ENERGY

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Online
FT reporters assess the likely demand for energy in key global markets

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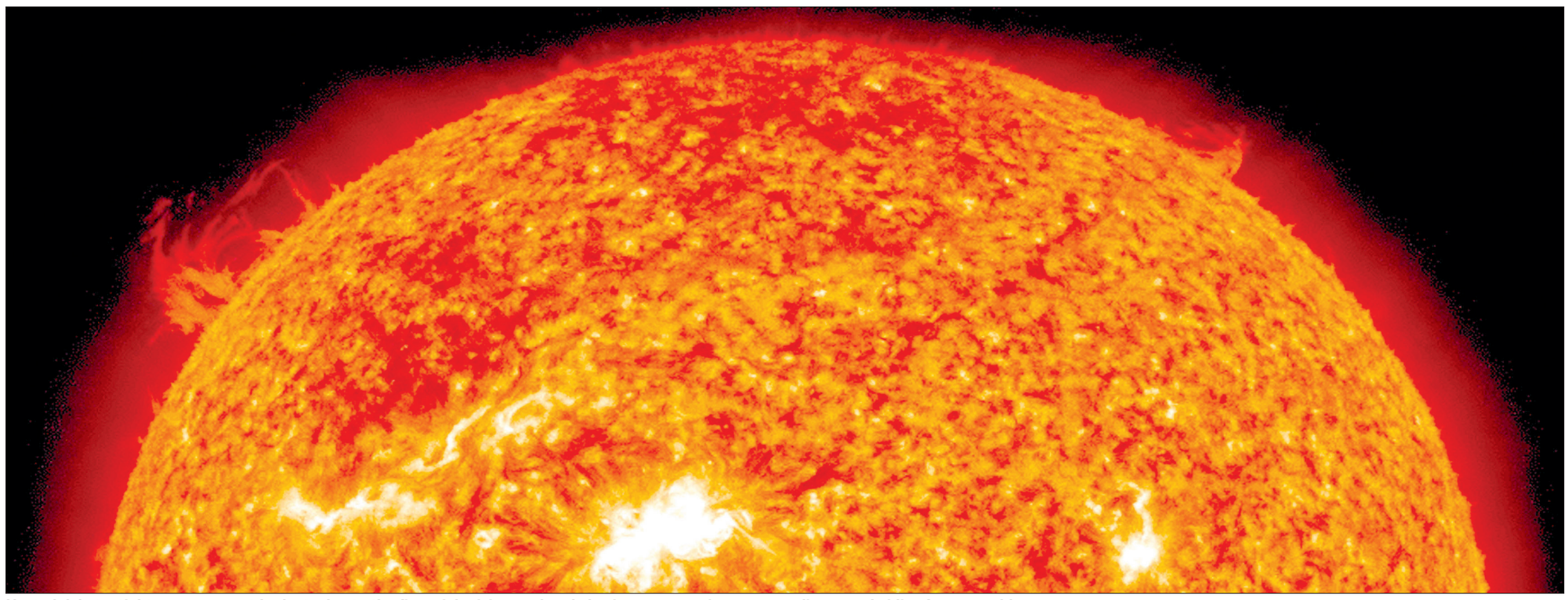
Volatility to remain dominant feature

Shocks to the sector have undermined past stability and growth, writes **Sylvia Pfeifer**



Heated debate: tighter government budgets due to the financial crisis are already having repercussions on spending on subsidies for renewable energy Getty

Three years ago, energy investment plunged in the face of a tougher financing environment and weaker demand for power, as the worst recession since the second world war took hold.

The recovery has been uneven, but global primary energy demand rebounded strongly, up a remarkable 5 per cent in 2010.

Today, the eurozone crisis and fears over the US's indebtedness have once again put energy executives on alert. As governments implement tough austerity measures, executives are watching closely whether the weakening economic outlook in the west will affect demand and curtail investment plans.

Policymakers are under pressure to ensure energy bills remain affordable.

So far demand has held up, thanks to the unquenched appetite from the emerging economies of Asia, Latin America and the Middle East.

Executives struck a bullish tone at a conference in London in October, insisting pessimism about energy demand was misplaced.

"We are looking at things as westerners," said Christophe de Margerie, chief executive of Total, the French energy group. "In the east, they don't have the same feeling," he added, noting that emerging economies were still showing underlying growth, fuelled by basic needs such as providing electricity.

The International Energy Agency (IEA) echoed a similar view in its World Energy Outlook published in November, predicting that over the next 25 years, 90 per cent of the projected growth in global energy demand will come from non-Organisation for Economic Co-operation and Development member countries. China alone is expected to account for more than 30 per cent.

The balance sheets of big oil also remain robust, underpinned by this year's high crude prices.

ExxonMobil, the world's largest quoted oil company, said in October that its capital and exploration expenditures of $26.7bn for the first nine months of the year was a record, as it sought to take advantage of the nearly 50 per cent rise in oil prices from a year earlier.

However, while global demand has held up despite the weakening economy, supply remains tight. The disruptions to production in north Africa and the Middle East in the wake of the Arab spring, notably in Libya, have helped underpin a stubbornly high oil price. Disappointing production from non-Opec countries such as Russia have exacerbated the situation.

"This year will be the first year ever with an average annual oil price above $100 a barrel. In real terms, this is the highest price since 1864," points out Christof Ruehl, chief economist at BP.

"The break-even price for government budgets in most producing countries has also gone up, as governments need more money to balance their budgets, and to help pay for increased social packages," he adds.

Of the large economies, the US is the most vulnerable to high oil prices. Unlike the European Union, Japan or China, which can increase their exports to producing countries, the US exports relatively little.

"The net impact on its trade balance would be the highest," says Mr Ruehl. "US consumers are on track to spend roughly $200bn more on oil this year than they did in 2010 because of higher crude prices."

Longer term, too, there are worries. Fatih Birol, chief economist of the IEA, has warned that more than 90 per cent of growth in oil production needs to come in the Middle East and north Africa because of the decline in output from fields in other parts of the world.

However, recent political developments in the regions could lead to "under-investment" – and consequently even tighter markets and higher prices.

The state of the economy will be among the factors taken into consideration when members of oil producing nations meet in Vienna in December and industry executives will be watching closely for any signals that a potential increase in production in the coming months may be on the cards.

A Goldman Sachs note that was published late in November says: "Despite the notable slowdown in global economic growth, we continue to expect that oil demand will grow well in excess of production capacity growth.

