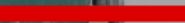


# Energy

Solving the problem  
with manufacturing



**Key  
Highlights**

The Current  
Situation

The Role of  
Manufacturing in  
energy production

Decarbonisation ; future  
opportunities for  
manufacturers

# Introduction Statement

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Within the manufacturing industry, energy remains a significant point of focus. From the production side, with the manufacture of energy technologies, and particularly decarbonised or clean energy technologies. From the operational side, with energy productivity and the implementation of energy efficient measures during the production process.

At present, both the energy sector and the manufacturing sector may be considered as dependent on the other. With increasing concerns around the supply of energy across Europe as a result of geopolitical instability in the region, manufacturers across might be wondering just how they can ensure operational continuity should energy supply be cut-off. Couple this concern with increasing pressure to move towards renewable energy and sustainable means of production, and manufacturers are faced with even greater pressure to switch to a different form of energy.

On the flip side, there exists a need to build the manufacturing capacity of Europe for the production of new, sustainable energy technology, both as a means of increasing the regions competitiveness in the global economy, due to fierce competition from countries such as China, and in order to meet the demands of decarbonisation and net-zero 2050. In this short paper, we discuss some of these current trends.

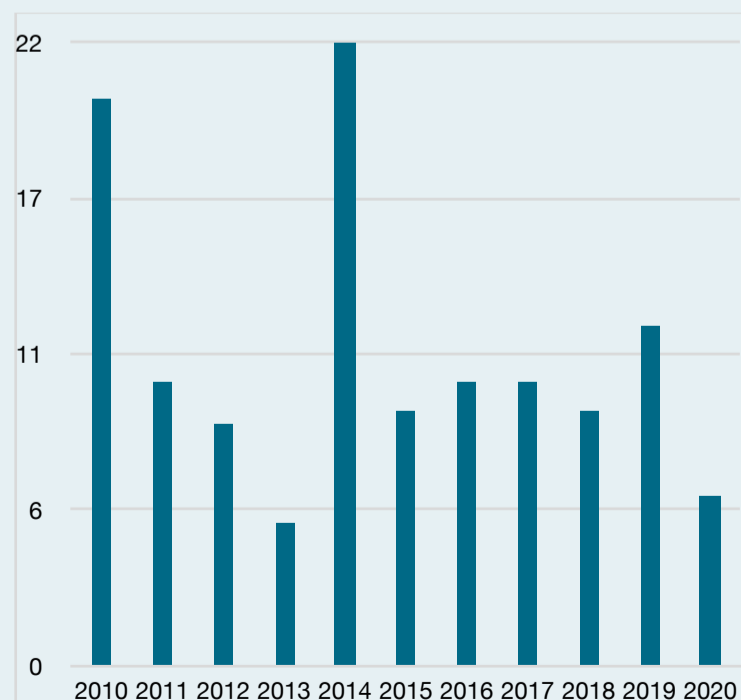
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# The Current Situation

In terms of primary energy production, renewable energies accounted for the highest share in the EU in 2020, taking a 40.8% share of the market, with nuclear heat taking a 30.5% share, solid fossil fuels 14.6%, natural gas 7.2%, oil and petroleum products 3.7% and non-renewable waste 2.4%. Although 2010-2020 saw a decrease in the region for primary energy production of solid fossil fuels, natural gas, oil and nuclear energy, this decrease has resulted in increased imports of primary energy and energy products. While this increase slowed down in 2020 as a result of the Covid-19 pandemic, the quantity of imported natural gas has more than doubled in the region over the period of 2010-2020, making natural gas the second largest imported energy product, and crude oil the first imported product. Export levels for the same period, are much lower than the levels of import, with gas oil and diesel oil ranking the highest, followed by motor gasoline and natural gas.

The manufacture of energy technologies in Europe currently paints a mixed picture, despite the increasing demand from society and policy to adopt sustainable, renewable sources of energy. Take for example the EU's production of wind turbines. In 2013, the production of these wind generating sets hit the lowest figure recorded, with production being in decline since 2010. In 2014, an increase in production occurred, before a decrease that saw production figures remain relatively constant until 2019. In 2020, however, a 6000-unit decrease occurred in sold quantity<sup>1</sup>.

**Wind Turbines Manufactured in the EU 2010-2020 ( Thousand Pieces )**



## Insight

### The Importance of Navigating the Energy Market as a Manufacturer

Since the beginning of 2022, the energy market has been characterised by high levels of volatility. High energy prices are currently increasing the cost of production for manufacturers, with concerns around energy supply further causing concern. To counter the risk faced by the volatile energy market, manufacturers might:

Renegotiate energy contracts with suppliers, opting for longer-term contracts providing cheaper rates.

Increase self-reliance by shifting to onsite and sustainable energy generation (i.e., through wind, solar or combined heat and power).

Use less energy to maximise energy efficiency.

# The Role of Manufacturing in Energy Production

While production and output of energy technology within the EU has been varied in the past decade, the region is waking up to the importance of this sector, driven primarily by the ongoing war in Ukraine. Europe is aiming to cut reliance on Russian gas, and as a result, the energy commissioner of the EU has recognised the need to rebuild Europe's industry of manufacturing parts for solar installations, with the region aiming to reduce Russian gas use by two thirds in 2022 and end all Russian gas use by 2027. A key strategy of the European plan to reduce Russian gas use is the acceleration of the transition to renewable energy, and a specific strategy for

increased solar energy implementation attempts to hasten the approval process for installations, build the solar manufacturing capacity of Europe and support more solar power purchase agreements. Indeed, some 170 billion cubic metres of Russian Gas, might be replaced with 480 gigawatts of wind, and 420 gigawatts of solar capacity by 2030. Yet with a reported shortage of installers, problems with equipment and supply, and permit issues, there are some short-term hurdles that must be mitigated- namely building the manufacturing capacity for the production of renewable energy technology.



