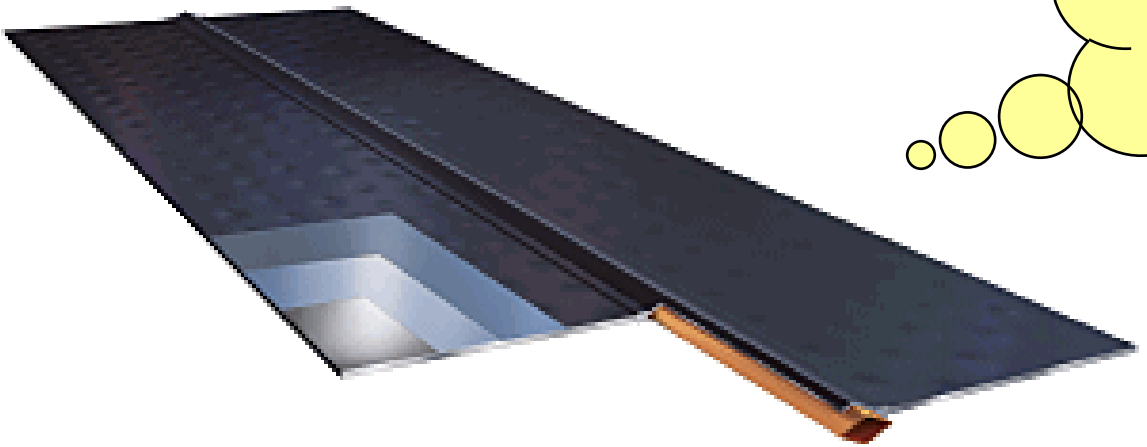
IEA SHC T45 – LARGE SYSTEMS

Some initial inputs from Sweden

April 5, 2011

