Reconnoitre Energies

ENERGY MATTERS

Not out!

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This month it is 50 years since I headed off to University to study geology! And that was where my love affair with rocks flourished and my interest in energy and natural resources was born.

As part of my anniversary celebrations, in this article, I look back across 50 years and use data to identify what's really changed, the winners and why. I cannot cover everything – I have picked out some themes which give insight to the energy transition, what can happen, and the future transition winners.

'Things have changed' is an understatement

Many aspects of today's energy sector had little relevance 50 years ago. Electric vehicles, offshore wind, blue & green hydrogen, wave energy, ESG, greenwashing & CCUS to name a few. In 1974, deepwater E&P, shale gas fracking & solar farms were still to take off, let alone achieve today's great scale. (There was also no e-mail, GPS, texting, YouTube, social media, Google, or online banking…). In 1974, the hole in the Ozone Layer was yet to be discovered (1985), there was no Montreal Protocol on substances that deplete the ozone layer (1987). Environmental activism was growing significantly but climate change was not taken seriously until 1988 with the establishment of the Intergovernmental Panel on Climate Change (IPCC). In 1995, carbon accounting began.

In 1997, the CEO of BP became the first amongst oil peers to acknowledge global warming and that reduced emissions were needed. That same year, the Kyoto Protocol arrived; it was ratified in 2005 becoming the first legally binding climate treaty. This required the developed countries to reduce emissions by 5 percent below 1990 levels and established a system to monitor progress. The Carbon Disclosure Project began in 2000, but it took another 15 years for most companies to be reporting emissions. ESG had become an official term in 2004 with publication of the 'Who cares wins' report, but it took another decade to get widespread acknowledgement across the resources sector.

Arguments about the climate science & scientific rigour continued through the early 2000s and many merchants of doom appeared. The Paris Agreement eventually followed in 2015, the most significant to date, requires all countries to set emissions-reduction pledges. In 2016, Algeria became the last country worldwide to ban leaded petrol for cars – Japan had been the first to ban it in 1986. By 2018, the IPCC published its report on how to limit global temperature rise to 1.5deg C. Each of these events is a gentle reminder of how the global energy scene changes and moves when opportunities occur, and needs must.

Something that has become constant in the energy sector is a fast pace. It's a supply-demand business with billions of transactions every second and ever changing prices. It invests many trillions of $ every year. Its shape and trajectory have literally changed a tiny bit whilst you read this article. Technical data that used to take many months to reach the interpreters desk following its acquisition, now takes seconds or minutes. And the interpreter can be sitting anywhere in the world. With the addition of large scale renewables, hydrogen, and other zero-emission energies in recent decades, it is not just fast paced but more diverse and far more complex.

Fast forward another 50 years, it seems likely that the energy sector will be radically different to what it is today. The energy transition is just one aspect of what will change alongside how energy will be produced, marketed, and consumed.

Creation of a global oil & gas industry

Fifty years ago, many of today's petroleum provinces were yet to be discovered, for example deepwater Guyana oil, offshore Vietnam gas, or the Eagle Ford shale gas & liquids in Texas. North Sea oil from the UK and Norway was about to burst onto the scene. In 1974, many now famous oil & gas fields were largely unheard of and yet to start production. Examples include Forties in the UK (1975), Arun in Indonesia (1975), Brent in the UK (1976), Prudhoe Bay in Alaska (1977), Cantarell in Mexico (1979), Statfjord in Norway (1979).

New geography was beginning to emerge – China's open door policy under leader Deng Xiaoping would create vast areas of offshore & onshore opportunities in the mid-1980s. Less than a decade later, the fall of the Berlin wall opened more new geography to eager IOCs – such as Azerbaijan, Kazakhstan, Georgia, Russia, Turkmenistan, Ukraine, Uzbekistan, and Mongolia.

In the late 1990s/early 2000s, there quickly followed a rapid overseas expansion of previously domestic-focussed NOCs, for example from China, India, Malaysia, Indonesia, Vietnam, and Thailand. Energy geography and energy politics had changed forever; it was now a global industry, with global markets and a structural frame of geopolitics.

You may think oil & gas companies appear sluggish or boring, but many IOCs have survived 70-100+ years in a fast changing world. They are proven winners. The vast majority are nimble, politically astute, and streetwise, customer aware, up to speed on research & technology, and capable of reinvention. They are ideally equipped to maximise opportunities from the energy transition.

