



Refrigerant Avoided Cost Calculator – Custom Project Training

California Public Utilities Commission – Energy Division

July 22, 2026

Agenda

- 9:30 Background
- 9:35 RACC-FSC Workbook
- 9:40 Technical Guidance Document
- 9:45 Refrigeration Example #1
- 10:15 Refrigeration Example #2
- 10:45 Questions



Background

Core functionality of tools

RACC

Refrigerant Avoided Cost Calculator

- Calculates lifecycle emissions due to refrigerant leakage in measure and baseline equipment
- Uses California Air Resources Board (CARB) lifecycle equipment emissions rates to determine:
 - Annual operational leakage
 - End-of-life leakage
- Determines net present value (NPV) lifecycle costs of refrigerant leakage emissions
- **Must be completed for custom applications that involve addition of refrigerant or changes to refrigerant types or charges**

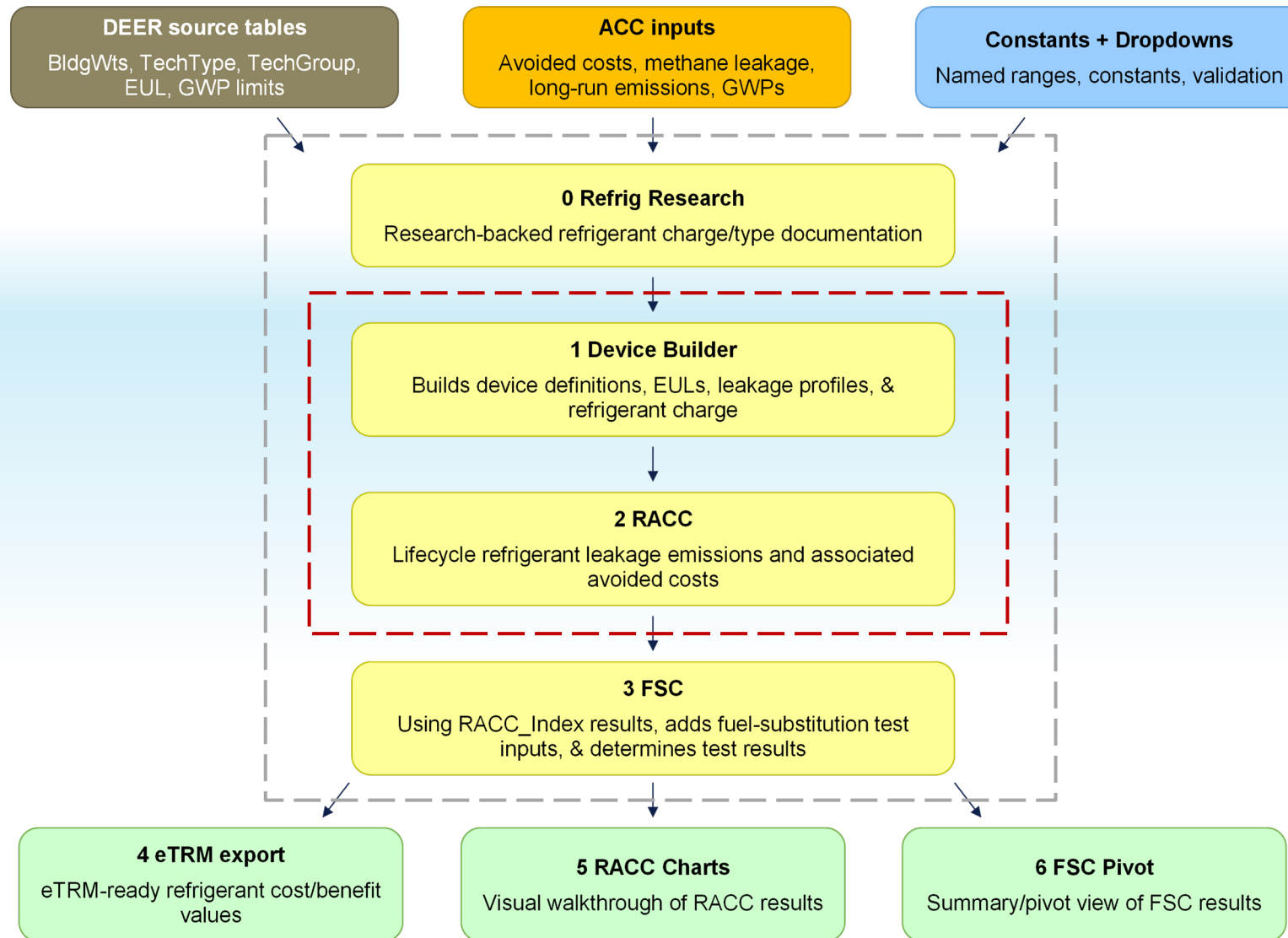
FSC

Fuel Substitution Calculator

- Determines whether fuel substitution measures pass Part 1 and Part 2 of the fuel substitution test:
 1. No increase to source energy* usage
 2. No increase in net CO₂e emissions
- Accounts for refrigerant leakage
- Accounts for methane leakage
 1. Upstream of natural gas power plants
 2. Behind the meter (residential, only)
- **Must be completed for custom fuel substitution measures**

**Source energy represents the total amount of raw fuel that is required to operate a given piece of equipment or end-use. It includes transmission, delivery, and production losses.*

RACC-FSC information flow



RACC-FSC workbook

User Inputs Worksheets	0 Refrig Research	} Core
	1 Device Builder	
	2 RACC	
	3 FSC	
Results Outputs Worksheets	4 eTRM Export (for deemed measure packages)	
	5 RACC Charts	
	6 FSC Pivot (for deemed measures)	
Constants and Dropdown Worksheets	CARB-EPA Limits	
	Constants + Dropdowns	
	Statewide WACC	
DEER Tables	EUL_basis_DEER	
	TechType_DEER	
	BldgWts_DEER	
	RefrigerantACC_DEER	
2022 RACC Worksheets in Use	ACC Inputs	
	Refrigerant Leakage	
	Refrigerant GWPs + Dates	
	RACC Change Log	
FuelSub_2022	Reference	
	Annual Factors	
	Methane Leakage	
	Long-run Emissions Inputs	

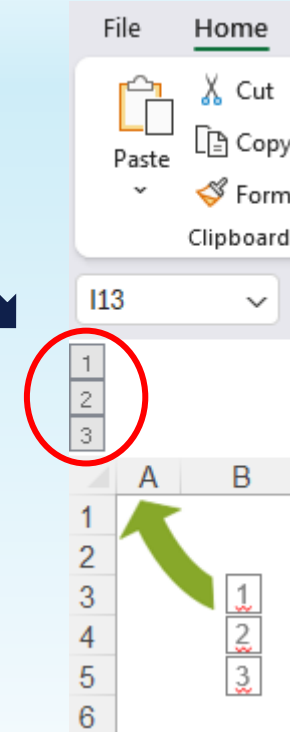
Worksheet color key

Intro and Change Log
Section dividers w/overviews
User inputs worksheets
Results outputs worksheets
Reference worksheets
DEER tables
2022 Refrigerant ACC worksheets
2022 FuelSub worksheets

RACC-FSC custom columns

- **Expandable column grouping buttons (Upper left corner)**
 - **1** – Default, hides most non-input columns
 - **2** – Expands, shows “Custom input (only)” columns
 - **3** – Expands all columns
- **Column Heading Color Coding**
 - Columns in the 2 RACC worksheet color coded to aid project entry

Column Heading Color Coding	
	Input, enter a value
	Input, select from dropdown list
	Custom input (only)
	Calculation step
	Lookup formula
	Final outputs



