

**A little more on
shale gas, shale oil and
hydraulic fracturing**

Some definitions (1/)

Hydraulic fracturing (fracking/fracing/hydrofracking):

Process of initiating and subsequently propagating a fracture in a rock layer, employing the pressure of a fluid as the source of energy. The fracturing is done from a well bore drilled into reservoir rock formations, in order to increase the extraction rates and ultimately recovery of oil and natural gas. Hydraulic fracturing for stimulation of oil and natural gas well was first used in the United States in 1947. It was first used commercially by Halliburton in 1949. Hydraulic fracturing was used before the 20th century to separate granite blocks from bedrock. Volcanic dikes and sills are examples of natural hydraulic fractures.

Source: http://en.wikipedia.org/wiki/Hydraulic_fracturing

Note: in a standard fracking operation between 7 and 15 cubic meters of water+sand+chemical are pumped through a well under very high pressure. The procedure can be repeated up to 14 times per well.

Source: Le Monde diplomatique – Juin 2011.

Some definitions (2/)

Shale gas:

Natural gas produced from shale (fine-grained sedimentary rock made of clay minerals, quartz, calcite...). Because shale ordinarily have insufficient permeability to allow significant fluid flow to a well bore, gas production in commercial quantities require fracture to provide permeability. For years shale gas has been produced using natural fracture. But modern technology in hydraulic fracking has permitted to create extensive artificial fractures around well bores. Horizontal drilling is often used with shale gas wells. The shale gas reserves are estimated to be five time the conventional gas one.

Source: http://en.wikipedia.org/wiki/Shale_gas

Some definitions (3/)

Shale oil from oil shale:

Oil shale is an organic-rich fine-grained sedimentary rock containing significant amounts of kerogen from which liquid hydrocarbons called shale oil can be produced. Shale oil is extracted by pyrolysis, hydrogenation or thermal dissolution of oil shale. The pyrolysis of the rock is performed in a retort, situated above ground or within the rock formation itself. First recorded extraction in history was in the early 14th century. As of 2008 most oil shale industries perform the shale oil extraction process after the rock is mined, crushed and transported to a retorting facility although several experimental technologies perform the process in-situ.

Source: http://en.wikipedia.org/wiki/Shale_oil

Note: using the fracking technology to extract shale oil is under consideration, even though I could not find an example of an existing operational shale oil fracking facility...

So what's wrong with fracking ?

Environmental & health effects:

- **Chemicals used in fracturing fluids:**

Fracturing fluids that are injected at high pressure into the ground contains about 90% water, about 9% propping agents (such as silica sand) and typically less than 0.5% chemical additives. In the U.S, Congress exempted fracturing fluid from regulations of the Safe Drinking Water Act in 2005. Some chemicals have been identified e.g. as carcinogens and endocrine disruptors.

- **Contamination of ground water**

Explosion of a water well in 2009 (Pennsylvania) due to combustible gas that has been allowed to escape in the region's groundwater supplies.

- **Risks to air quality**

Venting of bulk sand silos in the atmosphere can transport over several kilometers sulfuric oxides, nitrous oxides, volatile organic compounds (benzene, toluene, diesel fuels, hydrogen sulfides...).

Source: http://en.wikipedia.org/wiki/Hydraulic_fracturing

Movie now :-)

Where do we stand ? (1/)

France:

It is estimated that $\frac{1}{4}$ of the European resources are located in France. The prospection permits are covering about 10% of the French territory. In March 2010, 9672 square kilometers were opened to prospection. This was followed by a big protest movement (including visioning of Gasland) started in Ardeche, Aveyron, Drome, Gard, some of the regions covered by these permits. In June 2010, the government asked the gas companies to refrain using these permits until the publication of a mid-term report by a group of experts including engineers from the Mines et Ponts et Chaussees, the Ecology and Energy departments. The mid-April intermediary document authorized to pursue fracking in an experimental context, even though pointing out the lack of transparency in the permit attribution or information for the public. The protest movement extended then through ~80 associations monitoring wells activities, photographing, blocking trucks on their way to the sites. By December 2010 (election opportunism also helping ?) a law blocking the use of hydraulic fracking was adopted but...does not revoke the permits already given allowing other exploration techniques. TOTAL announced on May 13th, 2011 that it took some share in shale gas prospection in Poland, following the protest movement in France.

Where do we stand ? (2/)

United States:

Shale gas represents about 20% of the production of natural gas. Over 500 000 active wells have sprung up over the last ten years and at least 80 serious accidents (gas leak, water contamination, house explosion, death of cattle or domestic animals...). Clean water wells and rivers surrounding the drill sites in Colorado, Ohio, Pennsylvania, Texas and West Virginia are already polluted. Health problems and cancers rates have increased among residents living near these wells.

Source: Le Monde diplomatique – Juin 2011.

Switzerland:

Prospection has started with permits being granted in canton of Fribourg and Vaud starting at least in 2008. In April 2011, Fribourg canton suspended all authorizations to prospect on its territory for an undetermined period. Permits were granted to Texas-based Schuepbach Energy LLC (whose CEO is Martin Schuepbach, a Swiss geologist). Remark this is the same company that got a prospection permit for Ardeche (France).

Source: Swiss Info, wired article May 23rd, 2011 and tsr.ch (29 mars 2011).

Where do we stand ? (3/)

Germany:

Exxon Mobile Corp. started shale gas exploration drilling in western Germany with up to four exploratory wells.

Source: United Press International, wired article January 25th, 2011.

Sweden:

Abandoned the exploration of shale gas exploitation in Southern Sweden (declared as not viable) in 2011.

Source: http://en.wikipedia.org/Shale_gas

Poland:

Largest reserve of European shale gas is estimated to be in Poland (majority being in the Baltic sea basin). Halliburton carried out the first drilling operation in September 2010.

Source: http://en.wikipedia.org/Shale_gas