



4<sup>th</sup> EUROPEAN CONFERENCE ON HEALTHCARE ENGINEERING

51<sup>e</sup> JOURNÉES D'ÉTUDES ET DE FORMATION IHF

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# Why go geothermal?

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# Content

1. Why renewable energy?
2. Common 'shallow' geothermal technologies
3. Advantages of the technology
4. Belgian experiences
5. Conclusions
6. **TERRA ENERGY**

# 1. Why renewable energy?



Bankruptcy of fossil fuel era  
? Future Energy Supply ?



Global warming  
? Climate change ?

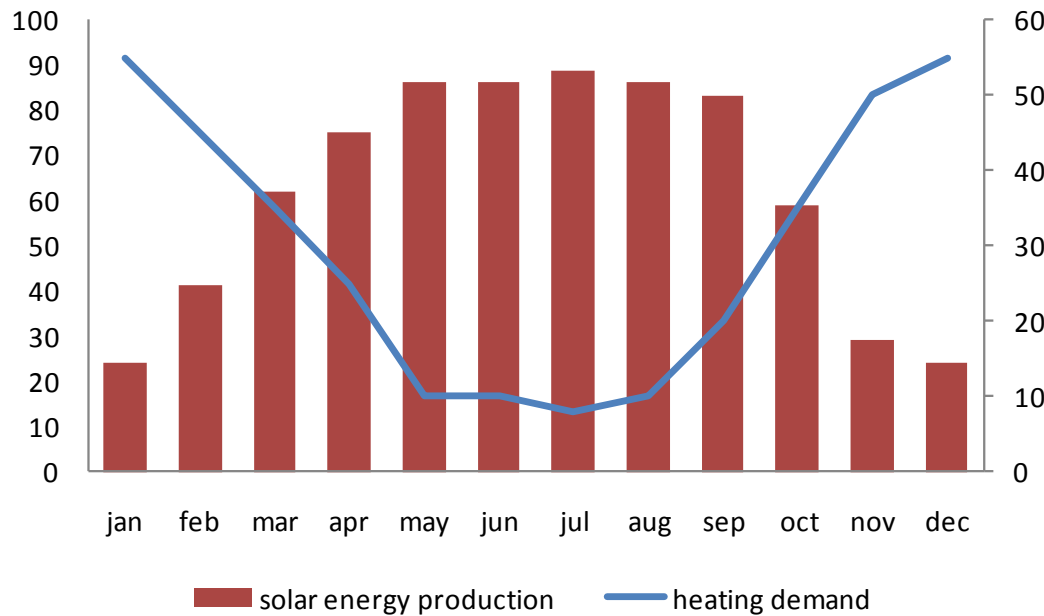
# 1. Why renewable energy?

- A. Reduction energy demand
- B. Use 'common' renewable energy sources
  - 1. Sun
  - 2. Water
  - 3. Wind
  - 4. Biomass

