



Global Wood Pellet Fuel Markets in 2022

SUPPLY SHOCK!

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A supply shock occurs when a significant portion of a good or service is no longer available in the market and substitutes are scarce or non-existent. This white paper describes how the loss of pellet fuel supply into western Europe and the UK as a result of sanctions on Russia following Russia's invasion of Ukraine has produced a supply shock that is having, and will continue to have, significant consequences.

Macroeconomics 101

Some readers may recall their economics lessons in which markets are described with supply and demand curves. The supply curve shows that as the price of a good increases, the quantity supplied increases. The supply curve will shift rightward if new production assets enter the market. The demand curve shows that as prices rise, the quantity demanded falls.

Markets will reach an equilibrium in price and quantity where the supply and demand curves cross.

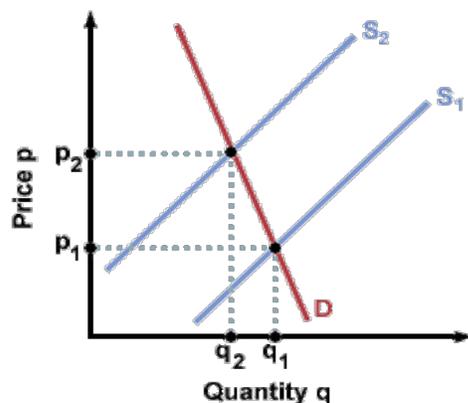


Figure 1 - Supply Shock with Inelastic Demand

The slope of the curves illustrates the sensitivity of supply or demand to changes in price. In Figure 1 the quantity demanded is relatively insensitive to a shift in the supply curve. In economics speak, demand is



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inelastic. As Figure 1 shows, a left shift in the supply curve results in a price increase from P_1 to P_2 . The quantity demanded falls, but the change in Q is less than the change in P .¹

Goods with inelastic demand are typically necessities. If consumers have limited options for substitution and the good is a fundamental necessity (like heat in the winter) then the demand curve will be nearly vertical. The result of a left shift in the supply curve is higher prices with quantity demanded remaining near Q_1 .

The Supply Shock in the Pellet Fuel Market

Global pellet supply has historically been, on average, sufficient to meet demand. Local seasonal shortages have not been uncommon if the winter is unusually long and cold. But the aggregate supply has been sufficient for aggregate demand.

In the pellet sector, growth in both heating and industrial pellet demand has motivated the development of new production assets. Because there is a relatively long lead time for bringing new production assets into full operation, there are fluctuations in the quantity of excess supply. But, as Figure 2 shows, in general, the markets have not experienced any medium or long-term supply shocks over the past decade.

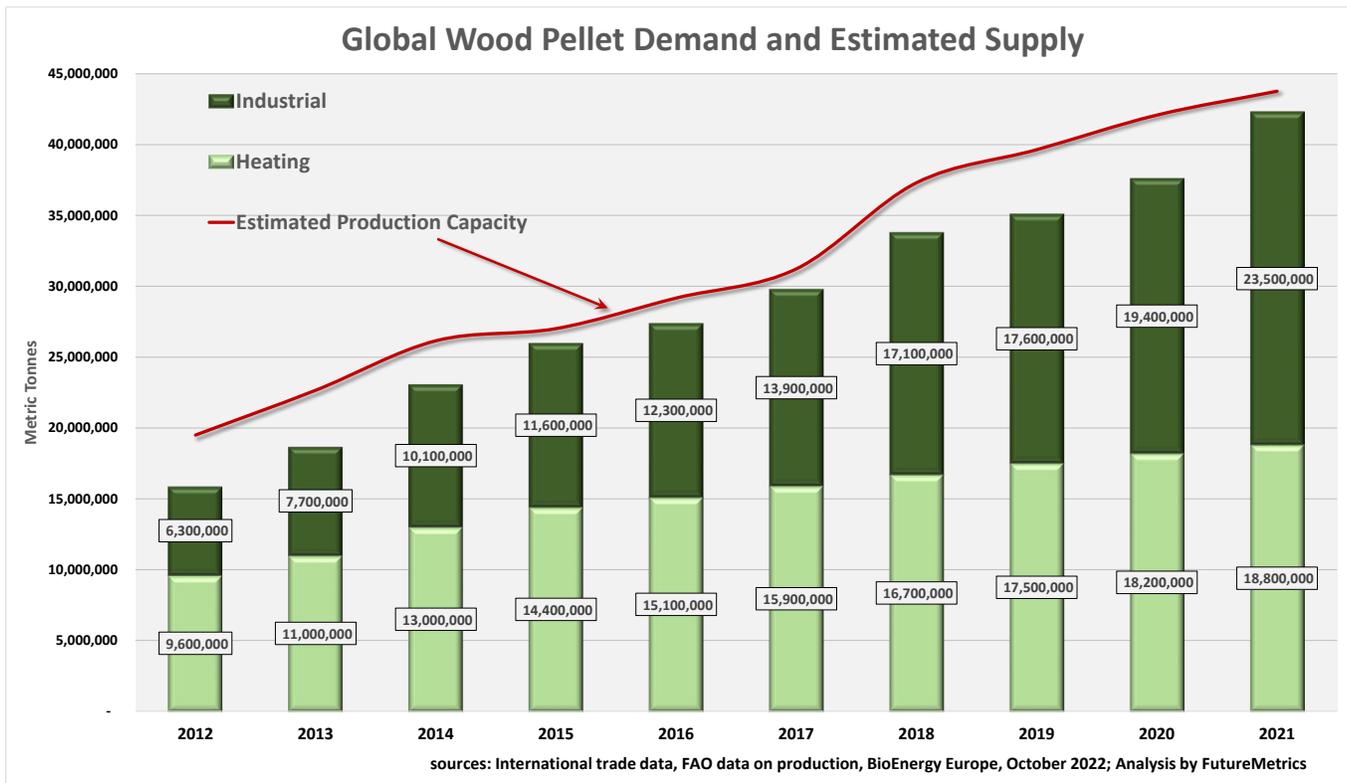


Figure 2 - Global Pellet Demand and Estimated Supply

¹ For a detailed explanation of elasticity in economics see [HERE](#).



