

**FORANE**<sup>®</sup>  
REFRIGERANTS

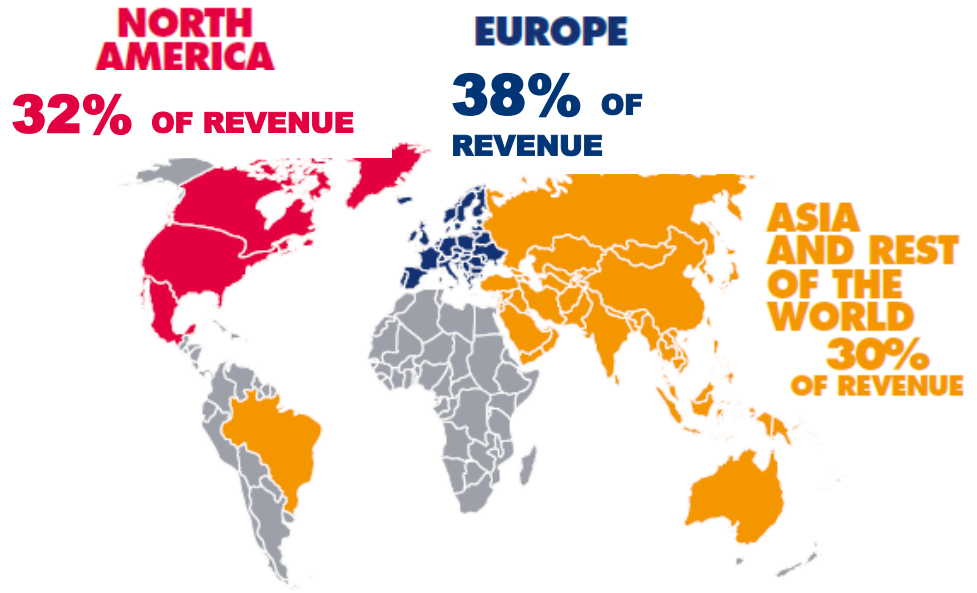


**FORANE**<sup>®</sup>  
REFRIGERANTS  
BY ARKEMA

# Arkema - Well-Balanced Geographic Footprint

## 阿科玛 - 平衡的全球布局

A GLOBAL GROWTH  
COMPANY, LEADER  
IN ITS ACTIVITIES



**2017 SALES:**  
**€8.3 bn**

€3 bn up since Arkema's creation in 2006

Market capitalization **x4.5** since 2006



**N°1 to 3**  
**IN THE WORLD IN OUR MAIN**  
**ACTIVITIES (90% OF SALES)**



A UNIQUE & INNOVATIVE  
POSITIONING IN THE  
SPECIALTY CHEMICALS  
MARKET COMBINING AN  
**ADVANCED  
MATERIALS  
AND ADHESIVES**  
OFFERING TO ADDRESS THE  
**KEY ECOLOGY  
AND ENERGY  
CHALLENGES  
OF TODAY'S WORLD**

**OUR DNA:  
“INNOVATIVE  
CHEMISTRY”**

**TOP 100  
GLOBAL  
INNOVATORS**  
Clarivate  
Analytics

**FOR THE 7<sup>TH</sup> CONSECUTIVE YEAR:  
ARKEMA IN THE TOP 100 GLOBAL  
INNOVATORS**

- ❖ **240** patents filed in 2017
- ❖ **1,500** researchers, **60** R&D partnerships
- ❖ **~3%** of Group sales allocated to R&D
- ❖ **1** incubator for breakthrough innovations

# Arkema Fluorochemicals 阿科玛氟化工部门

❖ **Arkema is a leading manufacturer of HCFCs and HFCs as well as an innovator of next generation low-GWP refrigerants**  
阿科玛既是HCFC/HFC的领先生产商，也是下一代低GWP制冷剂的革新者

