Acceleration efficient and climate firendly Commercial Refrigeration by leveraging U4E‘s Model Regulaiton Guidelines

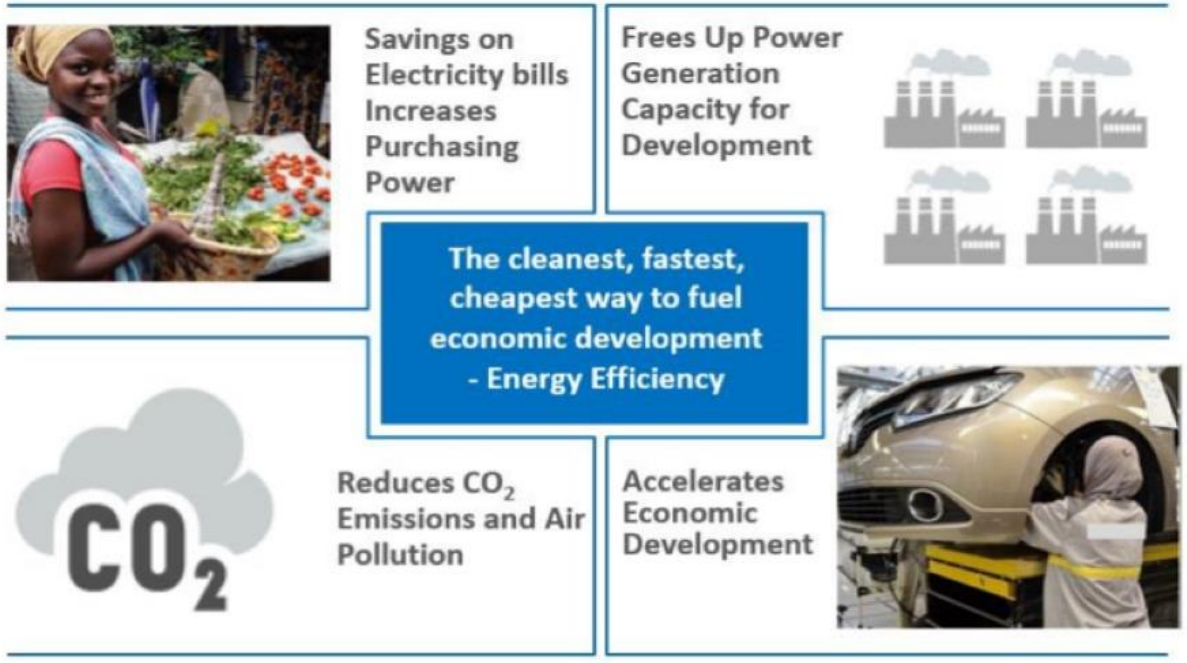
Marco Duran | UNEP | 13 September 2022

The United for Efficiency Initaitve

OUR MISSION

U4E works to help countries implement an integrated policy approach to enable a sustainable and cost-effective transformation to energy-efficient lighting, equipment and appliances.

WHY ENRGY EFFICIENCY?



U4E United for Efficiency

We inform policy makers of the potential environmental, financial and economic savings of a transition to high-efficiency products

