Background information on **REMA1000 Smart Supermarket**

**History**:

There are around 1 million supermarkets in Europe. The annual energy use in supermarkets in Germany is estimated to be 16 TWh, in Spain 6.8 TWh, in Italy 8.2 TWh, and in Norway about 1.5 TWh. The refrigeration system is normally responsible for 30 to 70 % of the electricity bill of a supermarket and heating, ventilation and air conditioning systems (HVAC) between 15 and 25 % .

Apart from the high energy use of the refrigeration systems, the supermarkets possess another environmental threat through refrigerants. Traditionally, hydro fluorocarbons (HFC) with a very high Global Warming Potential (GWP) have been used. CO2 as a natural refrigerant, with a negligible GWP and very good thermodynamic properties, has attracted significant interest in recent years as a potential replacement of HFC refrigerants. CO2 also offers a number of other advantages over HFC refrigerants, such as better heat transfer performance and smaller components for a given refrigeration load. Thus, systems applying CO2 as the only refrigerant, as the one in Kroppanmarka, have been developed and more than 6000 such supermarkets exist in Europe.

**Background numbers and figures:**

The two core systems, refrigeration and HVAC, are typically designed, operated and controlled as fully independent, neglecting considerable opportunities that exist from integration of the two systems system. Heat recovery or full heat pumping mode, amplified by demand side management and system diagnostics constitute an approach that is already technologically available but scarcely utilized. For the Kroppanmarka REMA1000 supermarket in Trondheim, Norway, it has already been verified experimentally that the integrated-planning approach yields immediate and m**easureable benefits of up to 30% reduction in the electricity consumption** compared to a classic design.

**Current situation:**

**SINTEF and NTNU are leading institutions with respect to the development of the next generation eco-friendly and energy efficient Supermarkets with CO2 technology. The team is coordinating two H2020 projects dedicated to support a fast introduction of this technology across Europe**

See: http://www.supersmart-supermarket.info/

**Future trends:**

Very soon, i.e. in 2017, towards SuperSMART, we will support local vendors and end-users across Europe to become confident that the CO2 refrigeration technology fits to their needs and commitments related to environmental footprint. The refrigeration systems in Supermarkets are normally exchanges within 10-15 years, i.e. until 2030, there will be no further greenhouse gas emissions from the Supermarket sector in Europe. The Energy consumption for these units will be reduced by 30 to 50% compared to traditional units applying non-natural refrigerants (banned by the EU- F-Gas regulation).

An efficient integration of all energy sub-units (frozen and chilled food cabinets, Air-Conditioning, hot water production, space heating, etc.) into the central CO2 refrigeration plant is key to reduce to total investment cost and significantly the operation costs.

**Additional information:**

<http://gemini.no/en/2014/06/drastic-cut-in-electricity-bill-for-supermarket/>

http://www.supersmart-supermarket.info/