

Refrigeration and the Environment LD 226



The Environmental Issue From Refrigerants is a **Mechanical** Issue, Not a **Chemical** Issue

The Industry states: “We are pleased to share that the federal transition will shrink U.S. annual greenhouse gas emissions by around 2.4 billion metric tons (5 Trillion Lbs.) of carbon dioxide by 2036”.

What will the unforeseen consequences from needless mechanical leaks be for the next generation of chemicals, a hole in the ozone being the first consequence, an equivalent CO2 consequence being the 2nd?

Chemical Companies Have No Interest in Addressing the Real Problem “Refrigerant Leaks”, Because They Make Billions By Selling Refrigerants for Leaky Systems and will continue to do so after the passing of LD226 if the real problem “leaks” is not addressed

What other industry is allowed to leak millions of metric tons of super potent chemicals into our environment without consequences?

Heat Pump Leaks

One Heat Pump Flair nut leaking 3 pounds of Refrigerant is Equal to the Carbon Produced by Burning One 275 Gallon Tank of Oil

Big Chillers

Each produce as much cooling as Bangor produced in its peak ice producing days



Large Supermarket Compressor Room

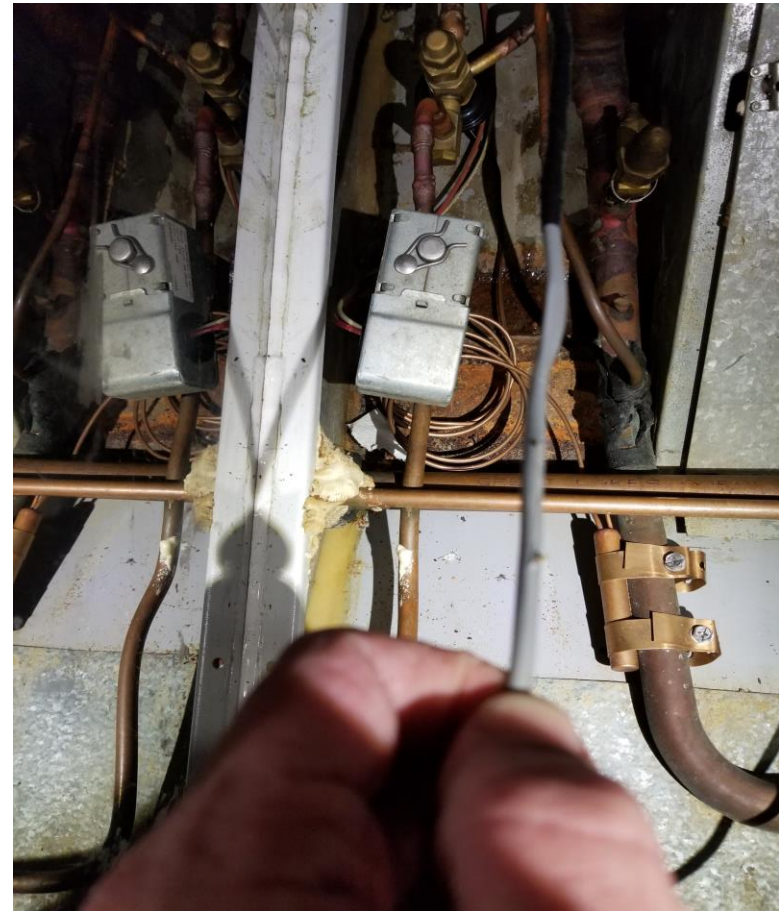


From the Back Room to the Sales Area

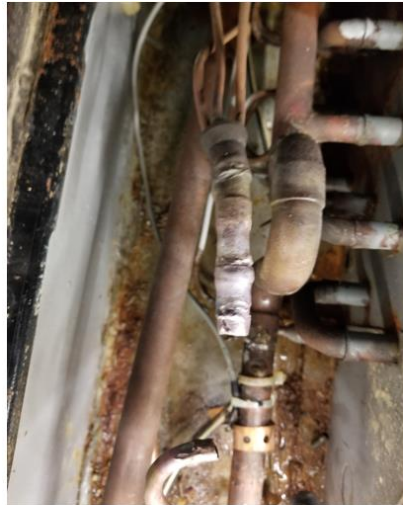
Thousands of feet of piping and fittings



Massive Opportunities for Leak in Every Case



New Chemicals Will Continue to Leak Until the Issue of Quality is Addressed



The 1st Generation of Refrigerants Leaked, the
2nd Generation Leaked and the 3rd Will Also



Refrigerant Leaks is a Reflection of Quality

Note: These are new cases from the factory

**No way to access service port
under blue valve Knob**



**Makeshift mounting and
twisting of pipes**



Medium Size Supermarket



Medium Size Supermarket

Compressors scattered all over the store, outside and on the roof



Small Supermarket

Notice bottom left picture with a host of obsolete refrigerants

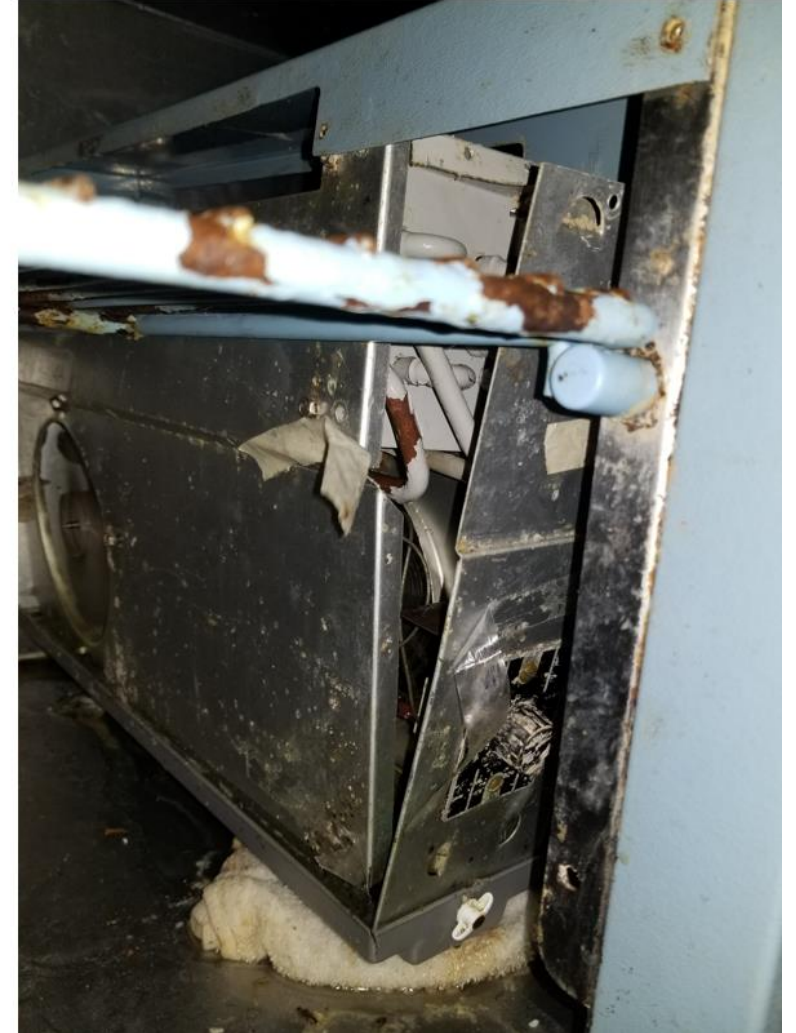
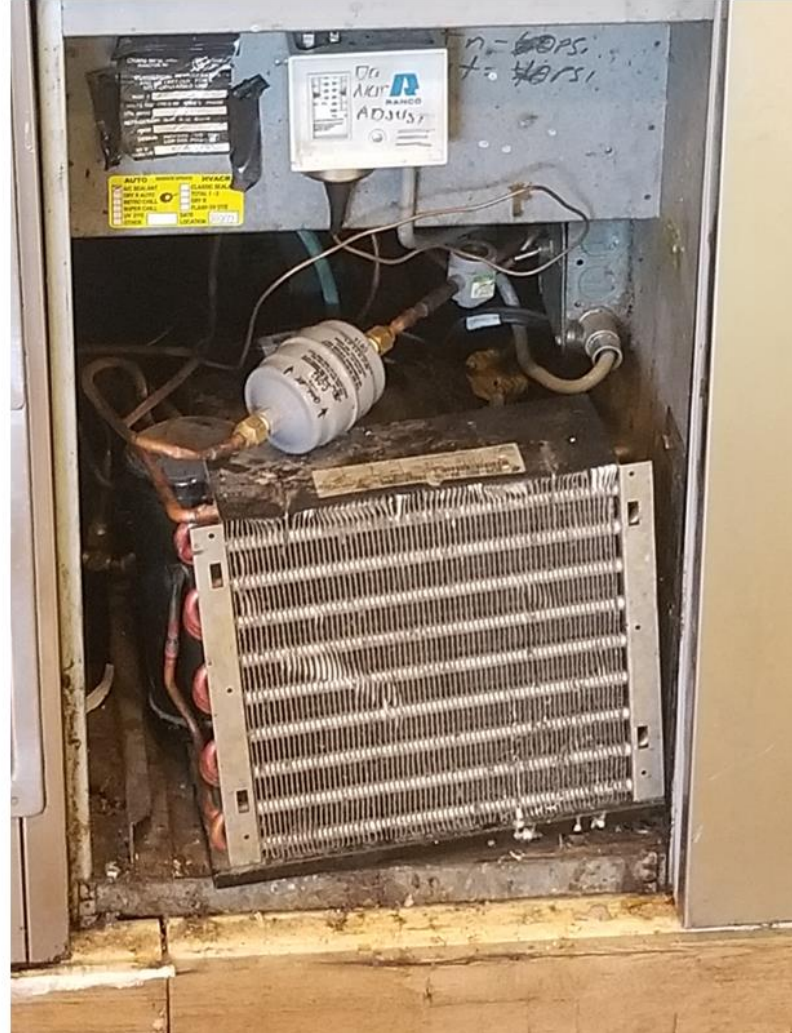


