

CHAPTER ONE

THE MOTHER OF ALL BATTLES. THE FLATTENING AND GLOBALIZATION OF THE ENERGY WORLD

There is nothing permanent, except change.

Heraclitus

At 2.46 pm on the 11 March 2011, the largest earthquake in the history of Japan triggered a giant tsunami wave that would change the energy world forever.

I was on a conference call in my office when the prices of the Japanese yen started to swing wildly. Something had happened. Shortly after, the news was hitting the wires: “Massive 9.0 Earthquake Hits East Coast of Japan. Tsunami Warning Issued”. While Japan had a long history of earthquakes, such as the Unzen earthquake and tsunami in 1792 that left a death toll of over 15,000,¹ a tremor of 9.0 on the Richter scale was at a whole new level, and would make this earthquake the largest in the history of Japan and the fifth largest globally since records began in 1900.

Within minutes, a series of giant tsunami waves reached Fukushima Daiichi power plant. More than twice as high as the protective seawalls, the waves flooded the power station and damaged the back-up generation and cooling systems. The situation was

out of control, and radiation was eventually released, making Fukushima the worst nuclear accident since Chernobyl in 1986, both rated level 7 on the International Nuclear Event Scale.

Nuclear politics

I immediately recognized Fukushima as yet another “black swan”, an event that has a very large impact that no one had anticipated before the fact, but that everyone viewed as obvious after the fact. The scale of the earthquake and the unfortunate series of events were unique to Fukushima, but lessons would be learnt and new processes and security measures would be put in place, as has always been the case when accidents and natural disasters have occurred.

But within days, and despite decades of safe nuclear power, countries around the world were closing down nuclear plants and rethinking their plans of extending the life of existing plants and building new ones. Politicians had taken over and were reshaping the future of nuclear power.

But not all countries reacted the same way. Fukushima did not change the position of France, which produces over 75% of its own energy needs from nuclear power. And it did not change the position of China either, which maintained its plans to build up to 70 new nuclear plants by 2020.

The nuclear world was polarized, but I was optimistic that common sense would prevail and that short-term knee-jerk reactions would give way to long-term constructive solutions and even safer power generation across the world.

There is, however, no doubt in my mind that Fukushima was a critical milestone towards the end of OPEC’s dominance. Let me tell you why.

The sustained spike in natural gas prices

The close down of all nuclear capacity in Japan left a large gap in power generation that had to be filled by coal, natural gas, and crude oil.

The seaborne coal market was able to absorb the increase in Japanese demand with relative ease, but the much smaller market of seaborne liquefied natural gas (LNG) suffered a severe shock that sent prices skyrocketing.

Prices of natural gas in Asia more than doubled reaching over \$20/MMBtu, equivalent to over US\$110 per barrel of oil equivalent (USD/boe).²

Fukushima impacted other large Asian consumers, such as Korea, Taiwan, and China, who also rely on natural gas for their current and future power generation mix, reinforcing the perception that Asia would buy “unlimited amounts of gas, at unlimited prices”.

The imbalances could not be resolved easily, and the price of LNG for delivery to Japan stayed at an extremely high level for several years in order to direct any available LNG towards North East Asia.

In March 2014, three years after the Fukushima accident, and after extensive political debate in Japan, Japanese Prime Minister Abe announced his pledge to gradually restart nuclear reactors towards the end of the year, which will most likely ease the demand and domestic tightness of natural gas in the region.

However, the sustained high prices and optimistic demand expectations have been a major incentive to the development of new production and liquefaction capacity around the world. The list of producing countries and investments is long.

Look at Australia, for example, investing over half a trillion dollars in new LNG infrastructure to unlock large stranded reserves.

Or Mozambique, where local engineers in the mid-1990s were telling me how desperate they were to prove the large potential of the country, but where the perception among politicians was that it was not worth exploring. Ten years later, with the incentives of high prices and cooperation with international investors and companies, the country made some of the most important gas discoveries and infrastructure development in the region.

Or, even Cyprus and Israel, where large discoveries are putting them on the energy map . . . as producers!

Fracking and the collapse in US natural gas prices

While Fukushima created a demand shock and sharply higher global LNG prices, a *quiet revolution* had been taking place in North America for over a decade that had transformed the supply and drastically reduced prices of domestic US natural gas.

For decades, engineers knew about the vast amounts of natural gas resources that were trapped inside shale formations, but had not found a way to extract them commercially on a large scale. But the supply revolution which had started quietly in the Barnett Shale, Texas, in the early 2000s changed that.