RACC-FSC use cases

Measure Packages and Custom Applications Uses	Worksheet(s) to Complete	
	2 RACC	3 FSC
Type of refrigerant changes	X	Only for fuel-substitution measures
Weight/charge of refrigerant changes	X	
EUL/RUL of refrigerant-using (or baseline) equipment changes	X	
Claiming avoided emissions when retired equipment's remaining refrigerant is recovered/reclaimed and documented <i>*Documentation requirements are still very much under development and will need to be agreed upon during measure package/custom application development for avoided emissions credit to be claimed.</i>	X	
Fuel-substitution measure w/o refrigerant (e.g., induction range) <i>*Even though equipment contains no refrigerant, information entered on 2 RACC is used by 3 FSC.</i>	X (\$0)*	X
Changes to equipment efficiency only (no refrigerant changes)	Not needed	Not needed

Technical Guidance Document

Refrigerant ACC and Fuel-Substitution Calculator
Technical Guidance

Guidance Document overview

- Document posted to CEDARS with RACC-FSC workbook
- Document Includes:
 - Detailed review of RACC-FSC workbook
 - Baseline Guidance
 - Appropriate baselines
 - EUL/RUL considerations
 - Refrigerant charge
 - Current refrigerant emissions policies
 - Measure Example Walkthroughs
 - Stationary Refrigeration
 - Stationary Air-Conditioning
 - Appliance

Refrigerant ACC and Fuel-Sub Calculator Technical Guidance



Definitions and Acronyms

Introduction

RACC-FSC Overview

Baseline Guidance

Stationary Refrigeration

Stationary Air-Conditioning

Appliances

Appendices

RACC-FSC products on CEDARS

CEDARS CALIFORNIA ENERGY DATA AND REPORTING SYSTEM

Programs Monthly Reports Budget & Application Filings Quarterly Claims Cost Effectiveness Tool (CET) Data Reports & Documents **DEER Resources**

DEER Resources

- + Deemed Measure Packages
- + Tools**
- EnergyPlus
- MASControl
- Water Heaters
- Load Shapes
- + Supporting Files**
- + DEER Database
- + DEER Versions
- Ex Ante Review Memos
- Help and Contact

Supporting Files

☐ Subscribed to email notifications for table updates

Show 10 entries

Download All

Search: RACC

Download	Title	Notes	Start Date	End Date	Date Posted	Actions																
	RACC-FSC Technical Guidance Document	Appendices A through C were updated based upon the draft 2024 Avoided Cost Calculators. Note: The DEER support email address has changed to DEERsupport@guidhouse.com.	2026 Jan 1	2027 Dec 31	2024 Nov 1	See history																
	RACC-FSC_v3	Modifications were made to enable distinguishing between updated EUL values and those previously in use. <table border="1"><thead><tr><th>No.</th><th>Modification</th></tr></thead><tbody><tr><td>1</td><td>Eliminated the word "Viable" from two fieldnames in DEER's TechType table.</td></tr><tr><td>2</td><td>In TechType table, updated fieldname "HasElecAlt" to "HasElectricAlt" to align with DEER database.</td></tr><tr><td>3</td><td>Corrected formulas that were not working as intended on Intro worksheet in DEER Status Table.</td></tr><tr><td>4</td><td>Provided conditional formatting on 1 Device Builder worksheet to make it evident when formulas are replaced with values.</td></tr><tr><td>5</td><td>Synchronized workbook with DEER tables in DEER database.</td></tr><tr><td>6</td><td>Added "StartDate" and "ExpiryDate" fields on 1 Device Builder worksheet to manage updated EUL values at Device_Builds table and EUL_Basis pivot table (aligns with EUL_basis table in DEER).</td></tr><tr><td>7</td><td>Replicated rows involving technology types with revised EUL values on 1 Device Builder worksheet to enable selecting "TechType (NormUnit)" appropriate to measure installation year.</td></tr></tbody></table> The RACC-FSC_v3 shall be used to calculate refrigerant leakage emissions and avoided costs of net refrigerant leakage emissions and perform fuel substitution tests for all measures that involve adding or replacing equipment that uses refrigerant and involves a change to the refrigerant type or to the refrigerant charge—these include most fuel substitution and electric resistance to heat pump measures. The completed RACC-FSC_v3.0—containing the relevant parameters associated with a given measure package—shall be provided as an addendum to each affected measure package in the eTRM. Guidance for how to do so is described in the "RACC-FSC Technical Guidance Document" that was issued along with the RACC-FSC_v3.0 workbook.	No.	Modification	1	Eliminated the word "Viable" from two fieldnames in DEER's TechType table.	2	In TechType table, updated fieldname "HasElecAlt" to "HasElectricAlt" to align with DEER database.	3	Corrected formulas that were not working as intended on Intro worksheet in DEER Status Table.	4	Provided conditional formatting on 1 Device Builder worksheet to make it evident when formulas are replaced with values.	5	Synchronized workbook with DEER tables in DEER database.	6	Added "StartDate" and "ExpiryDate" fields on 1 Device Builder worksheet to manage updated EUL values at Device_Builds table and EUL_Basis pivot table (aligns with EUL_basis table in DEER).	7	Replicated rows involving technology types with revised EUL values on 1 Device Builder worksheet to enable selecting "TechType (NormUnit)" appropriate to measure installation year.	2025 Jan 1		2024 Nov 1	See history
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7	Replicated rows involving technology types with revised EUL values on 1 Device Builder worksheet to enable selecting "TechType (NormUnit)" appropriate to measure installation year.																					

Cold storage process refrigeration system

RACC-FSC custom example - #1

Cold storage process refrigeration system

Site & baseline case

HFC Process Refrigeration System

Site Information:

- **Facility:** Cold-storage / food-processing facility
- **Location:** Urban
- **Decommissioning practices:** All refrigerant recovered

Existing Equipment:

- **Capacity:** 150 Ton
- **Refrigerant type:** R-404A (GWP: 3,922)
- **Refrigerant charge:** 6,000 lb.
- **Installation year:** 2016 (10 years old)
- **Condition:** Still operable & POE requirements satisfied

Installed (measure) case

Transcritical CO₂ (R-744) Process Refrigeration

Measure Details:

- **MAT:** Accelerated replacement (AR)
- **EUL/RUL:** 15 years / 5 years

Standard Practice Equipment:

- Same as installed equipment
 - (R-717 not feasible, R-744 best ROB option)

Installed (Measure) Equipment:

- **Capacity:** 150 Ton (nominally)
- **Refrigerant type:** R-744 (CO₂) (GWP: 1)
- **Refrigerant charge:** 5,000 lb.

RACC-FSC custom example - #1

Cold storage process refrigeration system

Add equipment to “1 Device Builder” worksheet:

- **Baseline equipment (part 1)**

- **Create a device type:** “Custom Cold Storage Freezer – R-404A”
- **Select TechTypeID (dropdown):** “Ref_Storage:RefrigFrz”
 - **NormUnit (normalizing unit):** Auto populates once a **TechTypeID** is selected, optional dropdown to select different normal unit (per kBtuh, per Ton, etc.) if required.
- **Select CARB_DeviceType (dropdown):** “Large industrial process cooling 2,000 lbs. +”

B	C	D	E	F	G	H
DeviceType	TechTypeID	TechTypeDesc	NormUnit	TechGroup (NormUnit)	CARB_Sector	CARB_DeviceType
Custom Cold Storage Freezer - R-404A	Ref_Storage:RefrigFrz	Refrigerator/Freezer	Each	Ref_Storage (Each) as of 2013-01-01	Stationary Refrigeration	Large industrial process cooling 2,000 lbs. +

RACC-FSC custom example - #1

Cold storage process refrigeration system

Add equipment to “1 Device Builder” worksheet:

- **CARB_DeviceType List**

Large industrial process cooling
2,000 lbs. +

Commercial Ice Machines
Large cold storage 2,000 lbs. +
Large commercial refrigeration 2,000 lbs. +
Large industrial process cooling 2,000 lbs. +
Medium cold storage 200-2,000 lbs.
Medium commercial refrigeration 200-2,000 lbs.
Medium industrial process cooling 200-2,000 lbs.
None
Refrigerated Food Processing and Dispensing Equipment
Refrigerated vending machines
Small cold storage 50-200 lbs.
Small commercial refrigeration 50-200 lbs.

