ENERGY STAR® Commercial Refrigerators and Freezers

Version 5.0 Discussion Guide

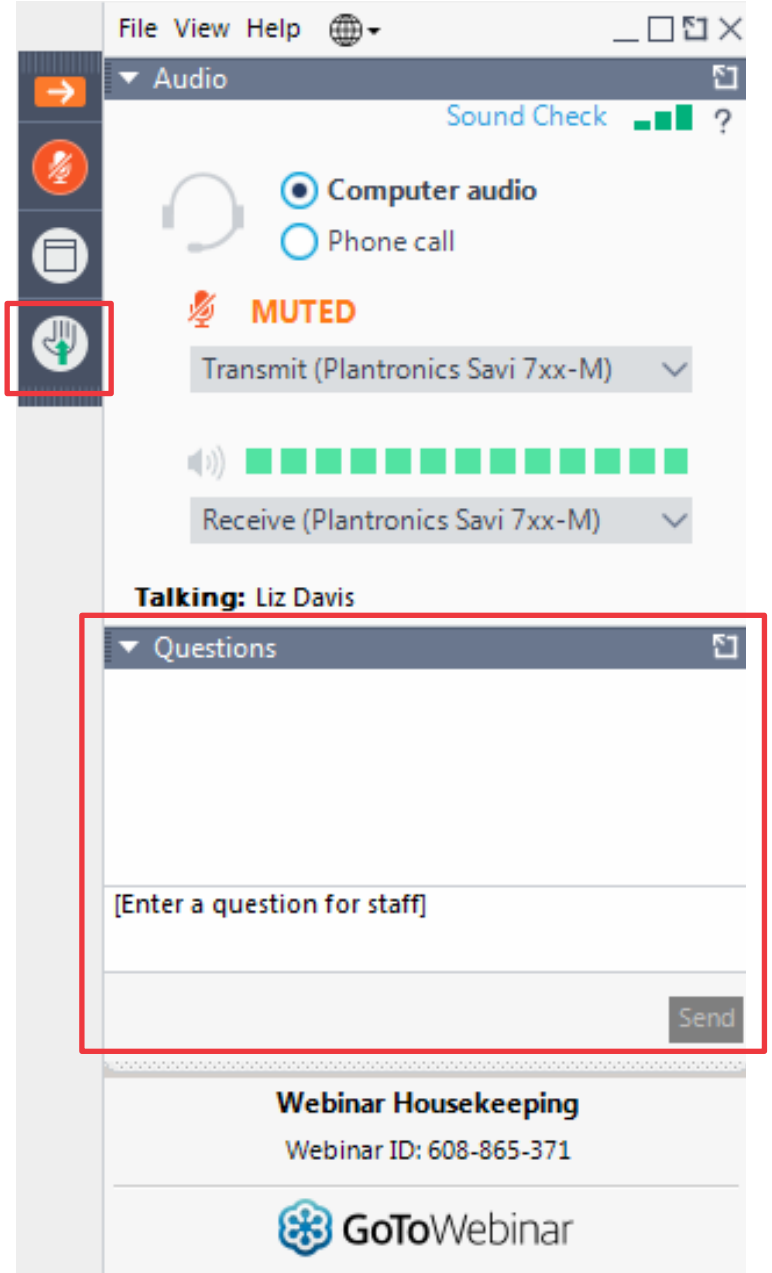
Stakeholder Meeting (Part 1)

February 2, 2021

Webinar Participation

- Please mute yourself when you are not speaking (use local mute or dial *6)
- Feel free to ask questions at any time

Submit written comments to cfs@energystar.gov by **February 23, 2021**



Poll Question #1

Which Stakeholder group do you identify as?

- Manufacturer
- Certification Body
- Restaurant or Commercial Operator (e.g., grocery store)
- Utility or EEPS
- Consultant
- Trade Association
- Other

Poll Question #2

What are your expectations for this webinar?

