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**Open-ended Working Group of the Parties to
the Montreal Protocol on Substances that
Deplete the Ozone Layer
Thirty-ninth meeting
Bangkok, 11–14 July 2017
Items 7 of the provisional agenda*
Energy efficiency**

Submissions by parties on energy efficiency

Note by the Secretariat

1. The present note presents a compilation of information shared by the parties to the Montreal Protocol on Substances that Deplete the Ozone Layer in response to decision XXVIII/3 of the Twenty-Eighth Meeting of the Parties.

I. Background

2. In decision XXVIII/3, the Meeting of the Parties recognized that a phase-down of hydrofluorocarbons (HFCs) would present additional opportunities to catalyse and secure improvements in the energy efficiency of appliances and equipment; noted that the air-conditioning and refrigeration sectors represented a substantial and increasing percentage of global electricity demand; appreciated the fact that improvements in energy efficiency could deliver a variety of co-benefits for sustainable development, including for energy security, public health and climate mitigation; and highlighted the large returns on investment that had resulted from modest expenditures on energy efficiency, and the substantial savings available for both consumers and Governments.

3. Paragraph 1 of decision XXVIII/3 requested the Technology and Economic Assessment Panel to review energy efficiency opportunities in the refrigeration, air-conditioning and heat-pump sectors related to a transition to climate-friendly alternatives, including not-in-kind options. Paragraph 2 invited the parties to submit to the Ozone Secretariat by May 2017, on a voluntary basis, relevant information on energy efficiency innovations in the refrigeration, air-conditioning and heat-pump sectors. In paragraph 3, the Panel was requested to assess the information provided by the parties and to present a report on the issue to the Twenty-Ninth Meeting of the Parties.

4. To facilitate the parties' submission of information in response to decision XXVIII/3, the Ozone Secretariat prepared a template containing a number of pertinent questions and, in correspondence dated 17 March 2017, invited all parties to consider using it as a guide, on a voluntary basis, noting that information could be submitted in any other format deemed appropriate by the parties.

* UNEP/OzL.Pro.WG.1/39/1.

II. Submissions by parties received in response to decision XXVIII/3

5. As an update to the information provided in paragraph 49 of the note by the Secretariat on issues for discussion by and information for the attention of the Open-ended Working Group of the Parties to the Montreal Protocol at its thirty-ninth meeting (UNEP/OzL.Pro.WG.1/39/INF/2), by 13 June 2017, the Ozone Secretariat had received submissions from the following parties: Armenia, Australia, Canada, China, Colombia, Egypt, El Salvador, Estonia, European Union, Ghana, Grenada, Guinea on behalf of the African Group, Japan, Mexico, Morocco, Paraguay, Rwanda, Switzerland, United States of America and Viet Nam.
6. The submissions were shared with the Technology and Economic Assessment Panel to enable it to assess the information, as requested in paragraph 3 of the decision, and to report thereon to the Twenty-Ninth Meeting of the Parties.
7. The submissions are presented in the annex to the present note, without formal editing or analysis. For submissions received in languages other than English, translations into English are provided.

Annex

Compilation of parties' responses to decision XXVIII/3 on energy efficiency

Armenia

Following the Decision XXVIII/3: Energy efficiency we would like to provide relevant information on energy efficiency innovations in the refrigeration, air-conditioning and heat-pump sectors in the Republic of Armenia, obtained through the consultations with RAC sector representatives and RAC Association of Armenia. The following technologies may be particular interest in terms of energy efficiency innovations:

- Free-cooling system with dry coolers, air handling units and fan coils for cooling office areas in large buildings which have cooling demand in cold season;
- Free-cooling of server rooms with the automatized outside air dampers and inverters fan system;
- Free-cooling of server rooms by the chillers with free-cooling coils for supplying the cooled glycol and water mixture directly to the computer rack integrated cooling system;
- Ground source heat pumps which works in cooling and heating modes on underground waters removed from the metro;
- Ground source heat pumps which works in cooling and heating modes on underground waters;
- Solar photo-voltaic modules with battery accumulators integrated with ground source heat pumps power supply system working on cooling and heating modes on underground waters.

Please note that the Ministry of Nature Protection will closely follow the developments in the RAC sector and will keep you informed on any new technologies emerging in the national market.

Australia

Relevant national energy efficiency policies

1. **Does your country have any policies in place that encourage or enforce the use of energy efficient RACHP equipment (for example minimum energy performance standards (MEPS), energy labelling systems, financial incentives)? Which RACHP market sectors are affected by these policies (eg domestic refrigerators, small or large-size room air-conditioners etc)?**

Air conditioners, liquid chilling packages, certain Close Control air conditioners (for data centres, etc), domestic refrigerators/freezers and some commercial refrigerated display cabinets are covered by Minimum Energy Performance Standards (<http://www.energyrating.gov.au/>). Single phase non-ducted air conditioners and domestic refrigerators/freezers are required to display an Energy Rating Label (<http://www.energyrating.gov.au/label>)

The Emissions Reduction Fund provides financial incentives for low cost emissions reductions across the Australian economy (<http://www.environment.gov.au/climate-change/emissions-reduction-fund>). A range of methods have been approved for use under the ERF, including the Industrial Energy and Fuel Efficiency method, which allows for upgrades to heating, ventilation and cooling systems, and the High Efficiency Commercial Appliances method, which allows for the installation of new, highly efficient, air conditioners.

Utility company efficiency initiatives

2. **Do any electricity utilities in your country operate schemes to incentivise the purchase of energy efficient RACHP equipment and if yes, in which RACHP market sectors?**

State-based schemes that aim to reduce the consumption of electricity by encouraging the implementation of energy saving activities are in place in New South Wales, Victoria, South Australia and the Australian Capital Territory. These schemes generally oblige electricity retailers and other large energy users to meet energy savings targets through purchasing and surrendering tradeable energy savings certificates. These certificates are created

through energy saving projects that are often undertaken by third parties, such as the bulk purchase and install of appliances like air conditioners that are more energy efficient than would have otherwise been installed.

Support initiatives for designers and equipment manufacturers

- 3. Do you have any energy efficiency programmes that encourage and support designers of systems (eg building services consultants) or equipment manufacturers to provide energy efficient solutions (for example, financial support for design activities or training programmes specifically targeted at increasing the energy efficiency in the RACHP sectors)?**

The Australian Institute of Refrigeration, Air Conditioning and Heating (AIRAH) (<http://www.airah.org.au/>) has delivered a wide range of activities for the HVAC&R industry in relation to energy efficiency. It has delivered the following training programmes (which is also relevant to question 4).

Scope & Conduct an Energy Audit
Maximise EE in Building Services Operations
Create an Energy Management Plan
Implement an Energy Management Plan
Design Energy Efficient HVAC Systems
Evaluate Design Principles of Energy Efficient HVAC Systems
Maximise energy efficiency in building services operations
Building Tuning
Energy Efficient Industrial Refrigeration
Industrial ammonia plant operations
Energy Auditing
Energy Efficient Building Operations
Energy Efficient HVAC Design
Energy Management Planning
HVAC Maintenance
Sustainable Building Operations
Climate Change, Sustainability & HVAC
Retrocommissioning Buildings for Energy Efficiency

- 4. Are there any energy efficiency programmes being undertaken by professional bodies, trade bodies or universities to help identify energy efficient solutions to the RACHP sectors?**

AIRAH’s annual conference programmes have a strong emphasis on energy efficiency for new buildings, for existing buildings and refrigeration. It has also published numerous case studies and technical papers in its Equilibrium journal over many years and developed a range of technical or “Design Aid” manuals focussing on whole of life and sustainability (<http://www.airah.org.au/Web/Resources/Publications/Ecolibrium/AIRAH/Navigation/Publications/Ecolibrium2/EcoLibrium.aspx?hkey=1da7bed0-57de-4fda-9fdd-15d78bc2e077>)

Projects/case studies illustrating improved efficiency

- 5. Are there projects or case studies on installation of energy efficient RACHP equipment (eg national demonstration programmes or any other relevant projects)?**

The Government-owned Clean Energy Finance Corporation invests, applying commercial rigour, to increase the flow of finance into the clean energy sector. This includes loans for building upgrades to heating, ventilation and air conditioning systems. A case study is available here: <http://www.cleanenergyfinancecorp.com.au/case-studies/club-cuts-energy-use-with-chiller-and-solar-upgrade.aspx>

Help and support required**6. Which kind of advice and information related to RACHP energy efficiency your country would find helpful receiving?**

Research and data about the energy efficiency benefits from correct installation and sizing.

Canada**Relevant national energy efficiency policies****1. Does your country have any policies in place that encourage or enforce the use of energy efficient RACHP equipment (for example minimum energy performance standards (MEPS), energy labelling systems, financial incentives)? Which RACHP market sectors are affected by these policies (eg domestic refrigerators, small or large-size room air-conditioners etc)?**

Yes, Canada's Energy Efficiency Regulations, administered by Natural Resources Canada, contains minimum energy performance standards (MEPS) and in some cases labelling requirements for over 40 energy using products. The market sectors that are affected by the RACHP policies are commercial refrigeration equipment, domestic refrigerators and all sizes of air conditioning equipment. The following is a link to the current Canada's Energy Efficiency Regulations (the version currently in force):

<http://laws-lois.justice.gc.ca/PDF/SOR-94-651.pdf>

In December 2016, Amendment 13 to Canada's Energy Efficiency Regulations was published in Canada Gazette Part II and comes into force on June 28, 2017. Here is a link to Amendment 13: [this one is easier to follow and will be in force on June 28, 2017]

http://gazette.gc.ca/rp-pr/p2/2016/2016-12-28/html/sor-dors311-eng.php?_cldee=a311bmdzdS5oYW5AbGdlLmNvbQ%3d%3d&recipientid=contact-53fd15634b03e61180d95065f38af9b1-8ec94bbab562410580f365f1f43a6922&esid=dc065772-0acd-e611-80f8-5065f38b2281

The ENERGY STAR product labelling program also certifies the top energy performing products in the market for similar products, although it is a voluntary program.