## Case Example

### The Chinese Photovoltaic Industry 2011

In the production of energy technologies, Europe faces heavy competition. China has become a global leader in certain green energy technology ventures. For example, solar photovoltaic panels are a key output from the country in the energy market, as a result of the sustainability-orientated innovation system currently applied to improve and adapt existing production and technology. In 2011, experts were largely taken by surprise when Chinese solar energy firms rose to become the leaders of the global industry, with policy makers across the EU assuming that the robust innovation policies implemented by China in terms of energy technology production, would also translate into competitive advantage for the solar photovoltaics industry of European countries such as Germany. Conversely, the support deployed by Germany in this Green energy was once predicted to be the driving force of economic prosperity in Germany, yet Germany's solar industry instead faced huge losses, job cuts, and the threat of bankruptcy, due to the overreliance on Chinese manufacturing.

During this time, although China accounted for 60% of the production of solar modules, of the 20 gigawatts produced, only 2 gigawatts were installed in China the same year, indicating a thriving export market for Chinese manufactured energy technology. Chinese firms were first able to enter the practice of photovoltaic manufacturing via the acquisition of advanced technology, with a strategy of vertical integration within different segments of the industry allowing for global competitiveness to be steadily increased. As a result of the international talent mobilization, flexibility of Chinese manufacturing, government policy incentives and global market formation policy, the transfer of photovoltaic technology advantage to the Chinese market was complete. case, only served to encourage the growth and expansion of the Photovoltaic industry in China, at the detriment of manufacturers in Germany, who were soon eclipsed.

# Decarbonisation : Future Opportunities for Manufactures

With the EU seeking to cut reliance on Russian gas use, and the transition to renewable energy in the region being a key strategy to achieve this, there also exists potential for further advancements towards decarbonisation. The Paris agreement target of net-zero carbon emissions by 2050 stipulates that all economic activities be decarbonised. Manufacturing activities that are energy-intensive, as well as power plants, are responsible for roughly 50% of the greenhouse gas emissions and are central to attaining carbon neutrality. Traditionally, it was widely reported that the increasing **move towards decarbonisation would provide two significant opportunities to the manufacturing sector:** by selling demand response services to the electricity industry and with the manufacture of low carbon products. For the power grid to operate stably, the supply and demand of electricity must be balanced on a moment-by-moment basis. Demand Response, or Demand Side Management, can present the opportunity for manufacturers to respond to grid operator requests for demand changes, presenting an opportunity for firms in the future of decarbonisation.

The move to decarbonisation requires new products, for example electric vehicles. The expertise of the European industry to produce goods such as vehicles signifies that the growth experienced within this sector of

manufacturing, is likely to increase as the push towards Net Zero and decarbonisation continues.

In the present day, a new trend emerges, which is the combination of both sustainable energy and Industry 4.0. to incorporate sustainable energy concepts into the digital factory. Some companies are already taking advantage of digital technologies to improve energy efficiency in their products and outputs. **For example, one German car manufacturer was able to achieve a 30% increase in energy efficiency for a robot by utilising Industry 4.0 technologies, whilst a Canadian company reports that the implementation of Industry 4.0 technologies in the production process saved 15% of energy.** In production processes, smart applications provide transparency about the patterns of energy consumption and allow for manufacturers to optimise the energy management of operations. As a result of automation-enabled temporal flexibility, smart factories and their energetic sources and drains can partake in a 'smart-grid', helping the energy system to stabilize via either the consumption or storage of energy in the event of energy surplus, or, in the case of energy shortage, via reducing consumption on demand. For the economies of industrialised countries, a more targeted and conscious approach to linking sustainable energy efforts is likely to stimulate huge opportunities for reductions in the carbon footprint of production and achievement of sustainability.



# Summary

When considering energy and manufacturing, two conclusions can be drawn. In the first instance, the manufacturing industry, and more specifically, the manufacture of energy technology, is an important sector for ensuring that key energy targets of decarbonisation are met, as well as aiding in the reduction of reliance on sources of gas from outside the EU, which places the energy supply of the region in a precarious position with ongoing geopolitical instability. With continued investment into this industry, in research and development and production, it will be possible to increase the production capacity and output of products such as photovoltaic panels, wind turbines or other energy technologies that help solve the energy problem. In the second instance, manufacturing processes are tantamount to all efforts to decarbonise the production of energy, with a need in the wider manufacturing industry to reduce emissions drastically to achieve net-zero 2050. The solution to this, is investment in Industry 4.0 technologies, which will allow for both the successful production of the necessary energy technology, and the monitoring and subsequent reduction of emissions in processes.

## The Snapshot

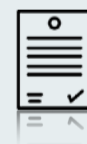
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For the economies of industrialised countries, a more targeted and conscious approach to linking sustainable energy efforts is likely to stimulate huge opportunities for reductions in the carbon footprint of production and achievement of sustainability.



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