"In our view, it is only a matter of time before inventories and Opec spare capacity become effectively exhausted, requiring higher oil prices to restrain demand, keeping it in line with available supply."

Tighter government budgets are already having repercussions on spending on subsidies for renewable energy.

While European governments had already begun to reduce subsidies for renewables after they had grown very quickly, the sovereign debt crisis will exacerbate the cuts.

As thousands of delegates meet in Durban, South Africa, for the latest round of UN climate talks, they do so against an increasingly tough funding background to address climate change.

Experts are warning that spending is likely to plunge by $22.5bn in the next few years, as government austerity cuts bite, and by as much as $45bn if the eurozone crisis escalates.

The report, by Ernst & Young, the consultants, predicts that European countries will suffer the brunt of spending cuts, but that large reductions could also be made in the US and Japan.

Among the 10 economies studied, the worst-hit in the short term is forecast to be Spain. Here, rigorous austerity measures suggest that the government will spend $5bn less between 2011 and 2015 on climate-change prevention than it would have done under "business as usual" conditions.

"The conditions under which the Durban meeting will take place could not be more challenging," warns Juan Costa Climent, global climate change and sustainability services leader at E&Y.

Policymakers, he adds will be meeting "under storm clouds of austerity, a global focus on national interests, and widespread scepticism for the prospects of securing a legally binding successor to the Kyoto protocol".

The energy world has experienced three big shocks over the past two years: BP's Gulf of Mexico spill; the accident at Japan's Fukushima nuclear plant; and supply disruptions because of the Arab uprisings. The repercussions are still being felt. Policymakers face the task of balancing conflicting pressures: maintaining energy security; meeting tough carbon reduction targets; and keeping energy affordable. The outlook is for more volatility.

The world has entered "an era of macroeconomic volatility – in sharp contrast to the strong growth and stability of the previous decade," according to Simon Henry, chief financial officer at Royal Dutch Shell.

"At Shell, we expect this kind of volatility to remain a feature of the next decade and beyond, as surging demand for energy puts supplies under pressure," he adds.

Inside

LET'S HEAT OUR CITIES WITH CLEANER ENERGY.

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LET'S GO.

Clean energy feels the pinch

Green technology

There are both winners and losers, says **Sarah Murray**

In many parts of the world, the clean energy sector is facing both economic and policy uncertainty. However, the picture is not a uniform one.

While cash-strapped US and European administrations place their clean-tech investments under scrutiny, China is pushing ahead, with strong government support for a range of renewable and clean energy technologies.

In the US, many institutions providing finance to renewables companies ran into difficulties in the financial and subprime mortgage crises and tightened access to credit for clean energy companies.

In the US, the political mood is turning against clean energy.

When it comes to solar energy, for example, the bankruptcy in August of Solyndra, a California-based solar-panel maker that received government funding, may have damped already weak enthusiasm for federal support.

Solyndra was forced to close

"There definitely is a big change in the political environment," says Stefan Heck, a director in McKinsey's Stamford office, who leads the consultancy's work in clean technology.

"And, even though not much has been cut yet, that cloud of uncertainty has led to caution among investors."

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Energy

Germany faces 'Herculean' task with move to renewables

Nuclear phase-out

Sceptics doubt the transition will be easy, says **Gerrit Wiesmann**

This spring, as the German government was preparing its landmark decision to phase out nuclear power by 2022 and replace it with renewable energy, the head of the country's second-largest utility gave a speech in which he noted he knew of no industrialised country that was "even rudimentarily able to rely on renewable energy".

Jürgen Grossmann, chief executive of RWE, seemed to speak for the German industry – generators, power-plant builders, and transmission companies – when he warned the government was confronting Germany with a "Herculean task".

Most fundamentally, the accelerated nuclear phase-out – brought forward from 2036 after the nuclear accident at Fukushima in Japan – challenged the country to replace its 17 nuclear power stations, which produce about a quarter of its total electricity, in just over a decade, while at the same time reconfiguring transmission networks.

Chancellor Angela Merkel in the summer sketched out how Germany would succeed. It could replace 20 gigawatts in nuclear capacity by building at least 10GW in wind and solar plants and at least 10GW in highly-efficient modern gas-fired power stations.

This, she argued, would increase the share of green energy in electricity generation from about 20 per cent today to 35 per cent by 2020. She also added a commitment to reduce electricity consumption by 10 per cent, and pledged Germany would still meet its 2020 aim of reducing CO_2 emissions by 40 per cent compared with 1990.

But what looked solid in blueprint appeared more rickety as experts started picking over it.

Power companies were already planning a new generation of offshore wind farms, but would they get them built in time? Would Germans allow pylons to be built in their back yards? And who would build new gas-fired plants?

Among the chorus of doubters, perhaps the wind farm builders best summed up the sceptical attitude.

Sven Utermöhlen, head of climate and renewables central Europe for RWE's rival Eon, this summer called Ms Merkel's goal for renewable energy capacity "a bit too ambitious". He said the country would probably need two to three big wind farms under construction in any one year. "How many are being built at the moment? Two."

But with the government working to change a whole plethora of incentives – for building gas fired plants, for example and other rules, he cautioned it would take another five or six years to predict reliably whether Germany could reach its goal.

Indeed, Mr Grossmann himself is currently perhaps the most high-profile person trying to make the government's blueprint come to life. He is negotiating with Gazprom, the Russian gas producer, about forming a joint-venture to run and build gas-fired power stations in Germany – and also the Benelux countries and the UK.

> 'If the conversion to green energy works, Germany could hit its target early'

But it is this fossil-fuel component of what the chancellor calls Germany's "energy switch" that has environmentalists worried. As numerous power company heads have pointed out, it is hard to replace low-emission nuclear power with fossil-fuel sources – even if only in the interim – and still expect CO_2 emissions to continue to fall.

Ms Merkels' environment minister Norbert Röttgen vehemently disagreed. He recently reminded that the government was "adamantly" sticking to its plans to reduce CO_2 emissions by 40 per cent between 1990 and 2020, rising to 70 per cent by 2040.

He noted that one reason to build so many new gas-fired power stations was to make it easier to take older ones out of service.

"If you replace technologically outdated power plants with an efficiency factor of 30 per cent with plants that are 60 per cent efficient, then this will quite logically have a positive impact total emissions."

