Solar Combisystem –
European Overview of installed Systems 2001-2003

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1. Introduction

SOLAR THERMAL COLLECTOR MARKET IN IEA MEMBER COUNTRIES

Within the framework of the Solar Heating and Cooling Programme (SHC) of the International Energy Agency (IEA) a study was prepared with the goal to document the collector areas previously installed in the SHC Member countries and other IEA Member countries, and to ascertain the contribution of solar plants to the supply of energy and the CO2 emissions avoided as a result of operating these plants. Below is a summary of the results [1]:

The installed collector area in the 22 IEA Member countries equaled around 58 million square meters at the end of year 2000. Of this, 17 million square meters was accounted for by unglazed collectors, which are used mainly to heat swimming pools, and 40 million square meters of flat-plate and evacuated tube collectors, which are used to prepare hot water and for space heating. Air collectors were installed to an extent of 1.35 million square meters. These are used for drying agricultural products and to a lesser extent for space heating.

If one observes the use of solar thermal energy it becomes clear that it greatly varies in the different countries respective economic regions. In North America (USA and Canada) swimming pool heating is dominant with 15 million square meters of unglazed collectors while in Europe (9.7 million square meters) and Japan (11.7 million square meters) plants with flat-plate and evacuated tube collectors mainly used to prepare hot water and for space heating are dominant.

Focusing on the installed flat-plate and evacuated tube collectors through the year 2000, then Greece, Austria and Turkey are leading with 264 m², 195 m², 113 m² per 1000 inhabitants respectively. They are followed by Japan, Denmark and Germany with collector areas between 93 and 34 m² per 1000 inhabitants.

Analyzing the market development from 1999 and 2000 in the field of plants for the preparation of hot water and space heating it can be seen that the market of flat plate and evacuated tube collectors grew from 2,025,384 m² in the year 1999 to 2,285,797 m² in the year 2000. This corresponds to a growth of 13%. The markets that underwent the greatest growth between 1999 and 2000 included Mexico at 226%, Sweden at 99%, Spain at 65%, Germany at 47% and France at 42%. The countries with stagnating markets were Japan, Italy, Norway and Turkey. Decreasing markets were recorded in Denmark at -16%, Switzerland at -11%, Portugal at -6%, and the USA and the Netherlands at -4%.

Until now there has been scarcely any information available on the contribution of solar collectors to the supply of energy, and the potential of this technology has been, for the greater part, underestimated. The calculated annual collector yield of all recorded systems in the 20 Member countries of the IEA SHC Programme is approximately 24,367 GWh (87,721 TJ). This corresponds to an oil equivalent of 3.9 billion liters and an annual avoidance of 10.7 million tons of CO2. Fig 1 shows the expected potential of solar combisystems in the EU.

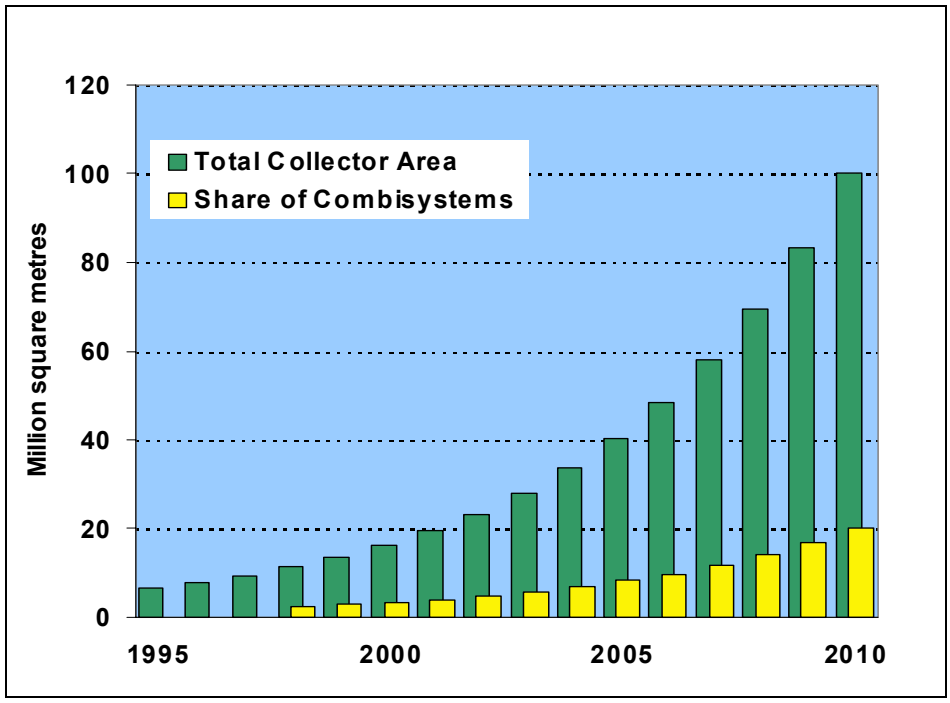

Fig 1 Increase rates forecast by the European Commission with solar thermal collectors and possible market share for solar combisystems until the year 2010.

