

Exploration of the Potential for Deep Geothermal Energy at the Weisweiler Power Plant Site of RWE Power AG

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Abstract: Within the framework of the EU (Interreg NWE) funded project “DGE-Roll out NEW” the basic geological potential for deep geothermal energy will be investigated in the area of the Netherlands, Belgium, NE-France and North Rhine-Westphalia. One site is the power plant of RWE Power AG in Weisweiler, which is currently still fired with lignite. Here the geological underground conditions will be investigated for the heat utilization potential. The target formations are the Devonian and Carboniferous limestones, which, due to their paleo-karstification known from outcrops in the surrounding area, could show natural pathways for hydrothermal and geothermal water. They are expected at depths of up to approx. 2,000-4,000 m and more.

Key words: carbonates, hydrothermal geothermal energy, real laboratory, Weisweiler, exploration, district heating

1. Introduction

In the new RWE Group renewable energy sources are moving into the focus of future energy generation. These are primarily wind and photovoltaics within RWE Renewables and the operation of hydropower and biomass power plants within RWE Generation. With the phasing out of nuclear energy and lignite by 2022 and 2038 respectively, RWE Power AG is investigating options for using new energy sources at existing energy sites. Deep geothermal energy is a new technology for the RWE Group (Fig. 1).

The EU-project “DGE-Roll out NEW”, funded by the INTERREG Structural Fund of the EU, was set up to investigate the fundamental geological potential for deep geothermal energy (DGE) in the Netherlands, Belgium, Northern France as well as in Western and Southwestern Germany. The geothermal use is to be developed at various pilot sites. One of these locations

is RWE Power AG's lignite fired power plant in Weisweiler.

At this site, the transformation from conventional to renewable energy generation using deep geothermal energy is to be implemented in concrete terms. In a first step, it is planned to provide the base load of the district heating supply for the city of Aachen of approx. 10-15 megawatts of thermal power by deep geothermal energy (Fig. 2).

The Weisweiler site is located in the west of Germany at the border to the Netherlands and Belgium. It is one of three power plant sites of RWE Power AG currently still in operation, where lignite is used to generate electricity. The lignite is provided by the Inden open-cast mine. The extraction and generation of electricity from lignite will be phased out by 2029. A follow-up use will be necessary to maintain this power plant site (Fig. 3).

2. The Weisweiler Site

For the Weisweiler site the Federal Environment Agency [1] has not yet designated an area with

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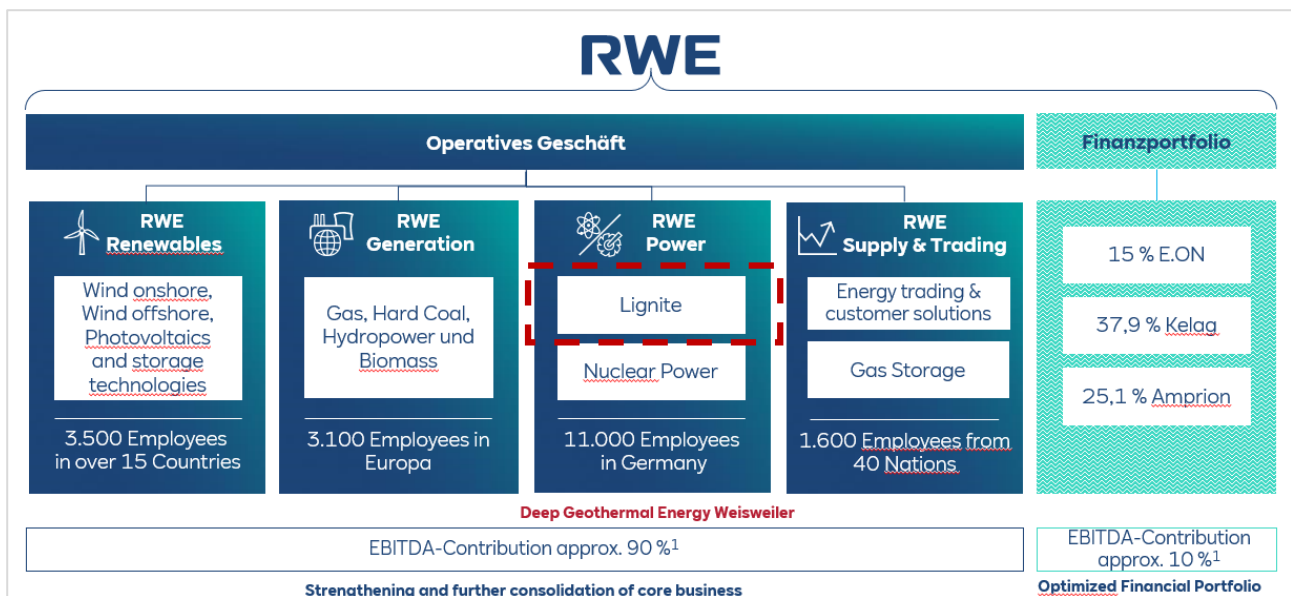


