Meeting Report

Selecting and Best Service Practices for Air Conditioning and Refrigeration Equipment Using Next-Generation Refrigerants for Energy Efficiency and Climate Protection

Summary

Selecting and Best Service Practices for Air Conditioning and Refrigeration Equipment Using Next-Generation Refrigerants for Energy Efficiency and Climate Protection was a one-day workshop that brought together India's business, government, air conditioning trade association, and civil society leaders to share the latest information on ozone-safe, low-GWP, energy-efficient Room Air Conditioning (RAC) and Mobile Air Conditioning (MAC).

The workshop was hosted at Mahratta Chamber of Commerce, Industries and Agriculture, Senapati Bapat Road, Pune, Maharashtra-411016, India on Wednesday, 5th March 2014. It included 14 presentations with additional time for discussion. In the afternoon, roundtable participants summarized their recommendations in the *Pune Declaration on Low Global Warming Potential Alternatives to Ozone Depleting Substances* in India, which was reviewed and edited to the satisfaction of all attending with a final draft to be circulated by e-mail for any word smithing or corrections.

A full list of participants is included in Appendix A. The meeting agenda is included in Appendix B. The final meeting outcome, *the Pune Declaration on Low Global Warming Potential Alternatives to Ozone Depleting Substances in India* is in Appendix C. Photos from the workshop participants are included in Appendix D.

Morning Session

Mr. Jayant Joshi, President of the Pune Chapter of American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE), opened the roundtable workshop and welcomed all of the participants to Pune. Mr. Joshi explained the chapter's dedication to the refrigerant issue. He highlighted that the chapter's focus, since its inception in 2009, is on refrigerant phase-out and explained ASHRAE Pune Chapter's work to provide training programs on the safe and efficient use of refrigerants and systems. He explained that the chapter is committed for promotion of natural refrigerants and green and sustainable growth.

Mr. Rajendra Shende, President of TERRE Policy Center, also welcomed the participants. Mr. Shende highlighted the link between air conditioning (AC) and refrigeration and climate change and the importance of addressing high global warming potential (GWP) refrigerants. Mr. Shende called attention to the benefits of improving energy efficiency while transitioning refrigerants, including benefits to building owners, consumers, and the national trade deficit of India. Mr. Shende outlined the goals and objectives of the workshop and suggested that participants discuss: (1) recovery/recycling/reuse best practices, (2) efficiency advantages of emerging alternatives to high-GWP refrigerants, (3) cost and financing of alternatives, and (4) developed country experience and how India can do better. He also recommended that at the end of the workshop, participants come to a broad agreement on principles and create a summary of principles and recommendations on India's transition to low-GWP alternative refrigerants. There was general agreement with the suggestion of a Declaration.

Dr. Stephen O. Andersen, Director of Research at the Institute for Governance & Sustainable Development (IGSD), presented the international scenario on emerging refrigerants and energy efficiency. Dr. Andersen began by explaining the urgency of addressing climate change and the similar urgency of

addressing ozone layer depletion at the time the issue was first discovered. Dr. Andersen explained how policies and technologies developed in response to the ozone layer crisis, though imperfect in terms of long-term global warming impact, came just in time to avert disastrous stratospheric ozone depletion. Dr. Andersen then highlighted some of the emerging, next-generation refrigerants and the importance of choosing refrigerants in a holistic manner taking into account GWP, ODP (ozone depleting potential), imbedded carbon emissions, and energy efficiency, while managing for flammability, toxicity and cost. He explained the importance of passing an amendment to the Montreal Protocol to phase down high-GWP HFCs and the flexibility that can be included in such an agreement to address the concerns and challenges of industry, particularly in developing countries.

Professor (Dr.) Atul Padalkar, Founder and Principal of Flora Institute of Technology, began his presentation on "Refrigerants: Indian Perspective" by highlighting India's contribution to climate emissions and explained that the world is looking to India to be a leader on climate change. At least fourteen new refrigerants have been commercialized in India since 2010. In the RAC sector, HFC-32 and HC-290 are emerging replacements for R-410a, while in the MAC sector, HFO-1234yf is an emerging replacement, and R-600a in commercial refrigeration. For heat pumps, HFCs, R-744 and HC-290 are being considered. Dr. Padalkar discussed Godrej's development of HC-290 unitary air-conditioning which has a very high energy efficiency rating and is a replacement for HCFC-22. Godrej with HC-290 and Daikin with HFC-32 expect to be able to meet the European safety standard while maintaining performance.

