Thermal interactions between neighbouring shallow geothermal systems: challenges and possible solutions

Dr. Henk Witte
Groenholland Geo-energiesystemen

In the Netherlands, as in the most part of Europe, the number ground source heat pump system is growing rapidly, especially as many municipalities are moving towards developing a gas-less infrastructure. Not only does the total number of systems increase, also the scale of the projects (ranging from 200 to almost 5000 units) becomes bigger with generally a high density of systems. Due to the small average distances between boreholes in large-scale developments the risk of temperature disturbance, which may affect the design performance, by neighbouring systems increases because the total temperature evolution of a system is the result of the superposition of all individual effects in the vicinity. In 2013 new legislation came into effect concerning ground source energy systems, one of the requirements made on new system is to assess potential negative interactions with surrounding systems and requires reporting of the results of this assessment to regulators. Unfortunately, it is not possible to calculate these effects with standard design software or models. Partly because the information available about the neighbouring systems is very limited, but especially because the standard tools are not able to deal with diverse systems. Systems that have different energy-usage profiles, different borehole depths or different heat exchangers types or that are not spaced equi-distant (to name but a few parameters) cannot be evaluated with the standard design toolkit. Groenholland was commissioned to develop a simple method to assess interactions between neighbouring small (< 70 kW thermal capacity on the ground) ground source heat pump systems. The simplified method, based on the well know line source method, which has been translated to standardized nomograms, has now been used by us and other in a large number of evaluation studies. Although it is somewhat conservative, for small systems and smaller clusters of systems, it has proven a valuable tool for an objective assessment of interference. The underlying calculation method furthermore been adapted to provide authorities with a tool to assist in the planning and distributing the the shallow geothermal energy resource in an optimal way between users in so-called Shallow Geothermal Energy Plans. In this presentation, we use some case studies to discuss how a designer can use the tool to assess interference and adjust the design. Also, we will take a look at how authorities may better plan the implementation of shallow geothermal energy systems. Finally, we will take a look at some future developments.