Small Supermarket

Two compressor rooms plus a host of small compressors throughout the store



Typical Unitary Refrigeration Equipment used in Stores and Restaurants



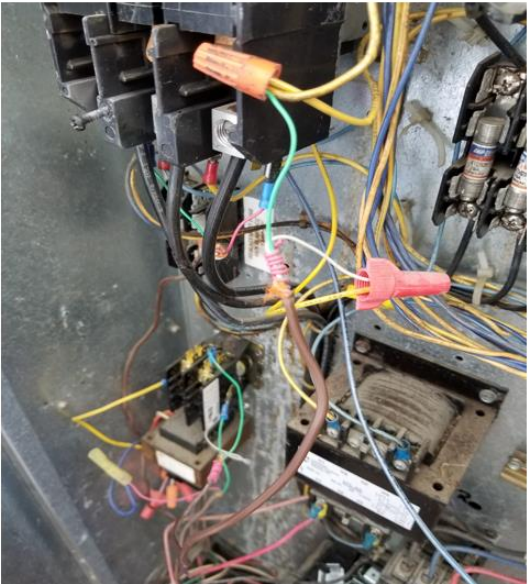
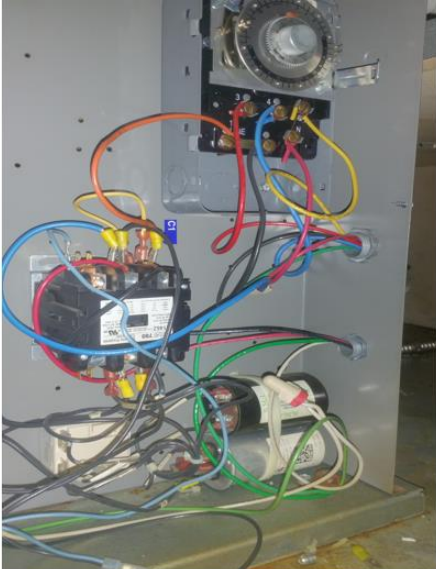
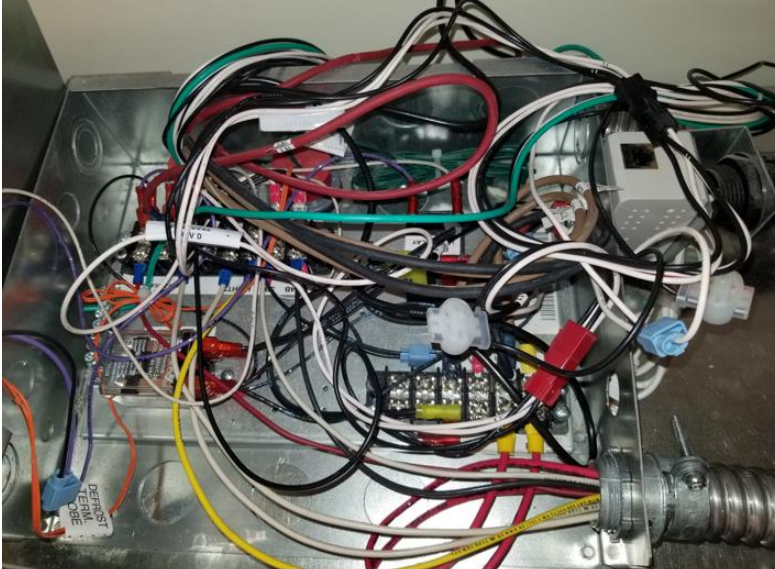
Quality and Serviceability Continues to be the Issue no Matter What the Chemical

Low price, low quality design,
engineering and serviceability
will continue to leak out the
next big chemical fix passed
by LD226.

The next generation of
chemicals have flammability
and other toxic issues, who's
going to take responsibility for
those leaks?

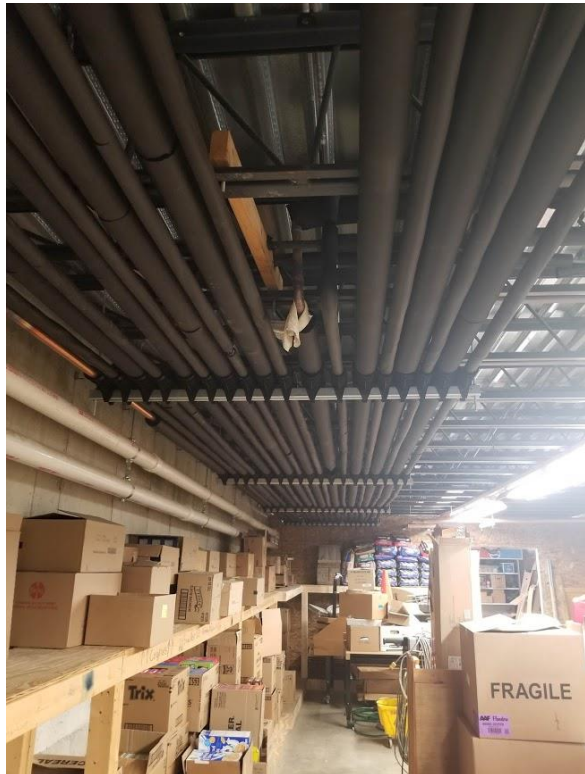


Wiring is also a reflection of the state of the industry



Installation Cost and Future Service Cost Correlate With Quantity of Material and Quality of Installation