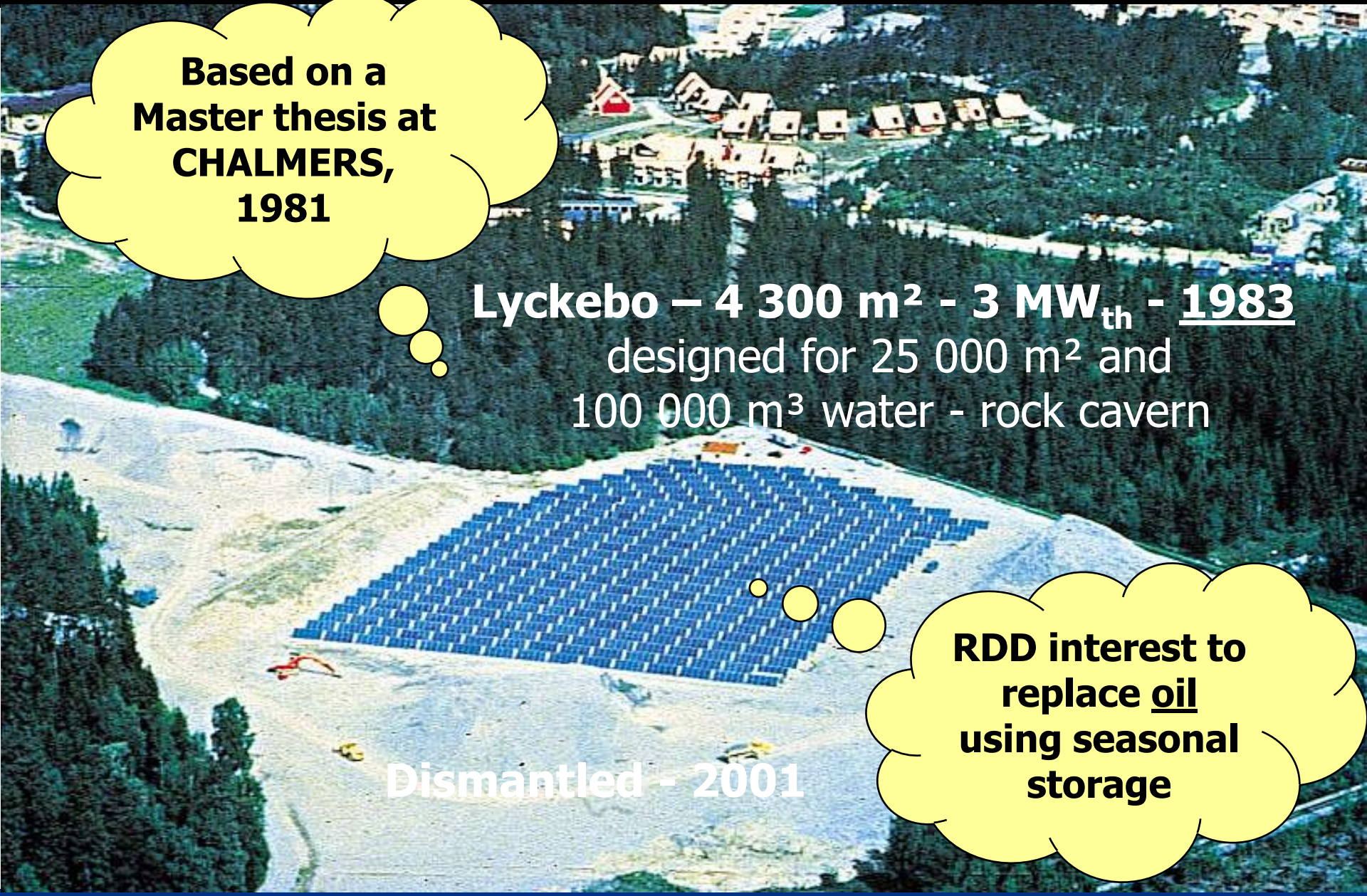
Jan-Olof Dalenbäck
Peter Kovacs

ALUMINUM ABSORBER

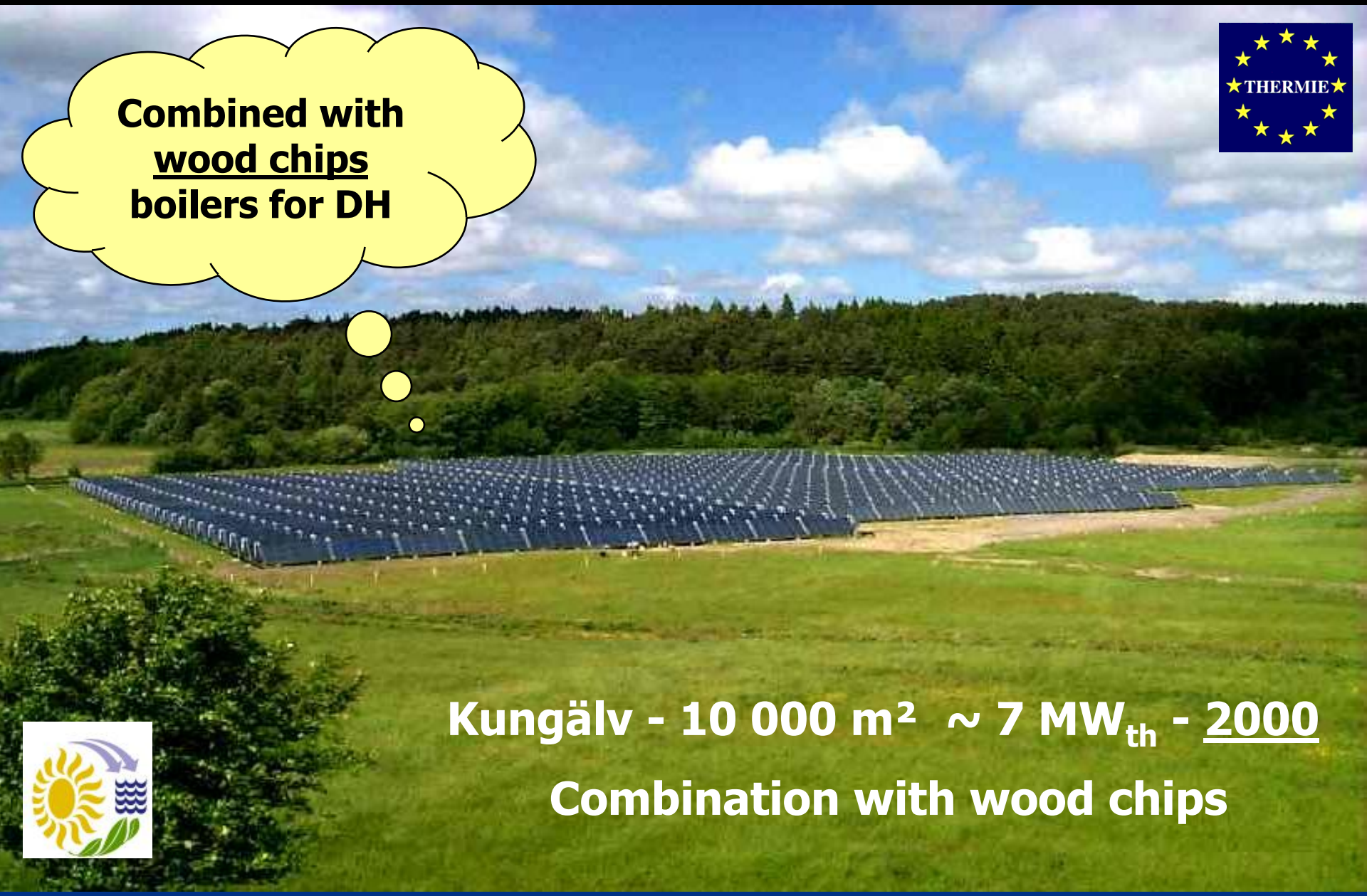


