Avoiding a Deep Dive into Shallow Water

Navigating the pitfalls of chiller technology trade-offs

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YORK INSTALL CONFIDENCE.

Johnson Controls

Macquarie Islands, circa 1870's

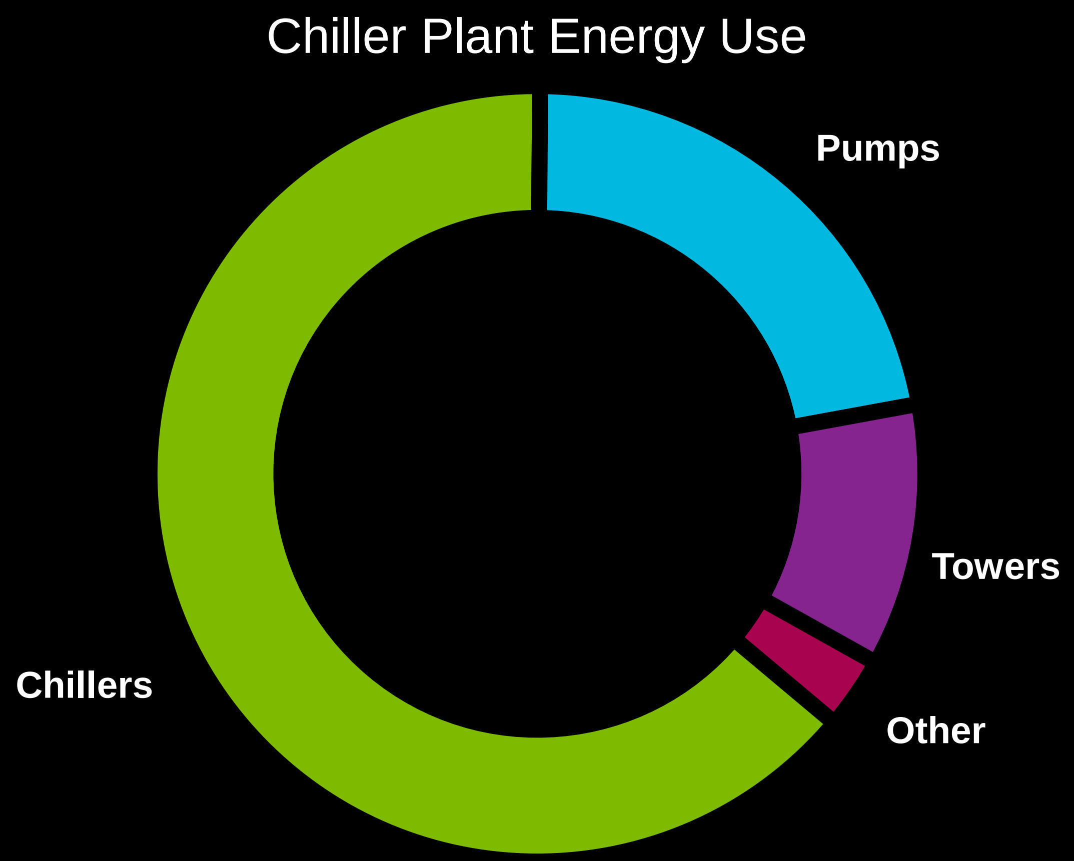
Unintended consequences

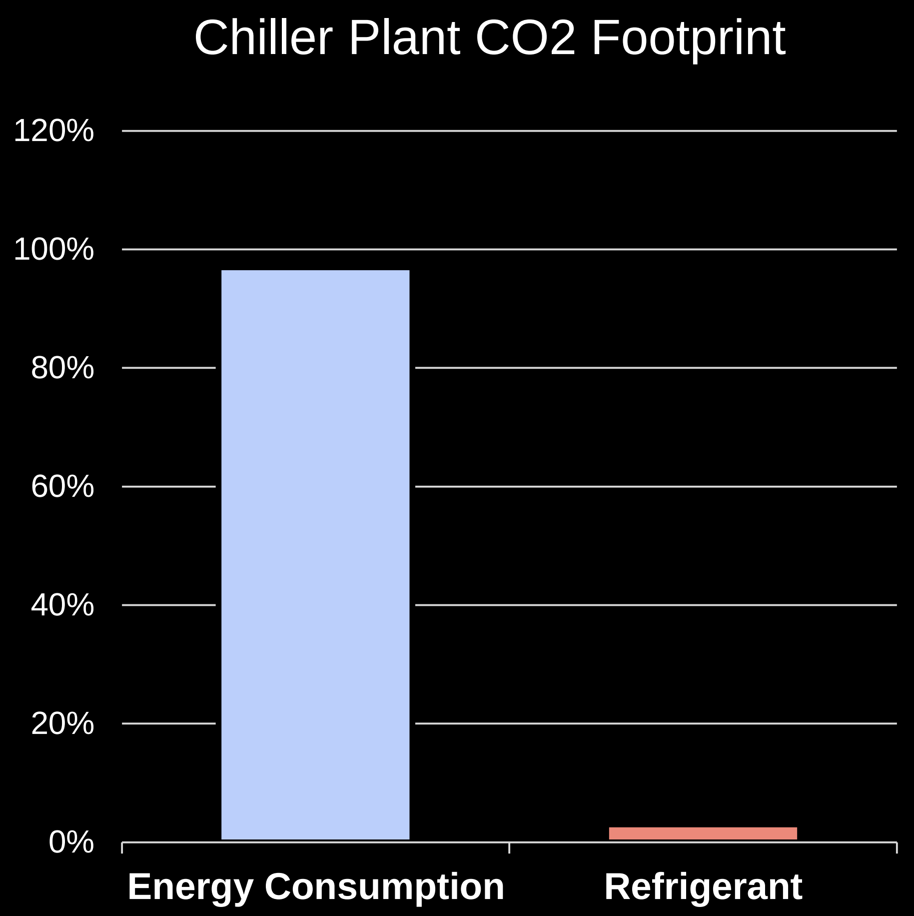
1968	Scientist introduced a virus to eliminate the rabbits
1980	Rabbit population reduced from 100,000 to 20,000
1985	With fewer rabbits, cats started eating the birds. Devised plan to eliminate all of the cats
2000	Last remaining cats are eliminated

Today…

Rabbits repopulating and destroying the vegetation again…

Energy efficiency has the greatest impact on chiller plant total cost of ownership, and environmental impact.

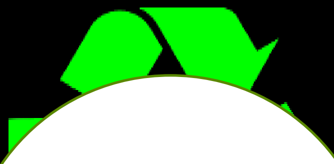




Three steps to improve energy efficiency, operating cost and carbon footprint.

1

Avoi… …ergy
Reduce …emand



2

Recy… …d heat
where available and
heating can be used

3

Desi… …y or
buy high efficiency
chiller equipment
and system

1 Reduce the demand…

- Reduce cooling demand by avoiding using energy use wherever and whenever possible
- Use natural lighting, retrofit to LEDs
- Upgrade building envelope – windows, insulation
- Building automation and Smart Building technology
- Reduce daytime demand and shift to early morning and evening hours with thermal storage

2 Recycle, reuse or repurpose wasted heat energy

- Engine jacket water
- Exhaust heat from combustion process
- Low to medium pressure steam
- Any source of hot water
- Cooling towers
- Steam condensers
- Pressure reducing stations

