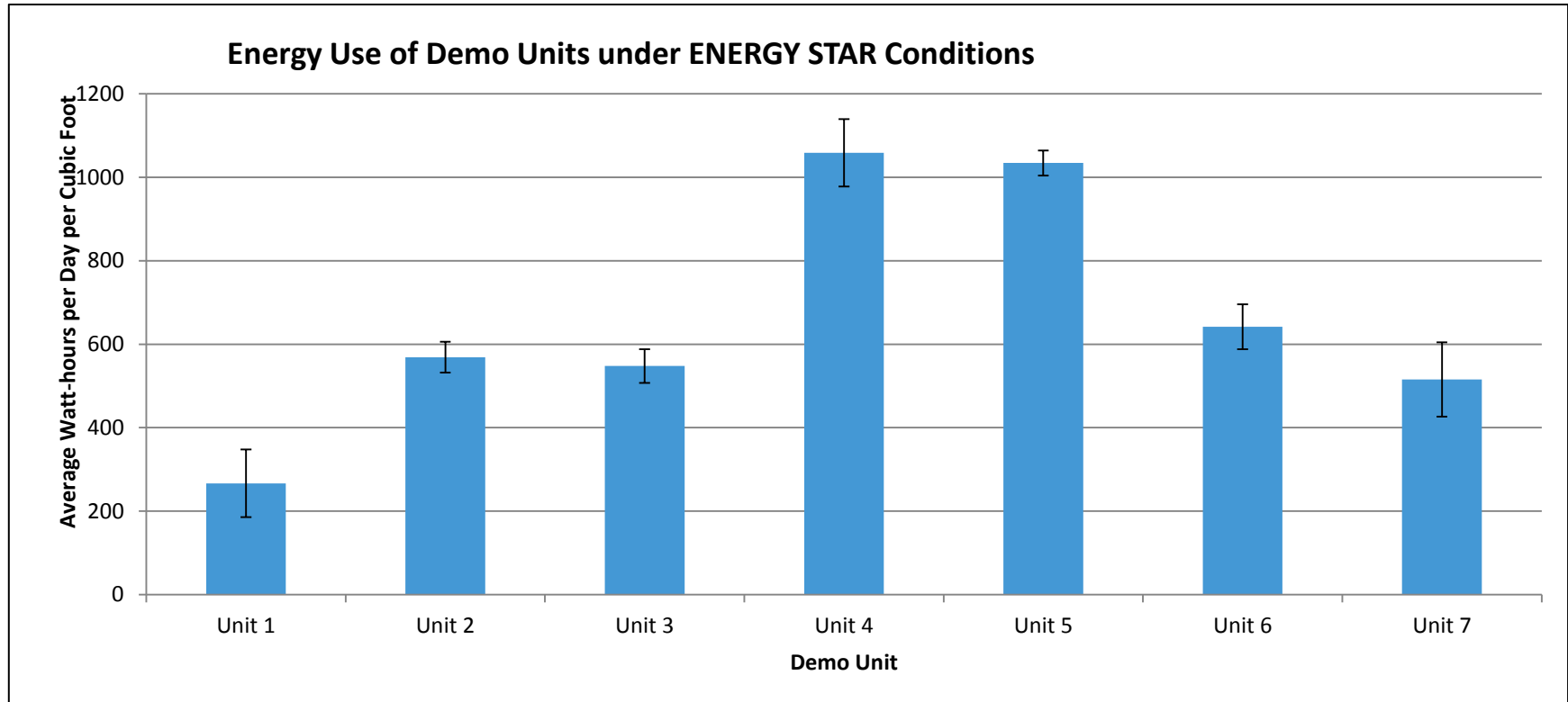


Freezer





DOE ULT Freezer Demonstration Data (2013)





DOE ULT Freezer Demonstration Data (2013)

DOE ULT Data	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7
Year ULT was manufactured	2013	2012	2013	2010	2009	2013	2012
Internal volume in cubic feet (rounded)	28	20	26	23	17	24	26
Number of outer doors	1	1	1	2	1	1	1
Number of inner doors	3	5	2	4	4	5	3
Volumetric daily energy use at ENERGY STAR conditions (Wh/day/cubic foot)	306	572	508	1058	980	725	516
Statistical error (Wh/day/cubic foot)	79	37	41	81	30	54	89



Changes in the Test Method - Impact on Data?

- The data from 2010 used a slightly different test method than the final DOE test method. New requirements include:
 - The use of weighted thermocouples
 - Reduces burden of meeting pull down requirements and temperature fluctuation
 - Measuring and reporting stability and uniformity for a 3-hr period **without** any door openings
 - Modification to door opening tolerances and requirements
 - Freezer/ULTs open a door once per hour for six consecutive hours



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Request for Additional Product Energy Test Data

- EPA is striving to assemble a more complete dataset that better reflects today's market:
 - Seeking additional product data primarily focused on Laboratory Grade Refrigerators, Freezers, and Ultra Low Temperature Freezers.
 - While data is needed for all three categories above, there is a particular shortage of Ultra Low Temperature Freezer data that may prevent their continued inclusion in the Draft 2 Specification if not resolved.
 - EPA will also review any data received regarding products currently proposed as excluded from scope.

Current Deadline for Data Submissions

January 30, 2015



Timeline

- To develop a robust data set, do stakeholders need more time to test and report performance of a range of products currently available in the market?
- Until we receive more data, EPA is unable to draft performance criteria with enough assurance that the levels set are appropriate for the current market and provides sufficient differentiation and choice for purchasers.
- Current data due date is January 30, 2015
 - EPA may considering extending the deadline a month or two but only if there are assurances from stakeholders that additional test data will be forthcoming.



Final Questions or Comments?





**Please send any additional comments to
labgraderefrigeration@energystar.gov or contact:**

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**ENERGY STAR is the simple choice for
energy efficiency.**