

En Pennsylvanie, des nappes phréatiques polluées par le gaz de schiste

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Publiée dimanche 23 juin dans la revue de l'Académie des sciences américaine, l'étude conduite par le biologiste Robert Jackson, professeur à la Duke University à Durham (Etats-Unis), devrait relancer l'affrontement entre les tenants et les adversaires de l'exploitation du gaz de schiste. Et fournir de nouveaux arguments à ces derniers.

De fait, les travaux du chercheur américain mettent en évidence, dans le nord-est de la Pennsylvanie, de fortes teneurs en méthane (CH₄) des eaux souterraines prélevées autour des puits de gaz non conventionnel. Cette pollution n'est pas circonscrite aux abords immédiats des gisements : elle concerne les zones situées jusqu'à un kilomètre autour des points de forage.

Les scientifiques ont analysé l'eau issue de 141 points de prélèvement dans les nappes phréatiques de cette partie des Appalaches. Environ 80 % des échantillons étudiés montrent des teneurs mesurables de méthane – l'hydrocarbure qui forme l'essentiel du gaz extrait. Loin des puits, les niveaux enregistrés sont généralement faibles. En revanche, à moins d'un kilomètre de la production, les niveaux de contamination sont six fois plus élevés, en moyenne.

TENEUR IMPORTANTE EN MÉTHANE

Les scientifiques ont cherché d'autres causes possibles à ces teneurs élevées en méthane (composition du sous-sol, topographie) mais le seul paramètre permettant de les expliquer est, selon leur analyse, la présence proche d'un forage. En outre, les auteurs ont examiné la signature isotopique du méthane retrouvé dans les nappes : plus les forages sont proches, plus cette signature est caractéristique du méthane piégé dans les roches profondes. La présence d'hydrocarbures dans les aquifères, lorsqu'elle dépasse un certain seuil, n'est donc pas imputable à des contaminations de bactéries "méthanogènes".

Les concentrations de méthane mesurées près des puits ne sont pas anecdotiques. Pour une vingtaine d'échantillons, tous ou presque situés à moins d'un kilomètre des forages, la teneur en méthane excède 10 milligrammes par litre (mg/l), seuil de préoccupation pour les autorités sanitaires américaines. Dans une douzaine de cas, l'hydrocarbure est présent, dans une eau présumée potable, à plus de 28 mg/l – soit le seuil d'"action immédiate", selon la réglementation en vigueur. L'eau la plus contaminée affiche une teneur en méthane de près de 70 mg/l.

Si le lien avec l'exploitation du gaz de schiste ne semble pas faire de doute, il n'est pas possible – en l'état – d'incriminer la technique de fracturation hydraulique elle-même. Celle-ci consiste à injecter sous haute pression et à très grande profondeur (plus d'un kilomètre en général) de l'eau mêlée à du sable et à des adjuvants chimiques. Ainsi fracturée, la roche libère les hydrocarbures qu'elle séquestre.

RISQUE DE FISSURES DANS LE SOUS-SOL

Pour ses adversaires, cette technique présente le risque d'ouvrir de longs réseaux de fissures dans le sous-sol, susceptibles de mettre en relation des réservoirs de gaz et des nappes phréatiques. Sans exclure ce processus assez improbable, les chercheurs américains jugent plus crédibles de mauvaises pratiques de forage : défauts de cimentation des puits, etc.

Une telle interprétation des résultats est appuyée par une autre découverte. Les niveaux de contamination des nappes

phréatiques ne seraient pas uniquement liés à la distance qui les sépare des puits de gaz de schiste. L'âge de ces derniers semble également jouer un rôle. "Dans nos données, il y a une petite tendance à voir des concentrations de méthane augmenter avec l'âge des puits", écrivent les chercheurs.

Deux explications sont proposées pour expliquer ce lien. La première est que les puits vieillissent mal et que leur étanchéité diminue à mesure que le temps passe. Dans ce cas, "les problèmes de potabilité de l'eau pourraient s'accroître au fil des années". La seconde serait que "les pratiques de forage s'améliorent avec le temps". Pour trancher, les auteurs de l'étude appellent à lancer rapidement de nouvelles études.

Shale gas won't stop peak oil, but could create an economic crisis

Ahmed Nafeez

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Overinflated industry claims could pull the rug out from optimistic growth forecasts within just five years

A new [report](#) out last week from the US Energy Information Administration (EIA) has doubled estimates of "technically recoverable" [oil](#) and [gas](#) resources available globally. The report says that shale-based resources potentially [increase the world's total oil supplies](#) by 11 per cent.

Acknowledging fault-lines in its new study, contracted to energy consulting firm [Advanced Resources International Inc.](#) (ARI), the EIA said:

"These shale oil and shale gas resource estimates are highly uncertain and will remain so until they are extensively tested with production wells."

The report estimates shale resources outside the US by extrapolation based on "the geology and resource recovery rates of similar shale formations in the United States." Hence, the EIA concedes that "the extent to which global technically recoverable shale resources will prove to be economically recoverable is not yet clear."

Two years ago, following the publication of the EIA April 2011 report a [New York Times investigation](#) obtained internal EIA communications showing how senior officials, including industry consultants and federal energy experts privately voiced scepticism about shale gas prospects.

