U.S. energy revolution: We can’t ignore the consequences

The global energy market is currently experiencing a major transformation. After several decades of decline, natural gas and oil production in the United States is surging spectacularly—a thrust that is expected to continue in the coming years, or even decades. This supply shock will have substantial and lasting impacts on the global energy market. Prices for natural gas and electricity will remain relatively weak and the major energy exporters will have to deal with a much more competitive global market than what was forecast a few years ago. Oil prices are not expected to collapse, however.

NOT LONG AGO THE SPECTRE OF A SHORTAGE OF HYDROCARBONS WAS VERY REAL

To realize the extent of the sea change the global energy market is facing, we have to look back at what the situation was like in the mid-2000s. At that time, the phenomenal economic growth in the emerging countries—with China in the lead—fueled rapidly growing global demand for oil that no one seemed able to accommodate. Despite record prices for black gold (graph 1) and major investments, oil production in the industrialized countries stagnated, and the question everyone was asking was: how long can Saudi Arabia supply the rest of the world with oil? The situation was no better with natural gas; the United States and Europe relied increasingly on imports to meet their needs.

All signs suggested that oil prices—which shot up from less than US$30 per barrel in 2003 to more than US$100 by 2007—would continue to climb and many thought that a decline in global production was inevitable in the short or medium term. The downturn in oil and gas production in the United States had taken hold, and that country’s growing dependency on increasingly expensive energy imports was a very serious concern. In stark contrast, the future appeared to be bright for energy exporting countries like Canada.

A TECHNOLOGICAL REVOLUTION PROPELLED BY SURGING PRICES

The mining of major oil and shale gas deposits has changed things dramatically. We have known about the existence of these vast pools of hydrocarbons trapped in sedimentary rock formations for many, many years. Shale gas started to be extracted in the United States in the mid-1800s, albeit on a very small scale. The first wells that applied hydraulic fracturing—a technique that consists of extracting gas by injecting pressurized liquid into rock, causing it to

François Dupuis
Vice-President and Chief Economist

Yves St-Maurice
Senior Director and Deputy Chief Economist

Mathieu D’Anjou
Senior Economist

514-281-2336 or 1 866 866-7000, ext. 2336
E-mail: desjardins.economics@desjardins.com

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«fracture»—started popping up at the end of the 1940s. However, it was only in the late 1990s that hydraulic fracturing became efficient enough to make shale gas operations profitable. By 2000, shale gas represented only 2% of all natural gas production in the United States.

The surge in natural gas prices in the 2000s prompted gas producers to intensify their efforts to mine more non-conventional deposits. Shale gas production increased modestly at first, but the number of drilling sites soon multiplied and new fracturing and horizontal drilling methods helped production to explode since the mid-2000s. As a result, natural gas production in the United States jumped 34% between 2005 and 2012 to reach a new historical peak (graph 2), while the proportion of shale gas soared to nearly 40%. The upsurge in U.S. proven gas reserves is even more impressive.

Graph 2 – After decades of difficulties, U.S. natural gas production and proven reserves have rebounded to new heights.

NATURAL GAS: FROM SHORTAGE TO SURPLUS

The spectacular surge in U.S. production took everyone by surprise. While just a few years ago it looked as though imports of liquid gas would be the only way to meet future demand in the United States, it quickly became clear that shale gas production would be more than enough to meet U.S. growth. Since the storage capacity for gas is limited and exporting vast quantities of natural gas to other continents is difficult to do, the North American market found itself in a surplus situation in no time. Natural gas prices dwindled and the U.S. recession even fueled concerns that prices would fall to zero as we edged closer to the maximum storage capacity. Rock-bottom prices temporarily halted the development of shale gas deposits and we expect production to be sluggish in 2013 and 2014. The market appears to be rebalancing, however, which has helped prices get back to more acceptable levels for producers.

ROUND 2: OIL

At first, the energy revolution seemed to have only natural gas in its sights. The mining of shale deposits was undoubtedly a positive development for the oil industry but, at best, it was expected to slow the longstanding downtrend in U.S. crude oil production, which plunged by almost 50% between 1970 and 2008.

The stunning surge in production at the Bakken field in North Dakota helped prove the effectiveness of new technologies in developing shale reservoirs that contain richer concentrations of oil. Since then, the results of shale oil extraction have kept beating the most optimistic expectations, and U.S. oil production has soared 30%—more than 2.5 million barrels a day—since 2008 (graph 3). This increase in production is comparable to the oil output in Venezuela, an important member of the Organization of the Petroleum Exporting Countries (OPEC). We can genuinely say that we are in the midst of another oil boom. In Western Canada, shale oil production has also exploded in the past few years.

Graph 3 – The U.S. oil industry is also experiencing a renaissance

WHY HAVE OIL PRICES HELD UP BETTER THAN GAS PRICES?