Chiller/heater/heat pumps

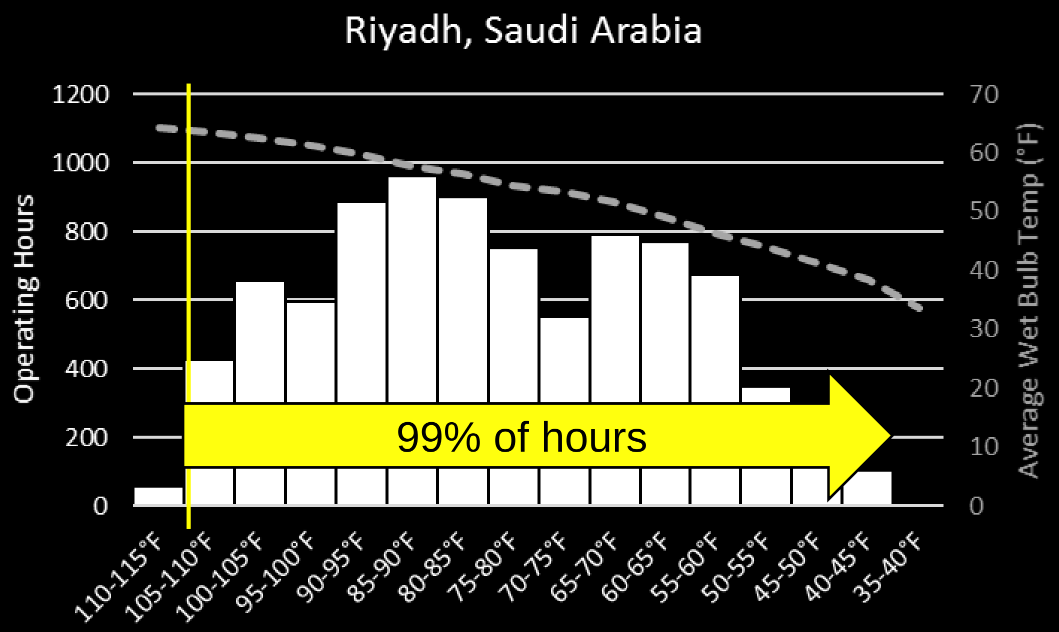
- Waste steam or hot water can drive the absorption chiller/heat pump process or drive a steam turbine driven chiller
- Condenser water, treated sewage effluent (TSE) or other low grade heat can be used as a heat pump’s source

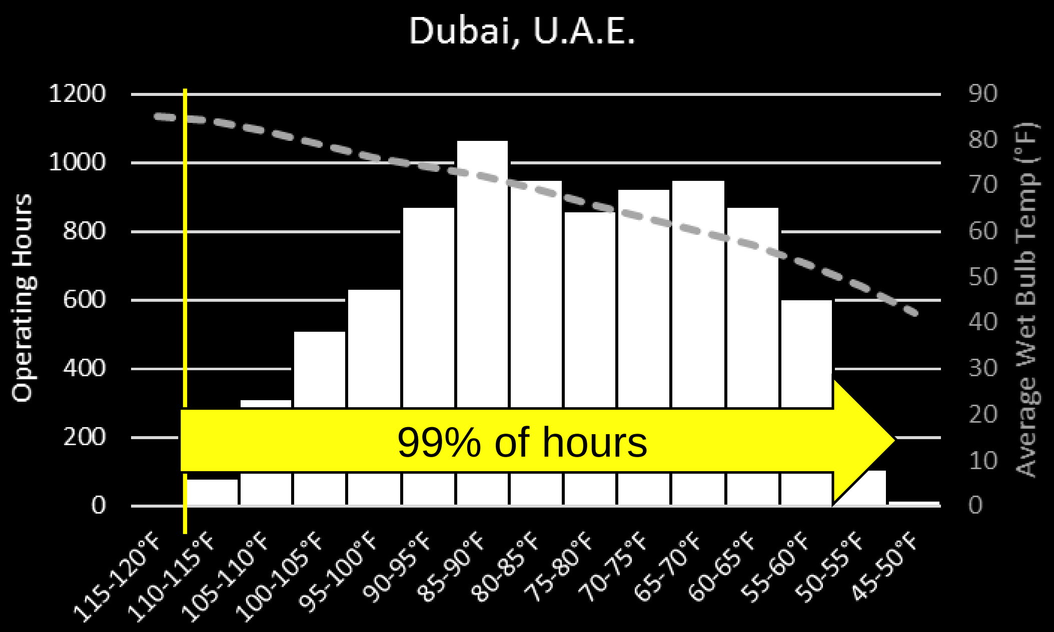
3

Design, specify or buy high efficiency chiller equipment and systems

- Evaluate based on overall system design and operation
- Consider chiller technology selections
- Pumping considerations
- Plant size and footprint