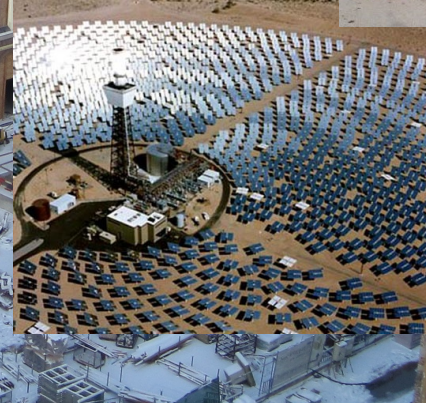


# 1. Why renewable energy?

## Disadvantages of 'common' renewable energy sources

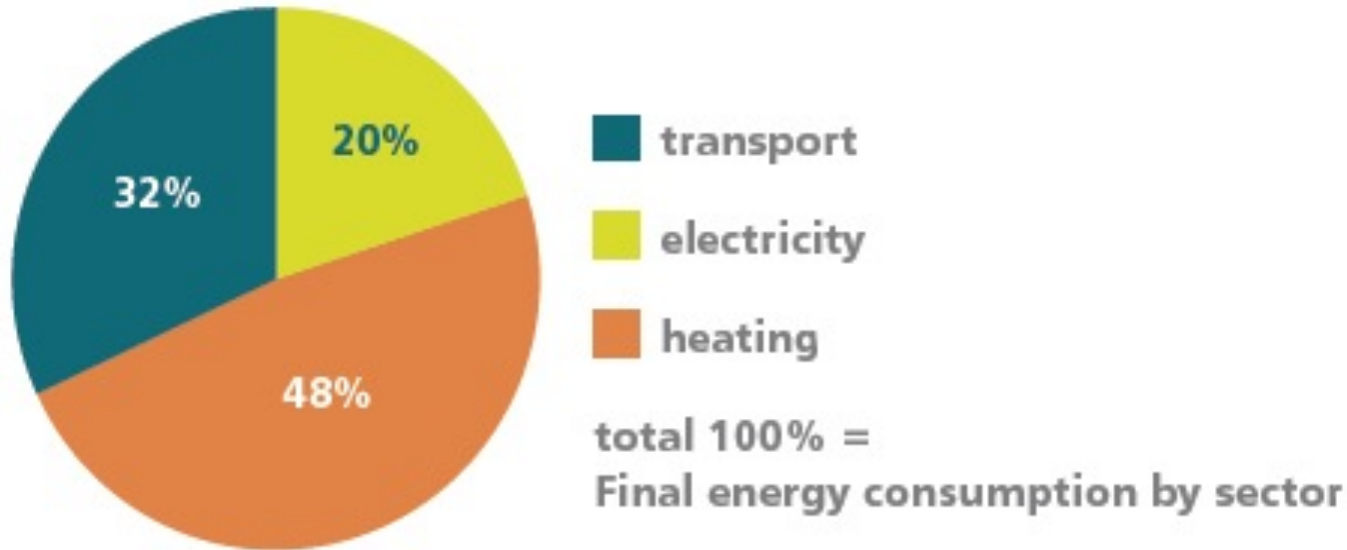


Difference supply-demand wind? Solar?



Focus on electrical power generation (plant)

# 1. Why renewable energy?



Source: Eurostat, elaborated by EREC

Use of thermal energy of decisive importance 50%!!!