This argument – and the belief that Germany will reach its renewable energy target – do appear to have persuaded some of the country's leading environmental groupings.

"If the conversion to green energy works as planned, we could even see Germany hit its target early," says Ann-Kathrin Schneider, a climate expert at Bund, the powerful eco-group.

"Having said that, there are other reasons to worry that Europe's largest economy may not in the end reach its emissions target over the next decade."

According to Bund, Ms Merkel's ambition to cut electricity consumption by 10 per cent over the next decade is not backed by serious component targets.

While it is all well and good providing incentives for homeowners to insulate their houses better: "The big problem for Germany with a view to its targets is getting better commitments from heavy industry, as well as the energy-producers themselves," Ms Schneider says.

This, as Bund argues, could probably only happen through higher standards at European Union level. European governments are discussing a widening of the region's CO_2 emissions reduction from 20 per cent to 30 per cent between 1990 and 2020, under which "major emitters" would agree to "take on their fair share" of cuts.

Despite his caution, even Mr Grossmann admits that Germany's "Herculean task" is still a work in progress that could fail – but, equally, could succeed.

"Maybe it's because I'm cheery by nature that I'm not in despair," he said. "But I'm also a rational optimist. I believe it's possible to make progress and to make the future."

Houston's commuters plug into electric cars

Motor vehicles

Sheila McNulty examines a scheme that aims to wean drivers off petroleum

At a former Hummer dealership on the outskirts of Houston, NRG Energy, a power producer, has established the headquarters of its electric vehicle-charging network, the first in the US to be privately funded.

The symbolism of clean, plug-in vehicle technology replacing dirty, gas-guzzling technology is readily apparent. But does it reflect reality? While it is rare to see a Hummer on the streets of Houston, the energy capital of the US, it also is rare to see an electric vehicle.

Ironically, the day I went for a test drive in a Nissan Leaf, we spotted a lone DeLorean sports car that had been converted to an electric vehicle, amid the lines of gas guzzlers on the packed highway.

"Gas?" read a sign on the back. "Where we're going, we don't need gas." Indeed, NRG EV Services' eVgo seven public charging stations have given Houstonians the ability to extend the range of their electric vehicles beyond what their home charger gives them, so they can travel in and around Houston without petrol.

NRG plans to spend $25m over five years to link Texas' three key cities – Houston, Dallas/Fort Worth and Austin – with charging stations. The plan calls for 50 stations in Houston, 70 in Dallas, and stations along the highways to link those cities with Austin, which is separately building its own charging network.

If all goes well, NRG will take the network national, where it could link up with other infrastructure fuelling projects in places like California.

Subscribers to the Houston network receive overnight chargers installed in their homes, which provide 70 miles of range with the heat or air running and 100 miles with the windows down. The average commute in the US is 31 miles.

The home chargers, which cost $2,000, are paid off in monthly instalments of $49. For $89 a month, users also can power up at the seven stations placed outside shopping centres and drug stores around town.

Two of the seven plug-in stations in Houston and one in Dallas have the latest, DC chargers, which provide 200 miles of range per hour of charge.

So a user can spend half an hour in the HEB grocery store beside one of the DC chargers in Houston and come out to a fully charged Nissan Leaf. The AC chargers at other stations provide up to 24 miles of range for every hour plugged in.

"It's not as fast as filling up at a gas station yet, but we're not at a gas station – you can do something you need to do," says David Knox, NRG spokesman, after taking on the highway to demonstrate how electric vehicles can keep up with gas-powered cars in the 70 miles an hour traffic.

Arun Banskota, president of NRG EV Services, will not divulge how sales are going in the year since eVgo was established, saying the company is not looking for a profit as it builds the infrastructure. Its focus is on growing public awareness, with 60 public events between July 4 and Thanksgiving. "When people see the electric vehicles, or drive them, they're sold," he says.

Bob Stokes, an eVgo customer in Houston, bought his Nissan Leaf about six months ago. He wanted both to help preserve the environment and also to be at the cutting edge of technology. He signed up for eVgo's $89 package.

> 'It's nice to be able to put your car in the garage at night and have it full when you get up in the morning'

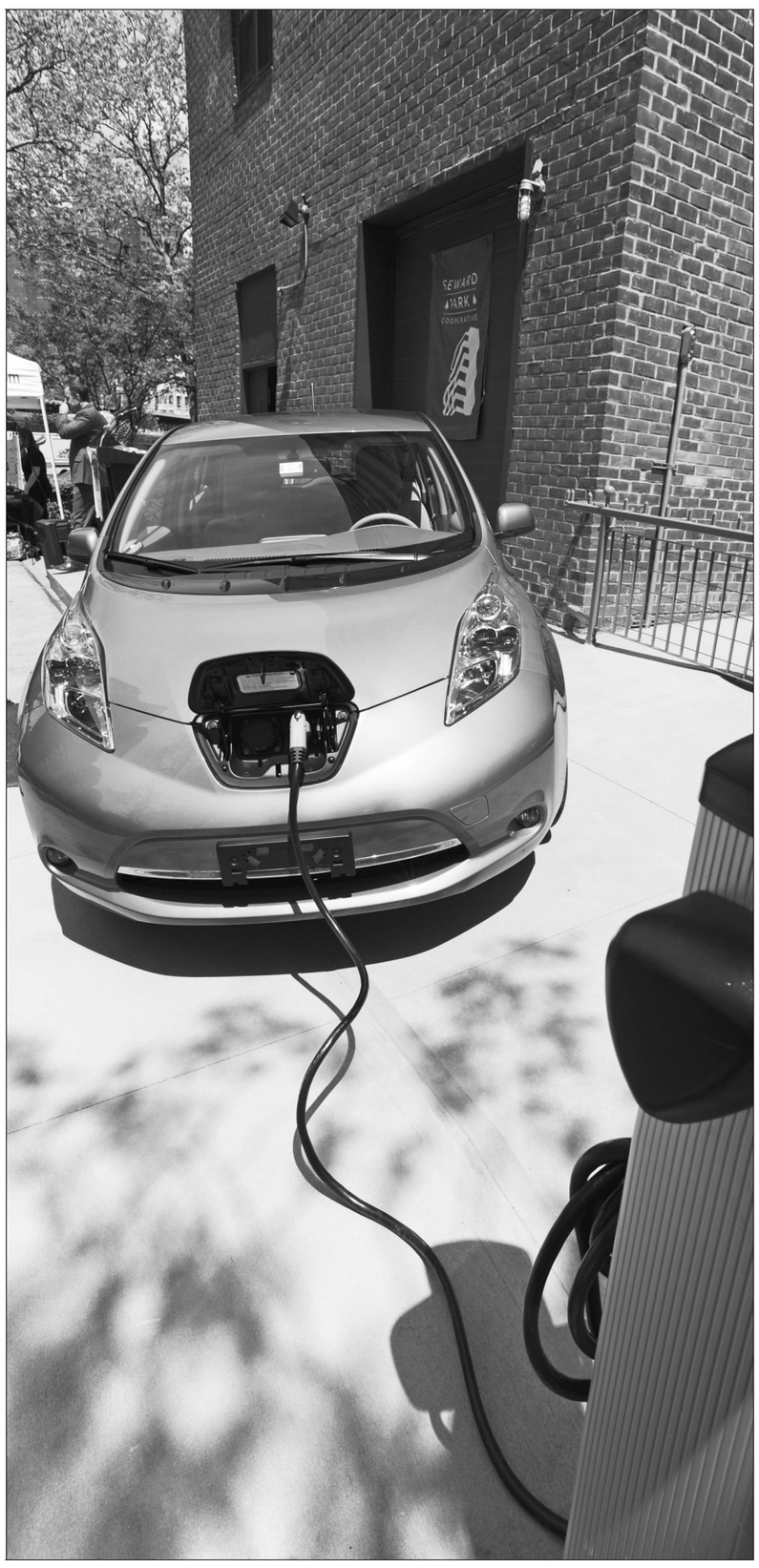
"It's nice to be able to put your car in the garage at night and have it full when you get up in the morning," he says.

