

UK Commercial - Autumn/Winter 2021

SPOTLIGHT  
Savills Research

# Gigafactories

The impact on the UK warehouse property market





The electric vehicle industry must begin to manufacture batteries on a giant scale

# Batteries include

Large-scale factories are required for the production of electric vehicles

Gigafactory – it’s one of the latest buzzwords being thrown around the Industrial and Logistics market, attracting a lot of interest. The term refers to the large-scale factories that produce rechargeable lithium-ion batteries, primarily for electric vehicles (EVs) at a gigantic scale. Elon Musk initially created the term for the name of Tesla’s manufacturing plants, the first and exemplar being the 1.9 million sq ft Gigafactory 1 plant in Nevada. The process itself is incredibly complex and has many separate components throughout the manufacturing process – there’s also a need to undertake constant laboratory analysis and further research and development practices, which means it is far more economical to complete the process in one place, requiring the factories to be very large.

Globally, we have seen a huge rise in efforts to tackle climate change that has the ability to alter human life as we know it. Treaties such as the Paris Agreement have been created which are legally binding goals to help tackle climate change. This particular treaty was adopted by 196 Parties at COP21 in Paris in 2015, with the goal to limit global warming to well below 2 degrees Celsius, preferably to 1.5 degrees Celsius compared to pre-industrial levels. Electric vehicles are a vital part to meeting these global goals on climate change as they produce no greenhouse gas emissions compared to internal combustion engines.

The United Kingdom has started to implement various policies and pieces of legislation that seek to reduce global greenhouse gas emissions, recently rumouring to announce a formal ban on the sale of new combustion-powered vehicles at an earlier than proposed date of 2030. Consequently, the demand for electric vehicles is set to skyrocket.

Gigafactories will be required throughout the world to cater for the anticipated surge in electric vehicle production through

providing the most critical component: the battery. As electric vehicle production has become more commonplace, it has become evident that over 40% of the EVs value lies within the battery, making it the most critical part within the automotive supply chain.

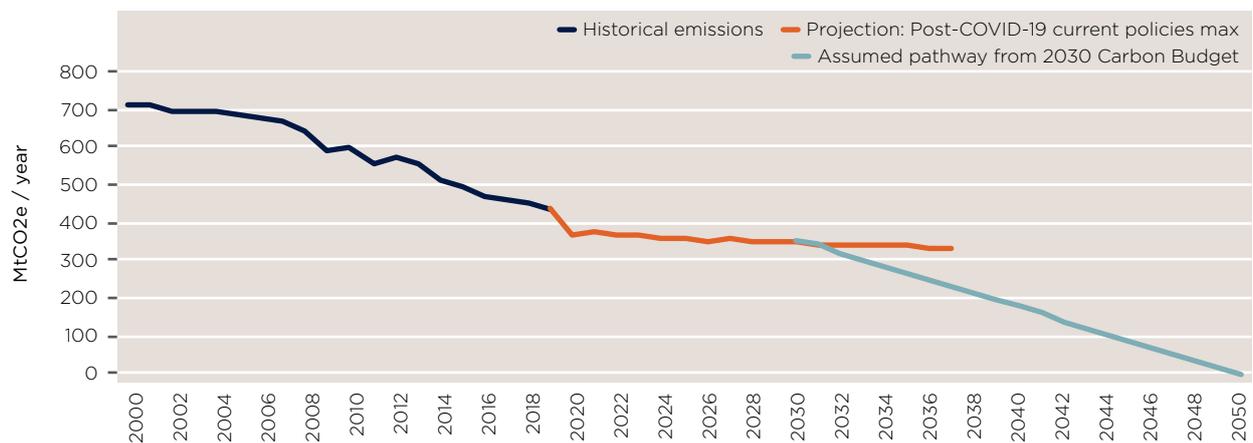
The industry must begin to manufacture these batteries on a giant scale in order to drive down overall costs through economics of scale that will bring the price of electric vehicles closer to traditional internal combustion cars. Moreover, to make the process viable, battery production should be located close to the electric vehicle production site – if the body production is on UK soil, then so should the battery plants.

