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**COMMISSION RECOMMENDATION**

**of 22.1.2014**

**on minimum principles for the exploration and production of hydrocarbons (such as shale gas) using high volume hydraulic fracturing**

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### on minimum principles for the exploration and production of hydrocarbons (such as shale gas) using high volume hydraulic fracturing

THE EUROPEAN COMMISSION,

Having regard to the Treaty on the Functioning of the European Union, and in particular Article 292 thereof,

Whereas:

- (1) Member States have the right to determine the conditions for exploiting their energy resources, as long as they respect the need to preserve, protect and improve the quality of the environment.
- (2) In the current state of technological development, the exploration and production of hydrocarbons, such as shale gas, requires the combined use of high volume hydraulic fracturing and directional (especially horizontal) drilling at a scale and intensity for which there is very limited experience in the Union. This hydraulic fracturing technique raises specific challenges, in particular for health and environment.
- (3) In its resolutions of 21 November 2012 the European Parliament noted the significant potential benefits of producing shale gas and oil, and called on the Commission to introduce an Union wide risk management framework for the exploration and extraction of unconventional fossil fuels, with a view to ensuring that harmonised provisions for the protection of human health and the environment apply across all Member States.
- (4) In its conclusions of 22 May 2013 the European Council stressed the need to diversify Europe's energy supply and develop indigenous energy resources to ensure the security of supply, reduce the Union's external energy dependency and stimulate economic growth. The Council acknowledged the Commission's intention to assess a more systematic recourse to indigenous sources of energy with a view to their safe, sustainable and cost-effective exploitation while respecting Member States choices of energy mix.
- (5) In its Communication of 22 January 2014 on unconventional hydrocarbon exploration and production in Europe,<sup>1</sup>[reference to the OJ to be added], the Commission outlined the potential new opportunities and challenges related to unconventional hydrocarbon extraction in the Union as well as the main elements deemed necessary to ensure the safety of this technique. The Communication concluded that there is a need for a Recommendation that lays down minimum principles that support Member States in the exploration and production of natural gas from shale formations and ensure that the climate and environment are safeguarded, resources are used efficiently, and the public is informed.
- (6) At international level, the International Energy Agency developed recommendations for the safe development of unconventional gas. These "Golden Rules" call for robust

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and appropriate regulatory regimes, careful site selection, adequate project planning, underground risk characterization, robust rules for well design, transparency on operations and monitoring of associated impacts, sound water and waste management and mitigation of air and greenhouse gas emissions.

- (7) Both general and environmental legislation of the Union apply to hydrocarbon exploration and production operations involving high volume hydraulic fracturing. In particular, Council Directive 89/391/EEC<sup>2</sup> laying down provisions on health and safety of workers introduces measures to encourage improvements in the safety and health of workers at work; Council Directive 92/91/EEC<sup>3</sup> laying down provisions on the mineral extraction through drilling lays down minimum requirements for the safety and health protection of workers in the mineral-extracting industries through drilling; Directive 94/22/EC of the European Parliament and of the Council<sup>4</sup> on conditions for granting and using authorizations for the prospection, exploration and production of hydrocarbons requires to grant authorisations in a non-discriminatory manner; Directive 2000/60/EC of the European Parliament and of the Council<sup>5</sup> establishing the water framework requires the operator to obtain authorisation for water abstraction and prohibits the direct discharge of pollutants into groundwater; Directive 2001/42/EC of the European Parliament and of the Council<sup>6</sup> laying down provisions on strategic environmental assessment requires assessment of plans and programmes in the areas of energy, industry, waste management, water management, transport or land use; Directive 2004/35/EC of the European Parliament and of the Council<sup>7</sup> laying down provisions on the environmental liability applies to occupational activities encompassing activities such as the management of waste and water abstraction; Directive 2006/21/EC of the European Parliament and of the Council<sup>8</sup> laying down provisions on mining waste regulates the management of surface and underground wastes resulting from the exploration and production of hydrocarbons using high-volume hydraulic fracturing; Directive 2006/118/EC of the European Parliament and of the Council<sup>9</sup> laying down provisions on groundwater obliges Member States to put in place measures that prevent or limit the input of pollutants into groundwater;

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<sup>2</sup> Council Directive 89/391/EEC of 12 June 1989 on the introduction of measures to encourage improvements in the safety and health of workers at work (OJ L 183, 29.6.1989, p. 1).

