



## A Case Study of the CO<sub>2</sub> Systems in Whole Foods Market Northern California Region

Tristam Coffin, LEED AP

Sustainable Facilities Coordinator, Whole Foods Market

Tom Wolgamot, PE, LEED AP BD+C, CPMP

Principal, DC Engineering



# Agenda

- Whole Foods Market (WFM) & Natural Refrigerants
- Systems Employed
- Performance Comparisons
- Lessons Learned
- Future Development

# WFM & Natural Refrigerants

- Refrigerant Reduction (GreenChill Partner with 3 Platinum Certifications)
- Low Energy Consumption (TEWI)
- Stable System Operation
- Reviewing all options available
- Different climate zones may call for different solutions

# System Details

| Store | Sq. Feet | MBH | System Type  |
|-------|----------|-----|--|
| FRE   | 39,026   | 847 | Distributed 407A scroll units, hybrid condensers   |
| OCN   | 26,632   | 735 | Glycol and 407A DX, closed loop heat pump fluid cooler system  |
| CAS   | 33,030   | 707 | Low-Temp DX CO <sub>2</sub> /Medium temp liquid overfeed CO <sub>2</sub> , cascaded to 407A, closed loop heat pump fluid cooler system |
| GIL   | 47,805   | 650 | CO <sub>2</sub> Transcritical  |
| ALM   | 34,236   | 752 | CO <sub>2</sub> Transcritical  |
| DUN   | 40,072   | 605 | Low-Temp DX CO <sub>2</sub> /Medium temp liquid overfeed CO <sub>2</sub> , cascaded to R717 (NH <sub>3</sub> ) system                  |

