

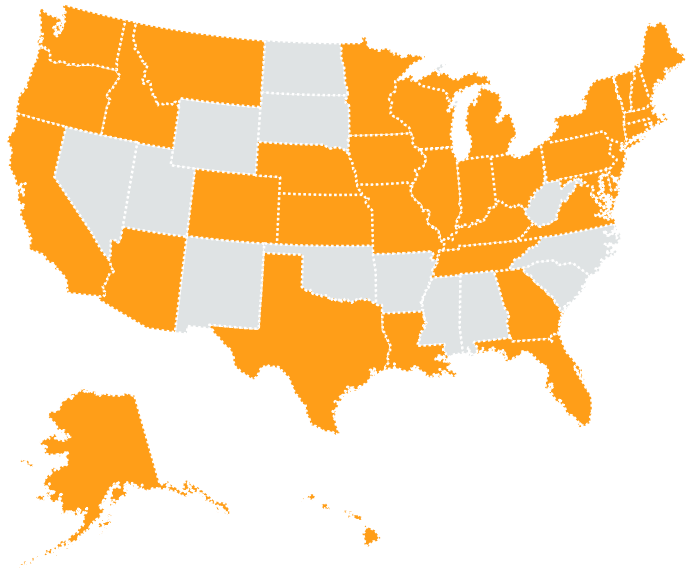


VEIC Training Series

**Refrigeration: Programs that  
Deliver Environmental,  
Economic and Health Benefits**

**May 15, 2020**

# About VEIC



**We're on a mission to generate the energy solutions the world needs.**

VEIC works with organizations across the energy landscape to create immediate and lasting change. Since 1986, we've served as an objective partner for our clients as they navigate complex energy challenges. With expertise in energy efficiency, building and transportation electrification, and new approaches for a clean and flexible grid, we bring new solutions to the market that meet goals and make change.



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**Together with our clients,  
we've been delivering  
customized trainings to  
the market to build  
expertise and drive value  
with end-use customers.**



# Our experts



**Ethan Bellavance**

Senior Energy Consultant, Engineer



**Ali White**

Energy Consultant, Engineer



**Nicole Duquette**

Energy Consultant, Engineer

## What we'll cover

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## Why Refrigeration?

What are the Benefits?

## Energy Efficiency Measures

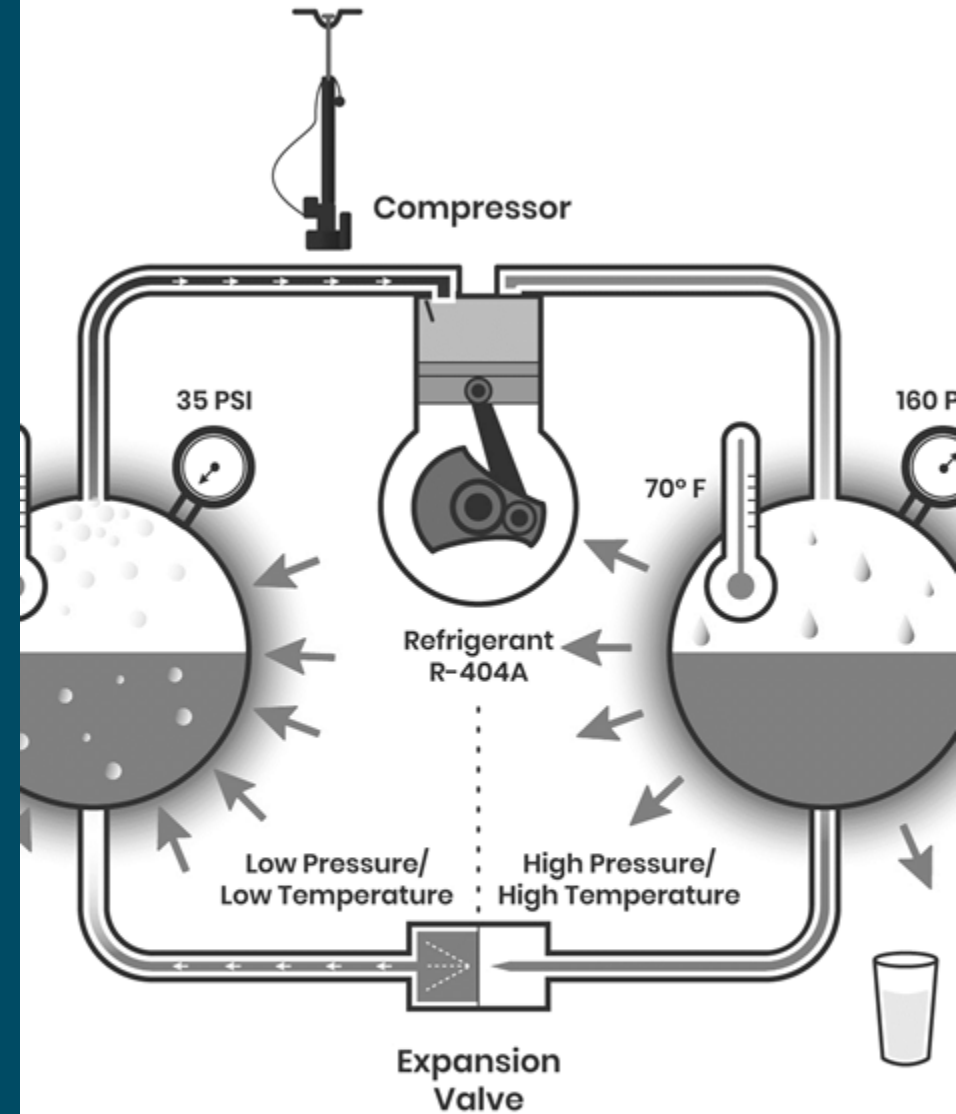
How do you build resiliency?

## Equipment Maintenance

How do you deliver continued environmental, economic and health benefits?