## Multiple new factories

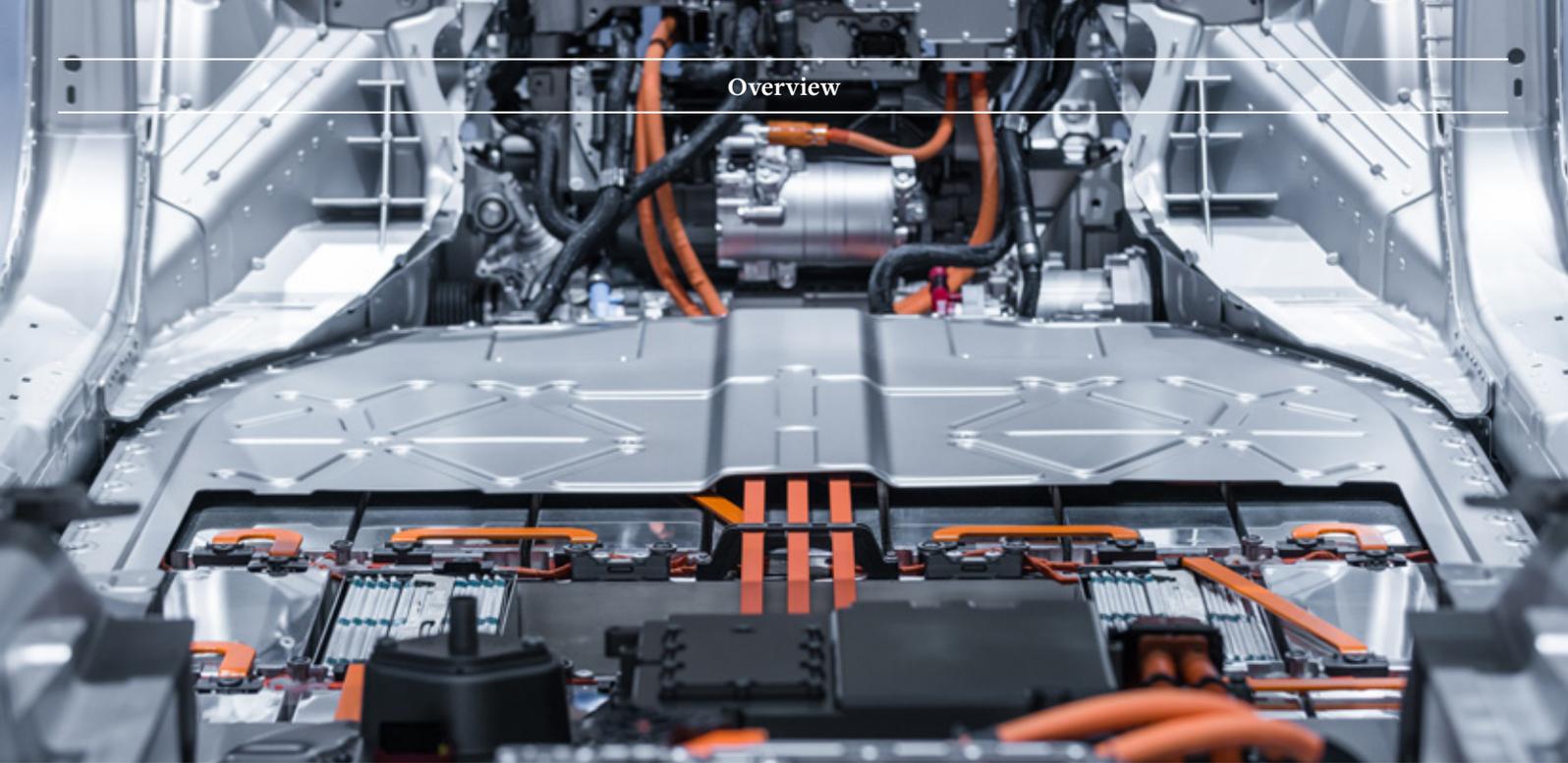
Currently, the UK is still waiting to get out of the blocks when it comes to pushing Gigafactories. Our first has only recently been announced. However, the UK needs to secure multiple new factories to develop and scale-up new high-performance lithium-ion batteries if the sector is to continue to face the twin perils of tariffs in a no-deal Brexit along with the potentially prolonged economic fallout from the Covid-19 pandemic – this will help ensure automotive production remains in the country.

If the UK does not attract and develop a battery manufacturing industry, there is a risk that the production of EVs could move out of the UK and gravitate towards where the batteries are manufactured to shorten supply chains and making them more economical. Without UK battery manufacturing, the Faraday Institution estimates that car production in the UK would decline and there would be a potential loss of some 114,000 existing automotive jobs by 2040.

