

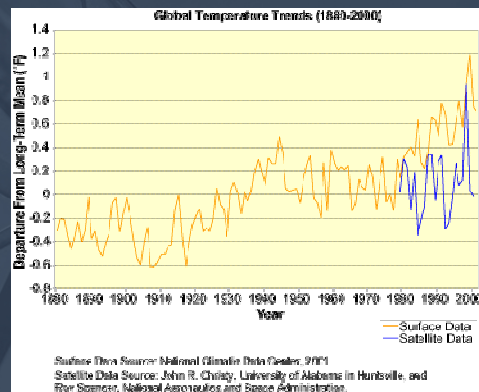




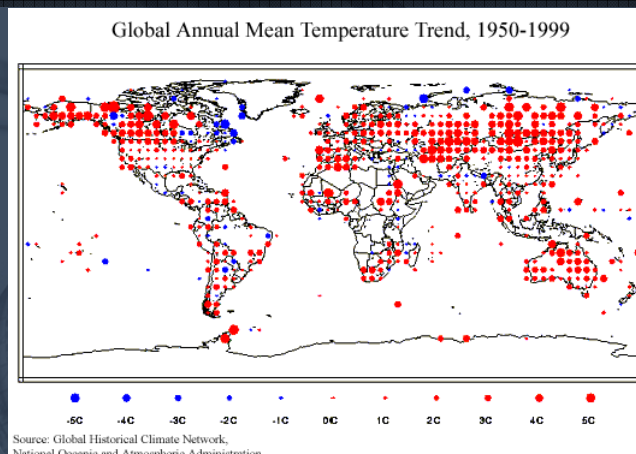


What's the Problem?

Global temperatures are rising. Observations collected over the last century suggest that the average land surface temperature has risen 0.45-0.6°C (0.8-1.0°F) in the last century.



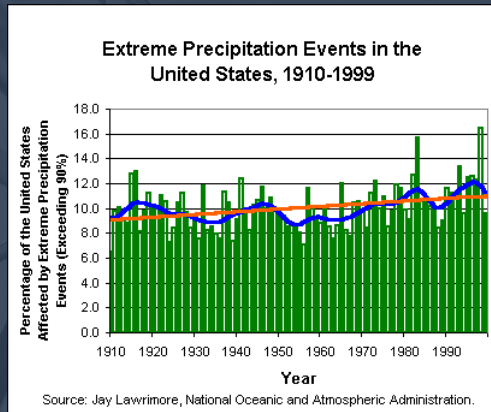
What's the Problem?



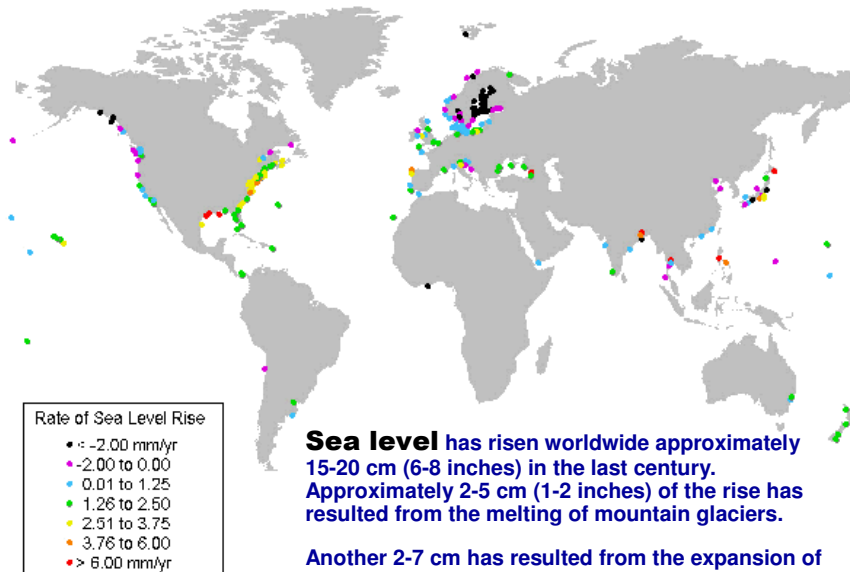
Red circles reflect warming — blue circles reflect cooling

What's the Problem?

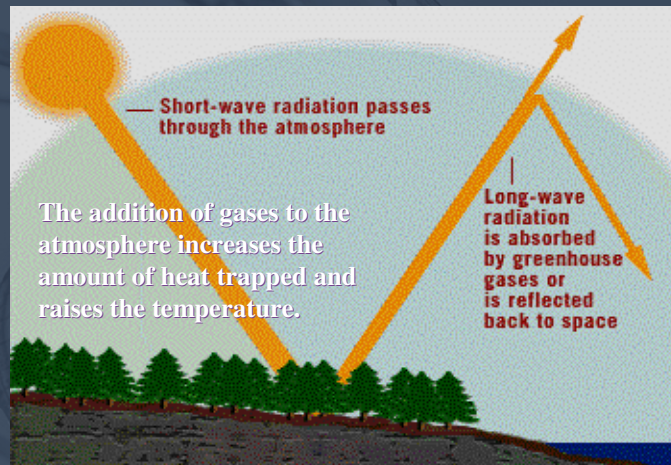
Precipitation has increased by about 1% over the world's continents in the last century. High latitude areas are tending to see more significant increases in rainfall, while precipitation has actually declined in many tropical areas.