CARB_DeviceType	Average Charge (lb.)	Annual Leak %	EOL Leak %	t_EOL
Large Chiller 2,000 lbs. +	3978	2.3%	20.0%	0
Medium Chiller 200-2,000 lbs.	526	3.0%	20.0%	0
Large cold storage 2,000 lbs. +	7252	14.8%	20.0%	0
Large commercial refrigeration 2,000 lbs. +	3352	24.2%	20.0%	0
Large industrial process cooling 2,000 lbs. +	5873	12.3%	20.0%	0
Medium cold storage 200-2,000 lbs.	552	10.3%	20.0%	0
Medium commercial refrigeration 200-2,000 lbs.	684	22.9%	20.0%	0
Medium industrial process cooling 200-2,000 lbs.	660	12.5%	20.0%	0
Small cold storage 50-200 lbs.	113	4.0%	20.0%	0
Small commercial refrigeration 50-200 lbs.	103	15.6%	20.0%	0
Small industrial process cooling 50-200 lbs.	104	9.1%	20.0%	0
Stand alone (self-contained) refrig units	1.023	1.0%	98.5%	10
Sub-small commercial refrigeration < 50 lbs.	23	15.0%	34.0%	0

RACC-FSC custom example - #1

Cold storage process refrigeration system

Add equipment to “1 Device Builder” worksheet:

- **Baseline equipment (part 2)**

- **Common Refrigerant Type(s):** Optional reference field; mostly used for deemed
- **RefrigCharge Pounds Per NormUnit:** “6,000” custom input of equipment specific charge

I	J	K	L	M	N	O	P	Q	R	S	T
Common Refrigerant Type(s)	RefrigCharge Pounds per CARB (lb/Each)	RefrigCharge Pounds Per NormUnit (copy from "0 Refrig Research")	Annual Leakage Rate per CARB	q_EOL per CARB	t_EOL per CARB	EUL_ID	StartDate	ExpiryDate	EUL_Yrs	CDindex	CDrows
5,873.0006,000.00012.3%20.0%0.00RefgWrhs-Comp2013-01-0115.00516											
0 Refrig Research		1 Device Builder		2 RACC		3 FSC		4 eTRM export		5 RACC Charts6 FSC Pivot	

RACC-FSC custom example - #1

Cold storage process refrigeration system

Add equipment to “1 Device Builder” worksheet:

- **Baseline equipment (part 3)**

- **EUL Input:**

- Use pivot table (starting in column V) to identify most appropriate DEER-recognized EUL ID.
- Will need to identify “EUL_ID”, “StartDate”, “ExpiryDate” if available; **paste as text**

- **EUL_ID:** “RefgWrhs-Comp”

- **StartDate:** “2013-01-01”

- **ExpiryDate:** no expiration date for this EUL ID, leave blank

I	J	K	L	M	N	O	P	Q	R	S	T
Common Refrigerant Type(s)	RefrigCharge Pounds per CARB (lb/Each)	RefrigCharge Pounds Per NormUnit (copy from "0 Refrig Research")	Annual Leakage Rate per CARB	q_EOL per CARB	t_EOL per CARB	EUL_ID	StartDate	ExpiryDate	EUL_Yrs	CDindex	CDrows
	5,873.000	6,000.000	12.3%	20.0%	0.00	RefgWrhs-Comp	2013-01-01		15.00	5	16

RACC-FSC custom example - #1

Cold storage process refrigeration system

Add equipment to “1 Device Builder” worksheet:

- **Measure equipment (part 1)**

- **Create a device type:** “Custom Cold Storage Freezer - CO2 (R-744)”
- **Select TechTypeID (dropdown):** “Ref_Storage:RefrigFrz”
 - **NormUnit (normalizing unit):** Auto populates once a **TechTypeID** is selected, optional dropdown to select different normal unit (per kBtuh, per Ton, etc.) if required.
- **Select CARB_DeviceType (dropdown):** “Large industrial process cooling 2,000 lbs. +”

B	C	D	E	F	G	H
DeviceType	TechTypeID	TechTypeDesc	NormUnit	TechGroup (NormUnit)	CARB_Sector	CARB_DeviceType
Custom Cold Storage Freezer - CO2 (R-744)	Ref_Storage:RefrigFrz	Refrigerator/Freezer	Each	Ref_Storage (Each) as of 2013-01-01	Stationary Refrigeration	Large industrial process cooling 2,000 lbs. +

RACC-FSC custom example - #1

Cold storage process refrigeration system

Add equipment to “1 Device Builder” worksheet:

- **Measure equipment (part 2)**

- **Common Refrigerant Type(s):** Optional reference field; mostly used for deemed
 - **RefrigCharge Pounds per CARB:** Auto populates from **CARB_DeviceType**
 - **RefrigCharge Pounds Per NormUnit:** “5,000” custom input of equipment specific charge

I	J	K	L	M	N	O	P	Q	R	S	T
Common Refrigerant Type(s)	RefrigCharge Pounds per CARB (lb/Each)	RefrigCharge Pounds Per NormUnit (copy from "0 Refrig Research")	Annual Leakage Rate per CARB	q_EOL per CARB	t_EOL per CARB	EUL_ID	StartDate	ExpiryDate	EUL_Yrs	CDindex	CDrows
5,873.0005,000.00012.3%20.0%0.00RefgWrhs-Comp2013-01-0115.00516											
0 Refrig Research		1 Device Builder		2 RACC		3 FSC		4 eTRM export		5 RACC Charts6 FSC Pivot	

RACC-FSC custom example - #1

Cold storage process refrigeration system

Add equipment to “1 Device Builder” worksheet:

- **Measure equipment (part 3)**

- **EUL Input:**

- Use pivot table (starting in column V) to identify most appropriate DEER-recognized EUL ID.
- Will need to identify “EUL_ID”, “StartDate”, “ExpiryDate” if available; **paste as text**

- **EUL_ID:** “RefgWrhs-Comp”

- **StartDate:** “2013-01-01”

- **ExpiryDate:** no expiration date for this EUL ID, leave blank

I	J	K	L	M	N	O	P	Q	R	S	T
Common Refrigerant Type(s)	RefrigCharge Pounds per CARB (lb/Each)	RefrigCharge Pounds Per NormUnit (copy from "0 Refrig Research")	Annual Leakage Rate per CARB	q_EOL per CARB	t_EOL per CARB	EUL_ID	StartDate	ExpiryDate	EUL_Yrs	CDindex	CDrows
	5,873.000	5,000.000	12.3%	20.0%	0.00	RefgWrhs-Comp	2013-01-01		15.00	5	16

RACC-FSC custom example - #1

Cold storage process refrigeration system

Enter measure into “2 RACC” worksheet:

- **General Inputs**

- **Refrig. Cost Basis:** “GHG Value from Natural Gas ACC” – unchanged from default input
- **Dollar/ACC Year:** “2024” – updated to most recent year available
- **WACC selection:** “Statewide” – using statewide for examples; custom projects should select specific PA for the project

General inputs	Notes	
Refrig. Cost Basis	GHG Value from Natural Gas ACC	
Dollar/ACC Year	2024	→ Select appropriate ACC
GWP Time Horizon	100-yr	→ Locked to 100-yr
WACC selection	Statewide	→ Statewide for Deemed
Active WACC%	7.30%	

