

**Accelerating HCFCs Phase-out
Process and Promoting New
Generation Environmental Friendly
Refrigerants in China**

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Oct. 12, 2010

My Topics

1. The rapid grow of Chinese R&AC industry
2. The CFCs phase-out progress
3. The HCFCs phase-out progress in China
4. The HCFCs phase-out progress in R&AC industry
5. Future works

1. The rapid grow of Chinese HVAC&R industry

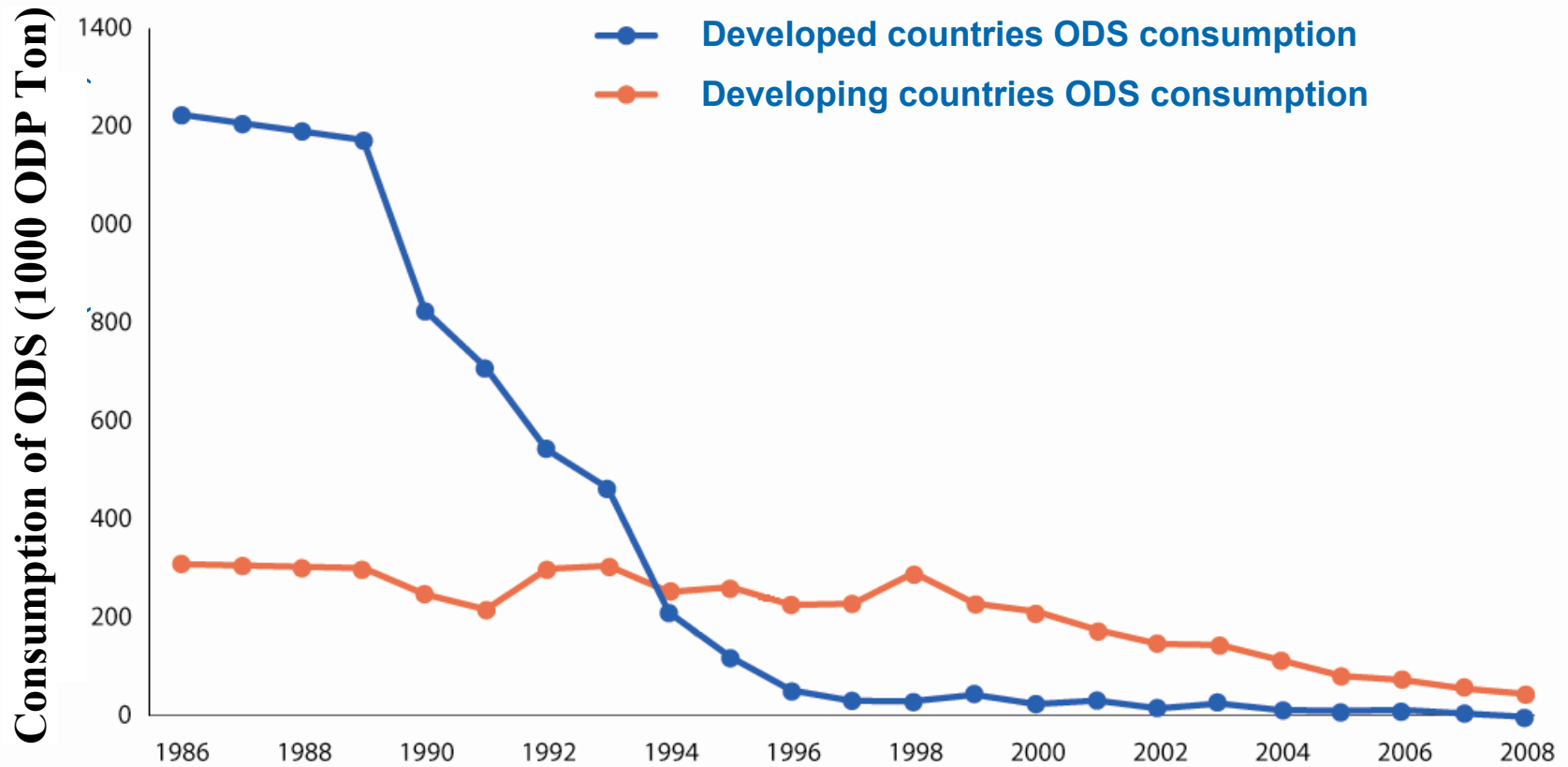
- **The backlash from Lehman shock appeared in first half of year 2009, but thanks to the government economic stimulus measures to boost the domestic demand, the entire industry showed a healthy growing trend again, from the second half of 2009.**
- **The gross production of HVAC&R industry in 2009 is 325 trillion RMB, achieved 5.9% increase over last year.**
- **The gross production of R&AC industry for commercial and industry sector along in 2009 is 143 trillion RMB, achieved 7.3% growth compared to 2008.**

