Geothermal Energy in the Netherlands

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Developing enabling frameworks for geothermal heating

- The case of The Netherlands (NL)

42,000 km²
17 mio inhabitants  > 400 inh/km²
Content

- intro
- a heating & cooling transition
- a country perspective: the case of The Netherlands
- enabling frameworks & instruments
- a (joint) way forward?
Source: Phil Vardon, TUD [https://www.youtube.com/watch?v=_a6KKQ6y6f8](https://www.youtube.com/watch?v=_a6KKQ6y6f8)
2007 Geothermal MineWater Heerlen propelling the Energy transition
Geothermal Energy in The Netherlands
2007 Geothermal Tomatoes – Bleiswijk (NL)
Eerste oogst aardbeien geteeld met aardwarmte

In opdracht van

• Ministerie van Economische Zaken

Zie ook

› Beleid Bodemenergie/Aardwarmte
› Financiële ondersteuning
› Financiële regelingen warmte en koude

Op 14 maart zijn in de Koekoekspolder bij Desselmuiden heel bijzondere aardbeien geoogst. Deze aardbeien zijn namelijk de eerste aardbeien ter wereld die geteeld zijn met aardwarmte.


Lees ook het artikel 'Eerste aardwarmte aardbeien ter wereld geplukt in de Koekoekspolder' op de website AGF.nl.

first Geothermal strawberries
2015
Den Haag – 2 April 2015

The NL Minister of Economic Affairs

Now

The beginning of a new end...

> water will be hot!
The rapid development of Geothermal Energy in The Netherlands

Total Geothermal Energy produced in NL in 2019 > 5 PJ
More than 25% of the EU population lives in areas directly suitable for geothermal district heating

Map of areas suitable for geoDH networks and actual geoDH installed capacity according to available geological data

Source: ETIP-DG, adapted from GEODH and EGEC market report
NL policy instruments and framework conditions
Paris 2015
well below 2 °C

NL Climate Agreement 2019
-95% CO₂ in 2050
-49% CO₂ in 2030

Electricity
Agriculture
Built Environment
Industry
Mobility
**NL Climate Agreement 2019**

- **49% CO₂ in 2030**
  - 10 years from now!

**Electricity**
- Phasing out coal-fired electricity production by 2030
- Accelerating renewable energy (subsidized until 2025) to 70% in 2030
- CO₂-minimum price for electricity-production

**Mobility**
- 100% new-sold passenger cars zero-emission by 2030
- Promoting EV by taxation measures and 1.8 million charging points by 2030
- Modal shift to bicycle/public transport and smart logistics

**Industry**
- Targeted carbon levy on every ton CO₂ emitted exceeding a fixed reduction path (push)
- Broadening the scope of subsidy scheme (SDE++) incl. limited subsidy for CCS (pull)
- Public-private innovation program for cost reduction in low carbon technologies
- Industrial cluster approach (incl. sector coupling)

**Built environment**
- Enhancing EE of 1.5 million houses and 1 million utility buildings
- New buildings will no longer be heated with natural gas
- Municipalities lead a local, participative approach to make housing emission free, neighbourhood by neighbourhood

**Agriculture & land-use**
- Sustainable heating in greenhouse horticulture
- Improved processing of manure to reduce livestock-emissions
- Exploring storage of carbon in soil and vegetation through pilot programmes and increasing forested surface

**Climate Agreement 49% reduction in 2030 relative to 1990**
2050: 7 mio houses + 1 mio other buildings ‘van gas los’

2030: 1.5 mio existing houses ‘van gas los’
  - Neighbourhood by neighbourhood
  - Municipalities know bij 2021 which neighbourhood will be tackled when
  - Residents will be involved

Close of Groningen Gas field by 2022
Alternatives for Heating with natural gas

Switch from high temperature to low temperature (district heating) systems

- **Collective Heat <70°C**
  - Residual heat from datacentres, surface water, thermal energy storage, geothermal

- **Collective Heat >70°C**
  - Industrial residual heat, biomass and geothermal

- **All Electric**
  - Heat pumps, infra-red, “zero energy”

- **Sustainable gas**:
  - Biogas, power to gas (H2)
  - Also: pellet stoves and biomass boilers

- **Geo-thermal energy including geothermal energy storage as a source for district heating**
Geothermal in the Built Environment

- Substantial potential share of **district heating** in 2050 (15 to 45%)
- **Geothermal**: important source for district heating
- Without growth in (LT-)district heating, little growth geothermal energy
- Currently all (but one) geothermal projects connected to **greenhouses**
- Only one district heating system connected to geothermal ---> **Minewater Heerlen**