RACC-FSC custom example - #1

Cold storage process refrigeration system

Enter measure into “2 RACC” worksheet:

- **Project input (part 1)**

- **Status:** Alert for user; “OK”, “Missing inputs”, “Calc error”, “GWP > CARB-EPA Limit”, “Std Code limit used for calcs”
- **Measure Description:** Enter in description of project, use as much detail as you feel you need
- **Msr Install Year:** “2026” (dropdown)
- **MeasAppType:** “AR” (dropdown)

A	B	C	D	E	F	G
RACC_Index	Status	Measure Description	Msr Install Year	MeasAppType	CARB_Sector	CARB_BldgCategory
1	OK	Custom ColdStorage Freezer Replacement, R-404A to R-744, refrigerant recovery standard practice	2026	AR	Stationary Refrigeration	Industrial

RACC-FSC custom example - #1

Cold storage process refrigeration system

Enter measure into “2 RACC” worksheet:

- **Project input (part 2)**

- **CARB_Sector:** “Stationary Refrigeration” – (dropdown) align selection with “1 Device Builder” entry
- **CARB_BldgCategory:** “Industrial”

A	B	C	D	E	F	G
RACC_Index	Status	Measure Description	Msr Install Year	MeasAppType	CARB_Sector	CARB_BldgCategory
1	OK	Custom ColdStorage Freezer Replacement, R-404A to R-744, refrigerant recovery standard practice	2026	AR	Stationary Refrigeration	Industrial

RACC-FSC custom example - #1

Cold storage process refrigeration system

Enter measure into “2 RACC” worksheet:

- **Project Input (part 3) | Measure Case**

- **Msr CARB_End-Use:** “Industrial Process Refrigeration (excl. chillers) (> 50 lbs refrigerant)”
- **Msr TechGroup (NormUnit):** Align with “1 Device Builder” entry
- **Msr Device Type:** Select device type created in device builder
- **Msr NumUnit:** “1” – default entry

Measure Case, New Device (Msr)					
H	I	J	K	L	M
Msr CARB_End-Use	Msr TechGroup (NormUnit)	Msr Device Type	Msr NumUnit	Msr EUL_ID	Msr EUL_Yrs
Industrial Process Refrigeration (excl. chillers) (> 50 lbs refrigerant)	Ref_Storage (Each) as of 2013-01-01	Custom Cold Storage Freezer - CO2 (R-744)	1.00	RefgWrhs-Comp	15.00

0 Refrig Research

1 Device Builder

2 RACC

3 FSC

4 eTRM export

5 RACC Charts

6 FSC Pivot

RACC-FSC custom example - #1

Cold storage process refrigeration system

Enter measure into “2 RACC” worksheet:

- **Project input (part 4) | Standard case / Counterfactual new**
 - **Std CARB_End-Use:** “Industrial Process Refrigeration (excl. chillers) (> 50 lbs refrigerant)”
 - **Std TechGroup (NormUnit):** Align with “1 Device Builder” entry
 - **Std Device Type:** Select device type created in device builder
 - **Std NumUnit:** “1” – default entry

Counterfactual New (Std)					
N	O	P	Q	R	S
Std CARB_End-Use	Std TechGroup (NormUnit)	Std Device Type	Std NumUnit	Std EUL_ID	Std EUL_Yrs
Industrial Process Refrigeration (excl. chillers) (> 50 lbs refrigerant)	Ref_Storage (Each) as of 2013-01-01	Custom Cold Storage Freezer - CO2 (R-744)	1.00	RefgWrhs-Comp	15.00

0 Refrig Research

1 Device Builder

2 RACC

3 FSC

4 eTRM export

5 RACC Charts

6 FSC Pivot

RACC-FSC custom example - #1

Cold storage process refrigeration system

Enter measure into “2 RACC” worksheet:

- **Project input (part 5) | existing case**

- **Pre Refrigerant Reclaimed Flag:** “TRUE” – To indicate existing refrigerant capture
- **Pre/Ext CARB_End-Use:** “Industrial Process Refrigeration (excl. chillers) (> 50 lbs refrigerant)”
- **Pre/Ext TechGroup (NormUnit):** Align with “1 Device Builder” entry
- **Pre/Ext Device Type:** Select device type created in device builder
- **Pre/Ext NumUnit:** “1” – default entry

T	U	V	W	X	Y	Z	AA	AB
Measure Existing (Pre)								
Counterfactual Existing (Ext)								
Pre Refrigerant Reclaimed Flag	Pre/Ext CARB_End-Use	Pre/Ext TechGroup (NormUnit)	Pre/Ext Device Type	Pre/Ext NumUnit	Pre/Ext EUL_ID	Pre/Ext EUL_Yrs	Pre/Ext Install Year	Pre/Ext Install Year Basis
TRUE	Industrial Process Refrigeration (excl. chillers) (> 50 lbs refrigerant)	Ref_Storage (Each) as of 2013-01-01	Custom Cold Storage Freezer - R-404A	1.00	RefgWrhs-Comp	15.00	2016	Deemed

RACC-FSC custom example - #1

Cold storage process refrigeration system

Enter measure into “2 RACC” worksheet:

- **Project input (part 6) | refrigerant types**

- *Msr | Std | Pre/Ext Refrigerant Type (dropdown):*

- **Msr | Std:** “Carbon Dioxide (GWP=1)” **Pre/Ext:** “R-404A (GWP=3,922)” for Pre/Ext”

AJ	AK	AL	AM	AN	AO	AP	AQ	AR	AS	AT	AU
Msr	Std	Pre	Msr	Std	Pre	Msr	Std	Pre	Msr	Std	Pre
		Ext			Ext			Ext			Ext
			Refrigerant properties color coding			Refrigerant properties color coding			Refrigerant properties color coding		
			The CARB-EPA limit is used in calcs.			Value replaced formula			Value replaced formula		
						Exceeds CARB-EPA limit, if any					
Msr Refrigerant Type	Std Refrigerant Type	Pre/Ext Refrigerant Type	Msr GWP Limit per CARB-EPA	Std GWP Limit per CARB-EPA	Pre/Ext GWP Limit per CARB-EPA	Msr GWP	Std GWP	Pre/Ext GWP	Msr GWP, User Specified	Std GWP, User Specified	Pre/Ext GWP, User Specified
Carbon Dioxide (GWP=1)	Carbon Dioxide (GWP=1)	R-404A (GWP=3,922)	300	300	None	1	1	3,922	1	1	3,922

RACC-FSC custom example - #1

Cold storage process refrigeration system

Enter measure into “2 RACC” worksheet:

- **Project input (part 7) | Additional custom inputs**
 - **Msr | Std | Pre/Ext Gross EOL Refrigerant Leakage %:** “0”
 - To model the site’s decommissioning practices → “All refrigerant recovered”

BH	BI	BJ	BK	BL	BM
Msr	Std	Pre	Msr	Std	Pre
		Ext			Ext
Refrigerant properties color coding			Refrigerant properties color coding		
Value replaced formula			Value replaced formula		
Device Builder value replaced			Value exceeds CARB rate		
Msr Gross EOL Refrigerant Leakage % per Device Builder	Std Gross EOL Refrigerant Leakage % per Device Builder	Pre/Ext Gross EOL Refrigerant Leakage % per Device Builder	Msr Gross EOL Refrigerant Leakage %	Std Gross EOL Refrigerant Leakage %	Pre/Ext Gross EOL Refrigerant Leakage %
20.0%	20.0%	20.0%	0.0%	0.0%	0.0%

RACC-FSC custom example - #2

Grocery Store – CO2/propane cascade system

RACC-FSC custom example - #2

Grocery store – CO₂/propane cascade system

Site & Baseline Case

Distributed HFC Scroll Units & Hybrid Condensers

Site Information:

- **Facility:** Grocery store
- **Location:** California
- **Decommissioning practices:** All refrigerant recovered

Existing Equipment:

- **Capacity:** 70 Ton

	Existing Case	Standard Case
Refrigerant type:	R-407A (GWP: 2,107)	R-449A (GWP: 1,396)
Charge/unit:	150 lb.	150 lb.
Qty:	8	8

- **Condition:** Still operable & POE requirements satisfied

Installed (Measure) Case

CO₂ Cascade Rack & R-290 Chiller Modules

Measure Details:

- **MAT:** Accelerated replacement (AR)
- **EUL/RUL:** 15 years / 5 years

Installed (Measure) Equipment:

- **Capacity:** 70 Ton (nominally)

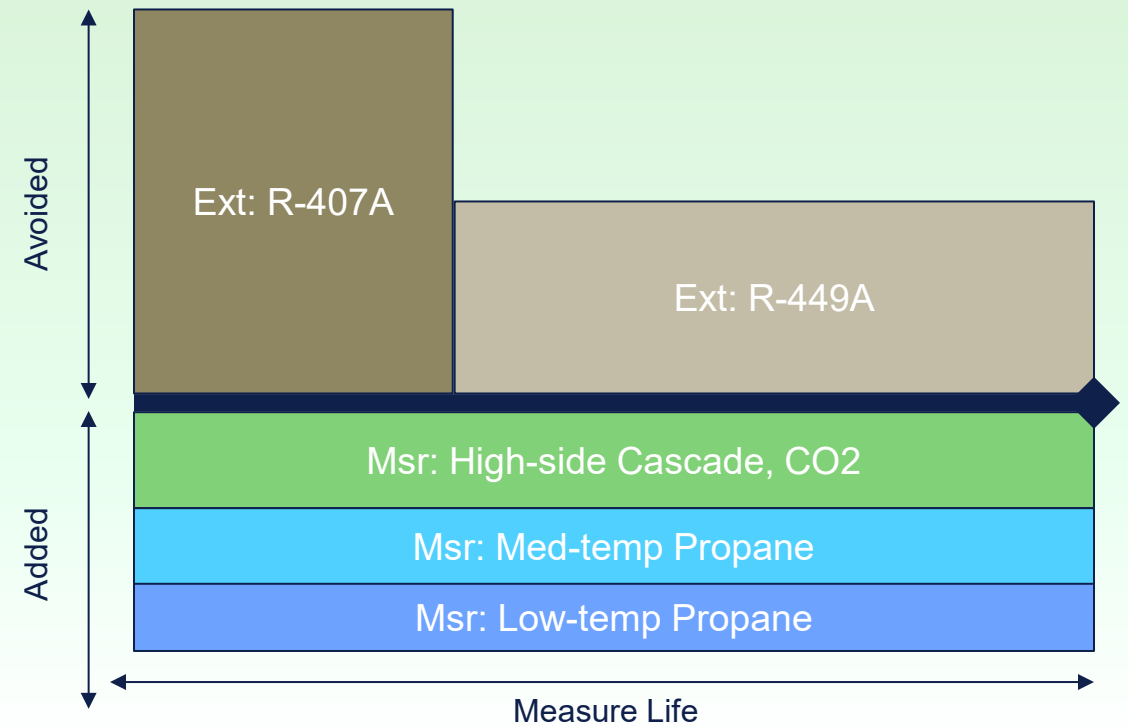
	Cascade Rack	MT Propane Modules	LT Propane Modules
Refrigerant type:	R-744 (CO ₂) (GWP: 1)	R-290 (GWP: 4)	R-290 (GWP: 4)
Charge/unit:	1,800 lb.	40 lb.	25 lb.
Qty:	1	4	3

RACC-FSC custom example - #2

Grocery store – CO₂/propane cascade system

Overview of project impacts

- **Avoided (benefits) refrigerant emissions:**
 - Existing equipment, R-407A for the RUL
 - Standard equipment, R-449 for (EUL – RUL)
- **Added (costs) refrigerant emissions:**
 - Measure equipment, High-side, CO₂
 - Measure equipment, Med-temp, Propane (R-290)
 - Measure equipment, Low-temp, Propane (R-290)



*Not to scale

RACC-FSC custom example - #2

Grocery store – CO₂/Propane cascade system

Split complex project into components to model in RACC

Component #1:

- All baseline conditions (Ext & Std.)
- High-side cascade (CO₂) measure case



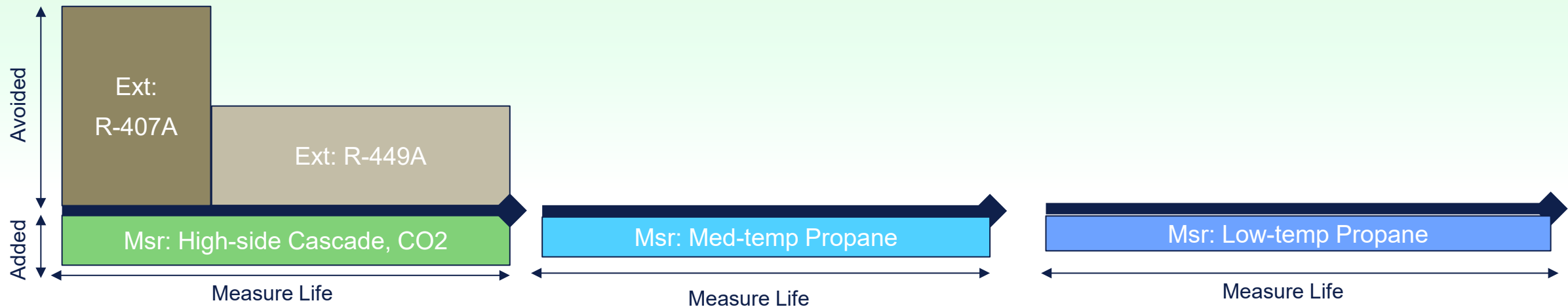
Component #2:

- Med-temp propane measure case



Component #3:

- Low-temp propane measure case



*Not to scale

RACC-FSC custom example - #2

Grocery store – CO₂/propane cascade system

Add equipment to “1 Device Builder” worksheet:

- **Existing & Standard Equipment (part 1)**

- **Create a device type:** “Custom - Distributed R-407A System” | “Custom - Distributed R-449A System”
- **Select TechTypeID (dropdown):** “Ref_Storage:RefrigFrz”
- **NormUnit (normalizing unit):** Auto populates once a **TechTypeID** is selected, optional dropdown to select different normal unit (per kBtuh, per Ton, etc.) if required.
- **Select CARB_DeviceType (dropdown):** “Small commercial refrigeration 50-200 lbs.”

