



Quarter of a Century of
Regulatory Collaboration

Development of a **Generic Exposure Scenario**
under the EU REACH Regulation for
hydraulic fracturing operations
(such as shale gas) in response to the
European Commission's Recommendation
on high volume hydraulic fracturing

Nik Robinson

Outline

- EU Drivers
- New REACH Requirements
- Use Descriptor System
- Specific Environmental Release Category
 - Hydraulic Fracturing Process
 - Potential Process Emissions
 - The SpERC document
- Commission & ECHA comments
- Conclusions



European Commission

Recommendation 2014/70/EU:

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

Communication COM/2014/023:

on the exploration and production of hydrocarbons (such as shale gas) using high volume hydraulic fracturing in the EU



New REACH Requirements

- “Hydraulic fracturing” referenced in REACH dossiers
- More specific use descriptors to be used
- Develop models or relevant SpERCs for environmental exposure

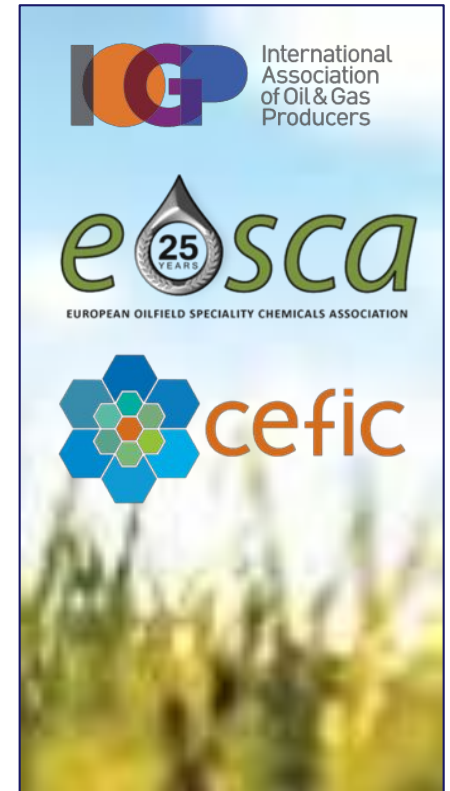


Use Descriptor System

Sector of Use (SU)	
SU2a	Mining, (without offshore industries)
SU2b	Offshore industries
Process Code (PROC)	
PROC1	Use in closed process, no likelihood of exposure
PROC2	Use in closed, continuous process with occasional controlled exposure
PROC3	Use in closed batch process (synthesis or formulation)
PROC4	Use in batch and other process (synthesis) where opportunity for exposure arises
Product Codes (PC)	
PC8	Biocidal products (e.g. Disinfectants, pest control)
PC20	Products such as ph-regulators, flocculants, precipitants, neutralization agents
PC37	Water treatment chemicals
PC41	<i>Hydraulic fracturing chemicals (proposed but not confirmed)</i>
PC0	Other (use UCN codes)
Environmental Release Categories (ERC)	
ERC4	Industrial use of processing aids in processes & products, not becoming part of articles
ERC7	Industrial use of substances in closed systems

Specific Environmental Release Category

- Working group: IOGP, EOSCA, Cefic
- Two documents:
 - SpERC Factsheet
 - Background Document
- SpERC: **standardised assessment** of the **environmental risks** associated with **generic use** of substances in **specific application**