SUN IN ACTION II – A SOLAR THERMAL STRATEGY FOR EUROPE

In the frame of the ALTENER project "Sun in Action II" also a market overview, Perspectives and Strategies for Growth were elaborated. The main topics of the executive summary are:

- Benefits of solar thermal for the users and the society as a whole
- An overview of the market growth until 2002
- The potential of solar thermal in the EU
- Four growth scenarios until 2015
- Reasons for success and barriers to growth
- Action plan to develop the solar thermal market to a fully self-sustained market. (Including: regulations, financial incentives, awareness and promotion, improving market structures, EU market integration – Promoting the Solar Keymark, research and development)

In parallel to "Sun in Action II", [2] for practical demonstration of solar combisystems this ALTENER project "Solar Combisystem" was worked out. The project is based on the research work, which experts in 9 European countries and in the United States of America did in the years 1998 to 2003 in the IEA-SHC Task26 [3]. Main topics of IEA-SHC Task26 were to work out a first overview of existing solar combisystems [4], analyse and optimize these solar combisystems and summarize all the knowledge in a Design Handbook [5].

In the frame of the Solar Combisystem project in seven participating countries more than 200 solar combisystems were planned, built and documented and some of them monitored for almost one year as well. The following diagrams give an overview of the main data of all documented plants. Detailed descriptions of the plants are given in the national documents, which can be downloaded from the project website: http://www.elle-kilde.dk/altener-combi. [6]

2. Key figures of the documented plants

Fig 2 gives a general overview of all documented solar combisystems. The collector area is in specific the gross collector area and the storage volume includes heat storage and domestic hot water (DHW) volume as well.

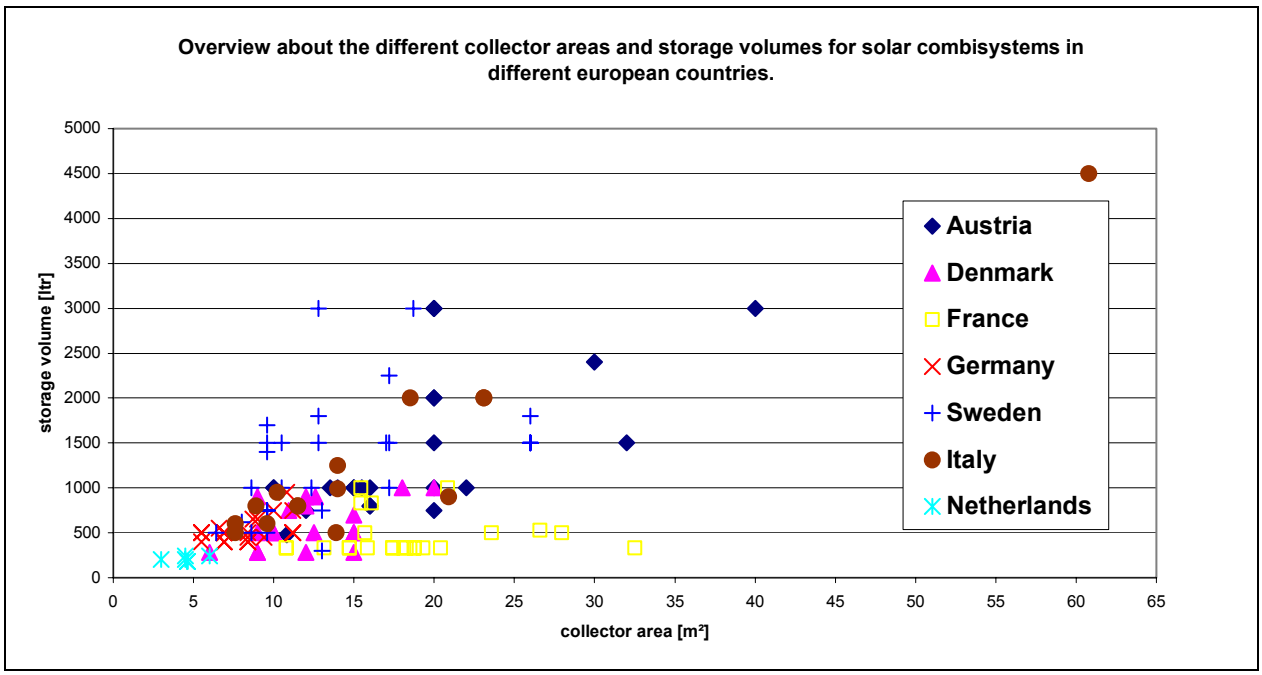

Fig 2 Collector area and storage volume of documented solar combisystems

Fig 3 to Fig 9 show for each country the specific storage volume per m² gross collector area, sorted by the size of collector area.

