

# Thermal interference (update 2026)

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Thermal interference between geothermal systems is an often overlooked but very important element of design. In this article, we introduce a major update to our interference module so that you can now calculate the interference for every geothermal project you can imagine.

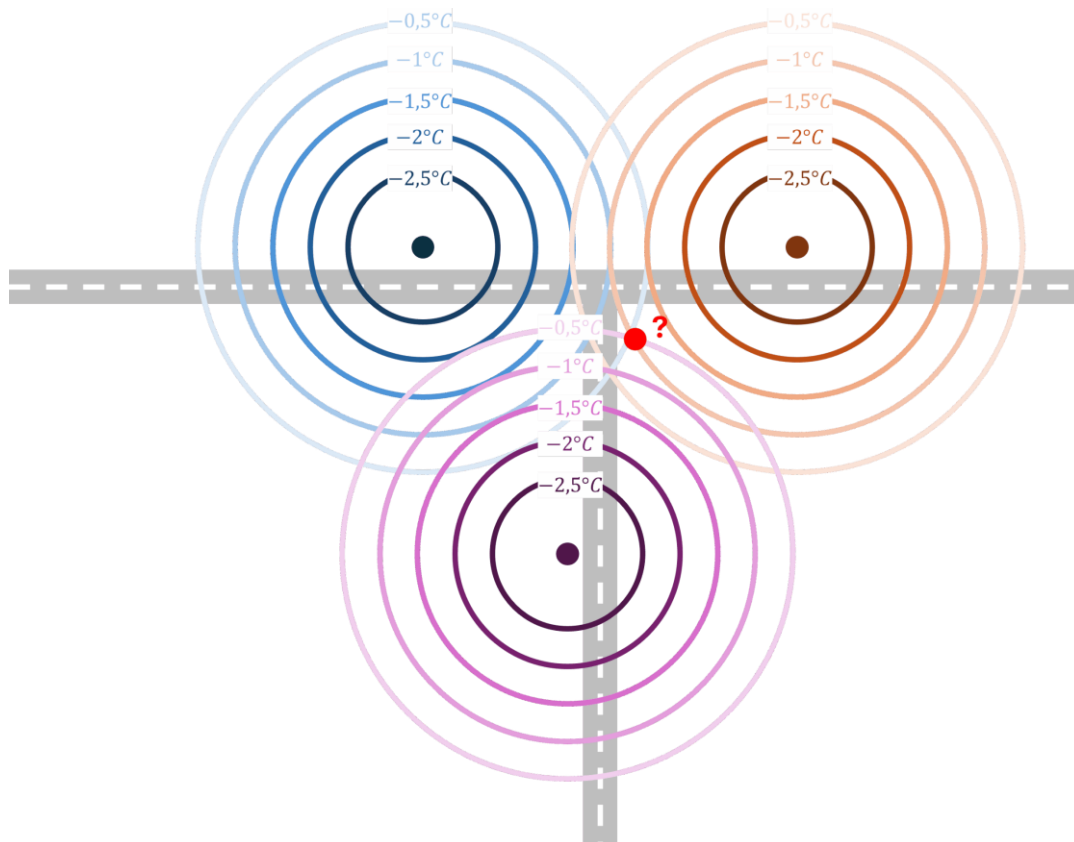
## **!Note**

*This article builds further on concepts explained in our original video on the problem of geothermal interference. You can read that article [here](#).*

## Thermal interference

Geothermal boreholes (or borefields, if the boreholes are connected to one another) act as a ground heat exchanger, storing and extracting energy from the ground. As long as the energy injected into the ground equals the amount of energy extracted from it, the system can work fine forever. However, when the two are not in balance, the imbalance causes a long-term change in the ground temperature.

This temperature drift does not end at the edge of your project, but continues far beyond your project boundaries, leaving behind a circular influence on the ground temperature as shown in the figure below.



*Illustration of the thermal interference for three existing boreholes.*

Here, all boreholes have a certain imbalance that influences the ground temperature in their surroundings. The problem is that all these interferences are cumulative, meaning that if you are going to design a borefield at the location of the red dot, you do not only experience a ground temperature that is, in the long-term, 1°C lower than normal due to the presence of your orange neighbour, but also 0.5°C from both the blue and the pink system. In the end, the cumulative temperature drift will be -2°C, meaning that if you design at 0°C, you will end up with -2°C in the end.