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The industrial market’s future demand is typically known in advance. Thus, pellet fuel supply for power generation projects that are replacing coal with pellets is developed to meet that expected demand; usually under long-term offtake agreements. Producers generally commit 80% or so of their expected annual production to those contracts. The remainder may be traded in the spot market, or some may be sold within the terms of the offtake agreement (depending on which price is higher).

The heating markets are less predictable. Variations in alternative heating fuel costs and the severity of winter impacts demand. Cheap energy and warm short winters will result in excess supply. Some of that supply may spill into the industrial markets and put downward pressure on industrial pellet spot prices. High energy costs and long cold winters will make the heating pellet markets tight. There may be short-term supply concerns in the latter half of a cold winter if inventories are depleted. This will put upward pressure on prices.

But 2022 has not been a typical year. There has been a sudden and unanticipated leftward shift in the pellet supply curve.

The conflict in Ukraine and the resulting sanctions have impacted the pellet sector significantly. As Table 1 shows, in 2021 Russia, Belarus, and Ukraine produced 15% of global trade in wood pellets.

Major Exporting Regions Annual Exports (metric tonnes)

	2021	CAGR 2012 to 2021	% of Market in 2021
United States	7,522,518	14.8%	32.5%
Russia, Belarus, Ukraine	3,472,344	38.6%	15.0%
Vietnam	3,748,439	60.1%	16.2%
Canada	3,140,845	8.7%	13.6%
Baltic States	3,870,871	9.3%	16.7%
Other SE Asia, Oceania, and S. America	1,397,896	48.4%	6.0%
	23,152,913	16.7%	100.0%

source: International trade data, October 2022; Analysis by FutureMetrics

Table 1 - Major Pellet Fuel Exporting Regions Annual Growth Rates, and Market Shares

The Sankey diagram below shows the extent of Russian exports in 2021². Each arrow represents a country, and the width of the arrow is relative to the quantity exported.

² The map is interactive and can be found on the [FutureMetrics](#) website. Hovering over the arrows brings up pop-ups with tonnages for each country. For a description of Sankey diagrams, see [HERE](#).



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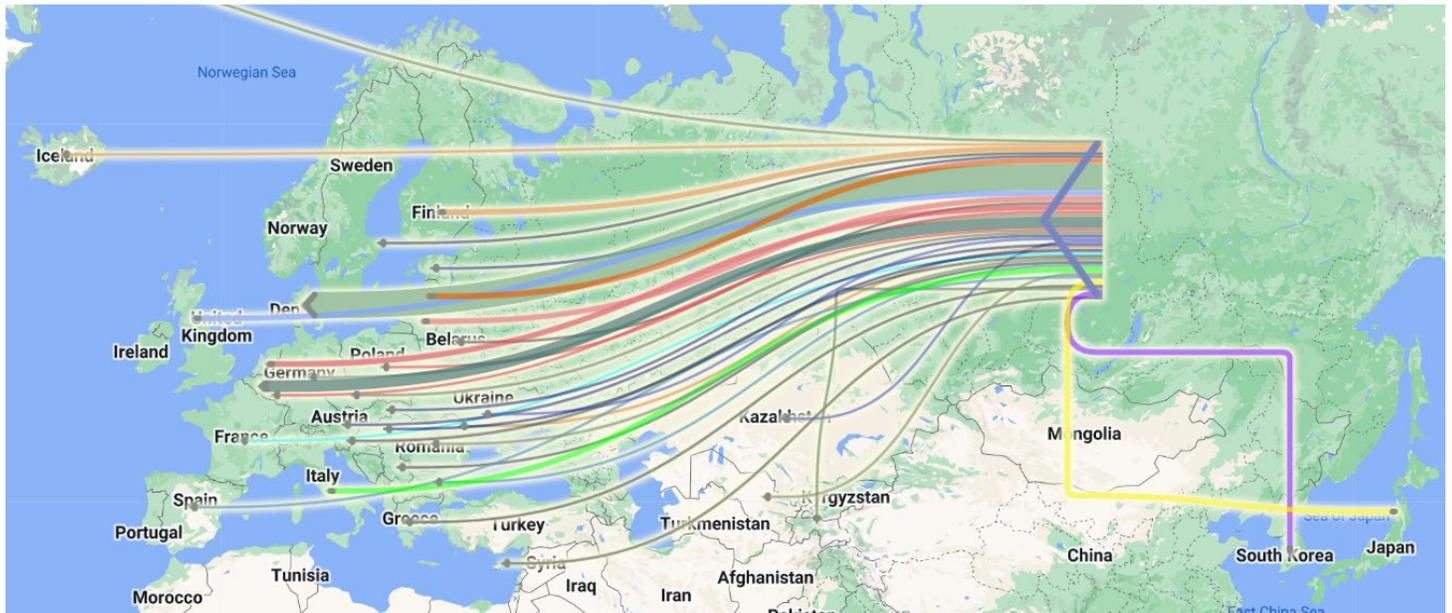


Figure 3 - Sankey Map of Russian Exports in 2021

A significant proportion of those exported pellets were destined for the western European heating markets. Now, a significant proportion of the 3.5 million metric tonnes that were exported in 2021 are no longer entering those markets.

The loss is a significant supply shock that centers on western Europe!

Figure 4 below shows exports from Russia, Belarus, and Ukraine have dropped significantly³.

Table 1 on the previous page and the chart below also illustrate how supply from those three countries has become an important part of global trade. The compound annual growth rate (CAGR) in international trade from those three countries from 2012 to 2021 was 38.6%.