We identify and promote global best practices in transforming markets

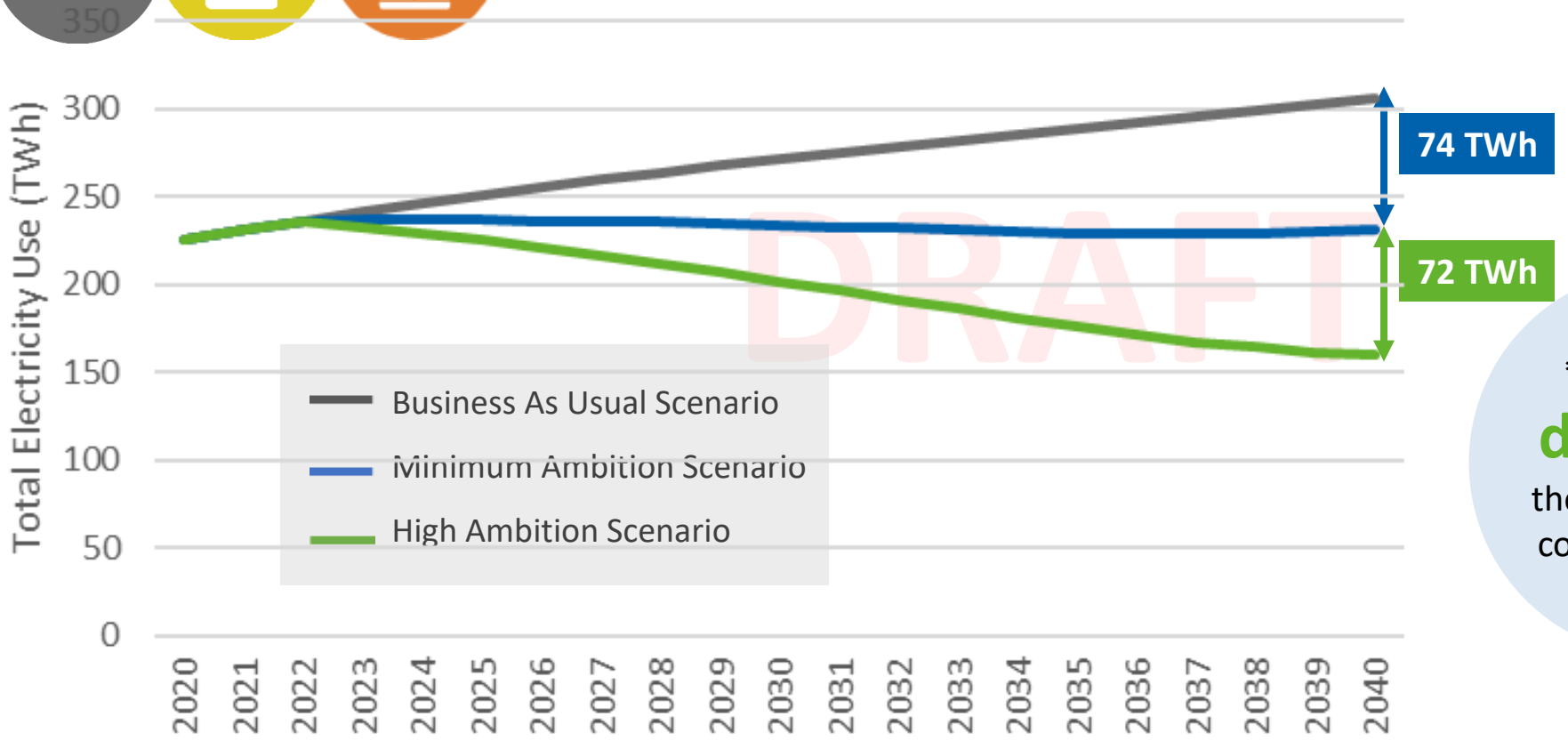
We offer tailored assistance to governments to develop and implement national and regional strategies and projects to achieve a fast and sustainable market transformation

www.united4efficiency.org/

In perspective

- The RAC accounts ~13% of the global total GHG emissions in 2030 (GIZ 2019).
- Commercial Refrigeration's share is ~12% of RAC sector emissions (GIZ 2018).
- In 2010 ~120 million CRE units—including supermarket systems, standalone equipment, condensing units, etc.—were in operation globally. (IIR, 2019)
- The IIR estimates energy consumption in the global cold chain at ~281 TWh with ~83 TWh at the retail sales stage.
- HFC emissions are increasing 8% annually and projected to account for 7-15% of global GHG emissions by 2050 (UNEP 2020).

Saving Opportunities in LAC for Cooling Equipment (U4E CSAs 2022 draft)



By 2040 the **electricity consumption** used for cooling is forecasted to increase by

