STAYING COOL

Working Together on a Triple Win

Status of discussion on decisions related to maintaining and/or enhancing energy efficiency under the MLF

Thanavat Junchaya

MP Operations, World Bank

International Conference on Sustainable Cooling & 5th COOL Workshop

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Decisions related to EE

- MOP Decision XXVIII-2 (para. 22) – To request ExCom to develop cost guidance associated with maintaining and/or enhancing the EE of low-GWP or zero-GWP replacement technologies and equipment, when phasing down HFCs, while taking note the role of other institutions addressing EE, when appropriate
- Update on ExCom work related to EE
  - ExCom has been discussing the development of cost guidelines since 2017 but has not yet completed their deliberations.
  - Energy efficiency remains one of the outstanding issues for further discussion
  - ExCom would hold further discussions at upcoming 82nd meeting next week while taking into account discussions from OEWG-40 and MOP-30.

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Additional work on EE to be requested to the Secretariat (in draft)

- Issues associated with maintaining and/or enhancing EE
  - Incremental costs in the manufacturing and servicing of RAC equipment
  - Pay-back periods and economic benefits associated with EE improvements in RAC sector
  - Possible modalities for funding, including operational modalities for co-funding with other institutions
  - Requirements for establishing MEPs including testing and verification of EE in equipment
  - Institutional and regulatory framework needed in A-5 countries
- Consider appropriate standards and directives (EU directives for reducing GHG emissions, etc.)
- Consider Austria paper (CRP submitted to 80th ExCom)
  - Similar issues with some differences, plus:
  - Inventory of EE activities already undertaken and/or funded by GEF and GCF
  - Cost guidance, methodologies, processes, monitoring, verification associated with EE interventions by GEF and GCF

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MOP-30 decision: Access to EE technologies in RACHP sector

- Request ExCom to consider flexibility within HFC-enabling activities
  - Developing and enforcing policies and regulations to avoid the market penetration of energy-inefficient RACHP equipment,
  - Promoting access to energy-efficient technologies in these sectors;
  - Targeted training on certification, safety and standards, awareness-raising and capacity-building aimed at maintaining and enhancing the energy efficiency
- Request ExCom to identify best practices, lessons learned, and additional opportunities for maintaining energy efficiency in the servicing sector

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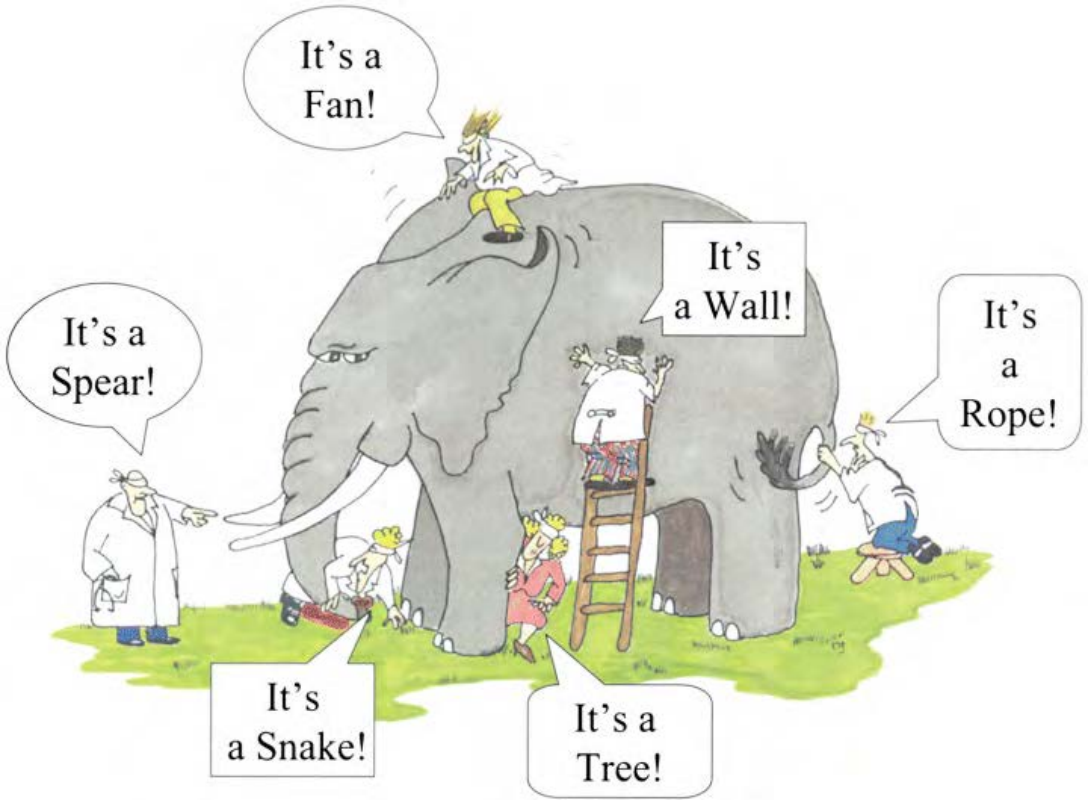
What are the *incremental costs* for maintaining and/or enhancing EE in the manufacturing of RAC equipment