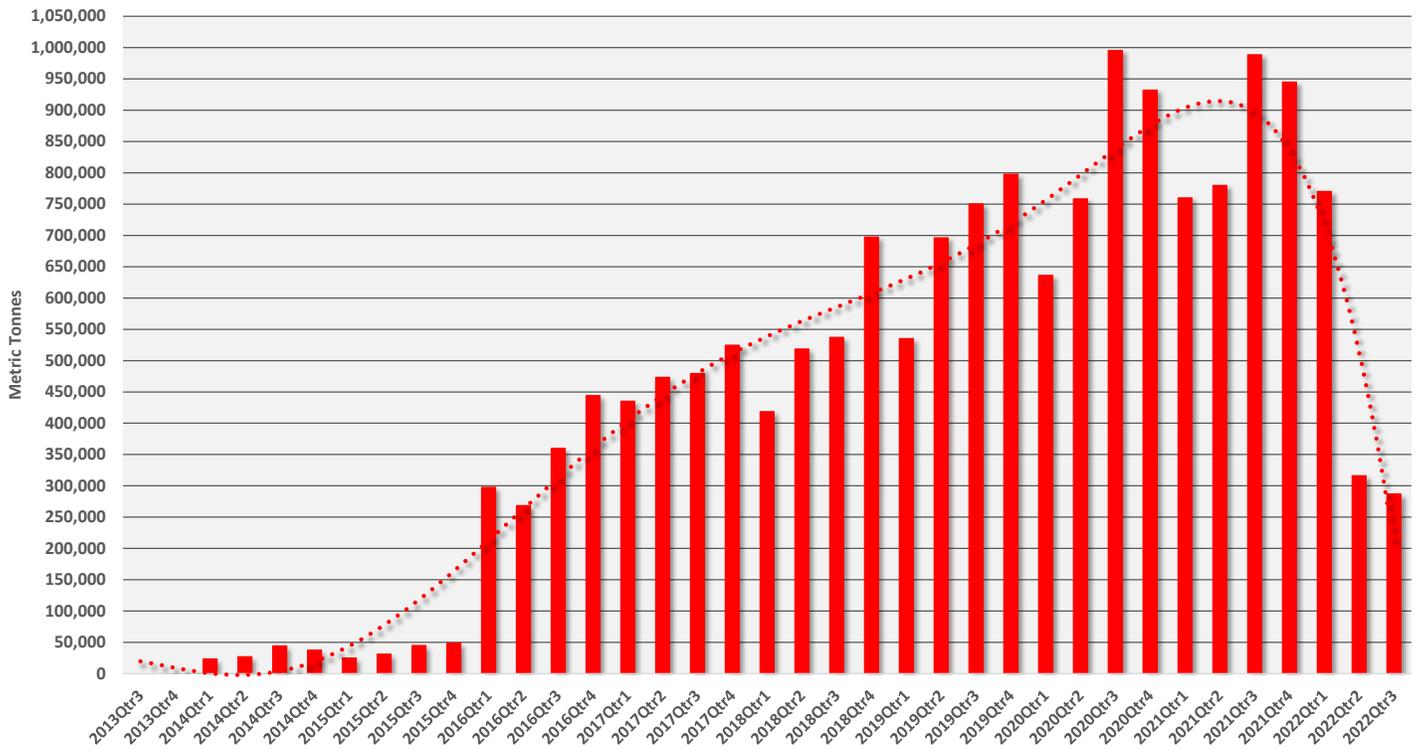
³ Data on Russian and Belarusian exports is not available since the end of 2021. However, import data from the countries that import pellets from those three countries allows an estimate of exports.



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Monthly Wood Pellet Exports from Russia, Belarus, and Ukraine



source: International trade data, October 2022; Analysis by FutureMetrics

Figure 4 - Monthly Wood Pellet Exports from Russia, Belarus, and Ukraine

Note that Russia is still exporting pellets as of Q3 2022. The largest importer of Russian pellets for the last 6 years has been Denmark. For the first part of 2022 Denmark's imports remained high. But then sanctions kicked in. The last month of data available at the time of the writing of this white paper shows that their imports were almost zero in July. Figure 5 below shows this.