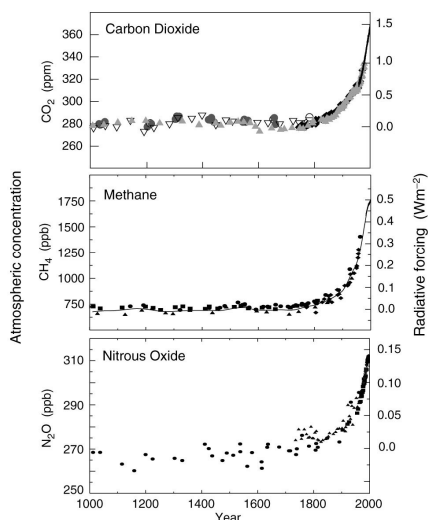
What's the Problem?



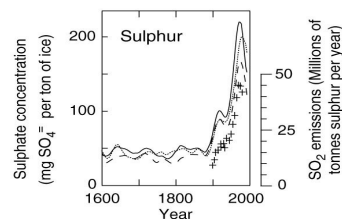
Why?



(a) Global atmospheric concentrations of three well mixed greenhouse gases



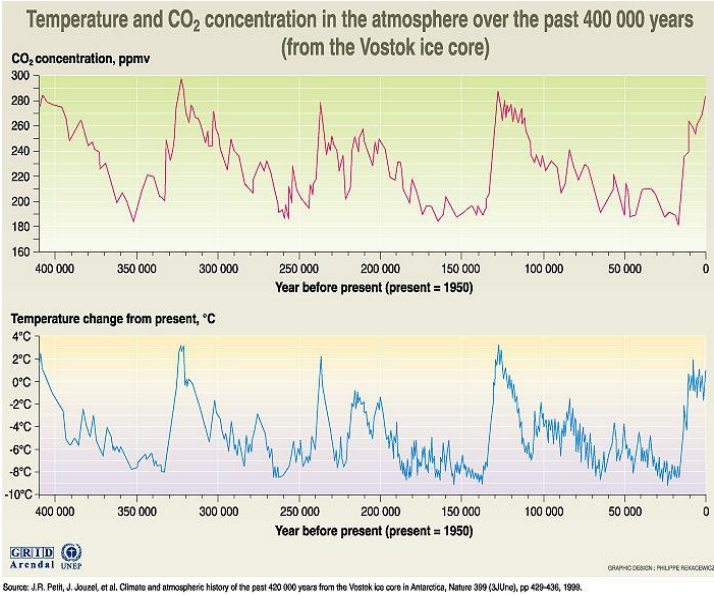
(b) Sulphate aerosols deposited in Greenland ice



Human activities have changed the composition of the atmosphere since the industrial era