- **Global Producer of Fluorochemicals**

全球氟化产品生产商

- **Presence in All Major Markets**

覆盖所有主要市场

- **Refrigerants, Foam Blowing Agents, Chemical Intermediates**

产品包括制冷剂，发泡剂和化学中间体

- **3 Research Centers**

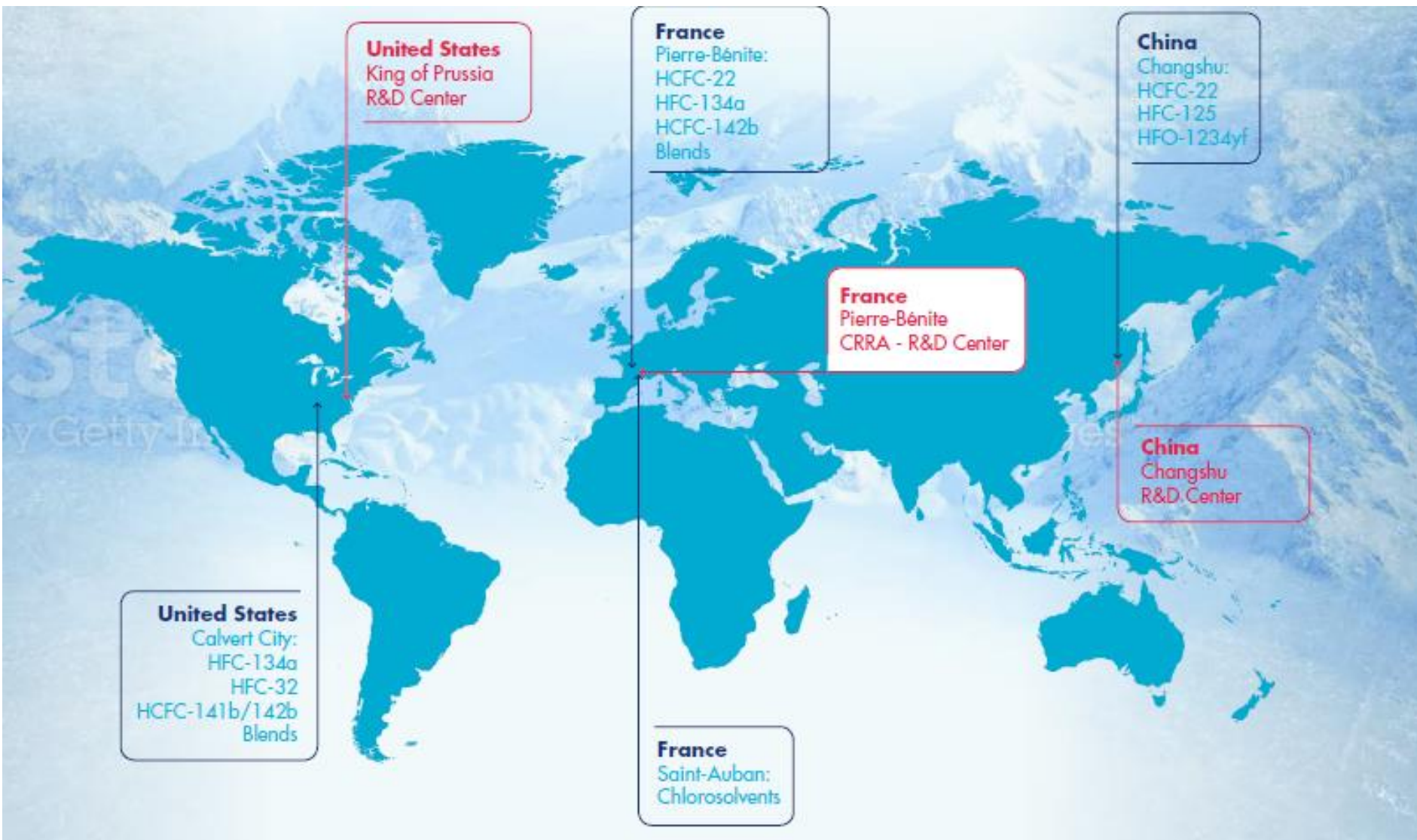
3个研发中心

- **3 Industrial Plants**

三个生产基地



# Global Production 全球化生产





# Regulation Snapshot And Arkema Solutions

## 全球法规一览及阿科玛的解决方案

**FORANE**<sup>®</sup>  
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# Hfc Phase Down Activities Snapshot-global

## 全球HFCs削减行动一览

- ❖ **European Union F-gas 欧盟的含氟气体法案**
  - Reduction of HFCs quota by 79% by 2030 (CO<sub>2</sub>-eq)
- ❖ **MAC directive(2006/40/CE)-Start from 2017, all new cars in EU should comply with refrigerants of GWP<150**

2017年生效的新的汽车空调指令，要求欧盟市场上的新车车用制冷剂GWP小于150
- ❖ **U.S. EPA SNAP Delisting Final Rule issued in Jul.2015 (SNAP1)**

美国环保署关于含氟气体的最终法案

  - Ban High GWPs refrigerants for selected applications
  - Ban R134a for passenger cars and light duty trucks from MY2021
  - Ban R134a for all new manufactured vehicles from MY2026
  - SNAP 2.0 Final Rule issued December 1, 2016
    - A/C-Ban R410A/R134a for Chillers from Jan.2024
    - Refrigeration-Ban R404A/407 Series from Jan.2021/2023 by different applications
- ❖ **Japan METI F-gas revised regulation 日本含氟气体修正案**
  - Ban High GWPs refrigerants for selected applications from 2018 onwards
  - MAC must apply GWP<150 for passenger car with seats<=10 from 2023
- ❖ **Australia announced to reduce by 85% of HFCs quota by 2036**