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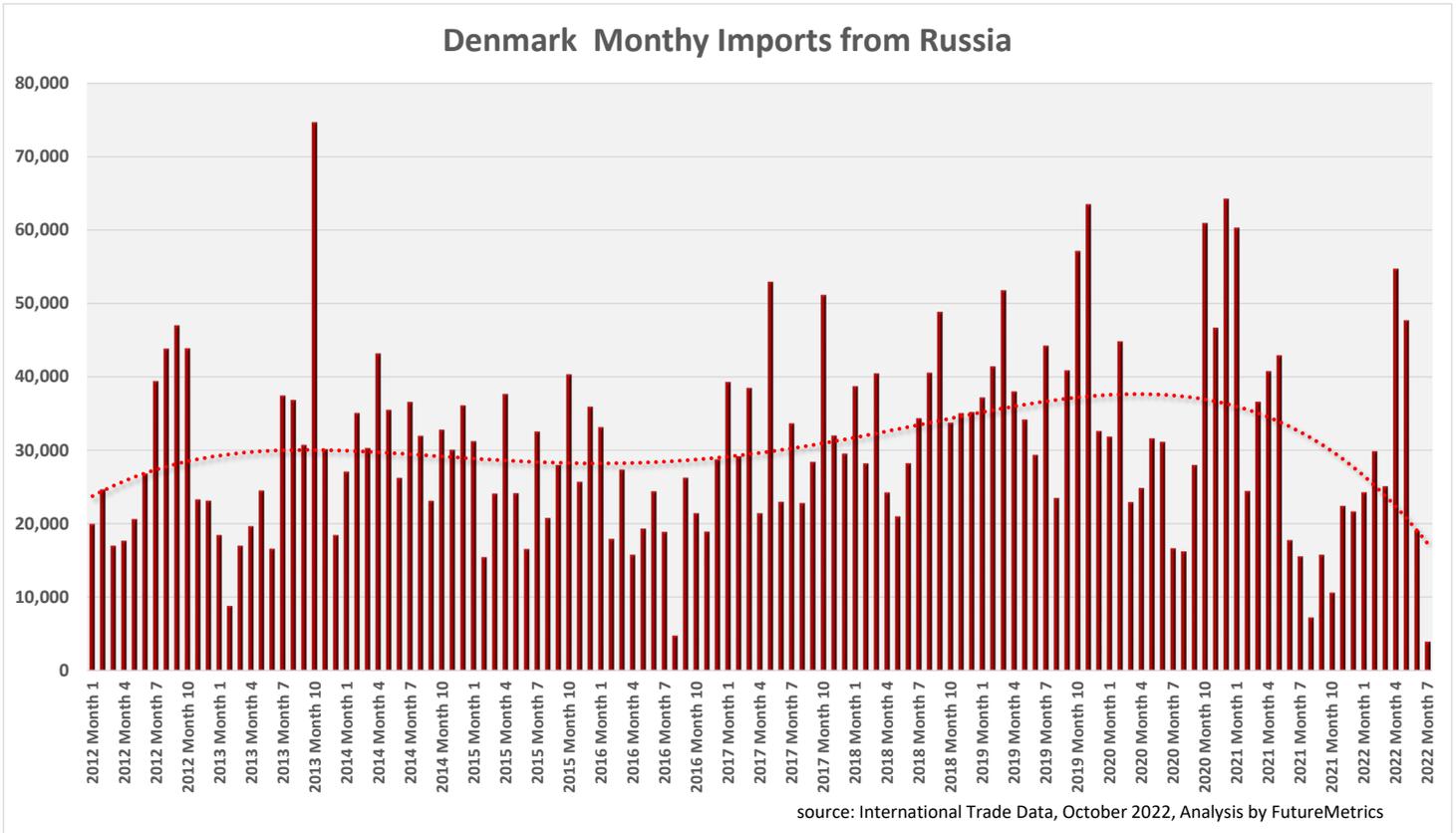
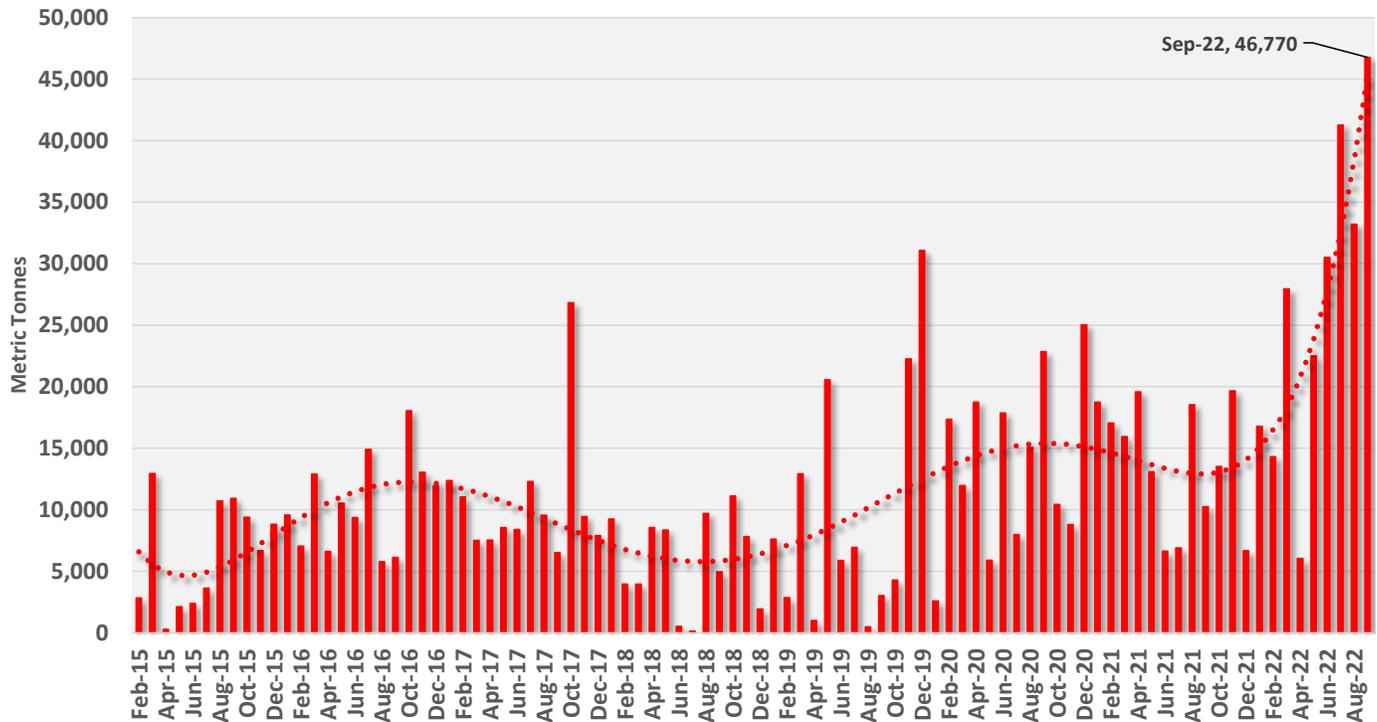


Figure 5 - Monthly Danish Pellet Imports from Russia

The nation that has increased imports of Russian pellets significantly is South Korea. Figure 6 below shows that in September 2022, S. Korea imported a record tonnage from Russia. Vietnam remained the top supplier to S. Korea in September 2022 but Russia, for the first time, was the second largest supplier.



South Korea Monthly Imports from Russia



source: International Trade Data, October 2022; Analysis by FutureMetrics

Figure 6 - Monthly Pellet Imports to South Korea

The Consequences of the Pellet Supply Shock

Prices for pellet fuels have risen to unseen levels in every country that uses pellet fuels for heat and/or power generation.