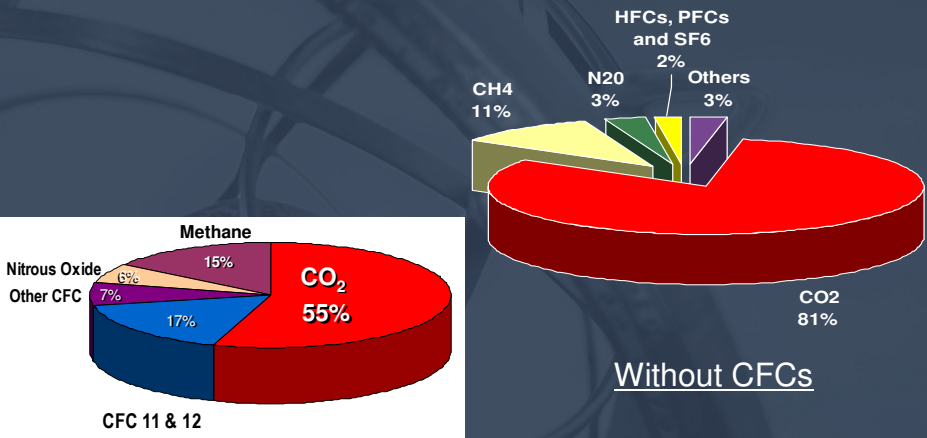
CCS-4

The Atmosphere

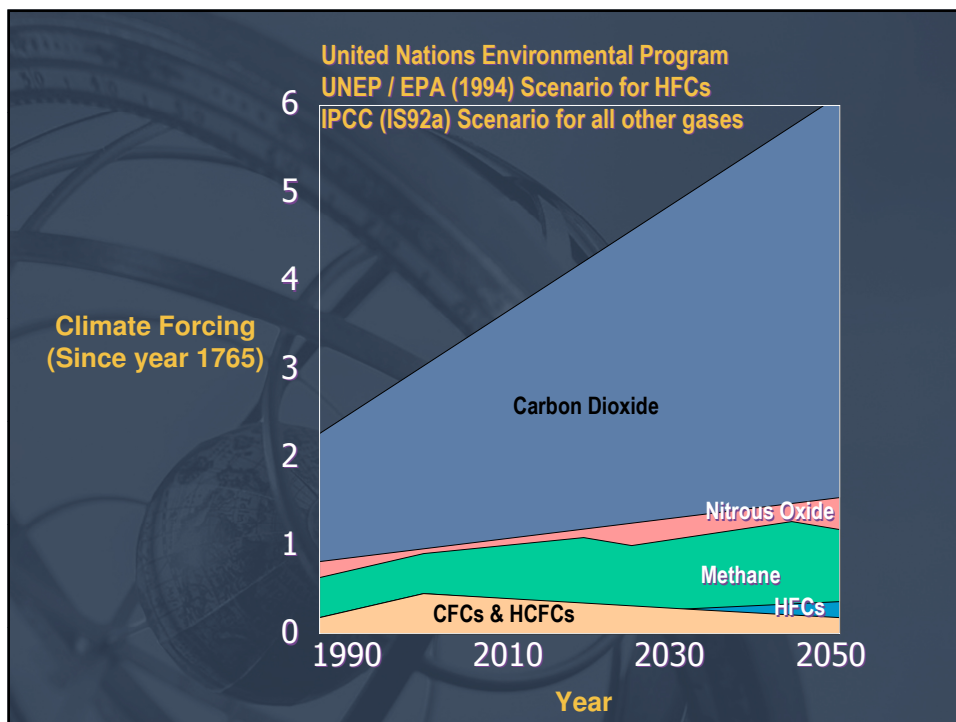
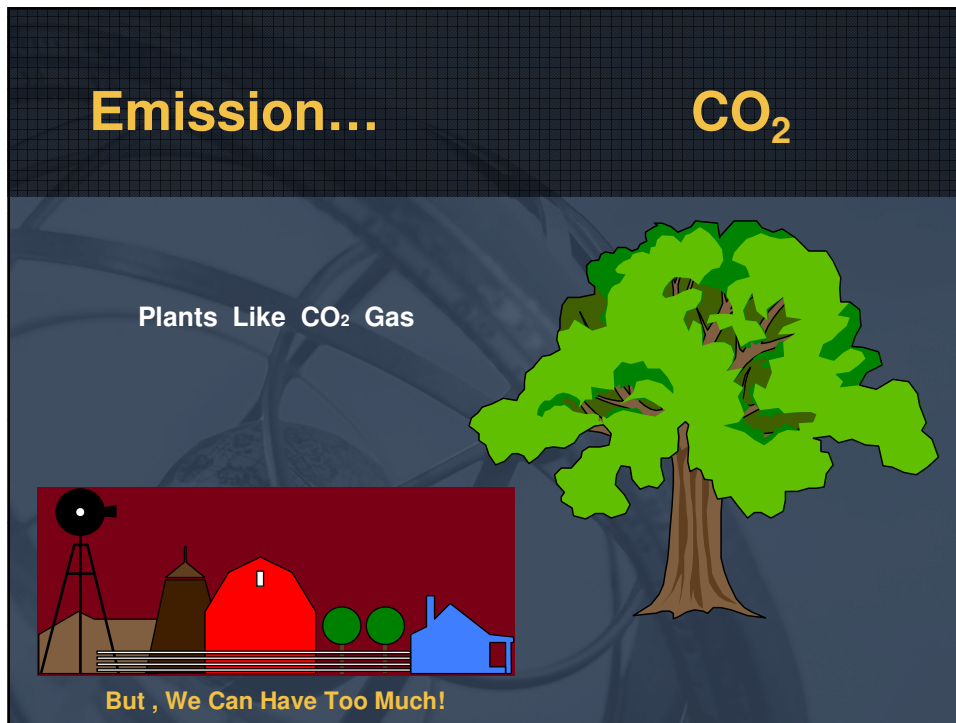


CCS-2

Greenhouse Gases



Source: IPCC Climate Change 1990



Global Climate Change - Berlin Mandate

▲ Science Assessment

- ◆ “discernible human influence on global climate”
- ◆ Increase of 2°C from 1990 - 2100
- ◆ Sea Level rise by 50 cm 1990 - 2100
- ◆ Stabilization at 2x pre-industrial levels requires 50% reduction

▲ Technical and Economic Assessment

- ◆ Emission reductions are technically possible
- ◆ Emission reductions are economically feasible
- ◆ “No-Regrets” opportunities are available

United Nations Kyoto Protocol Press Release

“It (The Protocol) creates new incentives for technological creativity and the adoption of “no-regrets” solutions that make economic and environmental sense irrespective of climate change. Because activities and products with zero or low emissions will gain competitive advantage, the energy, transport, industrial, housing, and agricultural sectors will gradually move toward more climate-friendly technologies and practices.”

Kyoto Protocol

Sets Greenhouse Gas
Emissions Limits

Signed December 1997

Agreement reached by 181 Countries

Ratified February 2005

Kyoto Protocol Greenhouse Gas Coverage

▲ Six (6) Gases

- ◆ Carbon Dioxide -- CO_2
- ◆ Methane -- CH_4
- ◆ Nitrous Oxide -- N_2O
- ◆ Hydrofluorocarbons -- HFCs
- ◆ Perfluorocarbons -- PFCs
- ◆ Sulfur hexafluoride -- SF_6

▲ Base Period

- ◆ 1990 for CO_2 , CH_4 , and N_2O
- ◆ 1990 or 1995 for HFCs, PFCs, and SF_6

Kyoto Protocol Developed Countries

▲ Targets & Timetables

- ◆ 38 Developed Countries
- ◆ Differentiated Targets
- ◆ 5.2 Percent Avg. reduction (versus 1990)
- ◆ 6 Greenhouse gases
- ◆ Commitment period: 2008 - 2012

Kyoto Protocol

▲ Ratification

- ◆ Effective on February 16, 2005
- ◆ 55 countries ratify (112 ratified)
- ◆ 55% of Developed Country Emissions