Here is the link to the full list of certified ENERGY STAR products:

<http://www.nrcan.gc.ca/energy/products/energystar/why-buy/13631>

With respect to financial incentives (other than those offered by utilities companies covered under question 2 below), some Canadian provincial governments have programs in place that provide some form of financial support to incentivize energy efficiency improvements and greenhouse gas reductions in various sectors, including RACHP sectors.

As an example, the Government of Québec' ÉcoPerformance program provides grants for energy efficiency and conversion projects in businesses, institutions and municipalities. Projects can include the recovery of energy from the operation of RACHP equipment, conversion of equipment to CO₂, and recovery of refrigerant emissions. Both the refrigeration and air conditioning sectors can be considered, although projects tend to target the commercial and industrial refrigeration sub-sectors. More information on this program can be found through the following link:

<http://www.transitionenergetique.gouv.qc.ca/clientele-affaires/ecoperformance/description/#.WUEhC2mGOJC>

Utility company efficiency initiatives**2. Do any electricity utilities in your country operate schemes to incentivise the purchase of energy efficient RACHP equipment and if yes, in which RACHP market sectors?**

Yes, many electricity utilities operate such schemes, one of the most common being rebate programmes for retiring old, inefficient domestic refrigerators and freezers. In addition, several utilities provide financial

incentives to both households and businesses for upgrading to more energy efficiency refrigeration and air conditioning equipment. As just one example, the following is a link to Ontario Hydro One's incentive program for upgrading rooftop air conditioning units (similar programmes are in place for commercial refrigeration and domestic appliances):

<http://www.hydroone.com/MyBusiness/SaveEnergy/Pages/RooftopAC.aspx>

Support initiatives for designers and equipment manufacturers

- 3. Do you have any energy efficiency programmes that encourage and support designers of systems (eg building services consultants) or equipment manufacturers to provide energy efficient solutions (for example, financial support for design activities or training programmes specifically targeted at increasing the energy efficiency in the RACHP sectors)?**

We are not aware of energy efficiency programs specifically targeting RACHP designers or equipment manufacturers, although there are various funding programs related to improving energy efficiency, which could in principle be accessed by RACHP designers and equipment manufacturers if they fulfil certain criteria, such as federal government's Program of Energy Research and Development and Energy Innovation Program.

In addition, the work of CanmetEnergy, a research and technology division of Natural Resources Canada, has contributed to the design and development of more energy efficient systems in some refrigeration applications. Notably, Canmet has helped to facilitate the introduction of CO₂ as a refrigerant and as a heat transfer fluid in secondary loop refrigeration systems, with a view to achieve both energy efficiency gains and reductions in direct emissions of refrigerants. Currently, Canmet is undertaking projects aimed at developing more efficient and cost effective heat pump systems and at improving and addressing barriers for the uptake of ejector technologies to optimize thermal energy for refrigeration and air conditioning systems. A description of these projects is included under Question 5 below.

- 4. Are there any energy efficiency programmes being undertaken by professional bodies, trade bodies or universities to help identify energy efficient solutions to the RACHP sectors?**

Many Canadian universities offer "energy management" certificates (Ryerson <http://ce-online.ryerson.ca/ce/default.aspx?id=3401> is just one example). While not specific to the RACHP sector, there are certain aspects of these programs that touch on refrigeration and air conditioning systems.

The Canadian Green Building Council (CaGBC) manages the LEED program for buildings (new and existing) and certifies professionals in the design of LEED buildings. While the LEED program uses the whole building approach, part of the rating comes from refrigeration/AC systems.

It is also interesting to note the City of Toronto's program to inform building owners/designers on how to design buildings that could be "district energy-ready" so it can use the Enwave "deep lake" district water cooling system, a large scale district cooling that would reduce the use of refrigerants as it uses cold lake Ontario water as the main cooling medium:

For information on the City of Toronto's Design Guideline for District Energy-ready Buildings:

<http://www1.toronto.ca/City%20of%20Toronto/Environment%20and%20Energy/Programs%20for%20Businesses/BBP/PDFs/District%20Energy%20Ready%20Guideline%20October%202016.pdf>

For information on Enwave's deep lake water district cooling system:

<http://www.districtenergy.org/assets/CDEA/Case-Studies/Enwave-case-history-Toronto7-19-07.pdf>

Projects/case studies illustrating improved efficiency

- 5. Are there projects or case studies on installation of energy efficient RACHP equipment (eg national demonstration programmes or any other relevant projects)?**

The Canadian federal government's CanmetEnergy, a division of Natural Resources Canada, has collaborated with stakeholders in the refrigeration industry and other levels of government to facilitate the adoption of energy-efficient, low-GWP technologies. In particular, Canmet has played a key role in the introduction of CO₂ as a

refrigerant and as a heat transfer fluid in secondary loop refrigeration systems. This included contributing to modifying the relevant Canadian standard to allow the use of CO₂ in commercial refrigeration and providing technical support for the first project validating the use of CO₂ secondary loop in a supermarket refrigeration system (operated by Loblaw's). At the time, this was the largest installation of a CO₂ secondary loop system in North America. It also included collaboration with Sobeys Québec Inc. Corporation to validate one of the first transcritical CO₂ systems in a North American supermarket, which also included a system to intensively recover and reuse heat rejected by the store's refrigeration units.

Between 2008 and 2013, Canmet also collaborated with the Government of Quebec in the development, implementation and evaluation of the Quebec Refrigeration Optimisation Program (OPTER). This program supported the adoption of measures to improve energy efficiency, together with the conversion/replacement of refrigeration equipment to low-GWP technologies, in over 130 installations (mainly in supermarkets, warehouses, arenas and the food industry).

These efforts have led to the adoption of CO₂-based refrigeration technology by a growing number of supermarkets, increased the use of ammonia in ice rinks, and resulted in significant gains in energy efficiency by the facilities concerned.

Currently, Canmet is conducting a project to develop highly efficient and cost effective renewable heating and cooling technologies for the Canadian built environment. Heat pump systems are the main project's component due to their unmatched characteristics such as the ability to generate more useful energy than the energy with economic value consumed and to maximize the use of renewable energy in heating and cooling applications. The project consists of six activities aimed at both adapting the technology and optimizing its integration within buildings in the Canadian cold climate. Two activities focus on technology development, which include simulations and experiments, and others focus on exploration of disruptive technology and are simulation-based.

Canmet is also working on the development of a new generation of ejectors for application in the following three domains:

- Low temperature waste heat (approximately 90% of energy consumption in Canadian industry is lost in waste heat)
- Renewable thermal energy for refrigeration and air conditioning
- Process irreversibilities (e.g. expansion devices)

Ejectors consist of two embedded nozzles, which make them simple, small, low cost and reliable (no moving parts) devices. Ejectors can operate with several different fluids, such as water, refrigerants, CO₂ and air. They can be activated by energy sources on a wide temperature range for gas compression and recirculation, and to create vacuum, for cooling/refrigeration applications and industrial process improvements. Ejectors are therefore a transformative technology that offers a great potential to significantly improve process thermal energy.

The proposed project intends to address the different barriers that prevent the uptake of the ejector technology for building, industrial and clean energy applications, by working in parallel on increasing the ejector performance, on increasing the technological readiness and economic viability of hybrid ejector compression systems, and developing more industrial applications. It will include (among various activities):

- Improvement of ejector design, performance and operating range;
- Development and optimization of hybrid refrigeration systems composed of ejector and mechanical systems, and
- Field trials of two ejector-based applications implemented in buildings: a CO₂ hybrid refrigeration system for low temperature cold storage and a thermal solar ejector cooling system.

Help and support required

6. Which kind of advice and information related to RACHP energy efficiency your country would find helpful receiving?

Specific data and information, corroborated by peer-reviewed research, on the relative energy efficiency of available RACHP products and equipment using natural and/or fluorinated refrigerants with GWPs lower than standard HFC-based technologies currently widely available on the market.

China

Relevant national energy efficiency policies

- 1. Does your country have any policies in place that encourage or enforce the use of energy efficient RACHP equipment (for example minimum energy performance standards (MEPS), energy labelling systems, financial incentives)? Which RACHP market sectors are affected by these policies (eg domestic refrigerators, small or large-size room air-conditioners etc)?**

National Development and Reform Commission(NDRC) and General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China(AQSIQ) jointly published Energy Efficiency Label Regulation firstly in Aug. 2004 and revised in 2016, and renewed Energy Efficiency Label Product Catalog every year accordingly, at least 11 RACHP products in this catalog have homologous energy efficiency standard at present. Many different kinds of RACHP products like domestic refrigerators, room air conditioners (both fixed speed and inverters), chillers, water (ground) source heat pump, all heat pump water heaters are affected.

Some standards are as followed:

- GB 12021.3-2010 The minimum allowable value of the energy efficiency and energy efficiency grades for room air conditioners
- GB 21455-2013 Minimum allowable value of the energy efficiency and energy efficiency grades for variable speed room air conditioners
- GB12021.2-2015 The maximum allowable values of the energy consumption and energy efficiency grade for household refrigerators
- GB29541-2013 Minimum allowable value of the energy efficiency and energy efficiency grades for heat pump water heaters

Utility company efficiency initiatives

- 2. Do any electricity utilities in your country operate schemes to incentivise the purchase of energy efficient RACHP equipment and if yes, in which RACHP market sectors?**

No, there is no incentive policy comes from the electricity utilities.

Support initiatives for designers and equipment manufacturers

- 3. Do you have any energy efficiency programmes that encourage and support designers of systems (eg building services consultants) or equipment manufacturers to provide energy efficient solutions (for example, financial support for design activities or training programmes specifically targeted at increasing the energy efficiency in the RACHP sectors)?**

The Ministry of Finance and National Development and Reform Commission (NDRC) implemented *people-benefit project on energy saving products* from 2009 to 2015 to promote specific energy saving products. RACHP products like air-conditioner and refrigerator were included.

The *Government Purchasing List on Energy Saving Products* published and renewed periodically by the Ministry of Finance and National Development and Reform Commission (NDRC) includes some RACHP products, all products in the list could be included in the government preferential procurement plan.

Beijing, Tianjin, Hebei, Shandong, Shanxi have subsidy policy within “transfer coal to electricity” program, it includes heat pump heating system.