Fig. 1 RWE AG and subsidiaries: Deep geothermal energy is a pilot project within RWE Power AG.



Fig. 2 Transformation of the Weisweiler site from conventional to renewable energy production.

geothermal potential. These areas are located in the north and south of Germany. Whereas the Geological Service of North Rhine-Westphalia considers the carbonates of the Lower Carboniferous and the Middle and Upper Devonian as formations with potential for deep hydrothermal geothermal energy. This results from the natural permeability of a paleo-karstification. In any case, the Weisweiler site is a “green field exploration”, i.e., the underground exploration is at an early stage.

3. Organization and Methods

3.1 Organization

In order to substantiate the potentials identified by the Geological Service NRW, the project DGE NWE (Deep Geothermal Energy Rollout North Western Europe; project number: NWE892) was applied for and approved by the EU/INTERREG. RWE Power AG is involved in this project as project partner under the direction of the Geological Survey NRW (Fig. 5).

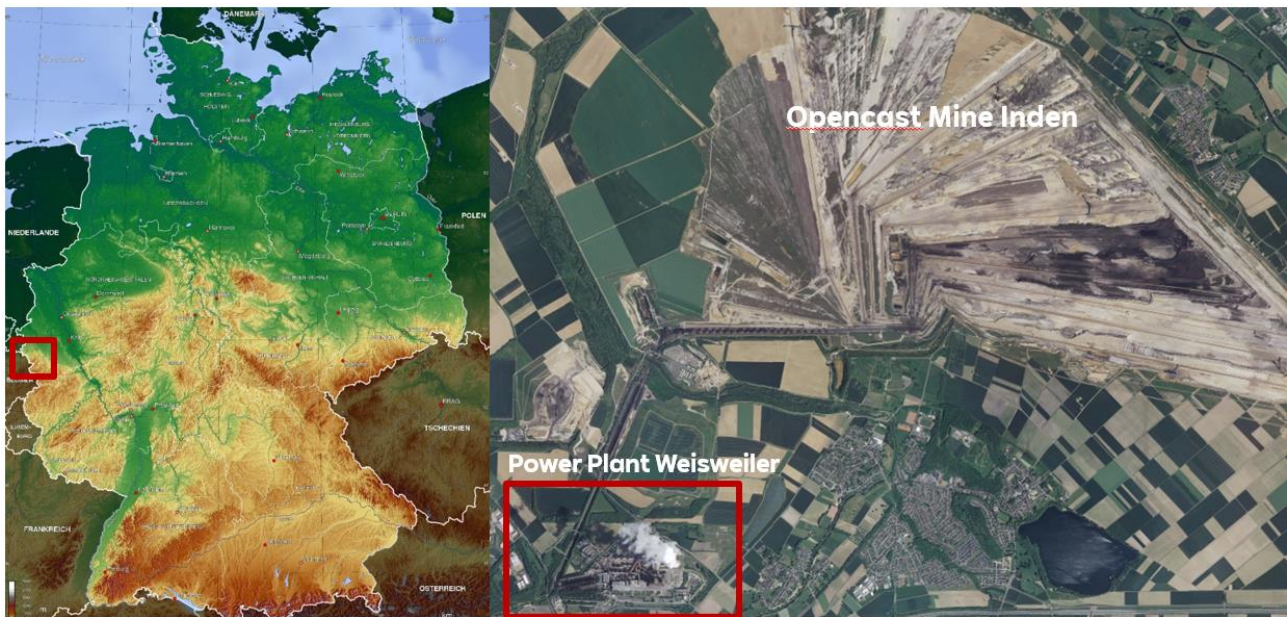


Fig. 3 The Weisweiler power plant site.

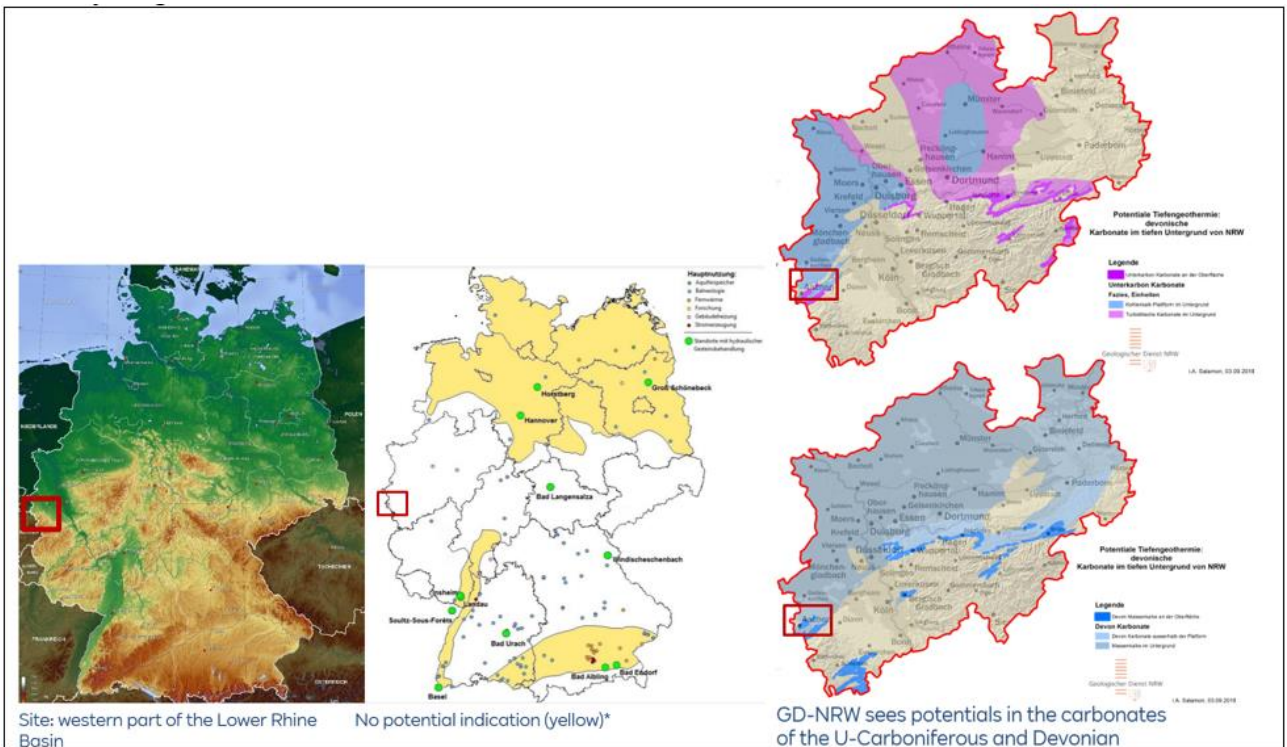


Fig. 4 The Weisweiler site can be described as a green field with potential. The violet and blue areas are carbonate formations in the Lower Carboniferous (top) and Devonian (bottom).