Participants asked Dr. Padalkar several questions about his organization's research, discussed the need for an Indian safety standard for flammable refrigerants and the need for skilled technicians to install and service hydrocarbon-based (HC) equipment. The representative from GIZ shared that they developed a handbook on good practice in servicing and trained 20,000 technicians in India that do service of CFC ACs. Participants also discussed whether ammonia is feasible for indoor AC units and concluded that small compressors would need to be developed and tested. They also discussed China's challenge with standards and suggested that Indian Society of Heating, Refrigerating and Air Conditioning Engineers (ISHRAE) and ASHRAE might consider working with Chinese colleagues on this issue.

Ms. Smita Vichare, Assistant Project Manager at GIZ-Proklima, presented GIZ's work on the implementation of India's HCFC Phase-out Management Plan (HPMP) in the service sector in India. She explained that 20,000 technicians were trained for the CFC phase-out. The HPMP is focused on technicians from institutions, franchisees and the semi-organized RAC sector. It aims to train technicians in good servicing practices, leak prevention and introduce them to alternative refrigerants. The goal is to train as many technicians as possible (but a minimum of 10,200) through a maximum 408 training programs. The "train-the-trainers" model is used. Ms. Vichare suggested that a professional association for technicians and a national certification program and/or requirement might be useful.

Participants discussed how the GIZ and other relevant organizations might collaborate with the All India Council for Technical Education to create a compulsory national certificate, perhaps beginning with a pilot certification program. It is important to bear in mind that many technicians are illiterate. Participants also discussed how these challenges also present an opportunity for job creation in the service sector.

Mr. Ramesh Paranjpey, ASHRAE Fellow and Life Member, presented information on the advantages of ammonia as a refrigerant. Mr. Paranjpey explained that ammonia is an environmentally-friendly refrigerant with zero ODP, near zero GWP, Zero Atmospheric life, high energy efficiency, low flammability, low cost and good performance. He suggested that ammonia's toxic characteristics can be taken care by following proper design and installation and maintenance practices

Participants discussed the challenges of developing small AC units that use ammonia and that this may be an opportunity for international collaboration. They also discussed the need to train technicians for safety and for

maximization of efficiency. Participants noted that some countries do their own training but government certification requirements are also important.

Mr. S.H. Kapoor (Technical Chief) and Mr. Prasanna Nagarhalli (AGM), Climate Control at TATA Motors Limited, gave a presentation on best practices for emissions reductions in the MAC sector. Mr. Kapoor explained that up to 20% of fuel use in Indian automobiles can be attributed to the power consumed by the MAC system - depending on ambient climatic conditions, vehicle type and driving pattern in city and on highways. Good practices for reducing indirect emissions caused by the MAC system include allowing the car to cool after parking in direct sun by lowering windows and operating the blower only for a few minutes and timely maintenance of the MAC system (such as refrigerant leak tests, condenser cleaning and air filter cleaning or changes) to preserve efficiency. He also explained that all OEM's track global developments in refrigerant policy as exports are very important. As and when the European Union F-gas regulation mandating the GWP of refrigerant for vehicles in the European Union becomes applicable to TATA Motors vehicles, compliance with regulation will be ensured. Tata Motors is actively working with alternative refrigerants with GWP<150, including HFO-1234yf. Efforts are underway to understand the pros and cons of a secondary loop technology for MAC, which could use HFO-1234yf, HFC-152a and other refrigerants with GWP<150. This is an opportunity for Indian experts to work on refrigerants for this part of the world and avoid need to rely on expensive HFO-1234yf refrigerant marketed by global multinationals. There is currently no MAC legislation in India, but this might be a helpful push.

Participants discussed the need to explain research and development to high-level corporate decision makers and to help customers understand the link between AC and fuel efficiency. Participants also asked about the compressor size involved in secondary loop and how the drop in efficiency associated with different refrigerants can be offset, for example by deceleration cooling.

