

# Global Market Trends of Danfoss Perspective

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# Global Overview

## Europe

- **50% of large packs CO<sub>2</sub> Transcritical**
- **Semi plug-in systems, refrigerant choice moving towards R290**

## North America

- **CO<sub>2</sub> Transcritical growth, but still uncertainty**
- **Semi plug-in, present but still developing**
- **Regulatory action slow down, market factors continue to push natural refrigerants**

## Latin America, China, India, Africa

- **Developing countries on a longer time frame**
- **Intentions on making the jump from R22 to CO<sub>2</sub> (skipping HFC's)**

# Local Overview

## **Australia & New Zealand**

- **CO<sub>2</sub> Subcritical systems since 2004**
- **Transition from Subcritical to Transcritical systems begun 2008**
- **Today multiple Transcritical CO<sub>2</sub> systems (15)**

## **MOVING FORWARD**

- **Advanced CO<sub>2</sub> Transcritical systems**
- **More efficient than HFC's in all climates**
- **First cost coming down to parity with traditional systems**

# Looking to the future

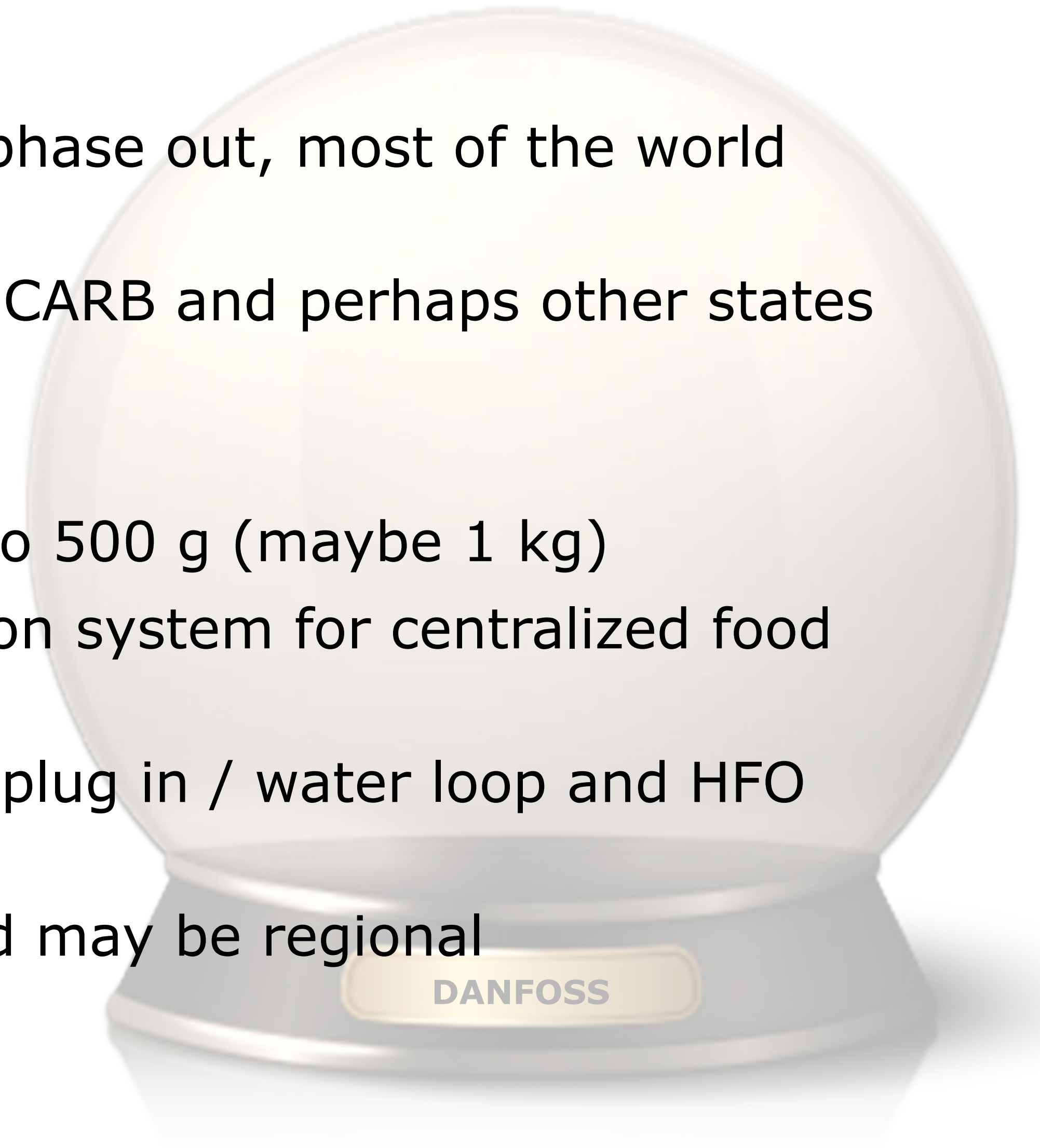
- » F-gas?
- » US EPA SNAP?
- » What about hydrocarbons?
- » What will the price be for HFC and HFO?
- » What about flammability?

If we just knew the crystal ball would work much better



# Our crystal ball

- » Europe – F-Gas is decided, moving toward HFC phase out, most of the world following.
- » US EPA SNAP – Will likely be on hold for a time, CARB and perhaps other states moving forward
- » Australian Phase down on HFC's
- » HC charge limitations will be raised from 150 g to 500 g (maybe 1 kg)
- » CO<sub>2</sub> Transcritical will be the dominant refrigeration system for centralized food retail systems
- » Other solutions will also be in the market, Semi-plug in / water loop and HFO solutions.
- » The solution for AC systems remains unclear and may be regional



# CO<sub>2</sub> Transcritical Technology Development Continues

## Ejector technology

- Bring cost down over time
- Reduce energy consumption

## Next Steps

- Heat recovery
- Integrated Systems w/ Air Conditioning
- Flooded Systems



Danfoss Multi Ejector



System	Energy saving VS. R404a	Compressor saving VS. Booster
Booster	-11%	0%
Parallel compression	7%	15%
Gas ejector	10%	18%
Liquid & gas ejector	22%	27%

Table 1: Potential energy savings by using parallel compression with gas ejector only or liquid & gas ejector. Comparisons are made at 32°C.

# Pacific CO<sub>2</sub> Transcritical Journey

Within the Pacific region Danfoss Began the journey back in 2007. Since then we have been involved in a number of projects which has given us a good basis to know what works and what doesn't.

But as they say you never stop learning !!

Looking forward to the next evolution in Transcritical CO<sub>2</sub> systems for the Pacific Region.



# Danfoss Mobile Training Unit



## Features:

### • Three CO<sub>2</sub> Transcritical Modes:

- Booster System
- Parallel Compression System
- Multi-Ejector System

### • Controller training stations (Pack, Case and Front End)

### • Charging/filling/servicing training station (safety, procedure etc.)

### • Simple one stage system with control system training station



**Coming to Australia in August 2017**





**ENGINEERING  
TOMORROW**