**Massive Complex Piping System
Field Installed**



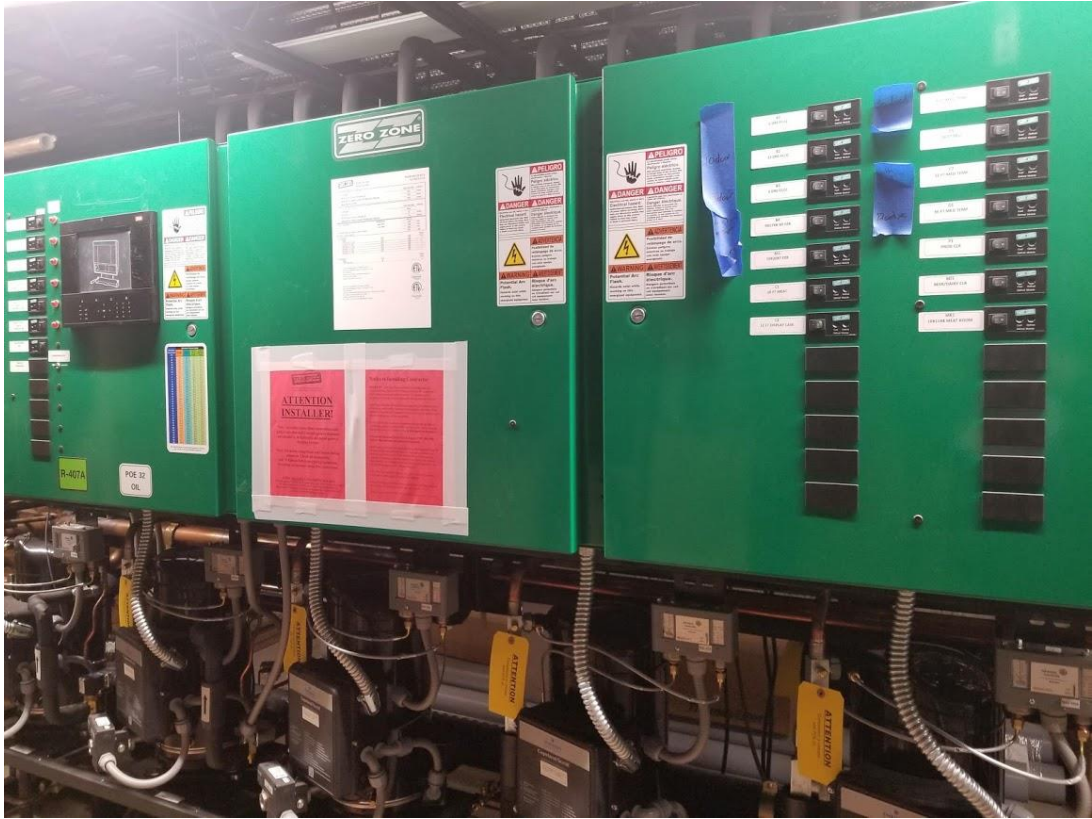
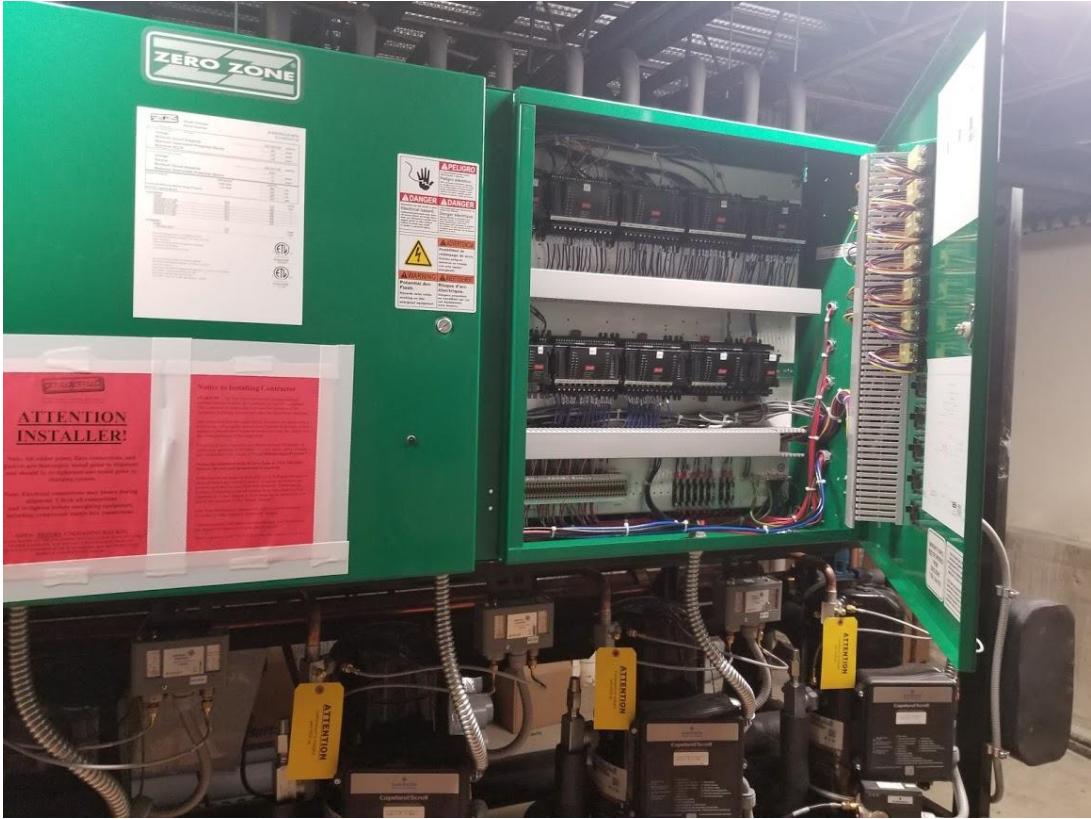
**Sub-Cooling Only on
Low Temperature System**



Massive Quantity of Field Piping, Fittings Etc.



Outdated Control Technology Microprocessor Based Instead of Cloud Based Computers

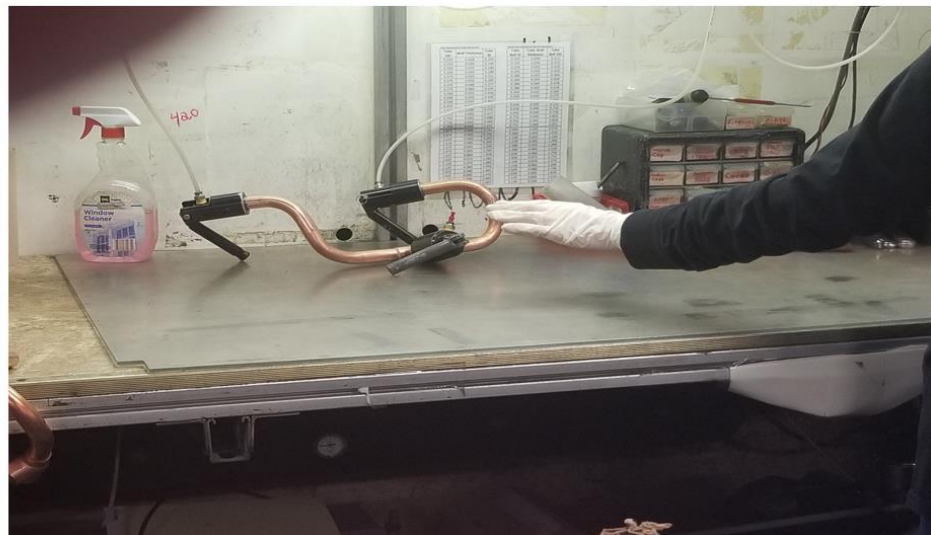
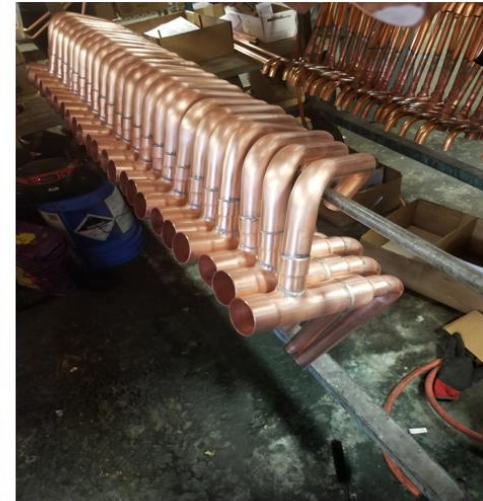