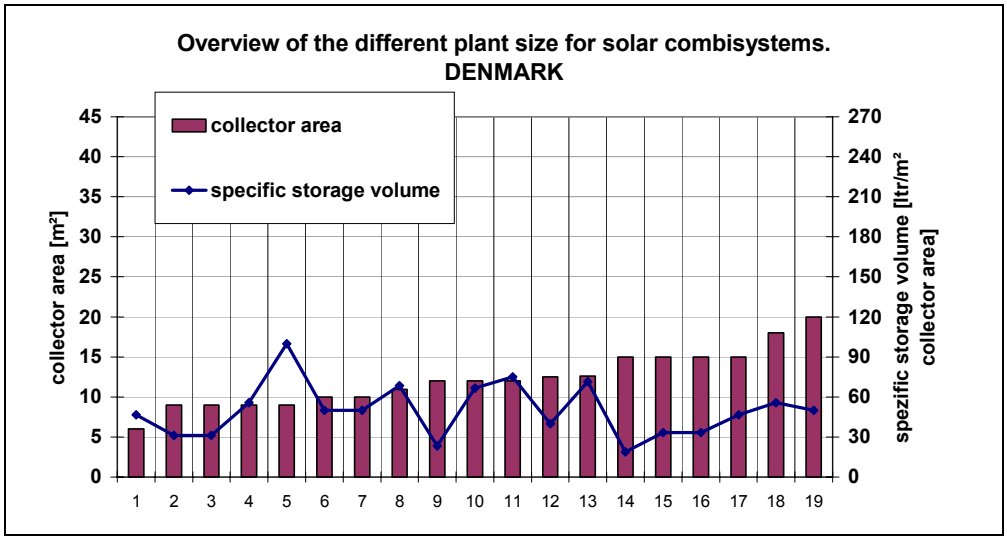

Fig 3 Key data of the solar combisystems in Denmark

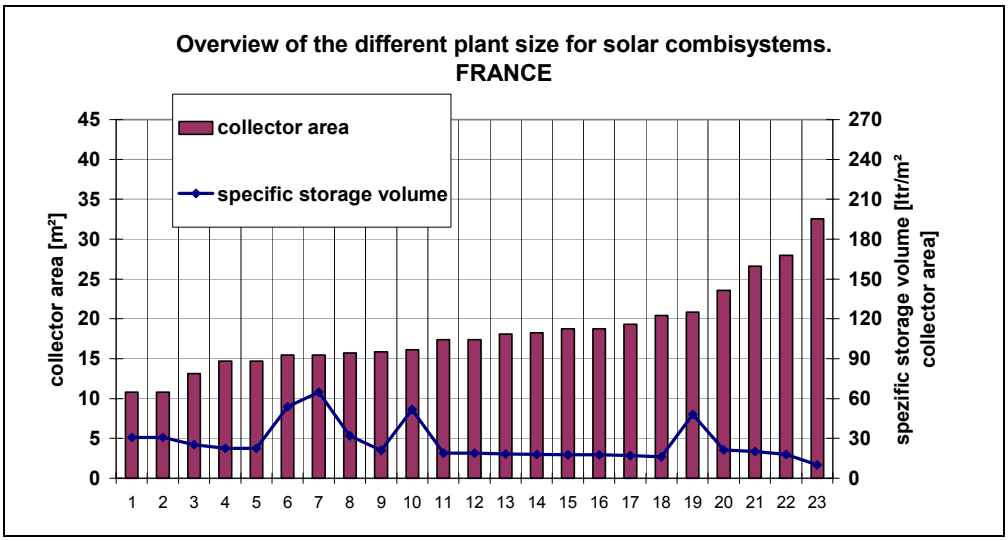

Fig 4 Key data of the solar combisystems in France

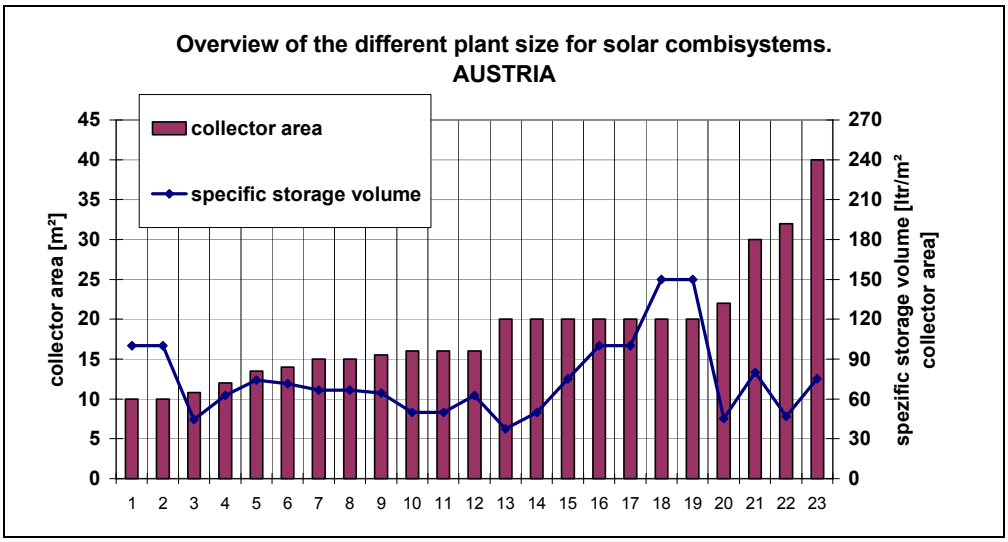

Fig 5 Key data of the solar combisystems in Austria

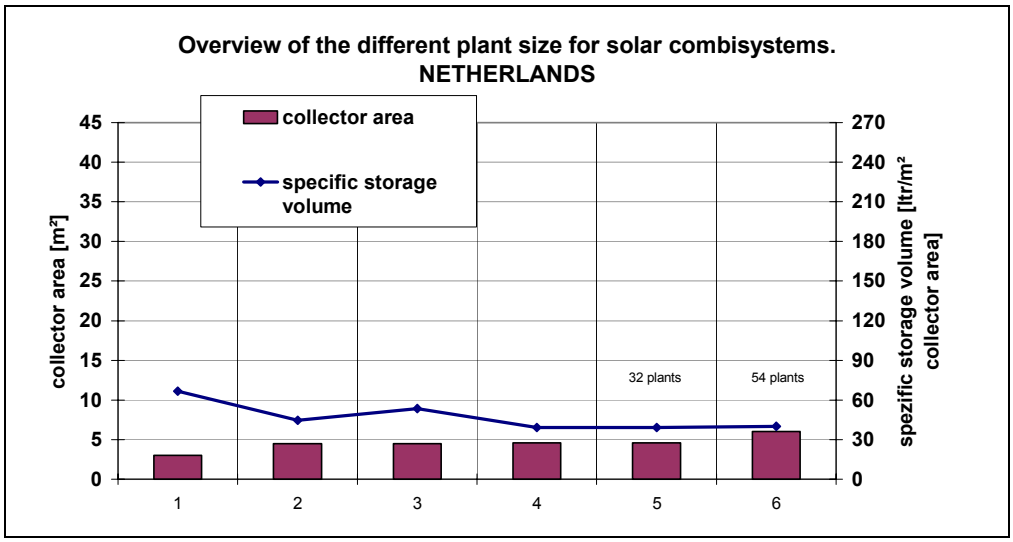

Fig 6 Key data of the solar combisystems in Netherlands

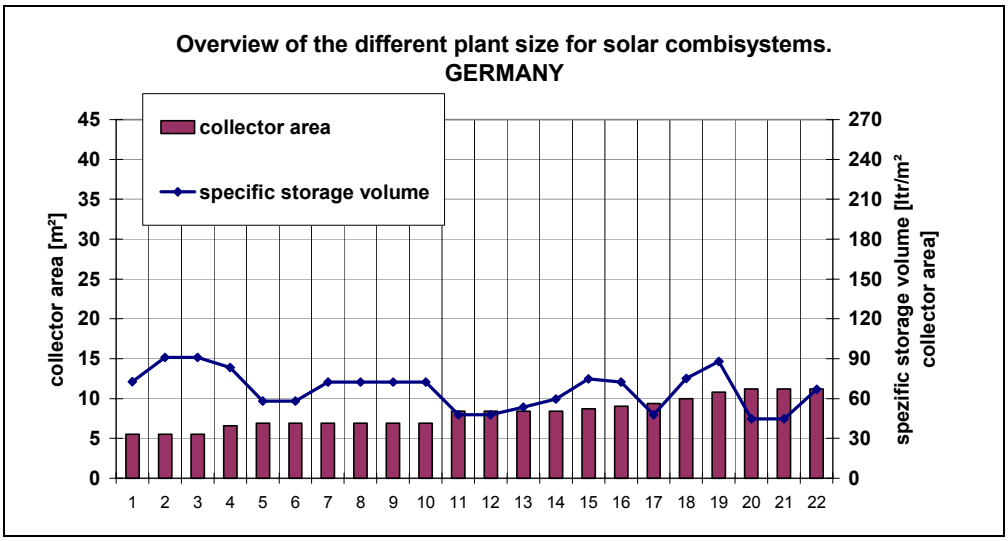

Fig 7 Key data of the solar combisystems in Germany

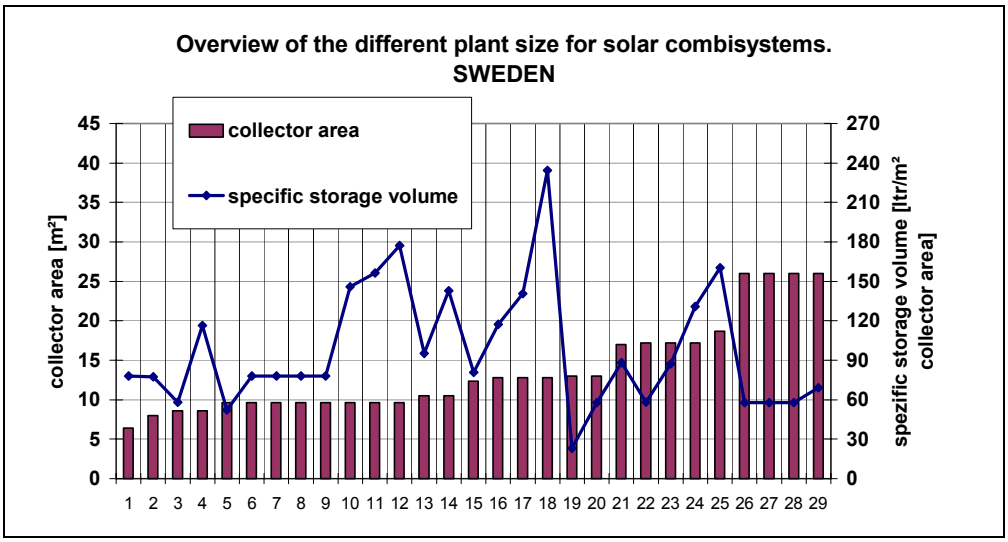

