

NEWS SEPTEMBER 2018

Total has started production at Kaombo, currently the biggest deep offshore development in Angola, located on block 32, off the coast of Luanda. The Kaombo Norte floating, production, storage and offloading (FPSO) vessel will produce an estimated 115,000 b/d of oil, while a second FPSO, Kaombo Sul, is expected to be commissioned next year. Overall production will reach an estimated 230,000 b/d of oil at peak with associated gas exported to the Angola LNG plant. The Kaombo project has an estimated 650mn barrel of reserves.

ExxonMobil has entered into an agreement with Azinam to acquire a 30% interest in petroleum exploration licence (PEL) 44, offshore Namibia. Azinam will retain a 12.5% stake, with Maurel and Prom, the licence operator, retaining its current 42.5% equity interest and Namibian partners NAMCOR, Livingstone Mining, and Frontier Minerals also retaining their carried interests of 8%, 4% and 3% respectively.

Six states accounted for 72% of US fuel ethanol production in 2016, according to the most recent estimates from the Energy Information Administration (EIA). Iowa, Nebraska, Illinois, Minnesota, Indiana and South Dakota collectively produced 265mn barrels of fuel ethanol out of the US total of 367mn barrels. All six states are among the top 10 US producers of corn, the primary feedstock for ethanol plants, according to the US Department of Agriculture (USDA). US fuel ethanol production more than doubled from 2006 to 2016. The Energy Policy Act of 2005 created the Renewable Fuel Standard, and by the end of that decade, most motor gasoline sold in the US was blended with 10% fuel ethanol by volume. In recent years, growth in export market has contributed to further increases in domestic fuel ethanol production.

Eni and Snam, through its subsidiary Snam4Mobility, have signed a second contract aimed at creating 20 new compressed natural gas (CNG) refuelling stations for vehicles in Italy, as part of both companies' commitment to promoting sustainable mobility in the country. The deal follows the contract signed a few months ago to create a group of 14 CNG stations, of which the first are due to open within 1Q2019.

Total is to acquire KKR – Energas' two gas – fired combined cycle power plants (CCGT) in the north and east of France, which represent an electricity generation capacity of approximately 825 MW. Through its 73% stake in Direct Energie, Total also has 800 MW of capacity in two power plants of 400 MW each in France and in Belgium. The development of another 400 MW plant is planned in the Brittany region. The group plans to secure a 15% share of the B2C gas and electricity supply market in France and Belgium within five years.

TechnipFMC has been awarded a contract by state – owned Hindustan Petroleum Corporation (HPCL) for a grassroots hydrogen generation unit (HGU). The project is part of the brown field expansion for the Visakh refinery modernisation programme, located in the state of Andhra Pradesh, India, which aims to increase refining capacity at the facility from 8.33 mn t/y to 15 mn t/y.

The rise in crude oil prices that has been such a feature of the global economy since the start of the year is providing little in the way of respite for fuel customers. Indeed, all the signs are that there will be no relief from the continued firmness in the fuel market until well into 2019, at the very earliest. The knock – on effect of the turnaround in the crude oil market – after more than three years of posting sub \$50/b – on airline costs, shipping costs and prices being paid at the fuel pump by motorists is palpable. GlobalPetrolPrices.com estimates that every 10% changes in oil prices leads, on average, to a 3% change in fuel prices in Europe and about a 7% change in the US. In principle, the higher the fuel taxes, the smaller the change in fuel prices for a given change in oil prices.

Fuel costs for airlines have increased more than 50% in the past year and they are continuing to rise. According to data from the International Air Transport Association's (IATA) Jet Fuel Price Monitor, fuel prices rose to \$687.5/t on 22 June 2018, up 58% from the same period a year ago. The impact of this price rise on the global airline's fuel bill is put at \$42.5bn. In June, both Delta Airlines and low cost airline Ryanair warned of a sharp hike in fares before the end of this year. Amid a fall in its share price, Delta cut its profit forecast. The airline was also forced to warn investors that it planned to make decisions on capacity this autumn, when demand usually drops off. American airlines also cut its profit forecast, saying that higher jet fuel prices would cost it \$2bn this year.

Ryanair has predicted a tough 2019 because of rising fuel prices, even as it reported a strong increase in passengers and profits in its annual results for 2018. Chief Executive Michael O'Leary said that he expected a rise of 9% in unit costs, with fuel alone adding €400mn. The airline is 90% hedged for its 2019 fuel bill, but the expected continued high prices will remain a concern to Ryanair.