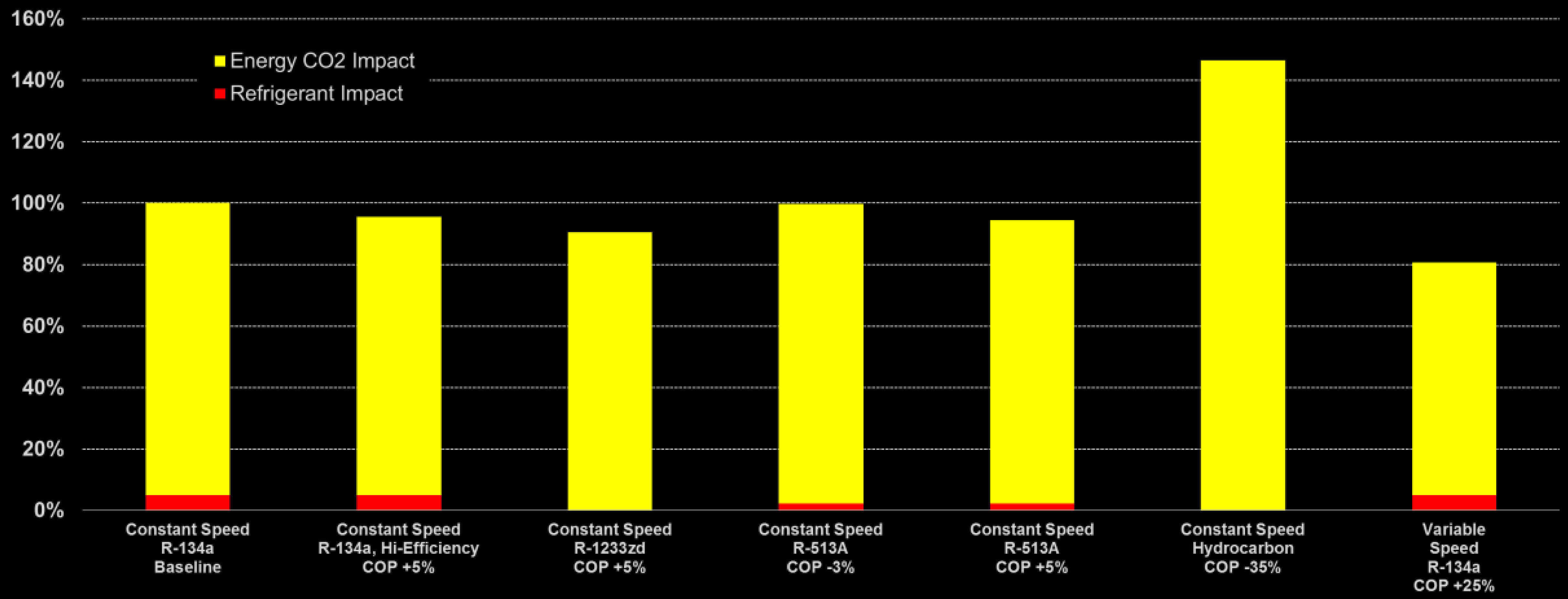
The majority of the operating hours are not at design conditions—they may be heavily loaded, but lower ambient wet bulb temperature allows for significant energy savings.



