



**WORKSHOP ON  
ENERGY EFFICIENCY**  
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# Understanding energy efficiency in RACHP

**Ray Gluckman**

TEAP Senior Expert

Member of RTOC and EETF

# Significant Potential to Improve RACHP Efficiency

## Cooling Load Reduction (30% to 60%)

Building space cooling

- shading, reflective surfaces, insulation

Cold chain

- doors on display cases, LEDs, VSD fans

## New Equipment Design (40% to 75%)

Variable speed compressors

High efficiency heat exchangers

Optimised refrigeration cycle

Good controls and instrumentation

## Operation and Control (15% to 30%)

Temperature and time control

Improved maintenance

Performance measurement and fault diagnosis

## Refrigerant Selection (5% to 10%)

Choice of most appropriate refrigerant

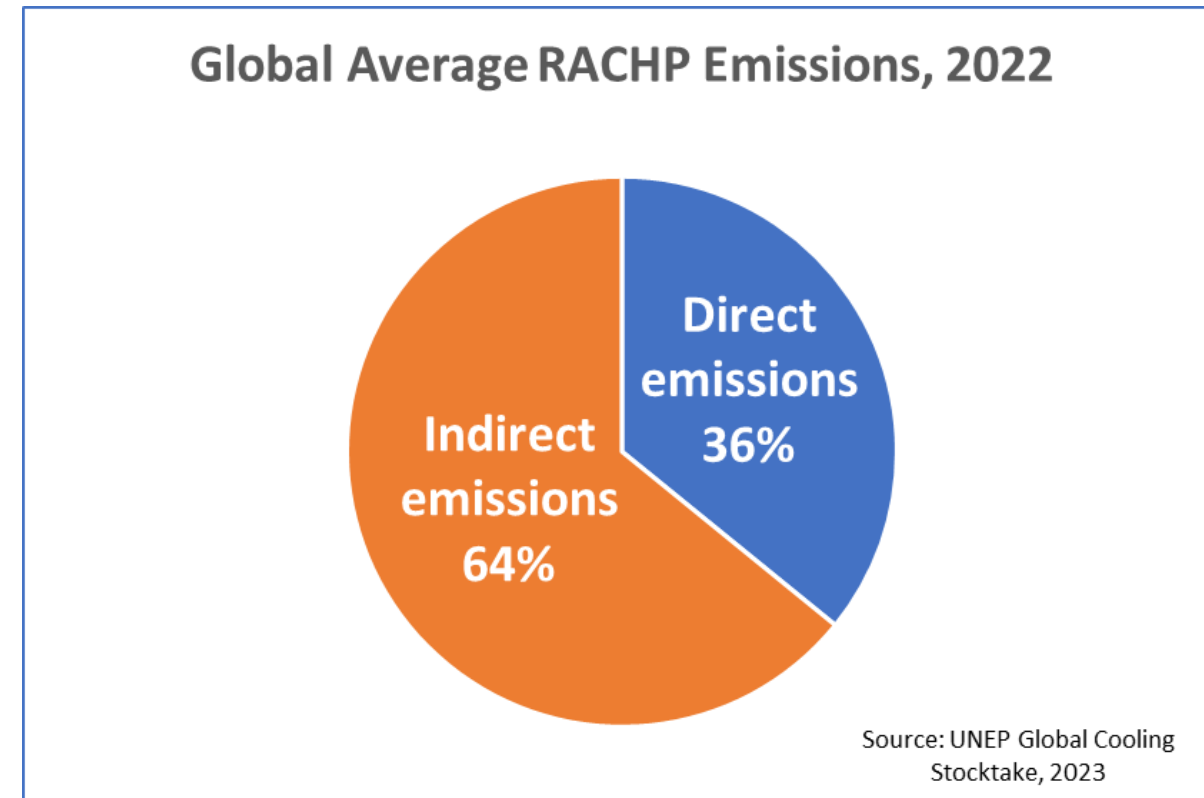
- from energy efficiency perspective

### Notes:

1. Saving estimates are indicative; higher and lower values are possible
2. Measures shown are examples; many others measures are possible

