WORKSHOP ON
ENERGY EFFICIENCY
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Challenges and barriers associated with making efficient RACHP using low- and zero- global-warming-potential refrigerant more accessible and adopted

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Efficient low- and zero-GWP RACHP technologies exist but are not adopted. Where is the disconnect?

Status

- The Montreal Protocol's phaseout of ozone depleting substances has prevented 1.1 degrees of warming in the Arctic by 2021, with the Kigali Amendment potentially reducing global warming by 0.3 to 0.5 degrees by 2100
- Increasing energy efficiency in RACHP equipment could double climate benefit
- RACHP equipment, utilizing low and medium GWP refrigerants is available and offers enhanced energy efficiency in all sectors, but not universally accessible
- Early action through Kigali Implementation Plans can facilitate transition

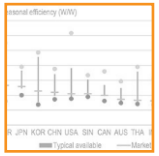
The Challenges

- Lack of Common Policy framework - there is a need for integrated energy and refrigerant performance and labelling with best practice metrics, building energy and safety standards, and ongoing service sector training, monitoring, compliance, and enforcement
  - Lack of coordination between NOUs and national energy and climate authorities
  - Need to upgrade training centres and upgrade curricula to enhance knowledge related to EE
- Limited comprehensive modelling for HFC and energy mitigation; Global Cooling Stocktake report is a first attempt to address this issue
- Lack of comprehensive understanding of circular economy related to energy and refrigerant in the RACHP sector

Additional Barriers

- Lack of consumer awareness
- Higher cost of EE products with limited or no access to finance
- The dumping of low energy efficient products in low-income countries coupled with the lack of knowledge and higher cost of purchase of energy efficient products [*Lack of capacity to prescribe and enforce laws to prohibit shipping of obsolete products*]
- The mismatch of interest between electricity supply and demand (and different government stakeholders)
- Lack of specialized training infrastructure to support energy efficient appliances (e.g., demonstration and training on VSD equipment)

EE Technology Availability, Accessibility, and Cost Update



Lower cost equipment with lowest possible efficiency (MEPS level) generally dominate the market

The availability of high energy efficiency technology in manufacturing countries does not ensure accessibility in importing countries

Manufacturers are typically faced with the choice of either buying higher EE technology/component or building the internal capacity to develop and manufacture it (make vs. buy):

Scale, based on the production volume, and speed, based on the capital recovery period, play a role in deciding the business strategy

Concerted effort on EE and low-GWP actions can reduce cost and produce better results

Typical cost above reference level for EE measures is US $0–20, while those for low-GWP are US $100-200 per $tCO_{2\text{-eq}}$

Energy efficient low- and zero- RACHP

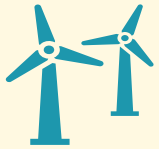
Improved urban planning (space cooling) and business models (cold chain)

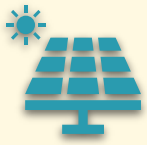
Reducing cooling loads

Improvement in component design using low- or zero- GWP technologies

Optimum control, operation, and maintenance

Heat recovery





Renewable energy integration

Role of Technicians in the Synergy between Energy Efficiency and Refrigerant Phase-Down

Technicians are the trusted advisors on decisions to upgrade or replace systems by end users.

Technicians taking the lead in bringing awareness about maintaining EE during service will also drive new higher efficiency products being put on the market.

Including EE in training and technical school curricula ensures sustainability of initiatives undertaken during HPMP and KIP.

Training and certification of technicians on alternative refrigerants for HCFC phase-out, HFC phase-down, and on maintaining EE are convergent and should not conflict each other.