**UK carbon emissions falling but current policies will not meet net zero obligation**



Source: Savills Research



### Strategically important

Recently, UK-based manufacturers such as Jaguar-Land Rover, Nissan and BMW have started lobbying the Government to help build more factories to support their efforts in swapping internal combustion engines that emit carbon dioxide for electric vehicles with zero exhaust emissions. As such, the Department for International Trade (DIT) is working with the industry to help make the UK the location of choice to develop world-class electric vehicle technologies by looking to find a four million sq ft site.

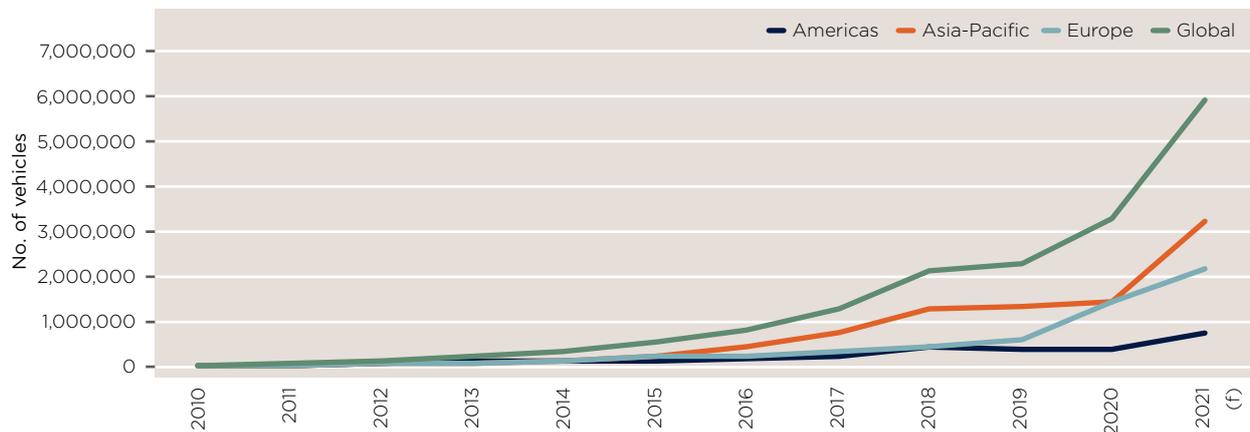
Putting the future battery requirement into context, Tesla alone noted that in order to ramp up production to 500,000 cars per year, the company would require today's entire worldwide supply of lithium-ion battery production. This would only cover a fraction of the demand. According to US automotive sales, there are roughly 17 million new passenger cars and light trucks sold each year. The UK, in isolation, has seen around 2.3 million new cars registered per annum, again highlighting the global shortfall of lithium-ion batteries for electric vehicle manufacturing.

There is indeed a clear advantage to having Gigafactories on UK soil. Our first Gigafactory is set to provide numerous

benefits – Britishvolt is committed to building a £2.6 billion facility in Northumberland. It will be up and running by 2023 and will operate at full capacity by 2027, by which time, it will be producing 300,000 lithium-ion battery packs a year, whilst creating 3,000 jobs directly and 5,000 in its wider supply chain to support production. The factory is strategically important for the UK automotive industry, and it will mark one of the largest UK industrial investments since 1984.

Finally, Gigafactories and the production of lithium-ion batteries are not just for electric vehicle production, but they are expected to take a central role in the UK's effort to retool the economy for a fossil fuel-free world. Rechargeable batteries are starting to reach a size that would enable renewable energy sources to replace small-to-medium-sized natural gas generators that were traditionally charged by fossil fuels. Moreover, adding such storage makes renewable energy more profitable as one of the main challenges of renewable energy is that the more you put on the grid, the more the value declines. Storage helps deal with that by soaking up excess energy that would have been lost in the middle of the day, when electricity demand is lower, moving it to a time when it is more valuable.

### Global sales of electric vehicles accelerate



Source: EV-volumes.com



The availability of sites where the requirements of a Gigafactory can be met are few and far between

# Big footprints

What are the real estate implications of Gigafactory development in the UK?