SOLUTIONS

Non-existing pipe and joints will never leak

Quality joints will very seldom if ever leak

Quality piping and testing is available



Elimination of pipes and soldered joints is key



System Solutions

Four Distributed Mini Modules (R407F) Vs. Rack With R407A or R448A

Hanging Mini Module



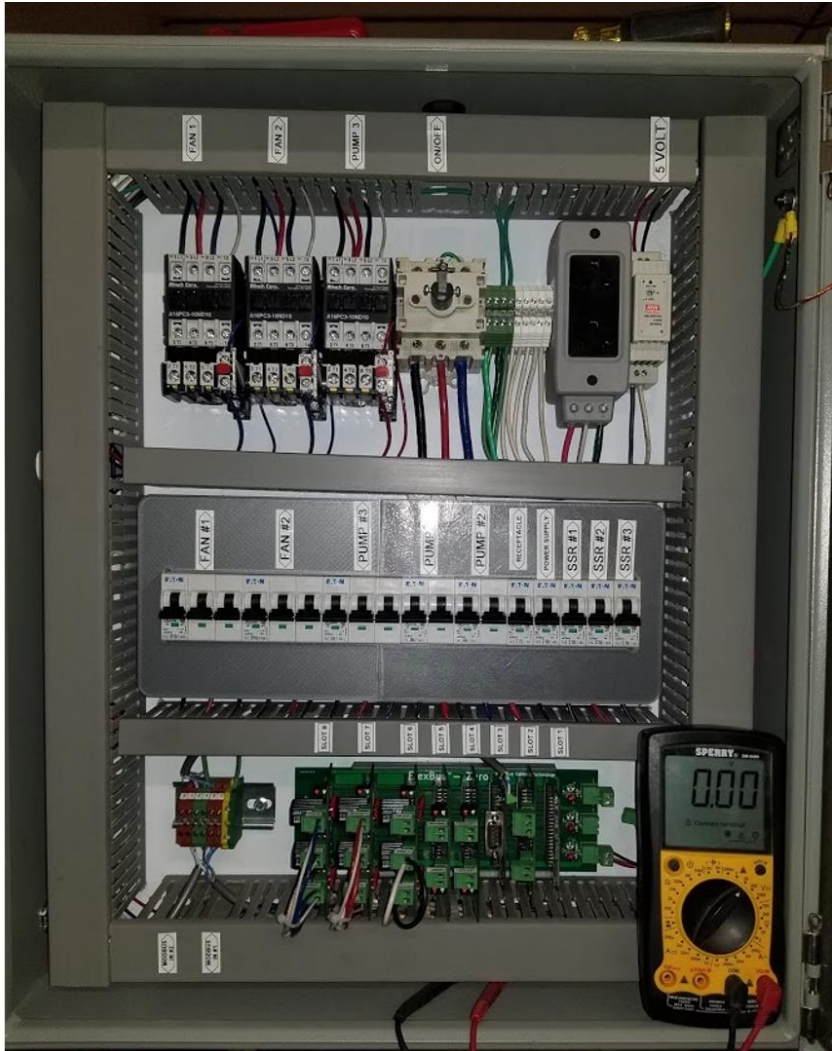
Conventional Rack



Distributed Refrigeration Heat Transferred By Water Not Refrigerant



Most refrigerant piping and fittings eliminated by one PVC pipe water loop

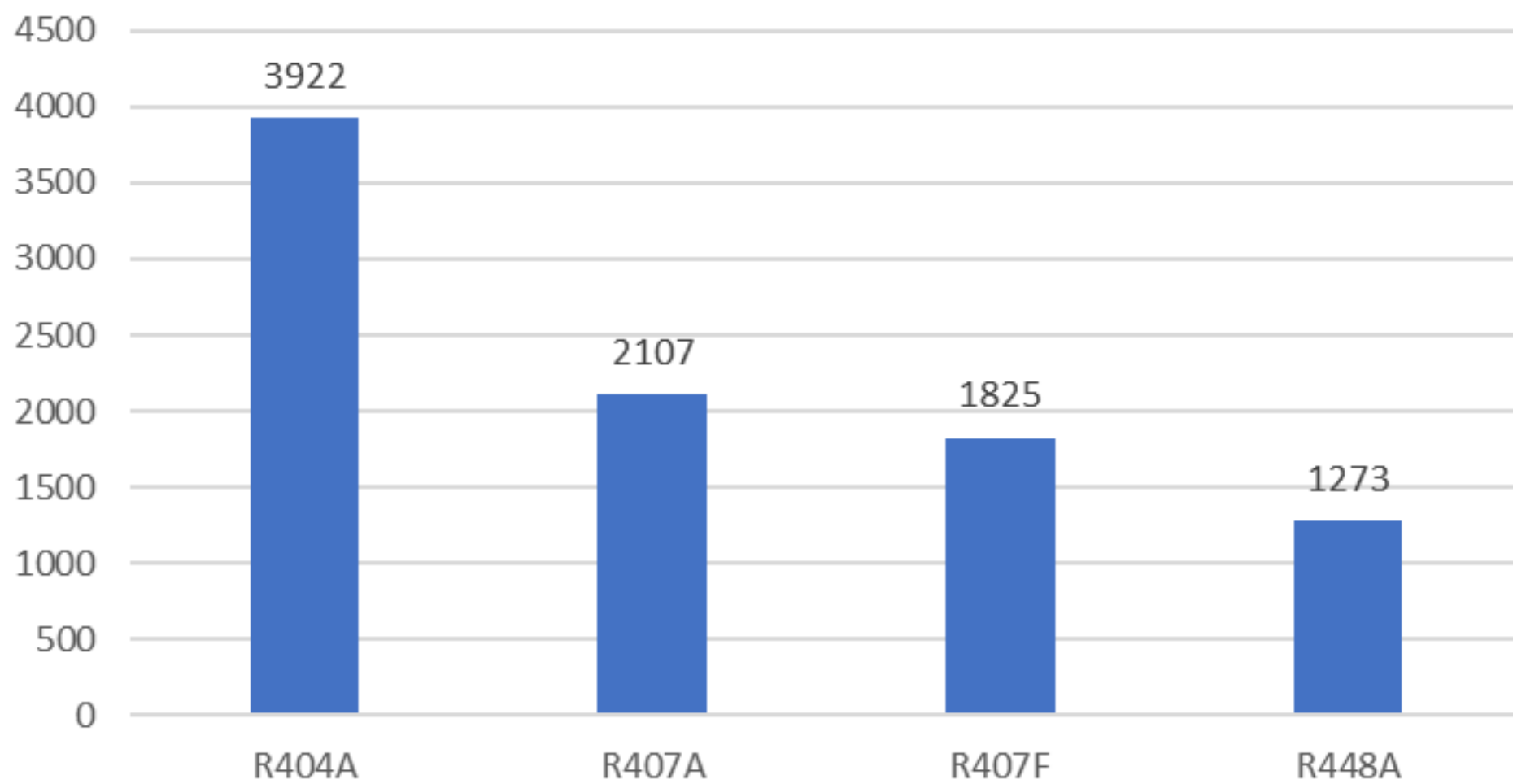


Quality From A to Z is Needed to Reduce Leaks, Industry Needs a Lot of Help



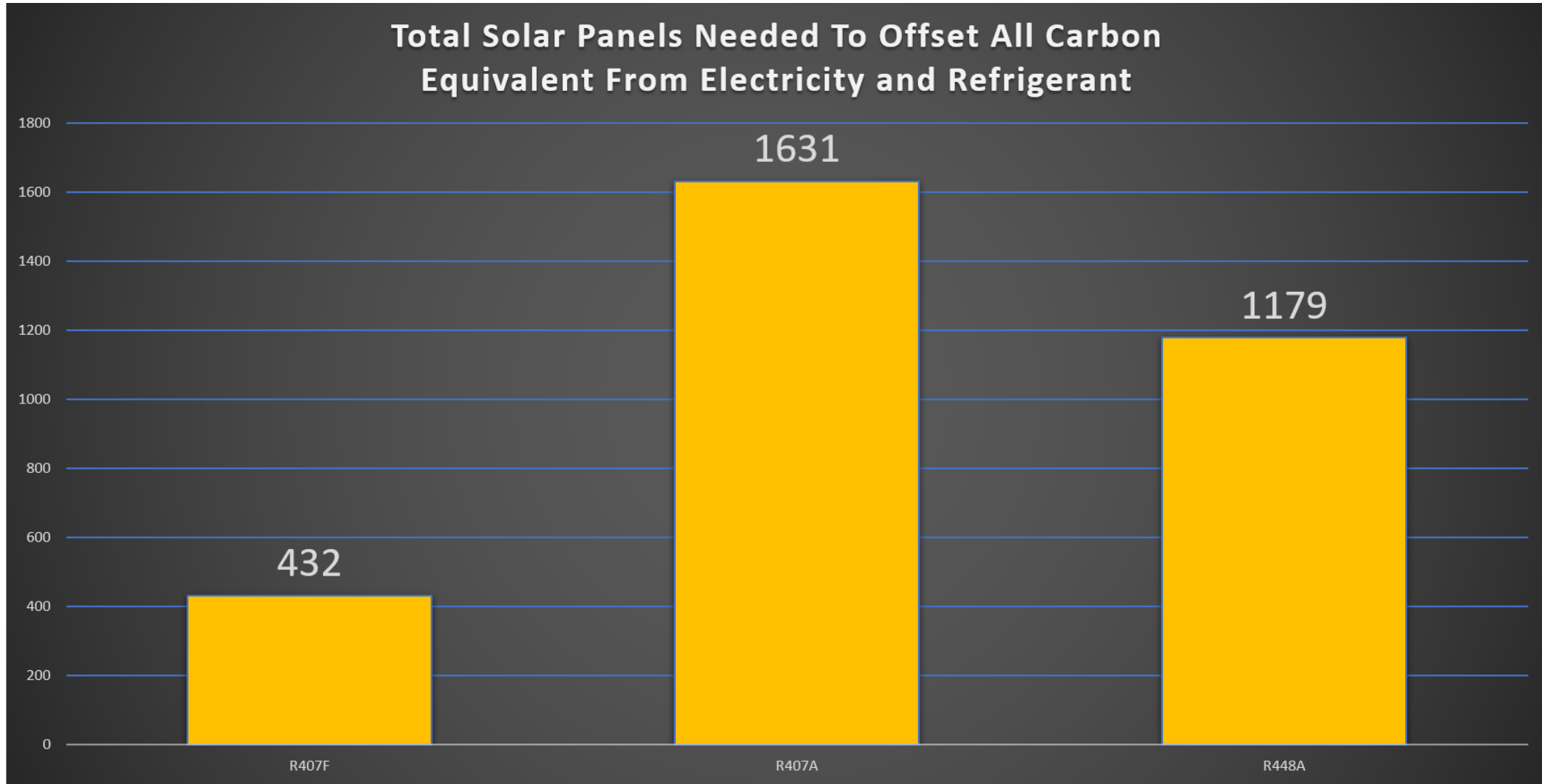
Beyond Chemicals, its all about the
“Net Environmental Impact Calculations”

