



The Importance of Mobile Air Conditioning to Climate Protection

Stephen O. Andersen
US EPA

US & EC Share Climate Concern

- The United States shares global concern for Climate Change and is taking action outside the Kyoto framework
- Vehicle air conditioning is a global technology that requires global solutions to achieve sustainable results
- European Commission Leadership and the hard work and dedication of Matti Vainio and colleagues has set the stage for regulatory and market incentives

EPA Approach to Vehicle AC

- Performance, Not Prescription
- Environmental Cost-Effectiveness
- Partnerships at the Speed of Business
- Cooperation on Standards and Testing
- Government as Customer (e.g. US Army)
- Proactive on Refrigerant Safety and Environmental Protection

Global MAC Partnerships Speed New Mobile AC Technology

- RACE, PNGV & Freedom Car
- The Mobile Air Conditioning Climate Protection Partnership (MAC-CPP)
- Alternate Refrigerants Task Force of the Society of Automotive Engineers (SAE) Interior Climate Control Standards Committee
- SAE Alternative Refrigerant Cooperative Research Program (ARCRP)

MAC Climate Protection Partnership

- Goals
 - Minimize Emissions from HFC-134a Systems, Cooperate on Next-Generation AC Systems, Communicate Technical Progress
- Global Partners
 - Society of Automotive Engineers, Mobile Air Conditioning Society Worldwide
 - Canadian, EC, Japanese, US Environmental Authorities
 - Non-Government Research and Safety Organizations
 - Vehicle, System and Component Suppliers from Canada, France, Germany, Italy, Japan, Korea, Sweden, USA
- New Partners Welcome

HFC Unequivocal 1990 Choice

- Mobile AC Emissions Limited Choice
 - High vehicle refrigerant leaks and service and disposal venting prior to commercialization of recovery/recycle
 - Rejecting toxic, flammable, and high-pressure options
- HFCs Were Familiar but Daunting
 - Easy: physical properties, non-flammable, low toxicity
 - Hard: lubrication, materials, price, supply...
- Global Industry and Government Consensus
 - Saved the ozone layer: R&R plus zero-ODP HFC-134a
 - Six times lower GWP than CFC-12 plus containment
 - No disruption of vehicle markets, comparable performance, increased reliability, unnoticed cost

Why Reconsider HFC-134a?



- Significant HFC Greenhouse Gas Contribution
 - High leak rates in many markets
 - Global failure to enforce HFC recovery at service and disposal
 - Recharge without repair—even by amateurs
 - Vehicle AC penetrating global markets
- Limited Accountability for Fuel Efficiency
- European Agreement of +25% Fuel Efficiency by '08 (aiming at 140 g/km and further to 120 g/km)
- New Vehicle Platforms--DI, Fuel Cell, Hybrid
- EC, German, and other CO2 Leadership
- Enhanced and Future HFC-134a, HFC-152a, and HC
- Safety confidence for CO2 and flammable refrigerants