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# Intro to Refrigeration





# What are refrigerants?



# Refrigerants are responsible for the miracles of modern life





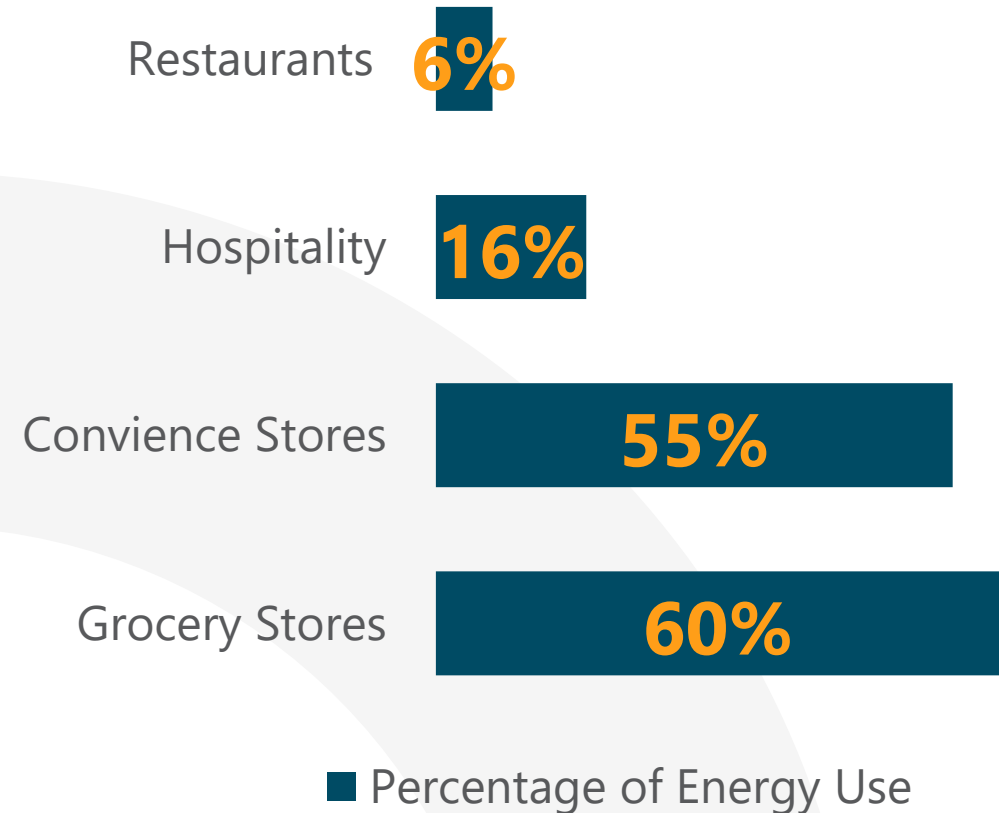
# Where refrigerants are found: commercial



# Where refrigerants are found: residential



# Refrigeration accounts for 17% of energy consumption worldwide

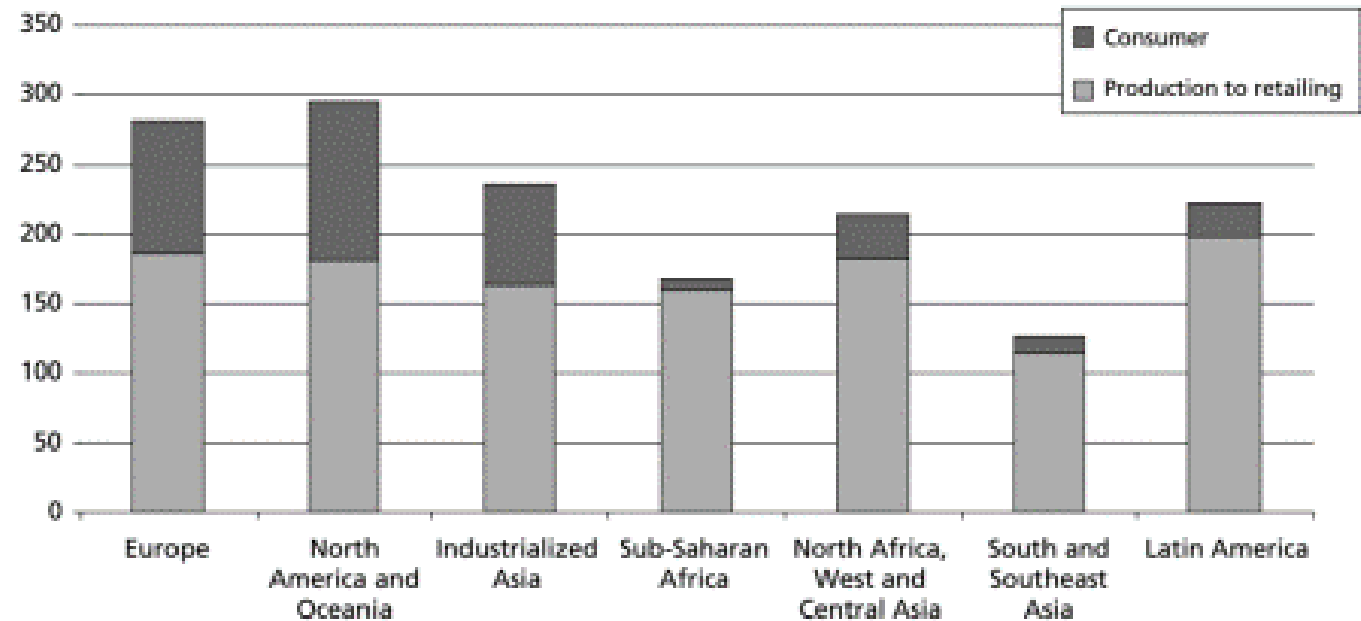




# Why do we focus on refrigeration?

- Address top climate change issues
  - High-GWP refrigerants
  - Food waste
- Impact
  - Significant energy and non-energy CO<sub>2</sub>e savings
  - VEIC's true north

## Per Capita Food Losses And Waste



Kg/year (Gustavsson et. al., 2011)

# Why should you focus on refrigeration?

- Large energy savings
- Low incremental costs
- High measure volume
- Untapped market
- Climate change
- **Resiliency**



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# Why should your customers focus on refrigeration?