Meanwhile, the world's biggest container shipping group – Maersk Line – is facing a 20% rise in its fuel cost this year. In May, it told customers that it was being forced to introduce an 'emergency bunker surcharge'. Commenting on the global fuel price situation, the company said: 'This unexpected development means that it is no longer possible for us to recover bunker costs through the standard bunker adjustment factors.'

In the first quarter of 2018, Maersk's total bunker costs rose to \$1.2bn, up from \$782mn a year earlier. Maersk cautioned this surcharge may not even be enough. It said, should bunker prices continue to rise to \$530/t, it would have to double the emergency surcharge. Other shipping companies, such as the Mediterranean shipping company (MSC), are also beginning to pass on higher prices to their customer. MSC has introduced a worldwide temporary emergency bunker surcharge on all ocean and land – based cargo carriage, although the details have yet to be released.

External forces

The fuel cost burden that is being placed on aviation, shipping and the ordinary motorist is largely a response to the external stimuli that is being provided by firming crude oil prices. In turn, this firming follows the several sharp 'shocks' that have impacted the system over the past 12 months. These were provided first by political instability in Venezuela and then more recently by the Trump administration's withdrawal from the Iran Nuclear deal, also known as the Joint Comprehensive Plan of Action (JCPA).

On 23 June 2018, the oil producers' cartel OPEC gathered in Vienna, Austria, with non – OPEC ministers to try and formulate a response. Delegates recalled that the 30 November 2016 Declaration of Cooperation (DOC) agreed a production 'adjustment' of 1.2mn b/d from OPEC member countries and 600,000 b/d from the key non – OPEC participants countries.

In wording that is typical of OPEC communiqués, the Secretariat released a statement at the close of the June session, noting that 'countries participating in the DOC have exceeded the required level of conformity that had reached 147% in May 2018... the 4th OPEC and non – OPEC Ministerial Meeting hereby decided that countries will strive to adhere to the overall conformity level, voluntarily adjusted to 100% as of 1 July 2018 for the remaining duration of the DOC'.

Effectively, this restores about 1mn b/d of crude oil to the market. It also represents the first increase in output since the production cuts were implemented in November 2016.

However, any hope that consumers may have entertained ahead of Vienna that opening the taps would take some of the steam out of the crude oil market and lead to a softening of refined product prices were very quickly dashed. Indeed, in the week following the joint session oil prices, instead of falling, renewed the surge that was witnessed earlier in the year.

The reasons why this should have happened are varied. Draw – downs in crude oil inventories, healthy oil demand and geopolitical developments have all supported this rising trend. But according to Oilprice.com an important supplementary reason is that the market simply doesn't believe that the announced output increase is enough to balance the oil market. Almost as if to back up this argument, the International Energy Agency (IEA's) most recent Oil Market Report (OMR) believes that by the end of this year, the call on OPEC crude will be nearly 1.5mn b/d more than its members are forecast to produce.

Even if OPEC managed to follow through on the full output increase, it would be insufficient to prevent further declines in global crude oil inventories. But there is also a big question mark against whether OPEC will actually be able to meet its announced 1mn b/d extra production could be closer to 700,000 b/d as some members are already producing at full capacity.

While OPEC is not exactly sanguine about the prospects of a crude oil supply shortfall, it is to some extent banking on a slowdown in the Chinese and Indian economies to cap any further oil price rise. In its June monthly oil market report, OPEC forecasts that, while Japan and the Euro – zone are projected to accelerate in the second half, China is expected to continue financial tightening. This, combined with monetary measures in the US, could dampen growth in this half. India is also forecast to show lower growth in the second half of the year, after a strong recovery during the first half.

No let – up

But OPEC's view of Asian demand not – withstanding crude oil prices are unlikely to weaken for the rest of this year and there will be no let – up in misery for fuel customers. Airline executives are warning that they may have to raise ticket prices and cut capacity if fuel costs continue to rise. The high price of fuel could also jeopardise newly added air routes. The rise in shipping costs as a result of higher fuel prices will also have a knock – on effect throughout the rest of the global economy. Maersk, with a 19% share of seaborne freight, is often seen as a barometer for global trade. It warns that a surcharge of \$120 on a 40 foot container of dry goods from Rotterdam to Shanghai translates into a 14% price hike for customers.