RWE Power is providing the power plant site with a facility for feeding heat into a district heating system. The GD NRW contributes its technical expertise with regard to the geological mapping and thus the

identification of the carbonates to this project. The Fraunhofer Institute plans to drill an exploratory borehole at the Weisweiler site within the framework of the EU project. This study is supported by the



Fig. 5 The DGE project and the main partners at the Weisweiler site.

Interreg NWE Programme through the Roll-out of Deep Geothermal Energy in North-West Europe (DGE-ROLLOUT) Project¹. The Interreg NWE Programme is part of the European Cohesion Policy and is financed by the European Regional Development Fund (ERDF)."

3.2 Target Rock Formations

The underground exploration is focused on two target formations. First, the carbonates of the Lower Carboniferous, the so-called Carboniferous Limestone and the carbonates of the Upper Middle and Lower Upper Devonian. Within the DGE project, which will run from the end of 2018 to October 2022, the carbonates of the Lower Carboniferous will be explored. In the framework contract for the long-term collaboration with Fh-IEG, the Devonian carbonates are also being investigated (Fig. 6).

The GD NRW created a first underground model on the basis of existing geological data. It shows an asymmetrical depression structure in the Weisweiler area, tilted to the north, with overthrusts due to the Variscan orogeny. The planned exploratory drilling and the 3-D seismic survey planned by Fraunhofer in

this area will further refine the underground model. In the next step the exploratory borehole will be drilled from the Weisweiler site.

This is primarily intended to validate the existing underground model. Fraunhofer will then expand the borehole into an observatory, to monitor the activities at the site and especially the natural and possible induced seismicity.

The target formations for the end points of a possible doublet are on the one hand the carbonates in the so-called Inde trough. The expected depths are between approx. 2,000 and 3,000 m. On the other hand, the carbonates are to be expected under the overthrusts at about 4000 meters depth (Fig. 7).

3.3 Approval Situation

In order to operate the planned geothermal power plant, a prospecting permit for exploration is required as a first step. This exploration permit for scientific purposes was applied for by Fh-IEG and has now been granted. It covers the Weisweiler field of RWE Power AG as well as the Aachen field of STAWAG. In the next step, the main operating plan for the exploratory well will be drawn up. Drilling work is scheduled to begin in mid 2021 (Fig. 8).

¹ <http://www.nweurope.eu/DGE-Rollout>.

supply for the city of Aachen could be covered by deep geothermal energy from 2026 for the first time in regular operation (Fig. 10).