Fig 8 Key data of the solar combisystems in Sweden

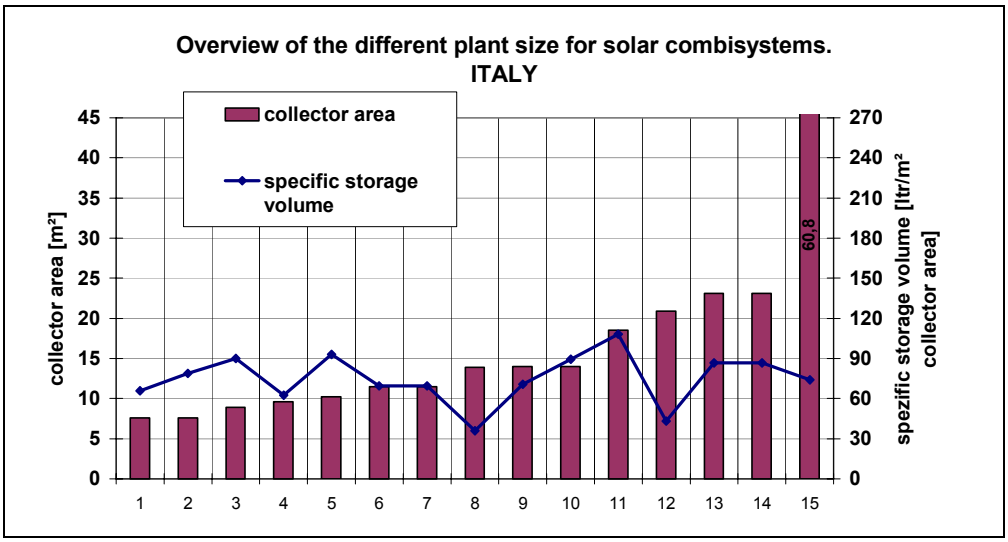

Fig 9 Key data of the solar combisystems in Italy

3. Economic view on the demonstration plants

One important part of this project was to get an overview of the system costs of solar combisystems on the European market. Because of very different system designs and other circumstances it was not possible to create only one key figure for comparing the plants. In general all costs are without VAT, without