

Executive Summary

SHALE GAS - Definition of a monitoring strategy

THE BACKGROUND OF THE SHALE GAS - DEFINITION OF A MONITORING STRATEGY REPORT

This report was published in June 2015 and was elaborated the WssTP Shale Gas Working Group

The main WssTP goals were:

1. To review European and international regulations, initiatives and demonstration projects targeting best practices related to water contamination during unconventional gas production.
2. To evaluate the risks related to these activities.
3. To identify further research and demonstration needs.

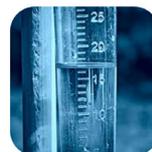
The WG objectives were to:

- Define the state of knowledge on best practices in setting up site-specific water quality monitoring strategies before, during and after the exploration or exploitation of shale gas. (key factors: geosystem, technology, substances, disposal).
- Define the state of knowledge according the research needs on properties, transport behavior, and transformation products of the fracking additives as well as formation water constituents under high temperature and pressure along flow path.
- Contribute to evaluation of current fracking fluids and designing of “green” fluids.

KNOWLEDGE GAPS AND RESEARCH NEEDS

Despite 20 years of high volume hydraulic fracturing in shale gas in the U.S., still comparably few peer-reviewed articles have been published about the risk of groundwater contamination of shale gas development and these ones do not necessarily seem to come to an agreement. Thus, a site-specific environmental risk assessment quantifying the long-term risk of groundwater contamination by substances, migrating from the fracking horizon during and after shale gas play development, has not yet been possible because several gaps of knowledge prevail, among which are:

- Lack of exploration techniques and monitoring campaigns determining properties of the deep subsurface in necessary detail.
- Lack of monitoring techniques and long-term monitoring campaigns to assess whether model assumptions are valid, including lack of baseline monitoring.
- Lack of information and environmental data to be communicated to the regulators and stakeholders.
- Lack of the baseline monitoring protocols.



A Common Vision for Water Research and Innovation

Several research needs can be further assessed in extensive literature studies, laboratory studies, and field studies without employing hydraulic fracturing. Given now that European countries are pursuing the exploration and exploitation of shale gas plays at a different pace, we argue that the current activities in some countries should be used for carrying out EU-funded targeted research at these sites independent from the oil & gas industry, to address the abovementioned gaps of knowledge in a scientific approach. The results of these investigations may also be valuable for quantifying risks in countries currently not actively pursuing shale gas developments. Targets to be addressed should be in particular:

Research needs regarding the relevance of impact pathways

- Monitoring programme to follow each potential impact pathway.
- Fault behaviour:
 - » Methods and techniques able to monitor widths and lengths of fractures generated by hydraulic fracturing.
 - » Monitoring of the methodology and techniques suitable for determining properties of the deep subsurface in necessary detail, e.g. detecting intersecting faults that affect only parts of the overburden.
- Research on monitoring of fracking fluid and formation brine along migration pathways under high pressure and temperature. Mass balancing approaches of the fracking fluid constituents injected into the fracking horizon and retrieved in the flowback could help to determine the behaviour and fate of substances in the fracking horizon, the fraction of fracking additives remaining underground, and the formation of transformation products.
- Baseline monitoring is needed to determine the reference condition with regard to the presence of fracking additives, methane, and formation water constituents.

Research needs regarding substance migration

- Research on using tracers in near-surface groundwater (e.g., thermogenic methane) as early-warning indicating relevant impact pathways between the fracking horizon and near-surface groundwater.
- Monitoring the toxicological and ecotoxicological hazard potentials of relevant migrating substances. As a condition, full disclosure of chemicals used in hydraulic fracturing is a necessary step in environmental risk assessment.
- Development of monitoring tool needed to prove the efficiency of the environmentally friendly (green) fracking fluids substitution of toxic substances, reduction or substitution of biocides, reduction of the numbers of additives used, lowering of concentrations used.
- Research on monitoring-based project control requires meaningful indicators and an evaluation system that ultimately provides options for stopping, limiting, or reversing any undesired developments.

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