GWP



Present HFC Technology Can Beat LD226

Compare Good HFC R-407F in Small Supermarket Technology to Solar Panels

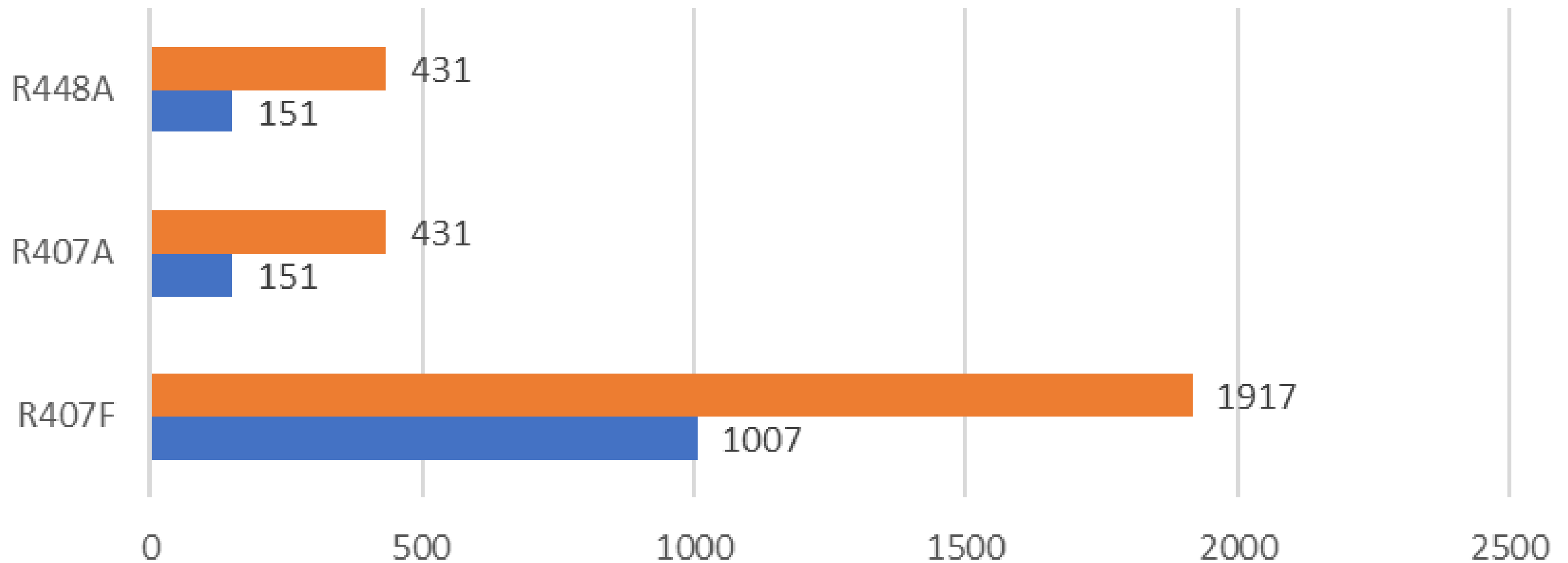


BTUH/LB of Refrigerant System Charge

■ BTUH/LB (Med. Temp.) ■ BTUH/LB (Low Temp.)

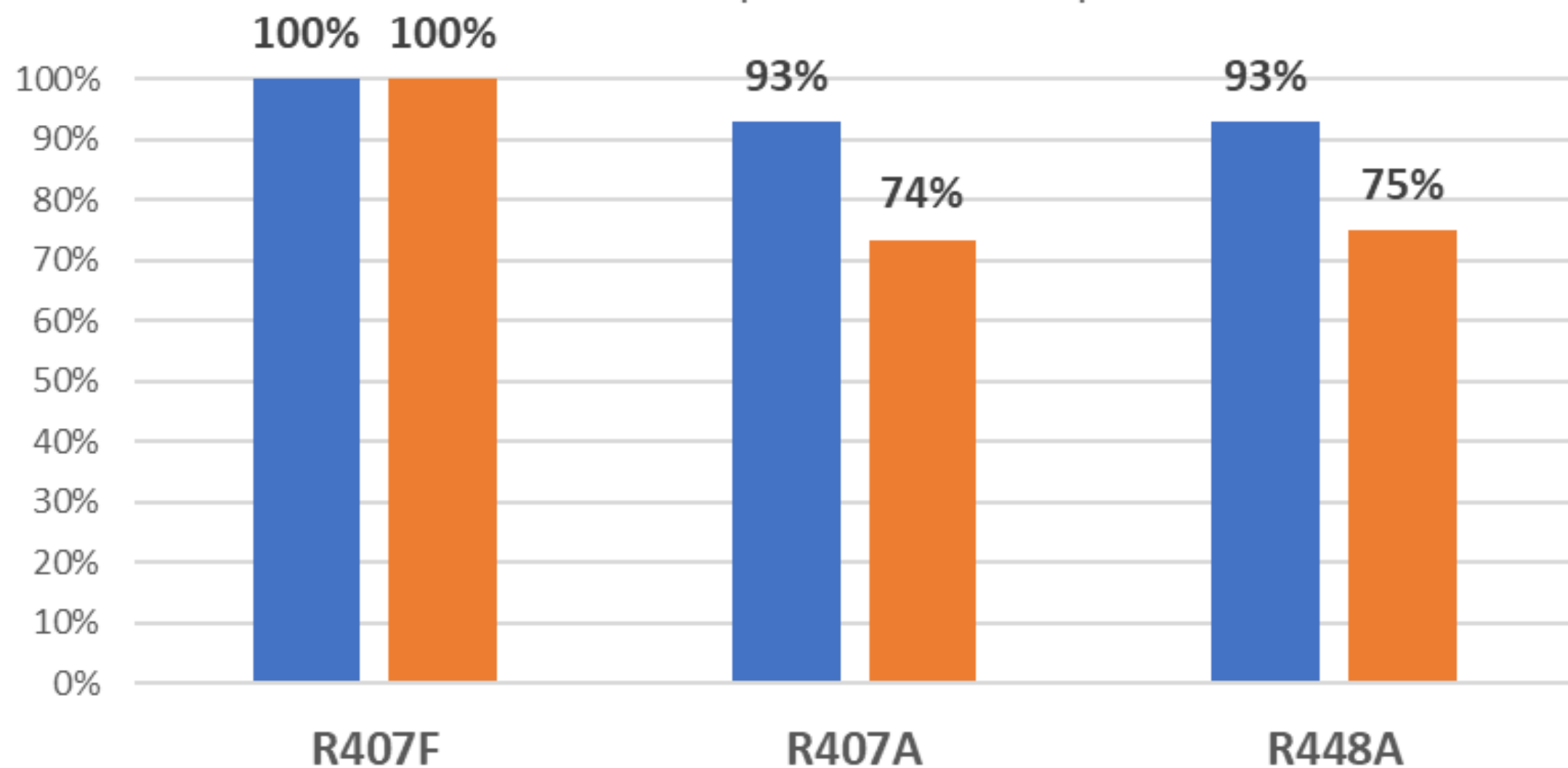
57,500 BTUH MT

32,200 BTUH LT



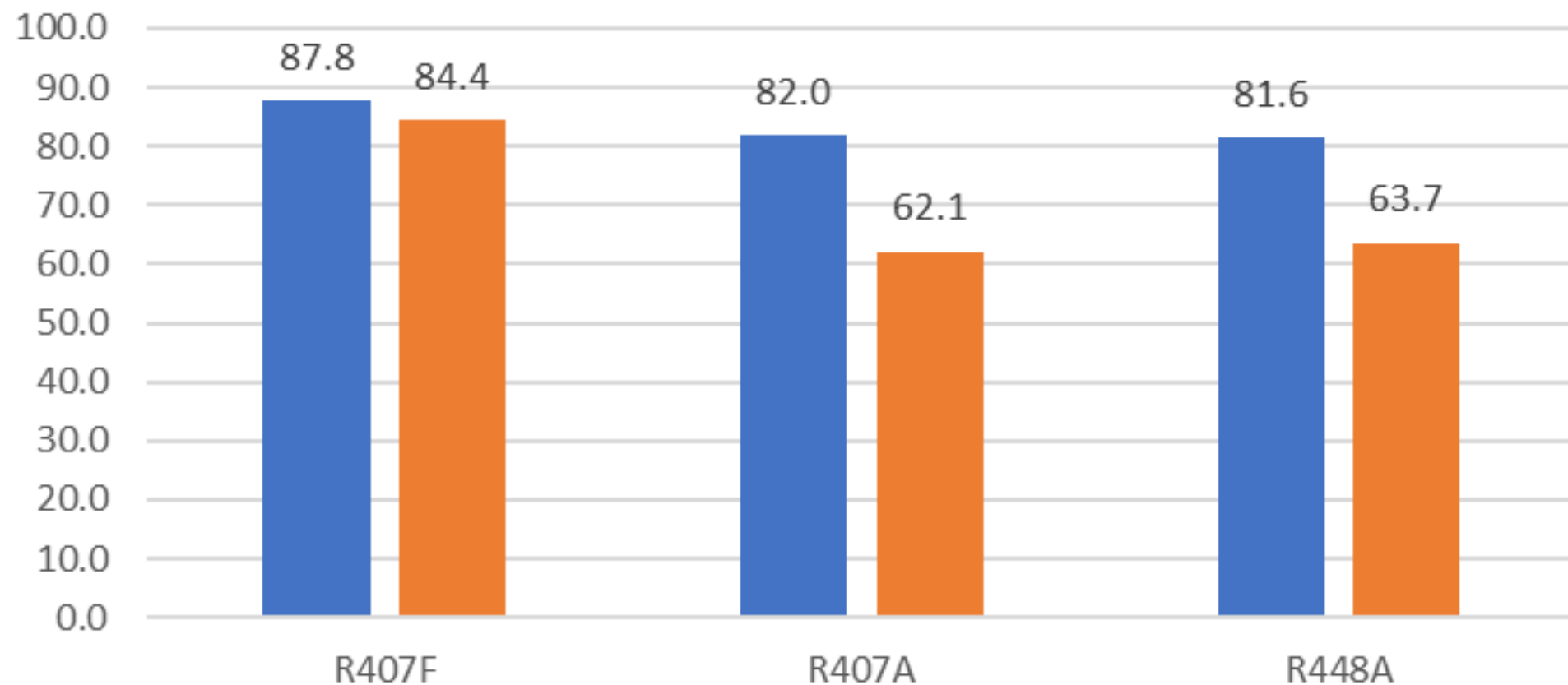
Compressor Capacity Variance per Unit Mass Flow (R407F Base)

■ Low Temp. ■ Med Temp.