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<thead>
<tr>
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<th>2030</th>
<th>2050</th>
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<tbody>
<tr>
<td>Letter to Parliament</td>
<td>15 PJ</td>
<td>110 PJ</td>
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<tr>
<td>Climate Agreement</td>
<td>20 PJ</td>
<td>135 PJ</td>
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<tr>
<td>Masterplan (sector)</td>
<td>50 PJ</td>
<td>200 PJ</td>
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- 30 PJ Industry
- 80 PJ Built Environment and Horticulture
Geothermal energy in the Netherlands

Status per 1/1/2019:

- 17 projects in use (≈4 PJ)
- 5 in test phase, 11 in preparation
- Current depths typically **between 2000 and 3000 m**
- Temperatures 70 – 90 °C
- Projects becoming larger: > 20MW
- Looking at **UltraDeepGeothermal**
- But also shallower 500-1500m

**Typical end users**

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<thead>
<tr>
<th>Name</th>
<th>Goal</th>
<th>Typical end users</th>
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| Heat and Cold Storage (HCS) | Excess heat or cold is stored in the ground for use during periods of high demand for heat (winter) or cold (summers) | - Heating and cooling of buildings
- Greenhouse horticulture
- Urban environment
- Light industry |
| Geothermal energy     | Up to depths of 2,000 metres, the temperature is between 30-60 °C, which requires a heat pump to increase to the desired temperature (e.g., 80 °C). Between 2,000-4,000 metres, higher temperatures can be extracted (60-120 °C). | - Generating electricity
- Light industry |
| Ultra-Deep Geothermal (UDG) | UDG is a method of producing heat with temperatures from 120-250 °C | - Generating electricity
- Light industry |

Source: [www.hoewerktaardwarmte.nl](http://www.hoewerktaardwarmte.nl)
Source: [www.geothermie.nl](http://www.geothermie.nl)
Policy: to strengthen and accelerate

Target: 20 PJ in 2030; 135 PJ in 2050

- On top of regular subsidy (SDE+) and geothermal guarantee schemes (RNES)
- Special legislation for geothermal (before equal to oil and gas)
- Exploration of subsurface: SCAN
- Center of Expertise Heat: ECW
- State participation
- Innovation
Subsidy & Guarantee schemes

Geothermal Guarantee Scheme  [www.rvo.nl/aardwarmte]
To cover the geological risk (P90) 9 rounds, start in 2009
• 28 projects submitted, 11 realized
• M€ 146 cumulative guarantees
• 4 claims

SDE+/SDE++  [www.rvo.nl/sde]
• Subsidises production of renewable energy including Renewable Heat since 2012
• 41 projects, > 850 MWth
• 18 projects operational (1/1/2020)
• 0,023 €/kWh subsidy for geothermal heat
Public Mining Data & Subsurface Exploration

- **NLOG**: central database [www.nlog.nl](http://www.nlog.nl) all mining data in NL public after 5 years

- Knowledge from oil and gas

- **SCAN**: Seismic Survey to increase knowledge of the subsurface (‘White spots’)

Centre of Expertise Heat & Heat Atlas

- **ECW**: Center of Expertise Heat @ RVO
  Knowledge Center for Heat Transition in the Built Environment
  www.expertisecentrumwarmte.nl

- **WarmteAtlas.nl**
  RVO HeatAtlas of the Netherlands: database with heat demand & sources per neighbourhood
  www.warmteatlas.nl
Innovation

- New markets
- Innovative technology
- Innovative concepts !!!
- Large scale Demonstration > Implementation
- Integral approach needed
- make geothermal robust, affordable and widely applicable > Make Heat Transition possible

Innovation Instruments @RVO

- **MMIP Renewable Heating & Cooling**
  Multi-anual Mission oriented Innovation Programme *(mid-TRL)*
  Warming Up *(19 M€, started 1/1/2020)*
  integral approach incl. Geothermal / Storage

- **DEI+ (high-TRL)**
  Demonstration Energy & Climate Innovations
  95M€ in 2020, max. 15M€/project

- **HE (high-TRL)**
  Renewable Energy Innovation projects
  2x50 M€ in 2019 and 2020, max. 6M€/project

- European+ cooperation:

OICW: Rijswijk Open Innovation Center for Sustainable Geo-Energy

*Paul Ramsak  RVO  14/5/2020*
a huge task in front of us
the Heat Transition

we need
large scale
Demonstration & Implementation of Geothermal

and
innovation
(concepts & technology)
to make geothermal robust, affordable and widely applicable
a huge task in front of us
the **Heat Transition**

we need a **vision** for our future

- Geothermal Food
- Geothermal Industries
- Geothermal Cities
Our Geothermal Food
Our Geothermal Cities
Our Geothermal Industries
a huge task in front of us
the Heat Transition

we need
all of you!

Industry

Research

Public authorities
National, Regional & Local authorities
Geothermal

= ‘Local for Local’

but we need as well

global cooperation
for a
heating & cooling transition

a joint vision
a common strategy
technology & knowledge-sharing & hands-on cooperation
Thanks for your attention!

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