<sup>3</sup> Council Directive 92/91/EEC of 3 November 1992 concerning the minimum requirements for improving the safety and health protection of workers in the mineral- extracting industries through drilling (eleventh individual Directive within the meaning of Article 16 (1) of Directive 89/391/EEC) (OJ L 348, 28.11.1992, p. 9).

<sup>4</sup> Directive 94/22/EC of the European Parliament and of the Council of 30 May 1994 on the conditions for granting and using authorizations for the prospection, exploration and production of hydrocarbons (OJ L 164 , 30.06.1994 p.3).

<sup>5</sup> Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy (OJ L 327, 22.12.2000, p. 1).

<sup>6</sup> Directive 2001/42/EC of the European Parliament and of the Council of 27 June 2001 on the assessment of the effects of certain plans and programmes on the environment (OJ L 197, 21.7.2001, p. 30).

<sup>7</sup> Directive 2004/35/EC of the European parliament and of the Council of 21 April 2004 on environmental liability with regard to the prevention and remedying of environmental damage (OJ L 143, 30.4.2004, p. 56).

<sup>8</sup> Directive 2006/21/EC of the European Parliament and of the Council of 15 March 2006 on the management of waste from extractive industries and amending Directive 2004/35/EC (OJ L 102, 11.4.2006, p. 15).

<sup>9</sup> Directive 2006/118/EC of the European Parliament and of the Council of 12 December 2006 on the protection of groundwater against pollution and deterioration (OJ L 372, 27.12.2006, p.19).

Regulation 1907/2006/EC of the European Parliament and of the Council<sup>10</sup> on the registration, evaluation, authorisation and restriction of chemicals (REACH) and Regulation 528/2012/EU of the European Parliament and of the Council<sup>11</sup> on the making available on the market and use of biocidal products apply to the use of chemicals and biocidal products that may be used for fracturing; Directive 2008/98/EC of the European Parliament and of the Council<sup>12</sup> laying down waste framework sets out the conditions applicable to the reusing the fluids that emerge at the surface following high-volume hydraulic fracturing and during production; Regulation 525/2013/EU of the European Parliament and of the Council<sup>13</sup> on a mechanism for monitoring and reporting greenhouse gas emissions and Decision 406/2009/EC of the European Parliament and of the Council<sup>14</sup> on the effort of Member States to reduce their greenhouse gas emissions up to 2020 apply to fugitive methane emissions; Directive 2010/75/EU of the European Parliament and of the Council<sup>15</sup> laying down provisions on industrial emissions applies to installations within which activities listed in Annex I to that Directive are operated; Directive 2011/92/EU of the European Parliament and of the Council<sup>16</sup> laying down provisions on environment impact assessment requires to conduct an environment impact assessment for projects involving the extraction of petroleum and natural gas for commercial purposes if the amount extracted exceeds 500 tonnes/day in the case of petroleum and 500.000 m<sup>3</sup> per day in the case of gas and a screening for deep-drilling projects and surface installations for extracting oil and gas; Council Directive 96/82/EC<sup>17</sup> on the control of major-accident hazards involving dangerous substances and, as of 1 June 2015, Directive 2012/18/EU of the European Parliament and of the Council<sup>18</sup> oblige operators of establishments where dangerous substances are present above certain thresholds defined in Annex I to these Directives to take all necessary measures to prevent major accidents and to limit their consequences for human health and the environment. This applies inter alia to chemical and thermal processing operations and

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<sup>10</sup> Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC (OJ L 396, 30.12.2006, p. 1).