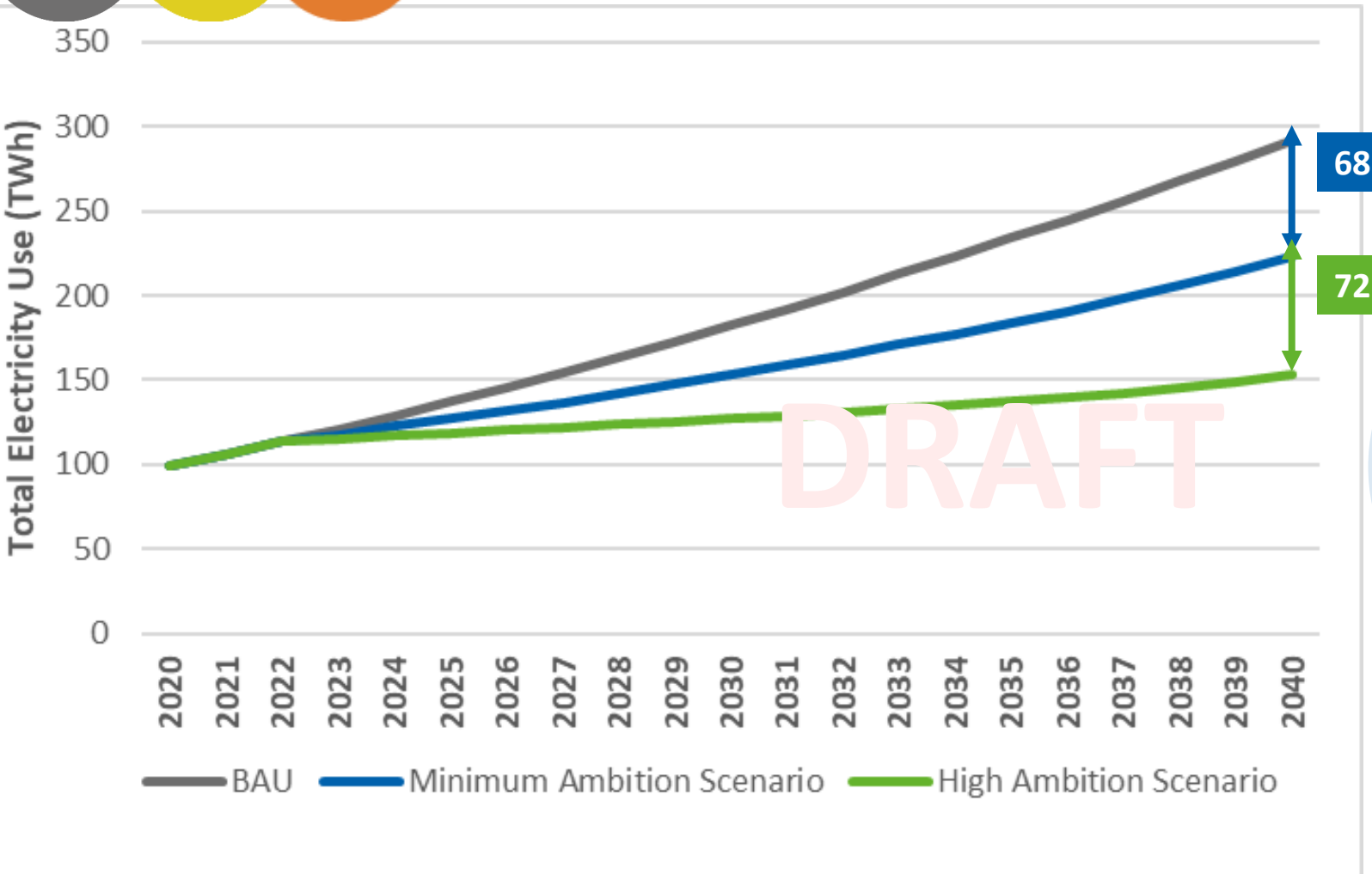
29%

*Policies can **decrease** the 2022 electric consumption by **2%** in 2040

More stringent policies can even **decrease the 2022 electric consumption by **32%** in 2040

*Minimum Ambition Scenario
**High Ambition Scenario

Saving Opportunities in Africa for Cooling Equipment (U4E CSAs 2022 draft)



By 2040 the **electricity consumption** used for cooling is forecasted to increase by