- 4. Are there any energy efficiency programmes being undertaken by professional bodies, trade bodies or universities to help identify energy efficient solutions to the RACHP sectors?**

Yes, we have some R&D programmes aided by government (usually it's not a special fund only for such programmes but for many different kinds of technology programmes) and undertaken by professional combo of universities and industries. For example Department of Science and Technology of Guangdong province has industry-university-research cooperation program *Development and Industrialization of key Technology Used in Air Source Heat Pump Heating System*.

Projects/case studies illustrating improved efficiency

- 5. Are there projects or case studies on installation of energy efficient RACHP equipment (eg national demonstration programmes or any other relevant projects)?**

Ministry of Housing and Rural-Urban development of the People`s Republic of China and some local governments could organize some programmes like “Green Building Demo Projects” and “Low Energy Consumption Building Demo Projects”, and it includes requirements on air conditioner system performance.

Help and support required

6. Which kind of advice and information related to RACHP energy efficiency your country would find helpful receiving?

Other countries` latest energy efficiency policies, standards and new technologies.

Colombia

Relevant national energy efficiency policies

1. Does your country have any policies in place that encourage or enforce the use of energy efficient RACHP equipment (for example minimum energy performance standards (MEPS), energy labelling systems, financial incentives)? Which RACHP market sectors are affected by these policies (eg domestic refrigerators, small or large-size room air-conditioners etc)?

1.1 General Policies

The Ministry of Mines and Energy, as the main energy authority of Colombia, is in charge of the management of non-renewable natural resources of the country within the framework of sustainable development. Amongst other functions, it is responsible for the adoption of policies and policy instruments on the rational use of energy and the development of alternative energy sources.

Attached to this Ministry, the Mining and Energy Planning Unit (UPME) is a Special Administrative Unit which plans the development and use of energy and mineral resources and produces and disseminates information of mining and energy. It also promotes the design and implementation of plans, programmes and projects related to saving, conservation and efficient use of energy in all productive and economic sectors.

Law 697 of 2001 declared the rational and efficient use of energy as a matter of social interest, public interest and national convenience, fundamental to ensure full and timely energy supply, competitiveness, consumer protection and promotion of unconventional energies in a sustainable way with the environment and natural resources.

Moreover, Law 1715 of 2014 declared the promotion, encouragement and incentive of activities of production and use of unconventional sources of energy as a matter of social interest, public and of national convenience, fundamental to ensure diversification of supply, energy efficiency, the competitiveness of the economy, the protection of the environment, the efficient use of energy and the preservation and conservation of renewable natural resources.

The Intersectoral Commission for the Rational and Efficient Use of Energy and Non-Conventional Energy Sources (CIURE, in Spanish) was created by Decrees 3683/2001 and 2501/2007 to advise and support the Ministry of Mines and Energy in the coordination of policies on the rational and efficient use of energy and Other unconventional forms of energy in the national interconnected system and in non-interconnected areas.

Regarding the policies on energy efficiency, the Ministry of Mines and Energy adopted the Indicative Action Plan 2010-2015 to develop a programme for the rational and efficient use of energy and other forms of non-conventional energy (PROURE, in Spanish). The second phase of this plan starts in 2017 until 2022. The overall objective of PROURE is "to promote the rational and efficient use of energy and other forms of non-conventional energy, contributing to ensure a full and well-timed energy supply, competitiveness of the Colombian economy, consumer protection and promotion of the use of non-conventional energy sustainably". PROURE has specific goals for:

- Industrial RAC
- Commercial air conditioning
- Domestic RAC

1.2 Energy performance standards

The Ministry of Mines and Energy issued the RETIQ standard (Resolution 41012 of 2015 and its modifications) in September 201 which entered into force on August 31, 2016. (<https://www.minminas.gov.co/documents/10180//23517//36731-Resolucion-41012-18Sep2015.pdf>). Its objective is to establish the mandatory use of labels reporting on the performance of the equipment in terms of energy consumption and efficiency indicators. This regulation applies to domestic and commercial refrigeration equipment; washing machines; air conditioners type window and split; industrial electric motors and gas equipment (stoves, ovens and heaters). In the case of electric motors, the regulation restricts the marketing of equipment with low efficiencies taking into account a transitory path (see section 12.1.1.2.1.).

The label also helps to promote the use of efficient technology in the country, to guide the user's preferences towards better energy performance equipment, and to increase market supply and demand for efficient equipment. RETIQ has the following specific requirements:

- Domestic refrigerators and/or freezer
- Commercial refrigerators and/or freezers (in formulation process term until August 2018).
- Air conditioners (Room air conditioners and unit air conditioners).

At the moment there are no Minimum Energy Performance Standards (MEPS) in Colombia.

1.3 Other Colombian Technical Standards (NTC, in Spanish) for RAC sector

NTC 4366 ENERGY EFFICIENCY IN AIR CONDITIONERS FOR OUTDOORS. RANGES OF ENERGY EFFICIENCY AND LABELING. First Update Edited 2003-03-25.

NTC 5104 ENERGY EFFICIENCY IN AIR CONDITIONERS UNIT TYPE. RANGES OF ENERGY EFFICIENCY AND LABELING. 2002-10-30.

NTC 5020:ENERGY EFFICIENCY IN REFRIGERATORS, REFRIGERATORS, FREEZERS AND FREEZERS FOR DOMESTIC USE. 2009-10-21.

NTC 5891:DOMESTIC REFRIGERATION ARTIFACTS. CHARACTERISTICS AND METHODS OF TESTING. 2011-12-14.

Currently, the ICONTEC Refrigeration Committee 125 is working on updating NTC 5310 "Energy efficiency in commercial refrigeration equipment. Efficiency and labeling ranges", for which the ISO 23953 standard is being used, but will have some adaptations. The standard is expected to be published for public consultation in August 2017.

Utility company efficiency initiatives

2. Do any electricity utilities in your country operate schemes to incentivise the purchase of energy efficient RACHP equipment and if yes, in which RACHP market sectors?

A few utilities currently have social projects to promote programmes and advise users on the rational use of energy. One of them carry out information campaigns, e.g. through their electricity bill; including information about the economic and environmental benefits of replacing old and inefficient electric and electronic appliances through new ones, which could be extended for domestic refrigerators.

Besides their usual services, some of the most important energy providers in Colombia offer a broad scope of consumer services including credit lines with a social character. Moreover they own an established infrastructure, broad knowledge and experience with the commercialization of products for the life quality improvement and household appliances, in particular in the socioeconomic strata 1-3. The refinancing takes place through the energy bill (on-bill financing) with attractive payment terms.

Support initiatives for designers and equipment manufacturers

3. Do you have any energy efficiency programmes that encourage and support designers of systems (eg building services consultants) or equipment manufacturers to provide energy efficient solutions (for example, financial support for design activities or training programmes specifically targeted at increasing the energy efficiency in the RACHP sectors)?

NO

4. Are there any energy efficiency programmes being undertaken by professional bodies, trade bodies or universities to help identify energy efficient solutions to the RACHP sectors?

The Colombian Energy Efficiency Council (CCEE, in Spanish) is a private non-profit association created on December 2, 2010, to develop and promote effective strategies that promote Energy Efficiency - EE and Renewable Energies - ER in Colombia.

To fulfil its corporate purpose, the CCEE permanently carries out various activities of dissemination, promotion, training, awareness raising and education on issues related to EE and ER, including innovation, scientific research and the promotion of new technologies. CCEE seeks cooperation and collaboration through professional networks of the different agents from all sectors whose actions contribute to its purpose and to the development of market opportunities for efficient energy management in Colombia. So far, this association has not worked on topics specific to the RAC sector.

The Universidad Pontificia Bolivariana has a research team on refrigeration and air conditioning systems. (See <https://www.upb.edu.co/es/investigacion/nuestro-sistema/semilleros/semillero-refrigeracion-climatizacion-medellin>) The Universidad Tecnológica de Pereira has an emphasis on mechanical engineering degree in the area of thermal sciences for the RAC sector. (See <http://mecanica.utp.edu.co/maestrias/ingenieria-mecanica/areas-enfasis.html>).

The research group in Analysis and modeling Energy Environment Economics is made up of researchers from the University of the Andes and the National University of Colombia. (<http://www.hermes.unal.edu.co/pages/Consultas/Grupo.jsf?idGrupo=829>)

Projects/case studies illustrating improved efficiency

5. Are there projects or case studies on installation of energy efficient RACHP equipment (eg national demonstration programmes or any other relevant projects)?

Some pilot projects promoted by the government were not specific for energy efficiency, but had components that considered this aspect:

As a precedent for the accomplishment of a National Replacement Programme for Domestic Refrigerators it is worth mentioning the pilot project for the scrapping of household refrigerators, supported by UTO/MADS and ANDI, Almacenes Éxito, HACEB and MABE between May and September 2008. Within this pilot project, 1,898 refrigerators manufactured with CFC were replaced and finally disposed.

Since then, some pilot replacement initiatives are being developed in cooperation with the private sector. Some of them include a bonus component when the old fridge is handed over for its final disposal. Utilities and household appliances stores from the traditional sales channel are getting involved in such initiatives. The models replaced currently have a higher efficiency; however, they are not free of HFCs and therefore not climate friendly. Moreover, these initiatives do not regard themselves as self-sustainable until now and require seed capital support, since the amount of recycled fridges is too small.

In the flower industry sector in Colombia, the initiative for the use of hydrocarbons (HC) as a refrigerant was promoted for cold storage rooms. This pilot project demonstrated a refrigeration system with a low-impact on the ozone layer and on the climate, in addition to an improvement in energy consumption. Currently this sector seeks to replicate this project as an option for environmental and energy improvement.

In addition, the UTO / MADS, the utility of Medellin - EPM and the cooperation office of the Swiss government - SECO, are currently promoting the implementation of district-cooling as an alternative to replace air conditioning systems in buildings, to improve energy efficiency, to contribute with the phase-out the Ozone Depletion Substances and reduce greenhouse gases in the building sector. Currently, this project has implemented the district-cooling of the Alpujarra in Medellin, which is in operation and supplies chilled water to the air conditioned systems in four buildings; and promotes this initiative in five cities in Colombia through energy maps allowing the identification of potential zones to implement these systems.