<sup>11</sup> Regulation (EU) No 528/2012 of the European Parliament and of the Council of 22 May 2012 concerning the making available on the market and use of biocidal products (OJ L 167, 27.6.2012, p. 1).  
<sup>12</sup> Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives (OJ L 312, 22.11.2008, p. 3).

<sup>13</sup> Regulation (EU) No 525/2013 of the European Parliament and of the Council of 21 May 2013 on a mechanism for monitoring and reporting greenhouse gas emissions and for reporting other information at national and Union level relevant to climate change and repealing Decision No 280/2004/EC (OJ L 165, 18.6.2013, p. 13).

<sup>14</sup> Decision No 406/2009/EC of the European Parliament and of the Council of 23 April 2009 on the effort of Member States to reduce their greenhouse gas emissions to meet the Community's greenhouse gas emission reduction commitments up to 2020 (OJ L 140, 5.6.2009, p. 136).

<sup>15</sup> Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control) (OJ L 334, 17.12.2010, p. 17).

<sup>16</sup> Directive 2011/92/EU of the European Parliament and of the Council of 13 December 2011 on the assessment of the effects of certain public and private projects on the environment (OJ L 26, 28.1.2012, p. 1).

<sup>17</sup> Council Directive 96/82/EC of 9 December 1996 on the control of major-accident hazards involving dangerous substances (OJ L 10, 14.1.1997, p. 13)

<sup>18</sup> Directive 2012/18/EU of the European Parliament and of the Council of 4 July 2012 on the control of major-accident hazards involving dangerous substances, amending and subsequently repealing Council Directive 96/82/EC (OJ L 197, 24.7.2012, p. 1)

related storage in the framework of the exploitation of minerals in mines and quarries as well as to onshore underground gas storage.

- (8) However, the Union's environmental legislation was developed at a time when high-volume hydraulic fracturing was not used in Europe. Therefore, certain environmental aspects associated with the exploration and production of hydrocarbons involving this practice are not comprehensively addressed in current Union legislation, in particular on strategic planning, underground risk assessment, well integrity, baseline and operational monitoring, capturing methane emissions and disclosure of information on chemicals used on a well by well basis.
- (9) Therefore, there is a need to lay down minimum principles which should be taken into account by the Member States when applying or adapting their regulation related to activities involving high volume hydraulic fracturing. A set of rules would level the playing field for operators, and improve investors' confidence and the functioning of the single energy market. Clear and transparent rules would also help alleviate public concerns, and possibly opposition to shale gas development. This set of rules neither implies that Member States are under any obligation to pursue the exploration or exploitation of activities using high volume hydraulic fracturing if they choose not to nor that Member States are prevented from maintaining or introducing more detailed measures matching the specific national, regional or local conditions.
- (10) There is no experience with the permitting of production of hydrocarbons using high volume hydraulic fracturing and limited experience with the permitting of exploration in the Union. Therefore, it is necessary to monitor the application of Union legislation and of this Recommendation in Member States. An updating of this Recommendation or the development of legally binding provisions may be necessary in view of technical progress, the need to address risks and impacts of exploration and production of hydrocarbons using techniques other than high volume hydraulic fracturing, unexpected challenges in the application of Union legislation or exploration and production of hydrocarbons using high volume hydraulic fracturing in offshore operations.
- (11) Therefore, this Recommendation laying down minimum principles to be applied as a common basis for the exploration or production of hydrocarbons with high-volume hydraulic fracturing is necessary at this point of time. It is complementary to existing Union legislation applicable to projects involving high volume hydraulic fracturing and should be implemented by Member States within 6 months.
- (12) This recommendation respects the rights and observes the principles recognised by the Charter of Fundamental Rights of the European Union, and notably the right to life and the right to the integrity of the person, the freedom of expression and information, the right to conduct a business, the right to property, and the high level of health and environmental protection. This recommendation has to be implemented in accordance with these rights and principles,

HAS ADOPTED THIS RECOMMENDATION:

## **1. Purpose and subject matter**

1.1. This Recommendation lays down the minimum principles needed to support Member States who wish to carry out exploration and production of hydrocarbons using high

volume hydraulic fracturing, while ensuring that the public health, climate and environment are safeguarded, resources are used efficiently, and the public is informed.