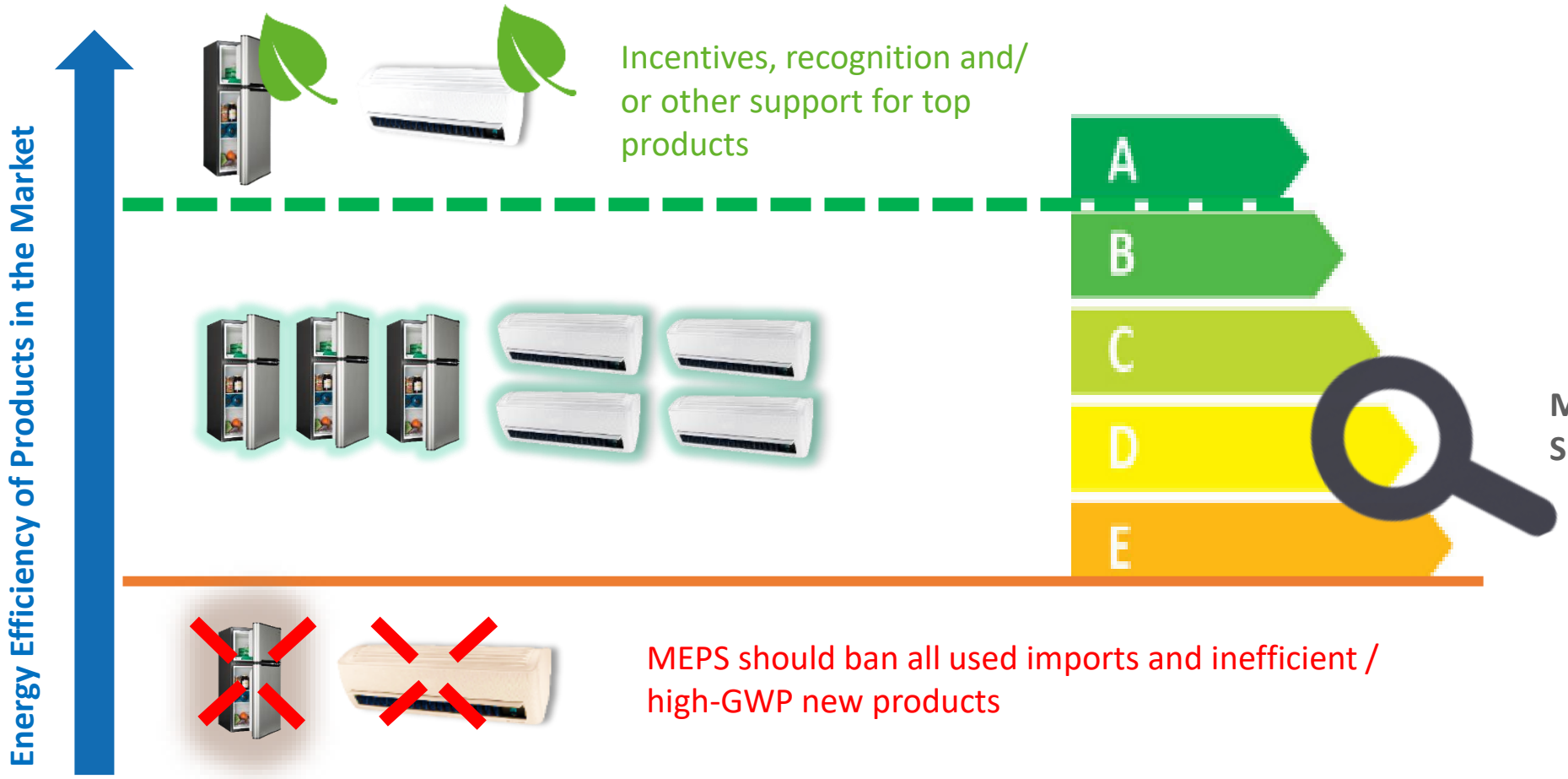
157%

*Policies can **decrease** this growth to **96%** in 2040

More stringent policies can even **decrease this growth to **35%** in 2040

*Minimum Ambition Scenario
**High Ambition Scenario

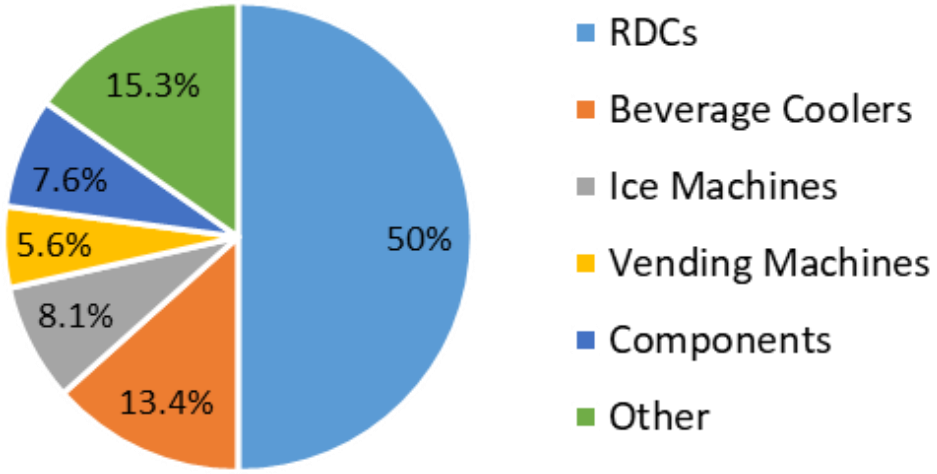
Role of MEPS & High-Performance Product Labels



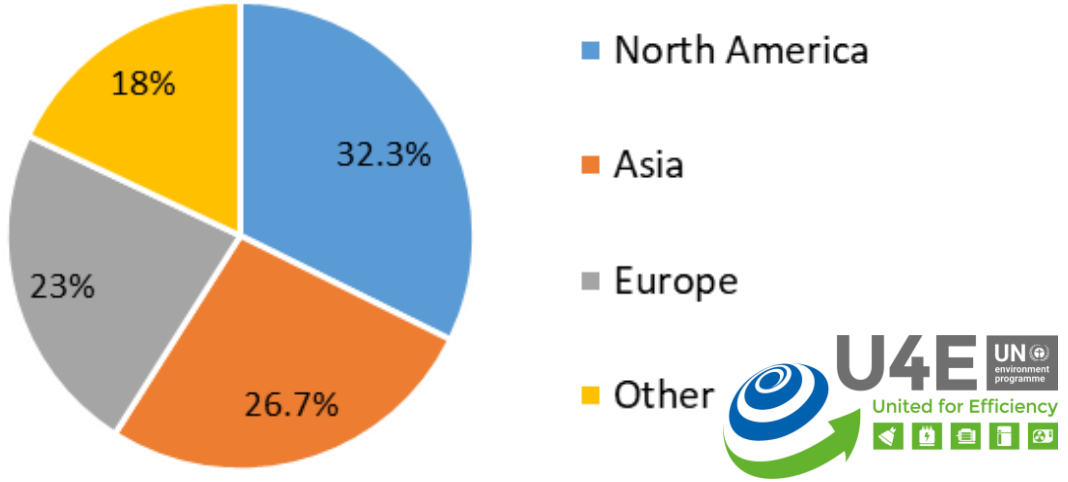
Global Commercial Refrigeration Equipment Market

- A shift in consumer shopping in large supermarkets to smaller supermarkets and convenience stores is driving Refrigerated Display Cabinet (RDCs) demand. Also, growing e-commerce is driving large cold-storage demand (JARN, 2020).
- RDCs are estimated to account for the half of the global commercial refrigeration equipment market.
- North America is the largest market in the world with a market value of US$ 14.7 B, followed by Asia (where China and India are leading the growth) and Europe.

Global Commercial Refrigeration Equipment Market (US$ 45.6B, 2019)



Global Commercial Refrigeration Equipment Market (US$ 45.6B, 2019)



Source: Japan Air Conditioning, Heating & Refrigeration News (JARN) (2020)

Commercial Refrigeration Model Regulation Guidelines

Green Cooling Summit 2022

Objective

Guidance to help **inform regulatory authorities and policy makers**

Robust **efficiency floor(s)** consistent with technology and market opportunities (indirect emissions)

Robust **refrigerant GWP ceiling(s)** for viable, fast action on the Kigali Amendment (direct emissions)

Informs on **higher efficiency tiers** to set energy labels and incentive programs

+ 50 technical experts from around the world contribute data, analysis, expert reviews

Reference **global technology and policy** trends

Content

Model Regulation:

- Definitions
- Scope of product coverage
- MEPS and labelling for an array of climate zones
- Refrigerant GWP limits
- Product information requirements
- Other best practice elements

Supporting Information: Underlying data, policy context, assumptions and methodologies

Published in 2021

U4E United for Efficiency

https://united4efficiency.org/resources/model-regulation-guidelines-for-energy-efficient-and-climate-friendly-commercial-refrigeration-equipment/

Scope Covered

Purpose	Condensing Unit	Configuration	Temperature	Reference Standard
Display	Integral	Horizontal	Chilled	• ISO 23953: 2015 (refrigerated display cabinets) • ISO 22043: 2020 (ice-cream freezers) • EN 16838: 2016 (refrigerated display scooping cabinets for gelato)
			Frozen	
		Vertical	Chilled	
			Frozen	
	Remote	Horizontal	Chilled	
			Frozen	
		Vertical	Chilled	
			Frozen	
Storage	Integral	Horizontal	Chilled	• ISO 22041: 2019
			Frozen	
		Vertical	Chilled	
			Frozen	
Refrigerated Vending Machines				• IEC 63252: 2020

Note: ISO 22044 under development can be considered for beverage coolers.

Drinks cabinet / Beverage cooler

Integral vertical chillers

Scooping cabinet

Ice cream freezer

Integral horizontal freezers

Remote vertical chiller

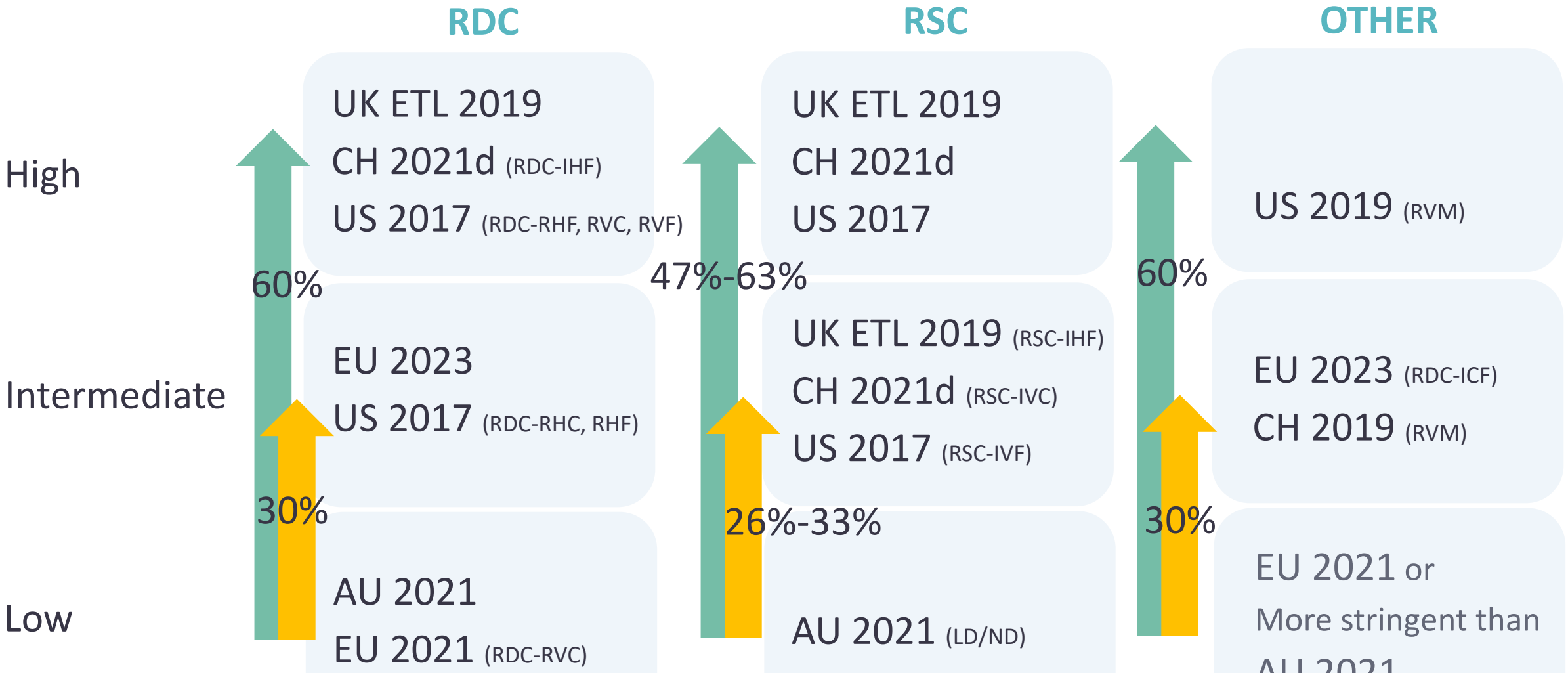
Integral vertical storage chiller

photo credits: Commercial refrigeration – refrigerated display and storage cabinets