Whilst the term Gigafactory conjures up imagery of advanced manufacturing and hi-tech investment the real estate implications of such development have yet to be considered in great detail. In layman’s terms, Gigafactories should be considered as the engine plants of the future. As we have seen historically, where automotive manufacturers invested in engine manufacturing plants, demand for warehouse space in the locality increased dramatically from their suppliers as companies looked to implement just-in-time supply chains to support the manufacturing process.

In relation to Gigafactory buildings themselves, it is important to first consider their real estate requirements before establishing the locations that could be matched to that demand.

## The plot thickens

Firstly there is the sheer scale of the building required. Estimates range between a building of between 2-3 million sq ft in terms of footprint. By way of comparison, the initial Tesla building in Nevada has a footprint of 1.9m sq ft on a building plot of c.230 acres, whereas phase 1 of the under-construction facility in Berlin will house a building close to 600,000 sq ft on a plot of 376 acres. Tesla has, however, purchased 740 acres in total and expects to roll out developments in phases as production increases.

Britishvolt, a UK battery manufacturing start-up, has committed to a site of 235 acres in Blyth that will house 2.75m sq ft of manufacturing space. Whilst financing obstacles still exist for the construction of this building if it does come to fruition, over a phased period of development, it would be the largest building by footprint in the UK. Whilst some manufacturing sites from current automotive manufacturers

## Substation locations that can accommodate 200MW of demand



Source: National Grid

## How would a Gigafactory impact the market Using Nevada as a case study\*

		Jobs	Warehouse rents (£psf)	Annual take-up	Vacancy	Annual Completions
North East	Pre Gigafactory	n/a	£4.95	3,320,213	3.80%	3,236,403
	Post Gigafactory	8,000	£8.42	6,557,420	2.17%	8,544,104
South Wales	Pre Gigafactory	n/a	£5.15	2,393,796	5.80%	425,894
	Post Gigafactory	8,000	£8.76	4,727,747	3.3%	1,124,360

\* Refer to North American case study on page eight

Source: Savills



### A key factor when choosing to locate a Gigafactory is the availability of clean power

such as JLR, Toyota and Nissan range between 3-5m sq ft in total, these are much more akin to campus-style developments with interconnected buildings rather than one unit.

Given the fact that Gigafactory buildings will be designed to be a single unit rather than a campus style development site, topology is also a critical factor. Given the expense of remediating sites and creating plateaus on undulating sites, it is important that, generally speaking, the terrain is predominantly flat in the first place.

A further key consideration is the availability of power to the site. Whilst estimates range, figures of a power draw of 150MVA for a unit of 2m sq ft have largely been accepted.

If we put this into context when compared with other warehouse and industrial developments, it is clear that the energy required to support battery production is vast. By way of comparison, a fully automated frozen cold store facility of around half a million sq ft would be expected to draw on c.5MVA which is also similar to a multi-level automated Amazon Customer Fulfilment Centre.

Property investors and developers should also take note that, Tesla aside, many companies operating in this arena are effectively start-ups. This brings into question concerns about covenant strength, but also the ability to pay for industrial land at today's retail prices. In order to facilitate development, it is highly likely that land needs to be sourced in cheaper locations or that the public sector can intervene and structure deals to provide land in more cost-effective ways.

Taking aside the real estate requirements, another key factor when choosing to locate a Gigafactory is the availability of skilled labour. Press reports regarding the announcement that Britishvolt plan to construct a Gigafactory in the North East suggest that 3,000 direct jobs will be created, with a further 5,000 roles within the wider supply chain.

If we compare this with other Gigafactory deployments around the world, it could be argued that even more jobs will be created with Tesla Nevada directly employing over 10,000 people and Tesla Berlin expected to employ 12,000. And whilst many of these roles will be focussed on the production line of cars and batteries many of the roles cover robotics, automation, data analytics and other maintenance roles.

#### Planning issues

Taking into account all of the variables around scale, topology, energy usage, land price and labour availability

“Proposed developments which incur green belt release are often contentious and expensive”

### What makes a good site for a Gigafactory?

As the world moves towards a zero emissions future, the electrification of the automotive industry will have a key role to play. The next decade is crucial in building the infrastructure that allows us to manufacture batteries at scale and ensure that the UK automotive industry remains competitive. Since our company was formed in 2019, Britishvolt has been searching for sites that will allow us to play a key role in that zero emissions future.