1.2. In applying or adapting their existing provisions implementing relevant Union legislation to the needs and specificities of exploration and production of hydrocarbons using high-volume hydraulic fracturing, Member States are encouraged to apply these principles, which concern planning, installation assessment, permits, operational and environmental performance and closure, and public participation and dissemination of information.

## **2. Definitions**

For the purpose of this Recommendation:

- (a) 'high volume hydraulic fracturing' means injecting 1000 m<sup>3</sup> or more of water per fracturing stage or 10 000 m<sup>3</sup> or more of water during the entire fracturing process into a well;
- (b) an 'installation' includes any related underground structures designated for the exploration or production of hydrocarbons using high volume hydraulic fracturing.

## **3. Strategic planning and environmental impact assessment**

3.1. Before granting licenses for exploration and/or production of hydrocarbons which may lead to the use of high-volume hydraulic fracturing, Member States should prepare a strategic environmental assessment to prevent, manage and reduce the impacts on and risks for human health and the environment. This assessment should be carried out on the basis of the requirements of Directive [2001/42/EC](#).

3.2. Member States should provide clear rules on possible restrictions of activities, for example in protected, flood-prone or seismic-prone areas, and on minimum distances between authorised operations and residential and water-protection areas. They should also establish minimum depth limitations between the area to be fractured and groundwater.

3.3. Member States should take the necessary measures to ensure that an environmental impact assessment is carried out on the basis of the requirements of Directive [2011/92/EU](#).

3.4. Member States should provide the public concerned with early and effective opportunities to participate in developing strategy referred to in point 3.1 and the impact assessment referred to in point 3.3.

## **4. Exploration and production permits**

Member States should ensure that the conditions and the procedures for obtaining permits in accordance with applicable Union legislation are fully coordinated if:

- (a) more than one competent authority is responsible for the permit(s) needed;
- (b) more than one operator is involved;
- (c) more than one permit is needed for a specific project phase;

- (d) more than one permit is needed under national or Union legislation.

## **5. Selection of the exploration and production site**

5.1. Member States should take the necessary measures to ensure that the geological formation of a site is suitable for the exploration or production of hydrocarbons using high volume hydraulic fracturing. They should ensure that operators carry out a characterisation and risk assessment of the potential site and surrounding surface and underground area.

5.2. The risk assessment should be based on sufficient data to make it possible to characterise the potential exploration and production area and identify all potential exposure pathways. This would make it possible to assess the risk of leakage or migration of drilling fluids, hydraulic fracturing fluids, naturally occurring material, hydrocarbons and gases from the well or target formation as well as of induced seismicity.

5.3. The risk assessment should:

- (a) be based on the best available techniques and take into account the relevant results of the information exchange between Member States, industries concerned and non-governmental organisations promoting environmental protection organised by the Commission;
- (b) anticipate the changing behaviour of the target formation, geological layers separating the reservoir from groundwater and existing wells or other manmade structures exposed to the high injection pressures used in high volume hydraulic fracturing and the volumes of fluids injected;
- (c) respect a minimum vertical separation distance between the zone to be fractured and groundwater;
- (d) be updated during operations whenever new data are collected.

5.4. A site should only be selected if the risk assessment conducted under points 5.1, 5.2 and 5.3 shows that the high volume hydraulic fracturing will not result in a direct discharge of pollutants into groundwater and that no damage is caused to other activities around the installation.

## **6. Baseline study**

6.1. Before high-volume hydraulic fracturing operations start, Member States should ensure that:

- a) the operator determines the environmental status (baseline) of the installation site and its surrounding surface and underground area potentially affected by the activities;
- b) the baseline is appropriately described and reported to the competent authority before operations begin.