2. The CFCs phase-out progress

Montreal Protocol

- **International community agreed the “Montreal Protocol on Substances That Deplete the Ozone Layer” in 1987, at Canada, in order to phase-out ODS from production to consumption, to protect the ozone layer which is the concern of the survival of our entire human race.**
- **Received high international reputation: Secretary-General of the United Nations Kofi Annan quoted as saying that “perhaps the single most successful international agreement to date has been the Montreal Protocol”.**
- **It has been ratified by 196 states up to June, 2010, and become the only widespread adopted and implemented international treaty.**

The Montreal Protocol was successfully implemented, and 95% of ODS in the world has been phased out



The adoptions of the protocol and its amendments in China

Protocol and amendments	Ratified by Chinese government
Montreal Protocol	June, 1991
London Amendment	June, 1991
Copenhagen Amendment	April, 2003
Montreal Amendment	May, 2010
Beijing Amendment	May, 2010

The overall progress of Montreal Protocol implementation in China

1) All the industries show a significant progress in ODS phase-out

- **Successfully phase-out the 12 ODS in production and consumption. The total phase-out is 100 thousand tons in production, and 110 thousand tons in consumption. Which is ahead of the CFCs and Halon phase-out schedule two and half year.**
- **Carried out more 400 individual projects, and 17 individual industry phase-out programs**

2) Made a significant contribution for the implementation of the protocol, showed a good example as a responsible nation

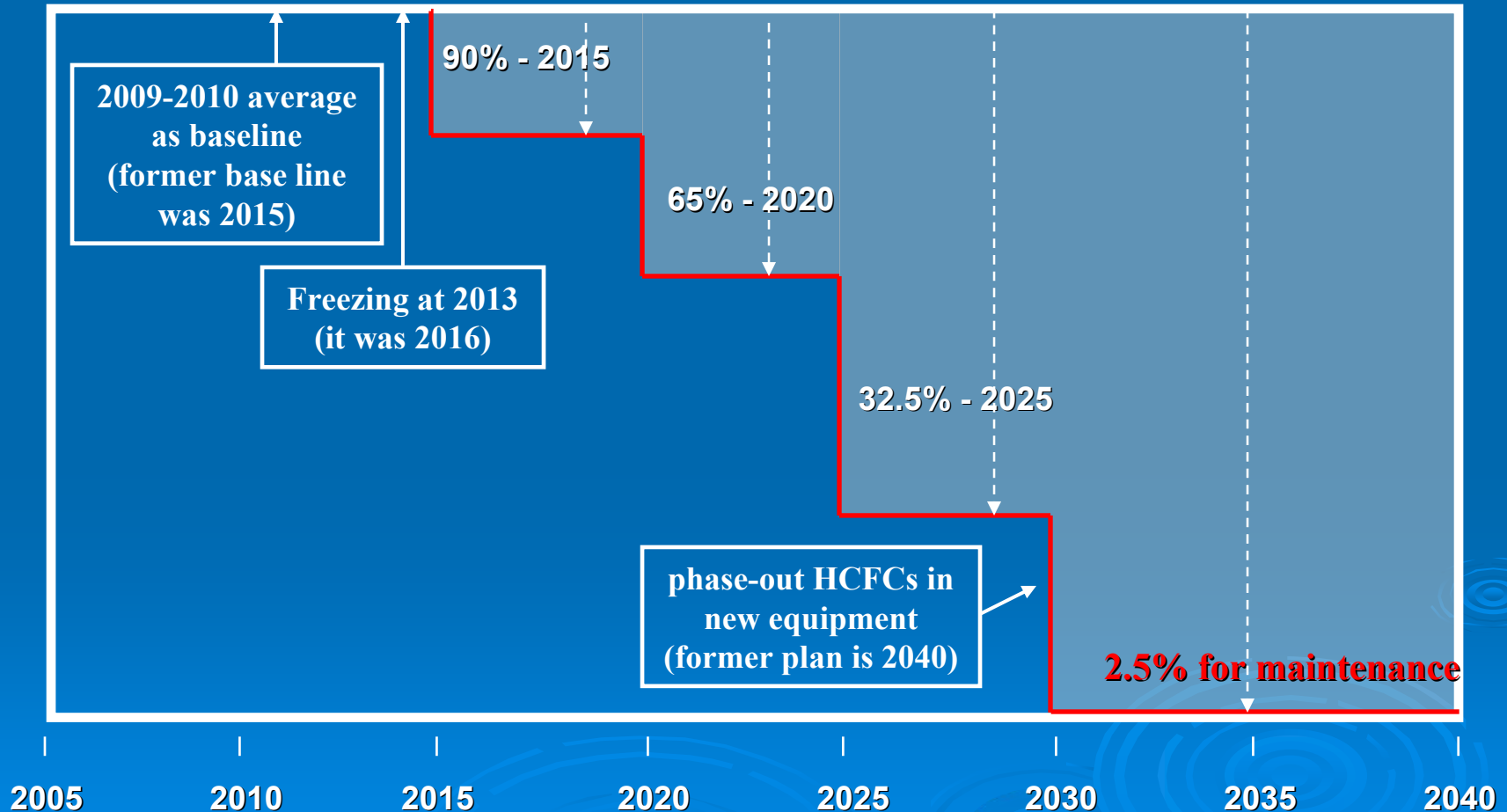
- The first national ODS phase-out program in the world(1991)**
- The first whole industry phase-out program(1997)**
- Use multilateral fund to support the products development with the original intellectual property (Successfully developed 10 thousand tons HFC134a synthesise plant in 2002)**
- Took the lead to accelerating the phase-out schedul(2004)**
- Took the lead of local capacity building for the protocol implementation (2005-2008)**