His commute is a 52 miles round-trip, so he uses an outlet in his office building and the public plug-in stations to charge up, if he has several stops to make before heading home.

"It's a little bit challenging as you have to plan ahead," he says.

Mr Stokes got stuck once, when he drove outside Houston and found the plug-in station he went to was not working.

Nissan towed him home for free, but the experience left its mark. "I wouldn't want to chance that again," he says.



A new Leaf: an electric vehicle from Nissan being recharged Getty

He uses his wife's gas-powered car when he goes on long road trips. But it is an inconvenience that he expects to disappear when the infrastructure is built out: "It's only going to get better."

Similar start-ups are being established in different parts of the US, but it has been a slow conversion in the economic downturn, given the initial upfront expense of an electric vehicle, despite the cheaper long-term fuel.

Nonetheless, state and federal incentives, with thousands of dollars in rebates or tax breaks, have encouraged the growth of plug-in stations across the country, with large concentrations focused in California and Florida.

David Wells, managing director in the Energy Practice at Navigant, the consultancy, says: "I see the electric vehicle market in the US growing slowly for the next several years, with the major opportunities focused in urban areas in the western US, the East Coast and Texas.'.

"Overall market growth will probably disappoint the auto industry, but it will allow the utilities time to develop more attractive service offerings and manage impact on the power grid," he says.

US has its eye on oil independence

North America

Ed Crooks considers the rising production capacity of the continent

For decades, America has worried about Saudi Arabia's plans for oil production; now Saudi Arabia is starting to worry about the US.

In a startling reversal, US oil production has begun to rise, and expectations are growing that North America (including Canada, where production is growing even faster) will become an increasingly potent force in world oil markets. Even the Saudis, holders of the world's largest reserves of crude, are having to pay attention.

In a speech in Riyadh last month, Khalid al-Falih, chief executive of Saudi Aramco, the kingdom's national oil company, described what he saw as an age of "abundance" of fossil fuels. That meant ample supplies not just of natural gas unlocked by the shale gas revolution, but also of oil, thanks to reserves being opened up in deep water and the Arctic, and "tight oil" onshore production in the US.

Mr al-Falih is not a disinterested observer. In general, it suits Saudi Arabia to encourage the idea that oil is in plentiful supply for the long term, because it discourages investment in alternatives.

However, Mr al-Falih was engaged in more than just low-cost long-range marketing. For Saudi Aramco, the outlook for oil production in other countries is of vital importance when making its own investment plans, to make sure it avoids global overcapacity in supply that would cause prices to plunge.

Expectations of increased supply from the US and Canada are one reason why Saudi Aramco has decided not to raise its capacity beyond its present target of 12.5m barrels a day.

The US is reversing its four-decade decline in oil production, from a peak in 1971, thanks to increases in production from the deep waters of the Gulf of Mexico and from tight oil: onshore fields previously not thought to be commercially viable because the oil flowed from them too slowly, but have been unlocked by the same "fracking" techniques used for extracting shale gas. These involve horizontal drilling and the injection of chemicals into the rock strata.

The use of these methods is creating a boom in onshore US oil production, centred for now on North Dakota's Bakken formation, but with the potential to spread to many other states, from Texas, to Colorado, to Ohio. The effects could be profound. US imports have already fallen to less than 50 per cent of consumption, from a peak in 2005 of 60 per cent.

The International Energy Agency, the think-tank backed by rich countries, has predicted net US production will rise modestly, by about 500,000 barrels a day, by 2035. Others, for example from the National Petroleum Council, an independent advisory body to the federal government, suggest stronger growth is possible.

It is not out of the question that US production could rise so much that it would need to import oil only from Canada, creating "oil independence" for North America. Barring a cataclysm, crude oil and refined products such as petrol would still flow in and out of the US, but in net terms the inflows and outflows would be in balance. In terms of helping strengthen the balance of payments and cushion the impact of oil price shocks, and providing some reassurance over energy security, that would be a very welcome outcome. Can it happen?

One problem is that the breakneck pace of growth is creating strains for the companies and the communities where they operate. With North Dakota's unemployment at just 3.5 per cent, as one oil industry adviser says: "If you can walk down the street and keep breathing, you can get a job."

As a result wages are soaring, as are operators' costs, putting pressure on some to scale back their expansions plans, at least for the time being.

> One issue may ultimately prove the most serious: alarm about the resulting greenhouse gas emissions

Another issue is public worries over fracking. So far, there has not been a single proved case of contamination of water supplies by fracking fluid while it is being pumped into a well, although there have been cases of pollution from fluids that were not properly disposed of.

A large-scale pollution incident from fracking could be devastating to the shale gas and tight oil industries.

One issue may ultimately prove the most serious: alarm about the resulting greenhouse gas emissions.