“Not sure I told you before”, a senior member of one the largest sovereign wealth funds in the world told me, “I have a degree in nuclear engineering. My first job during the 1970s was to research the application of nuclear technology to extract natural gas from shale formations. It has taken a few decades, and a different technology, but I guess my fellow engineers have finally won”.

Indeed, production engineers had found a solution to unlock the gas trapped inside shale rock formations thanks to the combination of horizontal drilling and hydraulic fracturing. And the potential was massive.

The United States, once thought to be in critical shortage of natural gas, was now enjoying an abundance with enough supply to cover over 100 years of demand.

I remember the first time I heard “US energy independence is real”. It was in 2006, and I was meeting large oil and gas producers in Houston. I had endless debates about decline rates, lack of commerciality, environmental risks, the impossibility to replicate the success of the Marcellus Shale elsewhere in the United States, and other considerations. At that time the

view was that shale gas would not be economical below \$8/MMBtu and that decline rates would make the “fad” disappear soon.

But the reality turned out to be quite different.

By April 2012, following the unusually warm winter in North America, the price of US natural gas had fallen to \$2/MMBtu,³ levels not seen for over a decade. The words of a good friend resonate in my head: “never bet against human ingenuity”.

The divergence in prices between North America and Asia had indeed been extraordinary. Exactly the same molecules of natural gas were trading at a 1000% premium across the world. The implications are deep, and go beyond energy markets.

Access to abundant, cheap, and cleaner energy has been an important contributor to the recovery and enhanced competitiveness of the United States relative to the rest of the world. On the other hand, expensive energy has had a negative impact on the Japanese economy and competitiveness.

Looking forward, the combination of political and logistical constraints may keep these extraordinary differentials for several more years, but this will not last forever. The markets are sending strong signals, and the response is simply a matter of time.

US tight oil

The shale gas revolution is not just about natural gas. It is also about crude oil.

The engineering feats of horizontal drilling and fracking have been applied with great success in the extraction of crude oil from shale-like formations.

The impact of this “tight oil” is very significant, and has contributed to the growth towards record domestic production in North America.

I was in Moscow in 2006 when a senior executive of a large national oil multinational told me “shale oil is a bluff”. I started

talking about the rapid development in technology and reduction in the cost curve, and how the trend would make tight oil economical within three years at above \$70/bbl. I could see he was getting agitated. “I will not see shale oil reach a meaningful level of production, and neither will my children nor my grandchildren”. And four years later, during a debate in Spain with some peak oil defenders who had never seen an oil field in their lives, I was told again “shale oil is a bluff”. Yet, during that time, the production in North Dakota had increased three-fold,⁴ twice as much as what doomsayers said would be “the peak”, contributing to the record US production, now as high as Saudi Arabia. Yet, still today I hear the occasional “shale oil is a bluff”.

Geopolitics and high crude oil prices

The oil embargo in 1973 had taken everyone by surprise, changed the energy world forever, and shaped international politics and economics.

Energy security became a top strategic priority for governments around the world, who were using any tool at their disposal to reduce their dependency on Middle East oil.

The high prices of the 1970s displaced crude oil from power generation and industrial uses in favour of coal, natural gas, nuclear, and other alternatives.

But crude oil managed to maintain its monopoly over the transportation sector. Gasoline, diesel, and jet fuel are all derived from crude oil and have *so far* faced limited competition from other fuels such as natural gas and electric cars.

Consumers have tried to find cheaper and more reliable alternatives, but until recently they have not been available on a large and commercial scale. But things are changing, and quickly.

In the meantime, geopolitics has remained a major source of volatility and uncertainty, giving consumers an incentive to find alternative solutions.

In 2011, around the same time as the Fukushima disaster was changing the nuclear and natural gas markets, North Africa was involved in a geopolitical tsunami that would become known as “the Arab Spring”.

The events that started in Tunisia quickly spread across the region – Egypt, Libya, Syria, Bahrain, Algeria – in what seemed like an unstoppable geopolitical domino that would eventually reach the core of the Middle East.