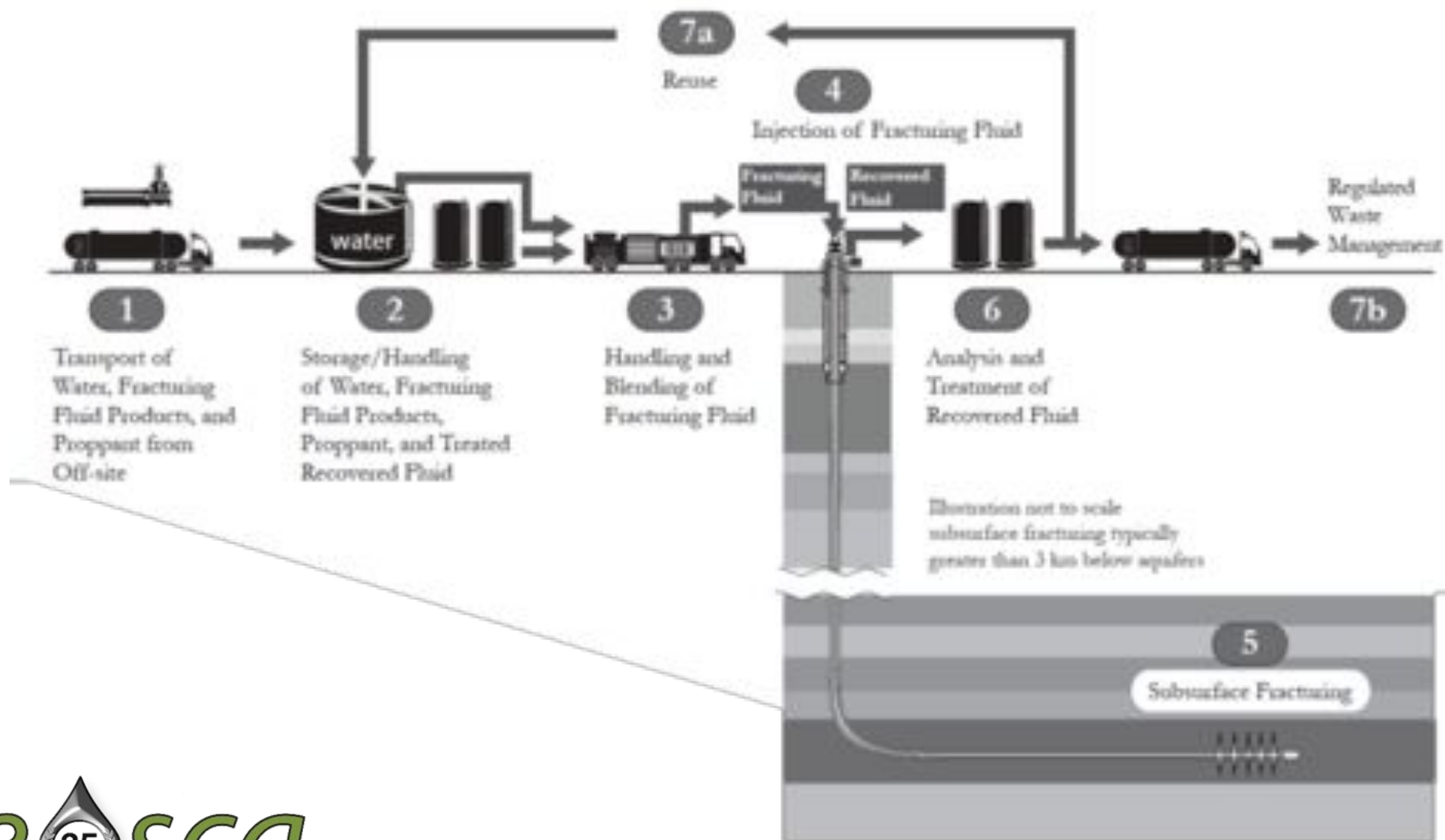


Summary of emissions

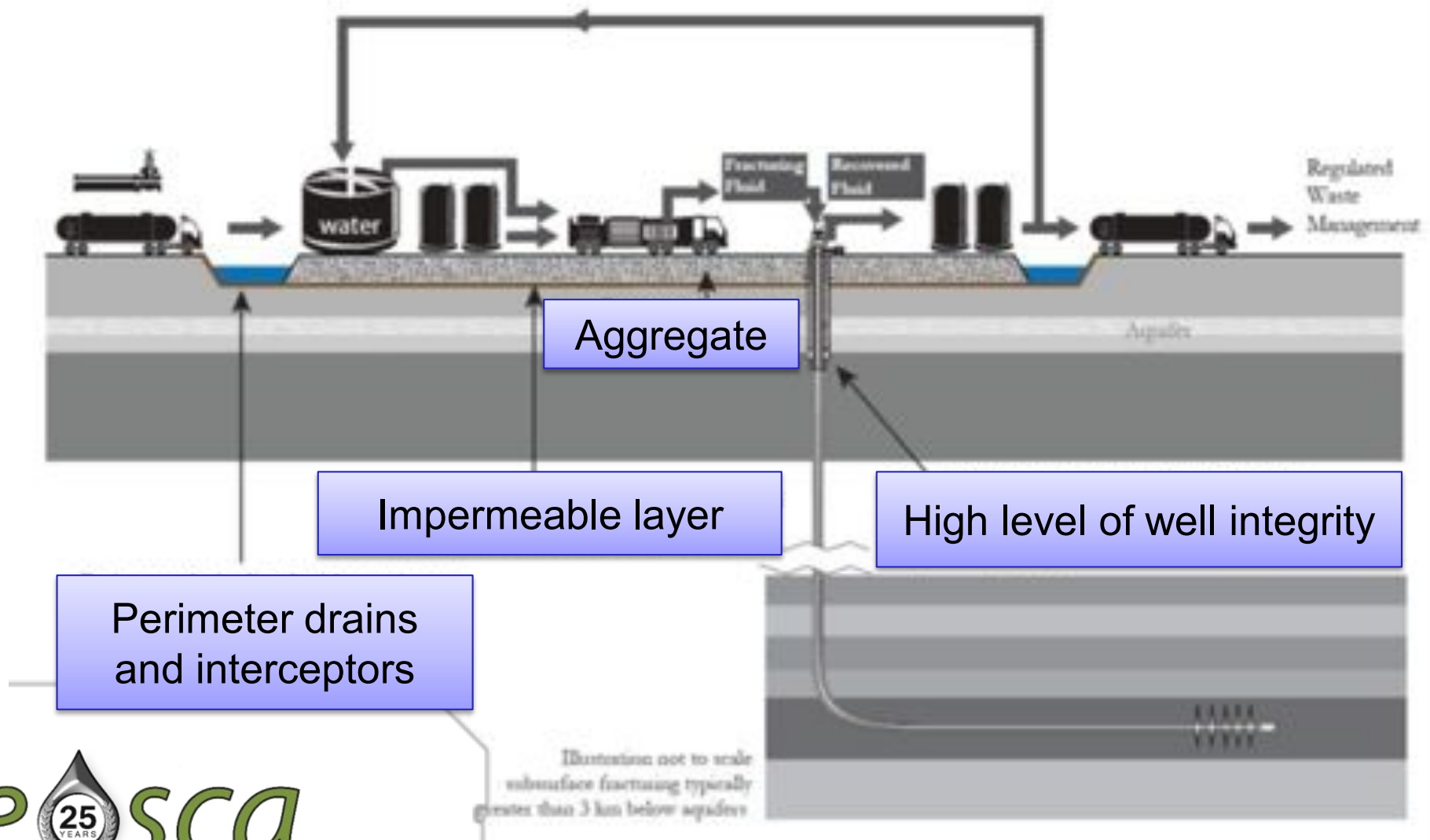
- Emissions for air only; water and soil controlled
- Air emissions are summed to give total emission factor
- Total emission factor applies per fracturing treatment
- Emissions take place over 4d for fluids and 2d for proppant
- These are worst case (shortest duration) scenarios