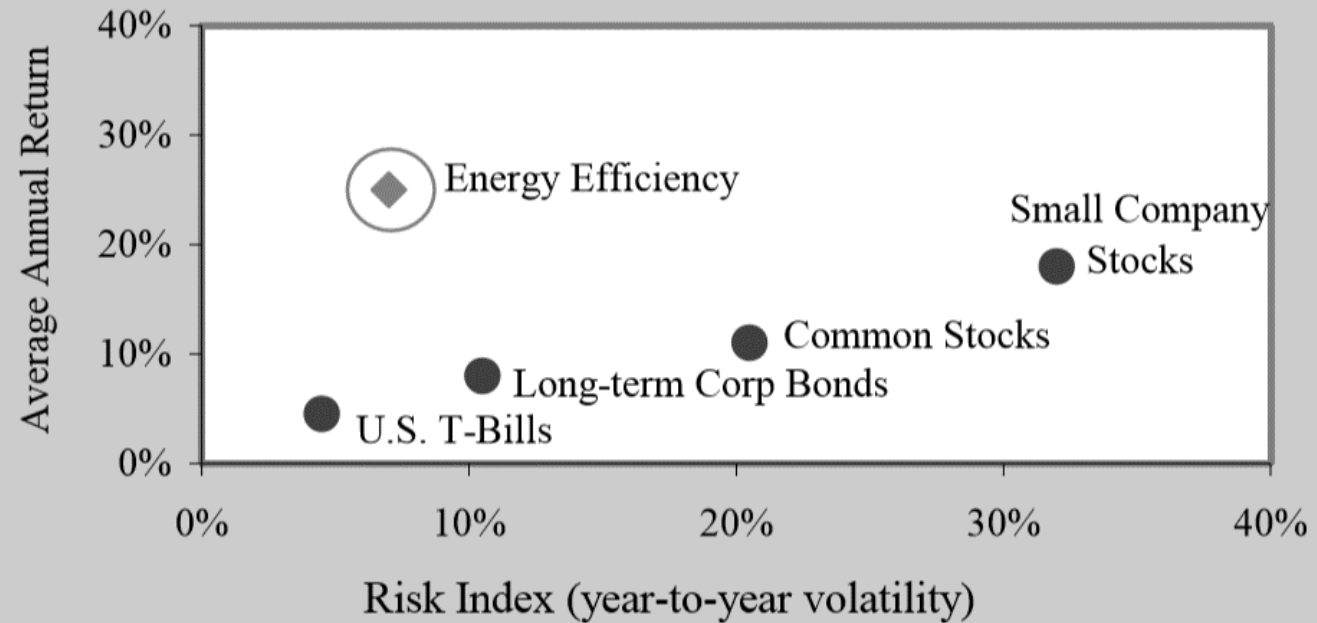


**Refrigeration is cheap  
compared to the  
product it is storing**



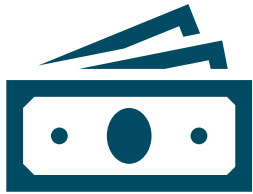
**Good place for  
businesses to put their  
money  
(if done  
appropriately)**

### Efficiency Investment Risks and Returns



Source: ACEEE estimates for energy efficiency; other estimates adapted from the Vanguard Group.

# Customer benefits: new refrigeration equipment



## Reduce Energy Costs

Buying new efficient refrigeration equipment can pay for itself with energy savings.



## Increase Reliability

New equipment can be both more efficient and reliable.

Reduction in food waste, greater margins.



## Short Pay-Back

Typically ~1 year payback when looking at incremental cost and utility incentives.



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# Energy Efficiency Measures



# Market & Opportunities

- All customers with commercial refrigeration equipment
- Customer and contractor engagement
- Focus on technologies
- Retrofit or new equipment
- Energy savings, peak reduction, cost savings



# Refrigeration Measures

## Rx / Midstream Measures

- Evaporator Fan Motors / Controls
- HECUs
- HEEvaps
- Anti-sweat Heater (ASH) Controls
- LED Case Lights / Controls
- Night Covers
- Zero Energy Doors
- Refrigeration Add Doors
- Self-Contained Equipment
- CoolBots
- Refrigerant Leak Detection/Repair

## Custom Measures

- Condenser Fan Motors / Controls
- Floating Head Pressure Controls
- Floating Suction Pressure Controls
- Outdoor Air Economizers
- Insulation or Air Sealing (walk-ins)
- Efficient Compressors
- Compressor Heat Recovery
- Refrigerant Leak Detection/Repair
- Consolidate/Downsize Equipment
- Intelligent Freezer Defrost Controls
- Microchannel/Oversized Condenser

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# Markets & Technologies





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# Walk-Ins



# Walk-ins: Equipment

## RACKS



## CONDENSING UNITS



## EVAPORATORS





# Walk-ins: Efficiency Measures

- Condensing Units
  - HECUs
    - Scroll compressor
    - EC condenser fan motors
    - Floating head pressure controls
  - Benefits
    - Maintenance savings
    - Equipment reliability
- Evaporators (retrofit)
  - EC evaporator fan motors
  - Benefits
    - Temperature Stability
    - Quick payback



# Walk-ins: Efficiency Measures cont.

- Evaporators (new equipment)
  - HEEVaps
    - EC fan motors & controls
    - Smart defrost
  - Benefits
    - Product quality
    - Reduced maintenance/install costs
    - Quick payback
- Racks
  - Floating head/suction pressure controls
  - Compressor VFDs
  - Benefits
    - Low cost
    - Load matching





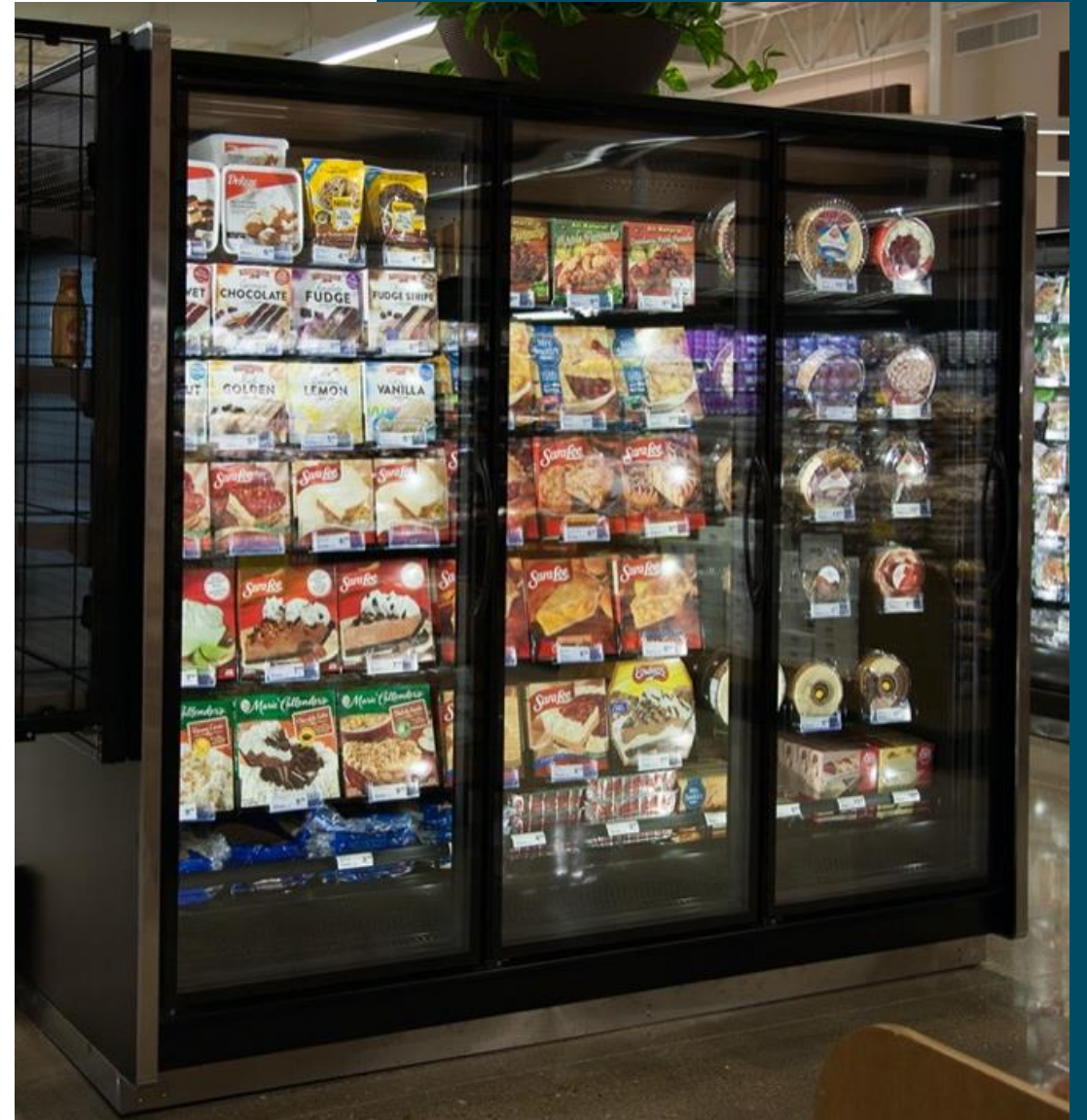
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# Remote Reach-in Cases