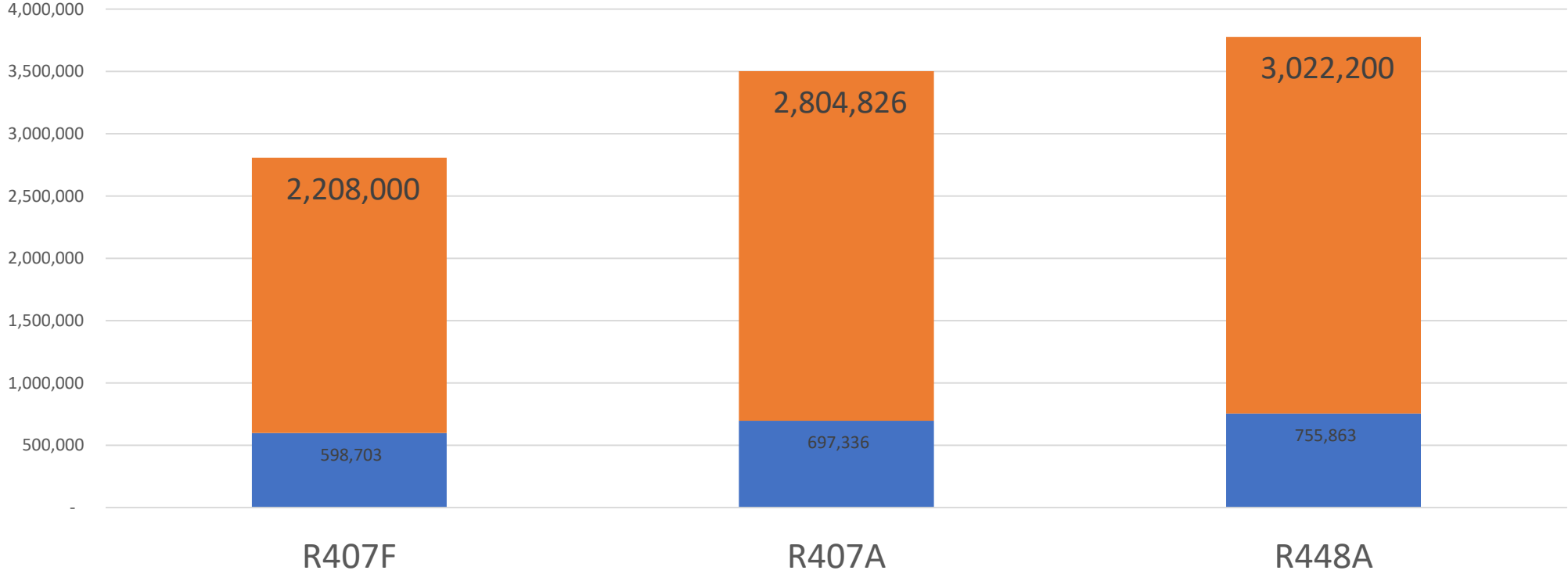
BTUH/Unit Mass Flow

■ Low Temp. ■ Med Temp.



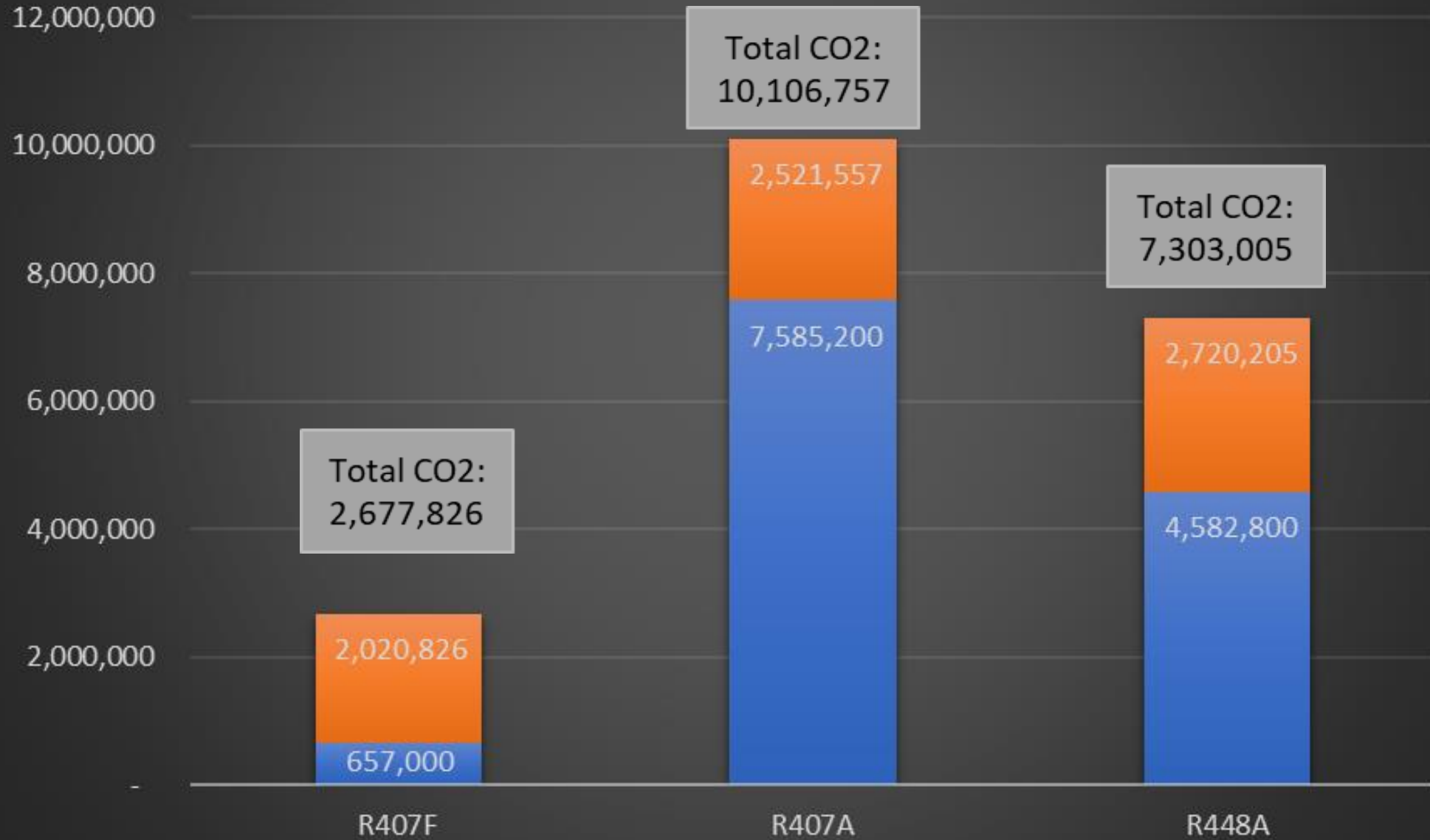
MWh over 20 years

■ 1x Low Temp. ■ 3x Med Temp.