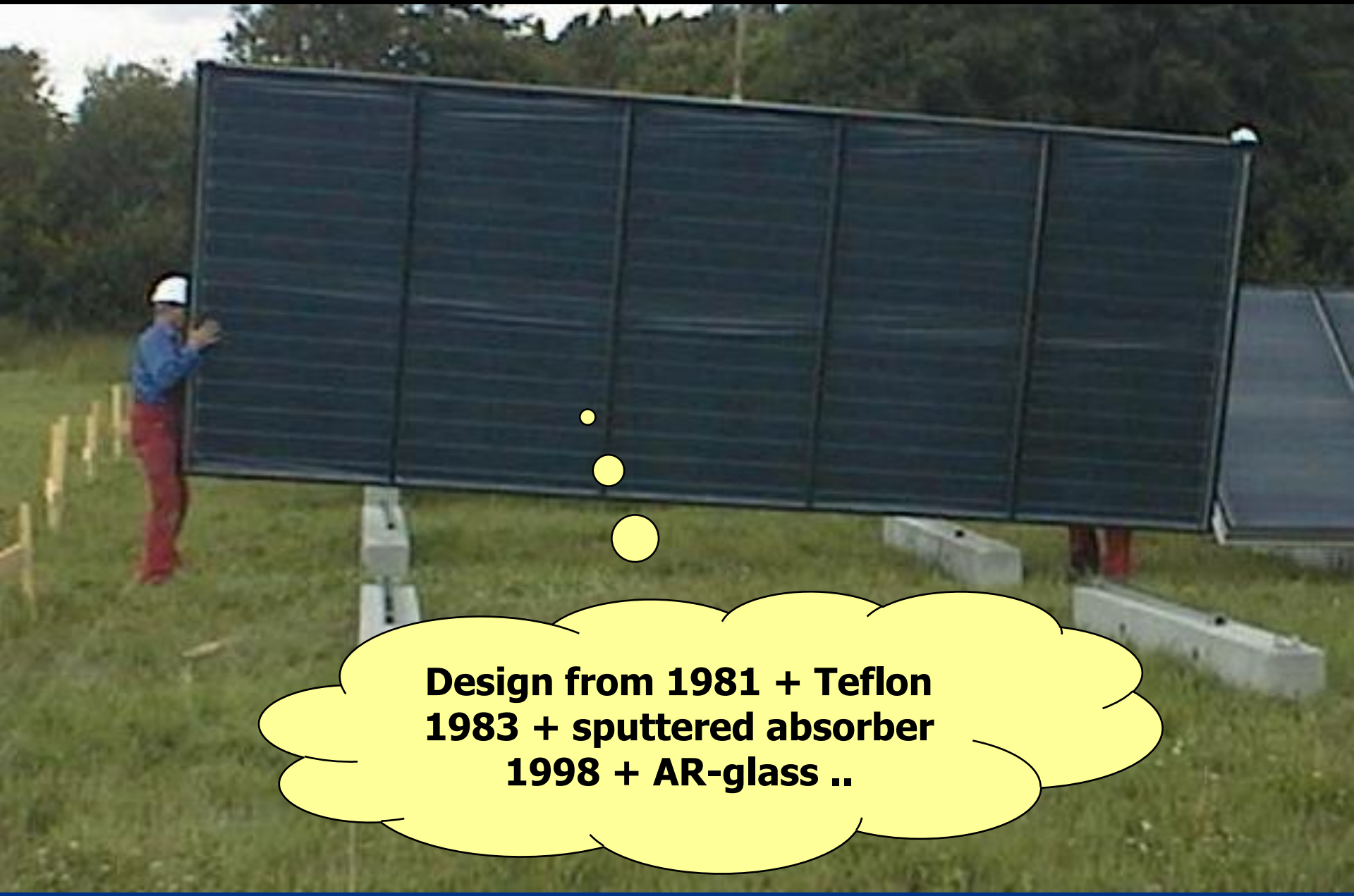
Advantages in large collectors (Advantages related to LCA)