Help and support required

6. Which kind of advice and information related to RACHP energy efficiency your country would find helpful receiving?

- Support for awareness raising and training on the importance of energy efficiency in RACHP sector.
- Support for the formulation of programs for designers, installers and professionals in RACHP sector.
- Support in the formulation of specific regulations for RACHP: Regulation of thermal installations in buildings, which will establish the requirements for the design conditions of cold systems for buildings.
- Support for the formulation of MEPS: the entire RACHP sector.
- Technical Assistance for Product Performance and Energy Efficiency Certification Processes.
- Capacity Building for Laboratory Testing Program for Commercial Refrigeration and Air Conditioning Equipment.

Egypt

1. Will your Ozone Unit and local companies be interested in receiving additional funding to improve energy efficiency during the HFC phasedown and the current HCFC phase-out?

Yes

2. Which of the following activities will you want financing for first? Second? Third?

- a. Energy labelling programs and minimum energy efficiency standards?
- b. "Buyers club "that combine purchasing power to get the most efficient products at an affordable price?
- c. Training workshops to learn how to install and service ACs to achieve the maximize energy efficiency (equipment sizing, component placement, line size, service contracts)?
- d. Training of trainers in the new concepts of energy efficiency?
- e. Establishment of Regional Energy Efficiency Centers?

First . "Buyers club "that combine purchasing power to get the most efficient products at an affordable price?

Second. Establishment of Regional Energy Efficiency Centers?

Third. Training of trainers in the new concepts of energy efficiency?

3. Do you already have energy efficiency programs in the Ozone Unit?

No

4. Do you quantify and/or take into consideration the life cycle performance criteria when looking into energy efficiency?

No

5. Do you coordinate with your national Energy departments/ministries/ UNFCCC focal points?

Yes

6. Would you like OzonAction to help organize regional energy efficiency standards and other strategies that can help improve efficiency?

Yes

7. Do you have any incentives in your country to promote energy efficiency?

No

8. Describe if and what do you anticipate as barriers for adoption of energy efficiency air conditioning and other products at a nationwide or federal level?

(Governmental Perception, Public culture, Lack of financial incentive)

9. Do you know the percentage of your country's energy consumption which is spent on the refrigeration and cooling sector?

No

10. Check the boxes of the five technologies and practices most important to have TEAP assess for energy efficiency gains in the HFC phase down?

- a. Training and tools to reduce refrigerant emissions and to be sure the refrigerant charge is at the amount for highest energy efficiency during instillation, servicing, and disposal.
- b. An analysis of bans preventing the import of used ACs and refrigerators that are less efficient than new products and equipment.
- c. Secondary-loop motor vehicle air conditioning (SL-MAC)¹ that allows the use of low cost, energy efficient refrigerants and increases fuel mileage.
- d. Solar powered refrigeration that works even during power outages.
- e. A list of the most efficient room ACs and refrigerators for climates with high ambient temperature.

Secondary-loop motor vehicle air conditioning (SL-MAC) that allows the use of low cost, energy efficient refrigerants and increases fuel mileage.

11. Would you like TEAP to make a list of technology that is ozone safe, super efficient, and pays back any increased purchase cost with electricity savings?

Yes

12. Would you like TEAP to catalogue the most successful incentives for energy efficiency, such as rebates, finance, or payment for old equipment when replaced with highly efficient new equipment?

Yes

13. What do you think the MLF and the Ex-Com should consider while looking into the guidelines for energy efficiency finance?

MLF and the Ex-Com should consider issues related to Technology Transfer, training, capacity building, technical support and focusing on the following five technologies:

- Magneto Caloric Technology
- Absorption Technology
- Indirect Evaporated cooling
- Adsorption
- Solar Assisted Refrigeration Unit

14. Have you included avoided emissions from energy efficiency gains (relevant to the phase out of HCFCs and in the future phase down of HFCs) in your current NDCs and if not, are you considering integrating them for the 2018 revision? Would you like assistance with this?

Yes

¹ The Secondary Loop Mobile Air Conditioner (SL-MAC) uses energy to cool the refrigerant, which then cools the water or antifreeze coolant, and, finally, the coolant is used to cool the air that circulates inside passenger compartment. It has been developed to allow the safe use of mildly flammable refrigerants that have a low global warming potential (GWP) and to achieve high cooling capacity, minimizing the losses and achieving an improved overall thermodynamic efficiency in the process. The SL-MAC reduces the refrigerant charge and lifecycle refrigerant emissions, thus increasing the system reliability and reducing the routine repair cost. It further enables enhanced fuel-saving features, such as regenerative cooling and prolonged idle stop (stop/start). It can be applied to MACs using hydrofluorocarbon (HFC)-134a, HFC-152a, hydrofluoroolefin (HFO)-1234yf, or any similar direct expansion refrigerant. In principle, it can be applied to carbon dioxide (CO₂) systems but the authors have not investigated the complications of high pressure and poor CO₂ cooling performance at high ambient temperature. The SL-MAC can be modified into a unitary heat pump air conditioner that can be reversed to distribute heat from where it is generated to where it is needed.

15. What are your general expectations concerning the issue of energy efficiency? Any other comments?

The general expectation:

- Energy Efficiency standards and other strategies is a must
 - Applying incentives to promote energy efficiency can help
 - Establishment of Regional Energy Efficiency Centres are needed
 - Awareness programs are needed
-

El Salvador

Relevant national energy efficiency policies

- 1. Does your country have any policies in place that encourage or enforce the use of energy efficient RACHP equipment (for example minimum energy performance standards (MEPS), energy labelling systems, financial incentives)? Which RACHP market sectors are affected by these policies (eg domestic refrigerators, small or large-size room air-conditioners etc)?**

Since March 5, 2012, the Salvadorean Organization for Standardization has issued certificates and certificates for the exemption of electric saving lamps and light bulbs, refrigerators for domestic and commercial use, in accordance with the following Salvadoran Standards (NSO):

NSO 97.47.04: 09

ENERGY EFFICIENCY FOR SELF-CONTAINED HOUSEHOLD REFRIGERATION EQUIPMENT. MAXIMUM ENERGY CONSUMPTION LIMITS, TEST METHODS AND LABELING.

NSO 97.47.03: 09

ENERGY EFFICIENCY FOR COMMERCIAL REFRIGERATION EQUIPMENT AUTOCONTENIDOS. MAXIMUM ENERGY CONSUMPTION LIMITS, TEST METHODS AND LABELING.

NSO 29.47.01: 09

ENERGY EFFICIENCY AND SAFETY OF COMPACT INTEGRATED FLUORESCENT LAMPS, ENERGY PERFORMANCE AND LABELING REQUIREMENTS.

Reference:

http://www.osn.gob.sv/index.php?option=com_content&view=article&id=90&Itemid=191

Utility company efficiency initiatives

- 2. Do any electricity utilities in your country operate schemes to incentivise the purchase of energy efficient RACHP equipment and if yes, in which RACHP market sectors?**

Information not available

Support initiatives for designers and equipment manufacturers

- 3. Do you have any energy efficiency programmes that encourage and support designers of systems (eg building services consultants) or equipment manufacturers to provide energy efficient solutions (for example, financial support for design activities or training programmes specifically targeted at increasing the energy efficiency in the RACHP sectors)?**

Information not available

- 4. Are there any energy efficiency programmes being undertaken by professional bodies, trade bodies or universities to help identify energy efficient solutions to the RACHP sectors?**

Information not available

Projects/case studies illustrating improved efficiency

5. Are there projects or case studies on installation of energy efficient RACHP equipment (eg national demonstration programmes or any other relevant projects)?

The National Energy Council, with the financial support of the United Nations Development Program, implemented the project "Energy Efficiency in Public Buildings" with which equipment of air conditioners of high energy consumption were replaced by other ones of lesser consumption. Which meant an annual saving of 91,246.81 KWh in electricity consumption and a reduction of 55.39 tons of CO₂. While the central air conditioning equipment with saving 52,560 KWh, equivalent to 31,904 tons of CO₂.

Further details in the document "ENERGY EFFICIENCY IN PUBLIC BUILDINGS (EEPB)" SYSTEMS OF EXPERIENCE AND LESSONS LEARNED IN THE IMPLEMENTATION OF ENERGY EFFICIENCY MEASURES FOR THE GOVERNMENT SECTOR.

Document available:

https://www.google.com/sv/url?sa=t&rct=j&q=&esrc=s&source=web&cd=4&cad=rja&uact=8&ved=0ahUKewiqp6qOjYzUAhXCUiYKHXYiCSkQFggyMAM&url=http%3A%2F%2Fwww.cne.gob.sv%2Findex.php%3Foption%3Dcom_phocadownload%26view%3Dcategory%26download%3D640%3A2014-05-02-14-32-53%26id%3D66%3Aproyecto-de-ee-en-el-sector-gubernamental%26Itemid%3D63&usg=AFQjCNE6oGl0SGNCq46Vs9vO9OdZ4x0WYA

Help and support required

6. Which kind of advice and information related to RACHP energy efficiency your country would find helpful receiving?

Regulations applicable to the use and management of hydrocarbons as refrigerant in the domestic and commercial refrigeration sector.

Estonia

Relevant national energy efficiency policies

1. Does your country have any policies in place that encourage or enforce the use of energy efficient RACHP equipment (for example minimum energy performance standards (MEPS), energy labelling systems, financial incentives)? Which RACHP market sectors are affected by these policies (eg domestic refrigerators, small or large-size room air-conditioners etc)?

In Estonia all policies come from EU regulations.

Utility company efficiency initiatives

2. Do any electricity utilities in your country operate schemes to incentivise the purchase of energy efficient RACHP equipment and if yes, in which RACHP market sectors?

-

Support initiatives for designers and equipment manufacturers

3. Do you have any energy efficiency programmes that encourage and support designers of systems (eg building services consultants) or equipment manufacturers to provide energy efficient solutions (for example, financial support for design activities or training programmes specifically targeted at increasing the energy efficiency in the RACHP sectors)?