Meanwhile, it is the ordinary motorist who has steadily witnessed an inexorable rise in pump fuel prices throughout this year that could be forgiven for thinking that it is actually they who are in the eye of the storm. Since January 2016, when crude oil prices were around \$30/b, pump prices have risen by an average of roughly 20%. In France, petrol went up 22%, which is similar to the UK. Italian petrol prices have risen 15% while in Germany petrol prices have gone up by 18%.

The increase for diesel is even higher. Compared to the end of January 2016, the French pay 42% more per litre; the British pay 26% more; and both the Italians and the Germans pay 27% more. This means that even though petrol and hybrid cars are increasingly popular, the relative popularity of diesel within the current European fleet is continuing to place a considerable drag on transportation costs.

Whether Saudi Arabia is capable of riding to the rescue of beleaguered consumers by pumping out more oil – as is the belief of UP President Trump's administration – remains to be seen. Most analysts are of the view that given the fact that Saudi Aramco wants an initial public offering, it is hardly in the kingdom's interest to see crude oil prices soften.

BHP Billiton sells US onshore unconventional assets to BP

BP is to acquire BHP Billiton's US onshore unconventional assets for \$10.5bn, including some of the best – in – class tight oil acreage in the Eagle Ford and Permian basins in Texas, and shale gas assets in the Haynesville in Texas and Louisiana. The assets have combined current production of 190,000 boe/d, about 45% of which is liquid hydrocarbons, and 4.6bn boe of resources.

'This is a transformational acquisition for our Lower 48 business, a major step in delivering our upstream strategy and a world – class addition to BP's distinctive portfolio,' said Bob Dudley, BP Group Chief Executive.

Commenting on the deal, Maxim Petrov, Senior Analyst, Wood Mackenzie, says: 'The most valuable part of the package is BHP's Eagle Ford position given its scale and attractive economics. But the Permian acreage offers the biggest longer – term upside, with some of the best break – evens in the play, well below \$50/b Brent. Similarly, the Haynesville assets have some of the most attractive shale gas economics outside the Marcellus, and nicely compliment BP's existing acreage in the play.'

He continues: 'The assets were initially acquired by BHP in 2011 but the cost generation and capital requirements ultimately proved unsuitable for the company. There's plenty of running room for BP to add value straight away as the assets have been under – invested for the past two years.'

'BP was previously underweight to US tight oil compared to its peers. This deal transforms BP's US business – it will immediately raise its US production by almost a fifth while providing competitive return and volumes growth. We see BP's combined US production hitting 1mn boe/d in 2020, with the potential to reach close to 1.4mn boe / d by 2025.'

Capacity glut to trigger refinery closures post – 2021

An excess of global refining capacity looms after 2021, according to ESAI Energy's latest global refining capacity five – year outlook. A significant increase in new distillation capacity is forecast to 2023. After lagging demand growth in recent years, the coming capacity build cycle will significantly outpace demand, predicts the market analyst. The resulting rise in spare capacity reduce global utilisation rates and put pressure on margins, particularly beyond 2021.

The need to produce additional gasoil for the bunker market is expected to insulate refinery margins and utilisation rates. However, high utilisation rates will lead to the oversupply of high sulphur fuel oil and some other products, which will weigh heavily on margins after 2021. Marginal refiners will have to make fuel oil upgrading investments to stay viable, according to the company. Furthermore, the need to invest coupled with rising spare distillation capacity is expected to lead to a much more bearish operating environment for refiners. These new conditions are forecast to trigger another round of consolidation and rationalisation.

'In conjunction with slower demand growth, new distillation capacity will lead to an increase in spare distillation capacity,' explains ESAI Energy Head of Global Refining, Chris Barber. 'This Spare capacity will cause refining margins and utilisation rates to fall, triggering another round of rationalisation after 2021.'

Houston – Galveston becomes net exporter of US crude

The US port district of Houston – Galveston in Texas recently began exporting more US crude oil than it imported for the first time on record, according to the EIA. Crude oil exports from the Houston – Galveston port district have increased since the restrictions on US crude oil exports were lifted at the end of 2015. In April 2018, crude oil exports from Houston – Galveston surpassed crude oil imports and imports increased substantially to 470,000 b/d. Total US crude oil exports rose to a

record high of 2mn b/d in may, reports the EIA. On average since mid 2017, the US port district of Houston – Galveston has accounted for slightly more than half of the crude oil exported from the US, and the share increased to a record 70% in May.