There are complex trade-offs involved if increased US oil supply leads to increased oil demand.

The carbon dioxide emissions reductions from switching from oil to an alternative fuel may be small to non-existent, if those alternatives are ethanol made from intensively farmed corn, or electricity from coal-fired power plants. So it is not necessarily the case that an economy that continues to use oil at a higher rate will have higher output of carbon dioxide.

Nevertheless, public opinion and lobby groups can put obstacles in the industry's path.

If the full potential of North America's oil reserves is to be realised over the decades to come, a policy for managing the effects of greenhouse gases may need to be part of the package.

Clean technology feels the pinch in US but booms in China

Continued from Page 1

Meanwhile, in China, the opposite trend prevails. Government support for clean energy has increased, with the recent announcement of the promotion of electric vehicles in 25 cities – the latest in a series of policy ambitious initiatives.

Many clean energy projects have received funding through the Clean Development Mechanism (CDM), through which companies in industrialised countries can receive carbon credits for investments made globally that result in emissions reductions.

However, despite prospects of the CDM ending along with the first Kyoto commitment period, which is due to end in 2012, few see the rapid growth of China's clean energy commitments coming to a halt.

"For China and renewable energy, it won't have a lot of impact," says Arne Eik, CDM expert at Thomson Reuters Point Carbon.

He adds: "China has high renewables targets, projects are big and have a lot of money, so are not dependent on additional revenue schemes."

Meanwhile, China's voracious appetite for energy, as much as its environmental concerns, is driving investment in a wide range of energy technologies.

Ian Muir, manager of carbon strategy at PFC Energy, a consultancy, says: "They have such an issue with regard to meeting demand for energy that they're going for an 'all of the above' approach."

With many governments introducing austerity measures, some are re-examining everything from feed-in tariffs for solar power to tax credits for wind farm developers. But it is not clear this will lead to a significant drop in government support for clean energies.

Mr Heck at McKinsey says: "There's a lot of noise in Europe because of the banking concerns and sovereign debt issues, and there's debate about whether the support [for clean energy] should change. But on the whole, beyond the scheduled annual feed-in tariff reductions that track successful cost reduction, the support hasn't changed a lot."

In cases where there has been less government support, this is often a reflection of the strength of the industry and, in the case of solar energy, sharp falls in the price of photovoltaic technology.

Germany, for example, has reduced its feed-in tariffs for solar energy.

Costs in the solar industry have fallen to the extent that this energy source is in some places reaching grid parity (the point at which solar power becomes at least as cheap as grid energy).

"There's a natural progression, and part of that is reducing subsidies," says Gil Forer, global leader of Ernst & Young's Global Cleantech Centre.

McDonald's is benefiting from the Climate Corps programme

"As technologies continue to advance and costs continue to be driven down, it makes sense to have gradual reduction in subsidies or incentives in certain markets," he adds.

One side of the clean energy equation that has actually been boosted by continuing economic woes is energy efficiency.

"Anything in the energy efficiency category, whether insulation materials, new air-conditioning systems or lighting upgrades, is relatively unaffected by the recession," says Mr Heck.

"We've seen cutbacks from corporations that have deferred investments, but on the whole there's not been any slowdown."

For companies, energy efficiency measures require relatively low investments and their rewards can be reaped quickly. Some estimate companies can cut 15 to 20 per cent of their energy costs by driving energy efficiency measures consistently.

Evidence of the savings have emerged in the Climate Corps programme, an internship initiative run by Environmental Defense Fund, a US advocacy group, which matches business school students with companies such as McDonald's, PepsiCo, Xerox and Verizon to develop energy efficiency plans.

Since the Climate Corps programme began, interns have uncovered energy efficiency opportunities that collectively could save $1bn in net operational costs over the project's course.

Mr Heck says: "Energy efficiency investments make economic sense and for people who can afford the investment to install them, they're an even better deal now because they're saving money."

Mr Forer also sees continued strength in corporate energy efficiency investments. "And it's not just as a cost-cutting measure," he says.

"Corporations also look at it from an operational efficiency perspective, which enables them to be more competitive."

A wind farm off Kent in the UK. Better distribution networks are needed for renewable sources of energy. In Denmark, wind farms often produce more energy than can be consumed PA

EU planners hint at fairytale future

European proposals

A rosy scenario is being outlined, says **Joshua Chaffin**

Imagine a future in which Europe derives virtually all its power from thousands of windmills and other sources of renewable energy. Meanwhile, smart electricity grids and refitted buildings prompt such big gains in energy efficiency that overall consumption falls even as the economy grows.

These virtuous developments, in turn, lead to a reduction in the proportion of energy Europe imports, from more than half to less than 40 per cent.

Does that sound like a fairytale? A team of specialists from the European Commission, the European Union's executive arm, sketch out this rosy scenario in a forthcoming report that has stirred both debate and anticipation throughout the continent's energy community: the Energy Roadmap 2050.

The authors freely admit they have no crystal ball to predict just how Europe's energy market will look so far in the future. Yet their exercise, which is expected to be published this month, is an attempt to address in broad strokes just how the EU might meet its overarching energy and climate goals by the year 2050.

Specifically, that means a "decarbonisation" of the economy, in which the emissions that have been blamed for global warming are reduced by 80 to 95 per cent from their 1990 levels.

The other priorities are to ensure that European industry remains competitive, and to improve the energy security of a bloc that has learnt the hard way about the dangers of being overly reliant on Russia as a main supplier.

The need to answer some of those questions has become more urgent in recent months, after growing complaints from industry investors about the regulatory uncertainty hanging over the sector. The result, these investors say, is that it is becoming impossible to make the sort of multi-billion-euro investments that must be programmed over 40 to 50 years.

"There is no stable regulation anymore," says Fulvio Conti, chief executive of Enel, the Italian utility, who also heads Eurelectric, the European energy industry trade group. "New packages and directives seem sometimes to be contradicting one another."

In a widely circulated research report published in September, Citigroup, the US bank, was more blunt, asking: "Have governments made the European utility sector uninvestable?" Its chief criticism was that the EU could not satisfy its ambitious climate goals while keeping prices low and ensuring security of supply.

The commission begs to differ. Through the road map, it aims to show some of the ways that the bloc might achieve its objectives and hopefully offer the industry and investors a clearer picture of the future.