▲ Second Commitment Period

Kyoto Protocol Policies and Measures

- ▲ Enhance energy efficiency
- ▲ Increase use of new and renewable forms of energy
- ▲ Phase out market imperfections
- ▲ Limit or reduce emissions of greenhouse gases

Kyoto Protocol Clean Development Mechanisms

- ▲ Emission reduction credits for projects between all parties
- ▲ Sharing Technologies
- ▲ Exporting Technologies

Kyoto Protocol Emissions Trading

▲ Developed Countries

▲ Details at MOP-2 (November 2006)

THE HVACR CONTRACTOR'S WEEKLY NEWSMAGAZINE SINCE 1926
Air Conditioning | Heating | Refrigeration

the NEWS

JULY 26, 2004 WWW.ACHRNEWS.COM A BNP MEDIA PUBLICATION \$3.00

HFCs Are On Shaky Ground In Europe

By Peter Powell
Of The News Staff

B RUSSELS, Belgium — HFCs remain on solid footing for the foreseeable future in North America, but they appear to be on very shaky ground in Europe.

A recent alternative refrigerant conference in Brussels drew 300 people to hear representative from such high-profile companies as Coca-Cola, McDonalds, and Unilever pledge that they will do whatever they can to end the use of HFCs in their refrigeration equipment used in many locations in Europe.

In a statement issued at the time of the conference, environmental group Greenpeace reported, "Unilever [said it] will purchase only HFC-free ice cream cabinets. Already some 14,000 units have been replaced. Coca-Cola..."

Continued on page 5

HFCs are increasingly used as ODS substitutes

European HFC Restrictions

▲ Denmark

- ◆ General HFC ban in 2006
- ◆ Large HVAC equipment HFC ban in 2007

▲ Austria

- ◆ HFC ban on appliances, HVAC, and autos in 2008

▲ Switzerland

- ◆ Domestic Refrigeration HFC Ban - 2003
- ◆ Air Conditioners HFC Ban - 2005
- ◆ Mobile Air Conditioning HFC Ban – 2008

European Union Draft HFC Regulation

▲ Containment of HFCs

- ◆ Prevent and minimize leakage
- ◆ Mandatory inspections
- ◆ Leakage detection systems
- ◆ Maintenance of records
- ◆ Recovery
- ◆ Training and Certification

▲ Automobile HFC-134a Ban

- ◆ No new vehicles with HFCs - GWP greater than 150 in 2012
- ◆ Prohibit sale of vehicles with HFCs greater than 150 in 2018

▲ 2005 Proposal in EU to ban HFC's in 2010

- ◆ Proposal voted down in parliament in November 2005
- ◆ Proposal will be revisited in 2008
- ◆ The clear focus on HFC's in EU is HFC containment
- ◆ Member states not allowed to enact more strict regulation

What is the best environmental solution?

Implications to the HVAC industry

It's Not Just About Global Warming

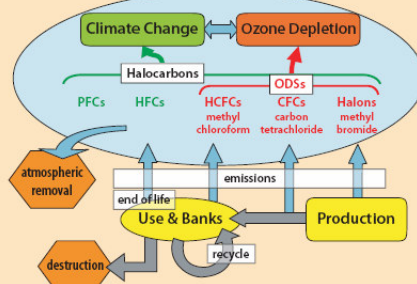
Two Protocols: One Integrated Solution

(Source: OzoneAction 50, 2005)

Montreal Protocol Contribution to Climate Protection

The IPCC/TEAP Special Report on Safeguarding the Ozone Layer and the Global Climate System (Issues Related to Hydrofluorocarbons and Perfluorocarbons) is the first integrated assessment of the efforts to protect the atmosphere through the Montreal Protocol and the UN Framework Convention on Climate Change and its Kyoto Protocol. It documents clear and persuasive scientific proof of the interconnections of climate change and stratospheric ozone depletion. It emphasizes the importance of coordinated early actions protect humans and their ecosystems from both dangers.

Figure 1. Major issues addressed by the IPCC TEAP joint report



Source: www.ipcc.ch/ipcc/srm/pdf_page1

Protocol can protect both the climate and the ozone layer while addressing... **...HCFC phaseout option does not need to apply for all uses: the Protocol could continue to permit HCFC-123 for applications where it demonstrates superior energy efficiency and near-zero emission...**

...continue to permit HCFC-123 for applications where it demonstrates superior energy efficiency and near zero emissions until an environmentally superior ozone-safe alternative is available and could permit HCFC-225 for applications where ODS-free substitutes are not yet technically or environmentally acceptable and for process agent applications, where they can replace more damaging CFCs. Service quantities of HCFCs might be required in developing countries for refrigeration and air conditioning equipment that cannot be retrofitted.

Parties to the UN Framework Convention on Climate Change could consider further protecting the climate and the ozone layer with economic incentives to reduce ODS emissions below levels allowed by the Montreal Protocol. For example, incentives could be considered for the portion of HCFC annual Montreal quotas not produced, for the amount of ODS collected and destroyed, and for ODS reductions by Article 5(1) countries below the stipulated compliance levels and for any incremental improvements in energy efficiency from replacing ODS in refrigeration, air conditioning, and thermal insulating applications. In addition, Parties could encourage only those HFC refrigerant and foam insulation applications that demonstrate superior Life-Cycle Climate Performance (LCCP).