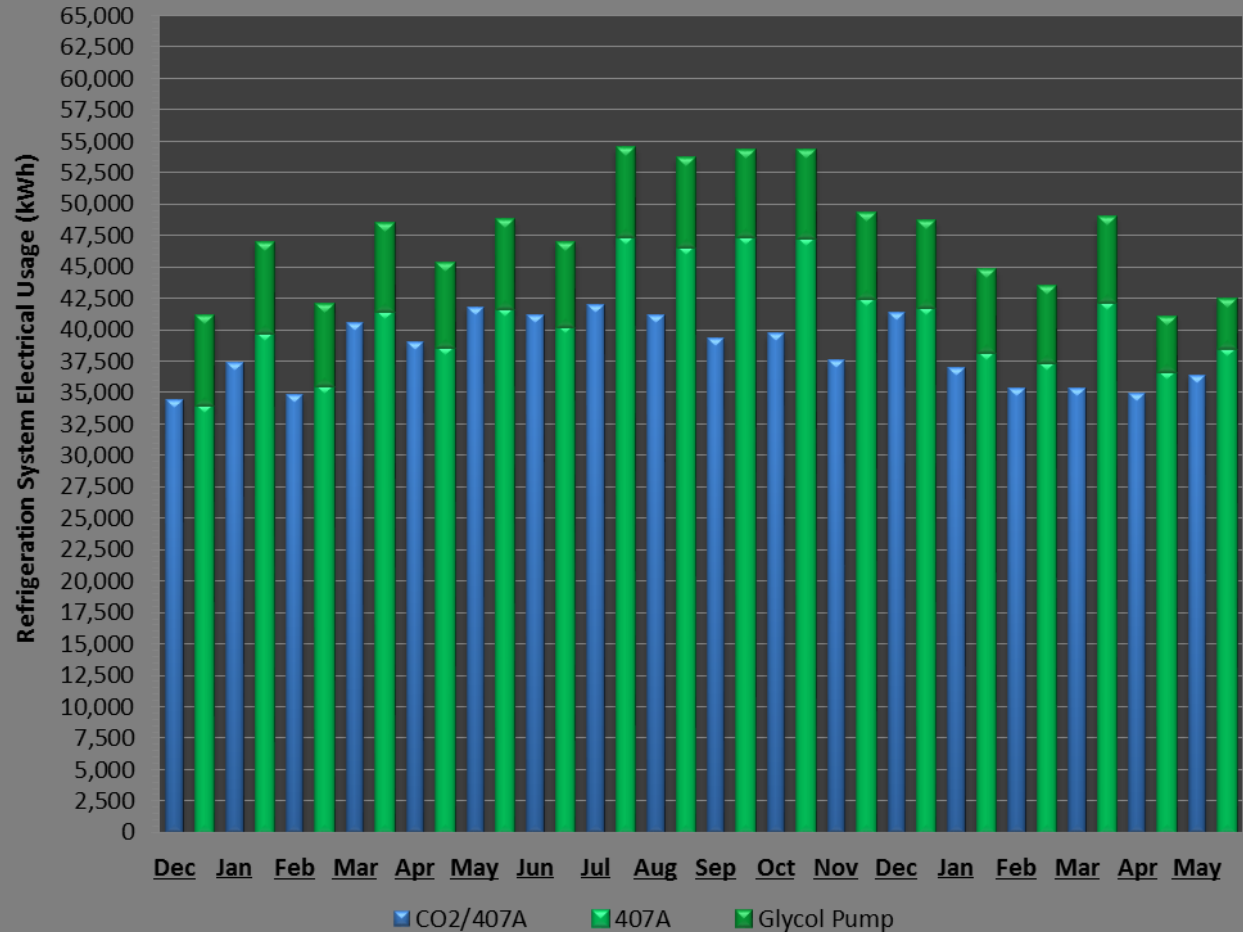
# System Cost

| Store | Type   | System Cost | Install Cost | Total | Percent Increase |
|-------|--|-------------|--------------|-------|------------------|
| FRE   | Baseline DX                                  | 1           | 1            | 2     | 0%               |
| CAS   | LT DX CO2, MT Liquid CO2, Cascade to HFC     | 1.10        | 1.11         | 2.21  | 10%              |
| OCN   | LT DX HFC, Glycol MT                         | 1.55        | 1.22         | 2.77  | 39%              |
| GIL   | Transcritical CO2                            | 1.22        | 2.01         | 3.23  | 61%              |
| DUN   | LT DX CO2, MT Liquid CO2, Cascade to Ammonia | 2.45        | 1.58         | 4.03  | 101%             |