- To increase my understanding of the new possible CRE scope expansions
- To voice questions concerning possible new levels
- To comment on best practices for open display cases
- To learn about the ENERGY STAR program for products
- Other

Meeting Agenda

1. **Introductions**
2. Current Specification
3. Scope Expansion Considerations
4. Discussion Questions
   a) VCT.RC.M/L
   b) SOC.RC.M & SOC.SC.M
5. Energy Savings for Open Display Cases
6. Closing - Next Steps & Questions

Introductions

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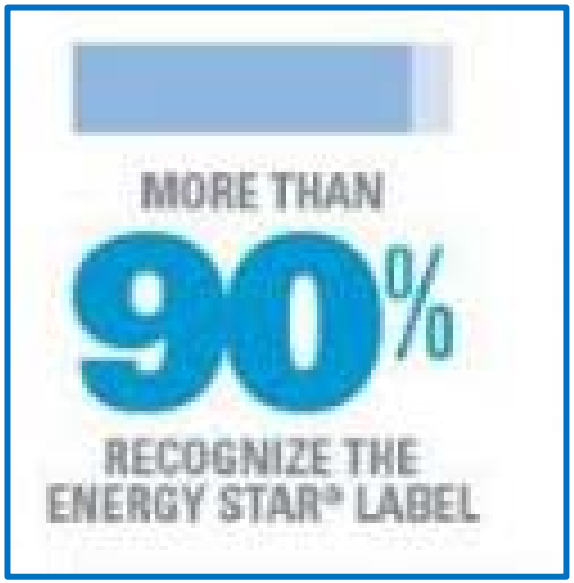
What is ENERGY STAR?

The simple choice for energy efficiency.

- Influential and trusted symbol of **energy efficiency**
- Available across **75+ product categories**
- Since 1992, a voluntary **partnership** among government, business, and consumers
- Products are independently certified to meet strict energy-efficiency guidelines set by the **U.S. EPA**
- **Utilities** offer **rebates** on ENERGY STAR certified equipment
- **Saves** end-users **energy**, **water**, and **money**
- Helps protect the **climate**

Benefits to joining ENERGY STAR



Source: CEE's 2019 Household Survey
https://www.energystar.gov/awareness

- Access a network of over 700 utilities
- Leverage the label recognition
- Access customer support teams at EPA
- Utilize co-brandable materials
- Participate in promotional events
- Get listed on publicly-available ENERGY STAR search tools
- Apply for the ENERGY STAR Partner of the Year Award
- Receive email notifications about program activities

ENERGY STAR Partnership Types

The simple choice for energy efficiency.

- Brand owner
- Retailer (*i.e.*, CFS dealer/distributor)
- Residential building
- Commercial building, service, product, or association
- Industrial plant, service, product, or association
- Energy Efficiency Program Sponsor

For more information on joining as an ENERGY STAR partner visit this webpage
https://www.energystar.gov/partner_resources/join-energy-star

Product Brand Owner Partnership Requirements

1. **Sign** partnership agreement. See partner resources page: https://www.energystar.gov/partner_resources/join-energy-star

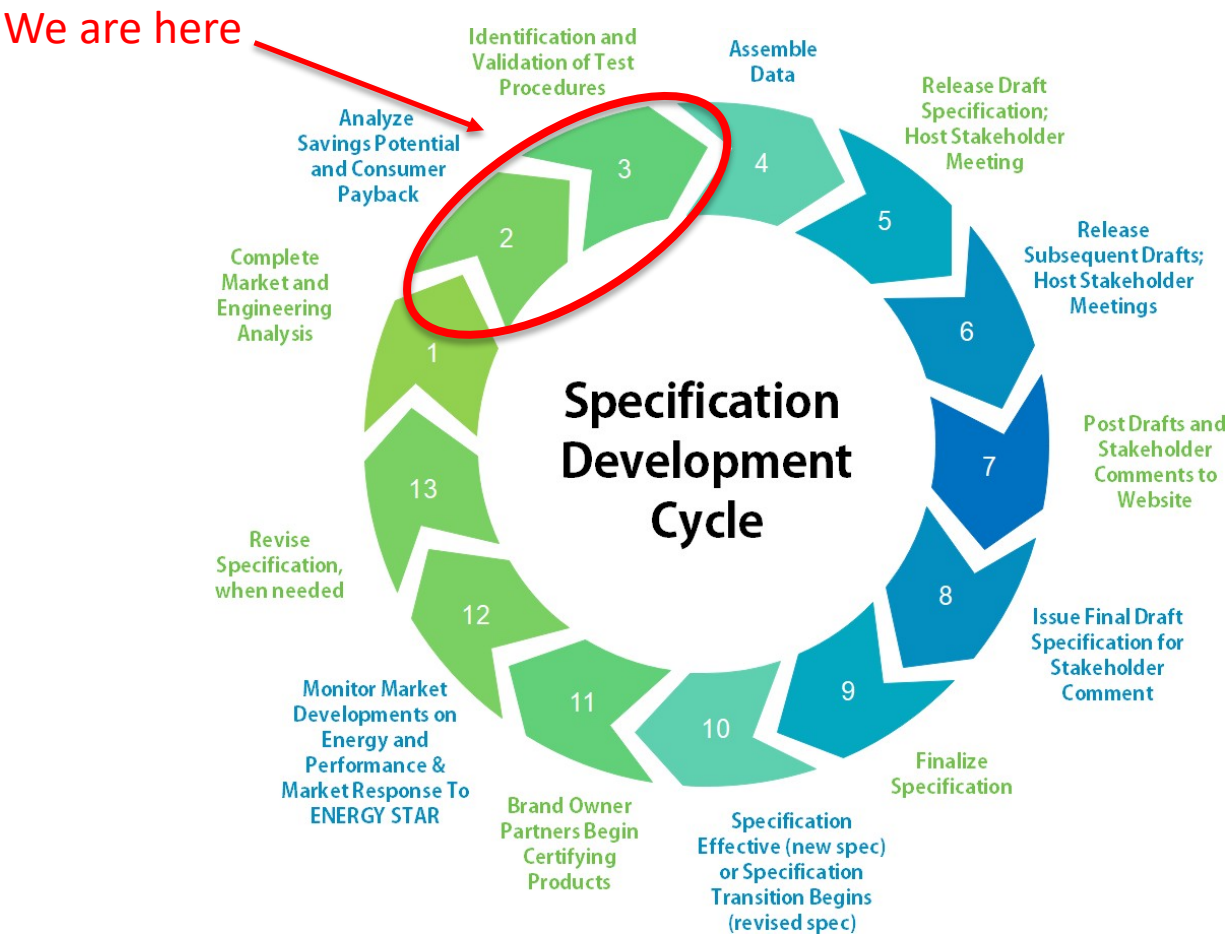
2. **Third-party certification** through an EPA-recognized certification body (CB): www.energystar.gov/3rdpartycert.