- Electrolytic from the 70's (Gränges Aluminium)
- Vacuum deposit from mid 90's (TeknoTerm)


Based on a Master thesis at CHALMERS, 1981
Lyckebo – 4 300 m² - 3 MW$_{th}$ - 1983
designed for 25 000 m² and
100 000 m³ water - rock cavern
Dismantled - 2001
RDD interest to replace oil using seasonal storage

Recycled 2008: 40t Al; 2t Cu; 1,4t Fe; glass; insulation ..


Combined with
wood chips
boilers for DH
THERMIE
Kungälv - 10 000 m² ~ 7 MW$_{th}$ - 2000
Combination with wood chips


Design from 1981 + Teflon
1983 + sputtered absorber
1998 + AR-glass ..

Göteborg/Hammarkullen ~ 1700 m² - 1985

EKSTA / Onsala, 220 m², 1995-

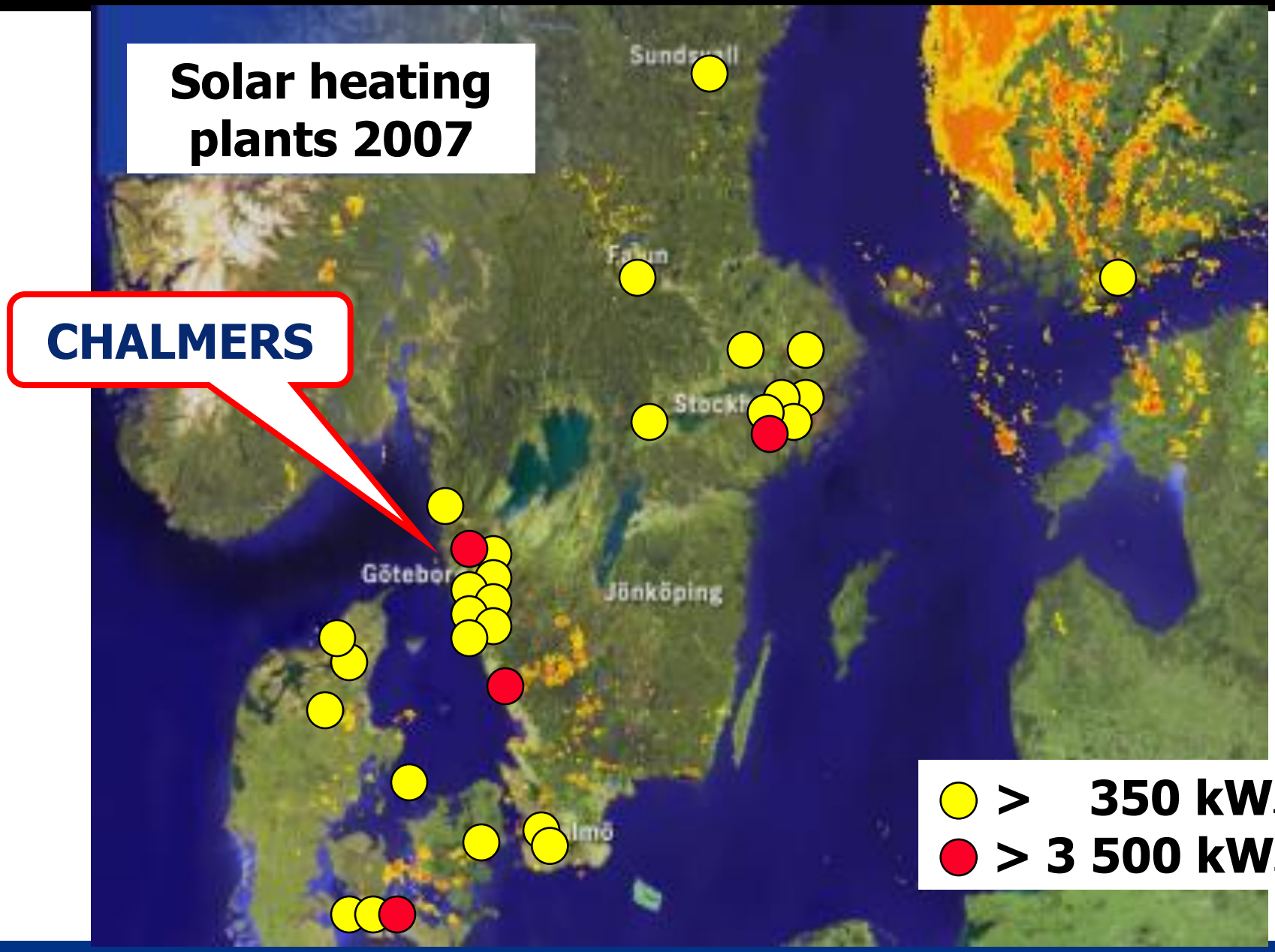
Roof module collector
Standard building dimensions

Gårdsten 2000

Main approach in early 80's ..

- **Large modules ..**
  - Requires in principle an Al-absorber ..
  - A teflon film was introduced to reduce convection ..
  - PRO1: Improved performance and logistics ..
  - PRO2: Less piping, lower mounting costs ..
- **Collector <u>array</u> design ..**
  - Low flow, smaller pipes, lower costs ..
    (introduced in scientific papers a lot later ..?)
  - Hydraulics .. even flow distribution without valves ..
- **Why are a number of new "large" solar heating systems still designed with numerous of small collector modules .. !?**

Solar heating plants 2007



Largest SH collector array ..

- Ingelstad, SE – 1 320 m² / 1979 †
- **Lambohov, SE – 2 900 m² / 1980 †**
- **Lyckebo, SE – 4 320 m² / 1983 †**
- **Falkenberg – 5 500 m² / 1989 †**
- **Nykvarn, SE – 7 500 m² / 1992 †**
- **Marstal, DK – 8 500 m² / 1996 -**
- **Kungälv, SE – 10 000 m² / 2000 -**
- **Marstal, DK - 18 300 m² / 2003 -**
- ???????, XX – 35 000 m² / 2010 ? -