While the document is still being revised, some general themes have already emerged. The most salient is the expectation of a huge proliferation of renewable sources of energy, such as wind and solar power, in the years to come.

According to one of the two main scenarios in a draft report, renewables would account for nearly 50 per cent of EU electricity generation in 2050, up from just 14 per cent in 2005.

Fossil fuels – the most polluting form of energy – would fall from 55 per cent to 30 per cent. One bright spot would be natural gas, which is cleaner than its fossil brethren, and may emerge as a vital back-up fuel for those days when the sun is not shining and the wind not blowing.

Europe's nuclear industry also looks set to suffer. Just a few years ago, the industry was touting a European renaissance, thanks in part to its lack of greenhouse gas emissions. But the road map acknowledges that nuclear has lost political acceptance across broad swathes of the continent since the Fukushima disaster in Japan. As a result, the authors forecast it will account for just 20 per cent of electricity generation in 2050.

Even this baseline scenario is open to question. It assumes, for example, that Europe will implement energy efficiency policies that have so far been neglected. EU leaders agreed in 2008 to improve efficiency 20 per cent by 2020, but that target was not legally binding and the bloc is likely to achieve only half that.

> 'Decarbonising at an acceptable cost is only possible at a European level. We have to invest in infrastructure to connect markets'

"Will Europe stop kidding itself that somehow it can regard this as a sort of policy without any need to achieve a result?" asked Philip Lowe, the Commission's director-general for energy, at a recent conference in Brussels.

All scenarios in the road map also imply Europe will have to make huge investments in its electricity grids and gas pipeline networks in the years ahead. New connections will be required, for example, to link offshore wind farms in the North Sea and solar installations in the Mediterranean to consumers and factories in central Germany.

Renewables pose particular challenges to the grid compared with traditional gas or coal-fired power plants because of their intermittent nature, say analysts. In order to make them worthwhile, it is essential that the electricity they produce – which cannot be efficiently stored – finds its way to needy customers at any given time and place. Otherwise, it will go to waste.

In Denmark, for example, wind farms routinely produce more electricity than the country can use. Because there are limited links to other markets, there is nothing to do with the excess.

In a new report, the European Climate Foundation, an environmental group, estimated that Europe would have to double its grid capacity in the period from 2020 to 2030, with most of the investment going to cross-border links.

Günther Oettinger, the EU's energy commissioner, has called for a grid that is robust and more flexible – and one that serves a truly integrated European energy market as opposed to a patchwork of national ones.

"Decarbonising at an acceptable cost is only possible at a European level," Mr Oettinger says. "We have to invest much more in infrastructure to connect markets."

Doing so will not be cheap. The Commission has estimated that Europe will require some €1,000bn in energy infrastructure investment just for the period between now and 2020. That includes money for gas pipeline connections so that supplies can be more easily moved among member states in times of crisis or market disruption.

For all its detail, the road map appears vague when it comes to explaining how all of this will be paid for by European governments currently sinking under a debt crisis. There are hopes of enticing pension funds and other long-term investors to support the sector.

But, however one reads the map, it seems that European consumers will be asked to bear a big part of the burden of a low-carbon future.

Clouds hang over carbon markets

Gas emission targets

There are fears there will be no successor to the Kyoto treaty, writes **Mike Scott**

The first commitment period of the Kyoto protocol runs out at the end of 2012, making the climate change summit taking place in Durban, South Africa, the last chance to agree new targets for countries to reduce their greenhouse gas emissions.

While all the large economies have some kind of climate change commitment, Kyoto was the only instrument that was internationally binding – something considered vital, given the global nature of the problem. However, the chances of an agreement on a second commitment period are virtually nil.

This has created great uncertainty about the future of international measures to address the problem, including the United Nations-backed carbon market, the clean development mechanism (CDM), which generates carbon credits from emission-reduction schemes in developing countries.

However, the carbon markets are largely separate from the wrangling over a wider climate deal, according to a report from Ernst & Young. "Carbon trading will continue as long as there is demand and a market for it," the report says.

The European Union is committed to maintaining its emissions trading scheme (ETS), which makes up 80 per cent of the global carbon market, to 2020 and beyond and "unless a specific decision is taken to abandon it, [the CDM] will continue . . ."

But the level of demand for CDM credits, known as certified emissions reductions (CERs), is uncertain. The EU's ETS guarantees a level of demand because high-emitting companies in the scheme are allowed to meet 11 per cent of their compliance targets using CERs, which are cheaper than EU carbon credits.

However, from the end of next year, the EU will only allow credits generated in the least developed countries. This will lead to a price differential between EU-eligible credits and those that are excluded, according to Stig Schjølset, head of EU carbon analysis at Thomson Reuters Point Carbon.

Sanjeev Kumar: transparency of how the CDM process operates needs to be improved

While China will be most affected by the change, this will not just be geographical – the EU has banned abatement projects from industrial gases, long dogged by accusations they are open to manipulation, which should encourage renewable efficiency projects.

Camco, a company that develops carbon-cutting projects, is confident about the CDM. "We have 45.9m tonnes of post-2012 credits in our portfolio. Prices in Europe might be off in the short term (currently less than €10 a tonne) but in the medium to long term, these are the best prospects we have seen in a long time," says Scott McGregor, chief executive.

He points to alternative markets that could soak up demand for CERs, such as Australia, which recently introduced its own cap and trade scheme. From 2015, companies will be able to use international offsets for 50 per cent of their compliance needs, while in the same year, South Korea is to start its own carbon market and China wants a national trading scheme, while in the US, California has implemented a carbon market.

Others say there are serious structural problems with the CDM. CDM Watch, a pressure group, says projects to make coal-fired power plants in developing countries more efficient should be excluded because the plants would have been built even without carbon credits.

The UN's CDM Methodologies Panel has recommended the process for generating credits from more efficient "supercritical" coal-fired power plants be put on hold immediately.

"The way CDM projects are credited and the transparency of the process has to be overhauled," says Sanjeev Kumar, responsible for European climate and energy policy at E3G, a consultancy. "The CDM is undermining the carbon market. The longer reform is delayed, the more people will go elsewhere."

Renaissance in nuclear power generation now a long way off

Fukushima fallout

Atomic energy has had a setback but is still a choice for many states, writes **Sylvia Pfeifer**

Two years ago, under the terms of its entry into the European Union, Lithuania closed its last, Soviet-style, nuclear reactor that had been generating 70 per cent of its electricity.