3. **Comply** with the ENERGY STAR **Brand Guidelines** for appropriate use of the logo: www.energystar.gov/logouse

4. **Participate** in **third-party verification** through an EPA-recognized certification body

5. **Provide** **annual unit shipment data** no later than **March 1** www.energystar.gov/unitshipmentdata

ENERGY STAR Specification Development Process



https://www.energystar.gov/partner_resources/product_specification_development_process

Guiding Principles That Drive Specification Revisions

- Revisions are driven by the need to continuously recognize and differentiate top performing products on the market:
  - New or revised test methods
  - Significant increase in ENERGY STAR market penetration, [46% as of 2019 USD Report]
  - Change in Federal minimum efficiency standards
  - Technological advancements
  - Product performance or quality concerns

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Commercial Refrigerators and Freezers Specification Timeline

Historic effective dates:

- V1.0 – 2001
- V2.0 – 2009 and 2010
- V3.0 – 2014
- V4.0 – 2017

Timeline for V5.0:

- Discussion Guide published – December 22, 2020
- **Discussion Guide Webinar (Part 1) – February 2, 2021**
- Discussion Guide Webinar (Part 2) – February 9, 2021
- Discussion Guide Comments Due – February 23, 2021

Product Development Website

Commercial Refrigerators and Freezers V4.0 Scope

2) Scope:

A. Included Products: Products that (1) meet the definitions of a Commercial Refrigerator, Freezer, and Refrigerator-Freezer, or Commercial Hybrid; and (2) fall under the eligible equipment class designations in Section 2.A.a-h, or a combination of equipment classes herein, are eligible for ENERGY STAR certification:

a) Horizontal Closed Solid Self-Contained Low Temperature (HCS.SC.L),
b) Horizontal Closed Solid Self-Contained Medium Temperature (HCS.SC.M),
c) Horizontal Closed Transparent Self-Contained Low Temperature (HCT.SC.L),
d) Horizontal Closed Transparent Self-Contained Medium Temperature (HCT.SC.M),
e) Vertical Closed Solid Self-Contained Low Temperature (VCS.SC.L),
f) Vertical Closed Solid Self-Contained Medium Temperature (VCS.SC.M),
g) Vertical Closed Transparent Self-Contained Low Temperature (VCT.SC.L), and/or
h) Vertical Closed Transparent Self-Contained Medium Temperature (VCT.SC.M).

Examples of product types that are eligible for qualification include: reach-in, roll-in, or pass-through units; merchandisers; under-counter units; hybrid units; milk coolers; back bar coolers; bottle coolers; glass frosters; deep well units; beer-dispensing or direct draw units; and bunker freezers.