EE Requirements

- The low-efficiency requirements align with the Australian 2021 and EU 2021 MEPS.
- The intermediate- and high-efficiency requirements are more stringent by ~30% and ~60% respectively than the low-efficiency requirements relative to Australia 2021 / EU 2021

Green Cooling Summit 2022



While UK ETL defines high-performance criteria, other regional standards represent minimum performance requirements. China and the US standards represent minimum performance requirements for selected sub-product categories.

Leveraging the CRE Model Regulation Guidelines

U4E + MINISTÉRIO DE MINAS E ENERGIA + PÁTRIA AMADA BRASIL GOVERNO FEDERAL + GREEN CLIMATE FUND = **Programa de 2 anos 2021-2023**

Componente 1: Engajamento das partes interessadas → "Atores principais estabelecem capacidades, sistemas e redes para o planejamento e programação das atividades financiadas pelo GCF"

Componente 3: Disseminação → "Estabelecimento de alianças para promover o desenvolvimento e disseminação de métodos, regulamentos e sistemas de informação nos níveis nacional e regional"

Componente 2: Regulamento → "Brasil desenvolve ou otimiza suas estruturas para trabalho estratégico visando abordar as lacunas regulamentares"

U4E United for Efficiency

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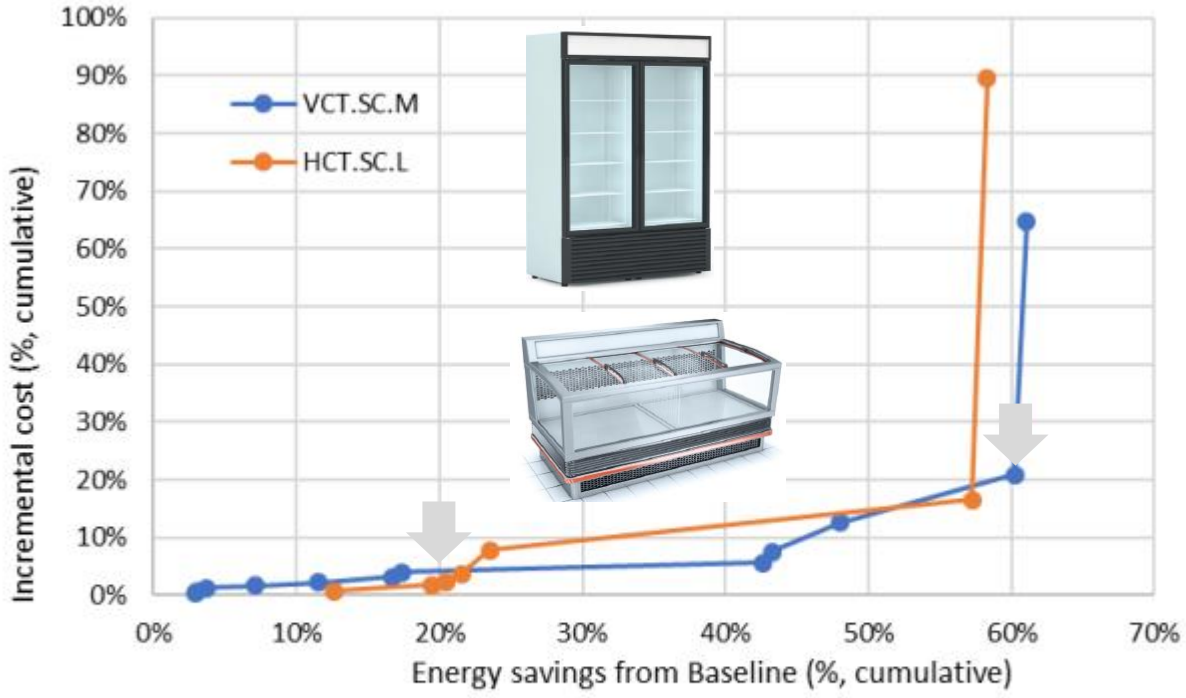
Cost of Improving Efficiency