# Refrigeration Energy Use

Update of 2014 ATMO presentation

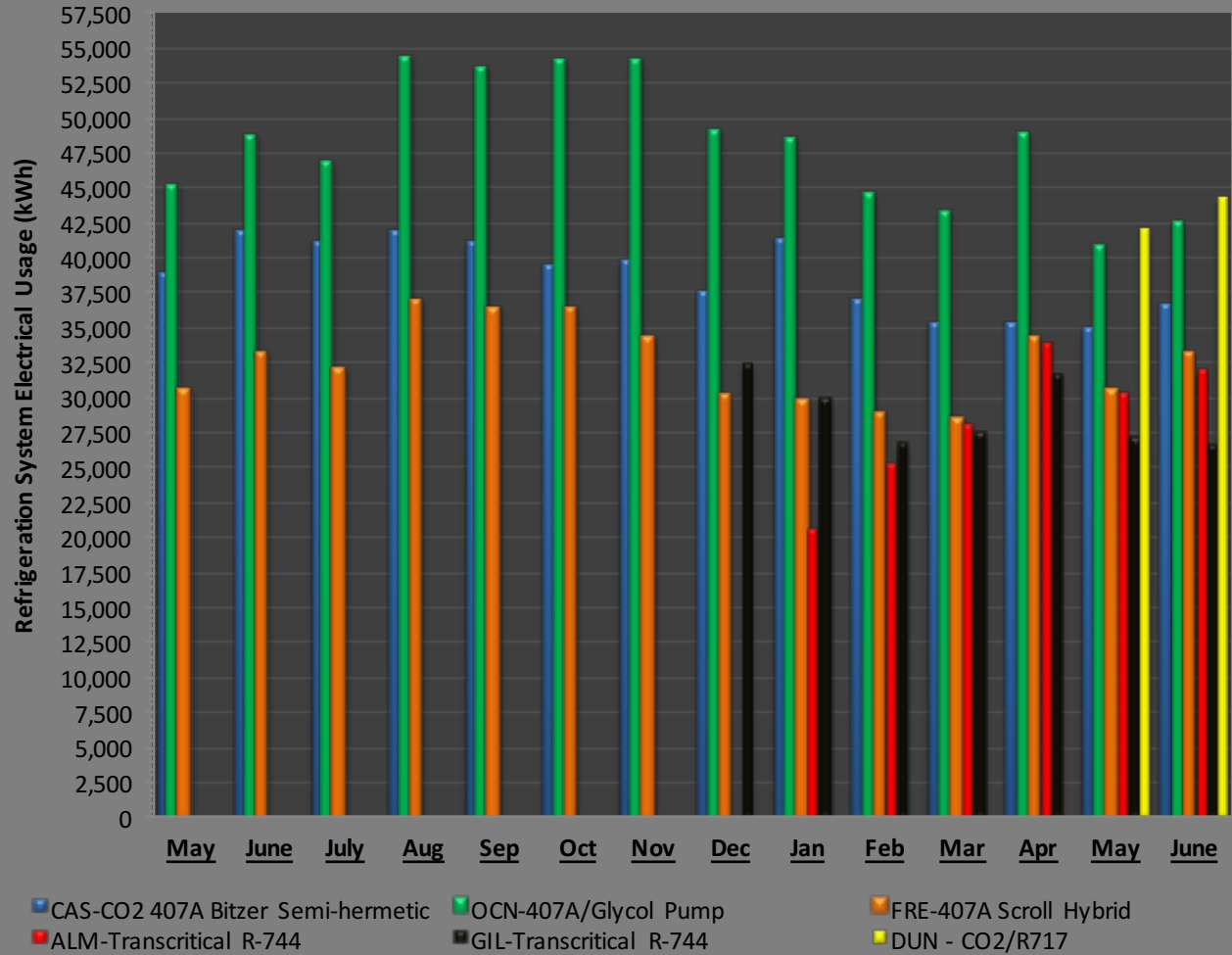
**Whole Foods Market**  
**Refrigeration Electrical Usage Comparison: CAS vs. OCN**