**SCIENCE SYMPOSIUM: CHALLENGES AND PERSPECTIVES –
OZONE LAYER PROTECTION**

**19 NOVEMBER 2004
PRAGUE, CZECH REPUBLIC
Chaired by Professor Mario Molina**

“We can further protect the ozone layer by accelerating the pace of phase outs. However, the acceleration can consider the impact of greenhouse gas accumulation.

For example, HCFC-123 could be allowed in specific air conditioning applications where its use promotes superior energy efficiency and assures near-zero refrigerant emissions.”

UNEP Review: March 2003

**Assessment Report from Refrigeration, A/C and
Heat Pumps Technical Options Committee**

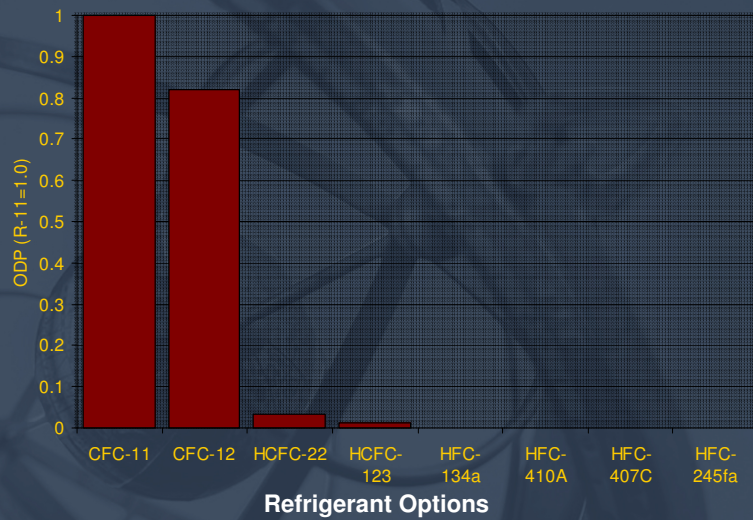
**“8.4.2.7 Environmental Evaluation for Retention of HCFC-123 as a
Refrigerant for Centrifugal Chillers”**

“Refrigerant HCFC-123 has a favourable overall impact on the environment that is attributable to five factors:

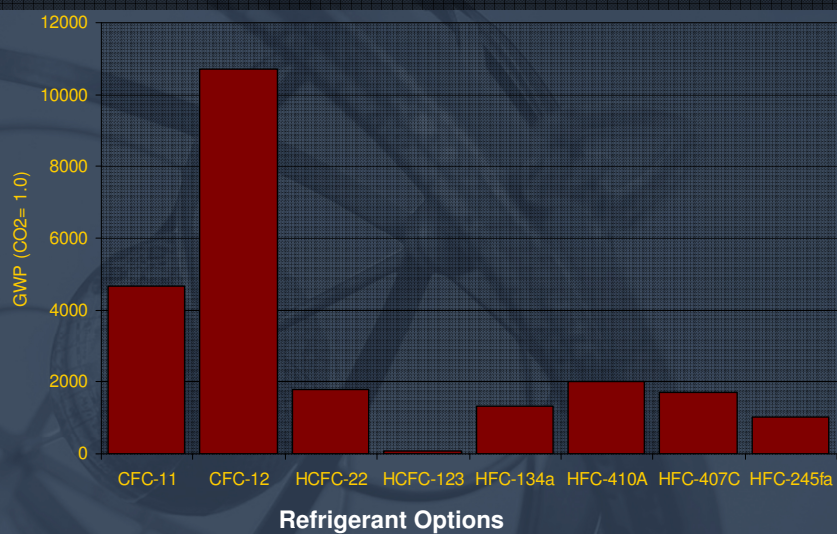
- (1) a low ODP
- (2) a very low GWP
- (3) a very short atmospheric lifetime
- (4) the extremely low emissions of current designs for HCFC-123 chillers
- (5) the highest efficiency of all current options