The Hydraulic Fracturing: Process

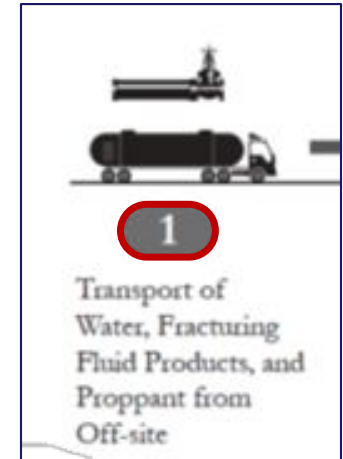


The Hydraulic Fracturing: Mitigation



The Hydraulic Fracturing Process

1. Transport of water, fracturing fluid products, and proppant from off-site

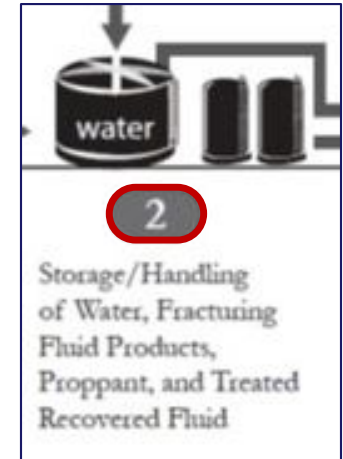


Transport not considered under REACH

Emission factor for transport: 0% to air

The Hydraulic Fracturing Process

2. Storage/handling of water, fracturing fluid products, proppant and treated recovered fluids



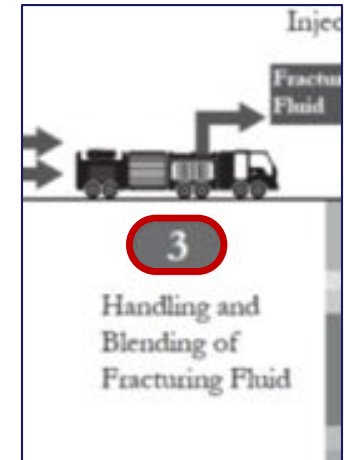
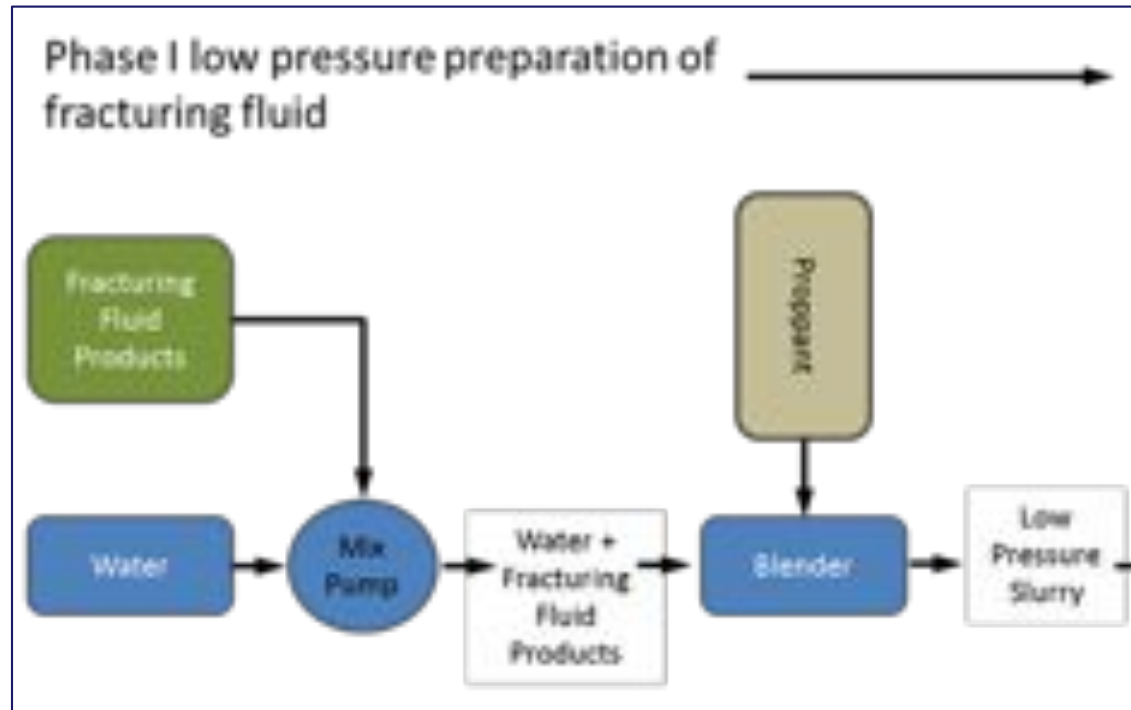
Pad design/construction limits exposure to ground and surface waters