We were awarded planning permission in July 2021 for our first Gigaplant development, a circa 2.8m sq ft facility on a 238-acre site. Construction commenced in September 2021, and we are on course for the first phase of this facility to be completed by the end of 2023. It's interesting to discuss the site selection criteria that led us here in the first place.

The first key parameter is the availability of energy, not just a plentiful supply, but also from renewable sources. The provision of certifiably clean and green power at a rate in line with comparable European markets is vital in establishing a competitive advantage for battery manufacturing in the UK.

In order to manufacture at the scale we intend to, we need an energy supply of at least 225MVA. There are very few sites in the UK that have access to such a supply in the first instance, and even fewer sites that can provide that from renewable sources. At our Cambois site in the North East, we can take advantage of a number of renewable energy sources; 1.3 GW of energy produced from hydroelectric sources, our own 28MW rooftop solar array, along with significant offshore wind being bought to the area that is yet to be quantified. This allows us to drive CO<sub>2</sub> out of our manufacturing processes and create a truly competitive product.

The second key factor is the deliverability of the site. Whilst there are sites that we examined that may have ultimately been suitable; how soon could we realistically be operational? Many sites may be in myriad ownership, have planning restrictions such as being in the green belt, or have other restrictions, such as the timescales National Grid need to deliver an electricity connection of the scale we need, which ultimately means development will take longer than five years to achieve.

Coupled with the above is the cost associated with purchasing land for such development. Many areas of the UK have seen industrial land values rise dramatically in the last five years. For a business like ours, which is still in a start-up phase, our ability to compete on the open market and pay the land values that traditional warehouse developers can afford to pay would ultimately jeopardise the future success of our operations.

Lastly, but by no means least, we also need a large supply of skilled labour. We plan to create around 3,000 high-quality jobs in the North East with many more being created within our wider supply chain.

From our experience and extensive work to find suitable sites in the UK, it will not be a straightforward process to bring forward sites for development for Gigafactory use. Our site in the North East brings together all of these key factors and we see it as the premier site for battery manufacturing and EV development in the UK.

**Peter Rolton**  
Chairman and UK CEO  
Britishvolt

BRITISHVOLT

and undertaking a filtering exercise, it becomes clear that there are very few markets where the Venn diagram aligns that would make the development of Gigafactories in the short term possible.

However, former industrial areas where local authorities have a vested interest in promoting regeneration of brownfield sites would rise to the top of any hierarchy when considering new locations. It is for these reasons that areas such as the North East and South Wales regularly appear when requirements for battery plants are released.

Given the West Midlands, in particular, has a strong automotive tradition, along with a significant amount of existing automotive infrastructure, including R&D, engine plants and manufacturing, it is not unreasonable to suggest that a Gigafactory could be constructed in the region.

With that in mind, the mayor of the West Midlands, Andy Street, has supported proposals to deliver a site in Coventry that could be used for battery production in the future. Whilst the site delivers on many of the variables already mentioned in this paper, it also highlights a further constraint to development, namely the planning system.

Under the use-class order, any battery production facility would be classified as a B2 development and due consideration would need to be given to factors such as noise,

emissions, air quality, traffic movements and the scale and massing of the building.

The proposed site in the West Midlands is currently also classified as green belt. As the wider industrial and logistics property market has already witnessed, proposed developments that incur green belt release are often contentious, time-consuming and expensive.

It remains to be seen how any such planning issues could be addressed in a timely fashion if the UK is to increase battery production as quickly as it needs to.

One possible solution, given the scale of development, is that any scheme is likely to be classified as a Nationally Significant Infrastructure Project. This opens up the option of a Development Consent Order, which provides multiple approvals, compulsory acquisition powers and has a high success rate.

**“ 49.88 million sq ft of warehouse space will be required in order to accommodate any future employment growth resulting from Gigafactory development ”**





# Making space

What are the implications for the wider industrial property market?

As we have witnessed in many geographies around the UK, manufacturing investment, particularly from automotive and aerospace companies, has resulted in a significant uptick in the take-up of more traditional warehouse take-up in the hinterland of any manufacturing plants. The benefits of agglomeration economics are well understood as suppliers and other complementary manufacturers establish a nearby base in order to feed into just-in-time supply chains.

In the West Midlands for example, where significant investment has been made by JLR, take-up of warehouse space associated with the manufacturing and automotive sector rose by 172% over three years, and 2017 accounted for 51% of all of the warehouse space transacted in the region, accounting for 3.2m sq ft.