A port district is a geographic region defined by US Customs and encompasses several individual US ports of entry. The Houston – Galveston port district includes the port of Houston as well as several other ports along the Texas Gulf Coast, from Galveston to Corpus Christi.

Ongoing efforts to expand crude oil export infrastructure at the ports of Houston and Corpus Christi have allowed for increased exports flows, notes the EIA. The only other port district that has seen significant crude oil export volumes recently is the US port district of Port Arthur, which includes the Texas ports of Port Arthur, Sabine, Beaumont, and Orange. This district has on average accounted for close to a quarter of all US crude oil exports since mid 2017.

Despite infrastructure improvements, however, crude oil export capacity is still limited on the US Gulf Coast, because most ports are unable to load larger crude oil vessels, the EIA reports.

New ethane cracker

ExxonMobil has commenced operations at its new 1.5mn t/y ethane cracker at the company's integrated Baytown chemical and refining complex in the US. The new cracker, part of ExxonMobil's Growing the Gulf' initiative, will provide ethylene feedstock to new performance polyethylene lines at the company's Mont Belvieu plastics plant, which began production in autumn 2017.

The Mont Belvieu plant is one of the largest polyethylene plants in the world, with manufacturing capacity of about 1.3mn t/y.

'Our new ethane cracker will help us meet the growing global demand for high performance plastic products that deliver key sustainability benefits such as lighter packaging weight, lower energy consumption and reduced emissions, further enhancing our competitiveness, further enhancing our competitiveness worldwide,' says John Verity, President of ExxonMobil Chemical Company. 'The abundance of domestically produced oil and natural gas has reduced energy costs and created new sources of feedstock for US Gulf refining and Chemical manufacturing while creating jobs and expanding economic activity in the area.'

Together, the Baytown ethane cracker and Mont Belvieu plant represent ExxonMobil's largest chemical investment in the US to date.

Yamal LNG begins gas exports

The first shipment of LNG from the second train of the Yamal LNG project in Northern Russia was ready to leave Sabetta on 20 August 2018. The train adds an additional 5.5mn t/y of LNG capacity to the facility, bringing the total capacity in operation to 11mn t/y. At full capacity, the three – train facility will supply 16.5mn t/y of LNG to Asian and European markets. The third train is expected to start up in early 2019.

Yamal LNG is operated by the Yamal LNG Company, owned by Russian independent gas producer Novatek (50.1%), Total (20%), CNPC (20%) and Silk Road Fund (9.9%).

One of the biggest LNG projects in the world, Yamal LNG is developing the 4.6bn boe of reserves from the giant onshore South Tambey gas and condensate field, located on the Yamal Peninsula.

The project includes an integrated gas treatment and liquefaction facility with three trains of 5.5mn t/y capacity each, storage tanks, and port and airport infrastructure.

Yamal LNG's production is sold under long – term contracts in Asian and European markets, predominantly under oil – indexed price formulas. LNG will be supplied to the markets all year round through an innovative shipping approach involving a fleet of purpose – designed ice – class LNG carriers that will travel the Northern Sea Route to Asia through the Bering Strait in the summer.

The first cargos of LNG from the project to were shipped to China via the Northern Sea Route in July 2018. The LNG tankers Vladimir Rusanov and Eduard Toll took just 19 days to sail from Sabetta to the Chinese port of Jiangsu Rudong. This compares to the 35 days for the traditional eastern route via the Suez Canal and the Strait of Malacca.

'This voyage begins a new era of Russia LNG shipments to meet the growing natural gas demands of the Asian – Pacific markets using the Northern Sea Route of the Arctic Ocean,' said Leonid Mickhelson, Chairman of Novatek's Management Board, at the time. 'The Northern Sea Route ensures shorter transportation time and lower costs, which plays a key role in developing our hydrocarbon fields on the Yamal and Gydan peninsulas. Our vast high – quality, conventional natural gas resource base combined with low capital intensity and operation and transportation costs positions Novatek's LNG projects among the most competitive projects globally. Utilising the Northern Sea Route as a viable transportation route contributes to the development of the Northern regions and is very important for our country's economic development.

1 TW of wind and solar now installed worldwide, as corporate appetite for renewable grows

The world has now broken the landmark figure of 1 TW of wind and solar generation capacity installed around the globe, with data from Bloomberg New Energy Finance (BNEF) indicating that the milestone was crossed sometime in June.