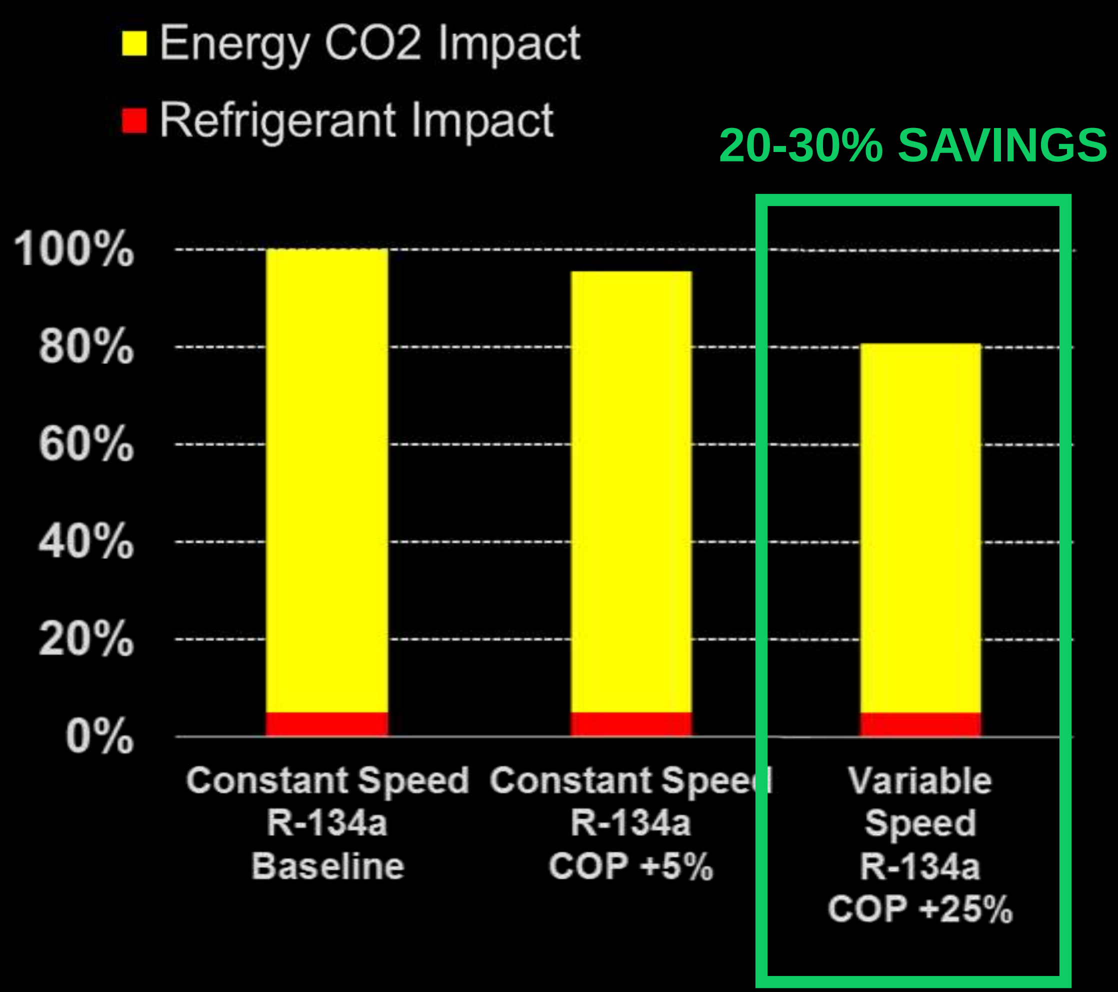


ANAF weather data

System energy consumption and resulting carbon footprint favors year-round operating energy efficiency