# Remote Reach-in Cases: Equipment

- Reach-in cases
  - Evaporator fan motors
  - Evaporator coils
  - Lights
  - Doors (closed cases)
  - Door/frame heaters (closed cases)
- New DOE-compliant or Energy Star cases
- Retrofit existing cases



# Remote Reach-in Cases: Efficiency Measures

- Anti-sweat Heater Controls
  - Cycles controls on-demand
  - Reduced heat gain to case
  - Involve refrigeration contractor for savings persistence
- LED Case Lights
  - Improved light and product quality
  - Reduced heat gain to case
  - Opportunity for controls





# Remote Reach-in Cases: Efficiency Measures cont.

- Night covers okay, **adding doors** much better
  - Increased case efficiency by 70%
  - Increased customer comfort
  - Better light and product quality
  - **Resiliency**
  - More stable case temperatures
  - Involve refrigeration contractor!!!



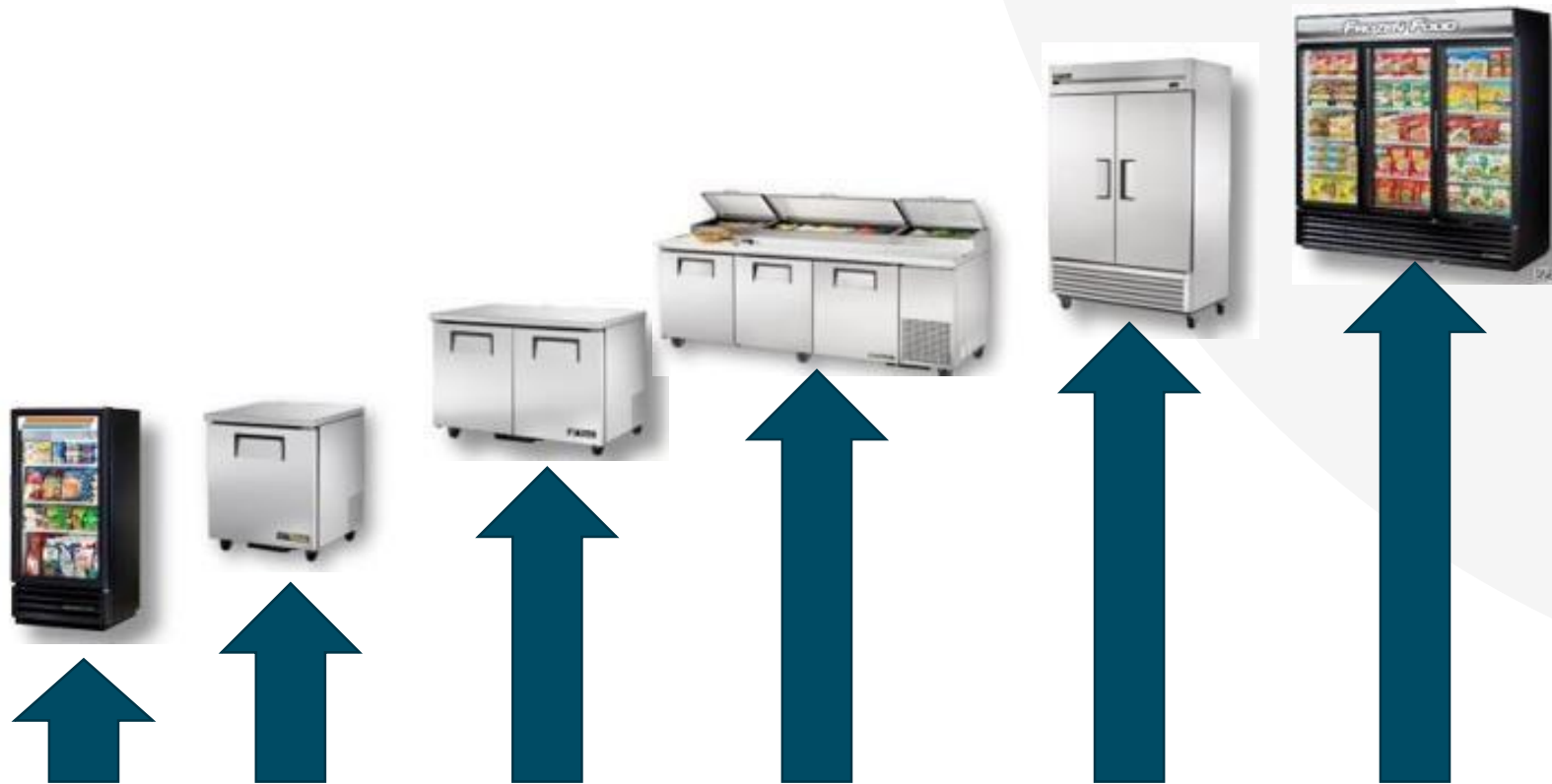


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# Self-contained merchandisers