⇒ NEED FOR ANOTHER ALTERNATIVE

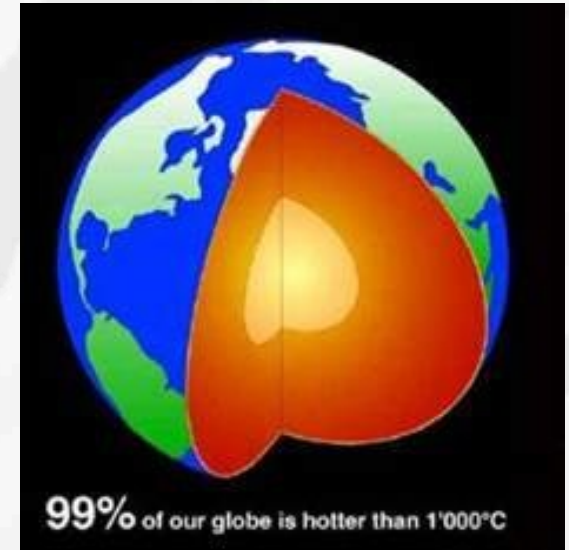
⇒ GEOTHERMAL ENERGY = 5th alternative

Sun – wind – water – biomass – **geothermal energy**

# 1. Geothermal energy?

## 1. Use underground **heat extraction**

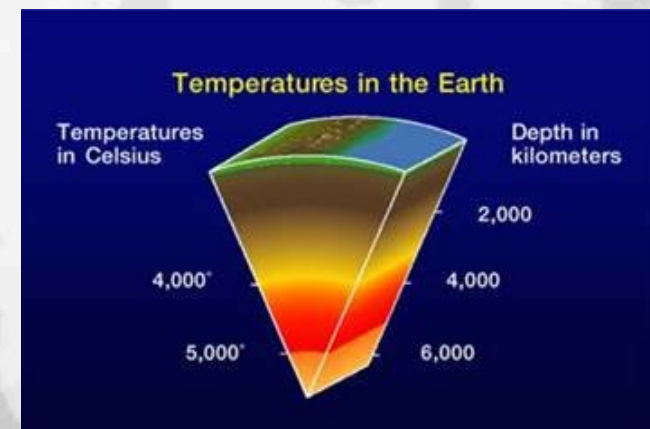
- Constant temperature 10-12°C at 100 m (Central Europe)
- Thermal gradient : 2 K /100 m
- ⇒ 50 C at 2.000 m depth
- ⇒ TOO Expensive



## 2. Use underground **thermal storage**

- Seasonal storage heat and cold

= Viable and feasible solution for hospitals, resthomes, offices...