The oil industry never gives up

When I started at Uni, oil production in 1974 was ~58mm barrels per day (mm bpd); today it is approaching double, ~103mm bpd. 1974 itself was a turbulent year – the oil embargo following the Yom Kippur war caused a barrel of oil to leap from the decades old level of US$ 2-3/bbl to US$ 10-12/bbl. This first 'oil shock' was followed by the 'second oil shock' resulting from the 1979 Iranian revolution. Oil prices quickly doubled from around US$ 15/bbl to US$ 30/bbl. The era of cheap oil as a foundation for economic growth was well and truly over.

50 years ago, most oil was produced in non-OECD countries (~75%) and most of it was consumed in the OECD (~73%). Nowadays most of the oil is still produced in non-OECD countries (~68%) but most is also consumed in non-OECD countries (~55%). Over time there has been a massive geographical shift in oil consumption.

Forecasting the year of Peak Oil production was a common discussion in the oil industry. Marion King Hubbert had first published his theory of Peak Oil in 1956. In 2001, Kenneth Deffeyes book titled 'Hubberts Peak – the impending world oil shortage' received global acclaim. Peak Oil production has occurred in various countries – Mexico, the UK and Vietnam are 3 excellent examples. But the reality has been that Peak Oil has never happened globally. Today, world production is at its highest levels. What we have seen is not peak production rather peak oil demand.

Technology improvement is a daily feature, both onshore and offshore. The march into offshore deeper water has been a standout success of exploration in the last 50 years. 50 years ago, 200m was considered deep water limits, then 400m, 1500m and nowadays 3000m. The industry will continue to push the boundaries, reaching 4000m very soon – a well is planned later this year in 3900m deep waters of the Caribbean offshore Colombia.

The shale gas fracking boom began in the US in 2005, growing at 40-50% per year over 5 years. Today ~70% of US gas, and ~40% US oil is from fracked wells. Fracking technology then spread to other countries, notably Argentina, Canada & China. Re-fracking of shale is now set to become a new trend. Later on, those same wells may be converted for geothermal heat & power or used for heat storage. The shale industry will now reinvent itself again and again; reusing a well multiple times has to be a winner!

Only the strong survive

Prices crashes have always reshaped the oil and gas sector. The oil price crash of 1998 was super-dramatic, coinciding with a global financial collapse, and many economies & markets in free-fall. At one point, you could buy a barrel of Mexican crude for just US$ 4!!

A process of consolidation among oil & gas companies began on a previously unseen scale. This lasted many years from the late 1990s into the 2000s, as companies sought scale, reduced operating costs, flexible portfolios, and stronger balance sheets amidst persistent low prices. A classic example was the combination of BP-Amoco-Arco-Vastar-Aral-Burmah Castrol. Others included Total-Fina-Elf, also Chevron-Texaco-Unocal, and Exxon-Mobil. Large scale job cuts are a repetitive, painful feature.

We should anticipate that take-overs and mega-mergers amongst IOCs, renewables companies, and power utilities is just a matter of time. When the valuations and premiums to be paid eventually seem right they will seek to maximise the rent available through the value chain, cut operating costs, sell off poor performing parts of the expanded portfolio and reduce headcount. It's a proven winning formula.

Long distance pipelines reshaped global politics

The construction of long distance cross-border oil and gas pipelines during the last 50 years has forever changed the dynamics of markets from domestic or local exports to giant international trade covering thousands of kilometres.

The Baku-Tbilisi-Ceyhan pipeline was built to bring Azeri crude all the way to the SE Turkey coast on the Mediterranean accessing European & global markets whilst deliberately avoiding transiting Russia. It crosses Azerbaijan, Georgia, and Turkey over ~1,750kms and began deliveries in 2006.

Another good example is Siberian gas into China through the Power of Siberia line commissioned in 2019. No longer is today's narrative about Russian gas flowing west into Europe. It is now about Russian gas flowing eastwards for thousands of kilometres into China. The network to China is ~3900kms & other pipelines routed across Mongolia are close to construction start up as well.

Yet another example are the multiple gas lines taking US gas into Mexico. Today these provide ~6bcf/d, about 60% of domestic demand, and Mexico represents the second largest piped gas importer. Natural gas underpins Mexico's economic expansion and near shoring; it has however surrendered its energy independence to the USA. In the long term, the goal must be replacing natural gas with much cleaner renewable power – particularly solar, wind and geothermal which are all abundant in Mexico.

From so little to so much!

50 years ago, there was very little liquefied natural gas (LNG).