-

4. Are there any energy efficiency programmes being undertaken by professional bodies, trade bodies or universities to help identify energy efficient solutions to the RACHP sectors?

Projects/case studies illustrating improved efficiency**5. Are there projects or case studies on installation of energy efficient RACHP equipment (eg national demonstration programmes or any other relevant projects)?****District cooling system in the city of Tartu, Estonia**

In May 2016 AS Fortum Tartu (the local heat and power company) opened the first district cooling plant and network in Tartu, Estonia. This cooling plant is also the first in the Baltic states. At the moment the Tartu district cooling network is 1.6 kilometres long. It increases the range of services for the customers in Tartu in addition to heat and electricity, which is produced by Fortum's local combined heat and power (CHP) plant.

The district cooling plant has a cooling capacity of 13 MW and it combines both traditional industrial cooling equipment and cold water from the Emajõgi river that flows through the city. Currently, the system provides 8.5 MW in cooling capacity.

In co-operation with SmartEnCity project, funded under the European Union's Horizon 2020 research and innovation programme, solar panels were installed to produce electricity for the plant's energy needs. Inside the plant there is a heat pump which helps transform the excess heat in the water coming from the district cooling customers to heat up the water for the district heating customers.

Description of cooling process

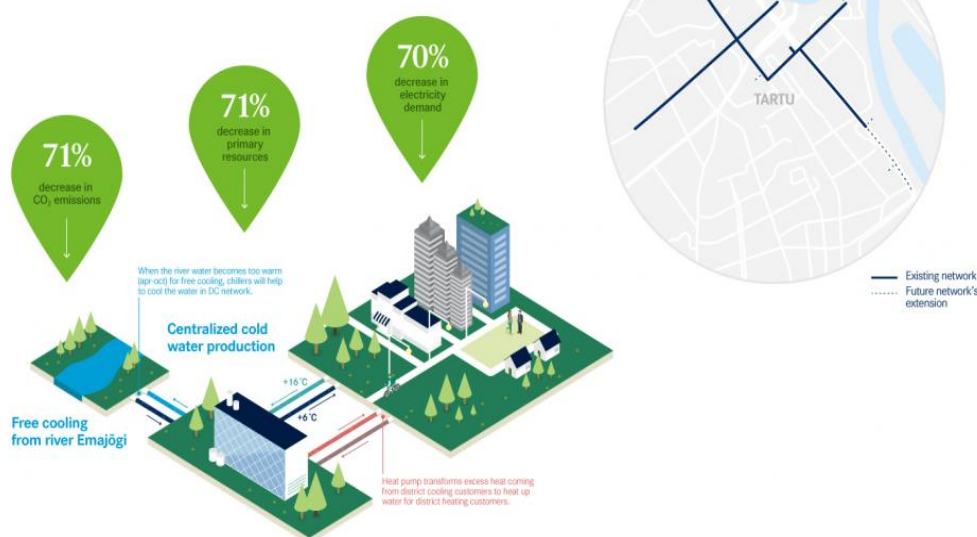
During the winter time (from April to October) water from the river is used for free cooling. Water temperature should be approximately 6 degrees Celsius. It will go through the district cooling pipeline and will end up in the client's system. The water returns to the cooling plant from the client's system at the temperature of 16 degrees Celsius. The heat is removed from the water by using a heat pump and further distributed to the district heating network. Then the water heads back to the river.

During the summer period water from the river is used for cooling the equipment (2 compressors and 1 heat pump). One of the compressors uses low GWP hydrofluorocarbons - HFC-1234yf (GWP 4) and the other HFC-

134 a (GWP 1 430).

District Cooling in Tartu

Available in central Tartu



Benefits of district cooling

District cooling has several advantages compared to other alternatives available on the market.

Connecting a property to the district cooling network eliminates the need for refrigeration equipment or A/C units on rooftops. This frees up large amounts of space and brings significant savings for the property owners who choose to go for district cooling.

District cooling is also effective and reliable due to durable and effective industrial equipment that is used for this purpose. Moreover, district cooling helps reduce energy consumption and protects the environment by reducing CO₂ emissions. Introduction of district cooling reduces electricity demand by ca 90% compared to conventional cooling and in case of Tartu it has also brought along a 70% decrease in CO₂ emissions compared to conventional refrigeration solutions. For other benefits see table 1.

Table 1. Benefits of district cooling

Environmental data	Unit	Zero-alt.	DC	Savings	
Electricity demand	GWh/year	3,0	0,9	2,1	70%
Primary resources	GWh/year	12	4	8,2	67%
CO ₂ emissions	ton/year	4 300	1 200	3 100	72%
Refrigerant charge	ton	2,4	1,0	1,4	58%
Refrigerant leakage	kg/year	150	20	130	86%

For more information contact AS Fortum Tartu
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 Tel: +372 733 7100

Fax: +372 733 7108
mail@fortumtartu.ee

Help and support required

6. Which kind of advice and information related to RACHP energy efficiency your country would find helpful receiving?

(no response)

European Union

European Commission (2011). DG ENTR. Preparatory Study for Ecodesign Requirements for refrigeration and freezing equipment.

http://www.eup-network.de/fileadmin/user_upload/Produktgruppen/Lots/Final_Documents/BIO_ENTR_Lot_1_summary_document_16052011_final.pdf

Preparatory Study for Eco-design

<https://circabc.europa.eu/webdav/CircaBC/Energy/Energy%20Efficiency/Library/Ecodesign%20preparatory%20studies/Lot%201%20-%20DG%20ENTR%20-%20Professional%20refrigeration>

European Commission (2012). Impact Assessment with regard to ecodesign requirements for air conditioners [..]

https://ec.europa.eu/energy/sites/ener/files/documents/en_impact_assesment.pdf

European Commission (2012). Preparatory Study for a Review of the Fgas Regulation plus Annexes

https://ec.europa.eu/clima/sites/clima/files/f-gas/docs/2011_study_en.pdf
https://ec.europa.eu/clima/sites/clima/files/f-gas/docs/2011_study_annex_en.pdf

European Commission (2014). JRC technical reports. Ecodesign for Commercial Refrigeration

http://publications.jrc.ec.europa.eu/repository/bitstream/JRC91168/comm_refrig_published_bkg_doc%20-%202014%20august%2026.pdf

European Commission (2014). JRC report. A review of factors affecting environmental and economic life-cycle performance for electrically-driven heat-pumps

<https://setis.ec.europa.eu/related-jrc-activities/jrc-setis-reports/review-of-factors-affecting-environmental-and-economic-life>

European Commission (2016). JRC report. Best practices and informal guidance on how to implement the Comprehensive Assessment at Member State level

<https://setis.ec.europa.eu/related-jrc-activities/jrc-setis-reports/best-practices-and-informal-guidance-how-implement>

European Commission (2016). JRC report. Efficient district heating and cooling systems in the EU

http://publications.jrc.ec.europa.eu/repository/bitstream/JRC104437/study%20on%20efficient%20dhc%20systems%20in%20the%20eu%20-%20dec2016_final%20-%20public%20report6.pdf

European Commission (2016). Impact Assessment with regard to ecodesign requirements for [..] cooling products [..]

http://ec.europa.eu/smart-regulation/impact/ia_carried_out/docs/ia_2016/swd_2016_0422_en.pdf

European Commission (2016). Executive Summary Impact Assessment with regard to ecodesign requirements for blast cabinets, storage cabinets, condensing units and process chillers

http://ec.europa.eu/smart-regulation/impact/ia_carried_out/docs/ia_2015/swd_2015_0096_en.pdf

European Commission (2016). Preparatory/Review Study with regard to ecodesign requirements for household refrigeration appliances

<http://www.ecodesign-bridges.eu/Documents/Household%20Refrigeration%20Review%20FINAL%20REPORT%2020160304.pdf>

European Commission (2017). JRC report. Efficient district heating and cooling markets in the EU: Case studies analysis, replicable key success factors and potential policy implications (From 2017)
<http://publications.jrc.ec.europa.eu/repository/handle/JRC104437>

EU Framework Programme 7 project EnE-HVAC
<http://www.ene-hvac.eu/>

EU Framework Programme 7 projects on energy-efficient buildings
http://e2b.ectp.org/fileadmin/user_upload/documents/E2B/0_EeB_PPP_Promising_Techno_Brochures/Energy_Building_Systems.pdf

EU Framework Programme 7 projects on urban district scale solutions
http://e2b.ectp.org/fileadmin/user_upload/documents/E2B/0_EeB_PPP_Promising_Techno_Brochures/Urban_District_Scale_Solutions.pdf

EU Framework Programme 7 projects on HVAC and lighting solutions
http://e2b.ectp.org/fileadmin/user_upload/documents/E2B/0_EeB_PPP_Promising_Techno_Brochures/HVAC_and_Lighting_Solutions.pdf

EU LIFE project ENER-ICE
http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=3460

van Holsteijn en Kemna B.V. et al. (2014). Review Study on Cold Appliances, [..]
http://susproc.jrc.ec.europa.eu/Washing_machines_and_washer_dryers/docs/omnibus_studyf_2014-03.pdf

Ghana

Relevant national energy efficiency policies

1. **Does your country have any policies in place that encourage or enforce the use of energy efficient RACHP equipment (for example minimum energy performance standards (MEPS), energy labelling systems, financial incentives)? Which RACHP market sectors are affected by these policies (eg domestic refrigerators, small or large-size room air-conditioners etc)?**

Ghana has energy efficiency policy in place for refrigerating appliances and room air conditioners. Minimum Energy Performance Standards (MEPS) were developed as far back as 2005 and 2008 for refrigerating and air-conditioning appliance respectively. The MEPS are backed by laws to make compliance mandatory and to give legal backing for enforcement. The market sector affected by these standards and regulations are the domestic appliance sector. There is also appliance labelling regime in place to drive the market towards energy efficiency. The labels have stars in them, the more the stars, the more efficient the appliance is.