# Content

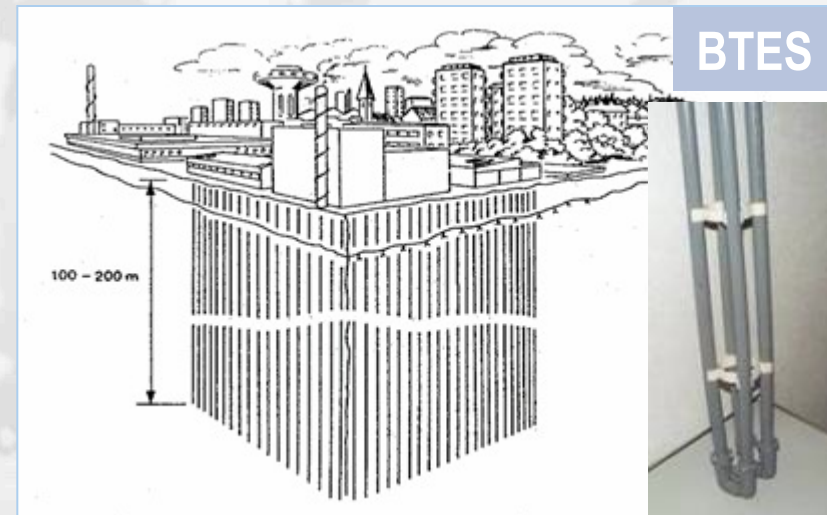
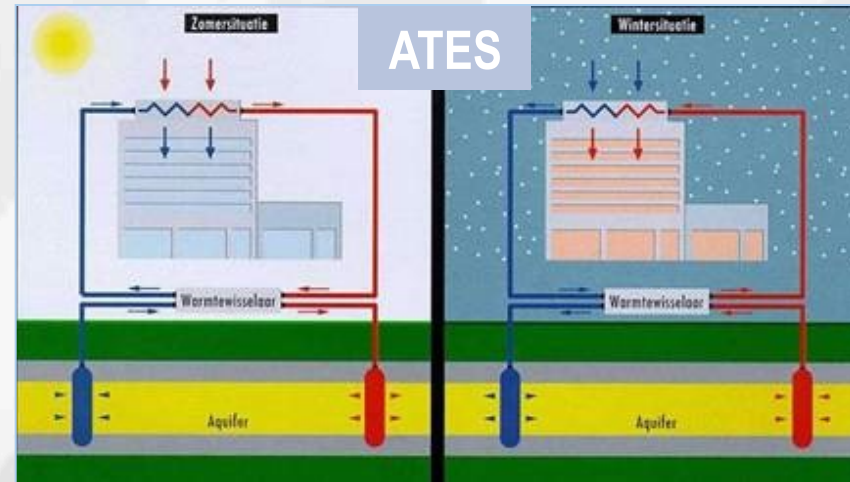
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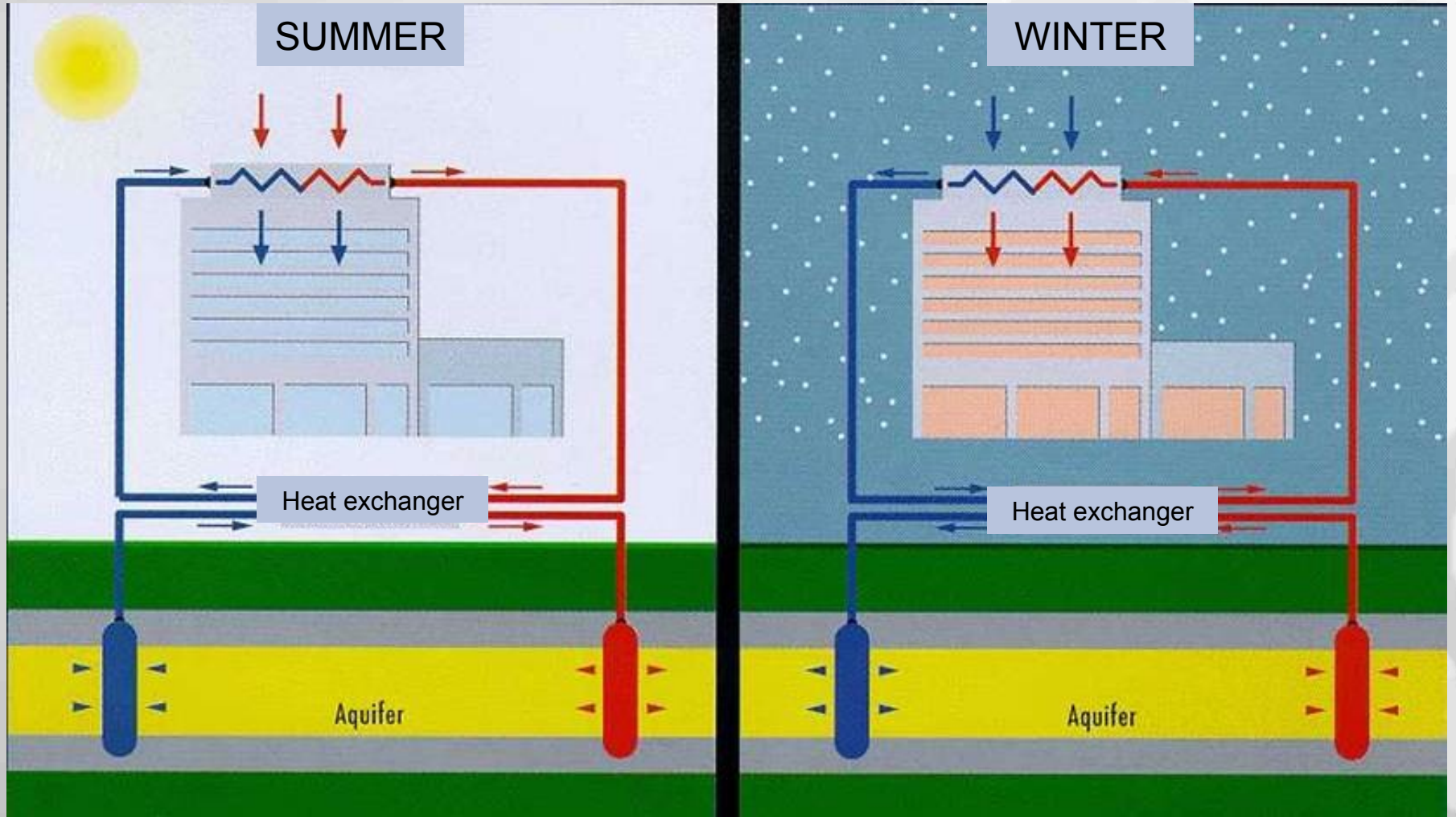
# 2. Common geothermal technologies