any subsidies and based on gross collector area. Fig 10 gives an total overview of all plants in all countries, but with a large number of different cost categories relating to Installation cost, cost of the auxiliary heater and cost of the heat delivery system in the house.

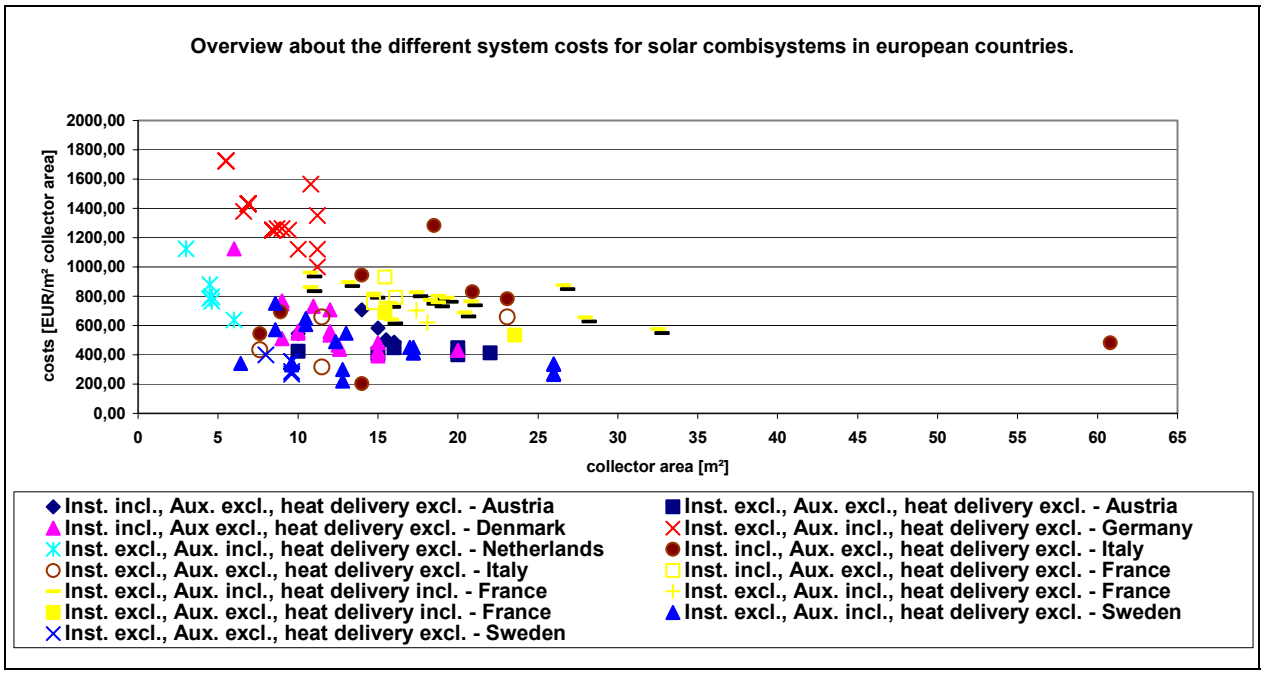

Fig 10 Overview of costs of all plants with different cost groups

Fig 11 to Fig 15 show the specific costs only for one cost category, so these figures can be compared much better.

