

## Basics, Akademiska Hus 2002/2003

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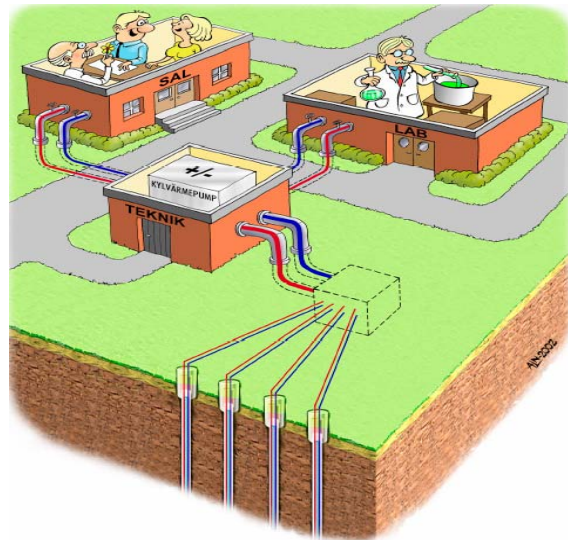
- A 100 % state-owned real estate company
  - Our business is to build, own and manage buildings for universities, colleges and other tenants with similar activities
  - Turnover 2002 4.2 bill. SEK (€ 0.45 b)
  - Estate value 2002 28 bill. SEK (€ 3.1 b)
  - Investments 2002 - 2005 approx. 8 bill. SEK (€ 0.9 b)
  - Total area approx 4 million m<sup>2</sup>
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- Education area 45 %
  - Laboratory area 37 %
  - Office/office like area 13 %
  - Other 5 %

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## Typical for AH buildings and northern climate

- High internal heat occurrence periodically (computers, students, lighting, sun etc.)
- Cooling demands on and off even during winter period
- Heating and cooling often occurs simultaneously but in different parts of a building
- Rather large air volumes are requested and handled (especially in laboratories)
- High demands concerning indoor climate
- Ground temperature varies from approx. +8 deg. in southern Sweden to approx. -2 in northerly parts. This corresponds to year average outdoor air temperature.

