

GEO THERMAL ENERGY for Münster

Invitation to
an information event!
*3D seismic surveys and
deep geothermal energy*
25 and 26 October 2024
Stadtwerke Münster
Hafenplatz 1

Dear residents of Münster,

The municipal energy transition towards climate-neutral is one of the key challenges for cities in Germany, including Münster. Our goal is to become independent of market developments with climate-neutral and stable energy. To achieve this, we need to break new technological ground with a great deal of pioneering spirit and a good dose of courage.

In November and December 2024, the City of Münster and Stadtwerke Münster will be using 3D seismic to investigate the potential of deep geothermal energy – one of the main pillars of the energy transition. The investigation uses sound waves at the earth's surface to create a detailed spatial model of the subterranean rock layers.

Using this technique, we aim to identify locations in Münster where hot thermal water can then be exploited. The vibro-trucks used for this investigation are specialised trucks equipped with a vibrating plate,

which could cause some light disturbance in the city as the teams work. We ask for your understanding! With the 3D seismic investigations, our city is once again taking on a pioneering role in the energy transition. As the project is intended to provide information for further geothermal projects in North Rhine-Westphalia. The project is supported by the Ministry of Economic Affairs, Industry, Climate Protection and Energy of the State of North Rhine-Westphalia.

With this brochure, we would like to provide you with comprehensive information on the

topic and the latest developments. You are also very welcome to contact our colleagues at Stadtwerke directly with any questions you may have.

Together, we will continue to develop Münster into a climate-friendly city!

Markus Lewe

Markus Lewe
Lord Mayor
of the City of Münster



„All the best for Münster's 3D seismic!“

In conversation with Ingo Schäfer, geologist from the Geological Survey of North Rhine-Westphalia

„The findings of the Geological Survey's 2D seismic survey were the basis for the City of Münster's decision to further explore the geothermal potential.“

Ingo Schäfer
Geological Survey of North Rhine-Westphalia

Mr Schäfer, you planned and carried out the 2D seismic survey in Münster in 2021 on behalf of the Geological Survey of North Rhine-Westphalia. What were your main findings?

Ingo Schäfer: You don't do a project like this on your own. We put together a team of geoscientific experts and an experienced communications agency to plan and carry out the 2D seismic survey. In 2021, we then investigated two areas, totalling 73.5 km, with 2D seismic. The survey area included the City of Münster and the neighbouring municipalities of Billerbeck, Dülmen, Havixbeck, Nottuln, Rosendahl, Senden and Sendenhorst. You have to imagine it like this: we used 2D seismic, to create a depth profile through the layers of earth, almost like a slice through a cake. Now we can see the cream layer of the cake – or in this case, the limestone layers below the surface.

This allowed us to identify three limestone horizons in which potential water flow is possible. We assume a temperature of around 40 °C for the first shallower limestone horizon from a depth of around 1,000 to 1,200 metres. The deeper limestone layers at a depth of five to six kilometres are expected to have temperatures of over 150 °C. In order to make use of these temperatures, sufficient water must be present in the

limestone. This way, the heat can be transported to the surface and utilised for heat supply.

The findings of the Geological Survey's 2D seismic survey formed the basis for the City of Münster's decision to further explore the geothermal potential.

The City of Münster has decided to go down the path of 3D seismic in a city council resolution. And the state of North Rhine-Westphalia is funding 3D seismic in Münster with 5.7 million euros. What exactly is happening now?

Ingo Schäfer: Stadtwerke Münster is adding a third dimension to the 2D model of the geological subsurface. With 3D seismic, sound waves are sent into the subsurface to get a better idea of the limestone layers. Going back to the example of the cake, this helps us understand where to find the most cream in the cake. This gives Stadtwerke Münster a much more accurate 3D image of the subsurface. Based on this knowledge, boreholes can then be planned and drilled into the relevant rock layers.

Mr Schäfer, you have just successfully carried out the 2D seismic survey in East Westphalia-Lippe. What needs to be considered during a seismic campaign?