		B	C	D	E	F	G	H
		DeviceType	TechTypeID	TechTypeDesc	NormUnit	TechGroup (NormUnit)	CARB_Sector	CARB_DeviceType
Ext		Custom - Distributed R-407A System	Ref_Storage:RefrigFrz	Refrigerator/Freezer	Each	Ref_Storage (Each) as of 2013-01-01	Stationary Refrigeration	Small commercial refrigeration 50-200 lbs.
Std		Custom - Distributed R-449A System	Ref_Storage:RefrigFrz	Refrigerator/Freezer	Each	Ref_Storage (Each) as of 2013-01-01	Stationary Refrigeration	Small commercial refrigeration 50-200 lbs.
34	DNV ©	0 Refrig Research	1 Device Builder	2 RACC	3 FSC	4 eTRM export	5 RACC Charts	6 FSC Pivot

RACC-FSC custom example - #2

Grocery store – CO₂/propane cascade system

Add equipment to “1 Device Builder” worksheet:

- **Existing & standard equipment (part 2)**

- **Common Refrigerant Type(s):** Optional reference field; mostly used for deemed
- **RefrigCharge Pounds Per NormUnit:** “150” custom input of equipment specific charge

	I	J	K	L	M	N	O	P	Q	R	S	T
	Common Refrigerant Type(s)	RefrigCharge Pounds per CARB (lb/Each)	RefrigCharge Pounds Per NormUnit (copy from "0 Refrig Research")	Annual Leakage Rate per CARB	q_EOL per CARB	t_EOL per CARB	EUL_ID	StartDate	ExpiryDate	EUL_Yrs	CDindex	CDrows
Ext		103.000	150.000	15.6%	20.0%	0.00	GrocSys-Cndsr	2013-01-01		15.00	5	16
Std		103.000	150.000	15.6%	20.0%	0.00	GrocSys-Cndsr	2013-01-01		15.00	5	16
	0 Refrig Research	1 Device Builder	2 RACC	3 FSC	4 eTRM export	5 RACC Charts	6 FSC Pivot					

RACC-FSC custom example - #2

Grocery store – CO₂/propane cascade system

Add equipment to “1 Device Builder” worksheet:

- **Baseline equipment (part 3)**

- **EUL Input:**

- Use pivot table (starting in column V) to identify most appropriate DEER-recognized EUL ID.
- Will need to identify “EUL_ID”, “StartDate”, “ExpiryDate” if available; **paste as text**

- **EUL_ID:** “GrocSys-Cndsr”

- **StartDate:** “2013-01-01”

- **ExpiryDate:** no expiration date for this EUL ID, leave blank

	I	J	K	L	M	N	O	P	Q	R	S	T
	Common Refrigerant Type(s)	RefrigCharge Pounds per CARB (lb/Each)	RefrigCharge Pounds Per NormUnit (copy from "0 Refrig Research")	Annual Leakage Rate per CARB	q_EOL per CARB	t_EOL per CARB	EUL_ID	StartDate	ExpiryDate	EUL_Yrs	CDindex	CDrows
Ext		103.000	150.000	15.6%	20.0%	0.00	GrocSys-Cndsr	2013-01-01		15.00	5	16
Std		103.000	150.000	15.6%	20.0%	0.00	GrocSys-Cndsr	2013-01-01		15.00	5	16
	0 Refrig Research	1 Device Builder	2 RACC	3 FSC	4 eTRM export	5 RACC Charts	6 FSC Pivot					

RACC-FSC custom example - #2

Grocery store – CO₂/propane cascade system

Add equipment to “1 Device Builder” worksheet:

- **Measure equipment (part 1)**

- **Create a device type:** “Custom - High-side CO2 (R-744) Cascade Rack” | “Custom - Med-Temp Propane Chiller Modules” | “Custom - Low-Temp Propane Chiller Modules”
- **Select TechTypeID (dropdown):** “Ref_Storage:RefrigFrz”
- **Select CARB_DeviceType (dropdown):** “Medium commercial refrigeration 200-2,000 lbs.” | “Sub-small commercial refrigeration < 50 lbs.”

		B	C	D	E	F	G	H
		DeviceType	TechTypeID	TechTypeDesc	NormUnit	TechGroup (NormUnit)	CARB_Sector	CARB_DeviceType
H		Custom - High-side CO2 (R-744) Cascade Rack	Ref_Storage:RefrigFrz	Refrigerator/Freezer	Each	Ref_Storage (Each) as of 2013-01-01	Stationary Refrigeration	Medium commercial refrigeration 200-2,000 lbs.
MT		Custom - Med-Temp Propane Chiller Modules	Ref_Storage:RefrigFrz	Refrigerator/Freezer	Each	Ref_Storage (Each) as of 2013-01-01	Stationary Refrigeration	Sub-small commercial refrigeration < 50 lbs.
LT		Custom - Low-Temp Propane Chiller Modules	Ref_Storage:RefrigFrz	Refrigerator/Freezer	Each	Ref_Storage (Each) as of 2013-01-01	Stationary Refrigeration	Sub-small commercial refrigeration < 50 lbs.
37	DNV ©	0 Refrig Research	1 Device Builder	2 RACC	3 FSC	4 eTRM export	5 RACC Charts	6 FSC Pivot

RACC-FSC custom example - #2

Grocery store – CO₂/propane cascade system

Add equipment to “1 Device Builder” worksheet:

- **Measure equipment (part 2)**

- **Common Refrigerant Type(s):** Optional reference field; mostly used for deemed
- **RefrigCharge Pounds Per NormUnit:** “1,800” | “40” | “25” custom input of equipment specific charge

	I	J	K	L	M	N	O	P	Q	R	S	T
	Common Refrigerant Type(s)	RefrigCharge Pounds per CARB (lb/Each)	RefrigCharge Pounds Per NormUnit (copy from "0 Refrig Research")	Annual Leakage Rate per CARB	q_EOL per CARB	t_EOL per CARB	EUL_ID	StartDate	ExpiryDate	EUL_Yrs	CDindex	CDrows
H		684.000	1,800.000	22.9%	20.0%	0.00	GrocSys-Cndsr	2013-01-01		15.00	5	16
MT		23.000	40.000	15.0%	34.0%	0.00	GrocSys-Cndsr	2013-01-01		15.00	5	16
LT		23.000	25.000	15.0%	34.0%	0.00	GrocSys-Cndsr	2013-01-01		15.00	5	16

RACC-FSC custom example - #2

Grocery store – CO₂/propane cascade system

Add equipment to “1 Device Builder” worksheet:

- **Measure equipment (part 3)**

- **EUL Input:** Use pivot table (starting in column V) to identify most appropriate DEER-recognized EUL ID.
- **EUL_ID:** “GrocSys-Cndsr”
- **StartDate:** “2013-01-01”
- **ExpiryDate:** no expiration date for this EUL ID, leave blank

	I	J	K	L	M	N	O	P	Q	R	S	T
	Common Refrigerant Type(s)	RefrigCharge Pounds per CARB (lb/Each)	RefrigCharge Pounds Per NormUnit (copy from "0 Refrig Research")	Annual Leakage Rate per CARB	q_EOL per CARB	t_EOL per CARB	EUL_ID	StartDate	ExpiryDate	EUL_Yrs	CDindex	CDrows
H		684.000	1,800.000	22.9%	20.0%	0.00	GrocSys-Cndsr	2013-01-01		15.00	5	16
MT		23.000	40.000	15.0%	34.0%	0.00	GrocSys-Cndsr	2013-01-01		15.00	5	16
LT		23.000	25.000	15.0%	34.0%	0.00	GrocSys-Cndsr	2013-01-01		15.00	5	16

RACC-FSC custom example - #2

Grocery store – CO₂/propane cascade system

Enter measure into “2 RACC” worksheet:

- **General Inputs**

- **Refrig. Cost Basis:** “GHG Value from Natural Gas ACC” – unchanged from default input
- **Dollar/ACC Year:** “2024” – updated to most recent year available
- **WACC selection:** “Statewide” – using statewide for examples; custom projects should select specific PA for the project

General inputs	Notes	
Refrig. Cost Basis	GHG Value from Natural Gas ACC	
Dollar/ACC Year	2024	→ Select appropriate ACC
GWP Time Horizon	100-yr	→ Locked to 100-yr
WACC selection	Statewide	→ Statewide for Deemed
Active WACC%	7.30%	

RACC-FSC custom example - #2

Grocery store – CO₂/propane cascade system

Enter measure into “2 RACC” worksheet:

- **Project input (part 1)**

- **Measure Description:** Enter in description of project, use as much detail as you feel you need
- **Msr Install Year:** “2026” (dropdown)
- **MeasAppType:** “AR” (dropdown)