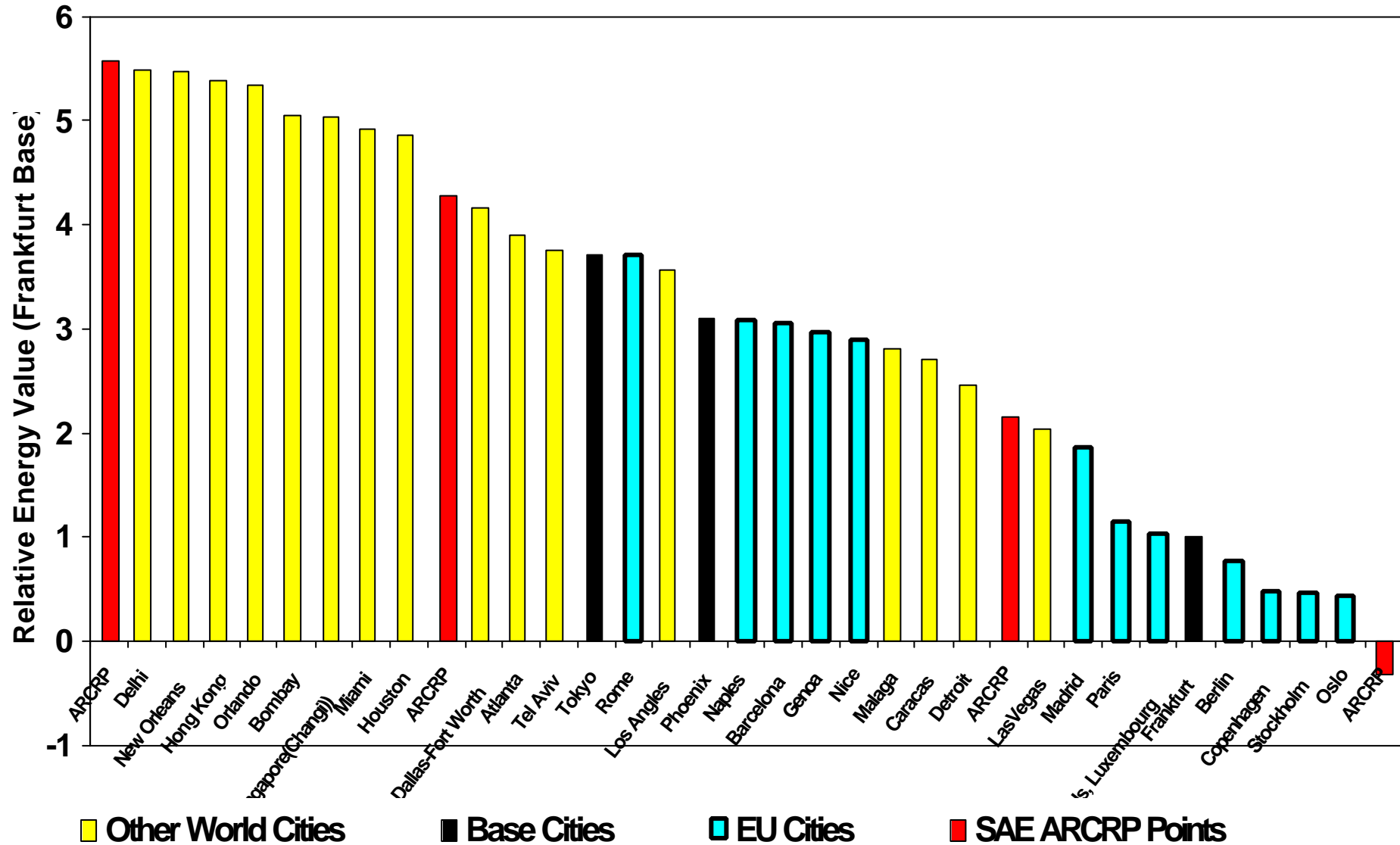
Developing Country Concerns

- Wise Choice for Domestic Mobile AC
 - Fuel efficiency, reliability, safety, and cost
- Vehicles Acceptable for Export Markets
- Opportunity to “Leap Frog” Newly Obsolete Technology
- Avoiding Over-Investment in HFC-134a Production Capacity

Mobile AC is Global

- High penetration and inventory in Asian and North American markets
- Increasing penetration in European and South American Markets
- Huge new markets in China, India, and other countries with increasingly prosperous citizens gaining access to personal transportation
- People generally live in or near hot and humid climates where mobile AC provides comfort

Global Mobile Cooling Challenge



Life-Cycle Climate Performance (LCCP)



- Direct Refrigerant Emissions:
 - CFC and HFC refrigerants used in MACs are potent greenhouses gasses that directly contribute to climate change
- Indirect Fuel Emissions:
 - Additional fuel burned to transport and power mobile AC results in CO₂ tailpipe emissions that indirectly contribute to climate change
- Embodied Manufacturing Emissions
- Necessary Disposal and Recycling Emissions

Vehicle AC Transition

- CO₂--AC and Heating
 - Cabin heating for next-generation vehicles
 - Toyota choice for fuel cell fleet; DaimlerChrysler, Audi, BMW, VW, and European leadership
 - EC holds the keys to CO₂ AC future
 - Regulatory incentives are essential
- Enhanced HFC-134a--Efficient/Leak Tight
 - Immediate relief for existing vehicles
- Hydrocarbon and HFC-152a
 - Incremental technology, traditional operating pressures, superior LCCP to HFC-134a, low marginal cost, local sourcing and patent-free technology for developing countries

MAC Summit Preview



(Future costs uncertain, not including servicing and retooling)

AC System Choice	Reduced Direct Emissions	Reduced Indirect Emissions	Added Cost (Euros)
HFC-134a	Baseline	Baseline	Baseline
Enhanced 134a	50%	25%	20
HFC-152a	95%	0-10%	15
Future 152a	95+%	30+%	40
CO2	100%	<20%	40-180?
Future CO2	100%	30+%	40-150?

EC Choice -- Proven Menu

- Voluntary Partnerships and Corporate Pledges
- Require HFC Recovery at Service and Disposal
 - USA, Japan, Australia (EC @ Disposal only)
- Sell Refrigerants Only to Certified Technicians
- HFC Deposits and Taxes as Price Incentives and to Finance HFC Management
 - Australia, Denmark, Japan, and Norway
- Tax Credits and Driving Privilege For Fuel-Efficient Vehicles
 - Japan, US, California, Maryland, Virginia

EC Choice -- Promising Menu

- Incentives for Enhanced Systems
 - MACS in Fuel Efficiency Standards
 - Grants to Develop Revolutionary Technology with Superior LCCP
 - GWP Tax for Refrigerants
 - Mandated Enhanced Systems and Best Engineering Practices
- Certified Repair Parts
- Prohibited Emissive Service Procedures