This summer, the small Baltic country announced it had started talks with a joint venture between Japan's Hitachi and America's General Electric to build a new plant by 2020.

The planned reactor will provide power not just to Lithuania but to its two Baltic neighbours, Latvia and Estonia, as well as to Poland, as the countries seek to reduce their dependence on gas imports from Russia.

The decision, coming less than six months after the devastating accident at the Fukushima nuclear plant in Japan, stood in marked contrast to the one taken by Lithuania's larger EU peer Germany.

Berlin responded by bringing forward the phase-out of nuclear power from 2034 to 2020.

The two responses are proof that while atomic power has experienced a serious setback in the wake of Fukushima, it remains a chosen source of energy for many countries.

Most governments with existing reactors have launched reviews of their safety and regulatory systems, but nuclear's powerful twin attractions – energy security and zero carbon emissions – remain strong arguments in its favour.

Andrius Kubilius, Lithuania's prime minister, said this summer that the project was important for energy independence, but it was also "an economic project whose development may have a positive impact on growth".

Lithuania and its former Communist neighbours are not the only ones. In Finland, which is building the world's first new-generation reactor, an industry consortium announced in October the first site of a new nuclear plant anywhere in the world since Fukushima. Like Lithuania, Finland relies heavily on Russian gas imports.

In the UK, the government insists it will continue with its ambitious programme to build eight reactors by 2025.

In China, which until the accident was leading the nuclear "renaissance" with 27 reactors under way and 51 more planned, the government has suspended approvals for new plants but not stopped construction.

> '[The industry] must demonstrate it is an economically competitive solution while increasing safety levels'

Even before Fukushima, construction was overwhelmingly centred in non-Organisation for Economic Co-operation and Development countries. The accident has had an even more "polarising effect", says Lady Judge, former chairwoman of the UK Atomic Energy Authority and a nuclear consultant.

"Countries that never wanted to do nuclear or who came at it reluctantly are using Fukushima to back out gracefully," she says, citing Germany and Switzerland as examples.

The accident, she adds, "is having a resounding effect in those countries where they wanted to hear it".

Nevertheless, even in those nations that remain committed to new nuclear power, the industry now faces the challenge of regaining both public and political confidence.

Europe's flagship project at Olkiluoto in Finland – the 1,600 megawatt EPR reactor being built by a consortium led by France's Areva, which will be the world's first third-generation reactor – has become a symbol of the enormous cost, complexity and risk of new atomic projects.

It is more than €$2.6bn ($3.47bn) over budget and five years late. Another Areva reactor, for EDF in Flamanville in France, is also facing delays.

The International Energy Agency in November cut its forecast for nuclear power's share of total primary energy demand for 2035 from 8 per cent to 7 per cent as a result of Fukushima. The agency also warned of higher construction costs as a result of the uncertainties.

The industry "must demonstrate it is able to remain an economically competitive solution to generating electricity while increasing safety levels compared with gas and renewables", says Pierre Derieux, partner at Boston Consulting Group (BCG).

Both the Finnish and French projects are paying the price for being prototypes. In the case of Finland, the delays have resulted in acrimonious arbitration between Areva and its Finnish customer, the utility TVO, about who will pay the additional costs.

Staff undergoing decontamination procedures at Fukushima EPA

"First-of-its-kind effects" were a big issue, says Claude Jaouen, vice-president in charge of reactors and services at Areva. The main problems were design and the supply chain – which had to be constructed, as no reactor had been built in Europe for 20 years – and the amount of documentation that had to be produced.

Areva's reactor design will also be used by EDF for its plants in the UK but Mr Jaouen insists that "things won't be the same at all". Not only will Areva have the experience of projects in Finland, France and China, but the licensing process for the design is different in the UK and will be finalised earlier.

Even before Fukushima the challenge for the industry was formidable. Eight months after the accident, that challenge has become tougher, with the loss of important developed markets.

Before Fukushima, BCG forecast worldwide installed nuclear capacity would reach 516GW by 2020, up from 378GW in 2010. The group is now predicting a "possible case", taking into account reviews of new-build projects and countries' strategic objectives, of 436GW by 2020.

Nuclear capacity will continue to grow, but it will take time before people once again talk of a "renaissance".

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Wave of enthusiasm for liquefied gas sweeps shipowners


Booming business: one of BW Gas's LNG tankers, the Oyo. The company believes it is seeing a long-term pick-up in LNG demand

Transport

Tanker bosses appear convinced there is now a market in the fuel, says **Robert Wright**

In the middle of the last decade, there were few surer ways to earn a sneer from a traditional oil tanker executive such as Ulf Ryder, chief executive of Gothenburg-based Stena Bulk, than to mention the possibility of getting involved in running tankers for liquefied natural gas.

The business was written off as expensive, dull and unlikely to provide an adequate return. Nearly all the gas moved on ships signed on charters of 20 or even 25 years with energy companies, which offered owners only marginal returns and onerous conditions.

Worse still, tanker owners could see the fate of others who had trusted the trade would eventually support a lively short-term spot market catering to the needs of a thriving, international gas-trading industry.

Many had been forced to lay up their ships – which had each cost about $200m – in sheltered bays and fiords, because no such market developed. Nearly all the gas moved under the long-term charters.

Yet, in May this year, Stena Bulk agreed to buy three LNG carriers from Taiwan's TMT Group for $700m and has since ordered four more tankers.

It is one of several such moves this year by traditional tanker owners who appear convinced that, after decades of disappointment, a vigorous market in shipping LNG could be about to offer shipowners opportunities to seek flexible, lucrative LNG shipping contracts.

Mr Ryder is convinced the market, where short-term charter rates for carriers have risen from an unprofitable $30,000 a day to a lucrative $125,000, has changed permanently from the days when the only opportunities in LNG shipping were in low-return long-term chartering. "We didn't want to be in that business," he says.

The boom both in availability of gas and demand for it worldwide, combined with the time and expense required to build more ships to meet the need, should ensure, Mr Ryder says, that 90 to 95 per cent of the available shipping capacity is in use for several years to come.

"When that happens, we always have a booming market," he says.

Keith Bainbridge, a partner specialising in LNG for Oslo's RS Platou shipbrokers, is more sceptical. He puts present conditions down to a temporary ship shortage, which is pushing up charter rates but will ease as new ships are delivered later this decade.

The spike is making it more difficult for the smaller, nimbler traders that provide much of the short-term business for crude oil tanker owners to enter the market, he says.