Mr. Selvaraji Muthu, DGM (NTD) at Subros, presented the technical challenges of alternative refrigerants for MAC. Due to European and US norms and global efforts to reduce greenhouse gas emissions, Subros and other companies are examining the changeover from high GWP HFC refrigerants in the MAC sector, such as R134a, to alternatives. Alternatives include HFO-1234yf, HFO-1234ze, and CO2. All of these alternatives have their merits and demerits. The retrofitting of HFC-134a system by drop-in of HFO-R1234yf is expected to give the lesser cooling capacity by 8% with the lower Co-efficient of Performance (COP) by 6%. This effect of reduced cooling capacity was observed in the passenger compartment cool down temperature conducted at the vehicle level test conducted in the wind-tunnel at 40, 60 & 80 kmph and idle conditions. In order to match the performance (cooling capacity and COP) of current system using HFC-134a with the replacement of HFO-1234yf, an additional internal heat exchanger (IHX) has be used in the system in spite of the additional cost and space requirements for the implementation of this newer part. R-1234yf may require about a 5% increase in refrigerant vs. HFC-134a. The current HFC-134a PAG oil will not work with HFO-1234yf; a new type of oil is required. HFO-1234yf can be recycled in the same way that HFC-134a has been in the past, but the service equipment needs to be manufactured to a different standard. Garages will require new RRR service equipment and will need to use it alongside their HFC-134a equipment. Leak detection equipment that meets the current standard will work with HFO-1234yf. Service ports are similar to HFC-134a, however, they are smaller in size to prevent misuse. Testing found that the same desiccant type and quantity works with HFC-134a and HFO-1234yf.

Participants discussed that CO2 must be in a trans-critical system; it cannot be used as a drop in. Secondary loop is an option for CO2. CO2 systems are complex and expensive and there are leakage problems. Honeywell has a contested application patent on HFO-1234yf. Indian producers should consider this opportunity, particularly in light of secondary loop potential to use HFC-152a which is not patented and can be manufactured and used without intellectual property restriction.

Afternoon Session

Mr. Abhijeet Kudva, Strategic Marketing Manager-Fluorine Products at Honeywell, presented case studies on low-GWP alternatives to HFCs. In low pressure applications, Honeywell is developing a range of low-GWP alternatives. These include HFO-1234yf (MAC, vending and refrigerators), HFO-1234zd (centrifugal chillers) and HFO-1234ze (chillers, heat pumps, CO2 cascades and refrigerators).

These refrigerants vary from low to mildly flammable. HFOs blended with HFCs are also important alternatives that can reduce flammability and/or GWP concerns in a range of applications. Participants asked questions about cost and commercialization. Prices are confidential. HFO-1234ze may be commercially available as soon as next month. Honeywell is very regulation driven and regulatory signals are important to commercialization.

Mr. Kuldeepak Virmani, VP-Business Planning at Daikin, gave the Daikin perspective on next-generation refrigerants for energy efficiency and climate protection. There is no one-size-fits-all solution for RAC. Daikin is developing HFC-32 split ACs from residential to light commercial range because HFC-32 is better suited to these applications. HFC-32 RAC is highly efficient, with zero ODP, relatively low GWP, and small charge size. Mild Flammability issue can be safely managed. HFC-32 at high ambient is 8% more efficient than R-410a. 100% of Daikin's RAC production is with HFC-32 in India. Mr. Virmani explained that today there are 53 models of HFC-32 in Japan; in 2012 there were just four. One million HFC-32 units have been installed and are working in Japan. In India, he explained, there are 18 models today. Many companies i.e. Panasonic, Hitachi, Mitsubishi Electric, Sharp etc. have launched HFC-32 units in Japan. Fujitsu is selling HFC-32 units in Australia. O-General will be launching HFC-32 in India. This was announced three days ago. Daikin strongly believes HFC-32 will be an important alternative and this is evident in its rapid commercialization by Daikin and others.

Participants asked questions related to the compressor size required for HFC-32 room ACs as well as the cost of HFC-32. Mr. Virmani explained that the HFC-32 compressor is slightly smaller than an R-22 RAC compressor. Daikin predicts that HFC-32 will have edge over HC-290 in RAC sector with usage of HC-290 restricted to window units and small tonnage splits, but this will depend on the economics of the HFOs. The price of HFC-32 is currently 5% higher than R-22. In response to one participant's query on availability of HFC-32 technology for other manufacturers in India, Mr. Virmani replied affirmatively and explained that HFC-32 is not patent protected and that some other companies in India are already looking into using it.

Ms. Danielle Fest Grabiel, Law Fellow at IGSD provided an update on developments in policy governing high-GWP HFCs. Ms. Grabiel provided an overview of laws, taxes, and other policies in place at the domestic level in Europe as well as Australia, New Zealand, Japan and other countries. She provided a more detailed update on the new European F-gas directive governing stationary sources of HFC emissions and domestic actions in the U.S. under the Significant New Alternatives Policy program, and the auto efficiency standards. Ms. Grabiel noted that the European directive permits the use of HFC-32 in RAC because its GWP limit for that sector is 750, and that the US EPA has indicated that it will approve HFC-32 soon as well for that sector. She noted that the European MAC standards limit the use of HFC-134a and that the use of this refrigerant will likely also be disapproved in the U.S. in the near future.