Storage/transfer no significant losses expected

Emission factor for storage/transfer: 0.3% to air

The Hydraulic Fracturing Process

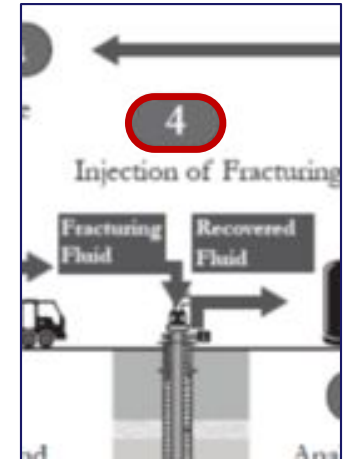
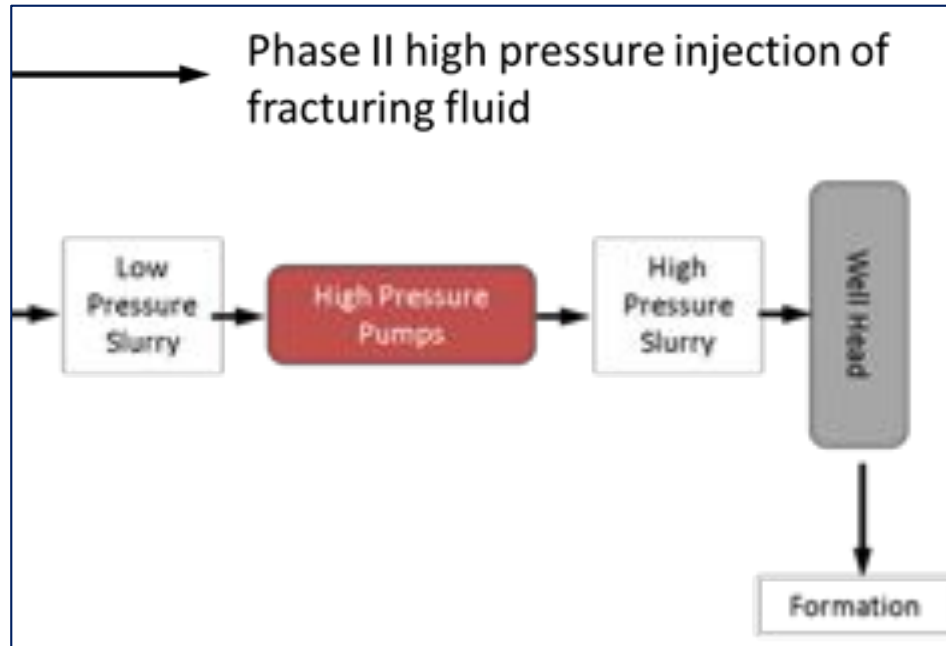
3. Handling/blending of fracturing fluid



Emission of fracturing fluid product handling: 1.2%

The Hydraulic Fracturing Process

4. Injection of fracturing fluid



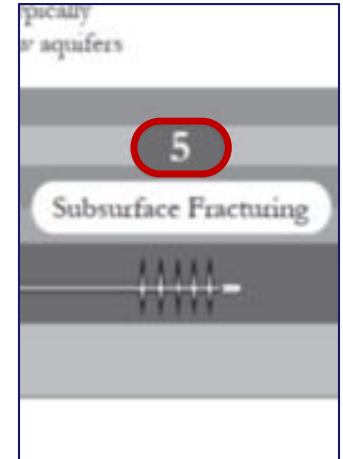
Emission of fracturing fluid products: 0%

The Hydraulic Fracturing Process

5. Subsurface fracturing

Two main concerns for pathway:

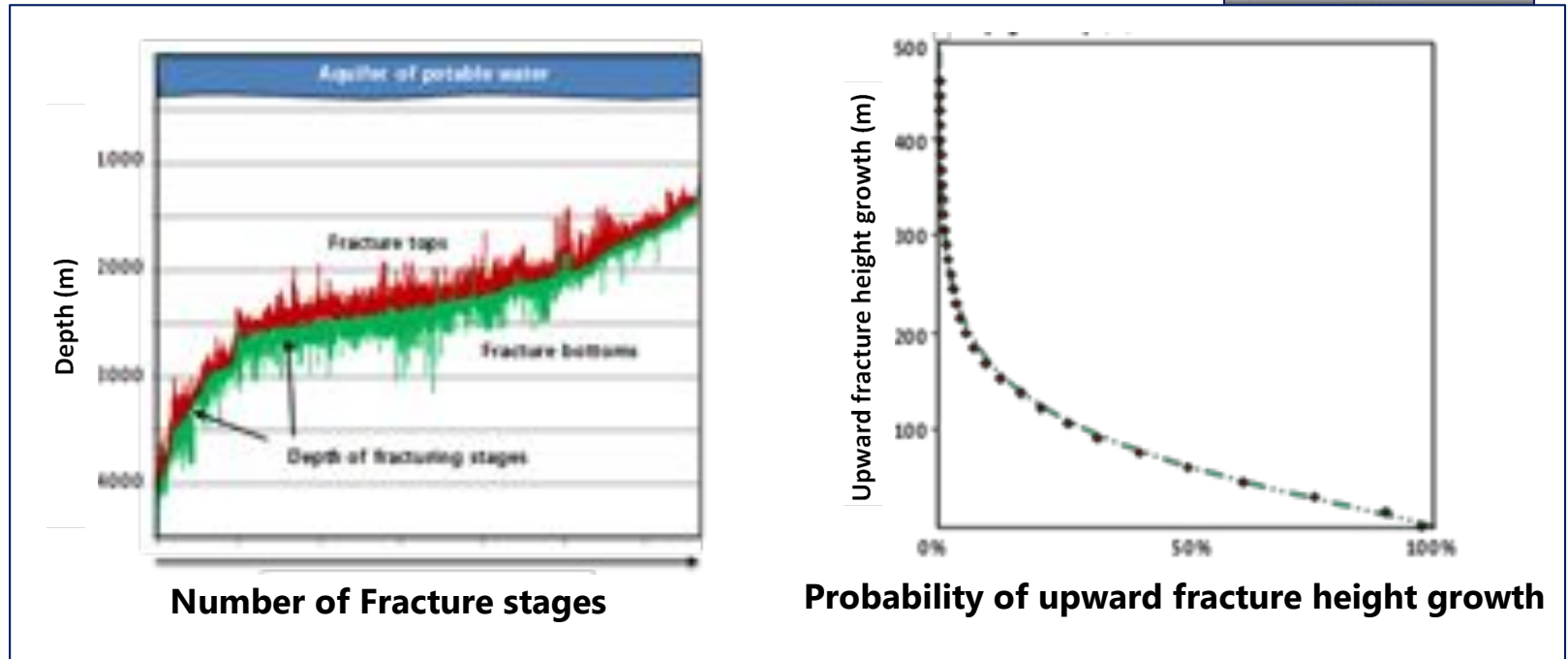
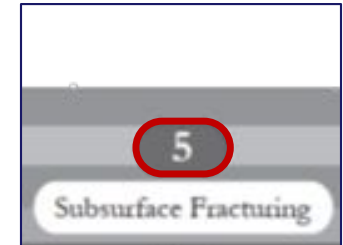
- Fracture propagation
- Well integrity