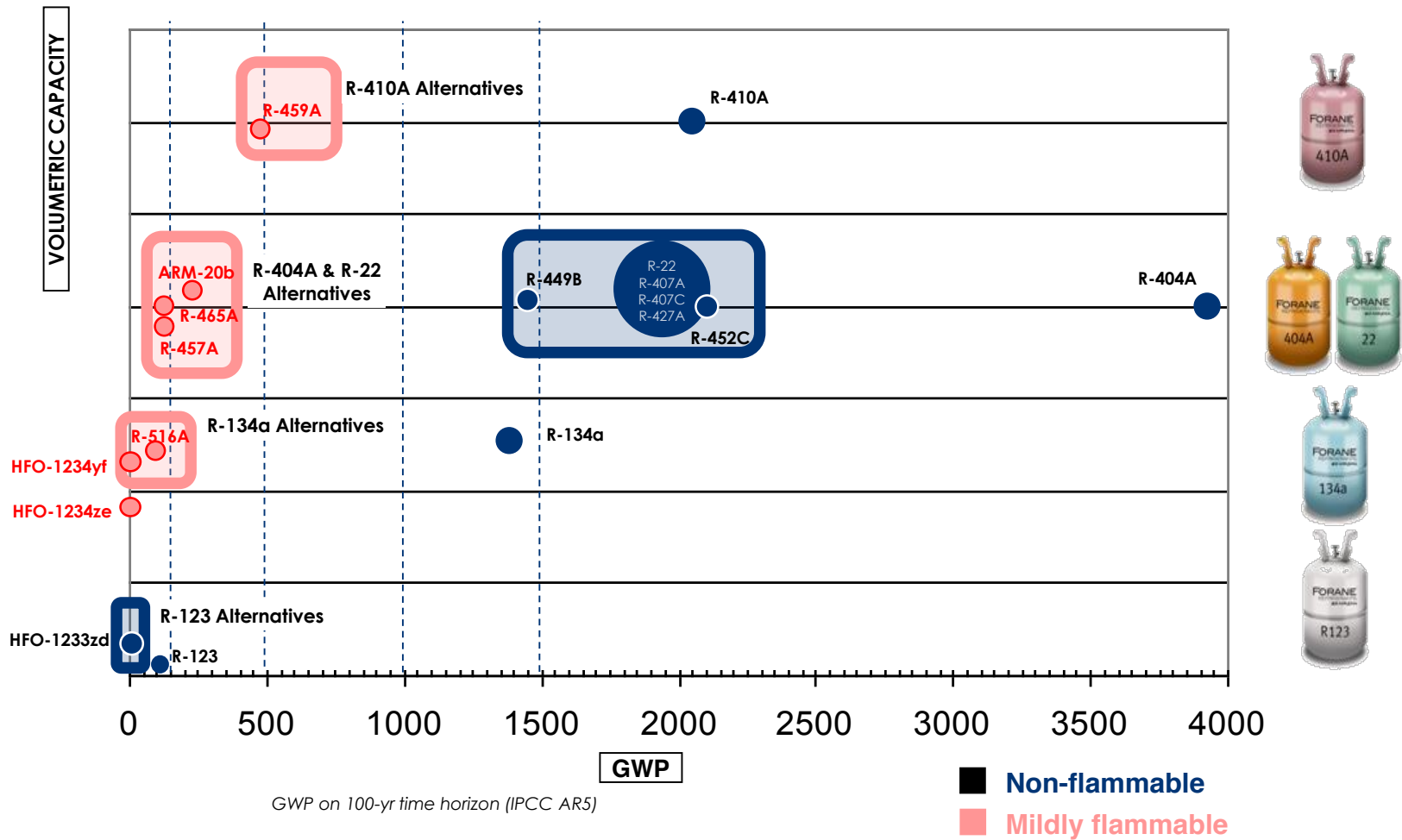
澳大利亚宣布到2036年削减85%HFC配额

Kigali,Rwanda agreement in Oct.2016 showed that the industry is ready to phase down HFCs globally over a period of time sufficient to replace them with low GWP alternatives  
2016年10月在基加利签署的修正案表明业界有信心逐步应用低GWP产品淘汰HFCs