[One internal EIA document](#) said oil companies had exaggerated "the appearance of shale gas well profitability" by highlighting performance only from the best wells, and using overly optimistic models for productivity projections over decades. The [NYT](#) reported that the EIA often "relies on research from outside consultants with ties to the industry." The latest EIA shale gas estimates, contracted to ARI, is no exception. ARI, according to the [NYT's 2011 article](#), has "major clients in the oil and gas industry" and the company's president, Vello Kuuskraa, is "a stockholder and board member of Southwestern Energy, an energy company heavily involved in drilling for gas in the Fayetteville shale formation in Arkansas."

Independent studies published over the last few months cast even more serious doubt over the viability of the shale gas boom.

A [report](#) released in March by the Berlin-based Energy Watch Group (EWG), a group of European scientists, undertook a comprehensive assessment of the availability and production rates for global oil and gas production, concluding that:

"... world oil production has not increased anymore but has entered a plateau since about 2005."

Crude oil production was "already in slight decline since about 2008." This is consistent with the EWG's earlier finding that global conventional oil production had [peaked in 2006](#) - as subsequently corroborated by the [International Energy Agency \(IEA\) in 2010](#).

The new report predicts that far from growing inexorably, "light tight oil production in the USA will peak between 2015 and 2017, followed by a steep decline", while shale gas production will most likely peak in 2015. Shale gas prospects outside the US are incomparable to gains made so far there "since geological, geographical, and industrial conditions are much less favourable."

Consequently, global gas prices are likely to increase rather than follow the initial US trend. In the meantime, conventional oil production will continue declining, dropping as much as 40 per cent by 2030. The upshot is that the US "will not become a net oil exporter."

The EGW report follows two other reports published earlier this year also challenging the conventional wisdom.

A [Post-Carbon Institute study](#) authored by geologist David Hughes, who worked for 32 years as a research manager at the Geological Survey of Canada, analysed US production data for 65,000 wells from 31 shale plays using a database widely used in industry and government. While acknowledging that shale has dramatically reversed "the long-standing decline of US oil and gas production", this can only:

"... provide a temporary reprieve from having to deal with the real problems: fossil fuels are finite, and production of new fossil fuel resources tends to be increasingly expensive and environmentally damaging."

Despite accounting for nearly 40 per cent of US natural gas production, shale gas production has "been on a plateau since December 2011 - 80 per cent of shale gas production comes from five plays", some of which are already in decline.

"The very high decline rates of shale gas wells require continuous inputs of capital - estimated at \$42 billion per year to drill more than 7,000 wells - in order to maintain production. In comparison, the value of shale gas produced in 2012 was just \$32.5 billion."

The report thus concludes:

"Notwithstanding the fact that in theory some of these resources have very large in situ volumes, the likely rate at which they can be converted to supply and their cost of acquisition will not allow them to quell higher energy costs and potential supply shortfalls."

Report author Hughes said that the main problem was the exclusion of price and rate of supply: "Price is critically important but not considered in these estimates." He added: "Only a small portion [of total estimated resources], likely less than 5-10 per cent will be recoverable at a low price..."

"Shale gas can continue to grow but only at higher prices and that growth will require an ever escalating drilling treadmill with associated collateral financial and environmental costs - and its long term sustainability is highly questionable."

Another [report](#) was put out by the Energy Policy Forum, and authored by former Wall Street analyst Deborah Rogers - now an adviser to the US Department of the Interior's Extractive Industries Transparency Initiative. Rogers warns that the interplay of geological constraints and financial exuberance are creating an unsustainable bubble. Her report shows that shale oil and gas reserves have been:

"... overestimated by a minimum of 100% and by as much as 400-500% by operators according to actual well production data filed in various states... Shale oil wells are following the same steep decline rates and poor recovery efficiency observed in shale gas wells."

Deliberate overproduction drove gas prices down so that Wall Street could maximise profits "from mergers & acquisitions and other transactional fees", as well as from share prices. Meanwhile, the industry must still service high levels of debt due to excessive borrowing justified by overinflated projections:

"... leases were bundled and flipped on unproved shale fields in much the same way as mortgage-backed securities had been bundled and sold on questionable underlying mortgage assets prior to the economic downturn of 2007."

Seeking to prevent outright collapse, the report argues, the US is ramping up gas exports so it can exploit the difference between low domestic and high international prices "to shore up ailing balance sheets invested in shale assets."

Rogers, who testified last month before the Senate Committee on Energy and Natural Resources, also expressed scepticism about the EIA's latest assessment:

"The EIA actually does retrospective assessments of their forecasting and their track record is dismal... They admit that they overestimated natural gas production 66 per cent of the time and crude 59.6 per cent of the time in their March 2013 assessment for 2012."

She added that "there is definitely a bubble." Though it would not have an impact as devastating as the banking crisis, she said:

"The oil majors do have losses, but the smaller independents are being shaken out. Chesapeake and others are struggling, like Devon, Continental, Kodiak and Range. Without exception, they all have had a significant deterioration in negative free cash since 2010. This is obviously not sustainable."

The impact of this would be greater centralisation, with smaller companies and their assets being absorbed by the oil majors through mergers and acquisitions. Rogers said:

"What is most troubling to me is that there appears to be a complacency setting in about transitioning to a more sustainable energy economy. Shales should be used as a bridge. But we are hearing far too much euphoric talk about 100-200 years of natural gas. Therefore no need to worry, it can be business as usual. This is highly problematic in my opinion. We must globally transition away from hydrocarbons."

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