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Regulatory framework for geothermal seismicity monitoring and insurance scheme in stimulation and operation phases. Application to the case of a felt and undetermined (man-made or natural) seismic event

A thematic extract from Destress deliverables D3.5 and D3.6 on Guidance to governments and Insurances Peterschmitt A.¹, Genter A.¹, Cuenot N.¹ ¹ES-Géothermie, Strasbourg, France



ICELAND No regulatory framework for fluid-induced seismicity + Information sent to the Icelandic Civil Protection **Geological Department** + Seismic monitoring implemented following best practice and international recommendations + Advanced and standard Traffic light system



No official licensing scheme for deep geothermal development in the UK (Curtis et al. 2019)

+Traffic light system Installed seismological network at UDGP: + Integrated Microseismic monitoring system (MMS)/ Ground vibration monitoring system (GVMS) + 5 seismic sensors installed, 2 more to be installed, and 9 raspberry shake seismometers.



The legislative framework status are very heteregenous from a country studied to another on the topic of geothermal energy. Except from very few countries (France, Germany,..) there is no specific regulation for the seismic monitoring and mandatory characteristics for the installation of

As it is necessary to monitor the geothermal projects, prior to the drilling and during operation, the following recommendation and best

+ At least 5 seismological stations with

+ Implementing Traffic Light System protocols

+ PGV (Peak Ground velocity) units for seismic



Regulation: Seismic and vibration monitoring networks to be installed and operated according to state of the art

Installed seimological monitoring network in Insheim: + 6 3-component permanent stations (9 before March 2014) operated by site owner + 3 permanent borehole stations operated by the regional earthquake survey



The legislative framework for geothermal energy is the mining code and other related codes (environment, energy..) + Alert systems + PGV units and Traffic Light System Minimum seimological monitoring network mandatory: + 4 Short period seismometers + 1 "multisensors" seismometer

BELGIUM

No information on the legislative framework for flamish area

+ A seismological network has been installed at Balmatt geothermal energy plant (Mol city). + Data communicated to the Royal Observatory of Belgium and seismic events are published online + Traffic light system

THE NETHERLANDS

Due to the geology and the location of drillings, there is a low probability of tangible damage related due to induced seismicity.

Recommandations for seismic monitoring of geothermal projects (Ritter et al, 2012): + 5 3-component seismometers should be installed + Operate Traffic light System

SWITZERLAND

+ Operators and regulators should accept the fact that geothermal projects carry a certain degree of seimic risk + Open data policy recommendation + GRID Methodology (Geothermal Risk of induced seismicity diagnosis, Trutnevyte et Weimer, 2017) + Adaptative **Traffic light system**



+ No laws or specific regulation specifically related to geothermal projects + Traffic light system

Installed seismic monitoring network in Pohang: + 8 shallow borehole seismometers +1vsp + 1 deep borehole sensor



STRASBOURG FELT SEISMIC EVENTS IN NOVEMBER 2019

Simplified French insurance scheme for deep geothermal project



Mid-November 2019, two seismic events occurred relatively closed (5km) to the Vendenheim geothermal project in the surroundings of Strasbourg city, France.

The first one, of a magnitude of 3.1, occurred at 14h38 the 12nd of November 2019 at about 5km of the geothermal site. Felt by the local population, the seismic event was immediately flagged by the French National seismological survey (RENASS) as an 'induced' event.

In the local press, the event was thus considered as induced by the geothermal activity near-by. In a press release, the developer of the geothermal project immediately declared that the activity on site was out of responsibility, as the injections were stopped in the wells since a few days.

On the 14th of November 2019, another earthquake of magnitude 2.6 occurs at 23h40, also felt by the local population. This time, the press spread the question of the responsibility of the geothermal project at a national level. The local mining authorities decided to stop injection operations on the geothermal site and launched a study to determine if the operator's responsibility was engaged in those felt events.

As the first conclusions of the French National Center for Scientific research were contested by the operating company, the French Ministry for the ecological and inclusive transition asked for the advice of an external committee constisting in experts in risks and induced/natural seismicity. This report is due by the end of January 2020.

For now, the question is still unsolved: were those events natural or man-made? Some minor damages could be linked to the occurrence of the two earthquakes, and the potential responsibility of the operator might be engaged. If so, the insurer of the project might need to take in charge the financial aspects of the reparation costs. As for now the situation is still unclear and under investigation. This situation is a good example of the potential complexity of the question of induced seismicity in case of felt events near a geothermal project and related damages.

Destress deliverable D3.6 Guidance to insurers. Peterschmitt A et Genter A. 2019

Currently, in France, deep geothermal sites are protected by the insurances of the plant owner and of the plant operator, which take in charge any damages due to unexpected event related to geothermal activity. The individual insurance premiums of inhabitants should not be impacted by the vicinity of a geothermal site and its potential impacts linked to operational

The actual French insurance scheme is fully adapted to the compensation and responsibility shares in case of induced damages. Thus the French insurance scheme could be applied to other EU countries by taking into account their own legal framework for EGS projects.

End of planned injection operations on the Vendenheim