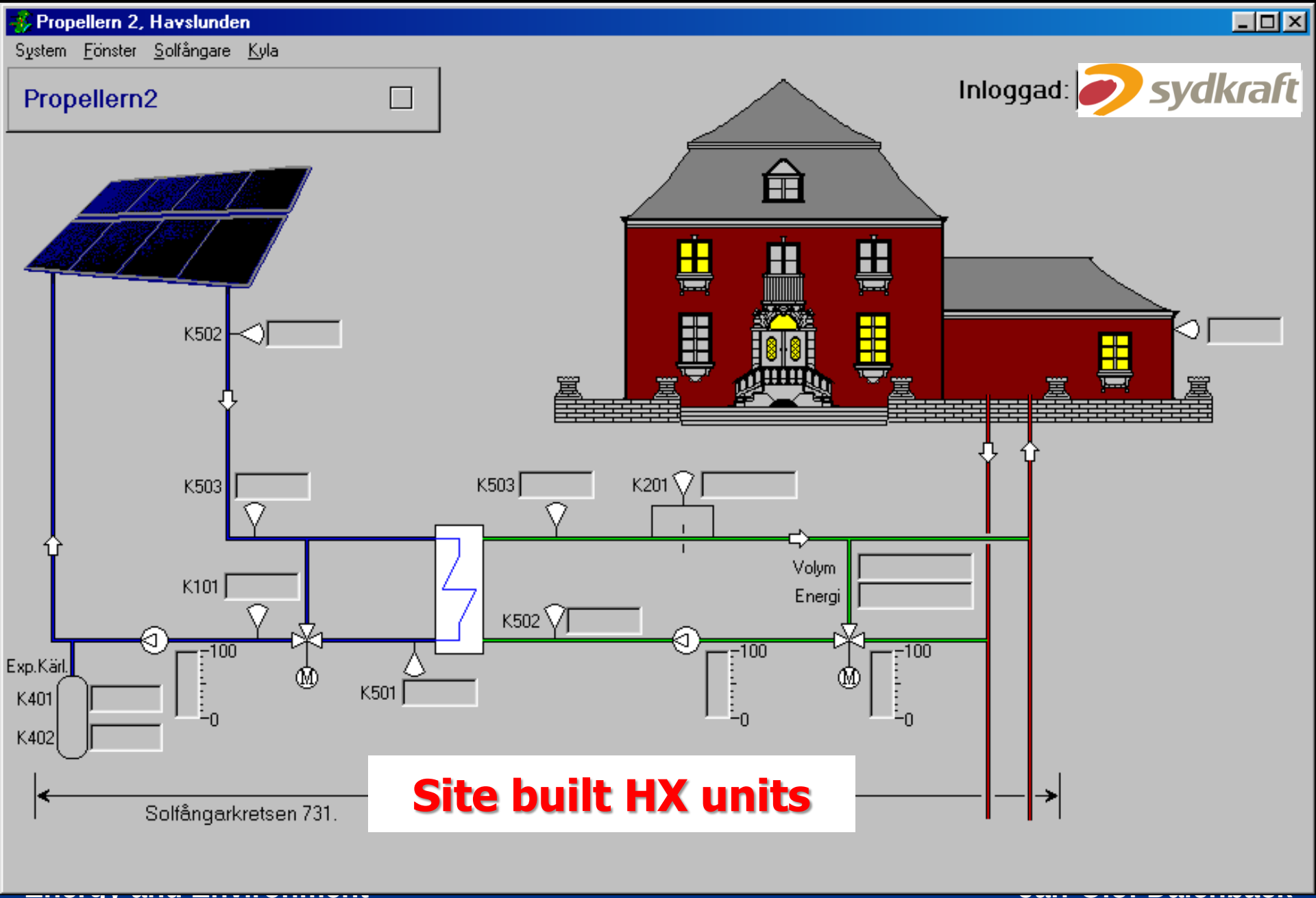
Bold with Sunstrip inside !

Recent activities in SE ..

- **Solar district heating ..**
  - New DH system with wood chips boiler + 1 000 (2 000) sqm for a large village in operation in 2010 ..
  - Planning of a 10 000 sqm system in a large DH ..
- **Distr. systems in DH .. FIT ..**
  - 70-80% of all large buildings have district heating ..
  - Interest from building owners to use solar ..
  - > 10 systems with 100 – 1 000 sqm in operation
- **Evaluation distr. Systems .. into Task 45 .. !?**
  - Technical .. Legislative .. PED ..
  - Ownership .. FIT .. Third party access ..