3. The HCFCs phase-out progress in China

1) Acceleration of HCFCs phase-out

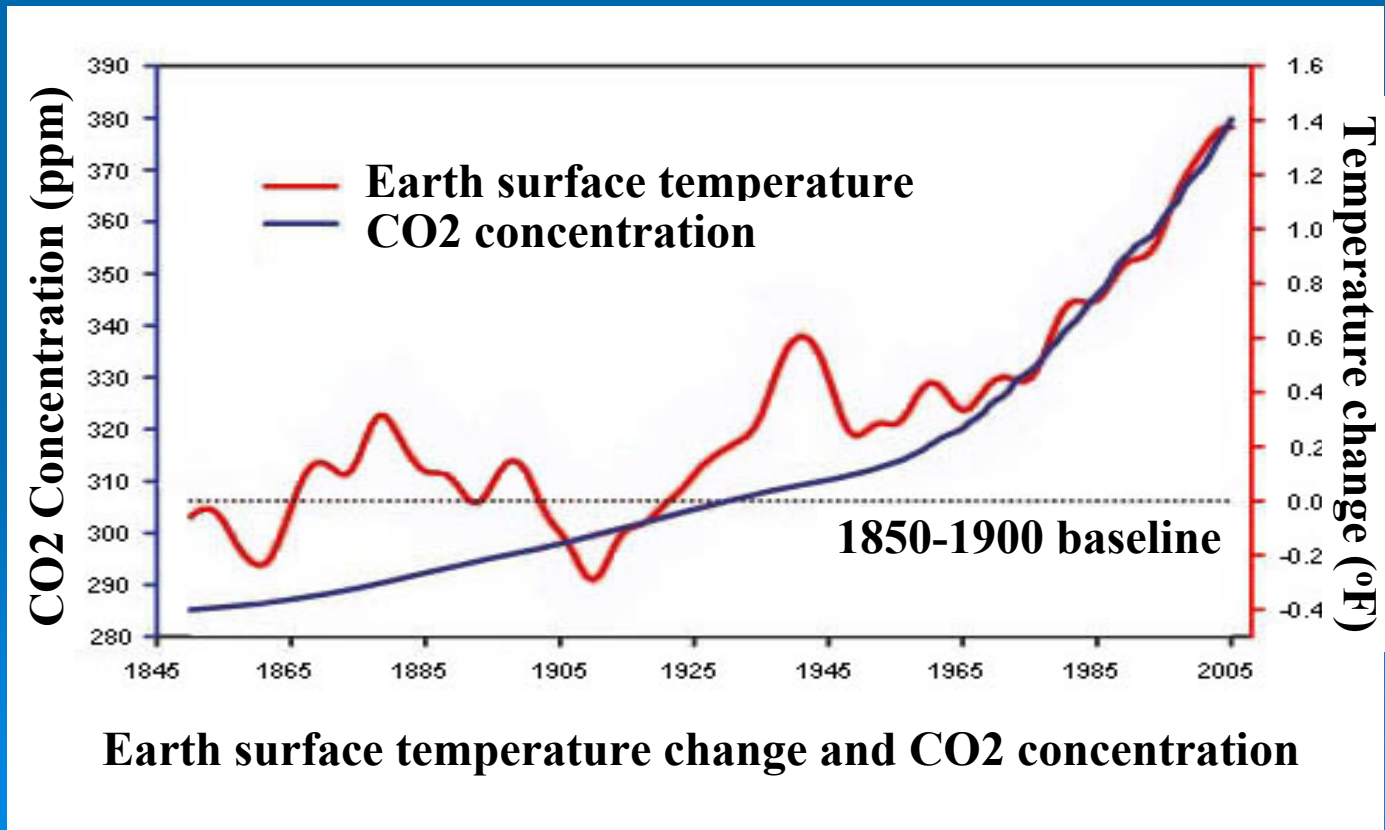
- Montreal Protocol plays a crucial and remarkable role in the ozone layer recovery and global environment protection**
- International community agreed to accelerate the HCFCs phase-out process at the 19th meeting, Sep. 2007, Montreal.**