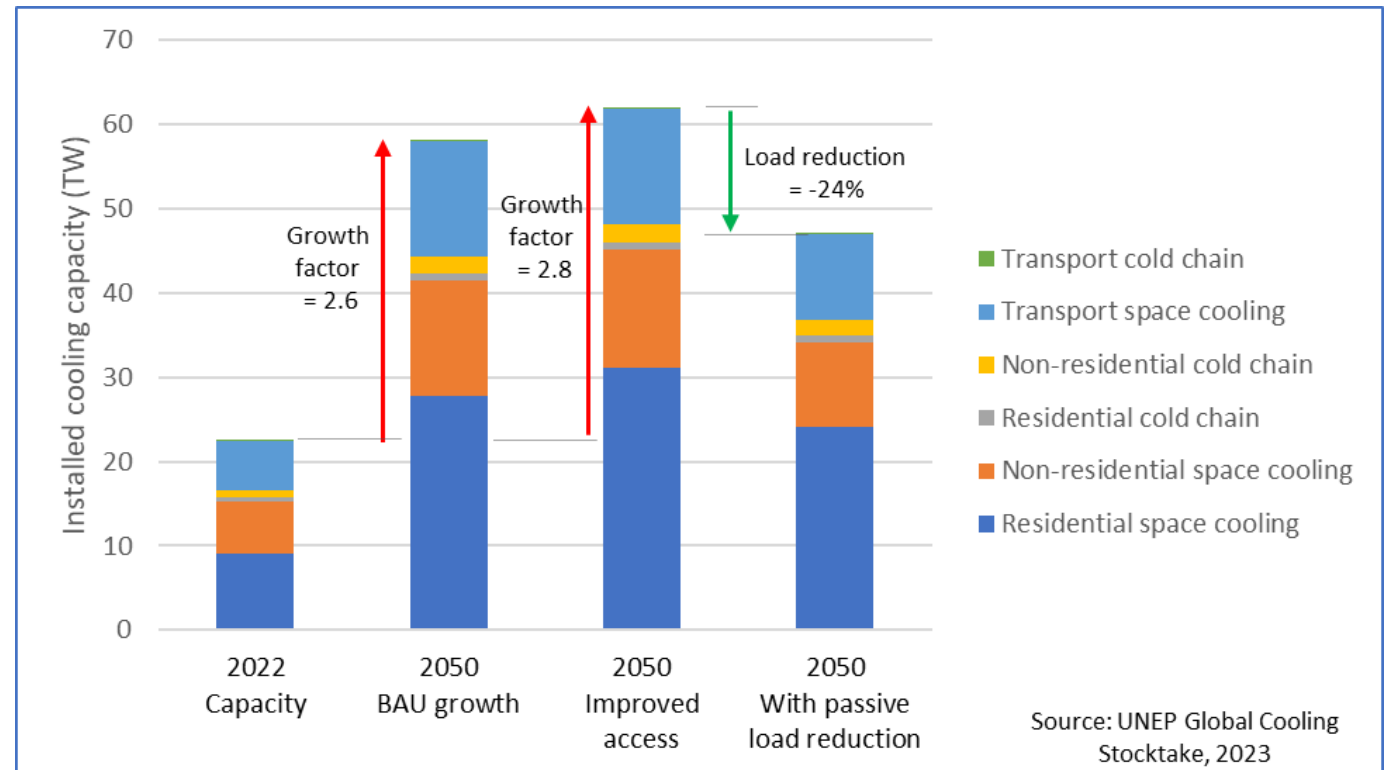
# GHG Emissions from RACHP

- **Direct emissions**
  - from refrigerant leakage
- **Indirect emissions**
  - from energy used
- **Ratio direct : indirect emissions**
  - depends on:
    - RACHP application
    - CO<sub>2</sub> emissions from electricity generation
- **Minimising indirect emissions during HFC phase-down is important**



# Rapid Growth in RACHP expected between now and 2050

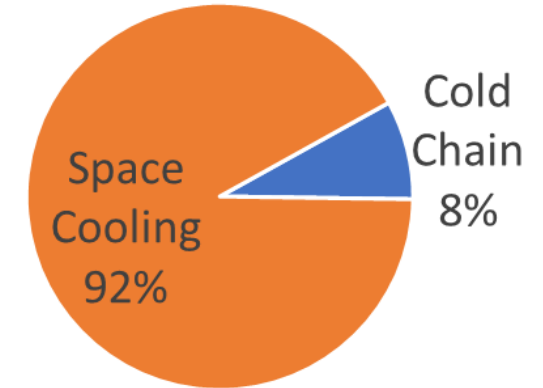
- **RACHP growth driven by:**
  - population growth
  - GDP growth
  - impact of higher temperatures
  - better access to cooling
- **2022 global capacity: 22 TW**
- **Possible 2050 capacity: ~62 TW**
- **Significant potential to reduce load growth**
  - through “passive measures”