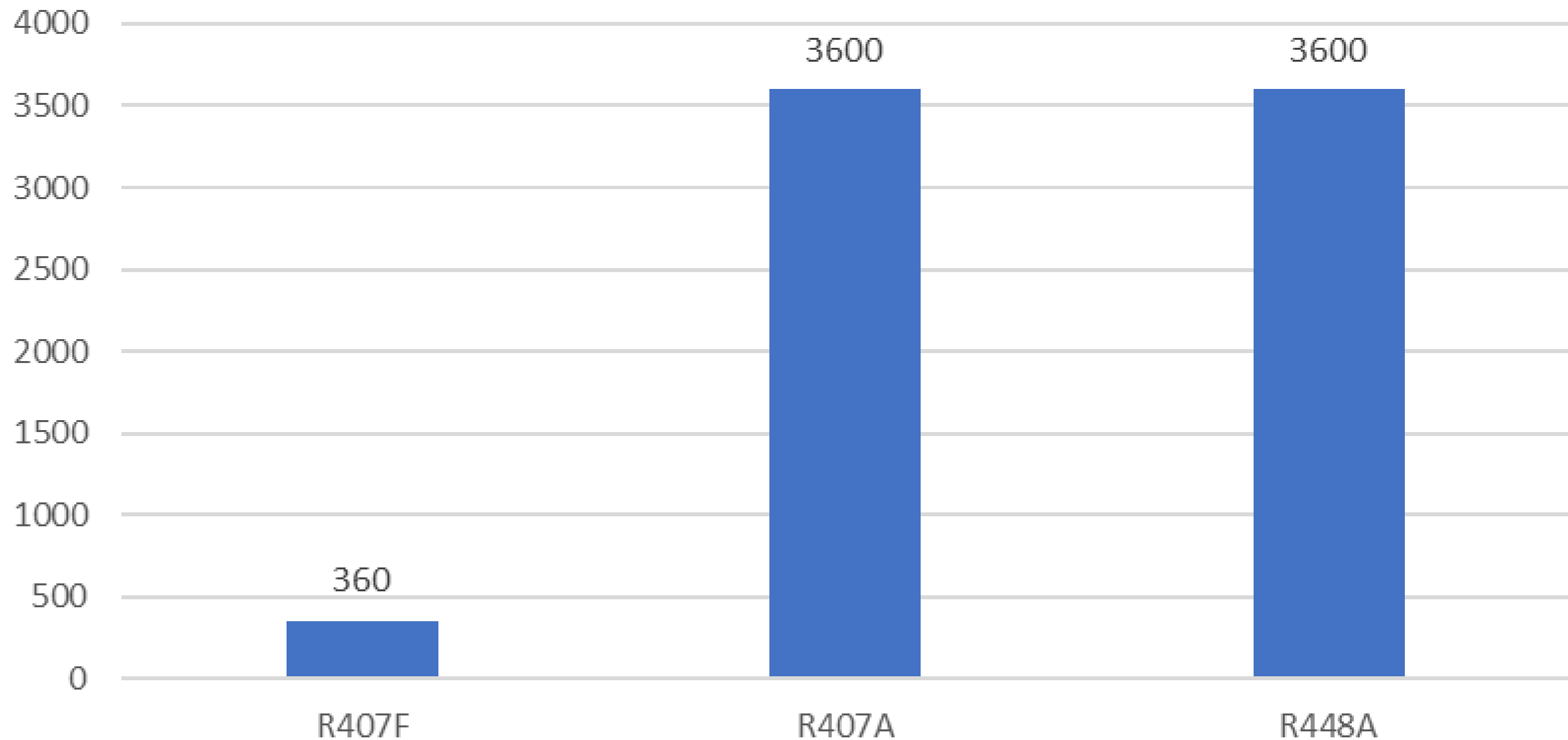


20 year Carbon Contribution

R-Carbon/20 years E-Carbon/20 years

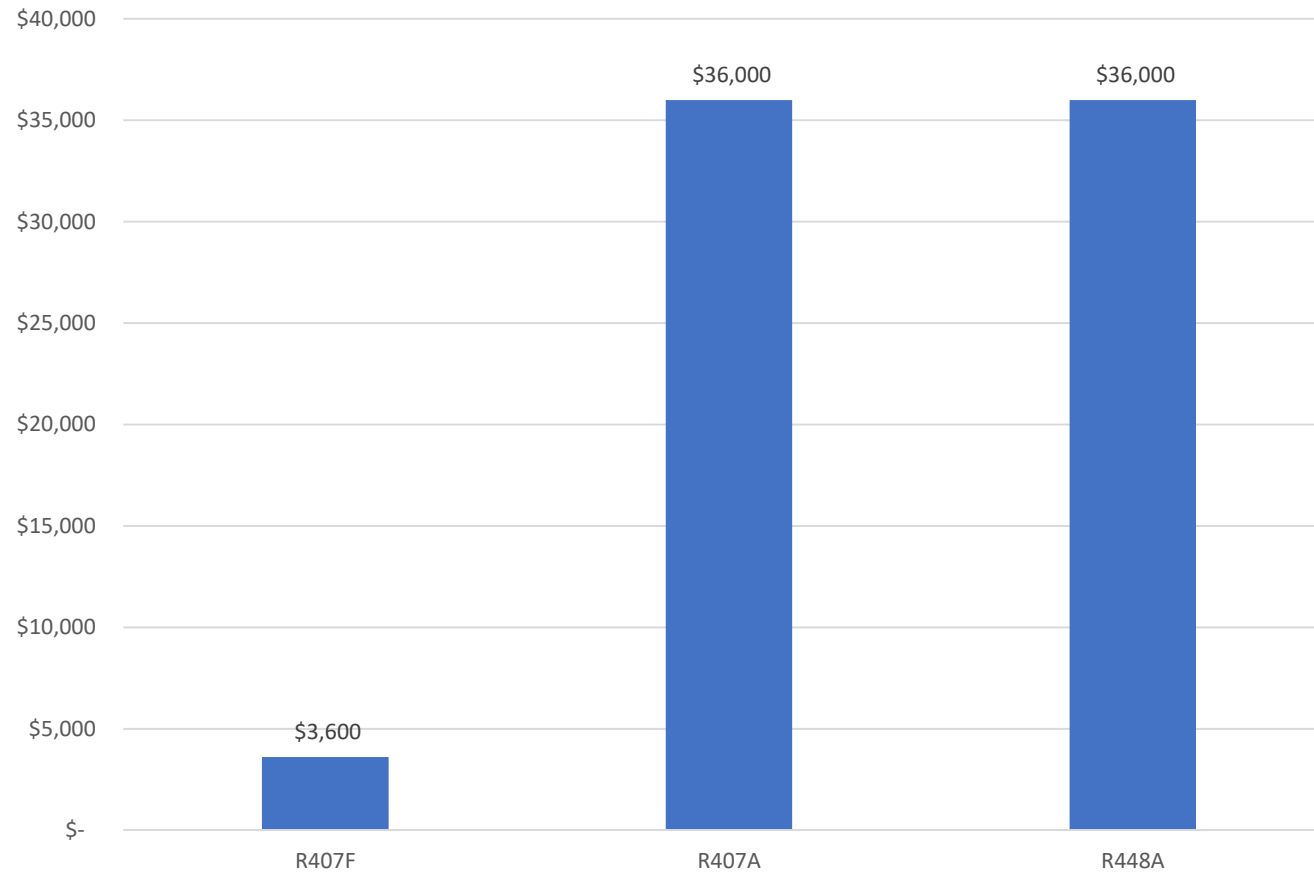


Pounds Of Refrigerant Lost over 20 years



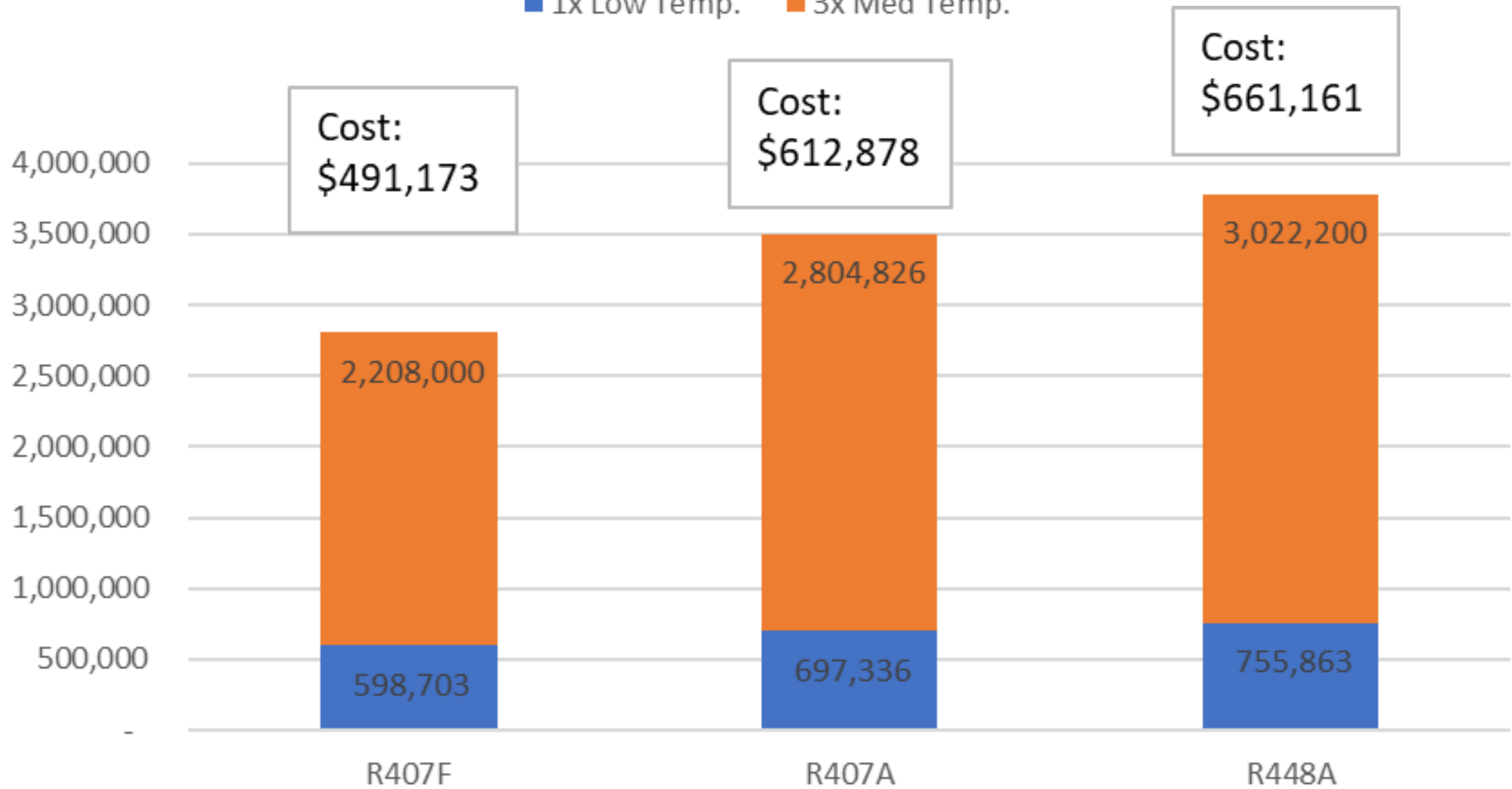
\$ in Refrigerant loss over 20 years

(At \$10 LB.)