	A	B	C	D	E	F	G
	RACC_Index	Status	Measure Description	Msr Install Year	MeasAppType	CARB_Sector	CARB_BldgCategory
Component #1	1	OK	Cascade Rack (CO2) with Propane Chiller Modules replacing Distributed HFC System - High-side component	2026	AR	Stationary Refrigeration	Retail food facility
Component #2	2	OK	Cascade Rack (CO2) with Propane Chiller Modules replacing Distributed HFC System - Med-Temp Component	2026	AR	Stationary Refrigeration	Retail food facility
Component #3	3	OK	Cascade Rack (CO2) with Propane Chiller Modules replacing Distributed HFC System - Low-Temp Component	2026	AR	Stationary Refrigeration	Retail food facility

RACC-FSC custom example - #2

Grocery store – CO₂/propane cascade system

Enter Measure into “2 RACC” Worksheet:

- **Project Input (part 2)**

- **CARB_Sector:** “Stationary Refrigeration” – (dropdown) align selection with “1 Device Builder” entry
- **CARB_BldgCategory:** “Retail food facility”

	A	B	C	D	E	F	G
	RACC_Index	Status	Measure Description	Msr Install Year	MeasAppType	CARB_Sector	CARB_BldgCategory
Component #1	1	OK	Cascade Rack (CO2) with Propane Chiller Modules replacing Distributed HFC System - High-side component	2026	AR	Stationary Refrigeration	Retail food facility
Component #2	2	OK	Cascade Rack (CO2) with Propane Chiller Modules replacing Distributed HFC System - Med-Temp Component	2026	AR	Stationary Refrigeration	Retail food facility
Component #3	3	OK	Cascade Rack (CO2) with Propane Chiller Modules replacing Distributed HFC System - Low-Temp Component	2026	AR	Stationary Refrigeration	Retail food facility

RACC-FSC custom example - #2

Grocery store – CO₂/propane cascade system

Enter measure into “2 RACC” worksheet:

- **Project input (part 3) | Measure case**

- **Msr CARB_End-Use:** (#1) “Retail Food Refrigeration (>50 lbs refrigerant)” | (#2 & #3) “Retail Food Refrigeration (<50 lbs refrigerant)”
- **Msr TechGroup (NormUnit):** Align with “1 Device Builder” entry
- **Msr Device Type:** Select device type created in device builder
- **Msr NumUnit:** (#1) “1” | (#2) “4” | (#3) “3”

	Measure Case, New Device (Msr)					
	H	I	J	K	L	M
	Msr CARB_End-Use	Msr TechGroup (NormUnit)	Msr Device Type	Msr NumUnit	Msr EUL_ID	Msr EUL_Yrs
Component #1	Retail Food Refrigeration (> 50 lbs refrigerant)	Ref_Storage (Each) as of 2013-01-01	Custom - High-side CO2 (R-744) Cascade Rack	1.00	GrocSys-Cndsr	15.00
Component #2	Retail Food Refrigeration (< 50 lbs refrigerant)	Ref_Storage (Each) as of 2013-01-01	Custom - Med-Temp Propane Chiller Modules	4.00	GrocSys-Cndsr	15.00
Component #3	Retail Food Refrigeration (< 50 lbs refrigerant)	Ref_Storage (Each) as of 2013-01-01	Custom - Low-Temp Propane Chiller Modules	3.00	GrocSys-Cndsr	15.00

RACC-FSC custom example - #2

Grocery store – CO₂/propane cascade system

Enter measure into “2 RACC” worksheet:

- **Project input (part 4) | standard case / counterfactual new**

- **Std CARB_End-Use:** “Retail Food Refrigeration (>50 lbs refrigerant)”

- **Std NumUnit:** “8”

- **Enter in the Standard equipment in all three components | Will only model refrigerant impacts with Component #1*

Counterfactual New (Std)					
N	O	P	Q	R	S
Std CARB_End-Use	Std TechGroup (NormUnit)	Std Device Type	Std NumUnit	Std EUL_ID	Std EUL_Yrs
Component #1 Retail Food Refrigeration (> 50 lbs refrigerant)	Ref_Storage (Each) as of 2013-01-01	Custom - Distributed R-449A System	8.00	GrocSys-Cndsr	15.00
Component #2 Retail Food Refrigeration (> 50 lbs refrigerant)	Ref_Storage (Each) as of 2013-01-01	Custom - Distributed R-449A System	8.00	GrocSys-Cndsr	15.00
Component #3 Retail Food Refrigeration (> 50 lbs refrigerant)	Ref_Storage (Each) as of 2013-01-01	Custom - Distributed R-449A System	8.00	GrocSys-Cndsr	15.00

RACC-FSC custom example - #2

Grocery store – CO₂/propane cascade system

Enter measure into “2 RACC” worksheet:

- **Project input (part 5) | Existing case**

- **Pre Refrigerant Reclaimed Flag:** “TRUE” – To indicate existing refrigerant capture
- **Pre/Ext CARB_End-Use:** “Retail Food Refrigeration (>50 lbs refrigerant)”
- **Pre/Ext NumUnit:** “8”
- **Enter in the Existing equipment in all three components | Will only model refrigerant impacts with Component #1*

#1

Measure Existing (Pre)								
T	U	V	W	X	Y	Z	AA	
Pre Refrigerant Reclaimed Flag	Pre/Ext CARB_End-Use	Pre/Ext TechGroup (NormUnit)	Pre/Ext Device Type	Pre/Ext NumUnit	Pre/Ext EUL_ID	Pre/Ext EUL_Yrs	Pre/Ext Install Year	
Component #1	TRUE	Retail Food Refrigeration (> 50 lbs refrigerant)	Ref_Storage (Each) as of 2013-01-01	Custom - Distributed R-407A System	8.00	GrocSys-Cndsr	15.00	2016
Component #2	TRUE	Retail Food Refrigeration (> 50 lbs refrigerant)	Ref_Storage (Each) as of 2013-01-01	Custom - Distributed R-407A System	8.00	GrocSys-Cndsr	15.00	2016
Component #3	TRUE	Retail Food Refrigeration (> 50 lbs refrigerant)	Ref_Storage (Each) as of 2013-01-01	Custom - Distributed R-407A System	8.00	GrocSys-Cndsr	15.00	2016

RACC-FSC custom example - #2

Grocery store – CO₂/propane cascade system

Enter measure into “2 RACC” worksheet:

• Project input (part 6) | Refrigerant types

• *Msr | Std | Pre/Ext Refrigerant Type (dropdown):*

- **[#1]** **Msr:** “Carbon Dioxide (GWP=1)” **Std:** “R-449A (GWP=1,396)” **Pre/Ext:** “R-407A (GWP=2,107)”
- **[#2|#3]** **Msr:** “Propane (GWP=4)” **Std:** “None” **Pre/Ext:** “None”

AJ	AK	AL	AM	AN	AO	AP	AQ	AR	AS	AT	AU
Msr	Std	Pre	Msr	Std	Pre	Msr	Std	Pre	Msr	Std	Pre
		Ext			Ext			Ext			Ext
			Refrigerant properties color coding			Refrigerant properties color coding			Refrigerant properties color coding		
			The CARB-EPA limit is used in calcs.			Value replaced formula			Value replaced formula		
						Exceeds CARB-EPA limit, if any					
Msr Refrigerant Type	Std Refrigerant Type	Pre/Ext Refrigerant Type	Msr GWP Limit per CARB-EPA	Std GWP Limit per CARB-EPA	Pre/Ext GWP Limit per CARB-EPA	Msr GWP	Std GWP	Pre/Ext GWP	Msr GWP, User Specified	Std GWP, User Specified	Pre/Ext GWP, User Specified
#1 Carbon Dioxide (GWP=1)	R-449A (GWP=1,396)	R-407A (GWP=2,107)	None	None	None	1	1,396	2,107	1.00	1,396	2,107
#2 Propane (GWP=4)	None	None	3,337		None	4	0	0	4.00	0	0
#3 Propane (GWP=4)	None	None	3,337		None	4	0	0	4.00	0	0