Best Practices

Regional Centres of Excellence advance sustainable development

Competence Standards: ISO 22712 for personnel skill assessment

Codes of refrigerants, certification, training, and enforcement

Cooling Action Plans set goals on EE and service training

Backup slides

Accessibility And Adoption of EE Equipment

- Certified labels enable trusted choice through mandatory or voluntary certification schemes
- Upgrading technicians' knowledge spreads awareness
- Technician certification improves operational practices which improves implementation of EE retrofits and reduces energy consumption
- SMEs in the assembly sector can benefit from regional centers of excellence and performing demonstration or end-user projects enhance their capabilities
- Electrical incompatibility restricts accessibility in some regions

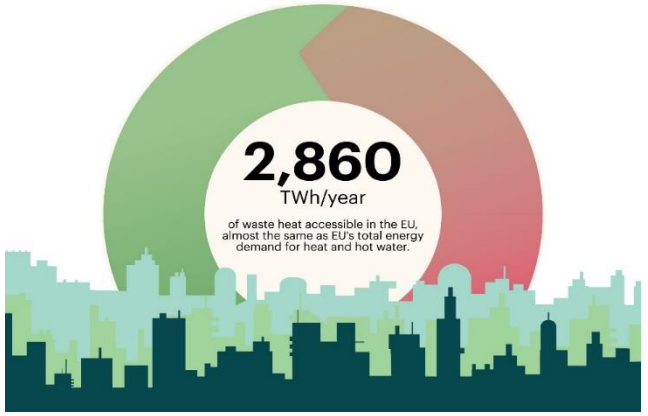
What’s next ? Two Examples for EE Opportunities

Heat Pump Technology for Electric Vehicles (EVs)

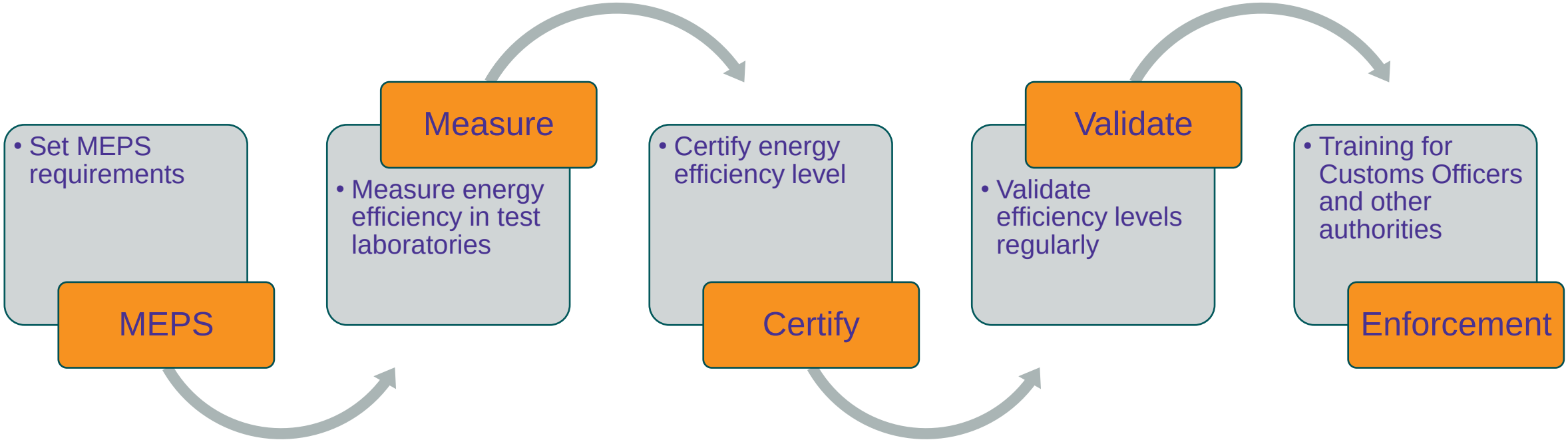
- Fast Growth of EVs
- From HFC-134a to HFO-1234yf and CO2
- Heat Pumps = EE solution for EVs
- Dedicated subsidies can accelerate uptake of EVs and heat pump technology in EVs