The Hydraulic Fracturing Process

5. Subsurface fracturing

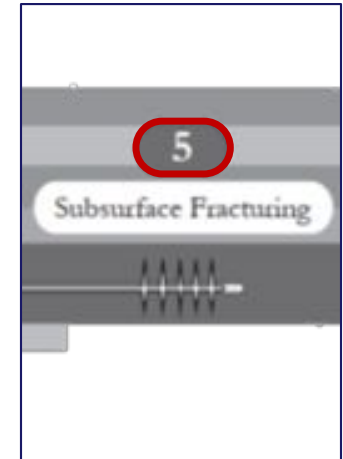
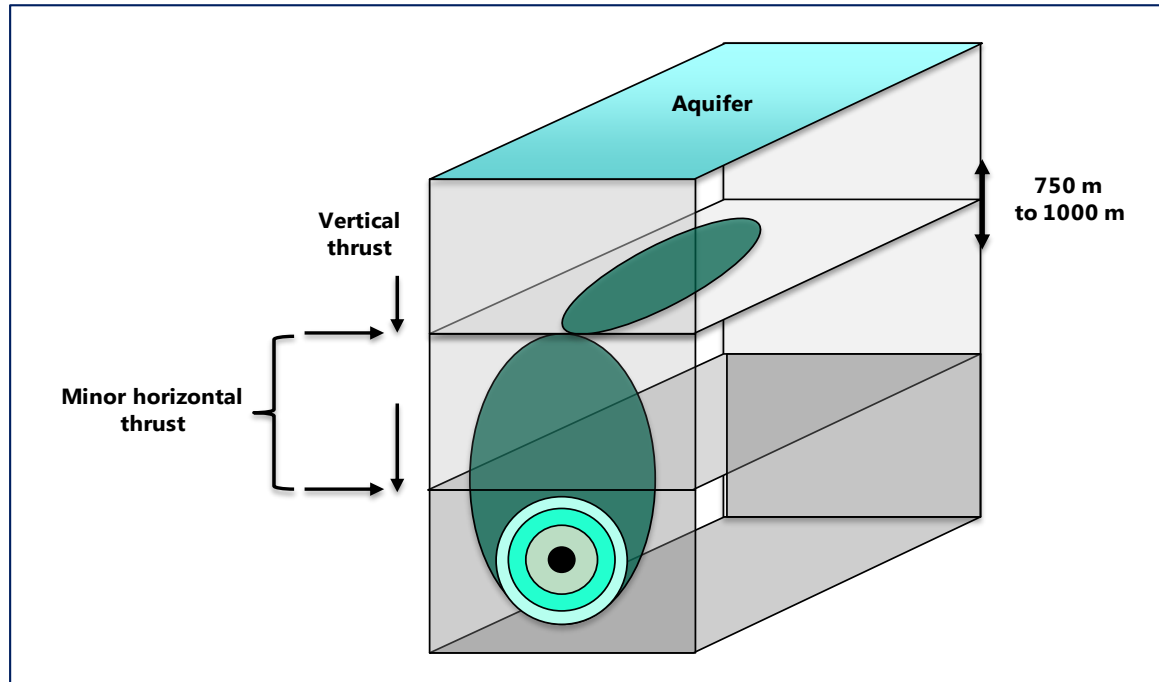
- Fracture propagation, part 1



The Hydraulic Fracturing Process

5. Subsurface fracturing

- Fracture propagation, part 2



Fracture direction varies with depth, ~600- 1000m
depth tendency for horizontal rather than vertical
propagation predominates

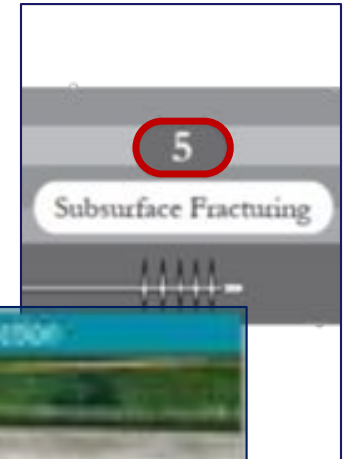
The Hydraulic Fracturing Process

5. Subsurface fracturing

- Well integrity

Isolation of hydrocarbons and pressure containment is basis of wellbore design/construction and are specified by best practices and guidelines