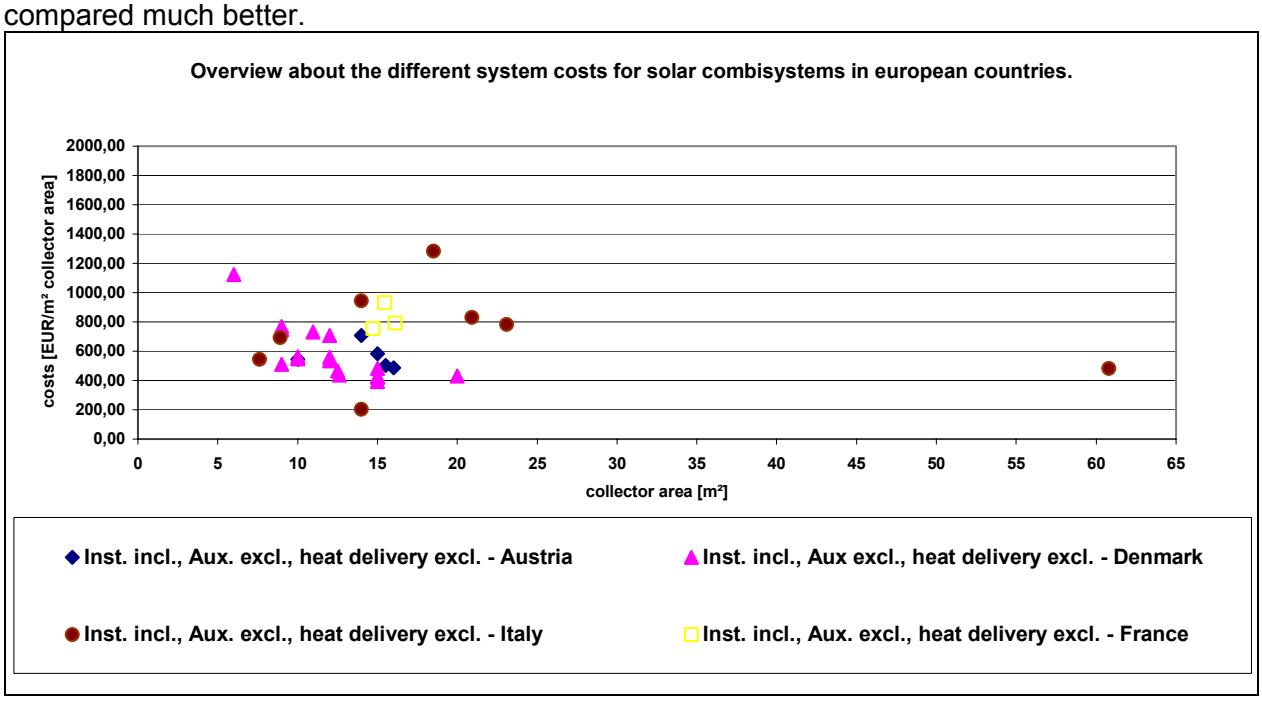

Fig 11 Overview of costs of plants with “Installation including, Auxiliary excluding, heat delivery excluding”