Commercial Refrigerators and Freezers V4.0 Criteria

3) Qualification Criteria:

A. Maximum Daily Energy Consumption (MDEC) Requirements:

Table 1: ENERGY STAR Requirements for Commercial Refrigerators, Freezers, and Refrigerator-Freezer[2]		
Product Volume (in cubic feet)	**Refrigerator**	**Freezer**
Vertical Closed		
Solid	*VCS.SC.M**	*VCS.SC.L*
0 < V < 15	0.022V+0.97	0.21V+0.9
15 ≤ V < 30	0.066V+0.31	0.12V+2.248
30 ≤ V < 50	0.04V+1.09	0.285V-2.703
50 ≤ V	0.024V+1.89	0.142V+4.445
Transparent	*VCT.SC.M*	*VCT.SC.L*
0 < V < 15	0.095V+0.445	0.232V+2.36
15 ≤ V < 30	0.05V+1.12	
30 ≤ V < 50	0.076V+0.34	
50 ≤ V	0.105V-1.111	
Horizontal Closed		
Solid or Transparent	*HCT.SC.M, HCS.SC.M*	*HCT.SC.L, HCS.SC.L*
All volumes	0.05V+0.28	0.057V+0.55

* DOE Equipment Class designations relevant to ENERGY STAR eligible product scope
(1) Equipment family code (HCS= horizontal closed solid, HCT=horizontal closed transparent, VCS= vertical closed solid, VCT=vertical closed transparent),
(2) Operating mode (SC=self-contained), and
(3) Rating Temperature (M=medium temperature (38 °F), L=low temperature (0 °F)).

B. Determination of Refrigerated Volume: The refrigerated volume (V) of a refrigerator or freezer shall be calculated in accordance with the DOE test procedure at 10 CFR §431.64.

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Existing and New DOE Equipment Classes

★ = V4.0 class

■ = new class for V5.0

RC = remote condensing

SC = self-contained

Vertical Closed Transparent	VCT		RC ■ SC ★
Vertical Closed Solid	VCS		RC SC ★
Horizontal Closed Transparent	HCT		RC SC ★
Horizontal Closed Solid	HCS		RC SC ★
Service Over Counter	SOC		RC ■ SC ■

1) refrigerators and 2) freezers

3) refrigerators

4) refrigerators

Source: Table adapted from 2014 DOE TSD

Remote-Condensing (RC) Units

- Definition (harmonized with DOE)
  - A factory-made assembly of refrigerating components designed to compress and liquefy a specific refrigerant that is remotely located from the refrigerated equipment and consists of one or more refrigerant compressors, refrigerant condensers, condenser fans and motors, and factory supplied accessories.

- Testing (referencing DOE Test Procedure)
  - Assesses the energy use and thermal performance of the refrigerated case itself, independent of the RC unit.
  - The tested thermal performance of the case is then used to determine a representative energy use for a RC unit supplying the necessary refrigeration

Remote-Condensing (RC) Units (con't)

- EPA recognizes that RC models can be connected to a range of RC units:
  - Dedicated RC units matched to individual cases; and,
  - Multi-compressor racks supplying refrigerant to multiple refrigerated cases

- **EPA is interested in better understanding how RC models are installed in the field, including the typical remote condensing unit types used for these models.**