Mr. Rajendra Shende presented on behalf of Mr. Marco Buoni, VP-Air Conditioning & Refrigeration European contractors' Association (AREA) on the European experience in certification of confidence in ODS substitutes. He mentioned that to limit the rise below 2 degree Celsius developed countries will need to take the lead by targeting a cut of 80-95% below 1990 levels by 2050. Globally Air-conditioning, refrigeration and heat pump equipment use 15 to 20% of the electrical energy. According to REGULATION (EC) 842/2006, each HCFC unit with charge above 3 kg should have a logbook, periodical inspections and installation and repair by only certified personnel. According to AREA, low GWP refrigerants have issues on

safety, flammability, toxicity and high pressure which will need to be properly considered when handling those refrigerants and hence specific modules will be required to be added to the existing HFC regulation. AREA alongwith EU and other organizations has initiated a project REAL alternatives (Refrigerant Emissions and Leakage-blended learning) that will address skills shortages amongst technicians working in the refrigeration, air conditioning and heat pump sector. The focus will be on carbon dioxide, ammonia, hydrocarbon and HFO refrigerants; delivered through innovative blended learning - a mix of e-learning, face-to-face training materials and an e-library of learning resources from across Europe. TERRE is a partner in the consortium and the information to REAL can be accessed through TERRE website.

Mr. Arvind Surange, ACR Project Consultants, presented on low-GWP and alternative refrigerants in cold chain projects. He gave the description of the entire cold chain processes followed from farm to fork. He also spoke about the wide-spread and consistent use of ammonia in cold-chain projects.

Mr. Goraksh Takalkar, Technical Lead at TESSOL, presented an upcoming efficient, low operating cost method of cooling a insulated container body and thereby keeping perishable products like ice cream, fruits, vegetables etc at precise temperature by use of "Electric Reefer Technology". This technology mainly operates through grid power & becomes alternative to diesel driven refrigeration system. Phase change materials (PCM), i.e. eutectic salt mixtures have been used to store energy at design eutectic temperature inside the plates during charging and used it during transportation period of 15 to 20 hrs. Such technology has been widely useful for both primary and secondary transportation.

Next Steps and Closing

Dr. Stephen O. Andersen, IGSD, presented potential next steps for participants to consider based on the day's discussions. These include: promotion of low GWP refrigerants by industry, crafting safety standards, training, national certification programs, the need for a regulatory signal, and the inclusion of Indian experts on the Montreal Protocol technical bodies. Mr. Rajendra Shende led the participants in drafting the Pune Declaration (Appendix B) to capture their conclusions and recommendations. Professor (Dr.) S. N. Sapali, H.o.D. Mechanical Engineering, College of Engineering, Pune provided a summary of the day's presentations and the roundtable was adjourned.

APPENDIX A

In association with

Selecting and Best Service Practices for Air Conditioning and Refrigeration Equipment Using Next-Generation Refrigerants for Energy Efficiency and Climate Protection

A Workshop on latest developments in best practices, energy efficiency, and innovative refrigerants for stationary and mobile air conditioning in India

Date: **Wednesday, 5th of March 2014**

Venue: **Bajaj Hall, Mahratta Chamber of Commerce, Industries and Agriculture, Senapati Bapat Road, Pune, Maharashtra-411016, India**

Selecting and Best Service Practices for Air Conditioning and Refrigeration Equipment Using Next-Generation Refrigerants for Energy Efficiency and Climate Protection is a one-day event to bring together India's business, government, air conditioning trade associations, and civil society leaders to share the latest information on ozone-safe, low-GWP, energy-efficient Room Air Conditioning (RAC) and Mobile Air Conditioning (MAC).