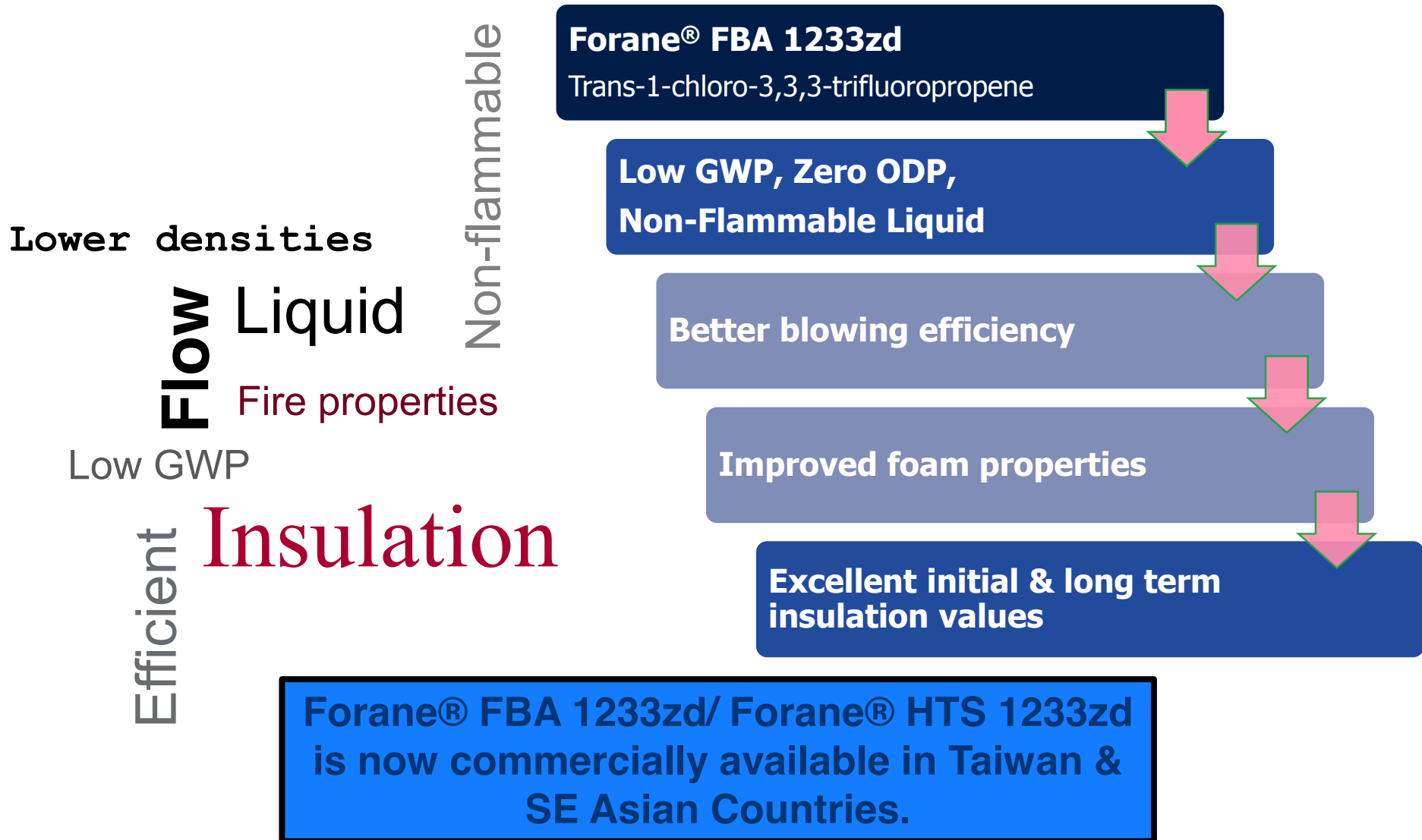


# Arkema's Next Generation Refrigerants

## 阿科玛提供下一代低GWP产品的解决方案



# Forane® 1233zd-Blowing Agent And Heat Transfer Fluid



# Arkema's Commitment To A Sustainable Future

## 阿科玛致力于给行业提供可持续发展的制冷剂解决方案

### ❖ Next generation solutions for all major applications

满足不同行业需要的下一代制冷剂方案

- HFO and new generation molecules **HFO**和新物质
- Lower-GWP HFO blends for HVAC-R 低GWP的HFO混合制冷剂用于空调制冷行业
- Different solutions based on GWP, performance, and flammability  
满足GWP, 性能, 可燃性等不同需求的解决方案

### ❖ Active involvement in industry wide effort to replace current HFCs

积极广泛参与行业活动以削减HFCs的应用

- Low GWP AREP First and Second Rounds 美国AREP项目第一轮和第二轮
- High Ambient Temperature Testing Initiatives (EGYPRA, PRAHA 2, HAT)  
高环温使用环境测试项目