## Gigafactory development

Based upon estimates from the Faraday Institute, by 2040, the UK can expect to house up to 21m sq ft of space producing batteries alone, and with Britishvolt suggesting a further 2-3m sq ft of warehouse space will be required to support its supply chain, it is fair to assume that over the course of the next 20 years, over 40m sq ft of warehouse space will be required to deliver the batteries the UK automotive industry needs.

Indeed, this ties in with more detailed analysis of employment densities and the amount of space required per each new job. Using the Faraday Institute job growth forecasts, we have been able to calculate the anticipated space requirement for the industry. The Institute expects an extra 83,000 new FTE jobs in the EV and battery manufacturing industry would be supported through the construction of eight Gigafactories.

They expect 8,000 new jobs in EV manufacturing (B2), 26,000 in battery manufacturing (B2), 47,000 jobs in the supply chain (B8) and 2,000 in research and development (B1c - which is now E(g)(iii) (England); B1(c) (Wales)).

Using the 3rd edition of the Employment Densities guide published in November 2015 by the Homes & Communities Agency, which pre-dates the Use Class changes of September 2020, we have assumed a density of 60 sq m per job for B1b, 36 sq m for B2 and 70 sq m for a B8 'Final Mile' distribution centre. The above densities highlight that 49.88m sq ft of warehouse space will be required in order to accommodate any future employment growth. Assuming a site cover of 45% by 2040, an additional 2,493 acres of industrial land (B1c, B2 and B8) will be required to meet that need.

In our opinion, this is where landlords and developers of warehouse and industrial space will see the largest benefit, by developing and leasing space to the suppliers of any additional manufacturing plants in the UK.

However, given the challenges and scale of development required, it is anticipated that demand will be volatile and stretched across the next two decades as more manufacturing capacity comes online and the demand for electric vehicles rise.

Should we see Gigafactory development take place in markets such as the North East and South Wales, this has the potential to dramatically alter the supply and demand dynamics in those markets as both regions are comparatively 'under warehoused' when compared with other core markets.

Indeed, for units over 100,000 sq ft, South Wales has just 7.7m sq ft of stock, and whilst the North East fares slightly better with 17.2m sq of stock, this pales into insignificance when compared to the Midlands with 200m sq ft of stock.

In South Wales, for example, total warehouse stock would need to increase by 40% should a battery production facility ever be constructed. It is likely that demand and supply would remain out of balance and, therefore, rents would increase ahead of the prevailing forecast levels at the time.

**Rents have risen and vacancy has fallen in Reno, NV, following the arrival of Tesla**



Source: Costar

**What has been the American experience?**

Following Tesla’s incorporation back in 2003, we have witnessed a classic case of growth in line with the theory of technology adoption by Geoffrey Moore, which states that initially we see limited activity before finally seeing mass market acceptance. Since Tesla acquired their first factory space in Fremont, California, back in 2010, their growth and impact on the wider industrial and logistics market has been vast.

Whilst the decision to acquire a second-hand factory by Tesla in California was interesting, in many ways it was an opportunistic (and cost-effective) property deal, as GM and Toyota were ceasing production at the facility. Perhaps more interesting has been their subsequent industrial real estate acquisitions, not just because of what Tesla are doing and where they are locating, but also because of the wider impact on the industrial market in the hinterland of the Gigafactory.

The first new facility was a 5.8m sq ft complex, originally built in 2016 and expanded in 2019 – which employs over 7,000 people outside of Sparks, Nevada. The entire complex is set to employ over 10,000 workers and is the primary battery facility for Tesla’s current vehicles, which are manufactured at their Fremont plant. According to the Nevada governor’s office, an additional 8,200 local jobs have been created due to Tesla having operations in the area. Since the

complex was first announced in 2015, the impact on the wider Reno industrial and logistics market has been huge. Indeed, since 2015, the vacancy rate in the market has fallen from 10.4% to 4.4%, and average rents have risen from £2.92 per sq ft to £4.96, a rise of 70% over six years.

During the same period, average take-up levels have risen to 7.9m sq ft per year, whereas pre-2015 take-up averaged 4m sq ft per year. In terms of warehouse construction, this has also seen a dramatic rise since the 2015 Tesla announcement. Development completions now stand at 3.7m sq ft a year, up from 1.4m sq ft per year.