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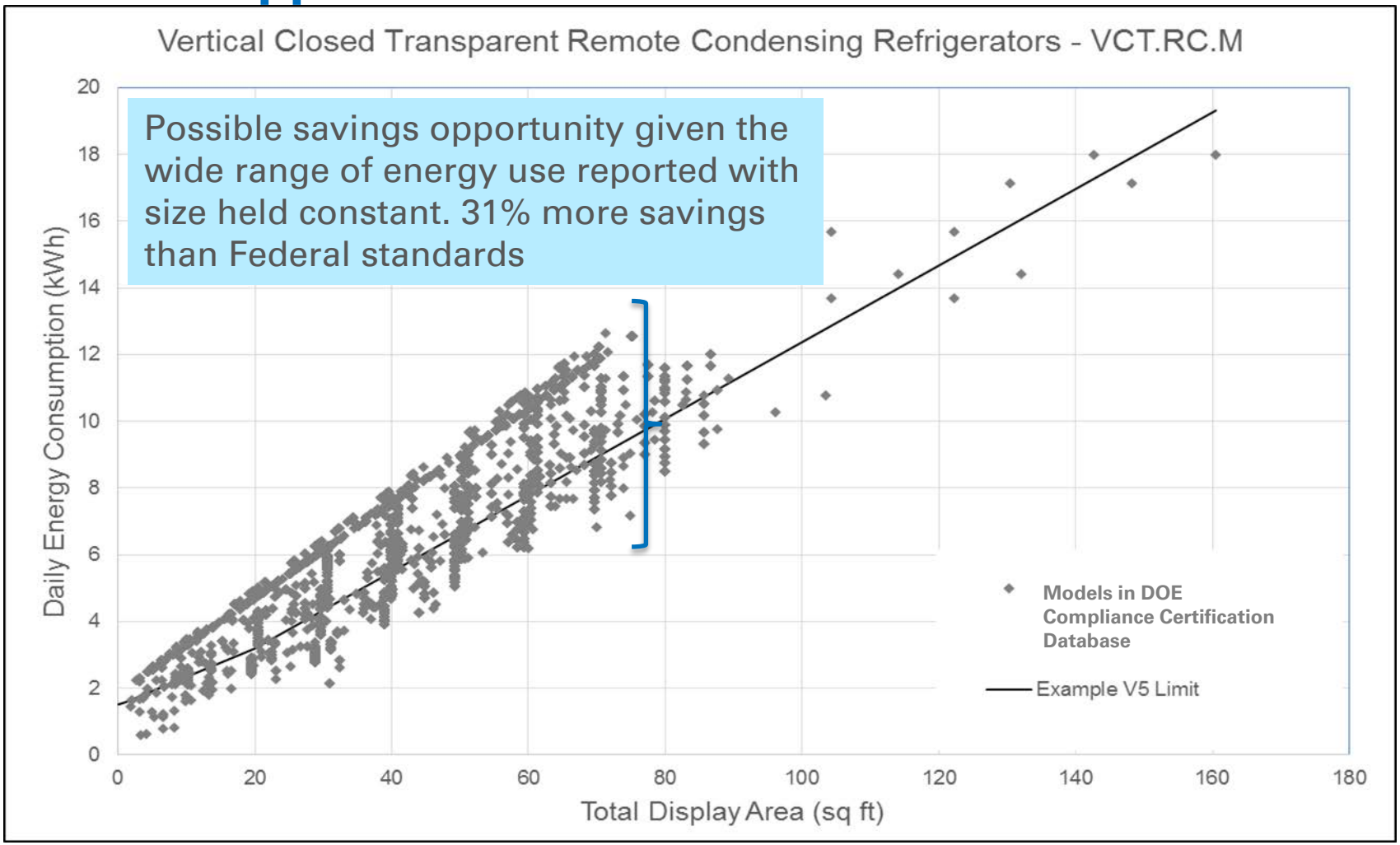
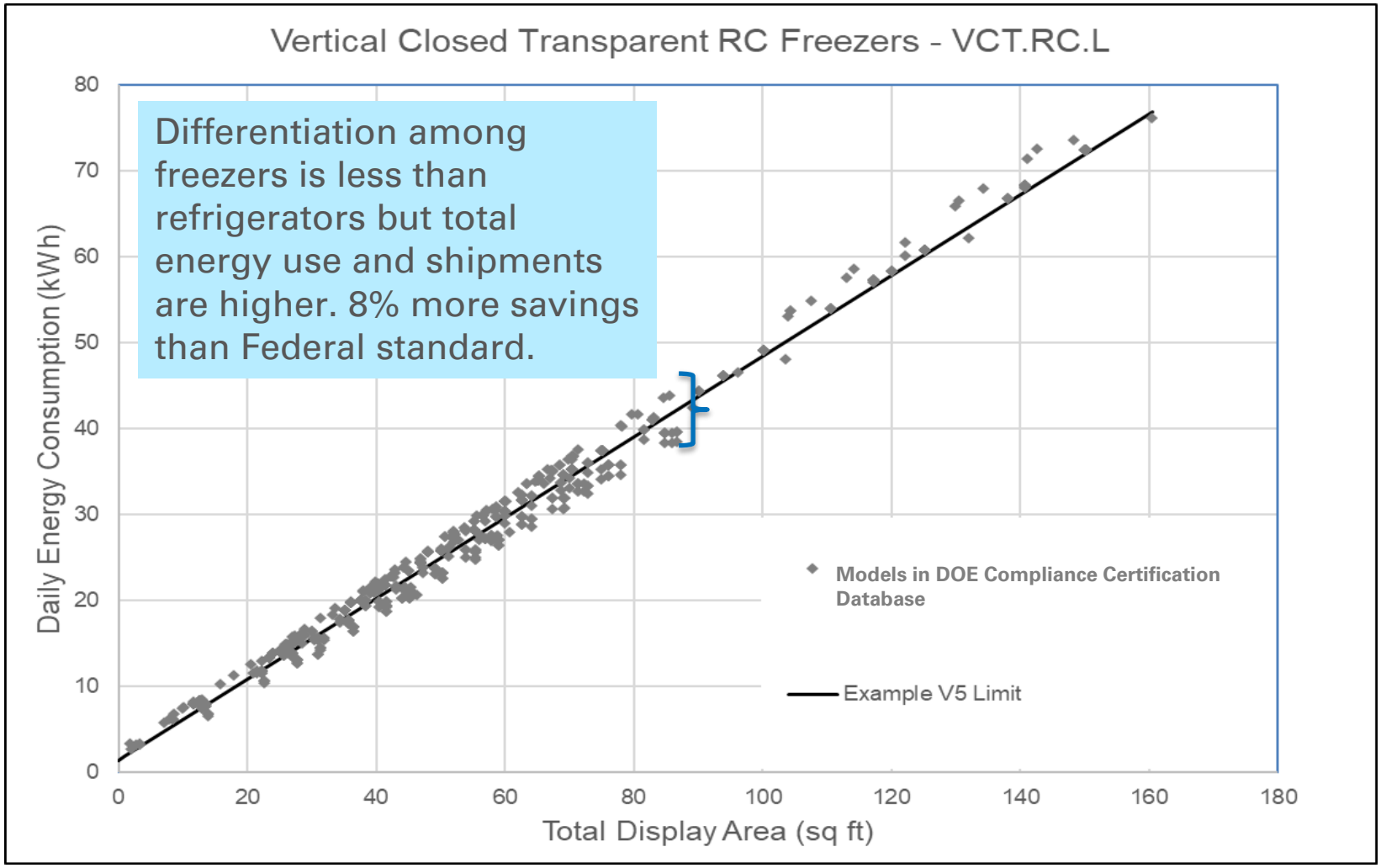
Criteria Applied to All Models – VCT.RC.M