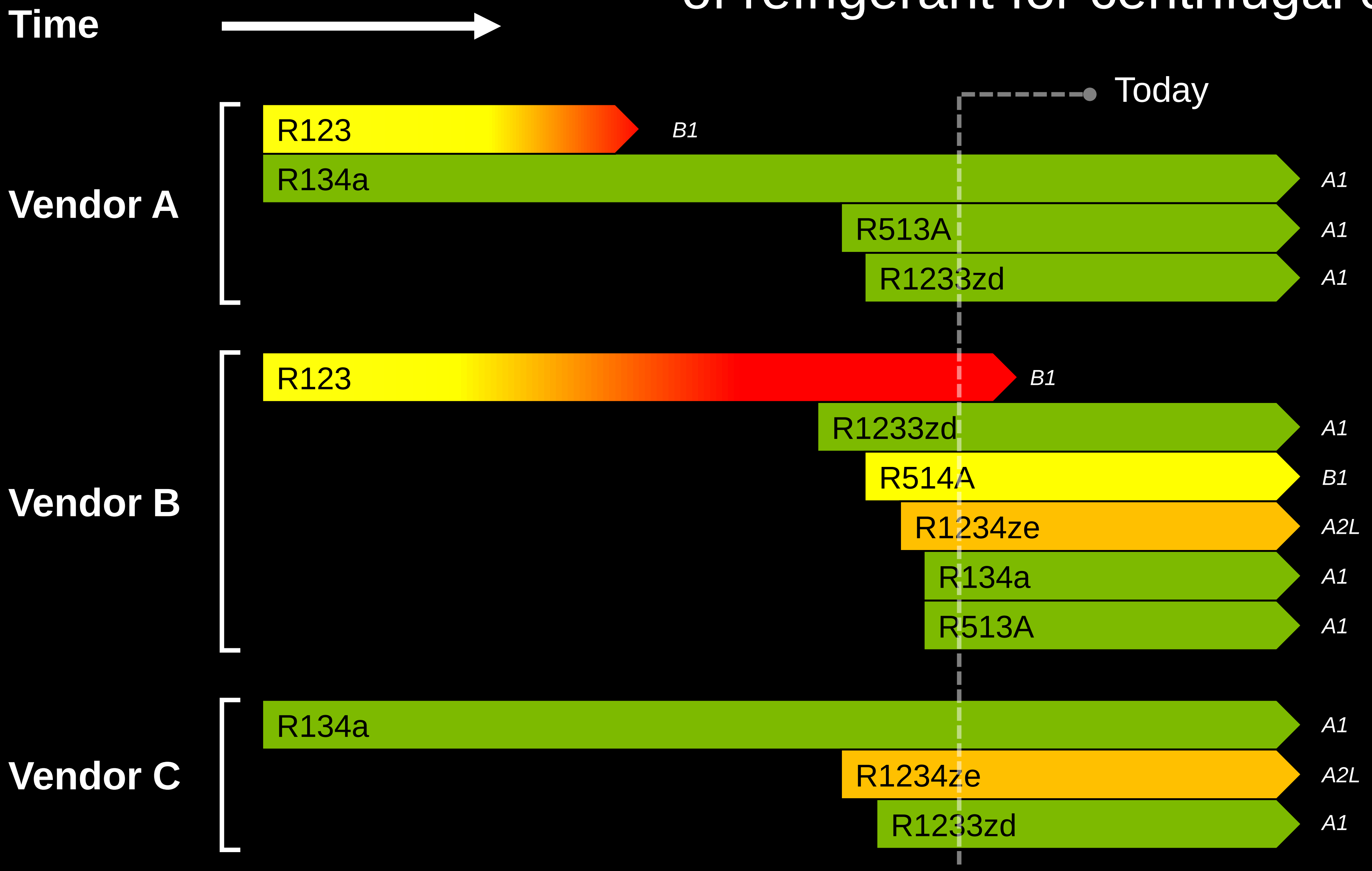


Variable speed reduces energy consumption (year round), cost and carbon footprint significantly greater than any refrigerant choice.



- Lowest operational cost
- Reduced electrical installation costs (i.e. generators, transformers)
- Best option for total environmental impact
- Economical first cost vs. solid state starter
- Shorter payback / better cash flow
- Near zero in-rush, easier on motors