“Smart” usage of subsoil: Energy-storage

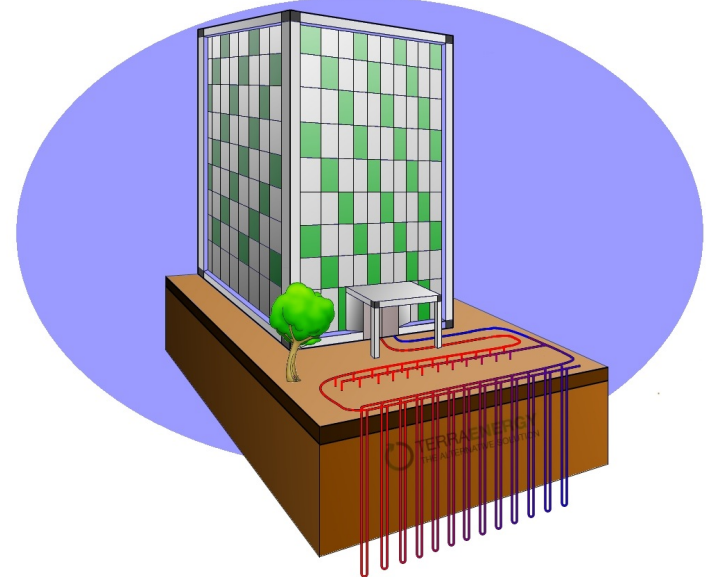
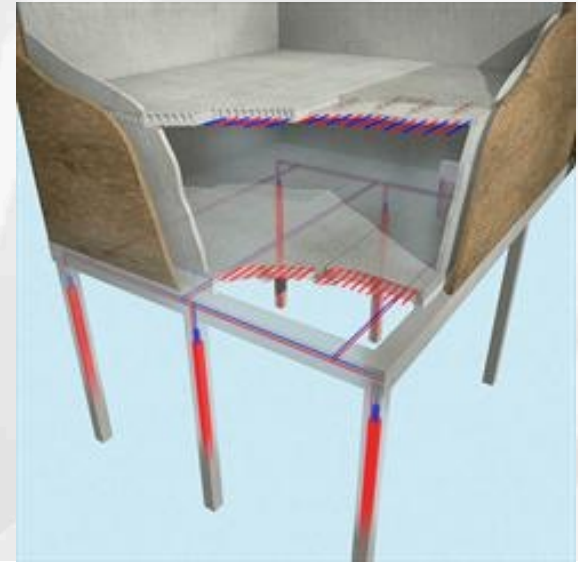
- 1. **ATES** (groundwater)
- 2. **BTES** (vertical tubes in boreholes)
- 3. *CTES* (cavern storage)