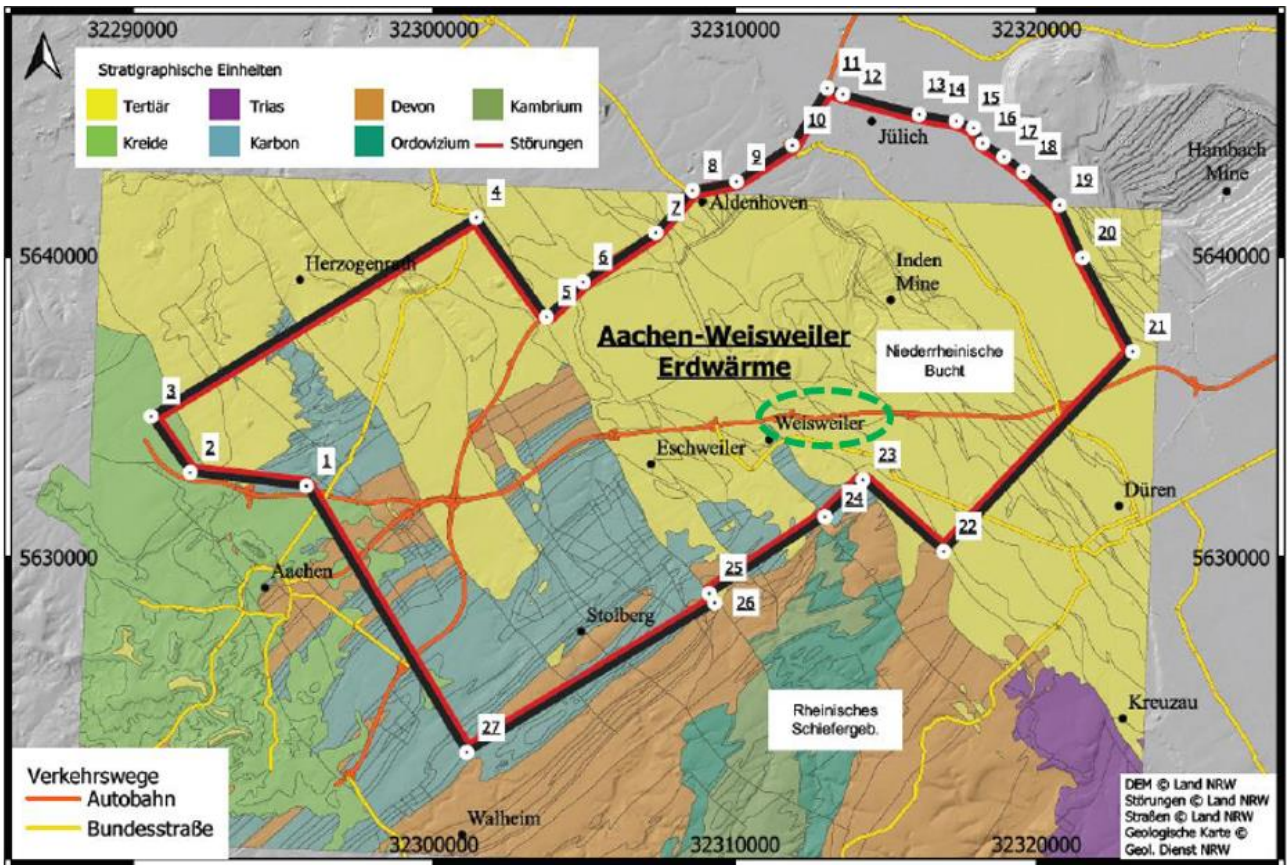


Fig. 8 The Aachen-Weisweiler exploration area.