Figure 7 below shows that industrial pellets are trading on the spot market at over \$26 per gigajoule (GJ) or \$453 per metrics tonne (assuming 17.5 GJ/tonne). As noted above, only a small proportion of industrial pellet production trades on the spot market. Most industrial pellets are traded under long-term bi-lateral offtake agreements.

There are reports of some contractual industrial pellet deliveries to Japan being delayed while those shipments are diverted to Europe to take advantage of the extremely high spot prices.



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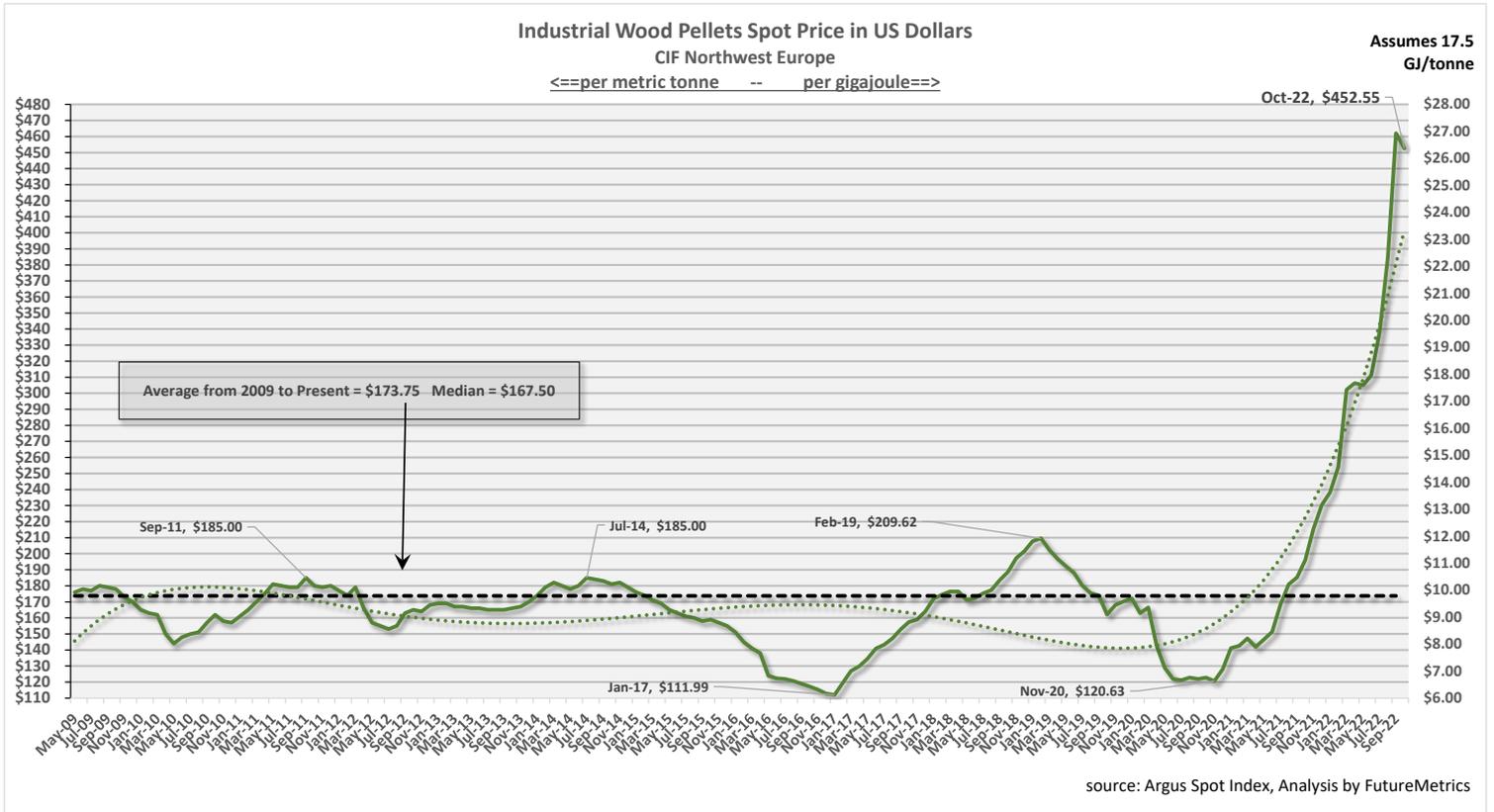


Figure 7 - Industrial Pellet Fuel European Spot Price

The heating pellet markets are, essentially, almost entirely sold and bought in a semi-spot market. Most producers of heating pellets negotiate buying deals every year. Price and quantity into the distribution channels are not known by producers beyond a year or so into the future. Inventory levels within the supply chain may become high or low depending on the severity of winter weather and the cost of alternative heating fuels.

The loss of imports from Russia, Belarus, and the disruption in production in Ukraine, plus the conflict-related high costs of natural gas and heating oil, has put pellet prices in the heating markets into the stratosphere.