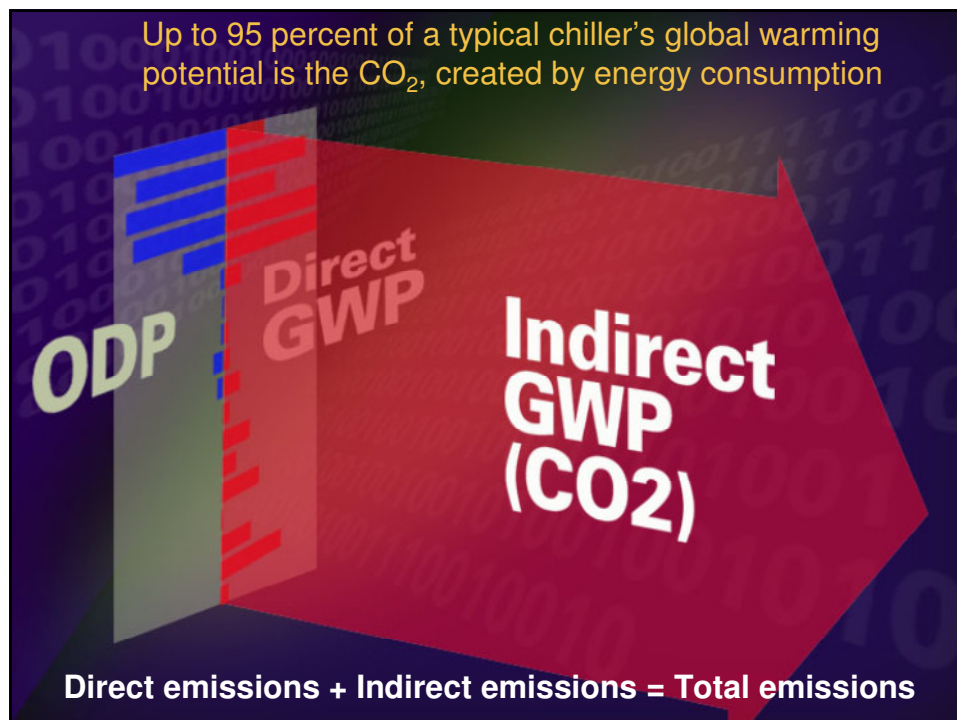
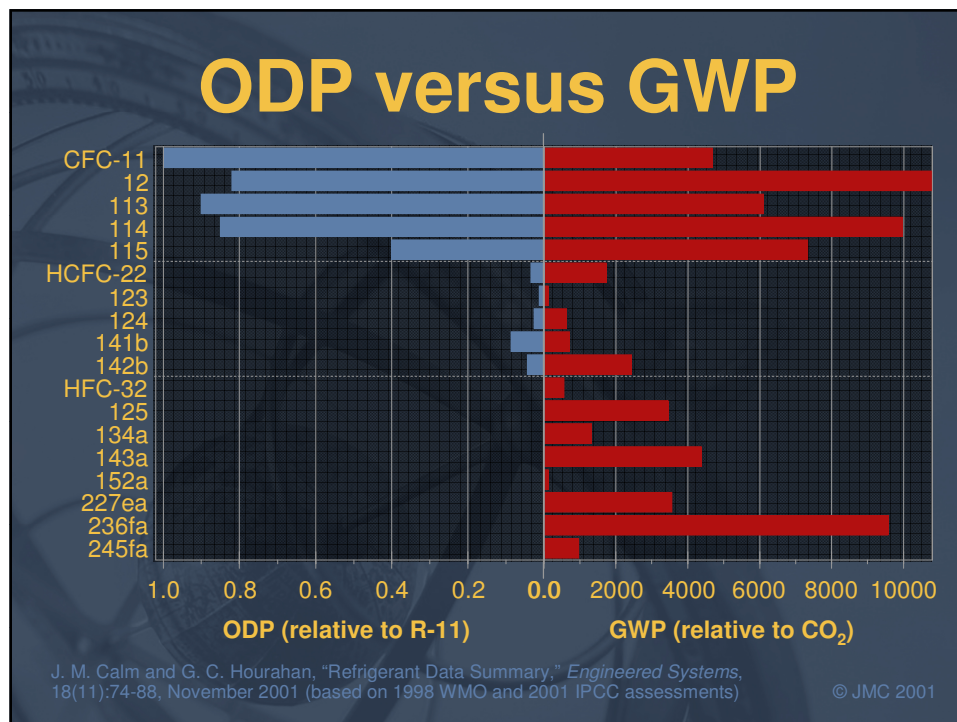
Based on integrated assessments, considering the tradeoffs between negligible impacts on stratospheric ozone and important benefits in