

Commercial Refrigeration Subcommittee Meeting #4



AYAD AL-SHAIKH
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Agenda

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- Materials:
 - Com Refrig, Sub Comm Mtg 4 – r2.xls
 - Technology Summary - 1.0 Comm Refrig r4.0.xls
- Consensus Items
 - Missing savings values
 - 1.07 – Night Covers
 - 1.03 & 1.11 - EC Motor Retrofit Measure Structure
 - 1.06a & b - Refrigeration Controls Measure Structure
 - Display Cases – Measure on hold; Measures not being consolidated.
- Cost – Work Order, WO017
- Building Type Discussion
- Specific Measure Issues
 - 1.08, Bare Refrigeration Line Insulation
 - 1.22 Commercial Reach-In Refrigerator and Freezer
- Next Meeting's Issues

Missing Savings Values

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- Mixed News

- ❑ 1.06 - Refrigeration Head Pressure Controls
- ❑ 1.10 - Compressor Retrofit: Multiplex
- ❑ 1.12 - Efficient Condenser: Air-Cooled to Evap (*HOLD – Measure Sunset*)
- ❑ 1.13 - Efficient Condenser: Multiplex (*HOLD – Measure Sunset*) – *at request of ESG*
- ❑ These measures do not have savings for all existing permutation choices in DEER. The specific issue here is that savings vary by Climate Zone (CZ01-05, CZ11-13, CZ16) and by Building Vintage (75, 85, 96, 03, and 07).
- ❑ Missing parameters will be modeled (*thanks to Chris!*) via MASControl to mimic this methodology for other areas.

- Bad News

- ❑ 1.14 - Floating Head Pressure – Single Compressor
- ❑ This one measure is modelled through DOE2.2r specifically for non-multiplex refrigeration racks. DEER only covers multiplex floating head pressure. Savings are available by Climate Zone (CZ01-05, CZ11-13, CZ16), but not for all Climate Zones.
- ❑ Initially, this measure will only serve these Climate Zones until additional models can be run.

1.07, Night Covers

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- **Broad agreement by email response**
 - DEER results vary by both Climate Zone and by PA.
 - DEER does not have measures for Low Temp cases, so these were modeled separately (in DOE2.2r) and only vary by climate zone.
 - If savings are averaged per Climate Zone, the net impact would be minimal.
 - ✦ Reduction of 100 kWh and increase of 8 therms in 2016.
 - **Recommendation:** Use a single value for savings for each climate zone that is the average of each DEER value for the Med Temp Open Vertical Display Case offering.
 - ✦ All offerings in this Measure would have parallel permutation constructions that only varied by Climate Zone.

1.03 & 1.11, EC Motor Retrofit

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- Phase 1: No savings values would change
 - The basis for savings already exists in all cases
 - Create 2 Measures for:
 - ✦ Display Case EC Motor Retrofit
 - ✦ Walk-In EC Motor Retrofit
 - Use ROB methodology from **PGECOREF109 & SCE13RN011**
 - ✦ Norm Unit = per motor
 - ✦ *For **both** Display Cases and Walk-Ins*
 - Add ER/(Accelerated Replacement) methodology from **PGE3PREF124**
 - ✦ Norm Unit = per motor
 - ✦ *For Display Cases only*

1.03 & 1.11, EC Motor Retrofits

- Phase 1

- No Permutation Collapse due to MT (Cooler) / LT (Freezer)
 - ✦ *Will document methodology for when it is recommended to create a standard process.*
- Permutation Collapse due to Climate Zone
 - ✦ 1-3% for SHP baseline motors
 - ✦ Note that PSC motor baseline is not be used currently.
- Notes for implementation of Collapse:
 - ✦ Discrete savings would be maintained for each Climate Zone within the eTRM.
 - ✦ Savings would be averaged over the Climate Zones based upon:
 - Simple average
 - Weighted average based upon
 - 2016 claims data
 - Number of business by CZ (grocery, retail)
- Question: Do we have consensus on:
 - ✦ Two measures; no savings value changes; ROB and ER offerings; Collapse CZ