The research organisation also estimates that the next additional TW of installed wind and solar capacity will arrive very quickly – by 2023, and at a cost 46% lower than the first.

Of the total capacity, 54% is made up of wind and 46% is solar power. BNEF highlights the speed of installations, with the total installed capacity growing 65 fold since the year 2000 and quadrupling since 2010.

Solar PV has shown faster growth over recent years. BNEF data indicates that 8 GW of solar PV capacity had been installed in 2007. Last year around 100GW of new solar was installed and PV has grown from 8% of the total installed wind and solar capacity in 2007 to the 46% figure seen today.

BNEF estimates that the capital expenditure on the world's next TW of wind and solar will total \$1.2tn between 2018 and 2022, compared to around the \$2.3tn it cost to deploy the first TW.

Alongside the rapid growth in wind and solar, BNEF highlights that the total capacity of all renewable worldwide, including hydropower, exceeds 2 TW and that the 1 TW mark was broken around a decade ago.

BNEF estimates that wind and solar will reach 1.1 TW of installed capacity by the end of the year, 11% more than the level it forecasted five year ago.

In a separate report BNEF also highlights that, so far this year, corporations worldwide have already surpassed last year's record of purchasing 5.4 GW of clean energy, buying 7.2 GW by the start of August.

The details are outlined in BNEF's 2H Corporate Energy Market Outlook report, which indicates that Facebook has been the largest buyer of renewable energy so far in 2018, purchasing over 1.1 GW. The company was followed by AT&T as the second largest buyer with 820MW, and aluminium manufacturers Norsk Hydro and Alcoa following with 667 MW and 524 MW, respectively.

Around 4.2 GW (60%) of the global corporate clean energy procurement has come from the US – record year for the country. BNEF notes some changes in the market – with new industries such as telecommunications and manufacturing purchasing renewable power, and companies utilising green tariffs. And smaller companies are aggregating to pool electricity demand and access the clean energy purchasing market.

BNEF says that companies in Europe have purchased a record 1.6 GW of clean energy so far this year, up from a total of 1.1 GW in 2017.

An example of purchasing activity in Europe is Mercedes Benz, which has announced Europe's first automotive power purchase agreement (PPA) with a Polish wind farm. It is also the first such deal signed in Poland, according to the trade body Wind Europe.

Mercedes Benz will buy electricity generated at the 45 MW Taczalin wind farm to power its manufacturing facility in Jawor, 10 km away from the generator. The wind farm has been in operation since 2013.

Global nuclear power generation increases for the fifth consecutive year

Global nuclear power generation increased for the fifth consecutive year in 2017 to reach 2,500 TWh – growth of around 30 TWh on 2016 – according to a new report from the World Nuclear Association (WNA). Although the total is still 150 TWh short of the peak figure recorded in 2006.

Last year saw nuclear power reactor availability improve to achieve a mean average capacity factor of 81%, according to the organisation's World Nuclear Performance Report. At the end of 2017, the global capacity of the 448, operable reactors worldwide stood at 392 GW, up 2 GW in the end of 2016, even while five reactors with a combined capacity of 3 GW were shut down over the year.

Nuclear construction times also gathered pace last year, with the median average construction time for new reactors down to 58 months from 74 months in 2016, and at less than half the average time taken between 1996 – 2000, says WNA.

Faring less well in 2017, however, was progress on plant construction. Four reactors started supplying electricity in 2017, down from the ten that were added in each of the two preceding years. But this is set to pick up, with more than 25 new reactors scheduled to come online between 2018-2019, according to WNA.

The report also features five case studies highlighting examples of nuclear reactor construction and operational performance around the world. This includes Dresden 3 in the US, one of the world's oldest operating reactors, which achieved a 100% availability factor in 2017; the restart of two reactors in Japan and the construction and operation of three new reactor models in Russia, South Korea and China.

Agneta Rising, Director General of WNA said: 'There is no sustainable energy future without nuclear energy. We will need all low carbon energy sources to work together. Nuclear capacity must expand to achieve the industry's "Harmony" goal to enable nuclear energy to supply 25% of the world's electricity demand by 2050.'

In related news, the recent heatwave across the northern hemisphere could affect nuclear generation amid fears that the hot weather will 'increase the risk of reactors getting dangerously hot or harming wildlife', reported The Times.

This has included the closure of a reactor at Ringhals in Sweden after sea water used for cooling purposes reached 25°C – the maximum temperature allowed under safety rules.