OBJECTIVES

- **Update best practices in refrigerant containment and product service.**
- **Discuss the latest developments in emerging refrigerants.**
- **Identify the energy efficiency advantages of the emerging refrigerants and the refrigeration and air conditioning systems.**
- **Deliberate cost and availability of refrigerants in specific sectors.**
- **Anticipate and gain access to financing for the transition from HCFCs and HFCs.**

9:00 – 13:00 MORNING SESSION

Time	Subject
08:30 – 09:00	**Registration/Coffee & Tea**
09:00 – 09:20	**Welcome and Opening Address** *Mr. A. Sardeshmukh, Director General, Mahratta Chamber of Commerce, Industries and Agriculture;* *Mr. Jayant Joshi, President ASHRAE Pune Chapter* **Goals and Objectives** *Mr. Rajendra Shende, TERRE Policy Centre (TERRE)*
09:20 – 09:30	**International Scenario on Emerging Refrigerants and Energy Efficiency** *Dr. Stephen O. Andersen, Institute for Governance & Sustainable Development (IGSD)*
09:30 – 09:50	**Refrigerants: Indian Perspective** *Prof. (Dr.) Atul Padalkar, Founder and Principal, Flora Institute of Technology, Pune*
09:50 – 10:30	**HCFC Phase-out Management Plan** *Mrs. Smita Vicahre, GIZ*
10:30 – 11:15	**Ammonia Refrigeration and Scenario in Industrial Refrigeration** *Mr Ramesh Paranjpey, ASHRAE Fellow and Life Member*
11:15 – 11:25	Coffee Break
11:25 – 12:00	**Discussion**
12:00 – 13:00	**Best Practices in Emissions Reductions in the MAC Sector** *Mr. S.H. Kapoor, Technical Chief (Climate Control), TATA Motors Ltd* **Technical Challenges with Alternative Refrigerants for Automotive Air Conditioning Applications** *Mr. Selvaraji Muthu - DGM - R&D (NTG), Subros*
13:00 – 14:30	Lunch

14:30 – 18:00 AFTERNOON SESSION

Time	Subject
14:30 – 14:55	**New Case studies on Low GWP alternative refrigerants for HFCs** *Mr Abhijeet Kudva, Strategic Marketing Manager, Fluorine Products, Honeywell*
14:55 – 15:20	**Room Air-Conditioning and Energy Efficiency: LCCP Scenario** *Mr. Virmani, VP, Business development, Daikin*
15:20 – 15:45	**Refrigeration, Air Conditioning : Global Policies, Initiatives and Best Practices** *Ms. Danielle Fest Grabiel, IGSD*
15:45 - 16:10	**European F-Gas Regulations and Certification Requirement for technicians** *Mr. Marco Buoni, Vice President, AREA*
16:10 – 16:35	**Low GWP and Energy efficient Refrigerant in Cold Chain Projects** *Mr. Arvind Surange, ACR Project Consultants Pvt Ltd*
16:35 – 17:00	**Discussion: HFCs: Short-Term and Long-Term Future** *Mr. Rajendra Shende / Dr. Stephen O. Andersen*
17:00 – 17:15	Coffee Break
17:25 – 17:45	**Next Steps: Integrated HCFC-HFC Management Plan? Demonstration Projects? Greater Participation of Indian Experts on TEAP and its RTOC?** *Dr. Stephen O. Andersen, IGSD*
17:45	**Closing Remarks and Adjourn** *Prof. (Dr.) S. N. Sapali, H.o.D. Mechanical Engineering , College of Engineering, Pune*

APPENDIX B

Sr. No.	NAME	DESIGNATION & ORGANIZATION
1	Mr. A. Sardeshmukh	Director General, Mahratta Chamber of Commerce, Industries and Agriculture
2	Mr. Jayant Joshi	President ASHRAE Pune Chapter
3	Mr. Rajendra Shende	TERRE Policy Centre
4	Dr. Stephen O. Andersen	Director of Research, Institute for Governance & Sustainable Development
5	Prof. (Dr.) Atul Padalkar	Founder and Principal, Flora Institute of Technology, Pune
6	Mrs. Smita Vicahre	GIZ - Proklima
7	Mr Ramesh Paranjpey	ASHRAE Fellow and Life Member
8	Mr. S.H. Kapoor	Technical Chief (Climate Control), TATA Motors Limited
9	Mr. Prasanna Nagarhalli	AGM, Climate Control, TATA Motors Limited
10	Mr. Selvaraji Muthu	DGM - R&D (NTG), Subros
11	Mr. Aseem Kumar Jaiswal	VP – R&D, Subros
12	Mr Abhijeet Kudva	Strategic Marketing Manager, Fluorine Products, Honeywell
13	Mr. Virmani	VP, Business development, Daikin
14	Ms. Danielle Fest Grabiel	Law Fellow, Institute for Governance & Sustainable Development
15	Mr. Arvind Surange	ACR Project Consultants Private Limited
16	Prof. (Dr.) S. N. Sapali	H.o.D. Mechanical Engineering , College of Engineering, Pune
17	Mr. Kumbhar Anil	EM & RBG, Voltas
18	Mr. Sampat Kumar	EM & RBG, Voltas
19	Mr.Takalkar Goraksha	Technical Lead, TESSOL Thermal Energy Solutions
20	Ms. R Uthra	Centre for Science & Environment
21	Mr. Kuldeep Singh	Pranav Vikas Group
22	Mr. D Govindaraj	Pranav Vikas Group
23	Mr. Amol R. Ghorpade	Project Leader, TERRE Policy Centre
24	Dr. Vinitaa Apte	President, TERRE Policy Centre
25	Mr. Moreshwar Hude	Project Leader, TERRE Policy Centre
26	Ms. Mrunmayi Apte	Media & editing, TERRE Policy Centre
27	Mr. Swapnil Borade	Media & editing, TERRE Policy Centre
28	Mr. Pramod Pungaonkar	Member ASHRAE and ISHRAE