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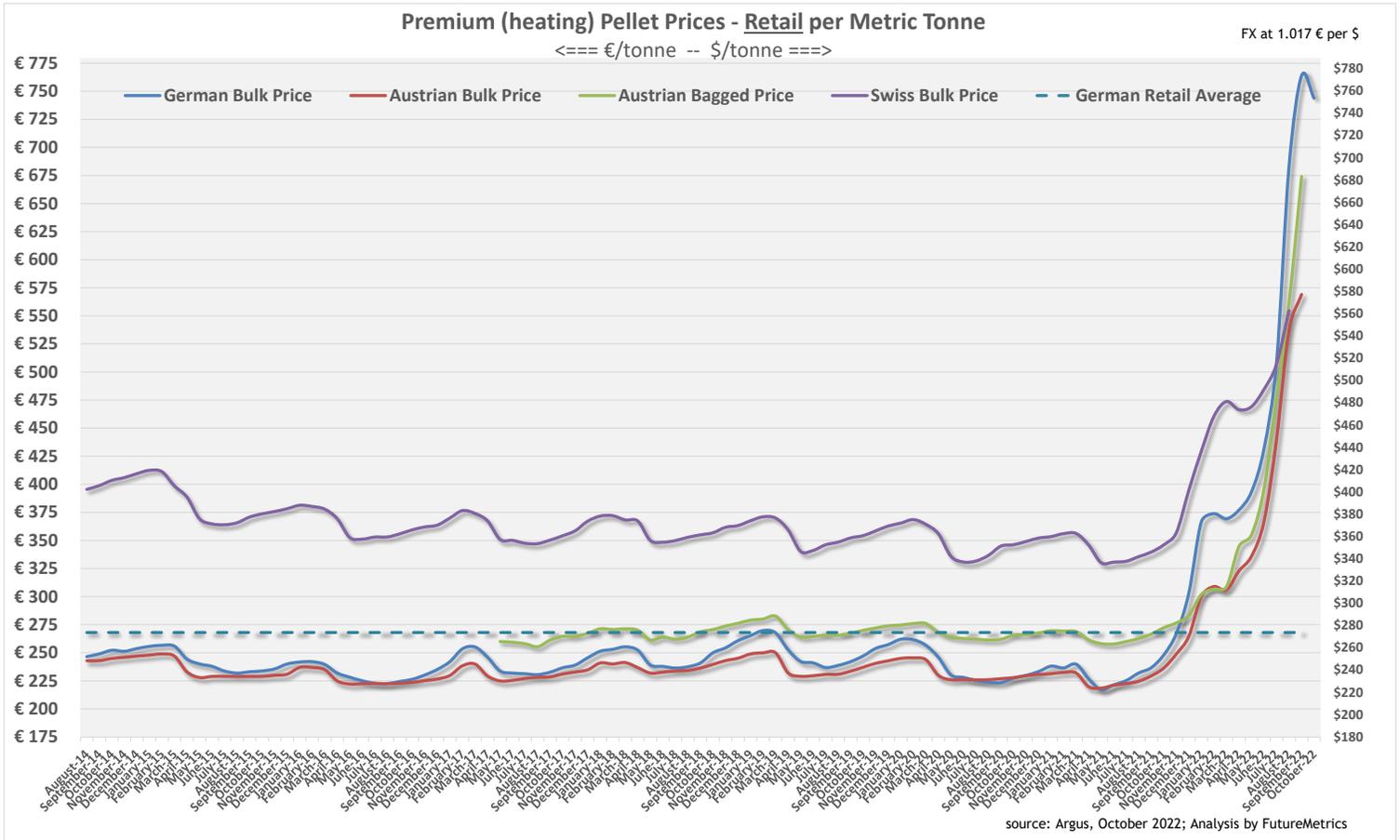


Figure 8 - Selected EU Heating Pellet Prices (retail)

The actual future growth in demand for heating and industrial pellets is of course not known. But based on current and expected policy⁴, Figure 9 on the next page shows that demand for pellet fuel, under an evolving policy scenario, is expected to exceed 75 million tonnes per year in 2030.

The green dotted line in Figure 9 shows actual estimated supply to the present, and then existing plus announced planned new supply from new pellet factories through 2024. The red solid line shows estimated supply after the loss of about 2.5 million tonnes per year⁵ as a result of sanctions on Russia.

Whereas the pellet markets were expected to be very tight in 2022 (aggregate supply not exceeding aggregate demand by much), the dropout of supply due to the sanctions created an almost instant shortfall of about 2 million tonnes. The red text above the bars shows the expected shortfall after the loss.

⁴ See FutureMetrics’ white papers discussing how the consequences of climate change, the need for renewable on-demand power to compliment wind and solar generation, and the implementation of BECCS (bioenergy carbon capture and sequestration) is expected to influence policy and drive pellet fuel demand growth.
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⁵ Actual loss into the markets may be higher or lower.



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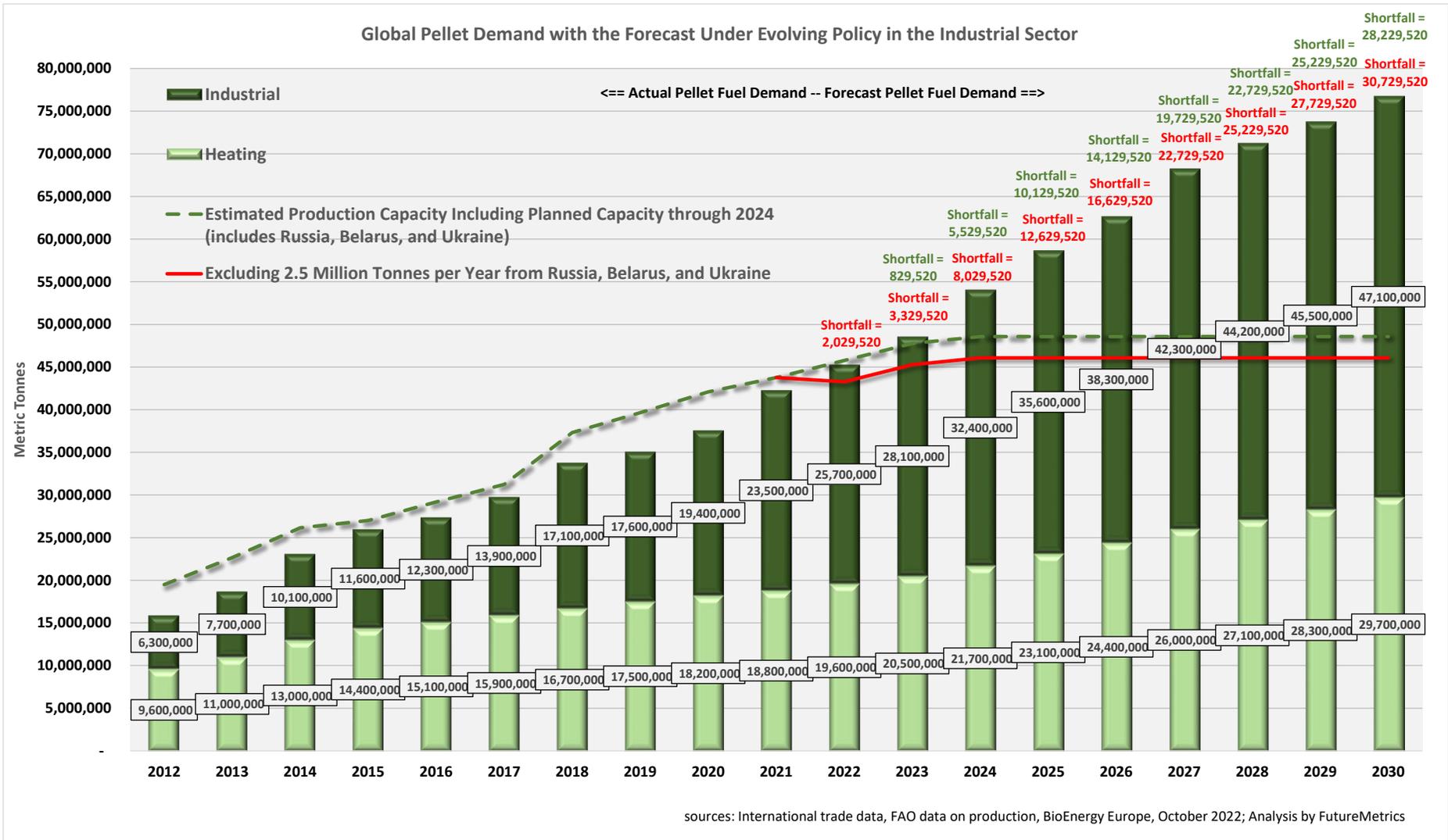