Ingo Schäfer: Above all, you need a long lead time for the preparations. For example, seismic measurements are subject to mining law and require authorisation from the mining authority. During the measurements, the vibrations generated are measured on the buildings along the route. Seismic measurements pose no danger to people in and around Münster.

In general, we have received very positive feedback for our measurements, whether at night in Münster in 2021, in the Rhineland, or now in East Westphalia-Lippe. Our public events and the information provided to citizens have also contributed to this. We are delighted that the state's preliminary work is now bearing fruit, and that Stadtwerke Münster is taking the next step towards a sustainable energy supply with a 3D seismic survey. The same vibro-trucks that took measurements in East Westphalia-Lippe are also being used in Münster.

We wish the entire team successful measurements and, above all, good results!



Geothermal energy is always there

What is geothermal energy?

The word "geothermal energy" consists of two components, "geo" stands for "earth" in Greek and "thermos" for "heat". Geothermal energy therefore means geothermal heat. In the depths of the earth, there are layers of limestone in which hot water flows – the result of ancient primordial oceans. The deeper we go, the hotter it gets: For example, the temperature rises by around three degrees Celsius every 100 metres depth – that's already 150 degrees Celsius at a depth of 5,000 metres. It is estimated, this thermal energy is inexhaustible.

How does geothermal energy work?

Stadtwerke Münster is pursuing a project for hydrothermal geothermal energy. This involves bringing hot thermal water, from a depth of 1,000 to 6,000 metres, to the surface by drilling a production well. In a geothermal heating plant on the surface, the deep water releases its thermal energy to the district heating network. This then supplies Münster's houses, flats, schools, nurseries and businesses with climate-neutral heat for heating and hot water. The cooled thermal water is channelled back underground via the so-called reinjection well, where it heats up again. A closed cycle.

How safe is it to access the deep water?

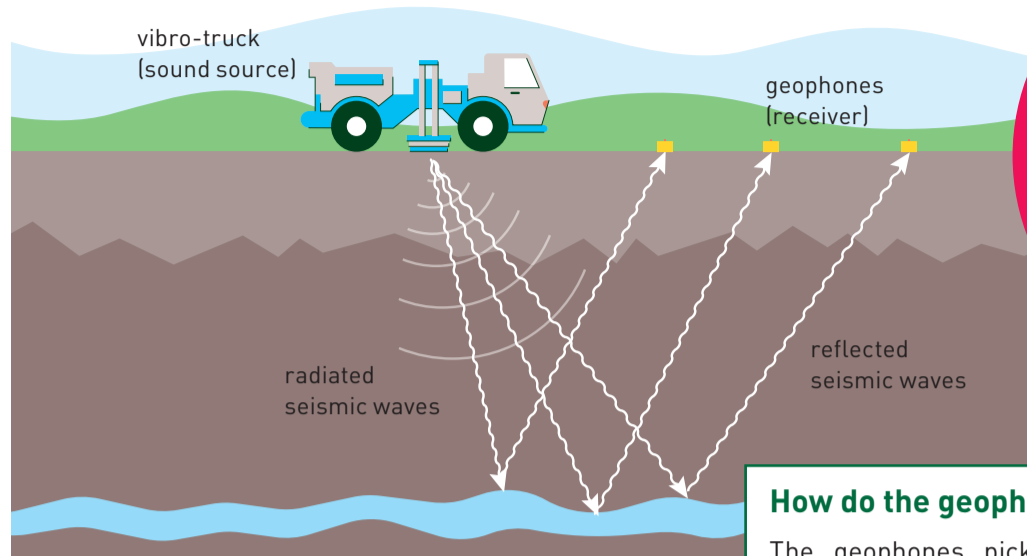
3D seismics are a prerequisite for mapping the depth, structures and fault zones of potential limestone layers and thus for planning successful drilling paths and creating water reservoir models. Deep geothermal energy has been practised successfully for many decades in Tuscany, Iceland, the Paris Basin or the greater Munich area. The technologies for seismic, drilling, geothermal heating plants and district heating networks have been tried and tested in many places. Of course, there is no total certainty for the success of drilling, but 3D seismic provide the best foundation through data. Each new data point increases the certainty for the next steps towards a geothermal heating plant for Münster. Stadtwerke Münster is being supported by a team of experts with many years of experience in geothermal projects.