addressing global warming, these studies recommend consideration of a phase out exemption for HCFC-123.”

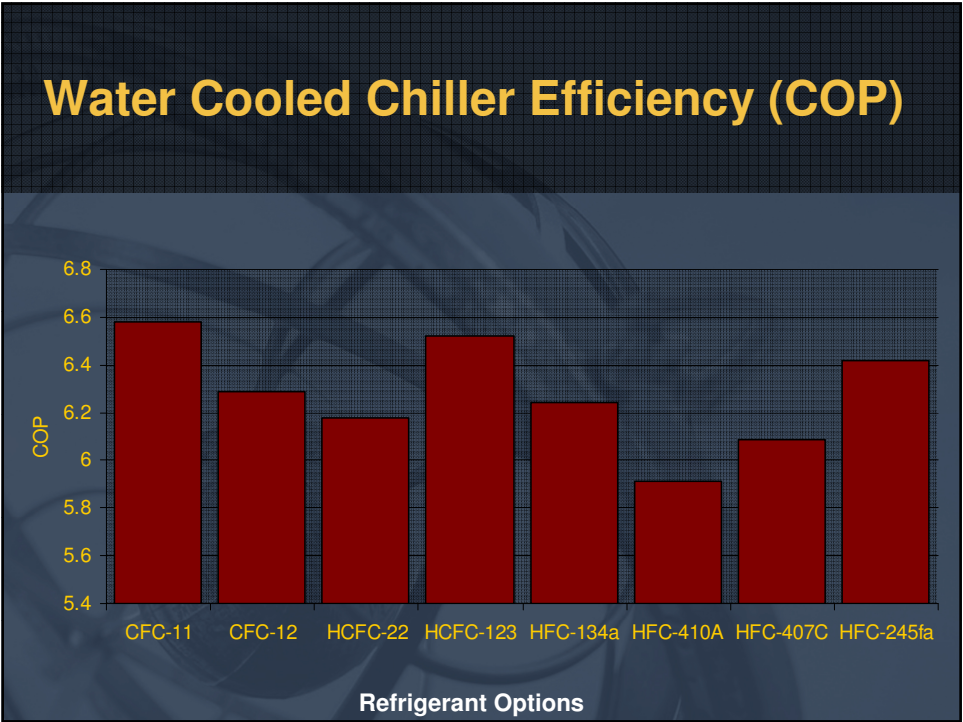
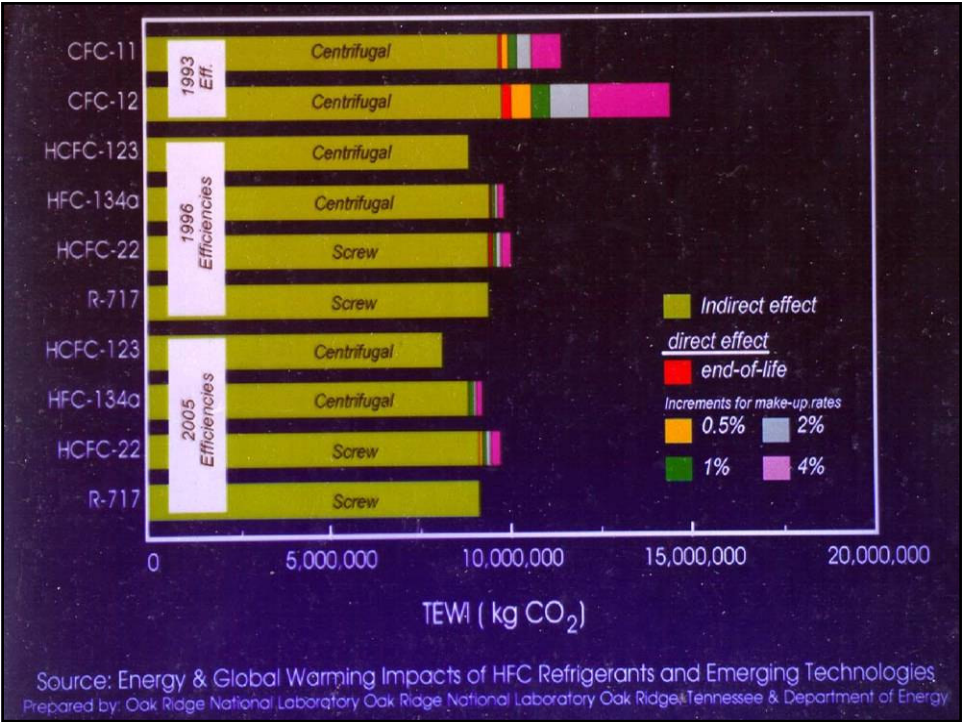
Ozone Depletion Potential (ODP)