Motorists may find it difficult to believe that we are in the middle of an oil revolution, with the price of gas and even oil at stubbornly high levels from a historical standpoint. This can be explained as follows: Until now, the energy revolution has been a North American and not a global phenomenon. For the natural gas market, which remains largely regional, the surge in U.S. production has changed everything. For the oil market, which is highly integrated on a global scale, ramped-up production in North America is significant but not enough to cause a price collapse. Insufficient infrastructure to transport this newly produced oil to refineries and international markets has also limited the impact on prices, until now.
Besides crude prices, the energy revolution has already had a major impact on the global oil market. North America is back on top and will continue to drive the run-up in crude oil production for the next few years. While the demand for oil is on a downtrend in North America, the escalation of production in the United States has already enabled that country to significantly reduce its net imports of oil. Unlike the oil sands, shale oil is a light crude oil, which will have major impacts on the refining industry that was readying itself to process heavy petroleum.

CONSEQUENCES
The energy revolution in the United States is real and all the experts agree that it will continue in the years ahead. For natural gas, after taking a breather in 2013 and 2014, we expect U.S. production to keep forging ahead for decades to come. Where oil is concerned, experts expect production to ramp up quickly until 2020, and then flatten. In our opinion, the main outcomes for the next few years are described in the following paragraphs.

Natural gas and electricity prices in North America will remain relatively weak. One major element about developing shale gas is that a new well produces a tremendous amount of gas in the early stages, which drops off considerably in time. This suggests that producers will be able to adjust quickly if gas prices shift away from the profitability level (graph 4). Stagnant production this year following the drop-off in prices last year illustrates this. As such, we could assume that natural gas prices in North America will remain close to the cost of developing shale gas, currently at about US$4 per MMBTU (Million British Thermal Unit), which could fall further if the technology continues to be developed. While natural gas and coal produce about two-thirds of electricity in the United States, the cost of electricity should also remain close to current levels for several more years.

The possibilities that oil prices will soar have been significantly reduced, but prices could stay close to their current levels. The ongoing development of shale oil deposits in North America will provide the global oil market with a wide margin of flexibility. The most recent forecasts of the International Energy Agency showed that the increase in production by non-OPEC oil producing countries will be almost enough to meet the increase in global demand until 2018 (graph 5). In this context, oil prices are unlikely to soar. However, we have to keep in mind that, much like the oil sands, developing shale deposits requires the price of crude oil to remain relatively high, i.e. around US$80 per barrel, to be profitable.

The major energy exporters will have much less clout than one would have expected. The marked drop in U.S. dependency on foreign energy (graph 6 on page 4) and its role as a net gas exporter as of 2020 (graph 7 on page 4) (based on certain estimates) will change everything for many countries. OPEC countries will have to turn to the emerging countries, and risk losing a lot of political clout in so doing. This could have major impacts on political stability, especially in the Middle East. Even in Europe, imports of coal from the United States and the potential to develop shale deposits have already slashed Russia’s clout which, just a few years ago, had the capacity to cut Europe’s power supply by interrupting its gas exports.

Mixed news for Canada. Things have also changed for Canadian producers who just a few years ago viewed the United States as a client who would pay almost any price to make sure it had access to energy. The U.S. market will remain open to imports, but the prices will be dictated by U.S. conditions, not by production costs. The development

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1 Light crude oil has lower density and viscosity and is easier to refine than heavy crude oil.
of oil sands should continue, but major efforts to control costs will have to be made. The prices for Quebec’s electricity exports, which have nosedived by about 50% since the mid-2000s, will remain weak and some projects aimed at boosting the production of electricity might need to be reviewed. That said, the activity triggered by the energy revolution and the drop in energy prices could have a positive ripple effect on North America overall.

The development of certain alternative energy sources could sputter. Besides the environmental issues, soaring energy prices and concerns about a shortage fueled the massive investments made to develop new energy sources in the 2000s. An environment that is flush with energy could be less favourable to these sectors. The future of ethanol seems particularly at risk, given that natural gas could very well become the more efficient and affordable alternative fuel. Fortunately, some technologies like electric cars and solar energy seem to have advanced to the degree that they could stand on their own, even if no shortage of hydrocarbons were to materialize.

The ecological consequences are hard to foresee. On the positive side, the shale gas and oil revolution has led to a substantial reduction in U.S. greenhouse gas emissions due to the declining use of coal. Part of this coal is being exported to Europe, however, where it might replace cleaner energy sources. In the end, developing shale deposits should lead to an increase in the overall use of hydrocarbons, with less efforts to develop nuclear and alternative energies, and reduce the use of coal. The long-term environmental effects of hydraulic fracturing, especially the impact on ground water, are also raising many concerns.

A worldwide revolution is likely to occur within the next few decades. For the time being, the energy revolution remains a North American phenomenon—with some international outcomes. Shale deposits exist everywhere on earth, however, and the U.S. experience could be repeated in many places, including Europe and China. This won’t happen overnight however, given the many obstacles to be dealt with in other countries (stricter environmental rules, less favourable geological environment, less expertise and less developed infrastructures). A worldwide revolution could lead to a widespread decline in energy costs, and it could have very positive effects on global economic growth over the long term.