LNG export took hold in a minor way in the 1960's – Algeria 1964, Alaska 1969. LNG production later began in Brunei in 1972, Indonesia & UAE in 1977, and Malaysia 1978. The Northwest Shelf LNG venture in Australia began exports in the late 1980s. Qatar's North Field had been discovered in 1971, but appraisal and production start-up of the world's largest non-associated gas field took until the early 1990s; then LNG export really took off. Trinidad & Nigeria followed in 1999, Oman in 2000, Egypt 2005, Norway 2007, Russia (Sakhalin) 2009, Peru 2010, Angola 2013, PNG 2014, Russia (Arctic) 2017, to name a few.

LNG today is a major global commodity with over 700 vessels, each typically transporting 3-6bcf. Today, giant purpose-built cargo ships cross both the Pacific, Indian and Atlantic oceans, as well as transiting Arctic waters, the Suez canal, and Panama canal. Japan owns the largest share of the world fleet, ~20%. Many countries have become heavily dependent on LNG deliveries – Japan, South Korea, China, UK. Much of Europe has leaned into increased LNG supply from the US, Middle East & Australia to make up for the large reduction in Russian piped gas due to the conflict with Ukraine. A niche commodity is now a global commodity.

LNG transformed the world's energy sector. The US and Qatar are today's leading exporters. LNG has become a key part of energy security, a globally traded commodity capable of smoothing out gas market disruptions. LNG shows what can be achieved; it has a key role as a bridging fuel as the transition progresses. It is a reminder that to win, the energy transition needs to be a technological, physical, and chemical transformation over decades.

Coal is king, yes, really it is!

The world has never burned more coal than 2024. Despite all the talk of coal phase-down and phase-out, and consigning coal to history books, we seem to be some way off peak global coal consumption.

In Asia, coal is definitely king for now. Coal-fired power plants are the main source of electricity, especially China and India who together consume over 60% of the world total. Even-so, China issued no permits for new coal-fired plants in the first half of 2024, whilst adding new clean energy capacity (mostly solar & wind) equal to the UK's total current power generation from all sources. In a few years, solar will become China's largest source of power gen. It's more evidence that there really is a transition.

The US, Japan, Russia, and Indonesia remain significant coal users today. Meanwhile in the UK, coal has gradually disappeared from the energy mix. Coal formed ~80% of power generation in 1974; this year its ~1%. Proof that it can be got rid of, and that we can do things better than we used to.

People drive emissions

In 1974, the global population was just under 4bn. Today, the global population has more than doubled to just over 8bn. During my 50 years in energy, around 75% of total global fossil fuel emissions have occurred. It is a frightening statistic!

The fast increasing population, together with ready availability of fossil fuels has driven consumption, and with it, emissions. Technology and energy efficiency have had a continual impact in reducing annual demand, but the correlation between growing population and increased fossil fuel consumption in my lifetime is inescapable.

Air travel has exploded over the last 50 years. Take London's Heathrow airport; this has transformed from handling 20 million passengers per year in 1974 to 80 million this year. It is a familiar story re-told all over the planet. In Mexico, 482 new international air routes have opened since 2018! There is an urgent need for sustainable aviation fuel.

The UN estimates that global peak population is reached around 2084 with maybe 10.3 to 10.6 billion people. What we have to face up to is that reaching Net Zero is a gigantic challenge, not just because the timeframe of 2050 is so short, but also because billions more people will want access to energy; both the growing population and those currently living in energy poverty.

Decarbonisation without deindustrialisation is a gigantic challenge and it is here that hydrogen can play a massive role. Estimates of coal consumption suggest that a coal peak could come as soon as 2030-2040. But peak oil demand estimates vary wildly. Note, there are some who think peak oil demand has already happened whilst others think it will never happen!, even so, 10-30 years from now seems reasonable. Peak gas demand is likely further still, 2060 or beyond. I hope I live to witness all 3 of those peaks!!

Can wind or solar power go faster?

Yes, of course they can. Permitting is the biggest drag on the pace of developments. Significant growth began in 2010, and last year, the single largest new power contribution globally was solar power (~1.1 GW) driven by small-scale roof top installations, next offshore wind (~0.9 GW), then onshore wind (~0.8 GW). During the year, China built more solar than the USA has in its entire history. Solar generation over the last decade has consistently grown faster than all predictions. In the US, 96% of 2024's new electricity capacity is planned to be emissions free. Solar with batteries is expected to form 80%. Long distance transmission cables will connect renewables to countries thousands of kilometres away (for example the Morocco to UK project ~4000kms, and the Australia to Singapore project, ~4300kms).