## Interference between boreholes

To calculate the interference between different boreholes, we can either assume them to be an infinite line or a finite line. (For more information, read our [previous article](#) on this topic.)

- **Infinite line source**

When you assume that each borehole is an infinite line, the problem reduces to a simple two-dimensional heat transfer problem, where the region of influence is in fact a circular gradient decreasing with distance away from the emitting borehole. This model is rather accurate if your boreholes are rather long and far apart. If they are not, it is better to assume them to be finite.

- **Finite line source**

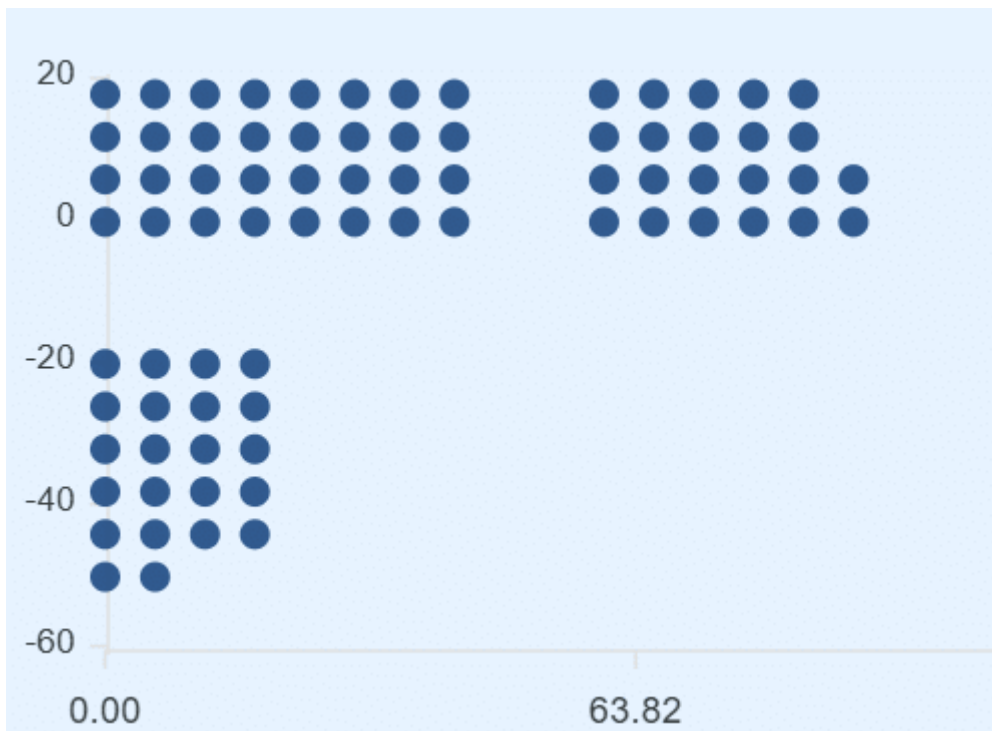
When you assume the boreholes to be finite in length, your problem is now three-dimensional, taking into account the actual borehole length. This can lead to quite an increase in accuracy, especially when boreholes with different lengths are placed next to each other.

This, of course, only works for borehole-to-borehole interactions. The story is slightly different when calculating the interference between borefields.

## Interference between borefields

When you have multiple boreholes connected in a field, you can model them as a single virtual borehole, located at the geometric centre of your borefield. According to the literature, this assumption is valid for up to 6 boreholes (GroenHolland, 2020). That is why, in our initial release of this method in Q3 2025, we allowed borefields of up to 6 boreholes.

The problem now is that more and more projects are becoming collective, leading to borefields with more than 6 boreholes. Imagine you have a new residential project consisting of three different apartment buildings, each with a separate collective borefield. Your total project will look something like the figure below.



