GROUNDSOURCE LIVE 2011

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ADVIESBUREAU VOOR MILIEUTECHNIEK
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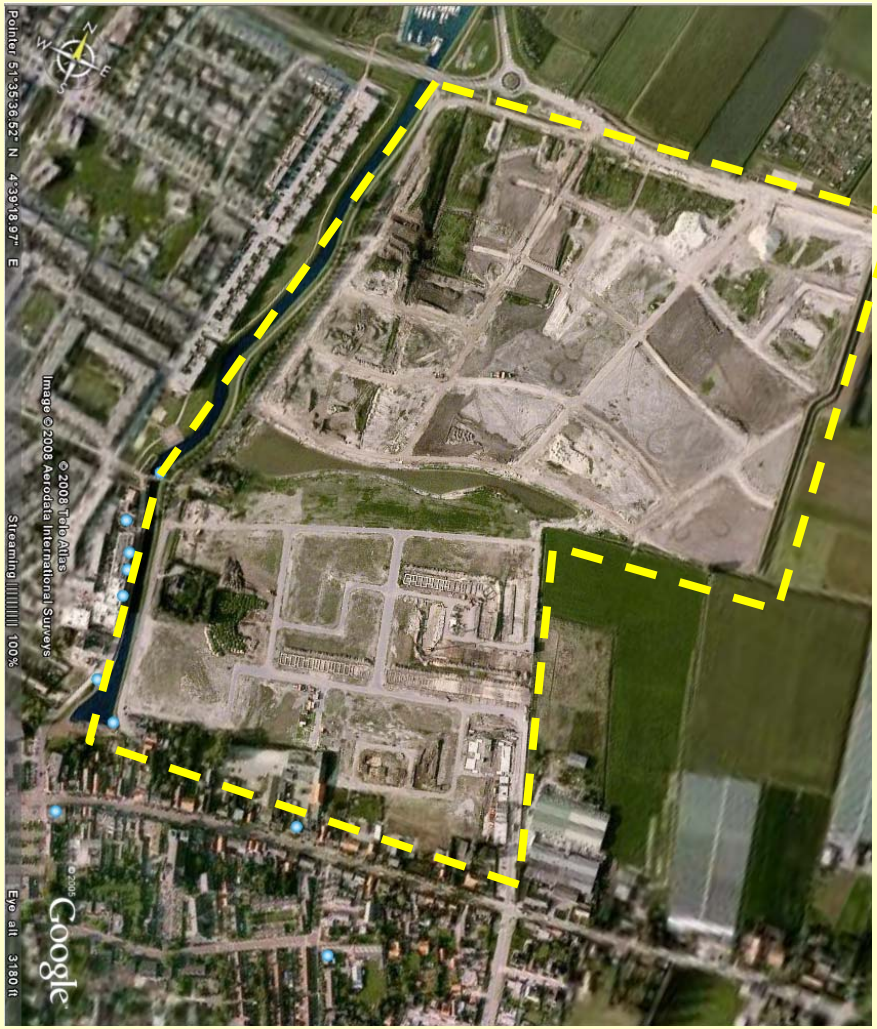
GROENHOLLAND PRESENTATION FEATURES

- **A 2006 large, novel and ambitous groundsource project**
- **The project in 2011 hindsight**
- **2006 – 2011 parallels with the groundsource industry**
- **A 2020 perspective for the groundsource industry**

2006 Project, Etten-Leur (NL)



- 25 hectares, new development
- 1200 individual homes
- Total 6 MW heat pump capacity
- Electric infrastructure, no gas
- Multiple main contractors
- Municipality in driving seat

THE 2006 QUESTIONS

- How to design?
- How to organise?
- How to warrant quality?
- The legal framework?
- The longterm?

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The 2006 questions and answers

DESIGN ?

- Define energy scenarios, spatial distribution & interference
- Trial boreholes, hydrological & geothermal (GRT) testing
- Modeling of thermal interaction, ground and groundwater effects

PROJECT ORGANISATION ?

- Several main contractors, 3 main installers of heatpumps
- One separate lot of 50 houses built and installed by owners

QUALITY ?

- Project specific heat pump installation guideline developed
- Installation design & quality was responsibility of installer/owner

THE LEGAL FRAMEWORK ?

- No legal framework, installation guideline in building permit

THE LONGTERM ?