Time table of the HCFCs phase-out in developing country



2) Kyoto Protocol

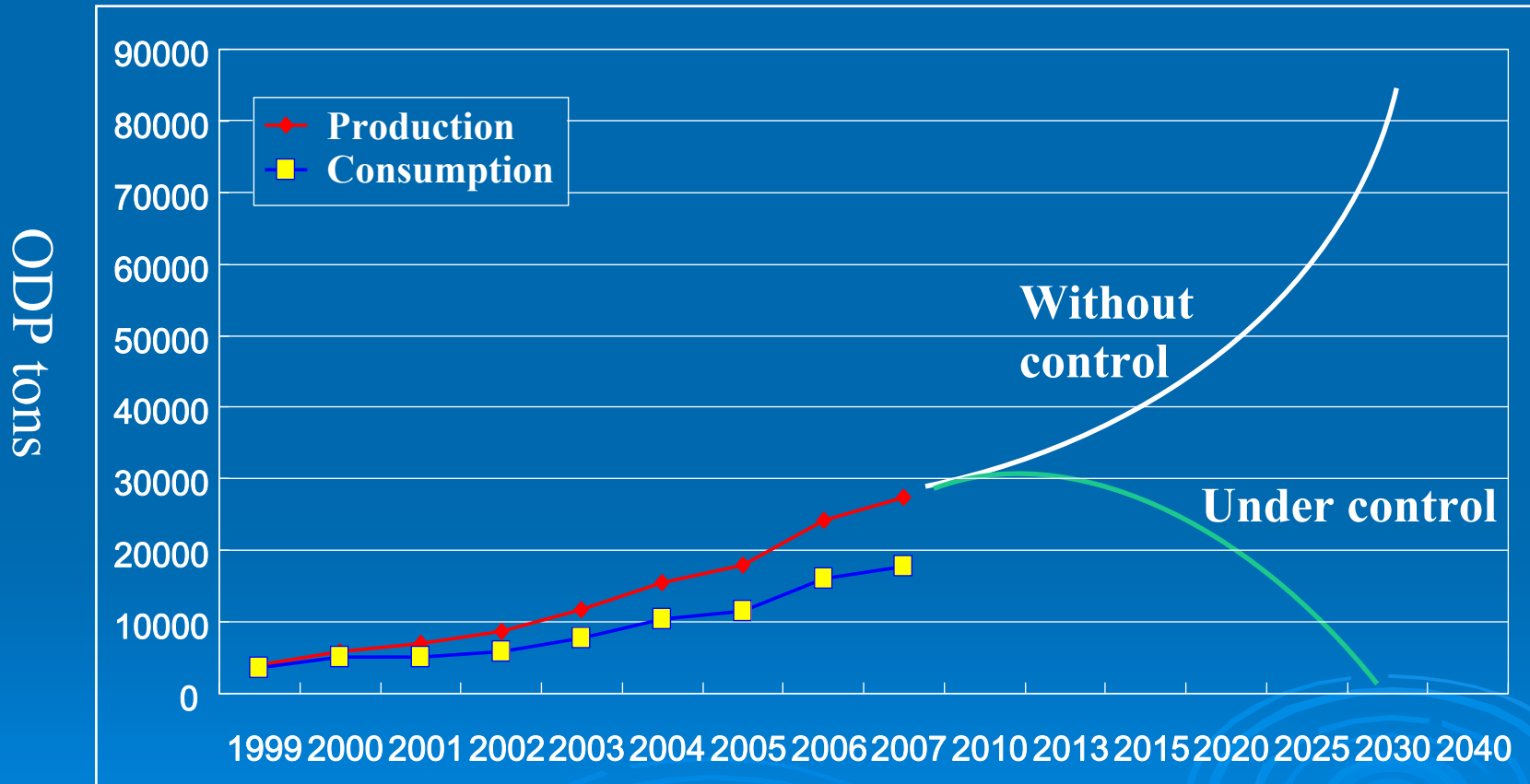
- Kyoto Protocol was adopted at the 3rd United Nations Framework Convention on Climate Change at Kyoto, Dec. 1997, which encourages international community to reduce the GHG emissions and sets binding targets for developed countries to reduce GHG emissions