Energy investment failing to keep up with security and sustainability goals – IEA

The electricity sector attracted the largest share of global energy investments in 2017, sustained by robust spending on grids – exceeding the oil and gas industry for the second year in row – as the energy sector moves toward greater electrification, according to the International Energy Agency's (IEA's) latest review of global energy spending.

Global energy investment totalled \$1.8tn in 2017, a 2% decline in real terms from the previous year, according to IEA energy analysts Michael Waldron and Simon Bennett, presenting the World Energy Investment 2018 report at the Energy Institute's headquarters in London in July. More than \$750bn went to the electricity sector, while \$715bn was spent on oil and gas supply globally.

The report indicates that state – backed investments are accounting for a rising share of global energy investment, as state – owned enterprises have remained more resilient in oil and gas and thermal power compared with private actors. The share of global energy investment driven by state – owned enterprises increased over the past five year to over 40% in 2017.

Meanwhile, government policies are playing a growing role in driving private spending. Across all power sector investments, more than 95% of investment is now based on regulation, with a dwindling role for new projects based solely on revenues from variable pricing in competitive wholesale markets. Investment in energy efficiency is particularly linked to government policy, often through energy performance standards.

The reports highlights that after several years of growth, combined global investment in renewable and energy efficiency declined by 3% in 2017 and there is a risk that it will slow further this year.

For instance, investment in renewable power, which accounted for two thirds of power generation spending, dropped 7% in 2017. Recent policy changes in China linked to support for the deployment of solar PV raise the risk of a slowdown in investment this year.

While investment in energy efficiency showed some of the strongest expansion in 2017, it was not enough to offset the decline in renewable. Moreover, efficiency investment growth has weakened in the past year as policy activity showed signs of slowing down. This trend is 'worrying', according to the IEA, as it could threaten the expansion of clean energy needed to meet energy security, climate and clean – air goals.

On innovation and new technologies, government energy research and development (R&D) spending increased by around 8% in 2017, reaching a new high of \$27bn. Most of the growth came from spending on low carbon technologies, which is estimated to have risen by 13%. Low carbon energy technologies account for three – quarters of public energy R&D spending.

Overall, governments allocate around 0.1% of their total public spending to energy R&D a level that has remained stable in recent years. IEA tracking of corporate energy R&D investment shows this grew in 2017 by 3% to \$88bn, with faster growth in low carbon sectors. A major contributor to this growth was the automotive sector, driven by intense technological competition, notably in electric vehicles (EVs) and new forms of mobility. Digital efficiency technology is also attracting more funding.

The IEA also states that new approaches to boosting investment in carbon capture, utilisation and storage (CCUS) are needed for the world to be on track to meet its climate goals. Only around 15% of the \$28bn earmarked for large CCUS projects since 2007 was actually spent, says the IEA, as commercial conditions and regulatory uncertainty have not encouraged private investment.

New York City's largest solar system goes online

New York City has launched its largest solar installation project – a 3.1 MW solar array – in a move to boost the city's ambition to source 50% of its electricity from renewable by 2030.

Located on Staten Island, the project comprises 9,000 solar panels and will generate nearly 4 GWh of solar energy each year. The power will be used by the City's Fordham University and Fordham Preparatory School in the Bronx, north New York, by 20% and 37% respectively.

The ground – mounted system, which sits on 4 ha of unused industrial land, uses remote – net metering; an arrangement that enables the kilowatt hours generated by solar on one site to offset the electricity needs of customers at a different location.

The move supports New York State Governor Andrew Cuomo's clean energy goal mandating 50% of electricity to come from renewable energy sources by 2030, which is part of the state's wider Reforming the Energy Vision, which was implemented in 2011.

Since 2011, solar usage in New York State has increased by more than 1,000% and leveraged more than \$2.8bn in private investments, according to the New York State Energy and Research Authority. Last year, New York was ranked the second most energy efficient city in the US by the American Council for an Energy – Efficient Economy, one position behind nearby Boston.

As well as solar power, New York State is pushing forward other renewable energy technologies, and has put forward a procurement plan for offshore wind power, aiming to reach the state's overall goal of 2.4 GW of offshore wind power installed by 2030.

The city has also announced an energy storage roadmap, which has been put in place to guide New York towards having 1,500 MW of energy storage capability installed by 2025. The roadmap outlines short – term recommendations for how energy storage can deliver affordable electricity to New York residents and cost – effectively address the needs and demands of the city's electricity grid.