# Self-Contained Merchandisers



**OVER 85% OF PRODUCT SOLD AVAILABLE IN HYDROCARBON  
(R290)**

# Self-Contained: Efficiency Measures

- Owned vs rented merchandisers
  - Same measures, slightly different approach
  - Many vendors spec high-efficiency units
- Natural Refrigerant Technologies
- Claiming Energy Savings
  - EnergySTAR
  - DOE vs Energy Code





# Self-Contained: Key Benefits

- Energy savings can justify retrofit
  - 30-50%
- Refrigerant Management/Proper Disposal
- New equipment or retrofit
  - Great for expansion/remodels
- Placement Flexibility
- Great opportunity for general stores and convenience stores
- Reduced Waste Heat

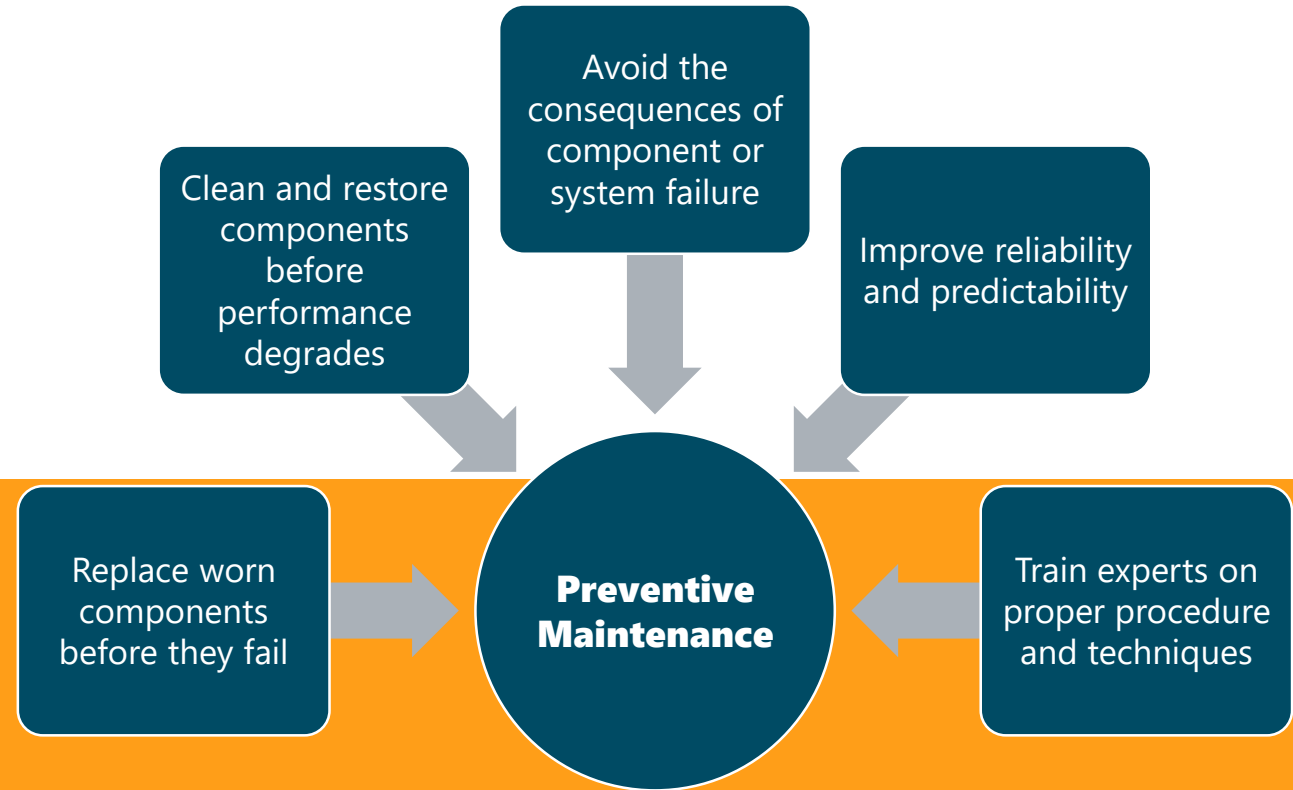


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# Preventative Maintenance Measures



# Why preventative maintenance?



- Energy Savings
  - Although historically difficult to claim
- Gain contractor trust by understanding importance of and advocating for PM
- Customers often don't see value
- Allows for planned equipment upgrades, rather than emergencies