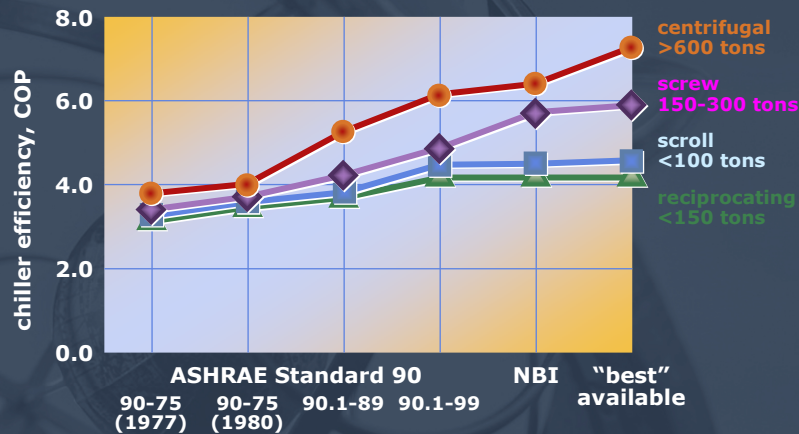
Global Warming Potential (GWP)





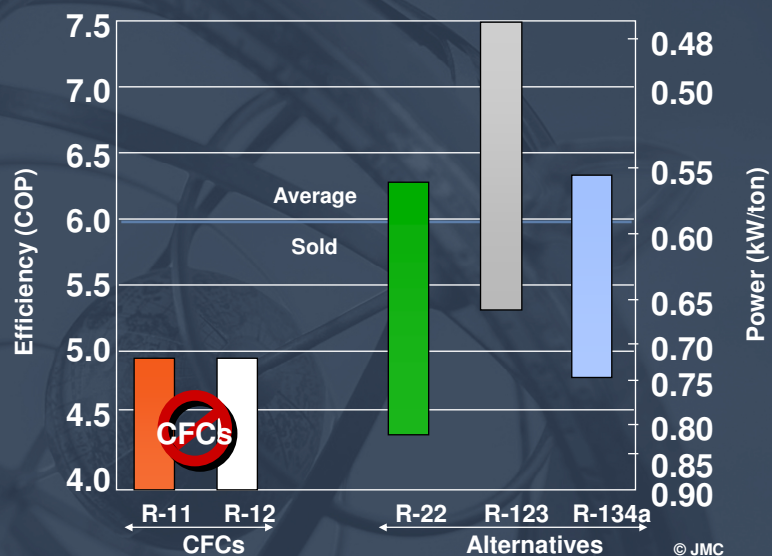


a history of Chiller Performance

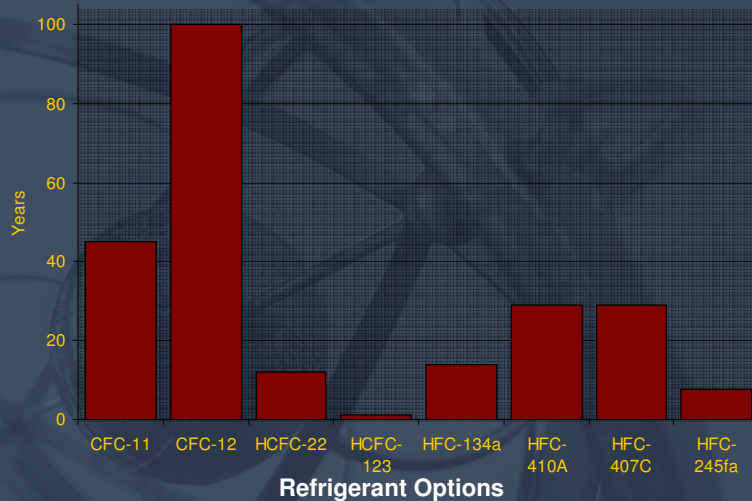


Chiller Efficiencies

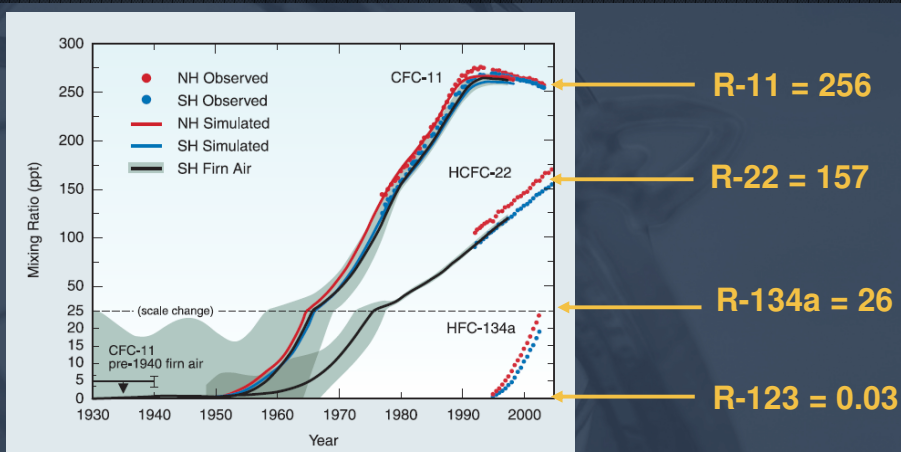
400 ton, water-cooled chillers (all compressor types)



Atmospheric Half-Life

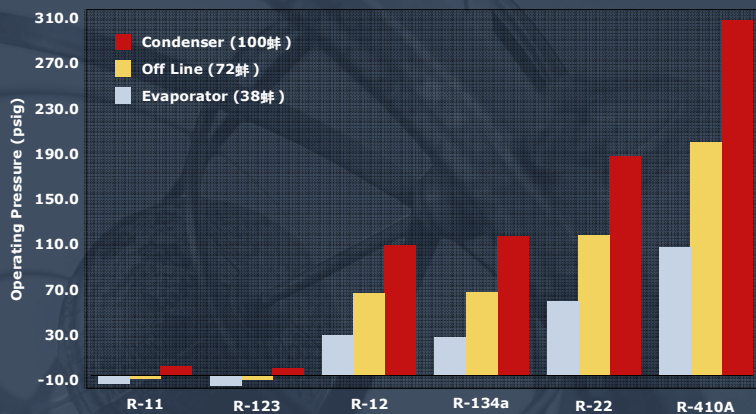


Observed Global Concentration Trends



Source: IPCC/TEAP Special Report on Safeguarding the Ozone Layer and the Global Climate System

Operating Pressure vs Emission



Refrigerant Options

How Long Would it Take to Discharge 50% of the Refrigerant into the Equipment Room?

Refrigerant	High Side Pressure (psig)	Discharge Time (minutes)	Offline Chiller (psig)	Discharge Time (minutes)	Low Side Pressure (psig)	Discharge Time (minutes)
R-11	8.8	22	-.8	Never	-8.0	Never
R-123	6.1	25	-2.8	Never	-9.2	Never
R-12	117.2	4	72.8	9	35.2	11
R-134a	124.1	5	74.1	7	33.1	13
R-22	195.9	3	125.7	4	65.6	8
R-410A	316.6	2	207.1	3	114.0	5

Chiller Emissions Study in U.S.

Number of Trane R-123 CenTraVacs	2768
Total Pounds of Charge	3,547,612 lbs
Total Pounds of Charge Added	16,229 lbs/yr
Annualized Total Loss Rate	0.4575 %



*The Trane Company
1997 Survey Results*

Study corroborated in "Impact on Global Ozone and Climate From Use and Emission of (HCFC-123)" By Calm, Wuebbles and Jain

The Future

Emissions



**Energy
Efficiency**



*Focusing on Emissions and Efficiency is
fundamental to doing what's right
both for business and the environment.*

Thinking Green

- ▲ Designing building for “best value versus lowest cost”
- ▲ Setting priority to energy efficiency
- ▲ Considering resource sustainability

“Green” Opportunities are Tremendous for:

- ▲ Building Owners
- ▲ Consulting Engineers
- ▲ Contractors
- ▲ Manufacturers
- ▲ Facility Engineers

Summary and Expectations

- ▲ We are all responsible to our own environment
- ▲ The best environmental solution is the balanced approach towards the key problems
- ▲ Take ownership to maximize energy efficiency and minimize emission
 - ◆ Replace inefficient Chillers , HVAC systems, Lighting, and other appliances
 - ◆ Life Cycle Cost purchasing will be the preferable process for obtaining energy efficient systems, appliances, buildings, and automobiles



THANK YOU

**You are part of the
Environmental Balance.**