Criteria Applied to All Models – VCT.RC.L



VCT.RC.M and VCT.RC.L – Discussion Question

Are there certain model characteristics or specifications (such as volume, display area, refrigeration load, configuration, etc.) that differentiate between models intended to be connected to dedicated RC units and those connected to multi-compressor rack systems?

VCT.RC.M and VCT.RC.L – Discussion Question

How common are dedicated RC unit installations for such models with specialty applications compared to installations with multi-compressor racks?

Do these models have distinguishing characteristics that should be considered?

VCT.RC.M and VCT.RC.L – Discussion Question

Would it be appropriate to apply in the ENERGY STAR criteria the DOE MDEC calculation based on the sum of DEC for hybrid R/F compartments based on Total Display Area (TDA)?

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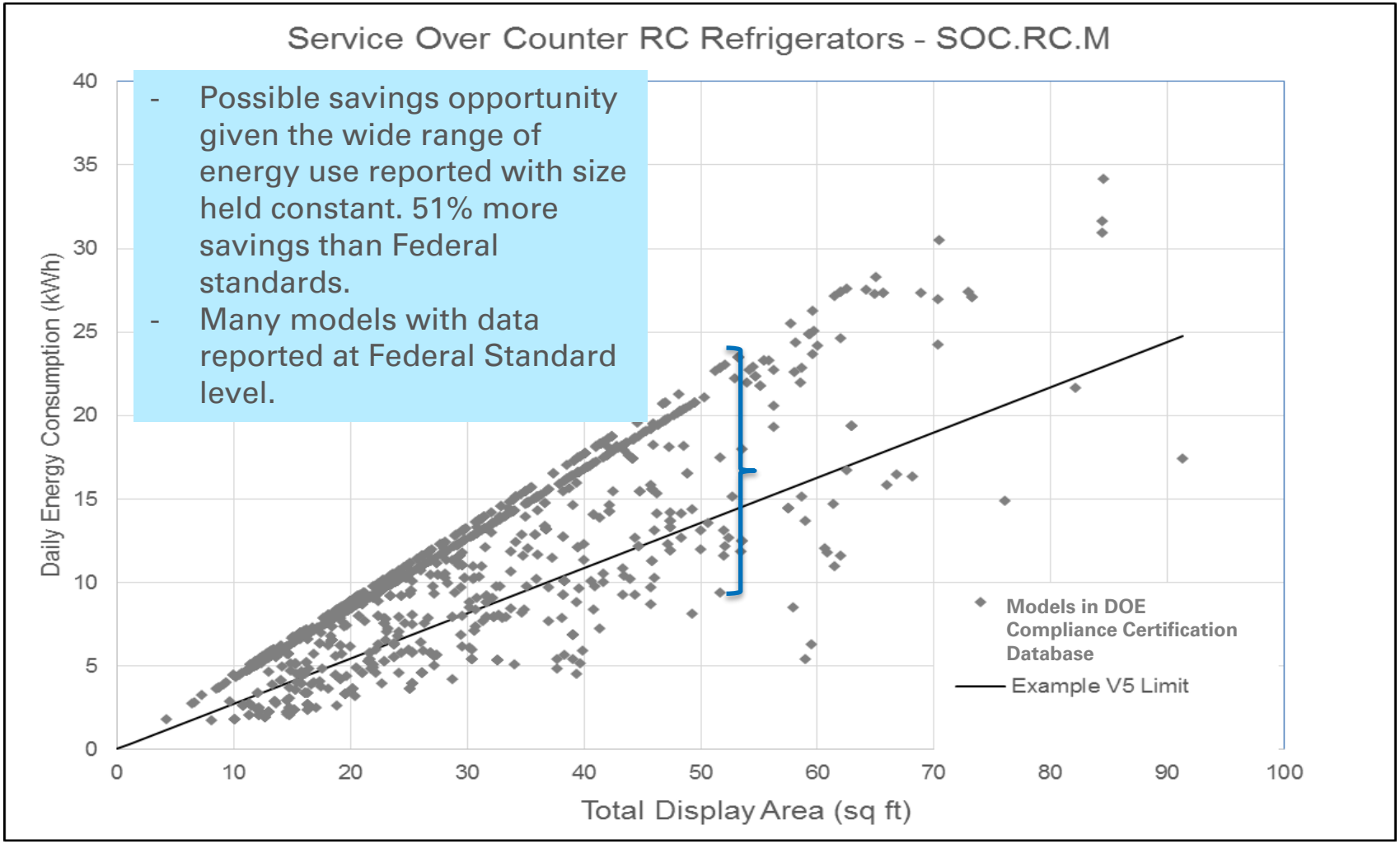
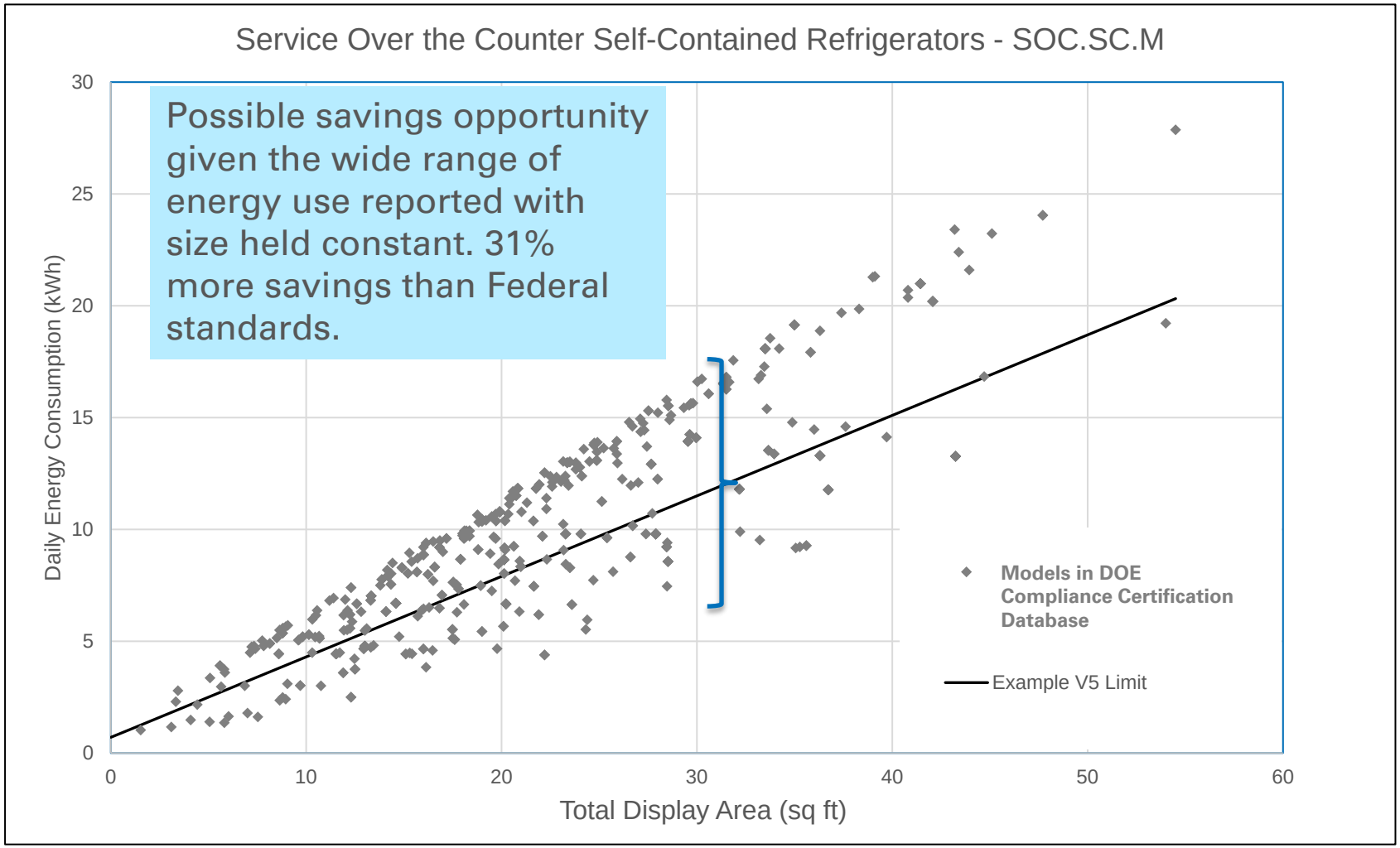
Criteria Applied to All Models – SOC.RC.M