Figure 9 - Historic and Forecast Supply and Demand for Wood Pellets



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The green text above the bars in Figure 9 shows the expected shortfall if production from Russia, Belarus, and Ukraine is included in the supply.

As has happened historically, as demand for pellet fuel grows, new supply will be built. The future green dotted line will certainly slope upward and, in general, remain above the green bars. By 2030, based on this forecast scenario, the market will need over 28 million tonnes per year of new production capacity if the sanctions against Russia are no longer in place (the green text above the 2030 bars).

In the long term it is likely that supply will eventually match demand.

What will Happen Next?

The current situation is challenging on multiple fronts.

Building a new pellet factory takes time. Development work to find a good site, permitting, construction, and commissioning typically takes at least two years; often longer and occasionally shorter. So, there is a significant lag between an investment decision and full production.

What will happen in the world in the two plus years it takes to build and commission new production capacity? When will the sanctioned pellets return to the markets?

Significant new capacity in Europe is unlikely. Europe is already a net importer.

To compound the shock, there have been spin-off effects as well for the Baltic states' producers in terms of pellet feedstock supply due to the curtailment of sawmill and harvest residuals that used to flow in from Russia.

Any significant new capacity would likely have to be from the Americas or perhaps even Southeast Asia via a very long ocean transit.

If new capacity is built just to fill the gap from the loss of supply from Russia, Belarus, and Ukraine, what happens if the sanctioned supply returns to the market? Given favorable logistics, it will be lower cost and, given the spot nature of the heating markets, it would likely crowd out the supply from afar. This uncertainty puts a chill on new investment made specifically to fill the gap. Uncertainty can be paralyzing.

There has been some discussion about the potential for the industrial pellet users to lower their pellet fuel consumption to free up some of the pellet fuel supply (that is committed under contract) into the heating markets. This would mitigate shortages and would lower the high prices that are particularly difficult for lower income households that depend on low-cost pellet fuel for heat.

The concept has strong moral merit but there are significant technological and economics hurdles.



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For those power stations that have made the full conversion from coal to pellet fuel, the modifications, particularly in the pulverizers and fuel burners, are not easily reversed. Furthermore, the infrastructure for coal handling may no longer be useable.

There are legal/contractual ramifications as well that limit CO₂ levels per MWh and/or mandate zero coal combustion in order to benefit from the support schemes.

There is a carbon tax in the EU that would further penalize increased coal use. And coal prices are also high. Figure 10 and Figure 11 below show this.