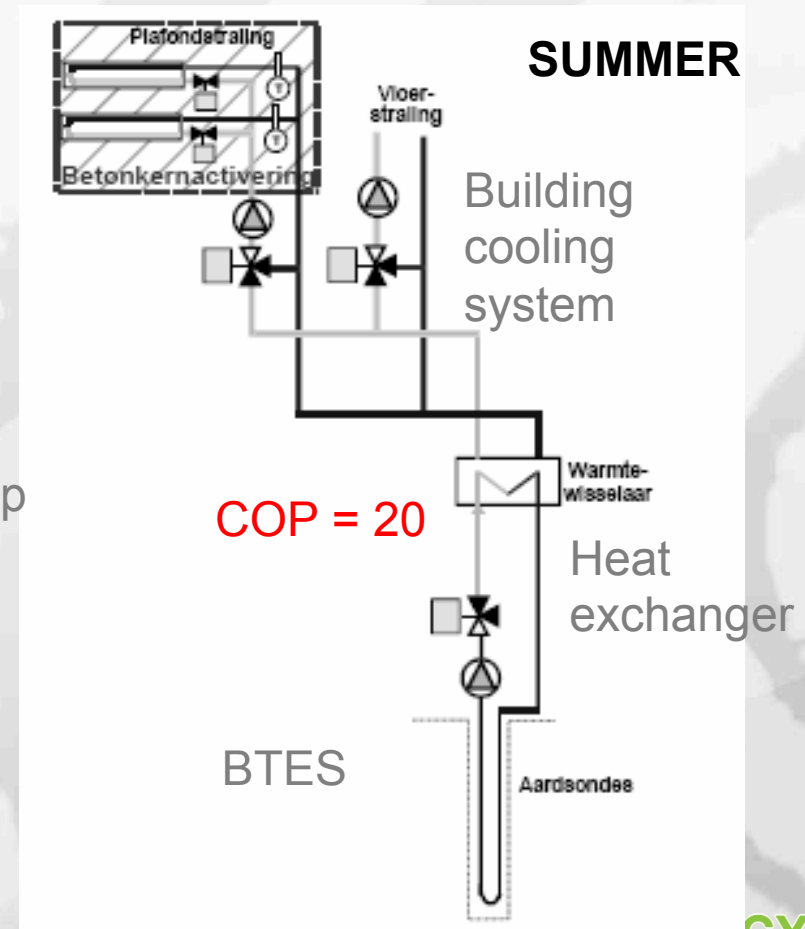
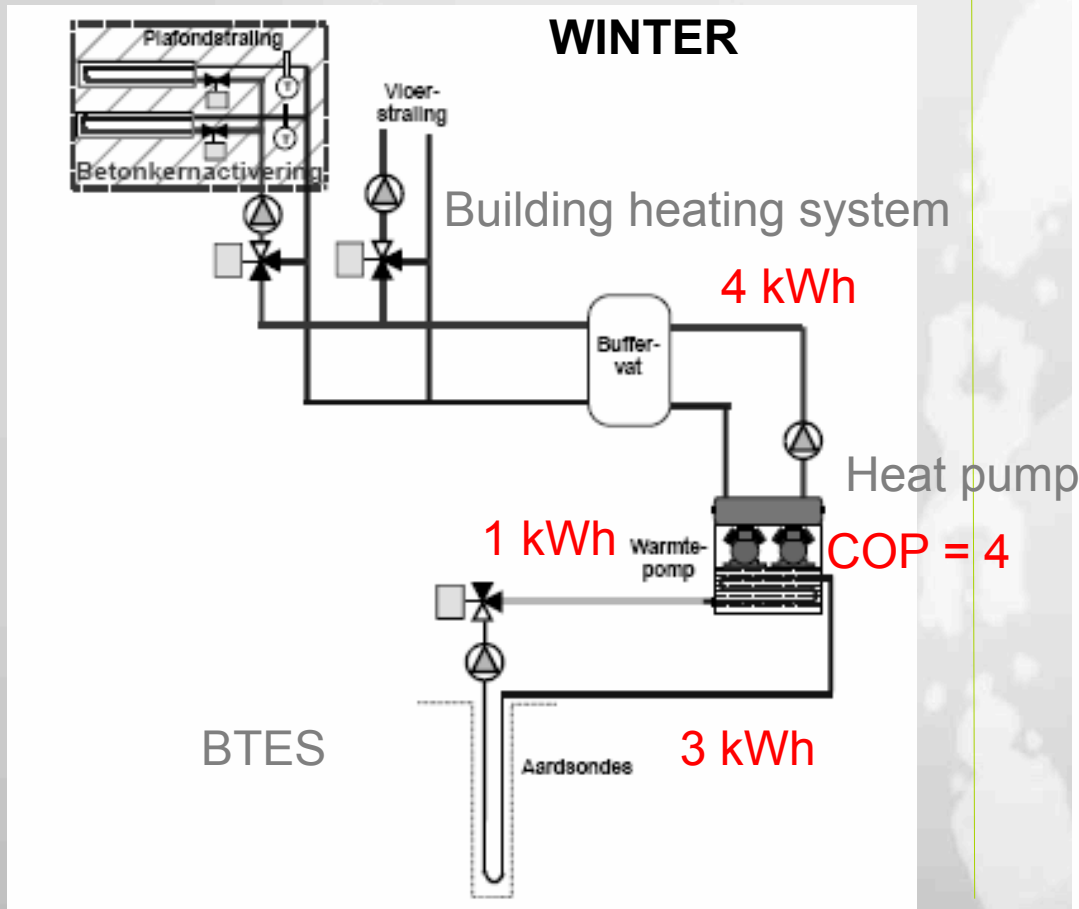
## 2. ATEs – Aquifer Thermal Energy Storage



# 2. BTES - Borehole Thermal Energy Storage



# 2. BTES - Borehole Thermal Energy Storage



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3. **Advantages of the technology**
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# 3. Advantages

1. Large savings on heating and cooling (50-80%)
2. Renewable energy source
3. Continuously available
4. Reliable / proven technology
5. Economically feasible... also without subsidy
6. Ideally suited for buildings with a decent heating and cooling demand (+ 200 kW)  
hospitals, resthomes, offices ...