In the summer of 2020, Tesla announced a new 4.5m sq ft complex will be built in Austin, Texas, with the aim of completing in late-2021. The facility when completed is expected to employ over 10,000 people on a 2,100-acre site and will be the primary factory for the Tesla Cybertruck and the Tesla Semi, as well as producing Model 3s and Model Ys for the eastern US states.

Whilst it is little over 18 months since the initial announcement, and vehicle production is yet to start, the impact on the wider industrial and logistics market has been quick and noticeable. In a little over 12 months, the market vacancy rate has fallen from 6.2% to 3.4%; and construction deliveries have risen to their highest ever level of 6.1m sq ft, and achieved rental levels have

seen their largest ever single-year increase to now stand at £7.67 per sq ft, a rise of 18% in just 12 months. As production increases and more of Tesla’s suppliers start to locate nearby, we can expect to see demand for warehouse space increase which, in turn, should see vacancy fall and rents continue to rise.

Examining detailed data on the labour market in both Reno and Austin also paints an interesting picture. Looking at job postings shows a wide variety of roles being required, from production line workers through to hardware and software engineers.

However, in more recent times, it has been reported that Tesla has been struggling to hire in and around Reno, which in turn has the potential to see wages rise in order to attract and retain the best talent. This, in turn, has had a wider impact on the residential market, with house prices in Reno rising 42% two years after the announcement, according to ATTOM Data Solutions.

Whilst it is difficult to entirely isolate the Tesla impact, given the wider trends in the industrial and logistics market, it is clear the Gigafactories are massive economic development engines which have amplified activity in the wider industrial markets of which they sit.

**Gregg Healy**  
Executive Vice President  
Head of Savills Industrial Services,  
North America

# Summary

## 5 KEY CONSIDERATIONS



### 1. Time

The UK has proposed banning the sale of cars with internal combustion engines by 2030. For UK automotive manufacturing to remain competitive, the engine plants of the future, the Gigafactory, need to be located on British soil. Planning for such facilities needs ramping up if the supply of batteries is able to meet demand.



### 2. Scale

The sites where Gigafactory development is viable are few and far between. Sites need to be vast in scale to accommodate buildings of up to 3m sq ft, have a power supply of at least 150MV, have access to a large skilled labour force, and the land has to be affordable, ruling out many traditional logistics and industrial markets.



### 3. Ripple effect

We estimate by 2040 there will be c.24m sq ft of Gigafactory space in the UK. This will create a ripple effect into the wider industrial and logistics market as suppliers look to locate their operations close to the Gigafactory developments. We estimate a further 25m sq ft of warehouse space will be needed to support the Gigafactory supply chain.



### 4. New markets

If, as it looks likely, Gigafactory developments will predominantly be located in regions away from the core industrial and logistics markets, there will be a looming supply crunch. In South Wales, for example, the total stock of warehouse space would need to rise by 40% to accommodate the requirements of a Gigafactory supply chain. This presents an opportunity for developers to bring forward new schemes targeting such occupiers.



### 5. Higher rents

In the USA, where a number of Gigafactories have been built, we have seen the demand for warehouse space rise whilst vacancy rates and rental levels have risen. In Reno, Nevada, where Tesla opened a Gigafactory in 2015, the vacancy rate in the wider warehouse market has fallen from 10.4% to 4.4% and average rents have risen from £2.92 per sq ft to £4.96, a rise of 70% over six years.



### Savills Research

Our commercial research team provides bespoke consultancy solutions to clients across all sectors, reaching from central London to the whole of the UK and also into key European markets.

#### Kevin Mofid

Commercial Research  
kmofid@savills.com  
+44 (0) 20 3618 3612

#### Will Laing

Commercial Research  
will.laing@savills.com  
+44 (0) 20 7535 2955

#### Chris Potts

Planning  
cpotts@savills.com  
+44 (0) 2920 368 901

#### David Thomas

Energy Director  
dgthomas@savills.com  
+44 (0) 2920 368 956

#### Richard Sullivan

Agency  
rsullivan@savills.com  
+44 (0) 20 7409 8125

#### Richard Merryweather

Investment  
rmerryweather@savills.com  
+44 (0) 20 7409 8838

#### Simon Collett

Building Consultancy  
scollett@savills.com  
+44 (0) 20 7409 5951

#### Gregg Healy

Savills North America  
ghealy@savills.us  
(949) 706 6638