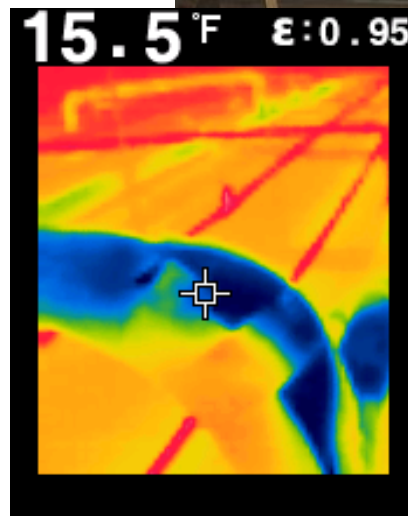
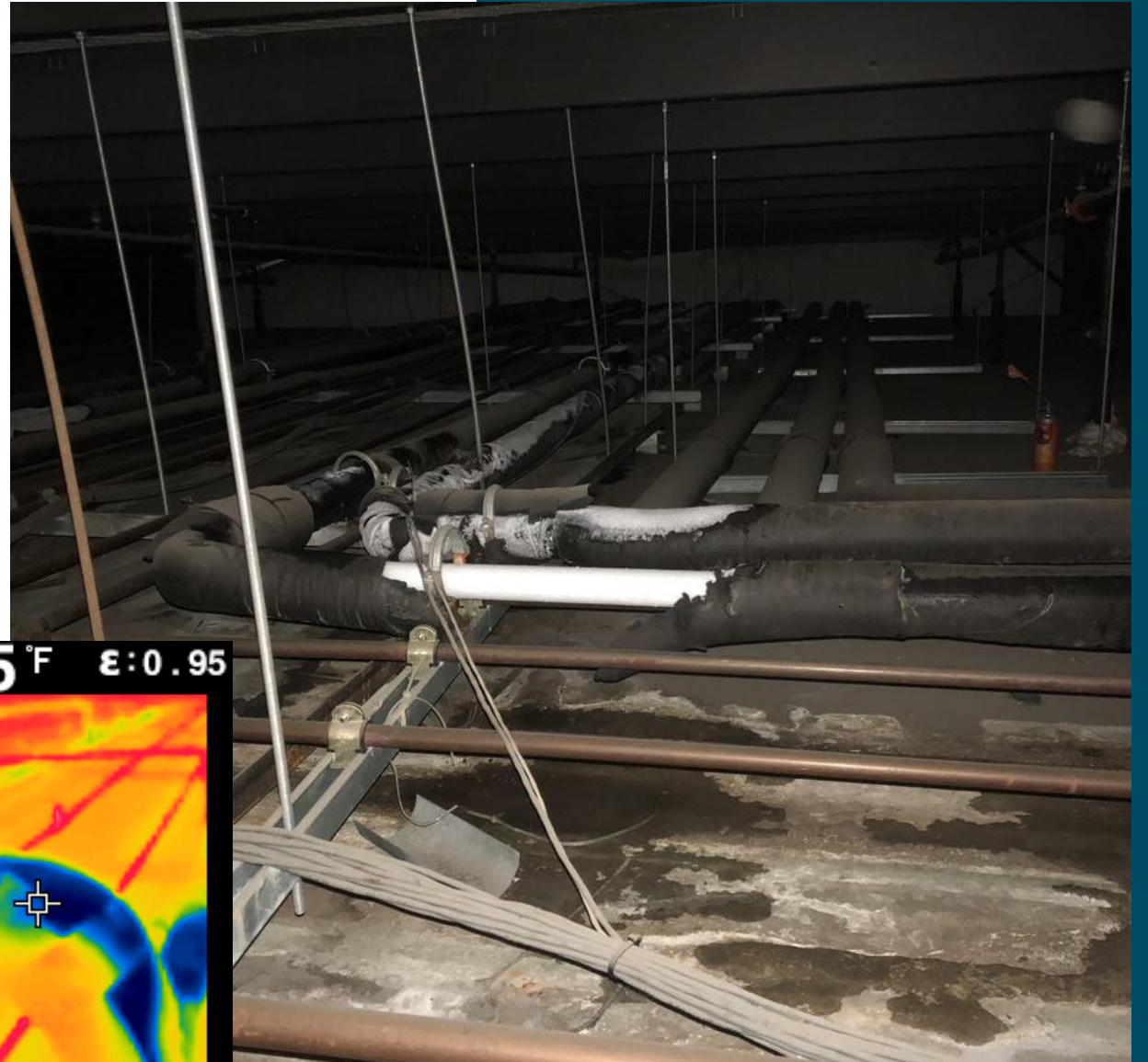
# What is preventative maintenance?

- Door seals
  - Filters
  - Gaskets
  - Air sealing
  - Insulate suction lines
  - Strip curtains
  - Auto door closers
  - Refrigerant Leak Repair
- ...not an exhaustive list!



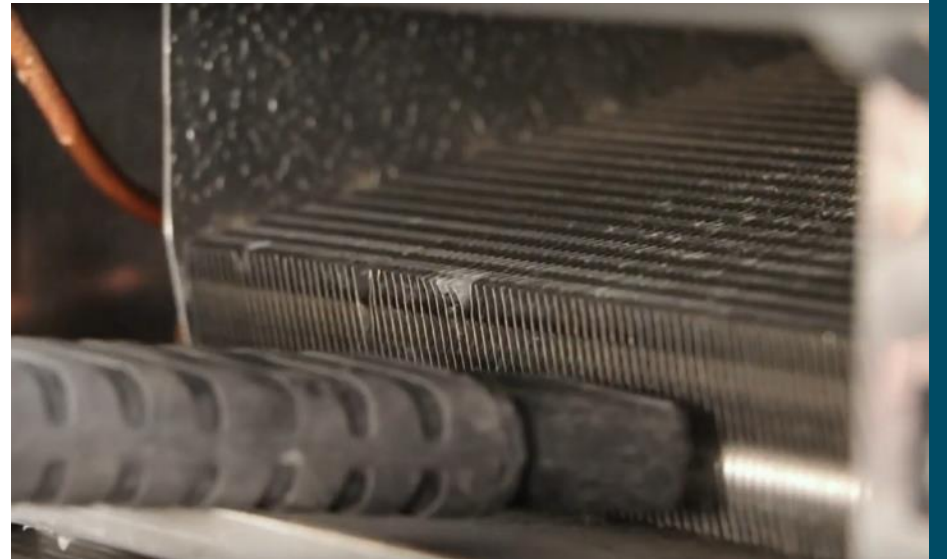
# Insulate suction lines

- Low side/"inside" piping
- Condensate control
  - Safety issues
  - Product quality issues
  - Significant energy savings



# Coiling Cleaning

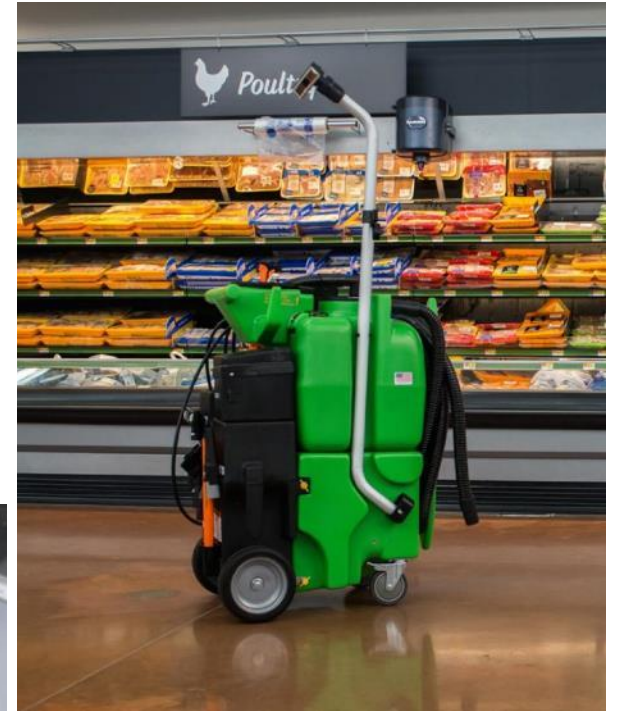
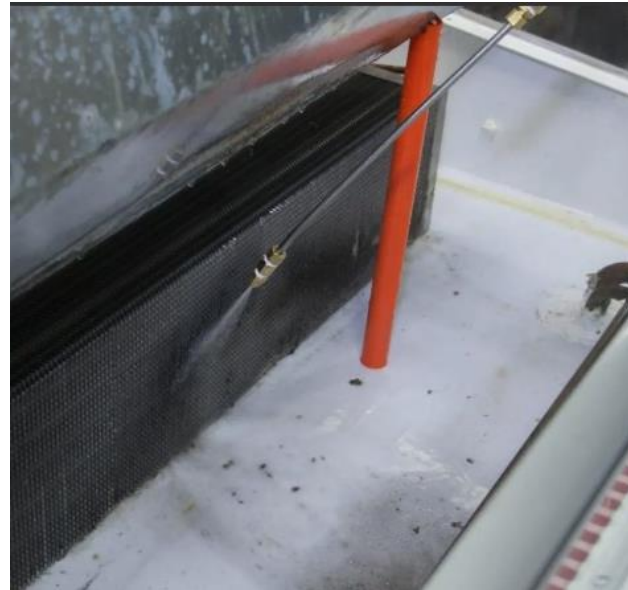
- “Biggest thing you can do for energy efficiency” – Kurt Matzke
- Scale/Dirt on coils reduces heat transfer significantly
  - 1/10” scale = 30% efficiency reduction
- Coils inside store
  - Case evaporators
  - Self-contained
- Coils outside store
  - Condensers/Condensing Units



