# SWEDEN - COUNTRY UPDATE

Per-Gunnar Alm and Leif Bjelm

Lund University of Technology. Department of Engineering Geology
P.O. Box 118, S-221 00 LUND, Sweden

Key words: Geothermal energy. Direct heat, Heat pump, Country update. Sweden.

The geothermal heat in Sweden is used for space heating. The major potential reservoirs for geothermal utilisation in Sweden are located in the province of Scania. Some of the potential geothermal reservoirs are found at depths of 500 - 800 meters. Due to the fact that the geothermal water temperature in these reservoirs is low, 20-25 °C, the geothermal plants include heat pumps.

Since the beginning of 1985 a geothermal heat plant has been in operation in Scania, the southernmost province of Sweden, see figure 1. In 1984. drilling of the first geothermal wells was started just outside the town of Lund

The geothermal plant was built in two stages. The first stage consisted of two production wells and two re-injection wells. The first part of the plant had a thermal capacity of 20 MW. The second stage was finished about one year after the first and the fully operational heat pump plant of 47 MW has been in operation since 1986. As of today the plant consists of four production wells and six re-injection wells. All production and re-injection zones are located at depths between 600 - 800 meters below surface.

A small geothermal plant also exists on the island Gotland in the Baltic sea. The results from that plant are not as good as the ones from Lund and further geothermal utilisation on Gotland is not being planned.

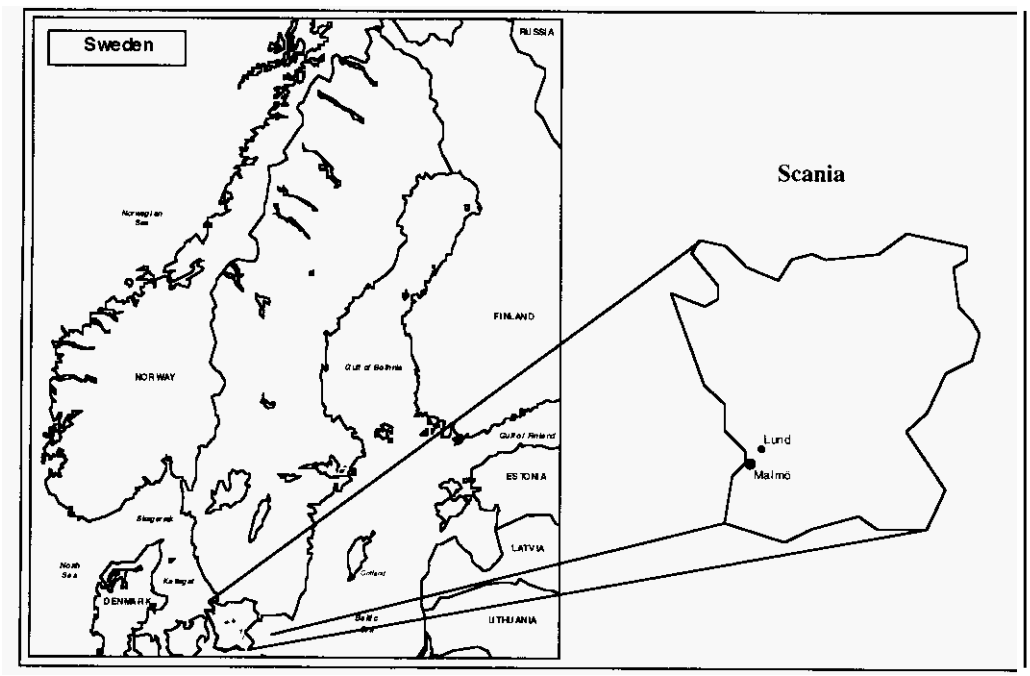


Figure 1. Scania the southernmost province in Sweden and the location of Lund.

## TABLE 3. UTILIZATION OF GEOTHERMAL ENERGY FOR DIRECT HEAT IN DECEMBER 1994

[1] I = Industrial process heat
C = Air conditioning
A = Agricultural drying
F = Fish and other animal farming
S = Snow melting
D = Space heating
B = Bathing and swimming
G = Greenhouses
O = Other (please specify by footnote)

[2] Enthalpy information is given only if there is steam or two-phase flow

[3] Energy use (TJ/yr) = Annual average water flow rate (kg/s) x [Inlet temp.(°C) - Outlet temp.(°C)] x 0.1319

| Locality | Type[1] | Maximum Utilization | | | | | Annual Utilization | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Flow Rate | Temperature (°C) | | Enthalpy[2] (kJ/kg) | | Average Flow Rate | Energy Use[3] | Load Factor |
| | | kg/s | Inlet | Outlet | Inlet | Outlet | kg/s | TJ/yr | |
| Lund | D | 455 | 20 | 4 | | | 455 | 960.2 | |

## TABLE 5. GEOTHERMAL HEAT PUMPS

[1] Thermal energy used (TJ/yr)
= Annual average geothermal water flow rate (kg/s) x [Inlet temp.(°C) - Outlet temp.(°C)] x 0.1319

| Locality | Heat Source °C | COP - Factor | Heat Pump Rating MW, (Output) | Thermal Energy Used in Heating Mode[1] TJ/yr |
|---|---|---|---|---|
| Lund | 20 | | 47 | 960.2 |

## TABLE 6. INFORMATION ABOUT GEOTHERMAL LOCALITIES

[1] Main type of reservoir rock

[2] Total dissolved solids (TDS) in water before flashing. Put v for vapor dominated

[3] N = Identified geothermal locality, but no assessment information available
R = Regional assessment
P = Pre-feasability studies
F = Feasability studies (Reservoir evaluation and Engineering studies)
U = Commercial utilization

| Locality | Location To Nearest 0.5 Degree | | Reservoir | | Status[3] in January 1995 | Reservoir Temp. (°C) | |
|---|---|---|---|---|---|---|---|
| | Latitude | Longitude | Rock[1] | Dissolved Solids[2] mg/kg | | Estimated | Measured |
| Lund | 55.6N | 13.0E | Sand, sandstone | 55.000ppm | U | | 22 |