Bo01 - Malmö

Kockum Fritid – Malmö - 2001

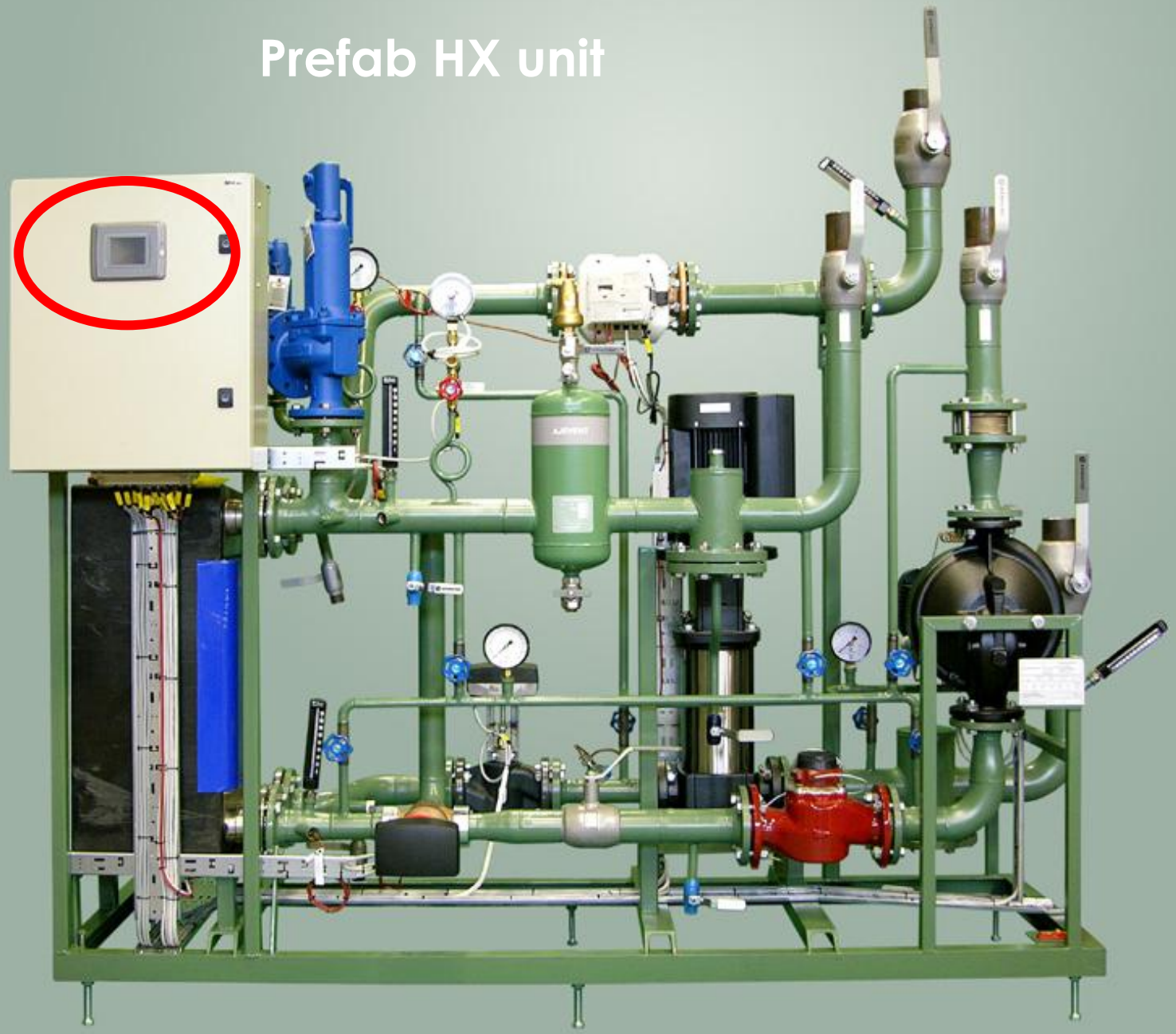


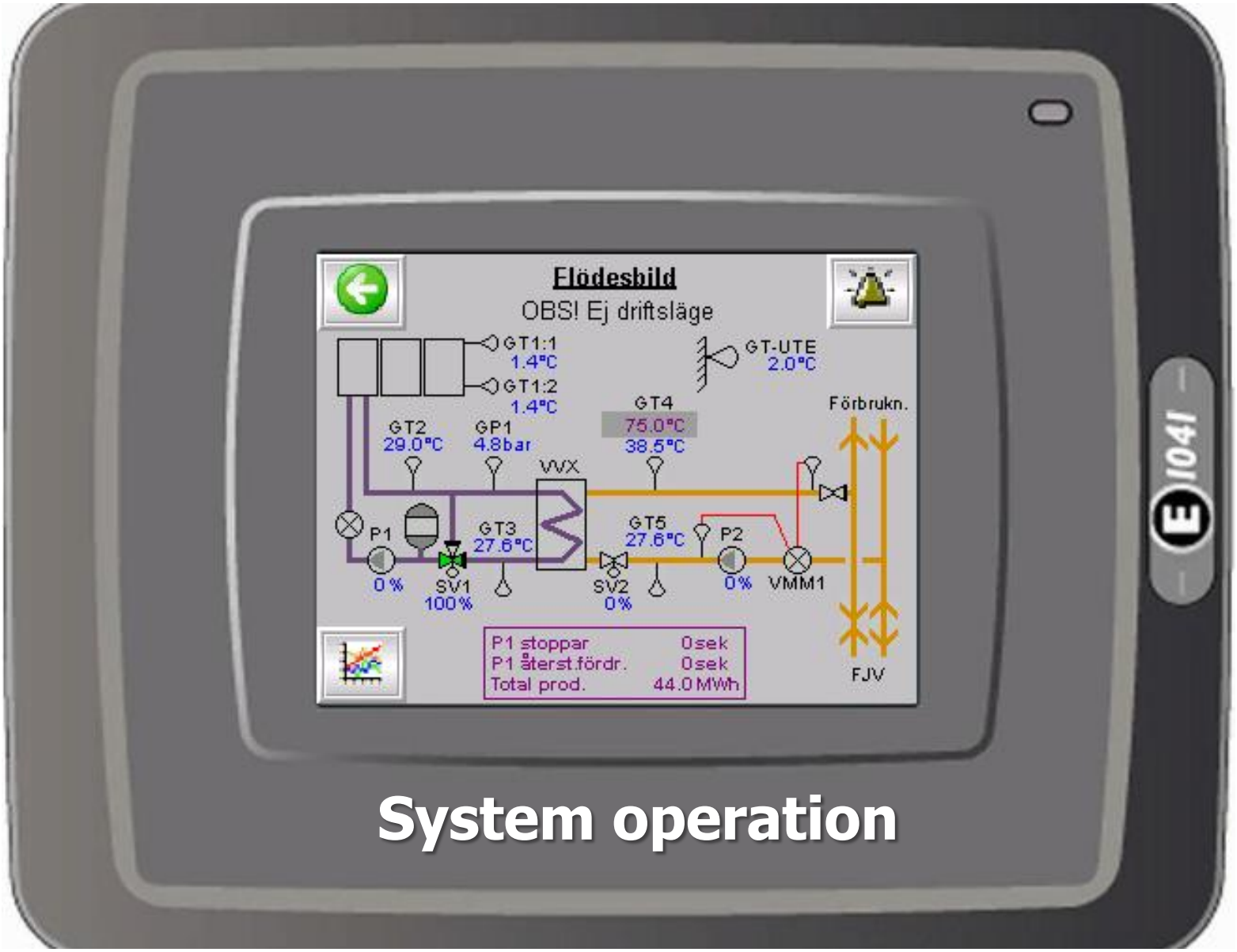
Site built HX units

Prefab HX units !!

Malmö - 2004

Prefab HX unit





System operation

Helsingborg - 2008

Vislanda - 2009

Timrå - 2009

Large system group ..

- **Management ..**
  - J-O. Dalenbäck, CHALMERS (SDHTO) ..
  - P. Kovacs, SE Techn. Research Institute (CEN etc) ..
- **Engineering consultants ..**
  - Andersson & Hultmark ..
  - Energianalys
- **Enterprises**
  - S-Solar, Aquasol, et al (collectors, systems, etc.) ..
  - Armatec et al (prefab sub-units, etc)
  - DH association, Building owners, etc ..