Refrigeration Controls

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- Looking for agreement on:
 - Process Controls
 - ✦ Recommendation: Remove process refrigeration controls measures and reconsider these for the Process Category.
 - Measure Break-Up
 - ✦ Recommendation: Create separate measures for
 - 1.06a, FHP-Multiplex (cap-tons)
 - 1.06b, Suction-Multiplex (cap-tons)
 - 1.14, FHP-Single Compressor (Rated-hp)
 - Impact due to Climate Zone is significant
 - ✦ Recommendation: Savings vary by 26-50% for kWh and 20-30% for therms. DEER presents these modeled values already, so Statewide implementation is straightforward.
 - Impact due to Building Vintage is significant
 - ✦ Recommendation: To capture savings accurately, Vintage should be included if it is the best representation of the sensitive variables that are truly driving savings variation.
 - Control Strategy Averaging
 - ✦ Recommendation: Use the distinction of control strategy. Do not average savings from multiple types.
- **Question: Do we have consensus on the 5 bullets?**

Refrigeration Controls

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- Vintage documentation:
 - (Checked .inp files from FHP prototype models - consistent)

Air-Cooled Condensers, separate condensers serving LT & MT refrigeration systems			
Vintage	Size, kBtu @ TD; SCT control		Efficiency, Btu/Watt @ TD; Cap control
	Low temperature	Medium Temperature	
<1978	464 kBtu @15TD, 90 setpoint	782 kBtu @20TD, 90 setpoint	45 Btu/W @ 10FTD, 4 cycling fans (each cond)
<1992	464 kBtu @15TD, 90 setpoint	782 kBtu @20TD, 90 setpoint	45 Btu/W @ 10FTD, 4 cycling fans
<2001	464 kBtu @10TD, 90 setpoint	782 kBtu @15TD, 90 setpoint	53 Btu/W @ 10FTD, 4 cycling fans
>2000	464 kBtu @10TD, 85 setpoint	782 kBtu @15TD, 85 setpoint	53 Btu/W @ 10FTD, 4 cycling fans
Current "T24" equivalent	464 kBtu @10TD, 80 setpoint	782 kBtu @15TD, 80 setpoint	53 Btu/W @ 10FTD, 4 cycling fans
EEM - Energy Efficient	464 kBtu @10TD, control varies	782 kBtu @15TD, control varies	85 Btu/W @ 10FTD, 4 fans, cycleor VFD
Note 1: Condenser is sized for the heat rejection indicated, at the sizing TD indicated. The condenser efficiency is based on the same condenser selection as the size, but the "Btu" in the "Btu/Watt" term is based on the heat-rejection capacity when a 10°F TD exists.			