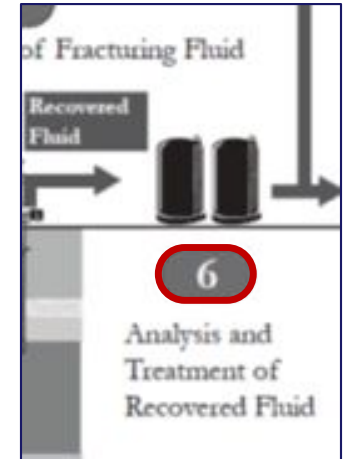
Emission: 0%



The Hydraulic Fracturing Process

6. Analysis and treatment of recovered fluids

20-75% of initially injected fracturing fluid may be recovered during flowback



Gas separation & flaring may lead to some emissions, also storage

Emission from handling/storage/flaring: 2.3% to air

The Hydraulic Fracturing Process

7. Regulated waste disposal or reuse of recovered fluids

- Re-use - treatment of recovered fluids, the use in future Fracturing Fluids
- Re-injection - some treatment and subsequent injection in other well(s)
- Regulated disposal - where waste fluids are processed by licensed waste contractors



Emission respectively: 0.3% / 0% / 0.3% to air

Summary of Emissions

Operation	Estimated Emissions to air (%)			
	Fracturing fluid product		Proppant	
Transport	0		0	
Storage and handling	0.3		0.03	
Handling and blending	1.2		0.02	
Injection of fluid	0		0	
Subsurface fracturing	0		0	
Treatment of recovered fluid	2.3		0	
Waste: re-use on-site	0.3			0
disposal off-site		0.3		0
injection on-site			0	0
Total emissions per fracture	4.1	4.1	3.8	0.05
Average emissions per day	1.025	1.025	0.95	0.025

SpERC Factsheet

FS Surface	Expected types of information		FS Surface	Expected types of information	
Process description	Description of operation:				
	Activities within the scope of the SpERC include: transfer of chemical and				
	RF air	Numeric value / percent of input amount: -0.95% if water is disposed of via re-injection to disposal well. -1.025% if waste-water is re-used or disposed of via treatment works.			
	Justification RF air	IOGP, CEFIC, EOSCA, 2015.			
	Substances in recovered water may be treated via a waste water treatment plant where there is potential for emissions to surface water.				

Background Document



BACKGROUND INFORMATION DOCUMENT SUPPORTING THE GENERIC EXPOSURE SCENARIO FOR THE USE OF CHEMICALS IN THE EXPLORATION AND PRODUCTION OF HYDROCARBONS (SUCH AS SHALE GAS) USING HIGH-VOLUME HYDRAULIC FRACTURING

1. Introduction

On 22 January 2014, the Commission adopted a decision on the exploration and production of hydrocarbons using high-volume hydraulic fracturing' (2014/70/EU) which sets out a framework for environmental management of such activities, including its use during

1. Scope of Generic Exposure Scenario according to REACH
2. Description of the hydraulic fracturing operation
3. Use of fracturing fluid products in hydraulic fracturing
4. Emission characterization for the hydraulic fracturing operation
5. Summary of emissions
6. Conclusions

EU Commission & ECHA comments

- The work was presented to EC DG Env. & ECHA
- Whilst generally well received some points raised:
 - Consider foreseeable accidents
 - EC/ECHA not convinced on well integrity
 - Further consider fate of substances in WWTW
 - Examples of relevant Human Health scenarios



Conclusions

- IUCLID 6: requirement to use Product Code PC41 for substances used in Hydraulic Fracturing
- IOGP, EOSCA & Cefic have worked jointly to develop a SpERC for Hydraulic Fracturing
- Final amendments in response to ECHA & EC will lead to publication of SpERC in Q4 2015
- Please use SpERC, run scenarios, and feedback!

Acknowledgements

The Hydraulic Fracturing Exposure Scenario Task Force:

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