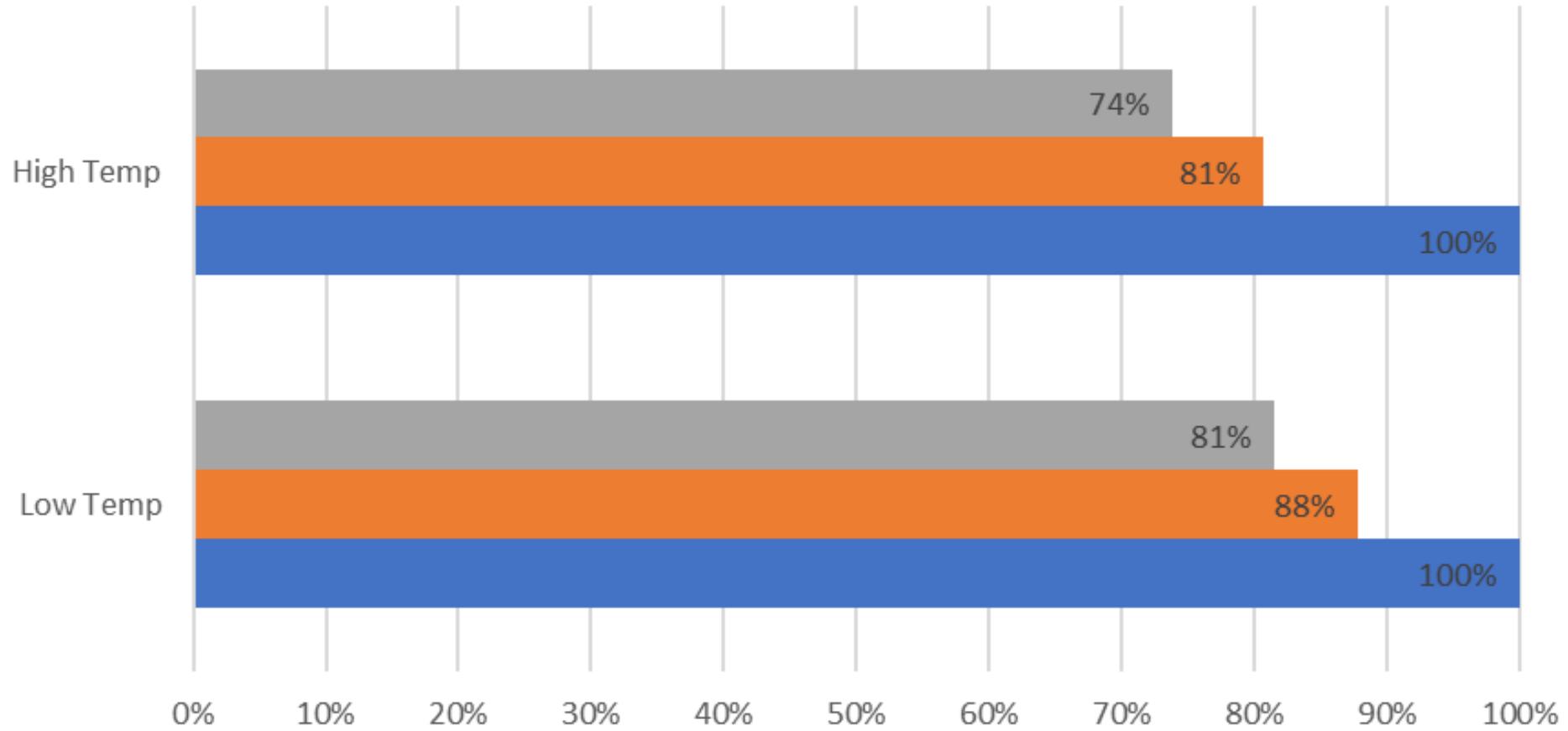
Kwh over 20 years

■ 1x Low Temp. ■ 3x Med Temp.



Difference in EER (407F as base)

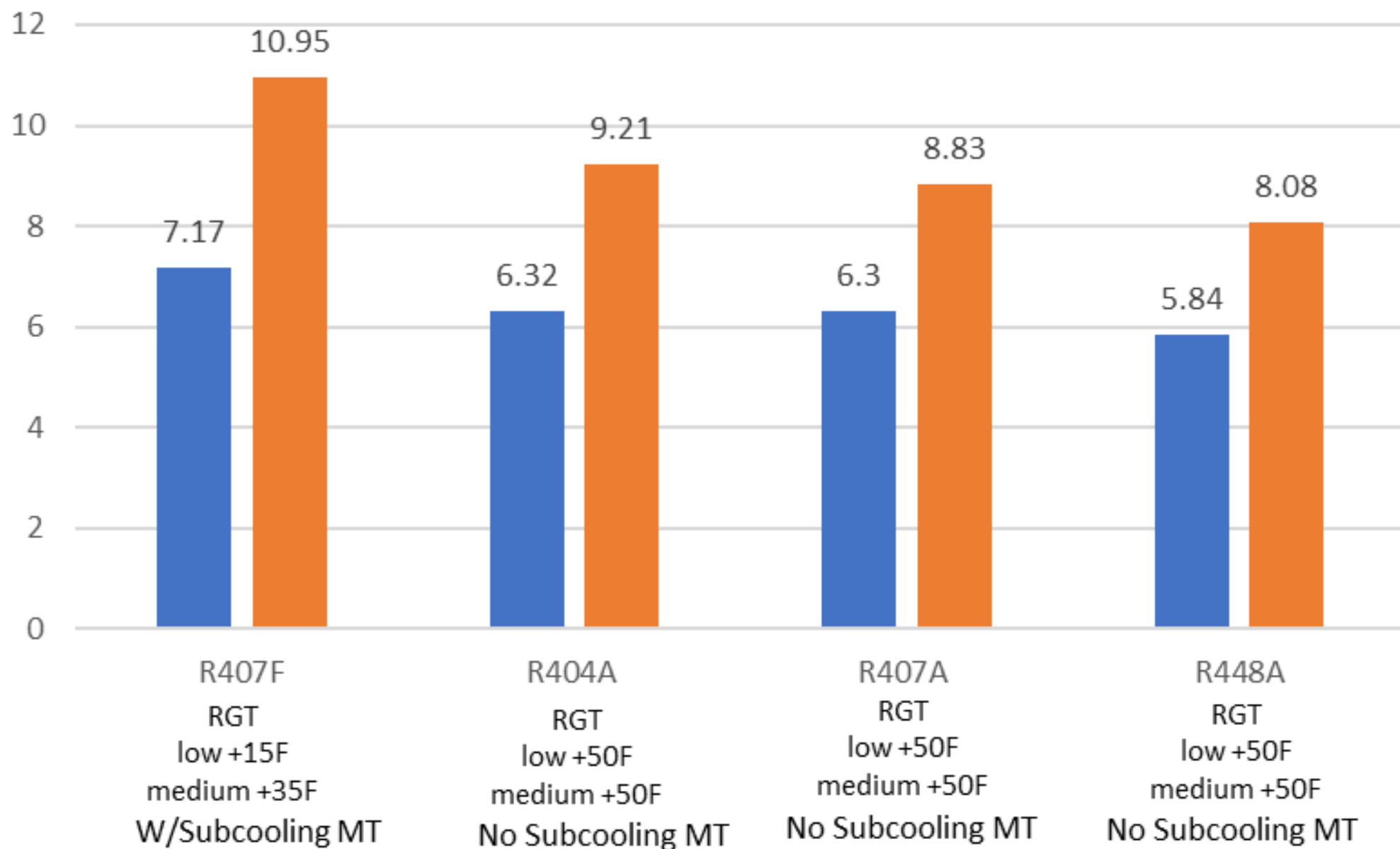
■ R448A ■ R407A ■ R407F



All Low Temp Applications
Are Sub-Cooled

EER Values

■ EER (-15°F) ■ EER (15°F)



Who's going to take responsibility for leaking millions of pounds of the next chemical fix if LD226 is passed as is?

Lets take our time and think through real solutions