To be able to transform the refrigerating market to more efficient one, financial incentive in the form of rebate scheme was put in place between 2011 to 2015. To assist consumers buy new and efficient refrigerating appliances, coupons with monetary values were given to consumers who voluntarily turned in their old and inefficient refrigerating appliances. The rebate value was based on the level of efficiency of the appliance determined by the number of stars on the affixed label. The coupon value was used as a top up to buy a new and efficient refrigerating appliance.

Utility company efficiency initiatives

2. **Do any electricity utilities in your country operate schemes to incentivise the purchase of energy efficient RACHP equipment and if yes, in which RACHP market sectors?**

The electricity utilities do not operate incentive schemes. However the tariff structure provides incentives to efficient users of power and penalizes consumers who do not use power efficiently.

Support initiatives for designers and equipment manufacturers

3. **Do you have any energy efficiency programmes that encourage and support designers of systems (eg building services consultants) or equipment manufacturers to provide energy efficient solutions (for example, financial support for design activities or training programmes specifically targeted at increasing the energy efficiency in the RACHP sectors)?**

No, there are no manufacturers yet as that sector of the economy is primarily import based.

4. **Are there any energy efficiency programmes being undertaken by professional bodies, trade bodies or universities to help identify energy efficient solutions to the RACHP sectors?**

The Kwame Nkrumah University of Science and Technology (KNUST) has a department that researches into energy efficiency in air-conditioners and refrigerating appliances.

Projects/case studies illustrating improved efficiency

5. **Are there projects or case studies on installation of energy efficient RACHP equipment (eg national demonstration programmes or any other relevant projects)?**

There have several demonstration done on refrigerating appliances as part of the market transformation agenda. The attention now is on ACs.

The Energy Commission has been educating the public, especially the Ministries, Department and Agencies (MDAs) and Hotels to start considering the installation of Variable Refrigerant Volume (VRV) air-conditioners as they are more efficient than the conventional ones. We have VRV ACs installed at the Commission and savings data are being collected to strengthen the education campaign.

Help and support required

6. **Which kind of advice and information related to RACHP energy efficiency your country would find helpful receiving?**

1. Technical and financial assistance to develop standards for heat pumps.

Grenada

Relevant national energy efficiency policies

1. **Does your country have any policies in place that encourage or enforce the use of energy efficient RACHP equipment (for example minimum energy performance standards (MEPS), energy labelling systems, financial incentives)? Which RACHP market sectors are affected by these policies (eg domestic refrigerators, small or large-size room air-conditioners etc)?**

Grenada has a National Energy Policy that addresses in very broad terms Energy Efficiency and is not specific to the HVAC Sector. MEPS and Energy labelling standards are currently worked on.

Utility company efficiency initiatives

2. **Do any electricity utilities in your country operate schemes to incentivise the purchase of energy efficient RACHP equipment and if yes, in which RACHP market sectors?**

The utility company does not have an incentive scheme in place but encourages EE through their PA initiatives.

Support initiatives for designers and equipment manufacturers

3. Do you have any energy efficiency programmes that encourage and support designers of systems (eg building services consultants) or equipment manufacturers to provide energy efficient solutions (for example, financial support for design activities or training programmes specifically targeted at increasing the energy efficiency in the RACHP sectors)?

No

4. Are there any energy efficiency programmes being undertaken by professional bodies, trade bodies or universities to help identify energy efficient solutions to the RACHP sectors?

There is one Private Sector HVAC company that offers a rebate of US40 per ton of R-22 system replaced with an EE alternative

Projects/case studies illustrating improved efficiency

5. Are there projects or case studies on installation of energy efficient RACHP equipment (eg national demonstration programmes or any other relevant projects)?

A number of private companies use comparative data of replacing old systems with EE systems as part of their marketing strategy

Help and support required

6. Which kind of advice and information related to RACHP energy efficiency your country would find helpful receiving?

(no response)

Guinea on behalf of African Group**African Group Submission to the Ozone Secretariat Further To Decision XXVIII/3 related to Relevant Information on Energy Efficiency Innovations In The Refrigeration, Air-Conditioning and Heat- Pump Sectors****BACKGROUND**

If a fast HFC phasedown under the Montreal Protocol can avoid 100 billion tons of CO₂-equivalent by 2050, improving energy efficiency in parallel with a phasedown could approach 80 to 100 billion tones avoided from appliance efficiency alone, nearly doubling the climate benefits of a phasedown alone².

When the Kigali Amendment is ratified, Africa, as well as most of the parties, will be bound to start phasing down HFCs by 2024. A fast start in implementing the Amendment as well as the possibility to leapfrog high GWP HFCs as soon as possible, are key prospects for Africa.

VIEWS ON ENERGY EFFICIENCY

As highlighted in the Decision XXVIII/3, **energy efficiency opportunities** in the refrigeration and air-conditioning and heat-pump sectors related to a transition to climate-friendly alternatives, including not-in-kind options, need to be assessed.

The assessment will bring clarity on national opportunities relevant to countries' needs and national contexts. It shall allow, not only to highlight the current baseline in terms of knowledge of communities, legislation, stakeholders, but also to identify the key institution to lead the transition to energy efficiency adoption in relevant sectors.

The African group hereby expresses the need for assistance in the different ways described below:

² <http://eetd.lbl.gov/publications/benefits-of-leapfrogging-to-superef-0>

1. Energy Efficiency Metrics

Back in 2007, the Ozone Secretariat had developed the **Multilateral Fund Climate Impact Indicator (MCII)**³, a tool designed to help with decision XIX/6. The objective of the MCII was to offer an indication of the climate impact prior to any conversion activities based on limited data.

It was a tool then which was not to replace any « *analysis that could be undertaken on the basis of more detailed information on the performance of specific RAC equipment, such as a life-cycle climate performance or a life-cycle analysis* ».

The group suggest that TEAP produces a report as soon as possible on the metrics of energy efficiency relevant to the energy efficiency gains, notably the life-cycle climate performance, in parallel to the HFC phase down.

2. Energy Efficiency Incentives & Schemes/Strategies

The group requests TEAP to catalogue and assess relevance of **available strategies and incentives** for energy efficiency (for instance; rebates, finance, or payment for old equipment when replaced with highly efficient new equipment, import bans of second hand equipment, green procurement and buyers' clubs⁴).

3. Technologies Assessment

The group requests the TEAP to assess and catalogue available, present and projected energy efficient technologies related to the RAC sector including in HAT regions.

The group requests the TEAP to list technology that is ozone safe, super efficient, and pays back any increased purchase cost with electricity savings.

The group requests the TEAP to explore and assess practices to put in place energy efficiency gains, in the HCFC phase out/ HFC phase down for example:

- a. Training and toolkits as well as personal safety gear to reduce refrigerant emissions and to be sure the refrigerant charge is at the amount for highest energy efficiency during installation, servicing, and disposal.
- b. Solar powered refrigeration.

4. Energy Efficiency And The Role Of Capacity Building For Article 5 Countries

Article 5 countries generally need financing for a vast of array of activities and while recognizing the need to maintain the role of implementing agencies need some guidance from the TEAP related to assessing in which order of priority activities should be financed.

For example:

- 1/ Energy labelling programs and establishment of minimum energy efficiency standards;
- 2/ Facilitation of "Buyers club" that combine purchasing power to get the most efficient products at an affordable price;
- 3/ Establishment of energy efficiency programs in the Ozone Unit
- 4/ Strengthening capacities in order to take into consideration emissions reductions from EE in the NDCs
- 5/ Capacity building under the HFC phase down.

5. Link with HPMP's Phase 2

Energy efficiency strategies need to be integrated in countries' HPMP phase 2 by:

- 1) Engaging technicians, operators, installers and consultants who can recommend alternative technology and systems
- 2) Improving service practice through training, enhanced curricula and new codes which will reduce leakage and improve performance (potentially including energy performance)

³ UNEP/OzL.Pro/ExCom/78/5 Annex V

⁴ Buyers club is a pool of members aggregating collective buying power, enabling them to make purchases at lower prices than are generally available, or purchase goods that might be difficult to obtain independently.

Japan

Top Runner Program

http://www.enecho.meti.go.jp/category/saving_and_new/saving/003/pdf/toprunner2011.03en-1103.pdf

Home Page of the Agency for natural Resources and Energy:

<http://www.enecho.meti.go.jp/en/>

Files related to energy efficiency which were distributed at the symposium held by Japan Refrigeration and Air Conditioning Industry Association in 2016:

A Study on High Efficiency Wing-vane Compressor

http://conf.montreal-protocol.org/meeting/oweg/oweg-39/presession/Japan_submissions/JRAIA-Symposium2016_0201_wing_vane_compressor_E.pdf

AC/DC Hybrid Air Conditioner

http://conf.montreal-protocol.org/meeting/oweg/oweg-39/presession/Japan_submissions/JRAIA-Symposium2016_0501_hybrid_air_conditioner_E.pdf

Energy-saving of VRF systems

http://conf.montreal-protocol.org/meeting/oweg/oweg-39/presession/Japan_submissions/JRAIA-Symposium2016_0502_vrf_E.pdf

Development of high efficiency VRV system

http://conf.montreal-protocol.org/meeting/oweg/oweg-39/presession/Japan_submissions/JRAIA-Symposium2016_0503_vrf_E.pdf

DEVELOPMENT OF HIGH EFFICIENCY FAN SYSTEM FOR OUTDOOR UNIT OF AIR-CONDITIONER

http://conf.montreal-protocol.org/meeting/oweg/oweg-39/presession/Japan_submissions/JRAIA-Symposium2016_0504_outdoor_fan_E.pdf

DEVELOPMENT OF ULTRA-HIGH-EFFICIENCY GHP XAIRII

http://conf.montreal-protocol.org/meeting/oweg/oweg-39/presession/Japan_submissions/JRAIA-Symposium2016_0505_ghp_E.pdf

DEVELOPMENT OF AIR-COOLED HEAT PUMP CHILLER" DT-R"

http://conf.montreal-protocol.org/meeting/oweg/oweg-39/presession/Japan_submissions/JRAIA-Symposium2016_0601_hp_chiller_E.pdf

HIGH-EFFICIENCY AND COMPACT CENTRIFUGAL CHILLER

http://conf.montreal-protocol.org/meeting/oweg/oweg-39/presession/Japan_submissions/JRAIA-Symposium2016_0602_centrifugal_chiller_E.pdf