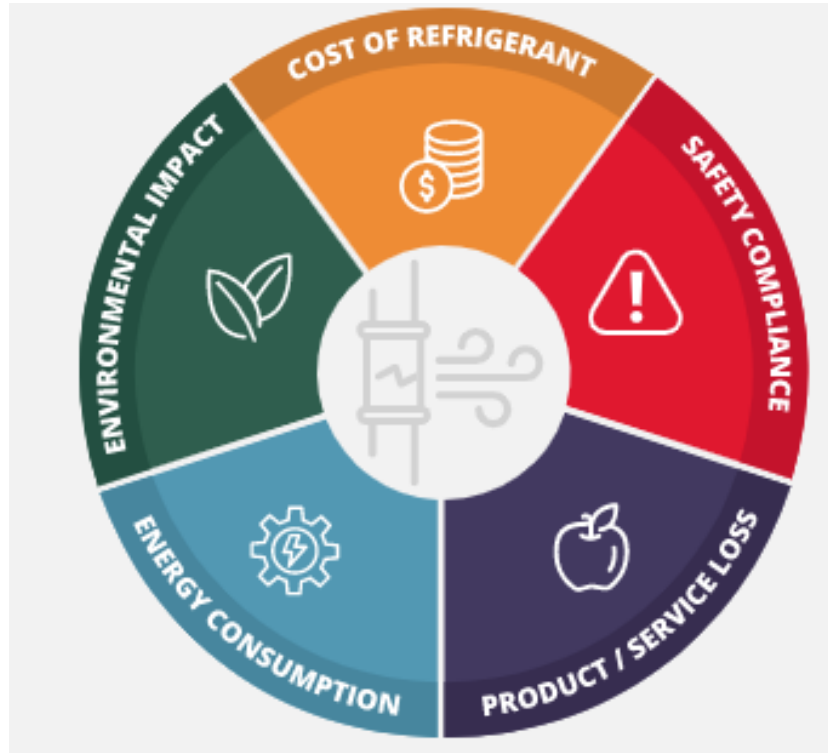


# Coiling Cleaning

- Often done by store staff
  - Need to empty cases
- Equipment makes it faster/easier
  - Kaivac Case Cleaner
  - Pressure washer/wet vac
- Benefits
  - Reduced service calls
  - Food safety and quality
  - Case longevity
  - Resiliency

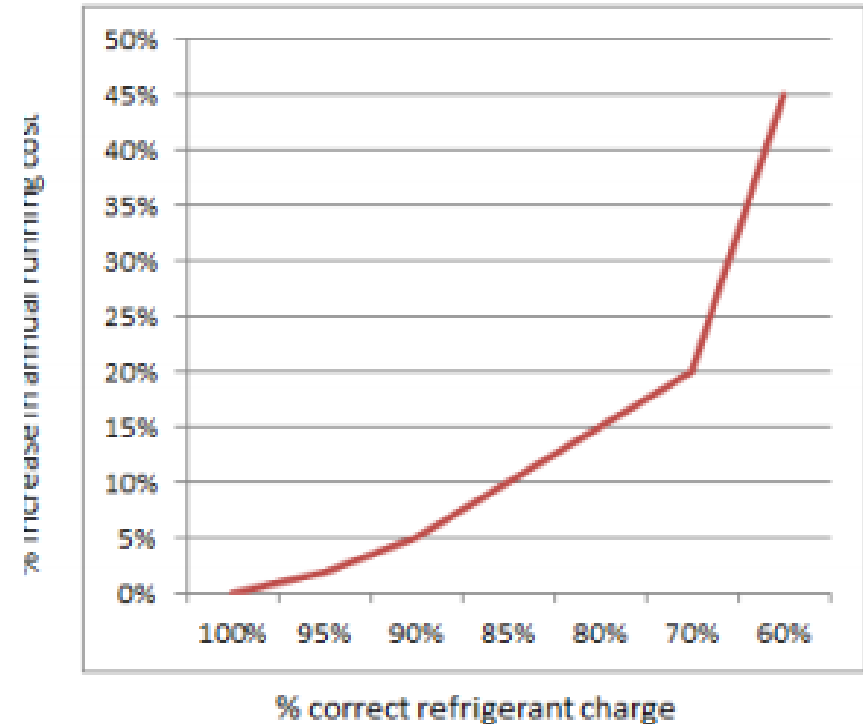


# Refrigerant Leak Detection and Repair



# Energy Efficiency Impact of Leaks

- Varies by system type/configuration, but low refrigerant charge can result in:
  - Increased compressor and condenser duty cycle
  - More annual run hours = more kWh used
  - Some studies estimate 1:1 correlation



