Let us speak about water usage

Oil & Gas operations may require significant amounts of water especially during the implementation of extensive hydraulic fracturing campaigns such as those dedicated to the development of unconventional shale plays. A fracturing fluid is 90% water, the rest being shared between a propping agent (9 to 9.5% of sand in most cases) and chemicals. For instance, a 10 multi-stage fracturing job will require between 10000 m^3 and 20000 m^3 of water the equivalent of an Olympic swimming pool.

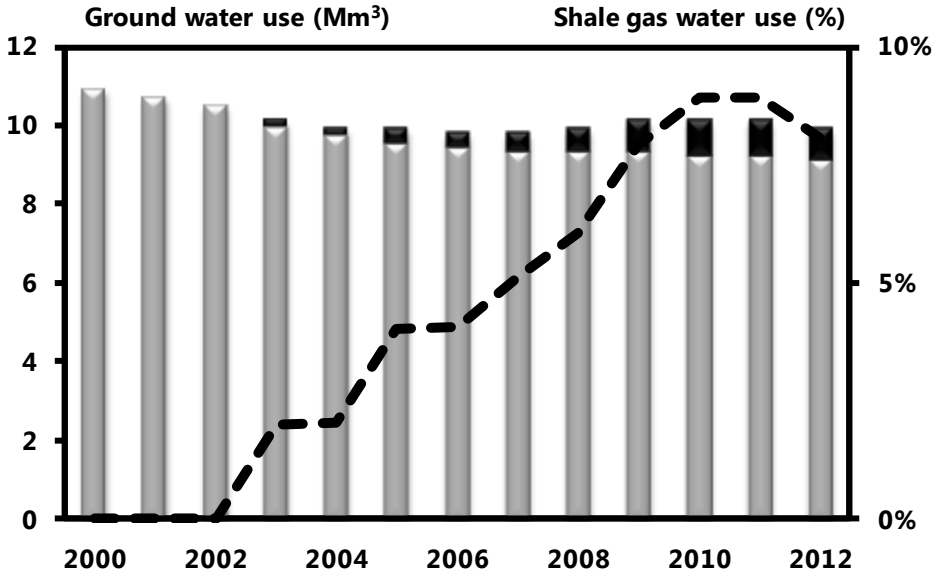

Figure 1 - Barnett shale water usage in the Northern Trinity Aquifer[1]

However, from a global point of view, water needs for hydraulic fracturing is not a key issue. Although these quantities may be considered extremely large by stakeholders owing to the large number of trucks circulating, water usage is purely a local issue. As shown in **Figure 1**, the 2011 water usage dedicated to shale gas operations in the Barnett area was in the range of 12 million cubic meters, that is, less than 8% of the total water usage **in the area**.

M^3 of water for 1 ton of	
Babana	350
Corn	450
Potatoes	600
Wheat	600
Soja	900
Rice	5000
Cotton	5000
Steel	80
Aluminium	1200

M^3 of water for 1MWh_{equ} of	
Nuclear power plan	2
Coal power plan	2
Gas power plan	1
Ethanol	275
Shale gas	0,017

Figure 2 – Shale gas, agriculture[2], industry[3,4] & other energy water usage[5]

[1] Source: Texas Water Development Board Report
[2] CNRS (http://www.cnrs.fr/cw/dossiers/doseau/decouv/usages/consoAgri.html)
[3] Water Use and Nuclear Power (Nuclear Energy Institute) (http://www.nei.org)

Figure 2 highlights water usage to produce various goods in agriculture and industry. Considering a conventional shale gas well from Barnett (15000 m^3 of water for 3Billion cubic feet of reserves), the water used in 2010 for US production of wheat (60Mtons) and steel (80Mtons) would be enough to drill respectively…2.6 million and 425,000 shale gas wells. In terms of power equivalent, a Barnet shale produces the same amount of heat with only 17 liters of water, whereas a nuclear or coal power plant requires 2m^3 and bio-ethanol…276 m^3.

An aggressive European shale gas project starting in 2020 and finishing in 2050 would need to drill 50,000 wells, with peaks of 1,000 and 3,000 wells respectively around 2035. To satisfy the needs of hydraulic fracturing, the total water usage would 1 billon m^3 over thirty years. These figures may seem high but are actually marginal on a European scale. The peak water usage would be around 60 million m^3 in 2035, a value to be compared with annual water consumption in France which, for 2012 alone was 33 billion m^3.

Locally, water has to be considered openly with respect to stakeholders. Before any operational activity starts, all relevant data related to water availability (river, lake, underground water), precipitation level and usage history (agriculture, industry, domestic) will be collected. The impact of future development will then be assessed by establishing a water balance workflow including water needs (for drilling fracturing and injection), the most relevant water sources, supply brought by precipitation and the amount of water that could possibly be recycled (see next paragraph). Stakeholders will be informed transparently about the quantities of water to be used and how the Company plan to manage it according to local availability and current usage. The Company will regularly publish the amount of water used and recycled and if necessary, will adapt its strategy to new situations. Finding substitutes for usual sources such as brackish or sea water, when there is easy access to the sea from the site, can help avoid drawing on sources for domestic, agriculture and industrial use and act in favor of acceptability.

[4] World Steel Association

[5] Ethanol equivalent energy is 26 10^3 MJ per ton (http://www.chimix.com/an7/prem/ethanol1.htm)