- **According to the report by the scientists from USA and other countries, at the Netherland, Mar. 2007, the result of ODS phase-out equivalents to 1.1 trillion tons/year of CO₂ emission reduction (2008-2012). It is 5.5 times of Kyoto protocol GHG reduction target (the target for all developed countries is 0.2 trillion tons/year)**
- **HFCs which has zero ODP was widely adopted in the world, but they are still listed substances need to be reduced in terms of global waring.**
- **It becomes a common goal and responsibility for international community to develop zero ODP and low GWP substances.**
- **Under the both Montreal Protocol and Kyoto Protocol, the industrial communities have to face a significant risk and uncertainty for their survival and growth.**

3) The HCFCs phase-out progress in China

HCFCs production and consumption in China

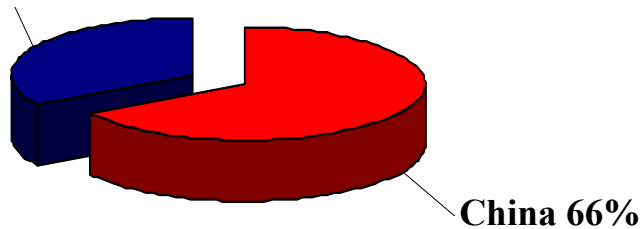


HCFCs production and consumption increase 20% annually, between 2002 – 2007 .

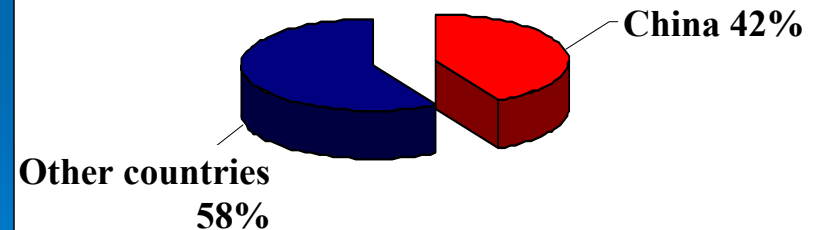
- **HCFCs phase-out becomes the biggest challenge of Montreal Protocol**
- **China draws a lot of attention**

Breakdown of global HCFCs production

**Other countries
34%**



Breakdown of global HCFCs consumption



- **The Ministry of Environmental Protection take the lead to establish the phase-out program of China.**
- **Industrial associations are responsible for making industries phase-out programs.**

HCFCs Phase-out Management Plan (HPMP)

- **July 2008, Multilateral fund committee approved Chinese HPMP action plan**
 - **China HPMP-UNDP**
 - **Industrial & Commercial Refrigeration (ICR) Sector HPMP-UNDP**
 - **Residential Air-conditioning Sector HPMP-UNIDO**
 - **Maintenance and Service Sector HPMP-UNEP**
 - **PU Foam Sector HPMP-World Bank**
 - **XPS Foam Sector HPMP-German GTZ, UNIDO, UNDP**
 - **HCFCs Producer Sector HPMP-World Bank**
 - **Capacity Building, Publicity, Training Program-UNEP**

4. The HCFCs phase-out progress in R&AC industry

- **After years of active efforts and hard working, China successfully phased-out CFCs by July 1st, 2007, two and half years ahead of the Montreal Protocol program, achieved a brilliant success in the first step.**
 - **Published “Strategy of China ICR&AC Industry CFCs Phase-out Process” in 1995**
 - **Established “China ICR&AC Industry CFCs Phase-out Action Plan” in 2002**
 - **ICR&AC Sector phased-out CFCs about 13,000 tons.**