The commercial development of offshore wind has accelerated globally partly as oil & gas companies leverage their offshore construction capabilities, knowledge, and technology. Some international oil companies have embarked on a transition from international oil company to international energy company (IOC to IEC), using oil & gas profits to invest in renewables. Even so, an array of giant offshore wind projects is now moving forward around the world with oil company participation, for example offshore Germany, Netherlands, Norway, Poland, South Korea, UK, USA. Offshore wind is the rising star of clean power in Europe; elsewhere, for example offshore Mexico and Brazil, there are vast wind resources just waiting to be tapped.

There are considerable challenges ahead. Better solutions to overcome irregular supply from solar & wind sources are needed; stability of the grid and giant grid-scale batteries are a key part. Stronger infrastructure will make for a quicker energy transition. All this highlights the added risk, uncertainty, and complexity of the transition.

The rush to install solar so often requires use of imported panels and imported technology – this creates a vulnerability, with reliance on manufacturing elsewhere, and a weakened energy independence. At the same time, developing more base-load power is critical; nuclear, small-scale nuclear, and geothermal can be good options for combining clean baseload with variable wind & solar, plus battery storage.

Rise of the machines

The retail self-checkout was launched in 1986 but took 20 years to get widespread acceptance. It changed convenience stores and retail shops forever. Now is the opportunity for artificial intelligence (AI). Over the next two decades, AI will completely change how the energy sector operates. First, it will transform supply chains, how energy is produced, transported, and managed. Secondly, every person working in the energy sector will have an AI assistant. Thirdly, AI will itself consume vast volumes of power and water.

Soon the demand for power to run AI systems and data centres will outstrip power demand growth in any other area. There will be a rush to build out the energy infrastructure needed and create uninterruptible supply, with sufficient electricity, water for cooling, ideally nearby customers, and essential security. Energy efficiency at data centres will become a high priority.

AI and data analytics will soon be throughout the energy sector – well management, facilities design, operations weather forecasting, power grid optimisation, supply chain purchasing, staff wellbeing, energy media, for example. At the moment, we are in the very earliest stages of AI demand growth and there is little public awareness of the magnitude of what's coming. The US, UK, Germany, Canada, India, Australia, and France currently lead the race to host the most data centres. Think 20 years ahead and AI has the ability to accelerate and transform the energy transition, helping make it happen quicker & more efficiently.

It's the education, stupid!

As a young student starting out 50 years ago at Southampton University, I was more interested in pin ball, heavy metal music and table soccer. When I started Uni, the no.1 movie was the Mel Brooks comedy 'Blazing Saddles'. The best-selling novel was 'Tinker Tailor Soldier Spy' by John le Carré, and top of the music charts was 'Kung Fu Fighting' sung by Carl Douglas. In my 2nd year, I crudely challenged my head of department who was a highly respected professor, 'What is the point in learning the names of these 50 old fossils in a wooden tray?' He answered gruffly 'It depends how much you value an education'. It was a turning point in my life. I learned the fossil names, and lots more too about geology & energy. From then on, the world of geology and energy opened up and showed me that opportunities exist everywhere.

We have to educate ourselves about the energy transition. The energy achievements of the last 50 years should fill us with confidence that changes needed in coming years are well within our grasp. The challenge is always to do things better than we did them before. Of course it will not be smooth, uniform, or easy, or perfect, and there will be both good and bad decisions along the way. I hope my Energy Matters articles have helped everyone understand a little bit more about the fast moving world of energy. You may have noticed that I love writing about the world of energy. It has been a privilege to write Energy Matters for ANZMEX since January 2019. It is symbolic that this 50th edition should be my last.

Heartfelt thanks to all my readers. Un gran abrazo,
Chris

About the Author

Chris writes an occasional series of topical articles on energy for ANZMEX. Between 2019 and 2024 he authored a series of 50 widely read ANZMEX 'Energy Matters' op-eds that tackled big energy issues using real-life personal experiences, and extensive research. Chris runs an award-winning advisory service, Reconnoitre Energies, offering insights to inform, shape a decision, policy & regulation, and guide the next steps for energy ventures; he is also a non-resident fellow at the Institute of Americas. Chris has worked in over 40 countries and published extensively over five decades.

Chris has an energy career of over 40 years, living in Mexico (2001–2018), Russia, Vietnam, Mongolia, China & UK. His contributions to the energy and education sectors have been recognised by the UK Government with both an MBE and CBE, and also the Aztec Eagle from the Mexican Government — the first foreigner in the energy sector to achieve this award. Chris' articles for ANZMEX reflect his experience and enthusiasm and are often also later published to a global audience in the USA, UK and Singapore. They are not paid for in any way.

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