I was supposed to fly to Riyadh in Saudi Arabia around those dates. During my career in the oil industry I have travelled to many live conflict areas – Sierra Leone, Nigeria, Colombia, Venezuela, and Jordan – and from the airport to the hotel to the meeting to the hotel and back to the airport, I have always been accompanied by bodyguards and a convoy of armoured cars. Sometimes it felt a bit excessive, but time would prove them right. During those trips I had numerous scares. Perhaps the worst one happened at the Sheraton in Ikeja, Nigeria, when we were woken in the middle of the night by gunfire as a mob was trying to assault the premises. Luckily the situation was kept under control, yet, as scary as it was, we had our morning meetings at the hotel the day after as if nothing had happened. However, this time, for some reason, it felt different.

The developments in North Africa sent crude oil prices skyrocketing in response to both actual and potential supply disruptions.

But the consumer world was better prepared this time and started to trigger its defence mechanisms. The US Energy Information Administration (EIA) coordinated the release of 60 million barrels from its global strategic petroleum reserves, helping to calm and stabilize the nervous markets.

Luckily the situation was contained, and the largest producers such as Saudi Arabia were not impacted, and despite the ongoing disruptions in North Africa, prices moved to what felt like an unstable equilibrium at high but moderate prices.

What is important to note is that events that perhaps create the perception that the energy world is not flat, such as geopolitics, supply concentration, and the dependence on oil, are actually strong flattening forces that destroy those imbalances.

How? Well, for every geopolitical event and every issue of security, consumers have always reacted by building buffers and making contingencies, from storage, to demand destruction, to new discoveries, to developing new technologies.

In 2014, despite the ongoing supply disruptions from Libya, oil sanctions in Iran, ongoing conflicts and disruptions from Sudan and Syria, and a drastic reduction in Iraq volumes, the price of crude oil had a very moderate response.

Yes, geopolitics can result in higher prices in the short term, but invariably result in lower prices in the longer term. The net result: a flatter energy world.

Expensive oil, cheap natural gas

In 2012, the price of crude oil in North America was almost 10 times more expensive than natural gas in energy equivalent terms. Never before had the ratio between crude oil and natural gas been so wide.

The reason for such extreme divergence is that there is no direct mechanism of *short-term* substitution between them. As discussed, crude oil is mostly used for transportation, and natural gas for power generation and residential and industrial uses.

But how about the *longer term*? Is there a mechanism for substitution? Why continue to rely on Middle East oil? Why continue to feed our cars with petrol? Or with corn-based ethanol? Why not use natural gas for transportation? Exactly!

In North America, the abundance of natural gas reserves, a surge in production, and a steep price discount are incentivizing consumers to develop and implement technologies that use less oil and more natural gas.

The substitution is starting to be evident and will have major implications for the crude oil market.

I am amused when I hear people say that crude oil is untouchable or that the shale revolution will only impact North America. The revolution is global and has deep implications across energy sectors with many winners and losers, OPEC among them.

The market does not attack, it defends itself

One of the first lessons I learnt when I got involved in the world of commodities is that prices are both signals and incentives.

Prices signal imbalances and incentivize economic behaviour, as the market “defends itself”. For example, Fukushima created a positive premium that incentivizes the transport of natural gas to Japan. On the other hand, shale gas has created a negative premium for US domestic producers, while incentivizing the demand via the substitution of coal for power generation, or attracting petrochemical businesses back to North America.

The large price differentials across crude oil and regional natural gas are incentivizing the development of new infrastructure capacity such as liquefaction plants, pipelines, and storage.

Energy infrastructure is very capital intensive, and can take many years to complete. A new LNG project can easily cost from \$5 billion to \$10 billion, and take 5 to 10 years to complete. But once the barriers to entry are removed and the investment decisions are triggered and completed, the capacity increases inexorably, perhaps slowly, but surely.

And the greater the barriers to entry, the greater the price signal and incentives needed, often creating “super-cycles” or multi-decade round trips from shortage to glut and back to shortage.

Winners and losers

We are currently living through an extraordinary phase in the energy world.

History books will look back at this period of transformation, which will ultimately transcend into a new world order.

Those who depend on commodity price inflation to survive or justify long-term returns are in trouble, but a flatter energy world is not a one-way “price inflation versus price deflation bet”. The dynamics are complex and reach beyond energy markets.

But before we dive into the energy revolution, the flattening of the energy world, and its winners and losers, I would like to review the recent history of the internet revolution and dot-com bubble and the important lessons and parallelisms it can show for the energy markets.

NOTES

1. National Geophysical Data Center.
2. Conversion factor from 1 million British thermal units (MMBtu) to crude oil barrel (bbl) is 5.8 MMBtu/bbl.
3. Bloomberg and NARECO Advisors.
4. US Energy Information Administration.