1) Status quo of refrigerants in China

- R22 is the primary refrigerant in Chinese R&AC industry.
- The consumption of R22 in 2008 is given as below;

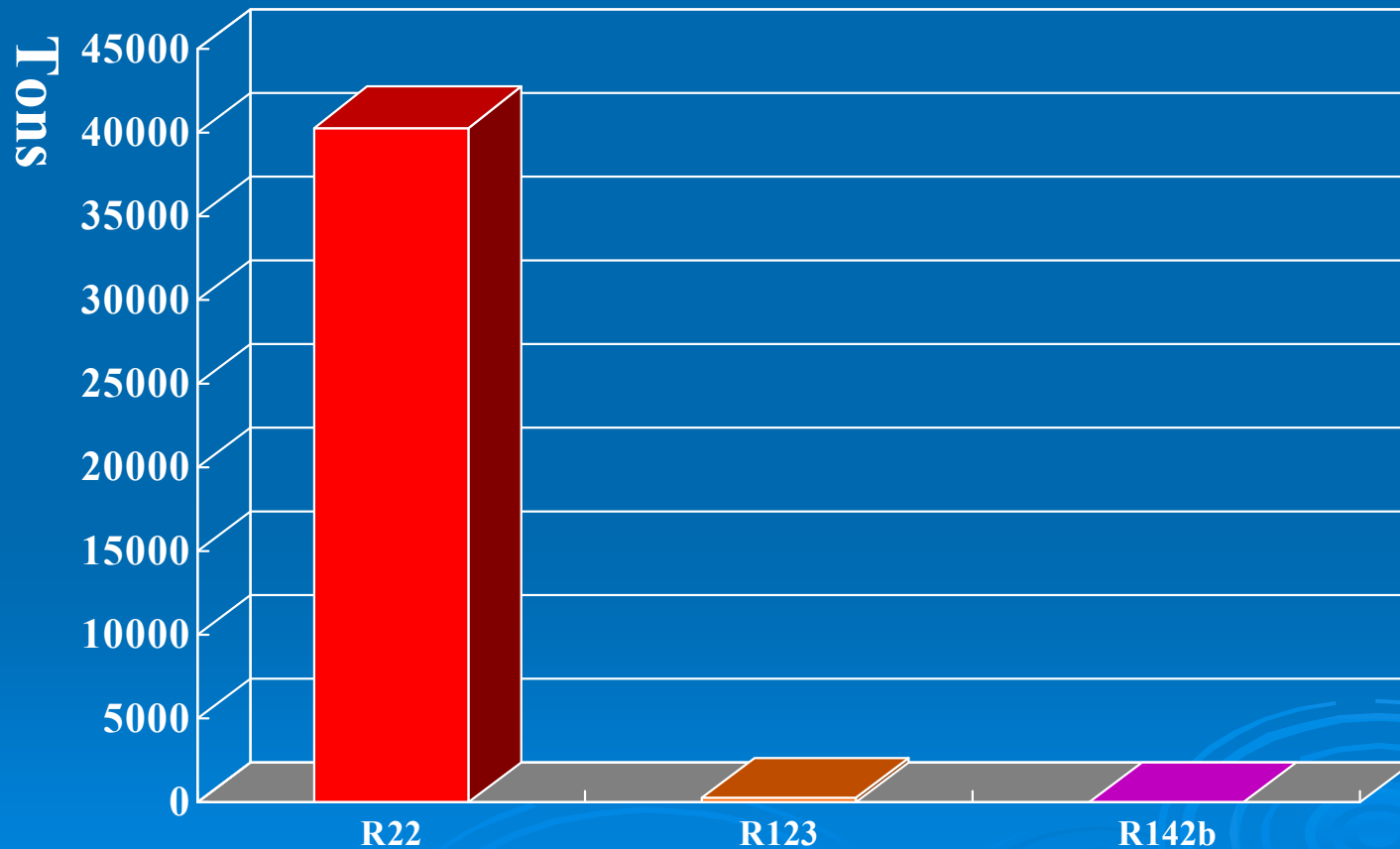
For total R&AC sector

- Equipment manufacturing: 100,000 tons
- Maintenance and service: 30,000 tons

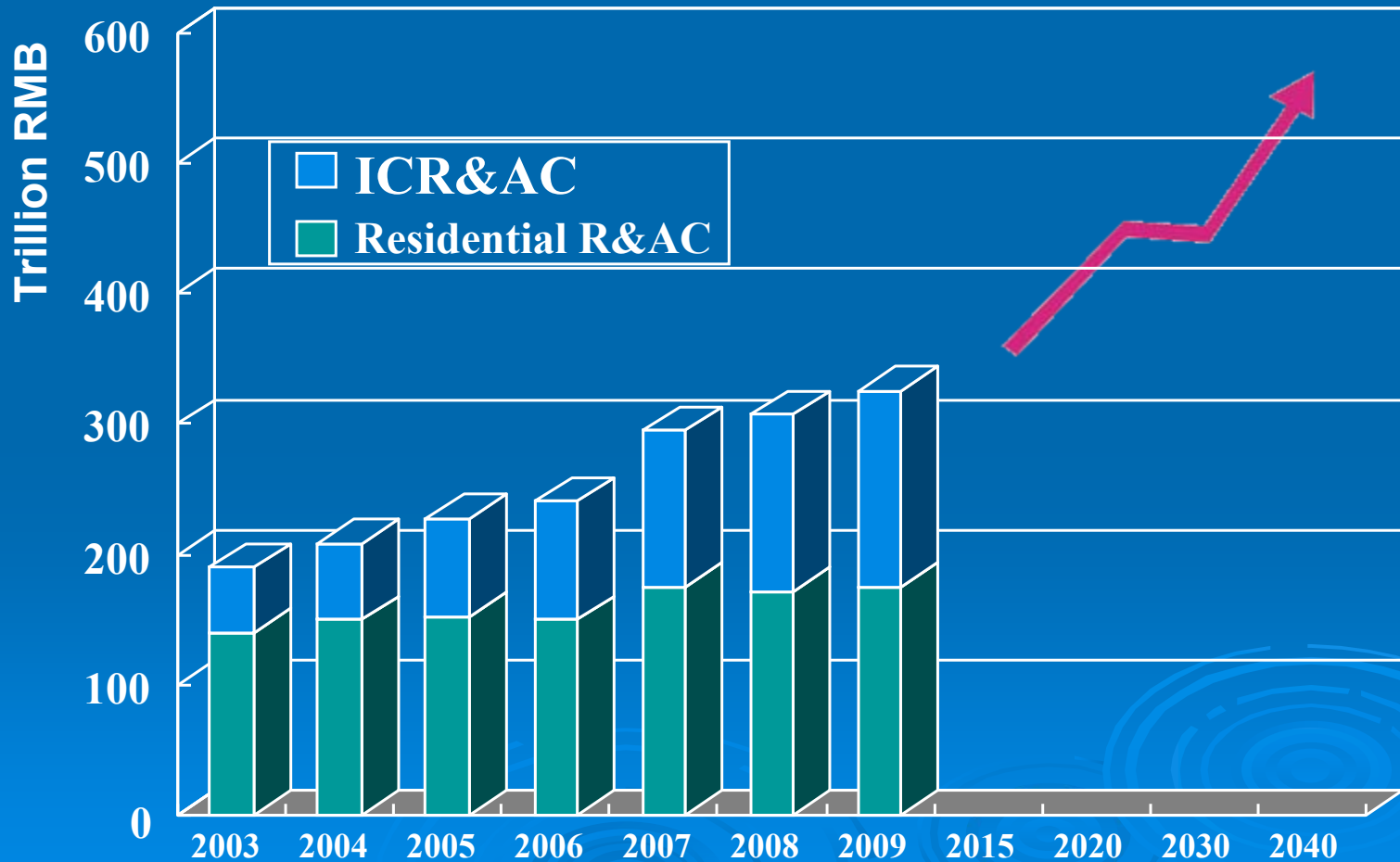
For ICR&AC sector along

- Equipment manufacturing: 40,000 tons
- Maintenance and service: 15,000 tons

HCFCs breakdown for ICR&AC equipment manufacturing sector 2008



2) Status quo of gross production of Chinese R&AC industry



3) HCFCs Phase-out Management Plan

- **CRAA and CHEAA were pointed by the Ministry of Environmental Protection to conduct the fundamental data survey, and to draft a phase-out management plan for R&AC manufacturing and maintenance service sector.**

- **Highlight of the HPMP**
 - **Conduct data survey**
 - **Explore alternative technologies and exchange of knowledge**
 - **Promote demo projects**
 - **Initiate standards and codes studies**
 - **Phase-out strategy: follow the national time schedule, freezing at 2013, 10% reduction at 2015; reinforce the refrigerant recovery/recycle**