IMPROVEMENT OF ENERGY EFFICIENT BY CASCADE SYSTEM WITH CO₂ REFRIGERANT

http://conf.montreal-protocol.org/meeting/oweg/oweg-39/presession/Japan_submissions/JRAIA-Symposium2016_0603_cascade_refrigeration_E.pdf

CENTRIFUGAL CHILLER USING HFO1233zd(E)

http://conf.montreal-protocol.org/meeting/oweg/oweg-39/presession/Japan_submissions/JRAIA-Symposium2016_0804_centrifugal_chiller_E.pdf

Developments of air conditioner using low GWP refrigerant

http://conf.montreal-protocol.org/meeting/oweg/oweg-39/presession/Japan_submissions/JRAIA-Symposium2016_0904_air_conditioner_E.pdf

CO₂ HEAT PUMP DESICCANT DEHUMIDIFIER [chris]

http://conf.montreal-protocol.org/meeting/oweg/oweg-39/presession/Japan_submissions/JRAIA-Symposium2016_P010_hp_dehumidifier_E.pdf

DEVELOPMENT OF LOW-TEMPERATURE DRIVEN DOUBLE-LIFT ABSORPTION CHILLERS

http://conf.montreal-protocol.org/meeting/oweg/oweg-39/presession/Japan_submissions/JRAIA-Symposium2016_P011_absorption_chiller_E.pdf

MULTI-POWER SOURCE TRANSPORT REFRIGERATION UNIT CORRESPONDING TO ENVIRONMENTAL ISSUES

http://conf.montreal-protocol.org/meeting/owg/owg-39/presentation/Japan_submissions/JRAIA-Symposium2016_P012_transport_refrigeration_E.pdf

Air Control Technology to Balance Energy-Saving with the Comfort of the Room Air-Conditioners.

http://conf.montreal-protocol.org/meeting/owg/owg-39/presentation/Japan_submissions/JRAIA-Symposium2016_P013_air_conditioner_control_E.pdf

DEVELOPMENT OF MICRO CHANNEL HEAT EXCHANGER FOR HEAT PUMP AIR-CONDITIONER

http://conf.montreal-protocol.org/meeting/owg/owg-39/presentation/Japan_submissions/JRAIA-Symposium2016_P014_heat_exchanger_E.pdf

‘INNOVATIVE SMART CHANNEL[®]’ HEAT EXCHANGER

http://conf.montreal-protocol.org/meeting/owg/owg-39/presentation/Japan_submissions/JRAIA-Symposium2016_P015_heat_exchanger_E.pdf

Mexico

Relevant national energy efficiency policies

- 1. Does your country have any policies in place that encourage or enforce the use of energy efficient RACHP equipment (for example minimum energy performance standards (MEPS), energy labelling systems, financial incentives)? Which RACHP market sectors are affected by these policies (eg domestic refrigerators, small or large-size room air-conditioners etc)?**

Yes, we have two Organisms that encourage the use of energy efficient RACHP equipment:

- National Commission for the Efficient Use of Energy (CONUEE, Comisión Nacional para el Uso Eficiente de Energía),
<https://www.gob.mx/conuee> and
- Trust for the Saving of Electrical Energy (FIDE, Fideicomiso para el Ahorro de Energía Eléctrica),
<http://www.fide.org.mx/>

And we have several MEPS for refrigerators and air conditioners:

- NOM-011-ENER-2006 (PDF) Energy efficiency in central, packaged or divided air conditioners. Boundaries, testing and labeling methods.
- NOM-015-ENER-2012 (PDF) Energy efficiency of refrigerators and freezers household appliances. Boundaries, testing and labeling methods
- NOM-022-ENER/SCFI-2014 (PDF) Energy efficiency and user safety requirements for self-contained commercial refrigeration appliances. Boundaries, testing and labeling methods.
- NOM-023-ENER-2010 (PDF) Energy efficiency in split type air conditioners, free discharge and without air ducts. Limits, testing method and labeling.
- NOM-026-ENER-2015 (PDF) Energy efficiency in split air conditioners (Inverter) with variable refrigerant flow, free discharge and without air ducts. Boundaries, testing and labeling methods.

Also, our FIDE has several programs:

- Energy labelling systems
http://fide.org.mx/index.php?option=com_content&view=article&id=101&Itemid=231
- Energy Efficient
http://fide.org.mx/index.php?option=com_content&view=article&id=121&Itemid=219
- Financial Incentives
http://fide.org.mx/index.php?option=com_content&view=article&id=645&Itemid=224

Utility company efficiency initiatives**2. Do any electricity utilities in your country operate schemes to incentivise the purchase of energy efficient RACHP equipment and if yes, in which RACHP market sectors?**

Yes, the Federal Electricity Commission (CFE, Comisión Federal de Electricidad) through the FIDE and CONUEE programs, incentivize the purchase of energy efficient RACH equipment in several sectors:

- Energy labelling systems
http://fide.org.mx/index.php?option=com_content&view=article&id=101&Itemid=231
- Energy Efficient
http://fide.org.mx/index.php?option=com_content&view=article&id=121&Itemid=219
- Financial Incentives
http://fide.org.mx/index.php?option=com_content&view=article&id=645&Itemid=224

Support initiatives for designers and equipment manufacturers**3. Do you have any energy efficiency programmes that encourage and support designers of systems (eg building services consultants) or equipment manufacturers to provide energy efficient solutions (for example, financial support for design activities or training programmes specifically targeted at increasing the energy efficiency in the RACHP sectors)?**

Yes, FIDE has programs like “Education for the Saving and Rational Use of Electricity (EDUCAREE)”,
http://fide.org.mx/index.php?option=com_content&view=article&id=103&Itemid=191

Accreditation of specialized companies by FIDE (Building services consultants)
http://www.fide.org.mx/index.php?option=com_content&view=article&id=222&Itemid=264

Also, CONUEE has training programmes, videos and guides of energy efficient:
<http://www.gob.mx/conuee/acciones-y-programas/micro-pequenas-y-medianas-empresas?state=published>
http://www.gob.mx/cms/uploads/attachment/file/183073/PAT_2017_160117_VF-ilovepdf-compressed.pdf
<https://www.gob.mx/conuee/articulos/webinars-2016?idiom=es>

4. Are there any energy efficiency programmes being undertaken by professional bodies, trade bodies or universities to help identify energy efficient solutions to the RACHP sectors?

Yes, we have the programmes indicated in the point 3.

Projects/case studies illustrating improved efficiency**5. Are there projects or case studies on installation of energy efficient RACHP equipment (eg national demonstration programmes or any other relevant projects)?**

Yes, the FIDE has relevant projects of energy efficient, and you can see in the next web pages:
http://www.fide.org.mx/index.php?option=com_content&view=article&id=449&Itemid=277
http://www.fide.org.mx/index.php?option=com_content&view=article&id=574&Itemid=260

Help and support required**6. Which kind of advice and information related to RACHP energy efficiency your country would find helpful receiving?**

For our country will be helpful receive information regard to the new standards for RACHP energy efficiency. Also, information of the new refrigerants with 0 ODP and low or null GWP, guides, videos and training courses.

Morocco

Relevant national energy efficiency policies

1. Does your country have any policies in place that encourage or enforce the use of energy efficient RACHP equipment (for example minimum energy performance standards (MEPS), energy labelling systems, financial incentives)? Which RACHP market sectors are affected by these policies (eg domestic refrigerators, small or large-size room air-conditioners etc)?

Yes, Morocco has adopted a harmonized mandatory labelling system for this type of RACHP equipment, which is currently being updated to align it with the system adopted in Europe. Morocco is in the process of developing a statutory instrument on minimum standards for energy performance and energy labelling of the following equipment: refrigerators, air conditioners, power transformers and electric motors.

Utility company efficiency initiatives

2. Do any electricity utilities in your country operate schemes to incentivise the purchase of energy efficient RACHP equipment and if yes, in which RACHP market sectors?

No

Support initiatives for designers and equipment manufacturers

3. Do you have any energy efficiency programmes that encourage and support designers of systems (eg building services consultants) or equipment manufacturers to provide energy efficient solutions (for example, financial support for design activities or training programmes specifically targeted at increasing the energy efficiency in the RACHP sectors)?

No

4. Are there any energy efficiency programmes being undertaken by professional bodies, trade bodies or universities to help identify energy efficient solutions to the RACHP sectors?

No

Projects/case studies illustrating improved efficiency

5. Are there projects or case studies on installation of energy efficient RACHP equipment (eg national demonstration programmes or any other relevant projects)?

Yes, demonstration projects for energy efficiency in the construction industry.

Help and support required

6. Which kind of advice and information related to RACHP energy efficiency your country would find helpful receiving?

Any type of information that promotes energy efficiency of energy-using equipment in the Moroccan context.

Paraguay

Relevant national energy efficiency policies

1. Does your country have any policies in place that encourage or enforce the use of energy efficient RACHP equipment (for example minimum energy performance standards (MEPS), energy labelling systems, financial incentives)? Which RACHP market sectors are affected by these policies (eg domestic refrigerators, small or large-size room air-conditioners etc)?

The country has institutions, policies, laws and regulations in place that address issues related to efficient energy use. At the institutional level, the Vice-Ministry of Mines and Energy (VMME) is responsible for establishing and guiding policies on the use and management of mineral and energy resources, while the Energy Efficiency Committee is composed of public institutions, standardization bodies and educational institutions whose goal is to identify existing projects and programmes related to energy efficiency and to establish energy efficiency criteria (product standardization and labelling, source replacement, etc.), among others.

With regard to the RACHP sector, energy efficiency is provided for within the framework of Paraguay's energy policy, and technical regulations have been developed for the energy labelling of equipment.

The main regulations and legislation relating to energy efficiency are as follows:

Legislation

- Decree 6092/16, whereby the energy policy of the Republic of Paraguay is approved

Affected sectors: productive sectors and general population

Paraguayan energy efficiency standards

NP 51 001 13 – Generic energy performance labelling. General requirements.