6.2. A baseline should be determined for:

- a) quality and flow characteristics of surface and ground water ;
- b) water quality at drinking water abstraction points;

- c) air quality;
- d) soil condition;
- e) presence of methane and other volatile organic compounds in water;
- f) seismicity.
- g) land use;
- h) biodiversity;
- i) status of infrastructure and buildings;
- j) existing wells and abandoned structures.

## **7. Installation design and construction**

Member States should ensure that the installation is constructed in a way that prevents possible surface leaks and spills to soil, water or air.

## **8. Infrastructure of a production area**

Member States should ensure that:

- a) operators or groups of operators apply an integrated approach to the development of a production area with the objective of preventing and reducing environmental and health impacts and risks, both for workers and the general public;
- b) adequate infrastructure requirements for servicing the installation are established before production begins. If an installation's primary purpose is producing oil using high-volume hydraulic fracturing, specific infrastructure that captures and transports associated natural gas should be installed.

## **9. Operational requirements**

9.1. Member States should ensure that operators use best available techniques taking into account the relevant results of the information exchange between Member States, industries concerned and non-governmental organisations promoting environmental protection organised by the Commission, as well as good industry practice to prevent, manage and reduce the impacts and risks associated with projects of exploration and production of hydrocarbons.

9.2. Member States should ensure that operators:

- (a) develop project-specific water-management plans to ensure that water is used efficiently during the entire project. Operators should ensure the traceability of water flows. The water management plan should take into account seasonal variations in water availability and avoid using water sources under stress;
- (b) develop transport management plans to minimise air emissions in general and the impacts on local communities and biodiversity in particular;
- (c) capture gases for subsequent use, minimise flaring and avoid venting. In particular, operators should put in place measures to ensure that air emissions



at the exploration and production stage are mitigated by capturing gas and its subsequent use. Venting of methane and other air pollutants should be limited to the most exceptional operational circumstances for safety reasons;

- (d) carry out the high volume fracturing process in a controlled manner and with appropriate pressure management with the objective to contain fractures within the reservoir and to avoid induced seismicity;
- (e) ensure well integrity through well design, construction and integrity tests. The results of integrity tests should be reviewed by an independent and qualified third party to ensure the well's operational performance, and its environmental and health safety at all stages of project development and after well closure;
- (f) develop risk management plans and the measures necessary to prevent and/or mitigate the impacts, and the measures necessary for response;
- (g) stop operations and urgently take any necessary remedial action if there is a loss of well integrity or if pollutants are accidentally discharged into groundwater;
- (h) immediately report to the competent authority in the event of any incident or accident affecting public health or the environment. The report should include the causes of the incident or accident, its consequences and remedial steps taken. The baseline study required under points 6.1 and 6.2 should be used as a reference.

9.3. Member States should promote the responsible use of water resources in high volume hydraulic fracturing.

## **10. Use of chemical substances and water in high volume hydraulic fracturing**

10.1. Member States should ensure that:

- (a) manufacturers, importers and downstream users of chemical substances used in hydraulic fracturing refer to "hydraulic fracturing" when complying with their obligations under Regulation (EC) No. 1907/2006;
- (b) using chemical substances in high-volume hydraulic fracturing is minimised;
- (c) the ability to treat fluids that emerge at the surface after high-volume hydraulic fracturing is considered during the selection of the chemical substances to be used.

10.2. Member States should encourage operators to use fracturing techniques that minimise water consumption and waste streams and do not use hazardous chemical substances, wherever technically feasible and sound from a human health, environment and climate perspective.

## **11. Monitoring requirements**

11.1. Member States should ensure that the operator regularly monitors the installation and the surrounding surface and underground area potentially affected by the operations during the exploration and production phase and in particular before, during and after high volume hydraulic fracturing.