Criteria Applied to All Models – SOC.SC.M



SOC.RC.M – Discussion Question

Are there certain model characteristics or specifications (such as volume, display area, refrigeration load, configuration, etc.) within the SOC.RC.M equipment class that differentiate between models intended to be connected to dedicated RC units and those connected to multi-compressor rack systems?

SOC.RC.M and SOC.SC.M – Discussion Question

Are there certain energy-saving technologies, components, or equipment designs that drive efficiency improvements?

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Energy Savings for Open Display Cases

- ENERGY STAR does not include open cases under the current specification, nor propose the addition of this equipment category in the v5.0 revision
- EPA recognizes that open cases represent a sizeable proportion of CRE models shipped (approx. 15-20%)
- EPA also recognizes that open cases use significantly more energy than display cases with doors
- **EPA is interested in highlighting energy savings options to consider as best practices that ENERGY STAR envisions sharing with CRE purchasers and users**
  - DOE's Better Buildings online toolkit
  - EPA's GreenChill online guidance

Energy Savings for Open Display Cases (con't)

- Refrigeration load increased by air infiltration, or entrainment of warm and moist air into the air curtain.
  - Infiltration could be substantially reduced during the hours when the store is closed (e.g., 12-6am) by using night curtains.
    - 39% reduction in case heat load when deployed
    - 6.1% savings for vertical open (VOP) equipment classes
    - 6.3% savings for semi-vertical open (SVO) equipment classes
  - Another option is retrofitting doors.
    - $191 saved per ft.
    - 1,708 kWh saved per ft.

Open Display Cases – Discussion Question

What installation locations are most typical for open cases used in the field?

In these typical end uses, are night curtains deployed for 6 hours per day? If not, how long are night curtains deployed per day?

Open Display Cases – Discussion Question

What is the percentage of open case models that are shipped with night curtains as a standard feature? Does this vary by equipment class (VOP, SVO, HZO)?

Open Display Cases – Discussion Question

How does the night curtain material affect measured performance, and what type of night curtains have the best performance for open cases?

How common are the best performing night curtains compared to other options? What are the achievable energy savings?

Open Display Cases – Discussion Question

Have air curtain designs improved since the 2014 DOE energy conservation standards final rule?

What is the typical range of air curtain performance currently available on the market based on these factors? Are there any other factors that are important to air curtain performance?

Open Display Cases – Discussion Question

Are any data available indicating the relative energy performance of a 'dual flow air curtain' design?

Open Display Cases – Discussion Question

Are any data available indicating the relative energy performance of cases with aerofoils compared to cases without aerofoils? Is this technology only appropriate for retrofitting existing open cases, or would it also improve the performance of newly manufactured equipment? Are any manufacturers or end users incorporating this technology into their equipment in the United States?

Next Steps

- Dec. 22, 2020 — Discussion Guide Published
- Feb. 2, 2021 — Stakeholder Webinar (Part 1)
- Feb. 9, 2021 — Stakeholder Webinar (Part 2)
- Feb. 23, 2021 — Comment Deadline
- April 2021 — Draft 1
- August 2021 — Draft 2

Follow the development process on the [product development webpage]

Questions

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Stakeholders are encouraged to provide written comments for consideration to cfs@energystar.gov by February 23, 2021.