Waste Heat / Cold Recovery

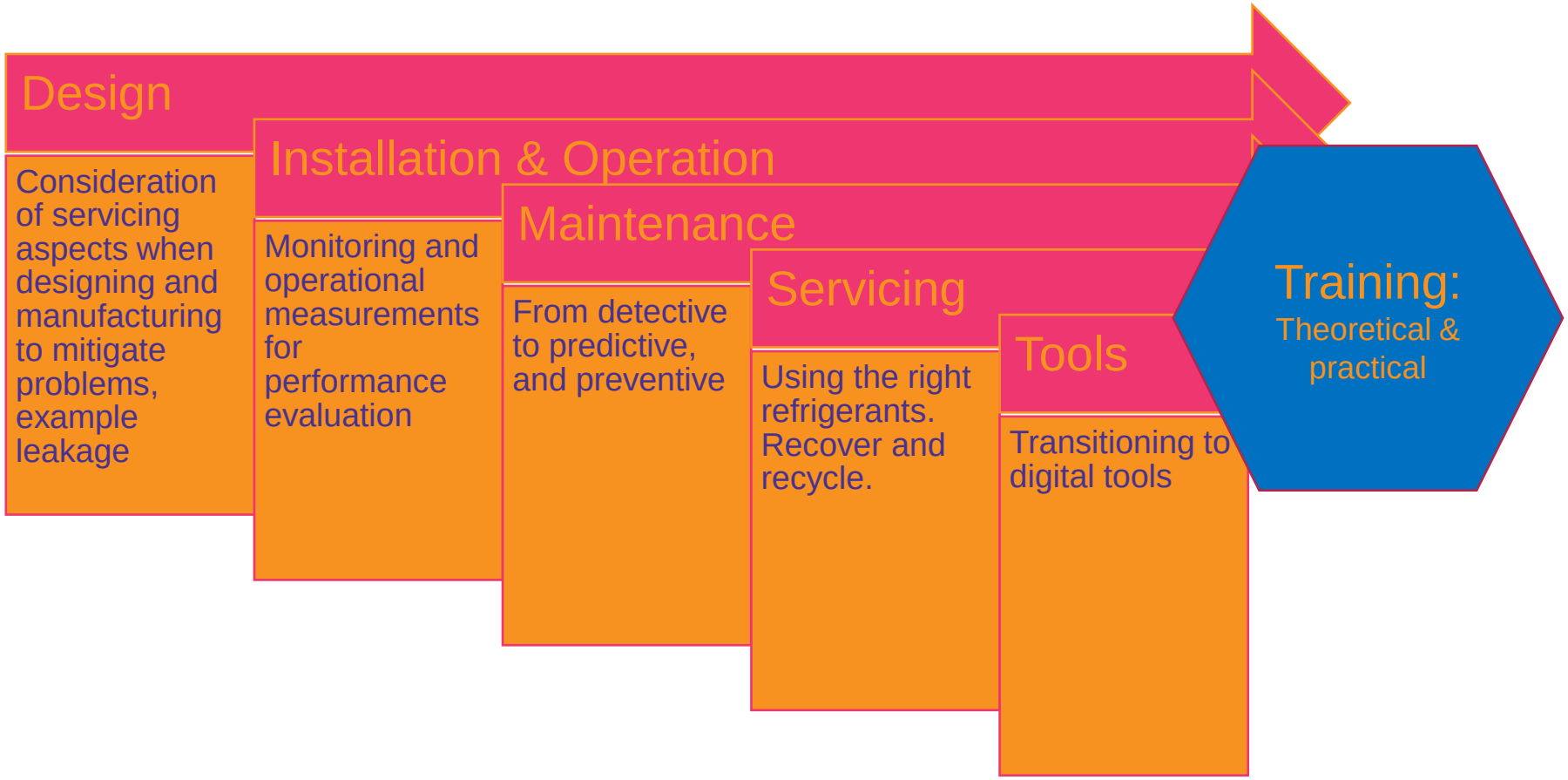
- An integrated approach to energy systems reduces the need for energy generation
- Demand side focus and use of waste heat or waste cold, reduce emissions and cost, and adds flexibility



Ensuring Compliance of Minimum Energy Performance Standards



Servicing Landscape & Requirements



Cost-benefit Analysis: Data Needs

- Cost vs Efficiency (Engineering analysis)
  - Energy savings estimates from more efficient components
  - Cost estimates for more efficient components
- Retail prices for baseline and efficient equipment
- Installation cost estimates
- Working capital
- R&D costs
- Cost of capital

- Energy use estimates (annual energy consumption for baseline and more efficient equipment)
- Electricity prices and price trend or forecasts
- Product lifetime
- Discount rates
- Price indices
- Additional data for manufacturer investment analysis
- Tax rate
- Depreciation