*Residential projects with three separate borefields.*

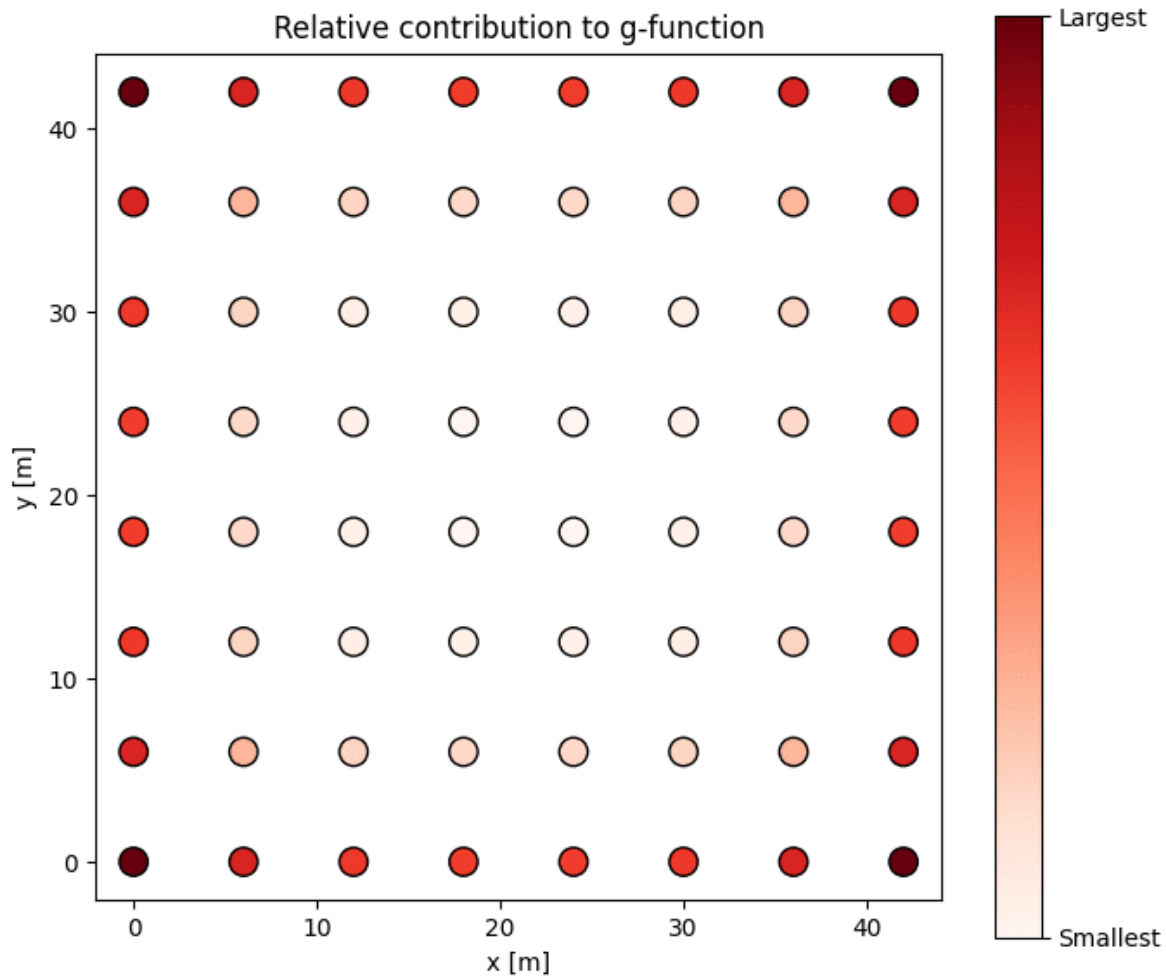
In this case, the borefields are quite close together, so it is clear that they will have a significant impact on each other. But how do you calculate this?

## Equal energy exchange

One initial thought might be to divide the total imbalance of the system across all the different boreholes. That way, we know what the influence of each borehole will be, and we can simply work with the borehole-to-borehole interference method from before. Therefore, we developed a more accurate model within GHETOOL to model this effect.

## Different borehole contributions

If you recall, the long-term behaviour of borefields is determined by the g-functions (find more information [here](#)) that encapsulate both the interaction of the borefield with the surrounding ground and the interaction between the different boreholes in the field. To put it simply, the overall thermal behaviour of your borefield is a combination of the contributions of the individual boreholes within it. This is illustrated in the image below.