- Adherence to guideline should warrant technical quality
- 50% thermal regeneration requirement warrants sustainability

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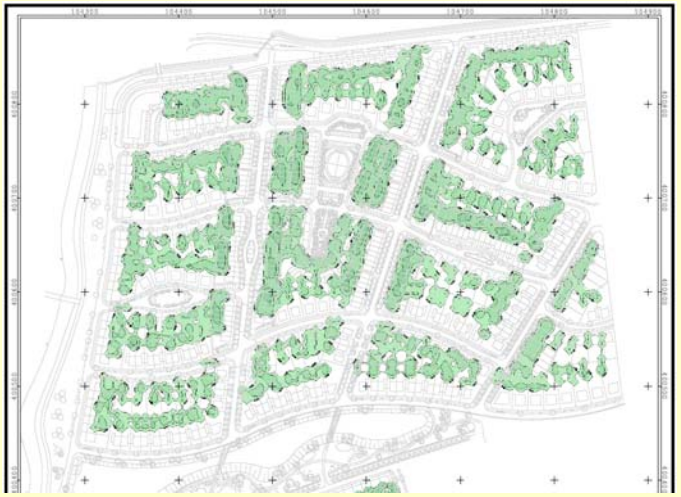
House types energy usage & BHE design

PARAMETER	WAARDE		
Heat exchanger type	U-loop PN16 SDR 11, 32 mm diameter		
Borehole interdistance (m)	5,0		
Diameter borehole (m)	0,15		
Circulatiemedium	10% monopropyleenglycol		
	Detached	**Semi-detached**	**Terraced**
COP heatpump	4,5	4,2	4,0
Flow borehole heat exchanger (m^3/hour)	1,15	1,14	1,05
ΔT borehole heat exchanger °C	4,75	3,5	2,5
Designtemperature, average mediumtemperature (at $T_{bodem\_in} \geq -2,5$ °C)	1,37	0,75	0,25

Dwelling	Peak capacity (kW)	Heating (MWh)	Cooling 0% (bww m)	Cooling 50% (bww m)	Cooling 70% (bww m)
Detached	8	13,5	3 x 108 (324)	3 x 97 (291)	3 x 92 (276)
Semi-detached	6	8,49	2 x 115 (230)	2 x 98 (196)	2 x 92 (184)
Terraced	4	6,84	2 x 87 (174)	2 x 58 (116)	2 x 48 (96)

Thermal model results: Scenario terraced homes



- **no thermal regeneration**
  - max ΔT 20K year 5
- **70% thermal regeneration**
  - max ΔT 5K year 5

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Thermal model results, groundwater flow effect

Flow direction

- **50% thermal regeneration**
  - temperature effect (-3, +3) year 5
- **70% thermal regeneration**
  - temperature effect (-1, +1) year 5

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Conclusions of 2006 design study

- **Without regeneration of the ground temperature, heat pump systems on this scale and density are not feasible in the long term.**
- **At least 50 % of the annual heating demand needs to be re-injected (at least 70 % of heat extracted from ground).**
- **Regeneration can be achieved through summertime free cooling or the integration of solar thermal panels.**
- **Balanced load profile (heating & cooling) reduces sensitivity of ground temperature to variations in demand.**
- **A more balanced load profile reduces downstream effects (cold spots) through groundwater flow**

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Evaluating the project in 2011

THE UP SIDE

- The project was completed over a three year period (2006-2009)
- All individual systems are running, no major technical problems
- Major reference for closed loop system reliability and robustness

THE DOWN SIDE

- System design and quality cause for worry
- Process very much price driven, knowledge lacking
- Thermal regeneration in many cases neglected
- No feedback on efficiency, no systems monitored
- Long term temperature development is cause for worry

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Groundsource industry parallel 2006 - 2011

THE UP SIDE

- Ground source is getting recognized as a standard technology
- Most installed systems are running
- Reference projects for groundsource reliability and robustness

THE DOWN SIDE

- Industry very price driven, knowledge & quality under valued
- Quality certification process mainly bureaucratic
- System design, quality and efficiency cause for worry
- Energy strategies & building installation integration lacking
- Little feedback on proven efficiency, very few systems monitored

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Industry near future 2011 -2020

THE OPPERTUNITIES

- Groundsoure technology, becoming a standard low energy solution
- High potential for large scale projects, realistic & challenging
- Groundsource integration into energy efficient building strategies
- Groundsource as integral part of smart energy grids & smart cities
- Groundsource requires integration into main stream curriculum

THE THREATS

- Standard systems do not meet minimum basic quality / efficiency
- Large scale applications need environmental issues resolved
- Quality guidelines unavoidable, but should not impede
- Lowest price focus, lack of knowledge and quality, threat to industry
- Lack of efficiency and long term sustainability is threat to industry

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The 2020 perspective

Homemade Ground Source Heat Pump

By Les Belzer, eHow Contributor updated March 09, 2011

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A ground source heat pump can reduce your heating and cooling costs. You may pay a substantial amount of money in initial costs or you can design it and do some of the work yourself to save on the capital outlay.

You can use a geothermal heat pump to heat and cool your country house.