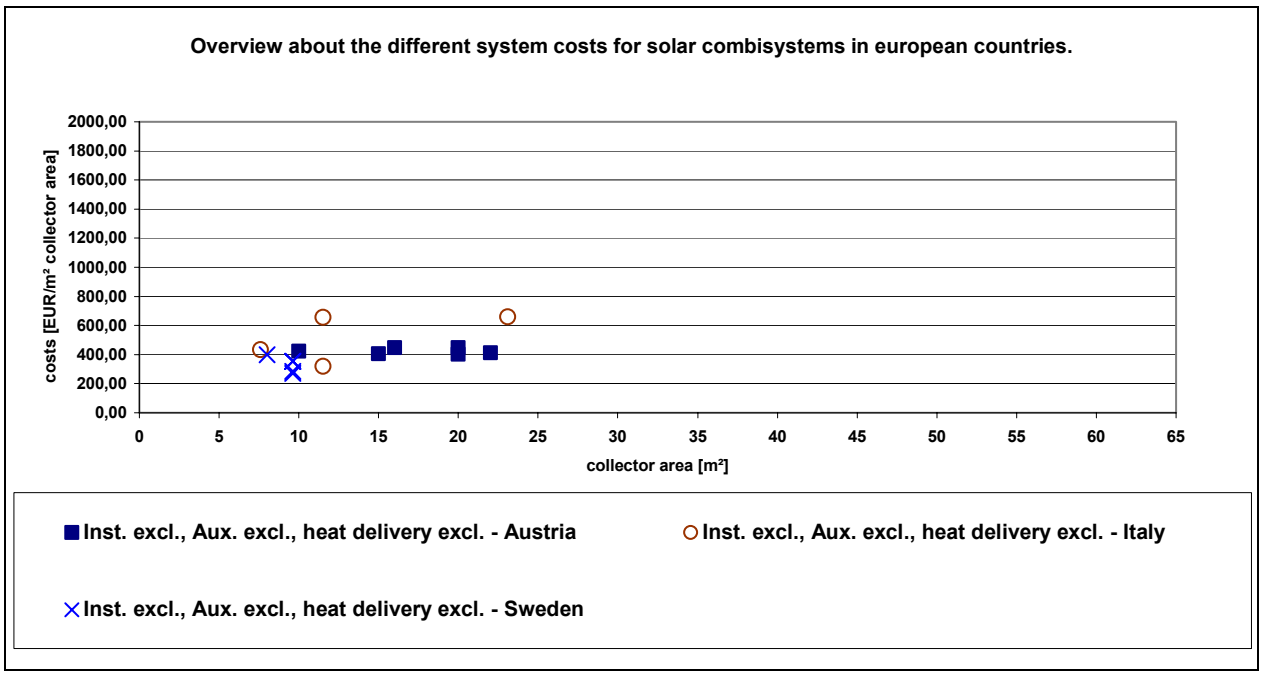

Fig 12 Overview of costs of plants with “Installation excluding, Auxiliary excluding, heat delivery excluding”

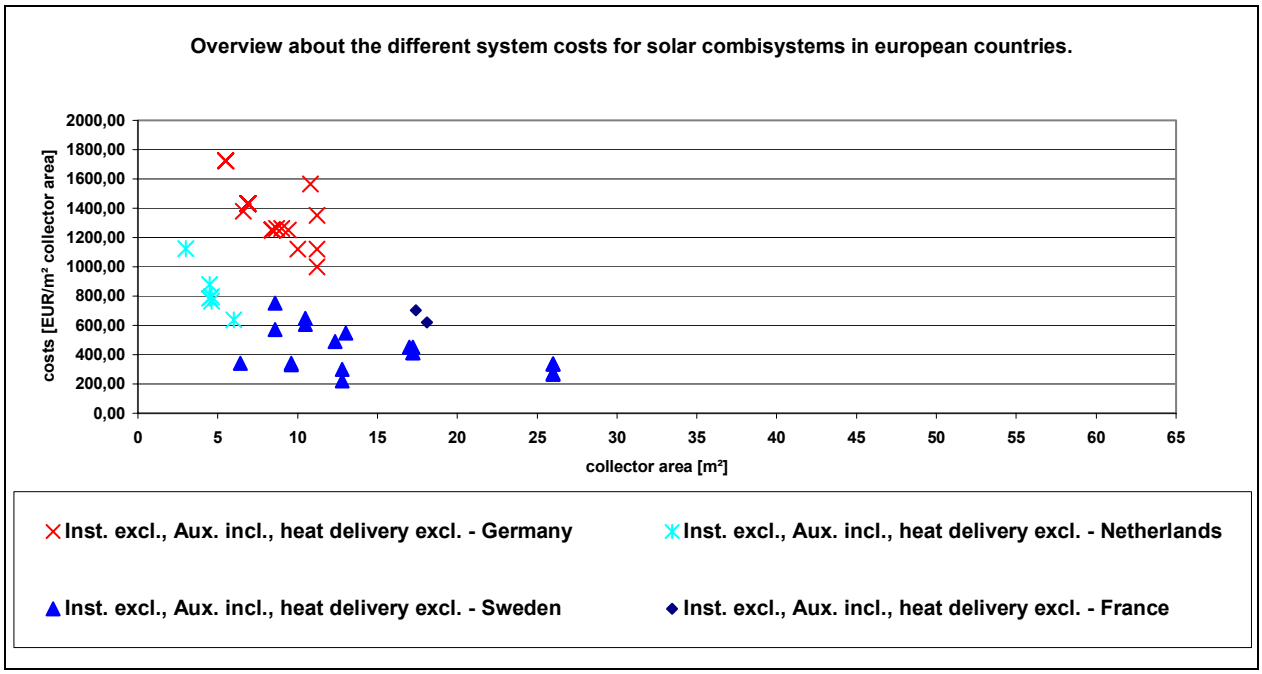

Fig 13 Overview of costs of plants with “Installation excluding, Auxiliary including, heat delivery excluding”