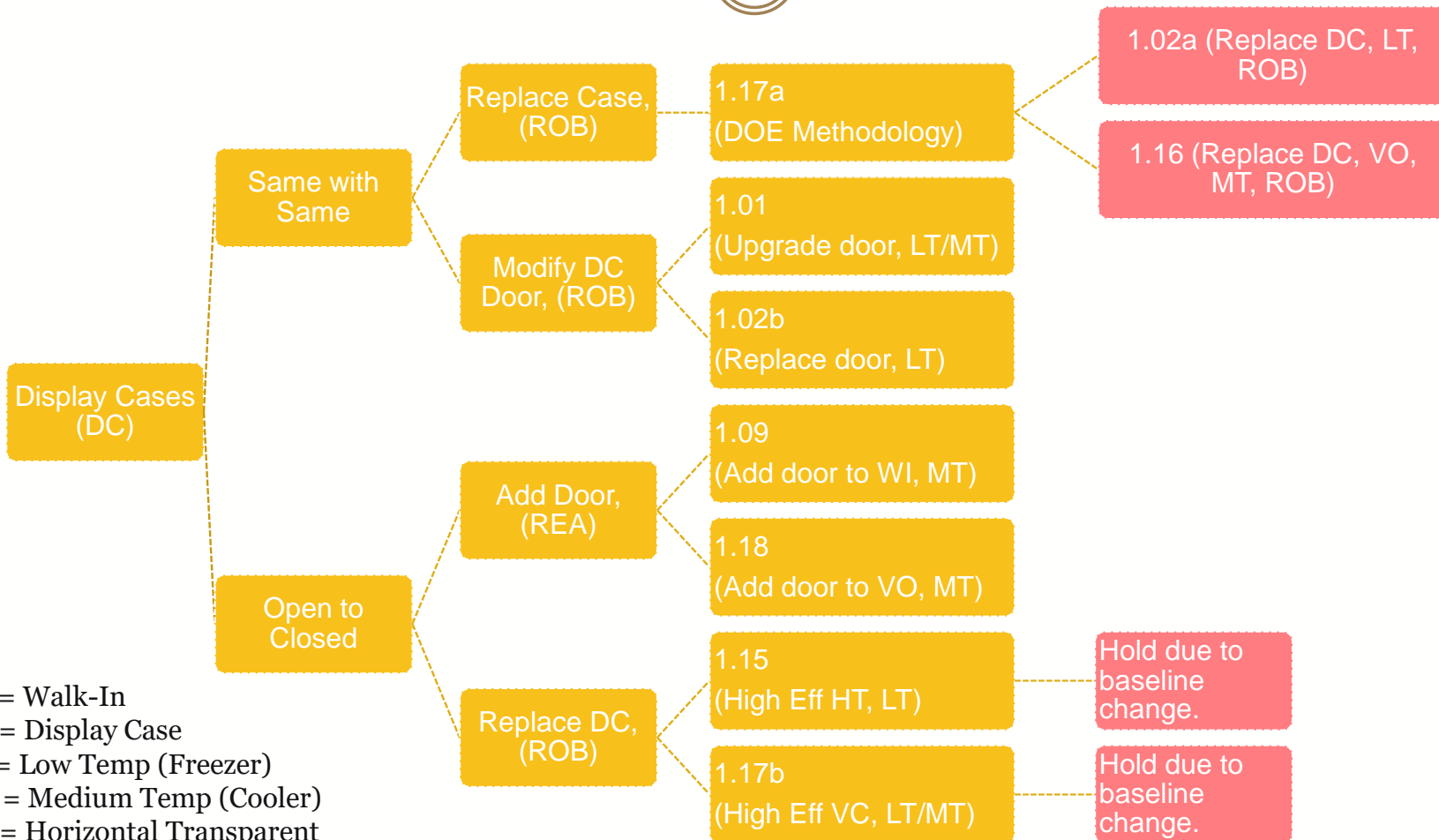
Display Case Measures

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- Measures recommended as overlapping:
 - 1.02b, Anti-Sweat Heater Display Doors
 - 1.16, Medium Temp Open Case Retrofit
- Measure recommended as “hold” because of baseline updates to measure:
 - 1.15, Low Temp Coffin to Reach-In
 - 1.17b, Display Cases with Doors
- 1.17a Approach – DOE methodology has measured results for 49 like-to-like replacements
 - Note: Does not include interactive effects?

Display Case Tree

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WI = Walk-In
 DC = Display Case
 LT = Low Temp (Freezer)
 MT = Medium Temp (Cooler)
 HT = Horizontal Transparent
 VO/C = Vertical Open or Vertical Closed
 Red Boxes = Overlapping measures to be removed

Cost Analysis

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- 1.01, Anti-Sweat Heater (ASH) Controls
 - Quotes with WO017 Labor Margin Approach
 - ✦ Cost per controller/amps → same for Freezer/Cooler
 - NEEP Approach
 - ✦ Cost per controller/doors → differs for Freezer/Cooler
- 1.04, Refrigerated Storage Auto Door Closer
 - WO017 cost is about 3x the DEER cost, but based upon the average of two sizes of doors. **What is typical size?** (pg. 130)

Measure Description	Cost Unit	N	Cost Estimate	DEER 2008	DEER 2005	DEER 2001
Auto-closers on main cooler/freezer doors, <42" wide	Per cooler door	1	\$155.67	\$120.00	\$322.59	N/A
Auto-closers on main cooler/freezer doors, >42" wide	Per cooler door	1	\$917.19	\$120.00	\$322.59	N/A

- Maybe we can consider a weighted average if likely to be more or less than 42"?