- MLF eligible incremental cost
  - Support manufacturer during its refrigerant transition to zero-, low, lower-GWP alternatives
  - Safety system if transition to flammable refrigerant
- What about "technical upgrade" EE improvement options – are they eligible

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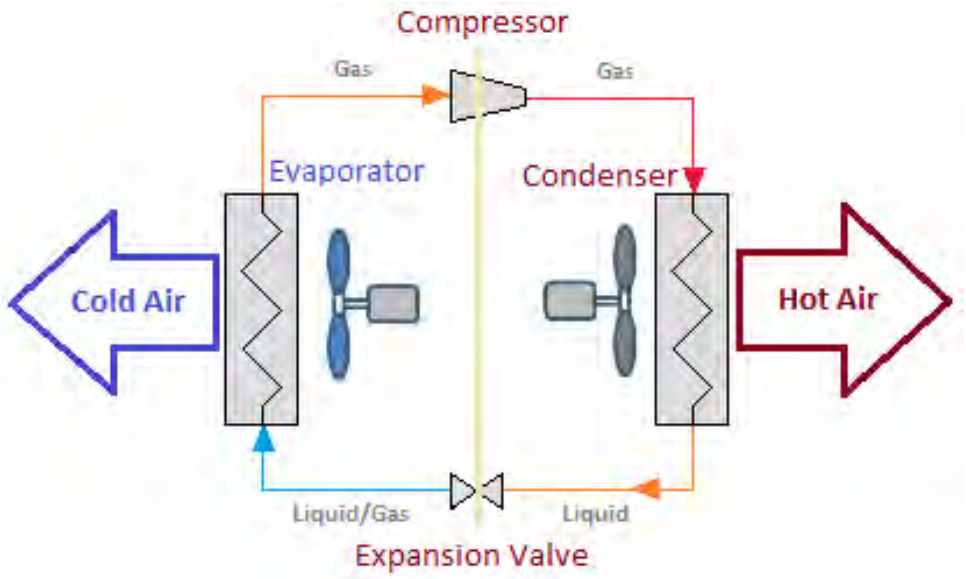
Main components of RACHP equipment



- EE improvement options
  - Compressor: inverter/variable speed
  - Heat exchanger improvements: microgroove tube, microchannel
  - Variable speed fan
  - Electronic expansion valve
  - Smart control/sensor

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Analysis of incremental costs

	Maintain (fixed speed > fixed speed)	Enhancing (fixed speed > inverter)
Product development		
Modification of R&D and testing facilities for handling flammable refrigerant (A2L or A3)	$10,000	
Improving calorimeter room for testing low load		$150,000
Product design, prototype development, field test, product certification	$8,500	$9,000
Capital Cost		
New refrigerant charging machine for flammable refrigerant	$75,000 (per unit)	
Replacement of vacuum pumps	$2,500 (per unit)	
Storage and transfer of flammable refrigerant	$30,000	
Safety: leak detectors, ventilation, fire suppression system...	$50,000	
Modifications to heat exchanger production line to handle higher pressure refrigerant	$90,000	
Inverter control box assembly line		$15,000
Improvement of functional test on inverter in condensing unit assembly line		$3,000

Analysis of incremental costs

	Maintain (fixed speed > fixed speed)	Enhancing (fixed speed > inverter)
Operating cost		
Compressor	$5-10	$85-120
Refrigerant cost	-	-
AC → variable speed DC fan motor in condensing unit		$15-24
Capillary tube → electronic expansion valve		$10
Inverter Drive Development		
Torque Testing Machine to tune Inverter Driver with Compressor Motor Parameter		$150,000
EMC testing facilities		$2,600,000
Surge Test, Lightening Test for Inverter Driver		$50,000
AC source to simulate undervoltage, overvoltage		$50,000
Testing Chamber for inverter driver		$60,000
Field test inverter driver		$3,000 (per model)

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Incremental costs for maintaining and/or enhancing EE in the servicing of RAC equipment

- Neglecting necessary maintenance ensures a steady decline in air conditioning performance while energy use steadily increases
- Best practice maintenance can deliver utility cost savings of 10–40% when compared with poor maintenance.

Source: https://www.airah.org.au/Content_Files/UsefulDocuments/DCCEE_HVAC_HESS_GuideToBestPractice2012.PDF

Pay-back periods and economic benefits associated with EE improvements in RAC sector

- Instead of incremental operating cost – higher EE RAC equipment would lead to incremental operating saving for end-users
- Thailand chiller replacement & global chiller projects – co-funding with GEF and other institutions
- MOP-30: Request ExCom, in dialogue with the Ozone Secretariat, to liaise with other funds and financial institutions to explore mobilizing additional resources and, as appropriate, set up modalities for co-operation

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Thank you

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