"Traders are being priced out of the market," Mr Bainbridge says. "What you have is the majors really tightening their control on the LNG market, just like they used to do with the oil market."

Yet, whether they turn out to be lasting or temporary, there is no doubt, according to Richard Beyer, a director of the Atlantic basin LNG business of Japan's NYK Line, that there have been significant changes from a year ago, when many ships were laid up.

"Conditions have changed in the past 12 months, so that a number of those ships have come out of lay-up and are back on the market," Mr Beyer says.

In the US, booming shale gas production has disrupted the market. Producers and shipping companies had assumed the country, which may soon become a net LNG exporter, would be a big importer.

Japan's March earthquake and tsunami, meanwhile, created substantial demand because they have put such a high proportion of nuclear power stations out of action.

The resulting price differential – between a price of some $4 per million British thermal units (MMBTU) in the US and as high as $20 per MMBTU in Japan – has encouraged energy companies to divert shipments that would have gone to the US to Japan and other Asian countries.

Many of the ships making the journeys had been expected to spend their entire careers working on a single route, such as the busy passage from Qatar to Milford Haven in the UK.

"Rather than go from A to B and back again and ships being designated as loading at a particular liquefaction project and going to the same regasification point for 15 years, there has been an increase in diversion," Mr Beyer says.

Andreas Sohmen-Pao, chief executive of Oslo-listed BW Gas, one of the world's biggest owners of LNG tankers, argues that the changes mark only the start of a long-term pick-up in LNG demand. He is particularly excited at the prospect that the US might soon start exporting its cheap gas.

"It's clean, it's flexible and it's increasingly abundant on the supply side," Mr Sohmen-Pao says of LNG. He adds: "The destinations have become much more flexible, to the extent that cargoes will move according to price differentials in different markets."

'The majors are tightening control on the LNG market, just like they used to do with the oil market'

Yet the risk remains that the current wave of enthusiasm could end as badly as a previous spike, at the end of 2001, when charter rates briefly touched $120,000 a day.

Then, excessive ship deliveries and a lack of gas because of late completion of LNG projects quickly sent rates tumbling. Alan Marsh, chief executive of London-based Braemar Shipping, a services company, recognises it will be a challenge to arrange charters for the many vessels to be delivered in 2013 and 2014.

"There's still a lot of tonnage needs to be fixed," he says.

But, while he denies there is yet anything in LNG to compare with the deep, sophisticated market in crude oil tanker chartering, he expects a rough balance between supply and demand to persist.

"I think the projects that we're expecting will match fairly well the need for more tonnage," he says.


Gearing up for exports: a rig at work in Pennsylvania Bloomberg

Gas market US set to change roles from importer to exporter

In a turnround that would have been unthinkable a few years ago, the US is predicted to become the world's top oil and gas producer by 2020, passing Russia and Saudi Arabia.

That is the message of a report produced by PFC Energy, a consultancy, in November. The reason is the rapid growth of production from shale rock sources because of advances in technology.

The forecast, on a barrel of oil equivalent basis, is a marked change for a country where overall oil, gas, and gas liquids production peaked in the early 1970s.

The growth in extraction from shale has made the US the world's largest producer of natural gas. It is now poised to enter the global liquefied natural gas export market.

"North America is the second-largest source of additional LNG capacity in this decade after Australia," Nikos Tsafos, senior manager in upstream and gas at PFC. "That is truly astonishing."

Just 10 years ago the US was trying to build terminals to import LNG. Today, those who had expected to import are moving to refit facilities so they can now export.

In late October, the BG Group signed the first long-term agreement to buy LNG from the Gulf coast, taking the US a step closer to becoming an exporter.

Roger Ihne, principal in the energy and resources practice at Deloitte, the consultancy, estimates that if the three terminals that have been approved for export proceed with their plans, the amount of gas sent abroad would be just under 10 per cent of current US consumption.

And the impact on prices would be minimal, adds Tom Choi, Deloitte's national practice leader for gas in the consultancy's MarketPoint forecasting group. He estimates that even with that amount of fuel exported, US natural gas prices would only rise less than 2 per cent because the resource is so abundant.

"Even if the US substantially increased the use of natural gas, there would still be substantial gas left to meet its domestic needs for decades," Mr Ihne says.

Nonetheless, US manufacturers, who have gained substantially from the drop in US natural gas prices associated with the shale production boom, are worried. The Industrial Energy Consumers of America, a non-partisan association of leading manufacturing companies with $700bn in annual sales, is urging changes to the natural gas export permit process.

"As substantial industrial consumers of natural gas and natural gas-fired electricity, we urge Congress to make important changes to the permitting process of waterborne exports of natural gas so that the interests of the public are truly protected," the group said in late November.

The group noted that six applications have been filed for export approval, and those alone would increase natural gas demand by about 14 per cent of the US total. To put that in perspective, US demand has increased only 3.4 per cent in the past 10 years.

"Consuming domestically produced natural gas to make value-added products here and ship them offshore is a better alternative for manufacturers and the country," the group said.

'The issue the world faces is there is not enough supply to meet LNG demand'

But Martin Houston, head of BG's LNG business, does not believe that exporting LNG from the US will move prices above $6 per million British thermal units – still substantially lower than global prices, though up from the domestic prices of about $4 seen over the past year.

"It will not impact price or volatility," he says. Which is not to say that it will not be in high demand.

"We don't see any shortage of customers," Mr Houston adds.

He predicted demand for US LNG will be strong, given the world must replace by 2020, on a global gas basis, 75 per cent of current supplies. That would require 9 per cent growth per year, three times the 3 per cent at which it is now growing annually.

"We have a view that the issue the world faces is that there is not enough supply to accommodate LNG demand," Mr Houston says.

Philip Weems, partner at K&S, the law firm, and co-leader of its global energy practice, sees that huge global demand as a growth opportunity for the US, as it will encourage additional exploration and development of gas across the country.

At present, producers have limited their production because prices are so low. But if the US starts to export the fuel, it will raise demand and lift prices to a level that promotes more production.

He does not believe that the knock-on effect will be substantially higher US natural gas prices – which would discourage manufacturing – as a result of the billions of dollars required to refit import terminals to enable them to export LNG. It is unlikely all of them will be refitted in any event.

"Funding sources are not yet clear," Mr Weems says. "It is early days for this trend."

Sheila McNulty

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