APPENDIX C

Pune Declaration on Low Global Warming Potential and Energy Efficient Alternatives to HCFCs in India

Indian and foreign experts in refrigeration, air conditioning, and environmental protection, having met in Pune, India on the 5th March 2014,

Mindful that high GWP alternatives to HCFCs are contributing to global warming,

Mindful that India is an emerging economy and a developing country that is undergoing rapid growth in its air-conditioning (AC) and refrigeration sectors,

Mindful that universities, NGOs, and companies in Pune, India are at the forefront of many next-generation technologies, such as improved ammonia refrigeration and AC, secondary-loop automobile AC, transport refrigeration, and more,

Cognizant that in some sectors Indian companies will need adequate time before the HCFC-22 phase-out if they are to avoid HFC-410a, HFC-404a, and HFC-134a and safely implement energy efficient low-GWP alternatives,

Reaffirming the importance of alternatives to HCFCs that are safe, cost-effective, technically proven, energy efficient, and safe for the environment,

Recalling Indian industry's historic global leadership in the transition away from CFCs and other ozone depleting substances,

Emphasizing the importance of capacity building, training, financial, technical, and other assistance for India to transition to environment-friendly alternatives to HCFCS,

Hereby:

- ***Note*** with appreciation the efforts of the Government of India, industry, academics, refrigeration and air conditioning associations, and civil society in the successful phase-out of CFCs and most other ODSs and its ongoing efforts to select low-GWP alternatives in implementing its HCFC Phase-out Management Plan;
- ***Volunteer*** to participate in the development of standards appropriate to India for flammable and toxic refrigerants;
- ***Volunteer*** to participate with , government, professional societies and other technical experts to develop low-GWP alternative refrigerants and technologies that are appropriate for the Indian context;
- ***Invite*** Indian industry, government, professional societies, and other technical experts to develop a national certification program for refrigeration and AC service technicians and other refrigeration and AC professionals/consultants;
- ***Urge*** Indian industry to submit for national and international funding project proposals for demonstration and awareness projects, including ammonia and other natural refrigerant based room AC
- ***Support*** adoption of low-GWP and energy efficient refrigerants in India that would help improve cost-effectiveness for the consumer at micro level and the country at the macro level;
- ***Urge*** the ASHRAE -Pune Chapter, TERRE, and other willing organizations, to continue dialogue with RAMA, BEE and the Ozone Cell of the Government of India to emphasize the importance of energy efficiency and mitigating the climate change impact of refrigeration and AC;

- ***Support*** the organization of meetings and other opportunities for stakeholders to identify strategies to address unresolved issues, such as disposal of f-gases, TEWI/LCCP for the alternatives, and the need for mandatory certification for technicians/professionals, and other challenges;
- ***Support*** widened TEAP/RTOC mandate to assess energy efficient, low GWP refrigerants.

PARTICIPATING ORGANIZATIONS
TERRE Policy Centre
Institute for Governance & Sustainable Development
ASHRAE Pune Chapter
Mahratta Chamber of Commerce, Industries and Agriculture
College of Engineering Pune
Flora Institute of Technology, Pune
GIZ - Proklima
Centre for Science & Environment
TATA Motors Limited
Subros
Pranav Vikas Group
Honeywell
Daikin
Voltas
ACR Project Consultants Private Limited
TESSOL Thermal Energy Solutions

APPENDIX D


TOSHIBA


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BAJA


EXIT