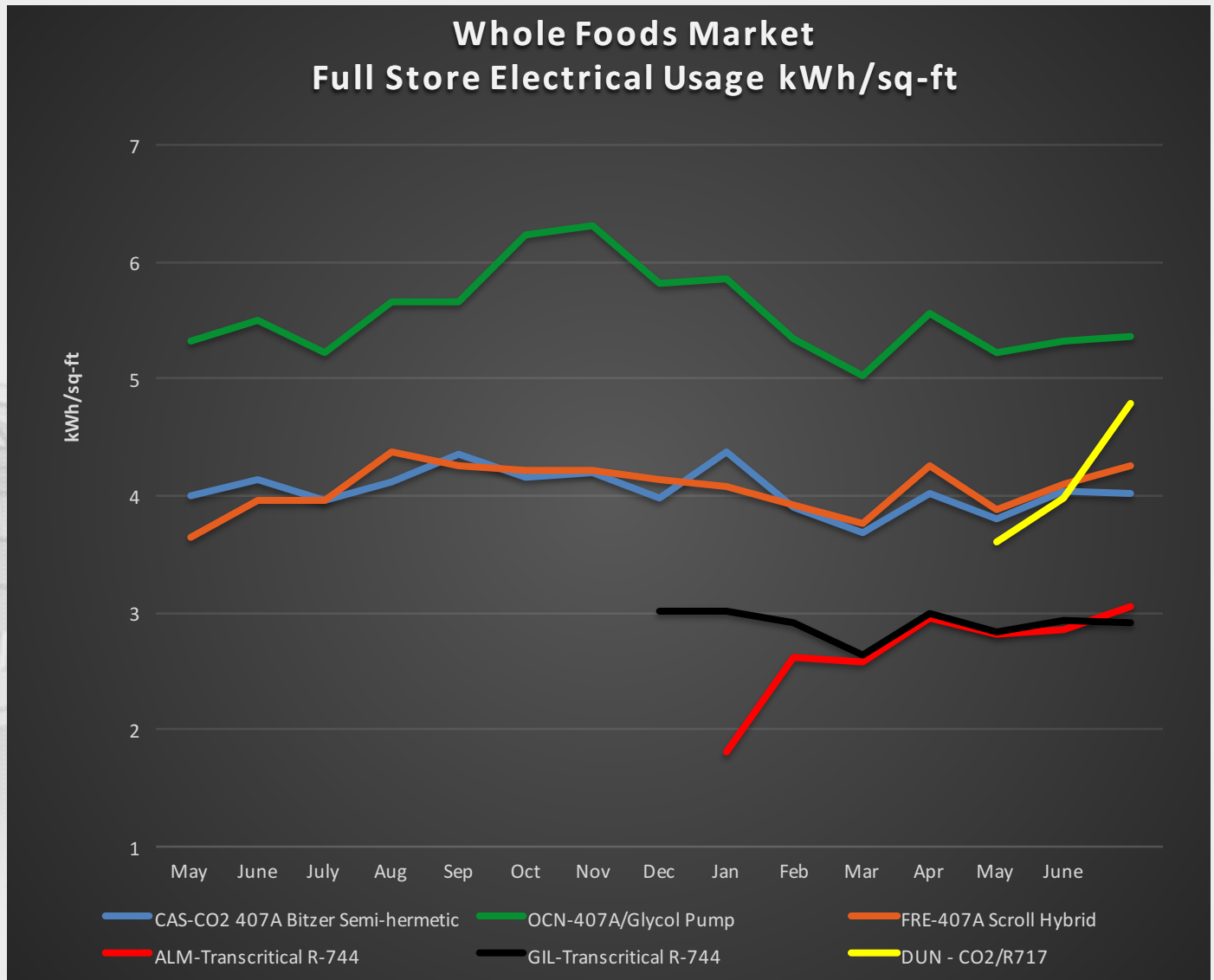
December

# Refrigeration Energy Use

**Whole Foods Market**  
**Refrigeration System's Electrical Usage Comparison**

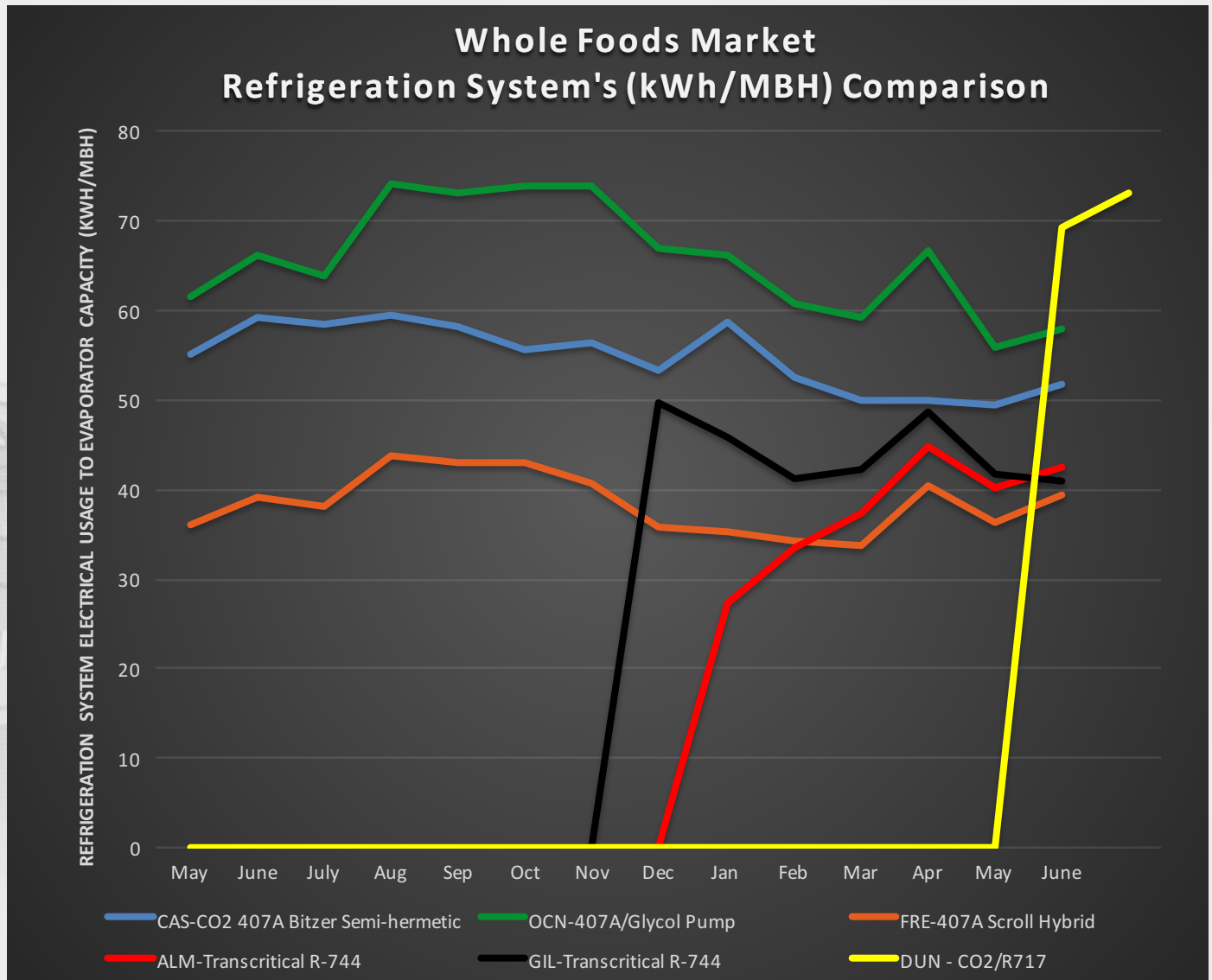


# Whole Store Energy Use





# Refrigeration Energy Use



# Lessons Learned

- Controls collaboration and commissioning are key
- CxA, EOR, and OEMs must work together
- High grade CO<sub>2</sub> not immediately available (stocking on-site, bottle disposition)
- Training of Service Technicians
- Safety – procedures, contractors, store personnel
- Equipment changes required for commercial applications versus industrial use need to be reviewed
- Anticipated energy penalty does not apply
- Overall experience has been positive

# Lessons Learned





# Lessons Learned



# Future Development

- Natural Refrigerant solutions will continue to be explored
  - Transcritical CO<sub>2</sub>
  - Subcritical / Cascade CO<sub>2</sub>, whether cascaded to NH<sub>3</sub> or small HFC system
  - Hydrocarbons

**Overall carbon footprint is important**



## A Case Study of the CO<sub>2</sub> System at Whole Foods Market, Castro

Tristam Coffin, LEED AP

Sustainable Facilities Coordinator, Whole Foods Market

[Tristam.Coffin@wholefoods.com](mailto:Tristam.Coffin@wholefoods.com)

Tom Wolgamot, PE, LEED AP, CPMP

Principal, DC Engineering

(406) 829-8828 x201

[twolgamot@dcengineering.net](mailto:twolgamot@dcengineering.net)