RACC-FSC custom example - #2

Grocery store – CO₂/propane cascade system

Enter measure into “2 RACC” worksheet:

- **Project input (part 7) | Additional custom inputs**

- *Msr | Std | Pre/Ext Gross EOL Refrigerant Leakage %: “0”*

- To model the site’s decommissioning practices → “All refrigerant recovered”

	BH	BI	BJ	BK	BL	BM
	Msr	Std	Pre	Msr	Std	Pre
			Ext			Ext
	Refrigerant properties color coding			Refrigerant properties color coding		
	Value replaced formula			Value replaced formula		
	Device Builder value replaced			Value exceeds CARB rate		
	Msr Gross EOL Refrigerant Leakage % per Device Builder	Std Gross EOL Refrigerant Leakage % per Device Builder	Pre/Ext Gross EOL Refrigerant Leakage % per Device Builder	Msr Gross EOL Refrigerant Leakage %	Std Gross EOL Refrigerant Leakage %	Pre/Ext Gross EOL Refrigerant Leakage %
Component #1	20.0%	20.0%	20.0%	0.0%	0.0%	0.0%
Component #2	34.0%	20.0%	20.0%	0.0%	0.0%	0.0%
Component #3	34.0%	20.0%	20.0%	0.0%	0.0%	0.0%

RACC-FSC custom example - #2

Grocery store – CO₂/propane cascade system

Enter measure into “2 RACC” worksheet:

- **Combined project results**

Total Project, Net Refrigerant Benefits at NPV (2024\$) =

$$\sum(\text{Total Refrigerant Emissions Benefit, Dollar}_i) - \sum(\text{Total Refrigerant Emission Cost, Dollar}_i)$$

DS	DT
<u>Total</u> Refrigerant Emission Cost, Dollar	<u>Total</u> Refrigerant Emissions Benefit, Dollar
	\$330,920.83
\$103.97	
\$48.73	

$$\$330,920.83 - (\$103.97 + \$48.73) = \$330,768.12$$

Total Net Refrigerant Benefit (NPV at 2024\$) = \$330,768.12

0 Refrig Research	1 Device Builder	2 RACC	3 FSC	4 eTRM export	5 RACC Charts	6 FSC Pivot
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RACC-FSC custom example - #3

From TGD: (Normal Replacement) complete refrigeration system replacement with natural refrigerant system

RACC-FSC custom example - #3

(NR) complete system replacement with nat. refrigerant system

Index of RACC-FSC Measure Examples in TGD

Table 1-1. Index of RACC-FSC measure example walkthroughs included in this document

Measure end use	Measure description	MAT	Refrigerants	Fuel substitution	Section / page
Stationary refrigeration	Complete system replacement with natural refrigerant system retail food refrigeration system with natural refrigerants, >50 lb. charge systems	AR	(Low/Med temp) Msr: CO2 (R-744) Std: <150 GWP Pre/Ext: R-404A (High temp) Msr: Propane (R-290) Std: <150 GWP Pre/Ext: R-407A	No	4-1
Stationary refrigeration	Complete system replacement with natural refrigerant system, >50 lb. charge systems	NR	(Low/Med temp) Msr: CO2 (R-744) Std: <150 GWP Pre/Ext: NA (High temp) Msr: Propane (R-290) Std: <150 GWP Pre/Ext: NA	No	4-14

- Found in the Introduction Section
- Provides quick overview of measure examples
 - Description
 - Measure Application Type
 - Refrigerant types
 - Fuel substitution flag
 - Link to measure example document

RACC-FSC custom example - #3

(NR) complete system replacement with nat. refrigerant system

Examples at the end of the TGD include Stationary Refrigeration, Stationary Air-Conditioning, and Appliance measure examples

Baseline case

Two-Gas HFC Cascade System (R-404A|R-407A)

Standard Practice Equipment:

- **Building Type:** Large retail food chain (≥20 stores)
- **Code Requirements:** Existing facility; however, >75% new equipment = “New Facility” requirements
- **System:** Medium Com. Refrigeration 200-2,000 lb.
- **Refrigerant type:** <150 GWP
- **Refrigerant charge:** Med/low-Temp: 1,392 lb. | High-side: 595 lb.

Installed (measure) case

Natural Refrigerant Cascade (Propane|CO₂)

Measure Details:

- **MAT:** Normal replacement (NR)
- **EUL/RUL:** 15 years / 5 years

Installed (Measure) Equipment:

- **System:** Medium Com. Refrigeration 200-2,000 lb.
- **Refrigerant type:** Med/Low-Temp: R-744 (CO₂) | High-side: Propane
- **Refrigerant charge:** Med/Low-Temp: 835 lb. | High-side: 175 lb.

Measure description

This example is a complete system replacement from a two-gas cascade system consisting of the R-404A system for the med/low-temperature side and R-407A for the high-temperature side. This example is for a NR scenario, in which the existing system has either failed or is no longer meeting the capacity needs of the facility. The new system will be a CO₂ system for the med/low-temperature side and a propane refrigerant system for the high-temperature side. The refrigeration system replacement is at an existing facility for a retail food company with 20 or more stores. The counterfactual baseline system would be required to have a refrigerant with a GWP of 150 or less based on CARB regulations at a "new facility".

NOTE: New refrigeration equipment at an existing facility may be required to meet the "New Facility" refrigeration equipment guidelines, if the existing facility has undergone replacement of 75% or more of its evaporators (by quantity/number) and 100% of its compressor racks, condensers, and connected evaporator loads.

To model the refrigerant leakage emissions impact of a cascade system with multiple refrigerants the system needs to be split into two measures. The medium/low-temperature side with CO₂ refrigerant, and high-temperature side with propane refrigerant need to be modelled as separate measures. The avoided cost result of the whole refrigeration system is the sum of the results from the two split measures in the RACC-FSC tool.

Measure input walkthrough

Input worksheet: 0 Refrig Research

0 Refrig Research	1 Device Builder	2 RACC	3 FSC	4 eTRM export	5 RACC Charts	6 FSC Pivot
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This worksheet is used to document refrigerant charge per normal unit for Deemed Measure Package development. This example assumes this measure will be custom where site-specific/equipment-specific refrigerant charge will be used for this measure.

Input Worksheet: 1 Device Builder

0 Refrig Research	1 Device Builder	2 RACC	3 FSC	4 eTRM export	5 RACC Charts	6 FSC Pivot
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Only a single device is required in the 1 Device Builder worksheet unless the charge size of the sides of the cascade refrigeration system fall into different CARB_DeviceType categories.

STEP 1 Check to See if Desired Equipment is Listed in the Device Builder Table

- If yes, continue to the 2 RACC worksheet.
- If no, add new device to the end of the table.

RACC-FSC custom example - #3

(NR) complete system replacement with nat. refrigerant system

Examples in the TGD include a step-by-step walkthrough:

- Covers all inputs for each worksheet
 - 0 Refrig Research
 - 1 Device Builder
 - 2 RACC
 - 3 FSC (not applicable for this example)

A blue pen with a textured grip lies diagonally across a spiral-bound notebook. The notebook has lined paper and a silver spiral binding on the right side. The background is a solid dark blue color.

Next steps



Planned office hours for Custom RACC-FSC questions

Office Hours (email Brad.Hoover@dnv.com)

- Planned date/times:
 - Wednesday, August 12, 9:30-10:30 AM
 - Wednesday, August 26, 9:30-10:30 AM
 - Wednesday, September 9, 9:30-10:30 AM
 - Wednesday, September 23, 9:30-10:30 AM

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