- 11.2. The baseline study required under points 6.1 and 6.2 should be used as a reference for subsequent monitoring.
- 11.3. In addition to environmental parameters determined in the baseline study, Member States should ensure that the operator monitors the following operational parameters:
- (a) the precise composition of the fracturing fluid used for each well;
  - (b) the volume of water used for the fracturing of each well;
  - (c) the pressure applied during high-volume fracturing;
  - (d) the fluids that emerge at the surface following high-volume hydraulic fracturing: return rate, volumes, characteristics, quantities re-used and/or treated for each well;
  - (e) air emissions of methane, other volatile organic compounds and other gases that are likely to have harmful effects on human health and/or the environment.
- 11.4. Member States should ensure that operators monitor the impacts of high-volume hydraulic fracturing on the integrity of wells and other manmade structures located in the surrounding surface and underground area potentially affected by the operations.
- 11.5. Member States should ensure that the monitoring results are reported to the competent authorities.

## **12. Environmental liability and financial guarantee**

- 12.1. Member States should apply the provisions on environmental liability to all activities taking place at an installation site including those that currently do not fall under the scope of Directive 2004/35/EC<sup>19</sup>.
- 12.2. Member States should ensure that the operator provides a financial guarantee or equivalent covering the permit provisions and potential liabilities for environmental damage prior to the start of operations involving high volume hydraulic fracturing.

## **13. Administrative capacity**

- 13.1. Member States should ensure that the competent authorities have adequate human, technical and financial resources to carry out their duties.
- 13.2. Member States should prevent conflicts of interest between the regulatory function of competent authorities and their function relating to the economic development of the resources.

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<sup>19</sup> Directive 2004/35/EC of the European parliament and of the Council of 21 April 2004 on environmental liability with regard to the prevention and remedying of environmental damage (OJ L 143, 30.4.2004, p. 56).

## 14. Closure obligations

Member States should ensure that a survey is carried out after each installation's closure to compare the environmental status of the installation site and its surrounding surface and underground area potentially affected by the activities with the status prior to the start of operations as defined in the baseline study.

## 15. Dissemination of information

Member States should ensure that:

- (a) the operator publicly disseminates information on the chemical substances and volumes of water that are intended to be used and are finally used for the high-volume hydraulic fracturing of each well. This information should list the names and Chemical Abstracts Service (CAS) numbers of all substances and include a safety data sheet, if available, and the substance's maximum concentration in the fracturing fluid;
- (b) the competent authorities should publish the following information on a publicly-accessible internet site within 6 months of this Recommendation's publication and in intervals of no longer than 12 months:
  - (i) the number of wells completed and planned projects involving high-volume hydraulic fracturing;
  - (ii) the number of permits granted, the names of operators involved and the permit conditions;
  - (iii) the baseline study produced under points 6.1 and 6.2 and the monitoring results produced under points 11.1, 11.2 and 11.3(b) to (e);
- (c) the competent authorities should also inform the public on the following without undue delay.
  - (i) incidents and accidents under point 9.2(f);
  - (ii) the results of inspections, non-compliance and sanctions.

## 16. Review

16.1. Member States having chosen to explore or exploit hydrocarbons using high volume hydraulic fracturing are invited to give effect to the minimum principles set out in this Recommendation by [6 months from publication date] and to annually inform the Commission about the measures they put in place in response to this Recommendation, and for the first time, by December 2014.

16.2. The Commission will closely monitor the Recommendation's application by comparing the situation in Member States in a publicly available scoreboard.

16.3. The Commission will review the Recommendation's effectiveness 18 months after its publication.

16.4. The review will include an assessment of the Recommendation's application, will consider the progress of the best available techniques information exchange and the

application of the relevant BAT reference documents, as well as any need for updating the Recommendation's provisions. The Commission will decide whether it is necessary to put forward legislative proposals with legally-binding provisions on the exploration and production of hydrocarbons using high volume hydraulic fracturing.

Done at Brussels, 22.1.2014

*For the Commission*

*Member of the Commission*