Vibro-trucks operating in Münster's depths

3D seismics work similarly to an ultrasound

Vibro-trucks generate vibrations and send sound waves into the depths. The sound waves propagate through the various geological layers and are reflected by these underground structures. The echo is recorded by small geophones, which are distributed throughout the city beforehand. „This allows us to look deep into the earth and obtain a picture of the geology at our feet,” says geophysicist Dr Carsten Lehmann, project manager for the 3D seismic survey at Stadtwerke Münster, „In the process, we identify suitable locations for subsequent deep drilling.“



Stadtwerke Münster will share the valuable information from the 3D seismic survey on the geological structures beneath Münster with interested third parties. Among other things, the wealth of data flows into a state-wide map of the geological subsurface.

How does 3D seismic actually work?

Four groups, each with three vibro-trucks travelling in convoy, will vibrate road by road through the entire city. The event will begin on 30 October 2024 in the south of Münster, with the groups then working their way north until 20 December 2024. Each group will drive on a different road, but the groups will not be far apart.

The routes of the vibro-truck groups are planned exactly in advance: Each section of the route is scouted in advance by escort vehicle. The condition of the roads is also documented.

The vibro-truck groups are escorted by two escort vehicles and the work of the vibro-trucks is documented by camera. Two people carry out accompanying vibration measurements and ensure that the reference values for vibrations in construction specified in DIN 4150-3 are strictly adhered to. Each vibro-truck group consists of eight to ten people, including a spokesperson for citizens along the route.

Vibro-trucks operate in the evening and at night

The vibro-trucks will be on the road six days a week, usually in the evening and at night, between hours 19:00 and 7:00. The vibro-trucks will NOT operate on Saturday nights. The night-time measurements are crucial for reliable data collection and to ensure that everyday life in the city is not disrupted.

This is because there is so much more road traffic during the day than in the evening and at night, and of course the emergency services, police and fire brigade have right of way, as do city buses, school buses and delivery traffic.

The vibro-trucks will pass once

The vibro-trucks only pass by once, however vibrations can be heard and felt, especially when the vibro-trucks pass houses. The vibration lasts approx. 60 seconds per measuring point. The measuring points are 30 metres apart. Experience from many seismic surveys has shown that it takes 30 minutes, at most, for the vibro-trucks to be out of range again. Carsten Lehmann: „It will be quite loud, but the good thing is that the vibro-trucks will only pass by once.“

The vibro-trucks sometimes pause their activity

Vibro-trucks also take breaks, as they do not operate during heavy rain, thunderstorms or black ice. Light snow, on the other hand, does not interfere. Furthermore, measurements are not taken on soaked or softened fields and surfaces, or on roads with cobblestones.

How do the geophones work?

The geophones pick up the echo of the vibration sound waves when the vibro-trucks are working. They are at rest during the day. All geophones are connected to each other through a Wi-Fi network and equipped with GPS, so their location can be monitored. The geophones can record measurement data for up to 50 days.