- *Up to ~20% and ~60% improvements in the baseline energy consumption levels incur cost increases of less than 4% and 20%, respectively.*



Note: Individual savings of components are multiplied when calculating the total electricity savings potential of a design combination. Baseline daily energy consumptions for VCT.SC.M and HCT.SC.L are based on [1] (ANSI/ASHRAE 72: 2005 and ANSI/AHRI 1200: 2010) and used as 14.4 kWh/yr and 2.28 kWh/yr, respectively.[4]

Figure 15. Cumulative cost increase vs. energy savings by design options

Table 11. Incremental cost of efficient components and designs for VCT.SC.M and HCT.SC.L

Vertical integral refrigerators with transparent doors (VCT.SC.M)					
Component	**Design option**	**Efficiency improvement (%)**	**Incremental cost (%)**	**Efficiency improvement (%, cumulative)**	**Incremental cost (%, cumulative)**
Compressor	High-efficiency reciprocating compressor	2.9%	0.3%	2.9%	0.3%
Heat exchanger	Optimized evaporator design	0.1%	0.4%	3.0%	0.7%
Fan motor	PSCs for condenser	0.7%	0.5%	3.7%	1.2%
Heat exchanger	Optimized condenser design	3.6%	0.5%	7.1%	1.7%
Fan motor	PSC for evaporator	4.7%	0.5%	11.5%	2.3%
	ECM (brushless DC) for evaporator	10.3%	1.4%	16.7%	3.1%
	ECM (brushless DC) for condenser	1.5%	1.4%	17.3%	4.0%
Lighting	High-efficiency lighting	30.6%	1.6%	42.6%	5.6%
Insulation	1/2 inch (1.27 cm) additional thickness	1.0%	1.8%	43.2%	7.5%
Lighting	LED lighting + occupancy sensors	36.4%	6.8%	48.0%	12.6%
Door	High-performance door with low infiltration	23.5%	8.2%	60.2%	20.9%
Insulation	VIP	2.0%	43.8%	61.0%	64.7%
Horizontal integral freezers with transparent doors (HCT.SC.L)					
Component	**Design option**	**Efficiency improvement (%)**	**Incremental cost (%)**	**Efficiency improvement (%, cumulative)**	**Incremental cost (%, cumulative)**
Heat exchanger	Optimized condenser design	12.6%	0.7%	12.6%	0.7%
Compressor	High-efficiency reciprocating compressor	7.9%	1.0%	19.5%	1.8%
Fan motor	PSC for condenser	1.2%	0.6%	20.4%	2.4%
	ECM (brushless DC) for condenser	2.5%	2.0%	21.5%	3.7%
Insulation	1/2 inch (1.27 cm) additional thickness	2.5%	4.1%	23.5%	7.8%
Door	High-performance door with low infiltration	44.1%	8.8%	57.2%	16.6%
Insulation	VIP	7.5%	72.9%	58.3%	89.5%

VCT.SC.M: vertical closed transparent with self-contained condensing unit for medium temperature

HCT.SC.L: horizontal closed transparent with self-contained condensing unit for low temperature

PSC: permanent split capacitor

Development Process MRG CRE

Green Cooling Summit 2022

Market assessment

Regional MEPS comparison

Energy consumption & savings potential

- Australia
- Europe
- United States
- China

Summary, findings & insights

Potential EE and low-GWP refrigerant requirements

1st Draft Model Regulation Guidelines (June 8, 2021)

2nd Draft Model Regulation Guidelines (August 19, 2021)

Update/ Finalization, outreach and deployment

Consultation Meetings with Experts