4) Explore alternative technologies

a) Organized China ICR&AC HCFCs Alternative Technology Committee

- Provide consultation and evaluation to the industries regarding the HCFCs phase-out plan, technology choices, action plan, etc.**

b) Factors for considering the lines of the alternative technologies

- **19th Meeting of the Parties Decision XIX/6**
“encourages Parties to promote the selection of alternatives to HCFCs that minimize environmental impacts, in particular impacts on climate, as well as meeting other health, safety and economic considerations”
- **Up-to-date, there is no zero ODP, low GWP, high energy efficiency, safe, and low cost refrigerant have been found.**
- **Different parts of the world, different experts may have different opinions and criteria for the future alternatives.**

- **Alternative choices should not only consider the GWP, but consider the overall climate impact during it's life time, and evaluate the alternatives in all aspects (i.e., adopt LCCP or TEWI evaluation)**
- **From the environmental point of view, the lowest overall climate impact during the entire life time should be the criteria to choose the alternatives, and this is also the most reasonable and the best choice for human society.**
- **Equipment manufacturers must also consider the safety, technology maturity, availability, manufacturing cost, market acceptance, and also the installation/maintenance/service cost.**

c) The Present Alternative Candidates

- **For industrial and commercial applications: HFCs appears to be the realistic candidates, and exploring the possibility of R32 for small and medium range capacity air-conditioning applications.**
- **For residential applications: R410A is already widely adopted, and exploring the possibility of R290 for small capacity residential air-conditioning applications.**

- **Montreal Protocol Multilateral Fund Executive Committee 60th meeting approved four HCFCs alternative technology development demo projects proposed by Chinese R&AC industry:**
 - **Tsinghua Tong Fang Artificial Environment Co. Ltd.: Conversion from R22 to R32 in the manufacture of commercial air-source chillers/heat pumps**
 - **Yantai Moon Group Co. Ltd.: Conversion from R22 to ammonia/CO2 in the manufacture of two-stage refrigeration systems for cold storage and freezing applications .**
 - **Guangdong Meizhi Co.: Conversion of room A/C compressor manufacturing from R22 to propane.**
 - **Midea Room Air-conditioner Manufacturing Company: Conversion from R22 to propane in the manufacture of room A/C.**
- **German GTZ also funded a project for conversion from R22 to propane at Gree Electric Appliances Inc.**

d) Policies and Regulations in China

- Amending “Air Pollution Prevention and Control Law”, ozone layer protection will be revised and become an individual chapter.
- Dec. 2008, Ministry of Environmental Protection issued official notice “Strict Control of the Newly Build, Renovation, or Expansion Projects with Hydro-Chloro-Fluoro-Carbons Production Capability”
- Oct. 2009, Ministry of Environmental Protection issued amended notice “Strict Control of the Newly Build, Renovation, or Expansion Projects with Hydro-Chloro-Fluoro-Carbons Production Capability”
- Mar. 2010, 2010.3 the State Council announced “Regulation of Ozone Depletion Substances”, effective June 1st, 2010

Regulation of Ozone Depletion Substances

- **Publish regulated ODS name list**
- **Industrial policy**
(Screen out the outdated technologies)
- **Gross control of ODS production and consumption, and license control**
- **Documentation of the ODS sales**
- **Report of ODS data**
- **Recover, recycle, and destroy ODS management system**

e) Pressures and Challenges

- **The HCFCs consumption of the R&AC industry is enormous.**
- **The target for freezing at 2013 level, and reduce 10% by 2015 is a formidable challenge, and the time is short.**
- **The ideal refrigerant is still not found.**

- **Phase-out plan tangled with various style, scale, condition, and products manufacturers, to organize and manage this this process is a very difficult task, and tons of works need to be done.**
- **The R&AC industry has to put an enormous effort to meet the first target of freezing the refrigerants consumption at 2013 level, because the demand for the refrigerants increases rapidly every year, due to the steady growth of Chinese R&AC industry.**
- **The entire phase-out and technology transition process need a huge input of both funds and man power.**

5. Future works

- Closely watching the development of the alternative technologies, promoting zero ODP, low GWP refrigerants. (->low overall climate impact refrigerants(lccp, tewi, etc))
- We will follow the path of energy saving, environmental protection and emission reduction, take our part of responsibility to preserve our common living space – fragile earth.

Thank you !