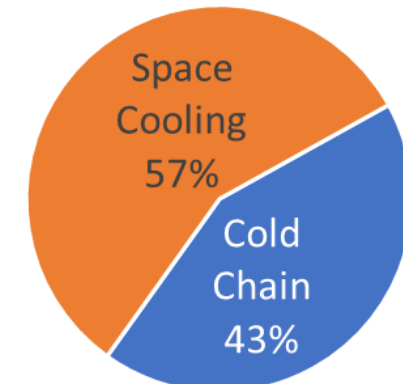
# RACHP Cooling Capacity and Energy Consumption

- **Global Cooling Capacity (TW)**
  - space cooling is dominant
- **Global Electricity Consumption**
  - space cooling less dominant
  - cold chain also important
- **Driver of peak demand**
  - space cooling
- **Driver of energy use**
  - space cooling AND cold chain

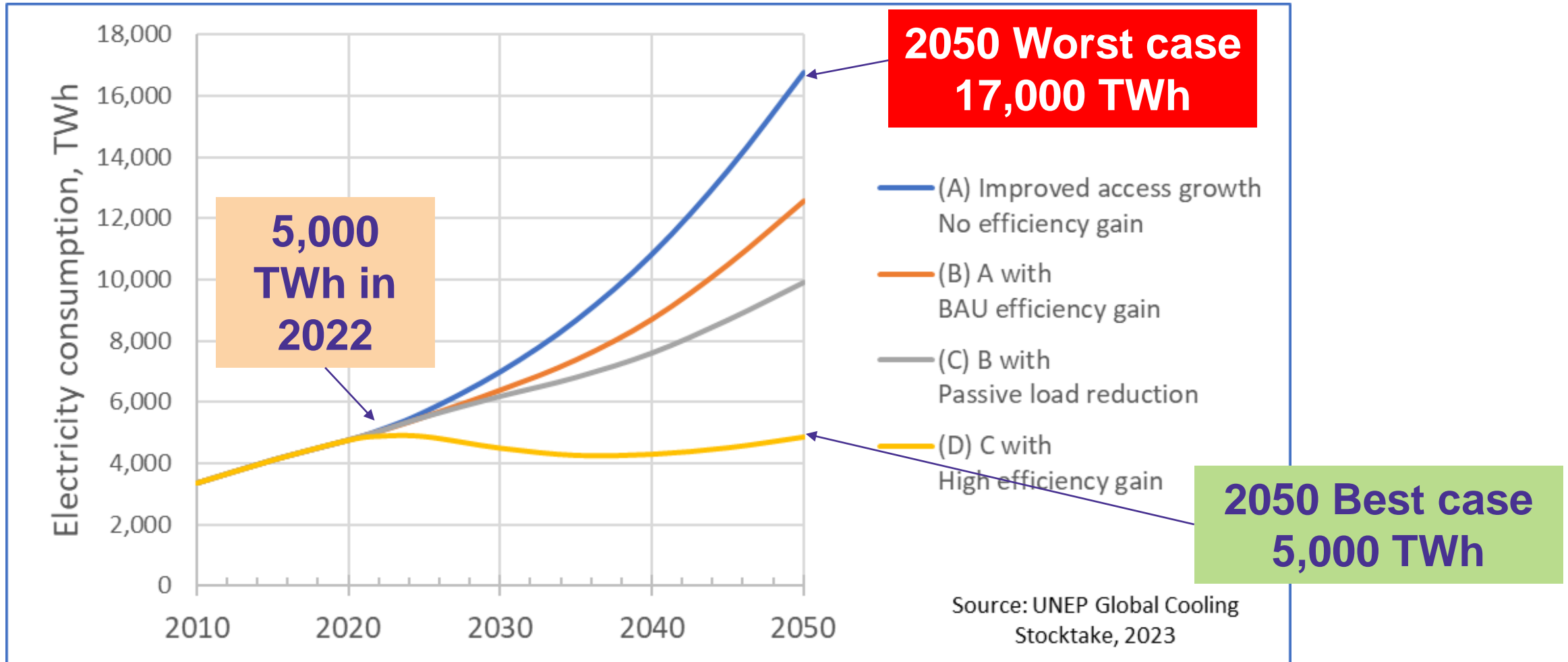
2022 Cooling Capacity TW



2022 Electricity Consumption TWh



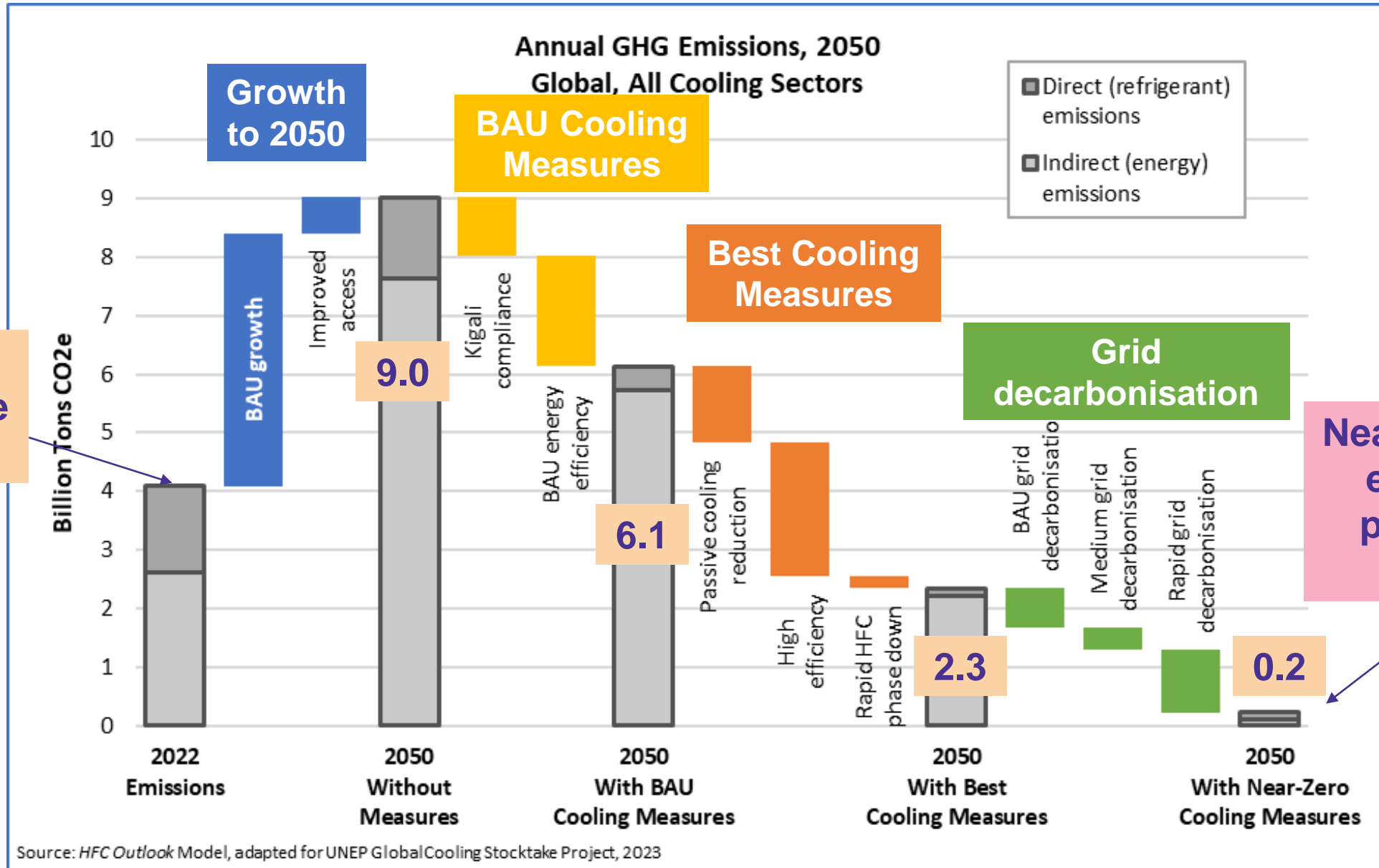
# Global RACHP Energy Efficiency Pathways



# How can we achieve Best Case to minimise energy use?

- **Much can be achieved with currently available technologies**
- **Cooling Load Reduction Measures**
  - building measures e.g. reflective surfaces, shading etc.
  - cold chain measures e.g. doors on retail displays
- **New equipment energy efficiency**
  - best available units are often 2 to 3 times more efficient than average sold
  - various policies can support this: e.g. MEPS, energy labels, financing schemes
- **Operating efficiency of existing equipment**
  - training and awareness campaigns will help users maximise efficiency
- **R&D to deliver higher energy efficiency of new products**
  - e.g. Global Cooling Prize showed 5 times improvement in EE possible

# Global GHG Emission Reduction Potential for RACHP



# Concluding Remarks

- excellent potential for improved RACHP energy efficiency and cooling load reduction
- much can be achieved by accelerated uptake of existing technologies
- even more is possible with further product developments
- barriers to improved EE are well understood
  - e.g. via TEAP EETF reports
  - and will be discussed today
- Parties need to implement appropriate policies to overcome these barriers