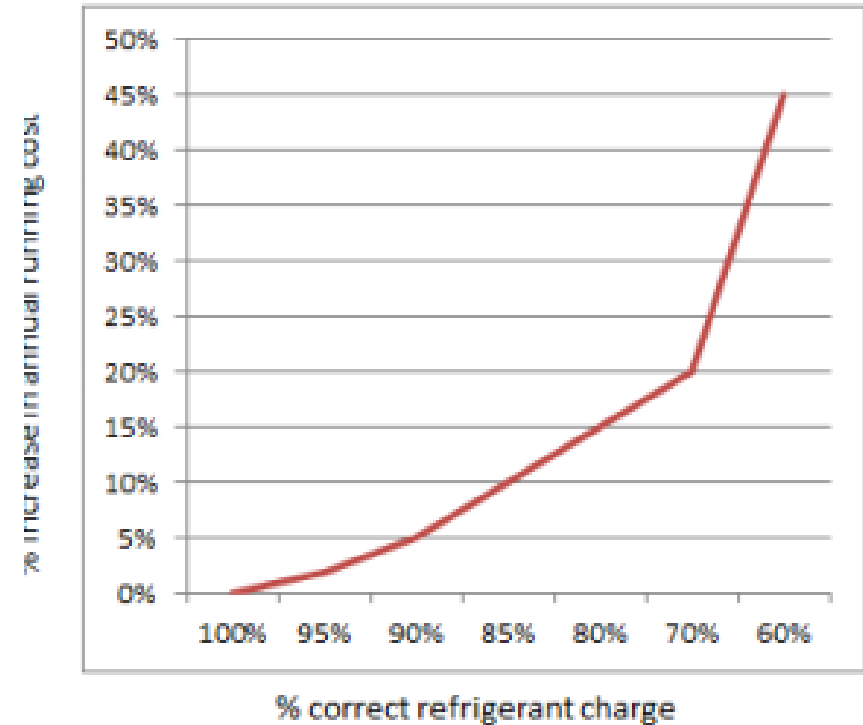
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# Energy Efficiency Impact of Leaks

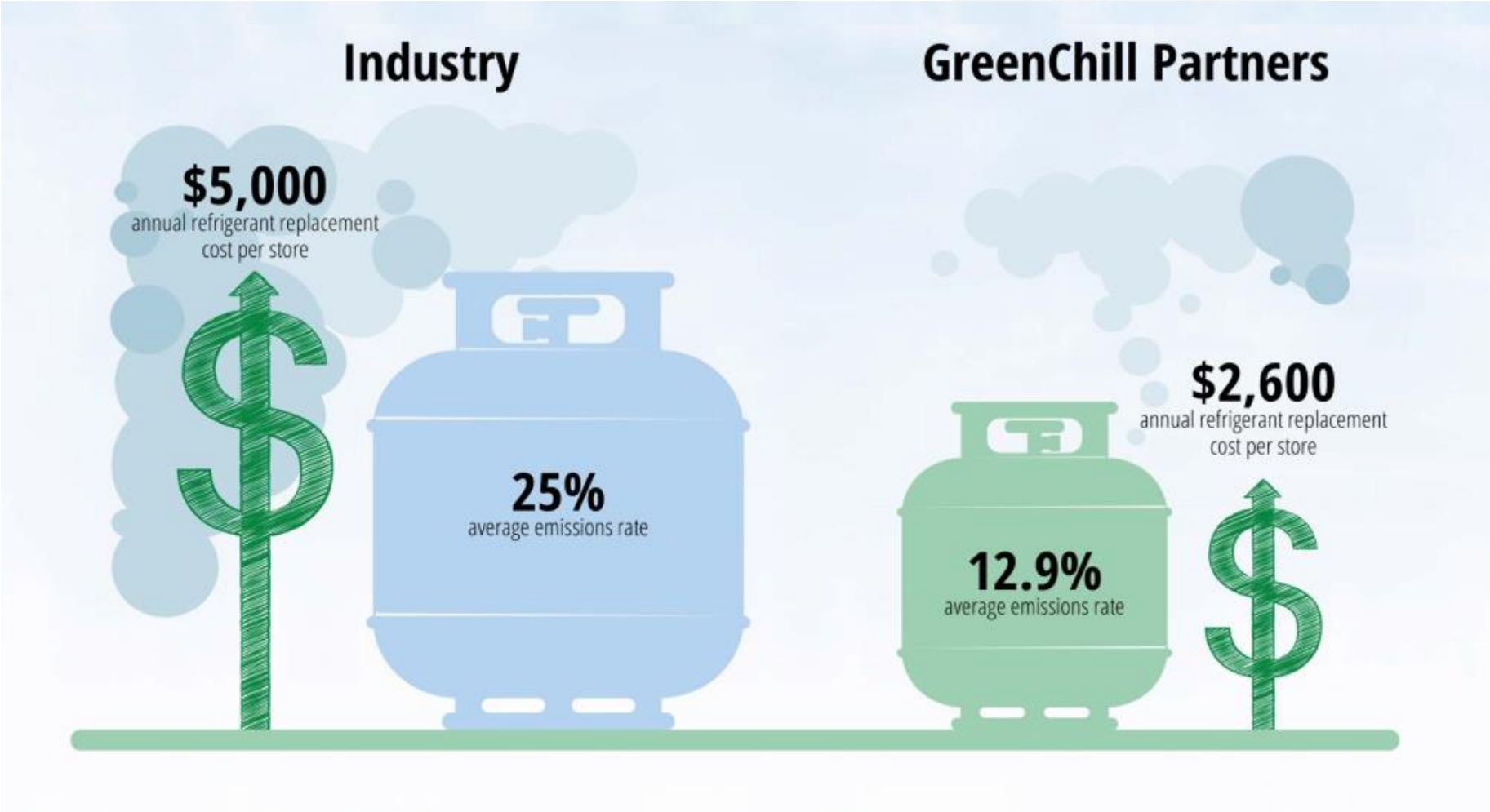
For smaller systems, we have estimated:

- 5 HP Condensing Unit = \$250/year in savings
- SMB customer with (4) condensing units ranging from 3-5 HP = \$800/year in energy savings
- Relatively small, but small cost (\$500-\$3,000/project)



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# Refrigerant Cost



# Equipment reliability

Low refrigerant charges can lead to:

- Compressor short cycling
- More frequent service calls
- Equipment failures

Which leads to...

- Product quality concerns
- Unexpected expenses
- Decreased system/customer resiliency





# Customer Benefits of Leak Repair

O&M Cost Reduction

Energy Savings

Compliance

Marketing

- EPA GreenChill Program
- Utility Programs

Equipment reliability

Product quality

Environmental Stewardship



# Summary

- Refrigeration systems are serving a critical need and they are still using significantly more energy than is necessary to do so!
- Technical assistance and utility efficiency program funding are more important than ever
- Traditional efficiency projects are still possible
  - Start with low-risk measures
  - Work up to more complex systems
- Preventative maintenance is essential to human, environmental, and economic health
- Refrigeration contractors are strongest allies



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# **Questions**





# More Free Trainings....



**May 15, 10 am EDT**

## **REFRIGERATION.**

Programs that deliver environmental, economic and health benefits.



**May 22, 10 am EDT**

## **RESIDENTIAL.**

Energy-smart spring cleaning



**May 29, 10 am EDT**

## **HVAC.**

Unlocking opportunities to maximize energy savings.



**Thank you!**



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**Vermont**



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