*Contributions of the different boreholes to the overall g-function.*

Here you can see that the outer boreholes have a larger influence on the long-term behaviour of the borefield than the inner ones and hence also carry a larger part of the borefield’s imbalance. This is because the boreholes in the middle are “insulated” by their neighbours and it is therefore difficult to exchange heat with the surrounding ground.

So, to calculate the borefield-to-borefield interaction, a new four step approach is used:

1. Calculate the g-function of each borefield. (This step is identical to every borefield simulation.)
2. Calculate the contribution of each borehole to the collective g-function.
3. Distribute the imbalance between the different boreholes, weighted by each contribution.
4. Calculate the interference between the borefields, based on the weighted sum of all their borehole-to-borehole interactions.

**!Caution**

*This also illustrates why it is not a good idea to divide the imbalance equally across all boreholes, since you are overestimating the contribution of the inner boreholes and underestimating the contribution of the outer ones. Since the outer boreholes are closer to your neighbouring systems, assuming an equal distribution of the imbalance can lead to a significant underestimation of the interference.*

## Interference with GHETool Cloud

To use this new functionality in GHETool Cloud, there are two different ways. Either you just perform an interference calculation, uploading your systems using the [template file](#), or you can link a certain scenario. When you do the latter, all the scenario settings as well as your particular borefield design (including tilted boreholes) are taken into account for the interference calculation. This way, whenever you update your scenario, your interference calculation will be updated as well.

ID	Name	New/existing	Heating [MWh/year]	DHW [MWh/year]	Cooling [MWh/year]	SCOP heating	SCOP DHW
1	Building A	New	-	-	-	-	-
2	Building B	New	-	-	-	-	-
3	Building C	New	-	-	-	-	-

*Print screen of the interference inputs in GHETool Cloud.*

**!Note**

*When you first use this new function in GHETool, it is possible that you get an error of overlapping boreholes. You need to make sure that you are working with a custom borefield where the coordinates are in their real positions. By default, all the borefields in GHETool start at (0,0), leading to overlapping boreholes if nothing is changed.*

**!Hint**

*To make your life easier, we implemented a functionality to move and rotate your borefield as a whole, so you do not need to change the coordinates of each borehole individually.*

## Options for the interference calculation

Just as before, you have the option to either work with the finite line source model for the interference or the infinite line source. The first one is the more accurate solution, whereas the second one is more conservative.

Besides the model for the interference, you also have the option to work with either the generic definitions for interference or use the ones specific to the legislation in the Netherlands. Although the results are the same, the generic method uses the terminology of SCOP (heating and domestic hot water) and SEER (cooling), whereas the method from the Netherlands uses the SPF for cooling and the SPF of the entire system instead.

## Compatibility with WKOtool

For our users in The Netherlands, the connection to the [WKOtool.nl](https://wkotool.nl) has been updated and extended to work with this new functionality. Therefore, systems with more than 6 boreholes (or systems >70 kW) will now also be imported into the tool, provided that the information is available. This way, you can easily design your borefield(s) in different scenarios and calculate the interference between all the new projects and the existing ones in seconds.

### **!Caution**

*Please note that there are mistakes in the data entry of the WKOtool. We have tried to solve some of them automatically, for example by changing the borehole depth and length when they were mixed up, but other mistakes can still remain. Please always double check them and make changes where necessary.*

## Conclusion

In this article, the major update to the interference module was introduced. It is now possible to calculate the interference between an unlimited number of systems together with an unlimited number of boreholes per system. By easily linking other scenarios to the interference calculation, all settings and design are automatically taken into account, saving you quite a lot of time whilst also improving the accuracy of your design!

## References

- Watch our video explanation over on our YouTube page by clicking [here](#).
- GroenHolland. (2020). ITGBES – InterferentieTool Gesloten BodemenergieSystemen. [https://www.sikb.nl/doc/GHNL\\_180760\\_Aanvullende\\_rapportage\\_2020.pdf](https://www.sikb.nl/doc/GHNL_180760_Aanvullende_rapportage_2020.pdf) [last visited: 15-03-2026]
- The method behind this implementation was created with the help of Massimo Cimmino and will be presented at Der Geothermiekongres in Potsdam at the end of the year.



Check out GHEtool today at:  
<https://ghetool.eu>