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# 4. Belgian experiences

Hospital : Sint Vincentius Antwerp





# 4. Belgian experiences I



New Hospital, 400 patient rooms

- o ATES with heat pump
- o Heating & cooling Ventilation air
- o Operational since 2000



ATES (groundwater) system

- o Max capacity 100 m<sup>3</sup>/h
- o Depth 65 m
- o Diameter 80 cm
- o Distance between hot & cold well 100 m

# 4. Belgian experiences



## Evaluation after 3 years monitoring

- o Reduction primary energy use 3.930 GJ/year
- o Primary energy savings 85 %
- o CO<sub>2</sub>-emission reduction 299 ton/year
- o Equivalent 4.750 m<sup>2</sup> photovoltaics
- o Global SPF heating 5,5
- o Global SPF cooling 14,8

## Financial

- o Extra investment ATES € 300.000
- o Energy savings a year € 40.000
- o Simple Pay-Back 7,5 years

**Without subsidy**

## 4. Belgian experiences II

Resthome : Sint-Bavo Wilrijk



# 4. Belgian experiences II

## Renovation rest-home

- o BTES with heat pump
- o Heating by floor heating
- o Cooling by ventilation
- o Construction phase

## BTES (borehole) system

- o 24 boreholes with PE-heat exchangers
- o Depth 130 m
- o Diameter 160 cm
- o Space 650 m<sup>2</sup> needed

## Design study

- o Primary energy savings
- o CO<sub>2</sub>-emission reduction
- o Equivalent

58 %

23 ton/year

370 m<sup>2</sup> photovoltaics

## Financial

- o Extra investment ATES
- o Energy savings a year
- o Simple Pay-Back

€ 82.000

€ 6.800

12 years

**Without subsidy**

## 4. Why do they go geothermal ???

- o Investment that has a decent pay back (8-12 years)  
After pay-back period => profit (long view)
- o Possibilities comfort cooling at high efficiencies
- o Sum of cooling and heating costs of the heat pump system is lower than a traditional heating boiler => comfort improvement at lower overall energy cost
- o **GREEN**
- o Less dependent on classic energy forms (electric/fossil fuels) and its variations (peaking energy prices)
- o Sustainability in accordance to social role of caring institute

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# 5. Conclusions

Geothermal energy is

- o Available for everyone at every time
- o Technical feasible for every underground type
- o Economic viable, certainly for projects with a decent heating demand and a cooling demand
- o Ecological a great energy saver (big CO<sub>2</sub>-reductions)
- o An electrical driven heating device => green electricity
  
- o The boiler of the future

# Energy evolution to... smart grids

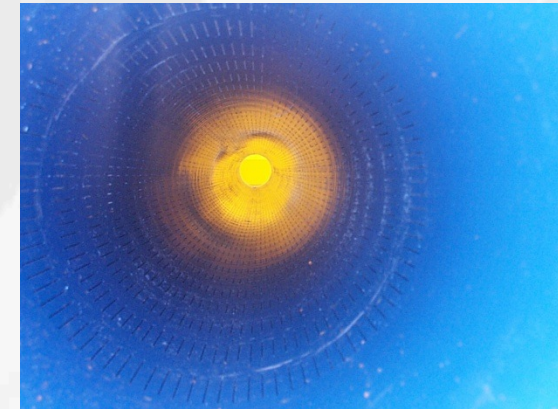




## TERRA ENERGY offers geothermal solutions:

### Studies:

- o Feasibility, potential, conceptual
- o Thermal Respons Test – pumping test
- o Design (incl. dimensioning, integration)
- o Monitoring projects



Design & Build

Turn-key

Financing

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