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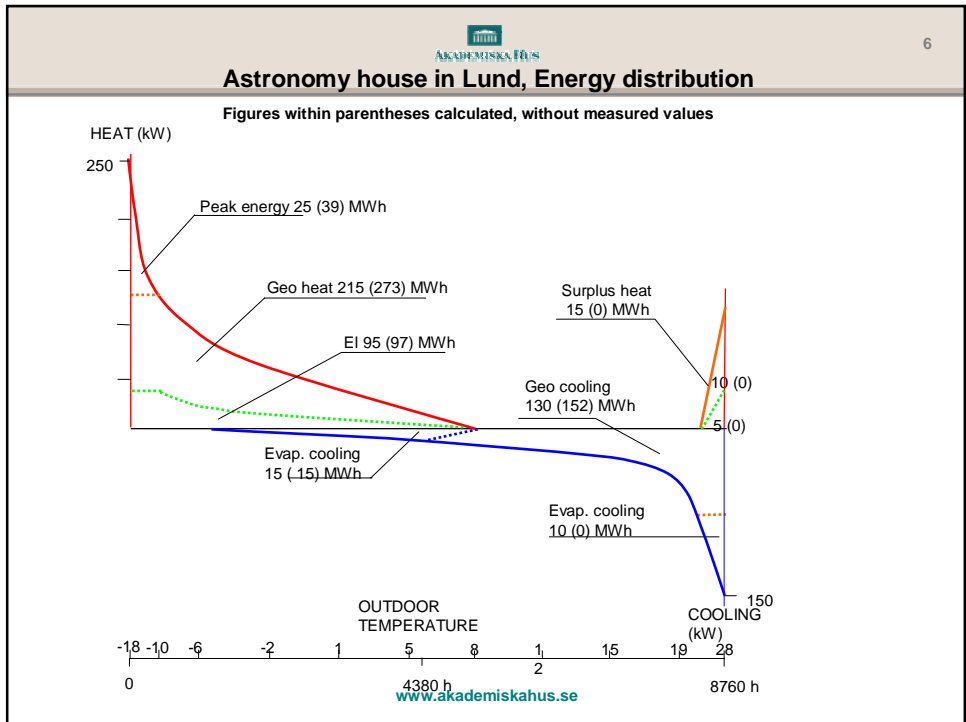
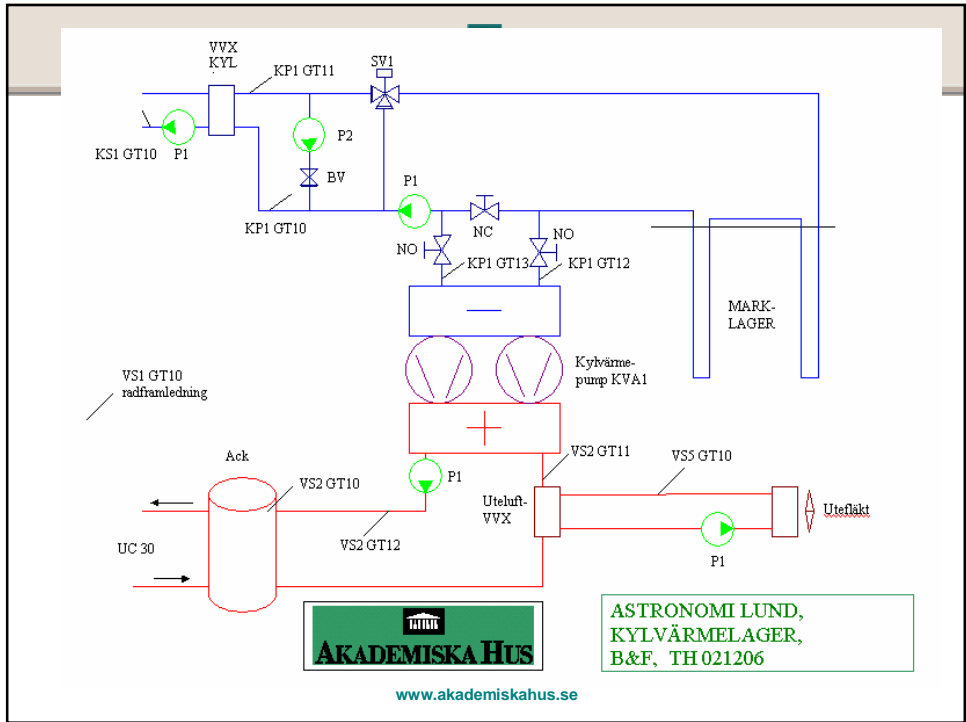


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## To consider when applying ground energy systems

- All cooling or heating surfaces must be designed larger than normally. Since heat is produced by a heat pump it's favourable with low temperatures. It's even more important that cooling surfaces are large enough to provide highest possible cooling ratio from the ground.
- Consider whether ground conditions are favourable for direct systems (aquifer technique) or for traditional drilling and pipe system. Aquifer is preferred where applicable.
- Design the ground energy plant approx. for the largest of half the peak of the cooling respectively the heating load.
- As for all techniques: conduct a economic calculation and be sure that it comes out positive!

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### Some figures from Astronomy plant

Total investment	2.2 MSEK (€ 0.24 M)
Total investment difference <sup>1)</sup>	~ 1.2 MSEK (€ 0.11 M)
Total annual energy cost reduction	~ 160 kSEK (€ 18 000)
Pay off	~ 8 years

<sup>1)</sup> inv. difference between regular installations and ground system

Specific energy consumption (kWh/m<sup>2</sup>/annum):

	without ground system	with ground system
Space heating	72	23
Space cooling	29	0