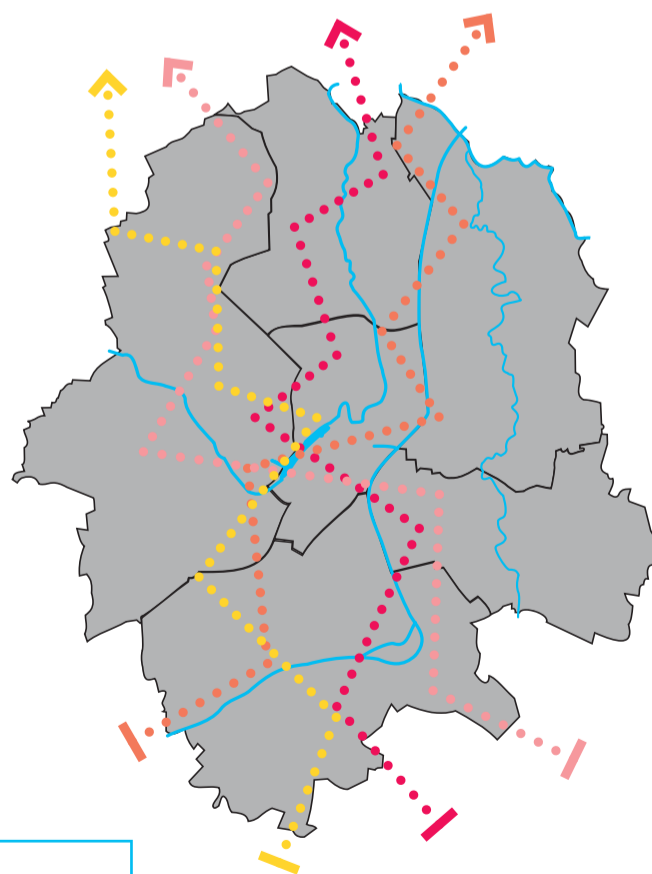


How can I find out where and when the vibro-trucks are at work?

The central information website www.stadtwerke-muenster.de/geothermie shows the areas being measured on a weekly basis. As the exact routes depend on the progress of the previous measurement, it is not possible to provide precise information on specific routes and exact times. In order to ensure the necessary flexibility for the vibro-truck groups, these route forecasts do not contain exact times or time periods, nor do they contain a street assignment with exact house numbers.

The vibro-trucks are work-vehicles!

All citizens are asked to keep a sufficient distance, to avoid interference with the vibro-truck teams and their work. In some cases, there may be temporary parking bans on narrow streets, and minor traffic jams behind the vibro-truck teams cannot be ruled out. Following or trailing the vibro-trucks is strictly prohibited.



2025 - early 2026
Evaluation of the seismic measurements, creation of the „geological map“ under Münster, recommendations for drilling locations.

From 14 October 2024
Successive deployment of geophones, over 35,000 in total.

30 October - 20 December 2024
Implementation of 3D seismic, in four groups of three vibro-trucks each, starting in the south of Münster and then successively in the north of the city.