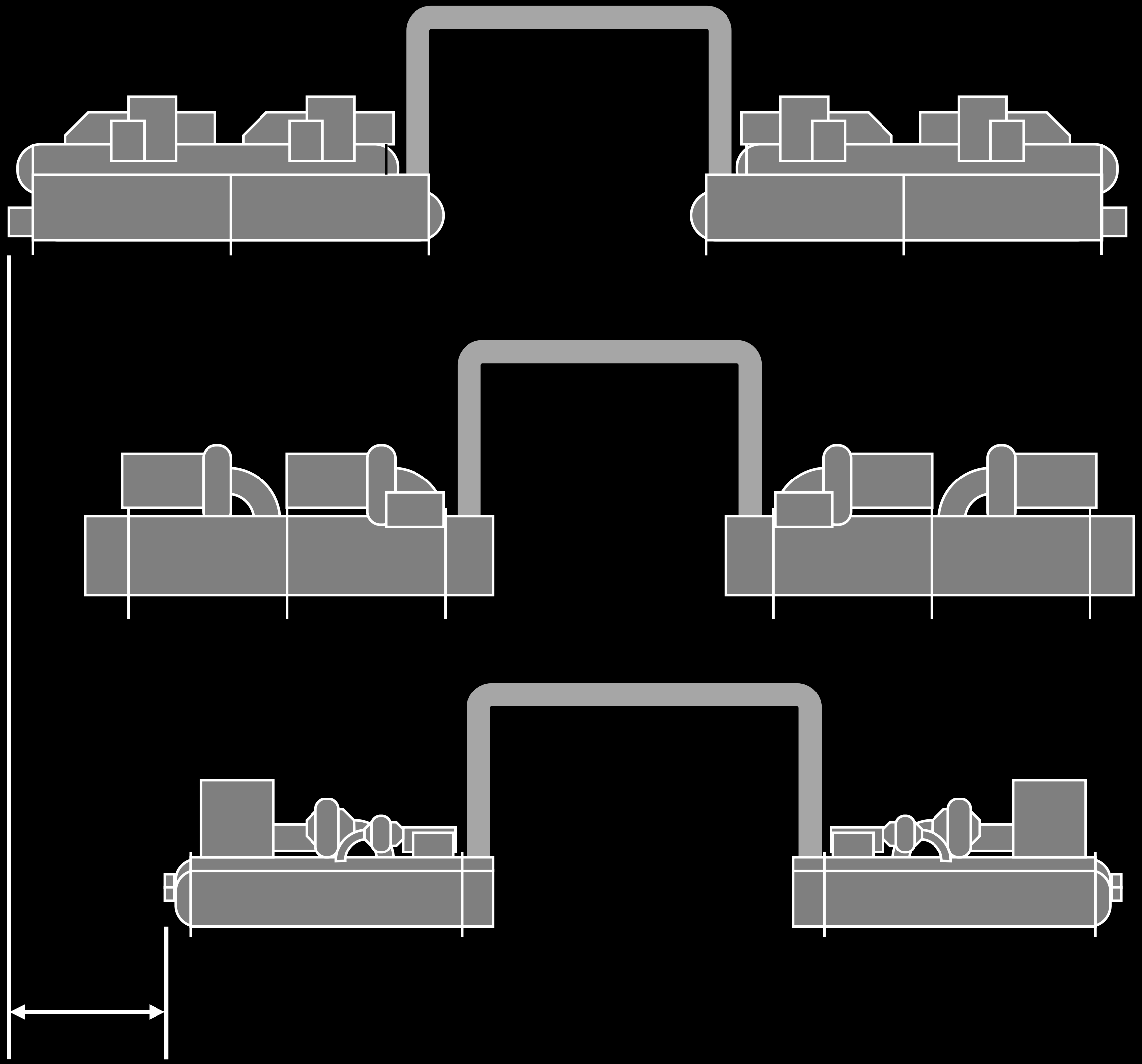
Chiller manufacturers recent choices of refrigerant for centrifugal chillers.



1% improvement in chiller efficiency	=	Off sets 60% of the *potential* lifetime emissions
~1.5% improvement in chiller efficiency	=	Off-sets direct emissions completely

Equipment size can drive first costs for land and building size

- Unit mount starters and VSDs to reduce footprint
- Fewer compressor = fewer starters/VSDs
- Shorter length/larger diameter = lower pumping costs AND up to 15% shorter overall length



Up to 15% savings

Three steps to improve energy efficiency, operating cost and carbon footprint.

1

Avoid using energy
Reduce demand

Design for efficiency and minimal demand. Reduces consumption of primary energy, and lowers overall operating costs and carbon footprint.

2

Recycle wasted heat where available and heating can be used

Leverage waste heat sources as energy driver for thermally drive chillers and heat pumps. Repurpose low grade heat for heat pump applications.

3

Design, specify or buy high efficiency chiller equipment and system

Select equipment and systems based on year-round or overall performance not on specific component technology choice. Performance drives operating and total cost of ownership.

THANK YOU