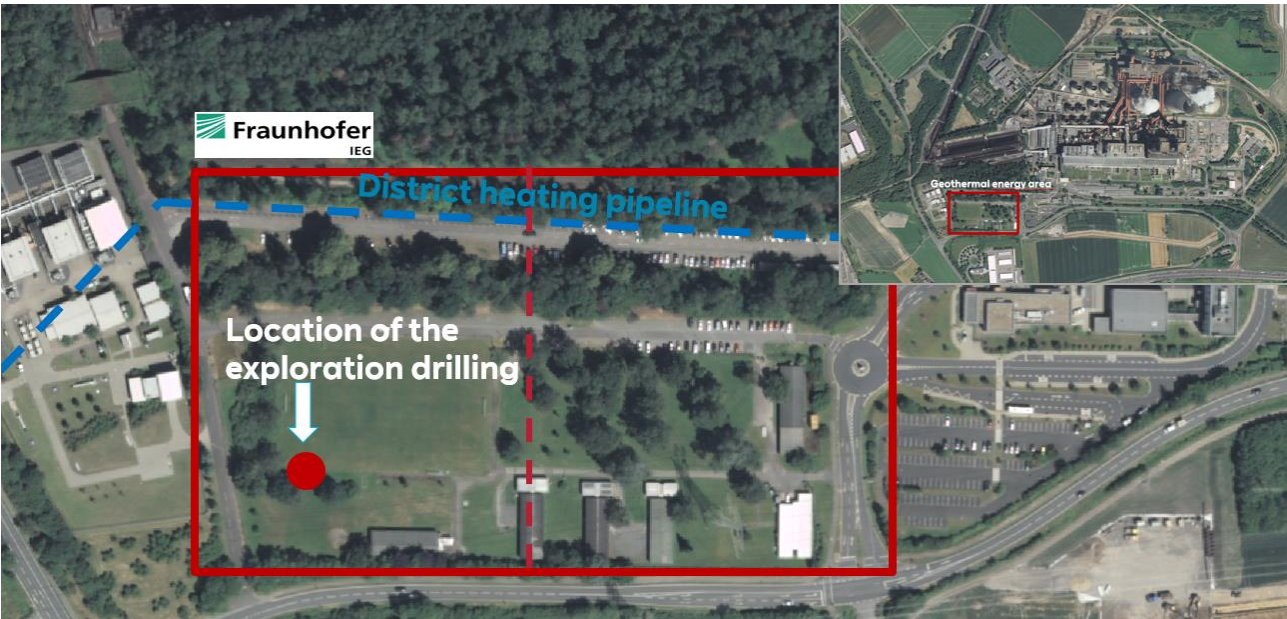


Fig. 9 The geothermal area at the Weisweiler site.

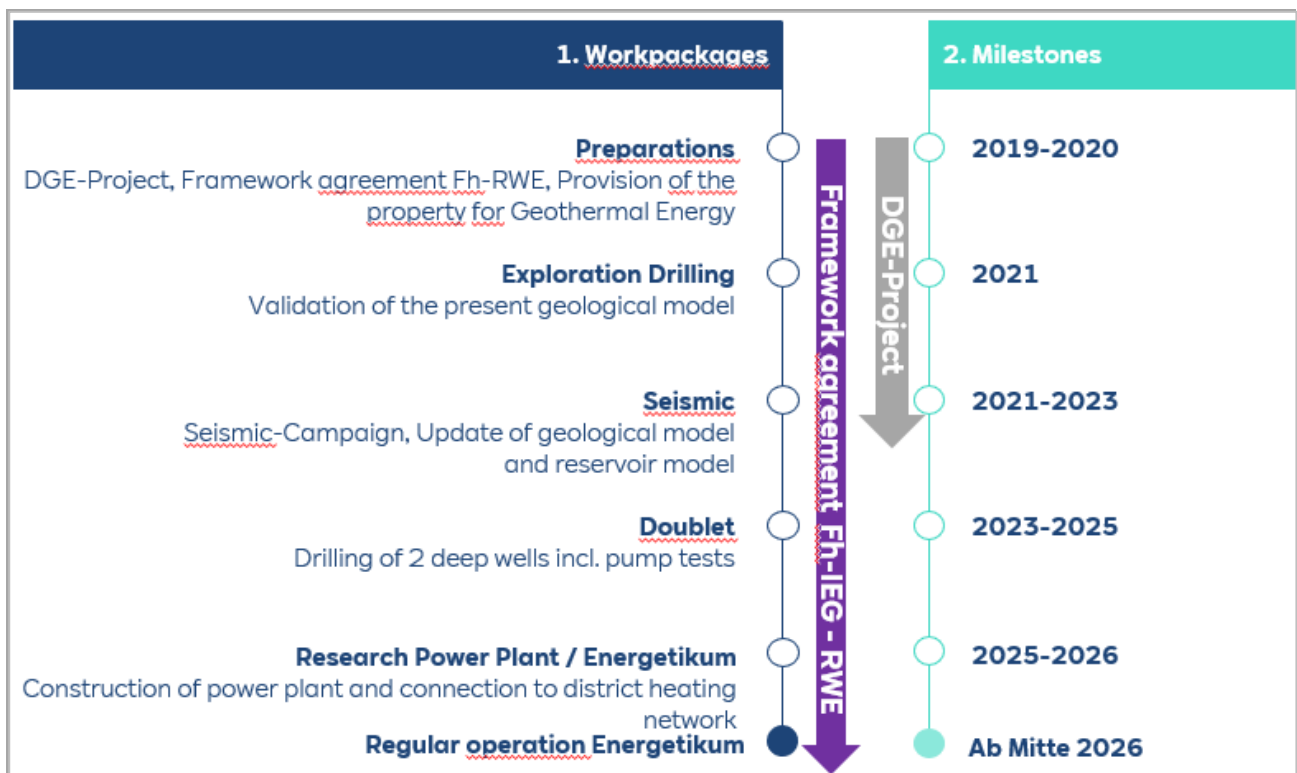


Fig. 10 Schedule for implementation.

References

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