27 December - 13 January 2025
Collection of the geophones.

Facts and figures

on 3D seismics in Münster



more than 35.000
geophones are deployed
for the measurement



approx. 48.000
planned points for
vibration



we can see
up to 6.000 Meter
deep underground with sound



the geophones
record the echo for
approx. 50 days



approx. 30 Meter
is the distance between
the measuring points



approx. 348 km²
is the size of the
study area



approx. 125
employees are on duty
during the measurements

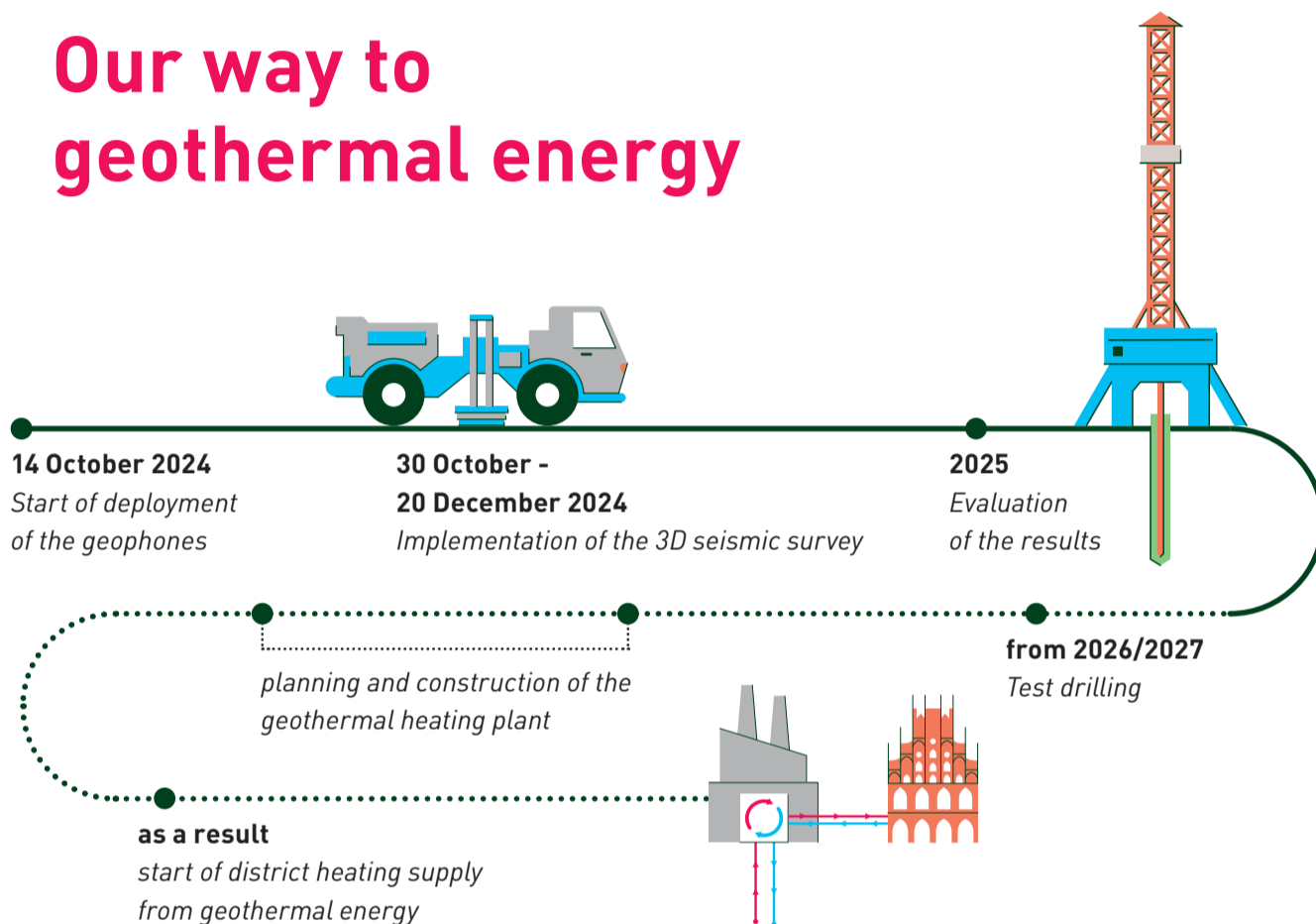
How does a vibro-truck work?



Vibro-trucks are specialised trucks that are used to generate controlled seismic waves. A vibro-truck is equipped with a vibrating plate, attached to the underside of the vehicle, which is lowered to the ground. The plate emits a controlled, repeatable vibration into the ground. This vibration is reflected and refracted by various geological layers.

Seismic sensors, known as geophones, record the reflected waves. Geophysicists can use this data to create detailed models of the subsurface.

Our way to geothermal energy



Vibro-trucks up close – at our information event!

What does a vibro-truck look like? How do 3D seismic work? What makes deep geothermal energy so fascinating and sustainable? What are Stadtwerke Münster's plans for the heat of the future?

You can get answers to all these questions at our information event, discussing 3D seismic measurements and deep geothermal energy.

Experts from Stadtwerke Münster and its partners await you at fair stands to present the project and answer your questions.



The event will take place

**on Friday, 25.10.2024
between hours 16:00 and 20:00**

**and on Saturday, 26.10.2024
between hours 16:00 and 20:00**

Stadtwerke Münster · Hafenplatz 1 in Münster

Bicycle, scooter and motorbike parking options are available on the harbour square. Car parking spaces are available in the nearby multi-storey car park Stadthaus 3, Albersloher Weg 11. The bus stop for lines 6, 8 and 17 is right outside the door.

How to reach us

You can reach us around the clock via our email: geothermie@stadtwerke-muenster.de and on our website www.stadtwerke-muenster.de, We are available via telephone from Monday to Friday, between hours 8:00 and 17:00, at: 0251 / 694-1234.

Imprint

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**Stadtwerke
Münster**