NP 51 002 13 – Energy efficiency labelling for air conditioners.

NP 51 003 15 – Energy efficiency labelling for self-contained refrigeration appliances (refrigerators, freezers and combined). General requirements.

Utility company efficiency initiatives

2. Do any electricity utilities in your country operate schemes to incentivise the purchase of energy efficient RACHP equipment and if yes, in which RACHP market sectors?

There are none.

Support initiatives for designers and equipment manufacturers

3. Do you have any energy efficiency programmes that encourage and support designers of systems (eg building services consultants) or equipment manufacturers to provide energy efficient solutions (for example, financial support for design activities or training programmes specifically targeted at increasing the energy efficiency in the RACHP sectors)?

No specific energy efficiency programmes for the design and/or manufacture of refrigeration and air conditioning equipment and systems have been identified. However, the Paraguayan Council for Sustainable Construction exists at the national level, and promotes the integration of sustainable technologies within the industry and the participatory creation of national rules, regulations and standards for sustainable construction, incorporating design criteria for venture systems.

Another initiative is the VMME National Energy Efficiency Plan and Practical Guide to Energy Saving and Efficiency, the objective of which is to promote energy efficiency provisions and programmes that consider technological innovation for various sectors.

4. Are there any energy efficiency programmes being undertaken by professional bodies, trade bodies or universities to help identify energy efficient solutions to the RACHP sectors?

In the academic sector, university courses and initiatives have been identified in which energy efficiency is promoted as part of the university curriculum.

The degree in Electromechanical Engineering of the National University of Asunción's Faculty of Engineering has undertaken many projects and theses linked to energy efficiency in RACHP sectors.

The following theses have been submitted at the Faculty in recent years:

Study, analysis and design of an optimal refrigeration system applied to the refrigeration industry (2013).

Study of energy efficiency applied to the National University of Asunción's Faculty of Engineering by Gustavo Emanuel Vera Giménez and Edgar Rodolfo Ruiz Díaz Román (2013).

Energy audit and proposals for implementing corrective measures for energy efficiency: the case of Hotel Los Alpes by Fabio Figueredo López and Marcelo Emilio Dávalos Ocampos (2014).

Projects/case studies illustrating improved efficiency

5. Are there projects or case studies on installation of energy efficient RACHP equipment (eg national demonstration programmes or any other relevant projects)?

The Ozone Department, under the Technical Directorate for Air of the General Directorate for Air –Environment Secretariat, has promoted and supported laboratory and pilot tests of uses of natural alternative refrigerants, during which energy efficiency associated with the use of alternative substances has been assessed. Such tests are described below:

Tests involving the replacement of HCFC refrigerant gases with alternative hydrocarbon refrigerants in air conditioners. Paraguay Environment Secretariat (SEAM)/UNDP (2012).

Energy efficiency test and assessment using alternative refrigerants with hydrocarbons in public institutions. Case study on the Natural History Museum of Paraguay. Associated Refrigeration Technicians of Paraguay (TRAP)/SEAM (2015).

Another initiative is the Energy Efficiency Pilot Project for Public Buildings by the National Energy Efficiency Committee (CNEE)/VMME and Inter-American Development Bank, which is in progress.

Help and support required

6. Which kind of advice and information related to RACHP energy efficiency your country would find helpful receiving?

The following would prove particularly helpful:

Sharing local knowledge and experience in the development of energy diagnosis methodologies and energy audits in refrigeration and air conditioning systems.

Transferring information on case studies and experience in the Latin American and Caribbean region regarding energy efficiency in refrigeration and climate control facilities through the use of alternative refrigerants.

Providing training and strengthening national capacity on issues related to energy efficiency.

Providing advice on and enhancing collaboration towards the implementation of energy labelling for air conditioners in accordance with national standards.

Rwanda

Relevant national energy efficiency policies

1. Does your country have any policies in place that encourage or enforce the use of energy efficient RACHP equipment (for example minimum energy performance standards (MEPS), energy labelling systems, financial incentives)? Which RACHP market sectors are affected by these policies (eg domestic refrigerators, small or large-size room air-conditioners etc)?

No

Utility company efficiency initiatives

2. Do any electricity utilities in your country operate schemes to incentivise the purchase of energy efficient RACHP equipment and if yes, in which RACHP market sectors?

NO

Support initiatives for designers and equipment manufacturers

3. **Do you have any energy efficiency programmes that encourage and support designers of systems (eg building services consultants) or equipment manufacturers to provide energy efficient solutions (for example, financial support for design activities or training programmes specifically targeted at increasing the energy efficiency in the RACHP sectors)?**

NO

4. **Are there any energy efficiency programmes being undertaken by professional bodies, trade bodies or universities to help identify energy efficient solutions to the RACHP sectors?**

Non at the moment

Projects/case studies illustrating improved efficiency

5. **Are there projects or case studies on installation of energy efficient RACHP equipment (eg national demonstration programmes or any other relevant projects)?**

No

Help and support required

6. **Which kind of advice and information related to RACHP energy efficiency your country would find helpful receiving?**

Information/advice/support on how to:

- i. Develop Energy labelling programs, energy efficiency standards and other strategies that can help improve efficiency.
- ii. Training workshops to learn how to install and service ACs to achieve the maximize energy efficiency (equipment sizing, component placement)
- iii. Training of trainers in the new concepts of energy efficiency.
- iv. To develop pilot projects (demonstrational) and incentive programs to promote energy efficiency.

Switzerland (Answers by the Swiss Federal Office of Energy (SFOE))**Relevant national energy efficiency policies**

1. **Does your country have any policies in place that encourage or enforce the use of energy efficient RACHP equipment (for example minimum energy performance standards (MEPS), energy labelling systems, financial incentives)? Which RACHP market sectors are affected by these policies (eg domestic refrigerators, small or large-size room air-conditioners etc)?**

For domestic and professional refrigerators, standalone-air conditioners, frosters and condensing units and recently for all kind of heating systems there are MEPS and labelling systems in our national legislation. For fix-installed room conditioning systems there are minimal energy requirements stipulated in the SN/SIA standards (Swiss standards and Swiss assoc. of architects and engineers). These standards (state of the art) have been integrated in the legislations of our 26 cantons.

Utility company efficiency initiatives

2. **Do any electricity utilities in your country operate schemes to incentivise the purchase of energy efficient RACHP equipment and if yes, in which RACHP market sectors?**

Some utilities promote energy efficient refrigerators in limited-time promotions.

Support initiatives for designers and equipment manufacturers

3. Do you have any energy efficiency programmes that encourage and support designers of systems (eg building services consultants) or equipment manufacturers to provide energy efficient solutions (for example, financial support for design activities or training programmes specifically targeted at increasing the energy efficiency in the RACHP sectors)?

There is a national promotion campaign by SFOE and swiss assoc. of refrigeration technics, SVK for efficient use of energy in refrigeration systems. (www.effizientekaelte.ch).

SFOE runs as well a competitive programme (www.prokilowatt.ch) to support economically unviable measures by financial incentives to reduce the electricity consumption in the industrial and tertiary sectors, as well as for home sector. There is a federal programme to replace (among other measures) fossil and electric direct heating systems by energy efficient heat pumps.

4. Are there any energy efficiency programmes being undertaken by professional bodies, trade bodies or universities to help identify energy efficient solutions to the RACHP sectors?

see 3.

Projects/case studies illustrating improved efficiency

5. Are there projects or case studies on installation of energy efficient RACHP equipment (eg national demonstration programmes or any other relevant projects)?

SFOE runs a Research and P+D-Program, but in the field of refrigeration the activities are at low rate. Dissemination: Flyers, documenting “good or best practise” examples would be helpful

Help and support required

6. Which kind of advice and information related to RACHP energy efficiency your country would find helpful receiving?

none

United States of America

The future of air conditioning for buildings – Executive Summary

<https://www.energy.gov/eere/buildings/downloads/future-air-conditioning-buildings-report>

The future of air conditioning for buildings - Full Report

<https://www.energy.gov/eere/buildings/downloads/future-air-conditioning-buildings-report>

Viet Nam

Relevant national energy efficiency policies

1. Does your country have any policies in place that encourage or enforce the use of energy efficient RACHP equipment (for example minimum energy performance standards (MEPS), energy labelling systems, financial incentives)? Which RACHP market sectors are affected by these policies (eg domestic refrigerators, small or large-size room air-conditioners etc)?

Currently, Vietnam has the MEPS system in place for domestic refrigerators, commercial refrigerators and domestic AC.

For the labelling program, currently for the AC, there is mandatory labeling with 5 categories starting 2013 and for the domestic refrigerators, there is mandatory labeling with 5 categories starting 2014.

Utility company efficiency initiatives

2. **Do any electricity utilities in your country operate schemes to incentivise the purchase of energy efficient RACHP equipment and if yes, in which RACHP market sectors?**

NO.

Support initiatives for designers and equipment manufacturers

3. **Do you have any energy efficiency programmes that encourage and support designers of systems (eg building services consultants) or equipment manufacturers to provide energy efficient solutions (for example, financial support for design activities or training programmes specifically targeted at increasing the energy efficiency in the RACHP sectors)?**

In the framework of the MLF/WB funded project “HCFC Phase-out Management Plan Project in Vietnam, stage I”, there have been some trainings for technicians operating in AC refrigeration and servicing sectors.

4. **Are there any energy efficiency programmes being undertaken by professional bodies, trade bodies or universities to help identify energy efficient solutions to the RACHP sectors?**

No.

Projects/case studies illustrating improved efficiency

5. **Are there projects or case studies on installation of energy efficient RACHP equipment (eg national demonstration programmes or any other relevant projects)?**

Project “Improving energy efficiency and reducing ozone depleting substances emission in industrial refrigeration in Vietnam”, in which four pilot sub-projects have been implemented throughout Vietnam for the conversion of 25 refrigeration units in 9 cold stores of four demonstration enterprises from HCFC-22 to HC-290.

Help and support required

6. **Which kind of advice and information related to RACHP energy efficiency your country would find helpful receiving?**

- More training programme/curriculum available for the vocational training centers/schools
- International expertise/consultation
- Updated technology
- Policy and institutional strengthening