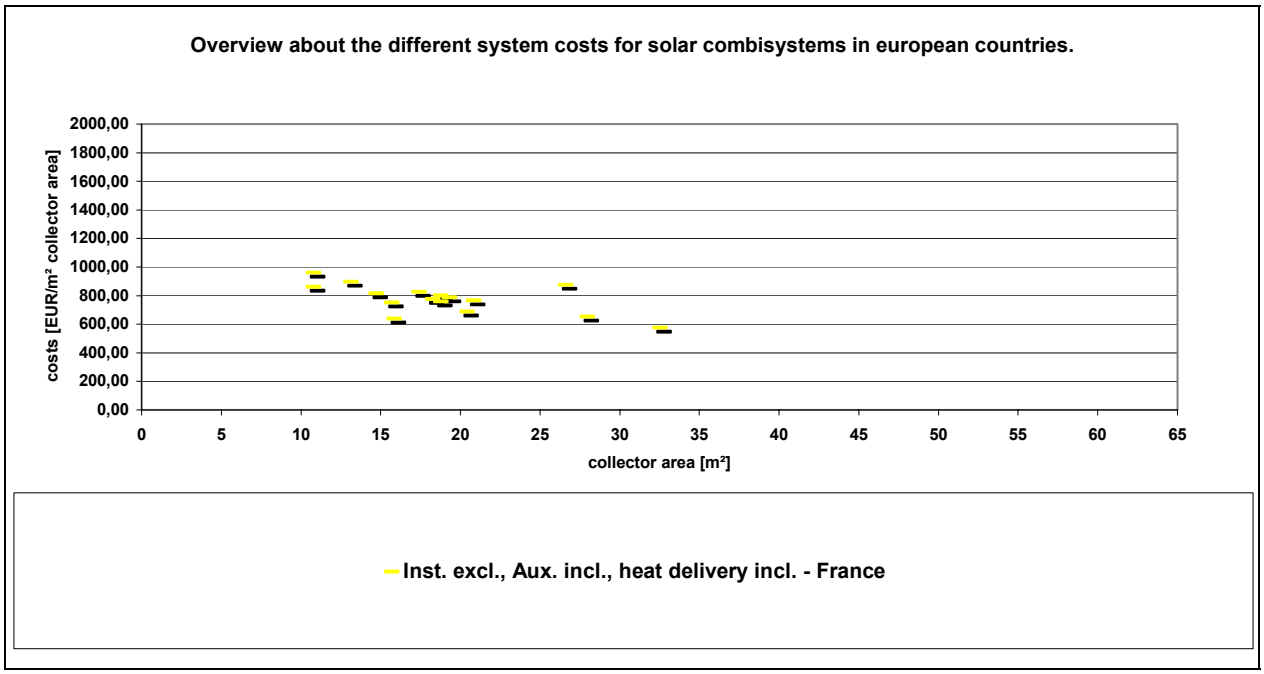

Fig 14 Overview of costs of plants with “Installation excluding, Auxiliary including, heat delivery including”

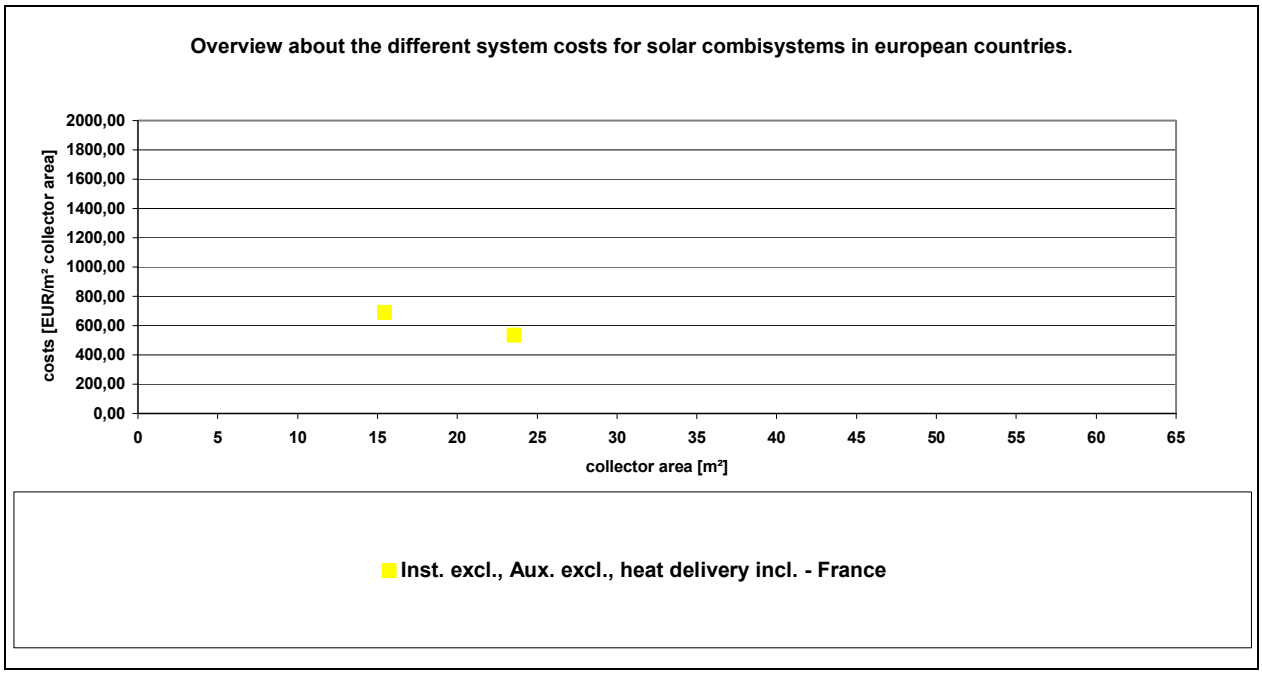

Fig 15 Overview of costs of plants with “Installation excluding, Auxiliary excluding, heat delivery including”

4. References

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[6] Thür A., Ellehauge K., Letz T., Drück H., Pauschinger T. Visser H., Perers B., Documentations of the national solar combisystems, ALTENER project „Solar Combisystem”, 2003, http://www.elle-kilde.dk/altener-combi:

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