Cost Analysis

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- 1.05, Walk-in Cooler Evaporative Fan Cycling and VFD Control
 - ❑ “WO017 costs are significantly higher because use a stand-alone fan controller product in conjunction with an ECM motor to reduce/vary fan speed as needed rather than duty-cycling the fan.”
 - ❑ Question: Do we need to add ECM savings to align cost and savings? (already attempted to subtract out)
 - ❑ PGE3PREF126, R2
 - ✦ Includes ECM savings with Controls
 - ✦ Unit = Rated-HP
 - ✦ Approach: Excel calculation

Cost Analysis

Floating head pressure (FHP), fixed setpoint (FSP) (air-cooled, retrofit)	Per discharge group	1	\$4,008	N/A	\$-	N/A
FHP, FSP (evap-cooled, retrofit)	Per discharge group	1	\$4,008	N/A	\$-	N/A
FHP, variable setpoint (VSP) (air-cooled, retrofit)	Per discharge group	1	\$4,406	N/A	\$10.04 ¹	N/A
FHP, VSP (evap-cooled, retrofit)	Per discharge group	1	\$4,709	N/A	\$8.93 ¹	N/A
FHP, VSP & variable speed (VS) (air-cooled, retrofit)	Per discharge group	1	\$6,241	N/A	\$294.33 ¹	N/A
FHP, VSP & VS (evap-cooled, retrofit)	Per discharge group	1	\$7,390	N/A	\$151.97 ¹	N/A

- 1.06a & 1.06b

- WO017 – per suction/discharge group

- ✦ Material cost, pg 130

- ✦ Labor cost, pg 296, 299

- Must convert from \$ / group to \$ / ton.

- **Question:**

- ✦ For a typical chain supermarket, low temperature discharge group design load ranges from 8 tons to 20 tons. Medium discharge group load ranges from 30 ton to 60 Tons.

- ✦ Use rough average of 20 tons

- ✦ Use weighted average between

- Grocery (50%) / Supermarket (50%),

- 3 MT / 2 LT groups in supermarket

- 2 MT / 1 LT groups in a grocery store

- Should there be a combined FHP / Suction Control Offering

- ✦ With a lower cost to implement together

- ✦ And could we support a lower cost

Building Type

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code	description
Asm	Assembly
Gro	Grocery
RFF	Restaurant - Fast-Food
RSD	Restaurant - Sit-Down
Rt3	Retail - Multistory Large
RtL	Retail - Single-Story Large
RtS	Retail - Small

- Claims existed also for:

- 1.01 – ASH Controls (SDG&E)
 - 30 of 21,570
- 1.03 – Evap Fan Motors (PG&E)
 - 594 of 2,632
 - Commercial, Lodging-Hotel, Storage-Unconditioned, Warehouse-Refrigerated
- 1.04 – Auto Door Closer (PG&E, SCE)
 - 366 of 1,760 (300 are PG&E/COM)
 - SUN, AGOTH, COM, Nrs, WRf, OfL, OfS, s_FSt, s_Mic
- 1.05 – Walk-in Cooler Evap Fan Control (PG&E)
 - 214 of 619
 - Commercial, Warehouse-Refrigerated
- 1.08 – Bare Refrigeration Lines (SDG&E)
 - 197 of 1,028
 - ESE, HTL, MLI, Nrs, OfL, OfS
- 1.22 – Commercial Refrigerators

- Question:

- Use Commercial Refrigeration standard set of building types for most Measure (all except blue)
 - Use an expanded set for blue measures (list = tbd).
- Use COM for all Commercial Refrigeration Measures that are not building type specific
 - COM intent is: “weighted average of all commercial building types” – *Verify statement is accurate.*
 - Not currently aware of any Com Refrig Measures that vary by Building Type.

1.22 Comm Reach-In Refrig and Freezer

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- Should Coincident Demand Factor (CDF) be part of this demand calculation?
 - Demand values is calculated as an average demand over a 24-hour period.
 - “A multiplier of 0.9 is used to conservatively estimate the peak demand reduction during the DEER peak period for the particular climate zone.”

Next

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- More cost data to review
- Adaptive Controls versus Evaporator Controls

Back-up

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