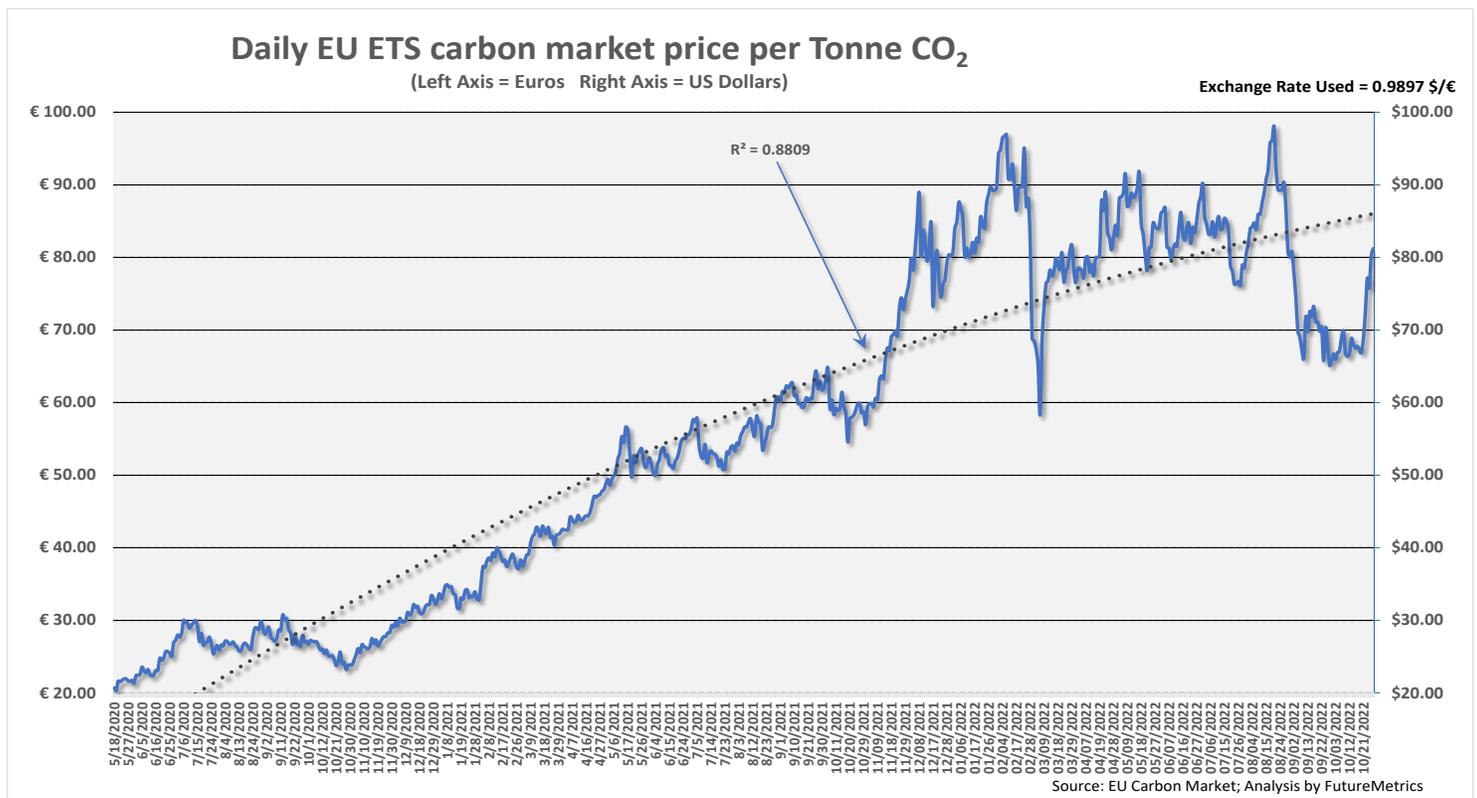


Figure 10 - Carbon Price in Europe

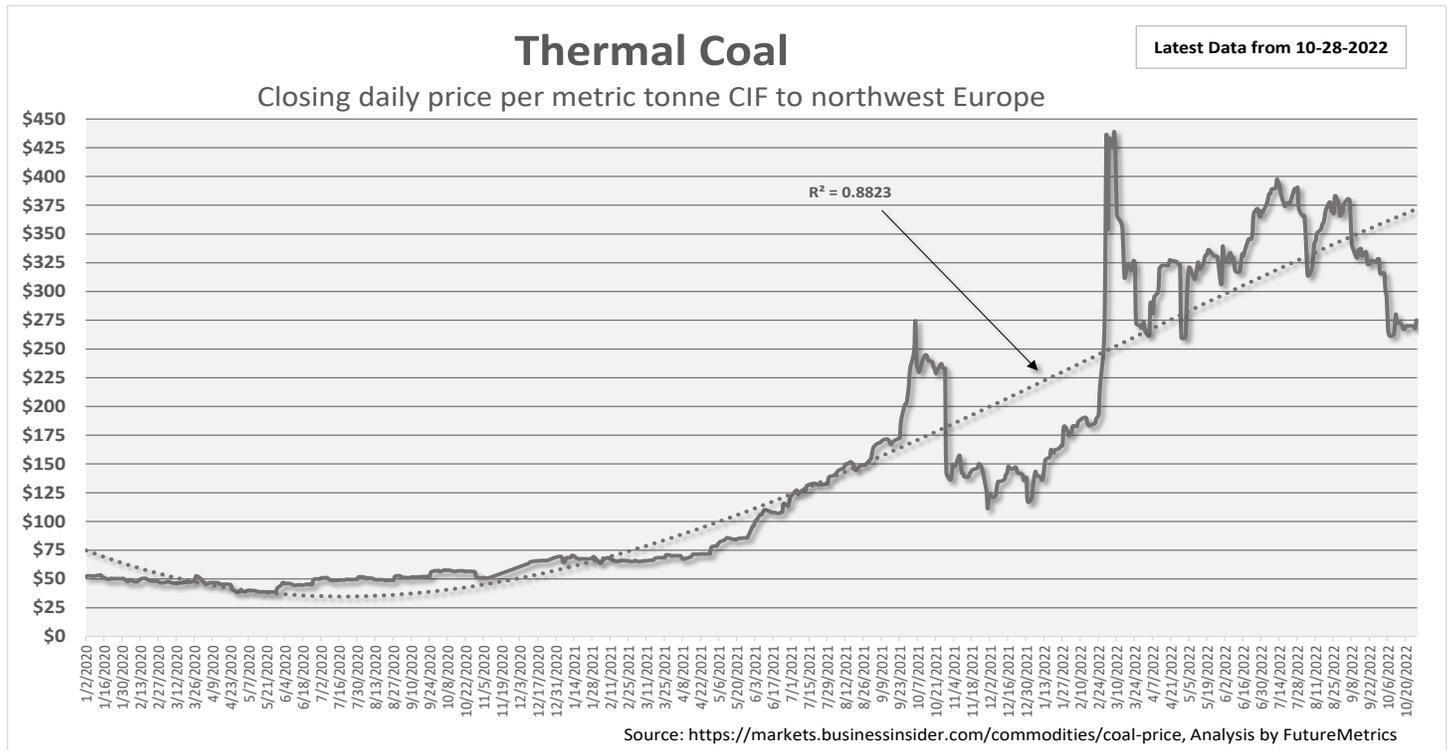


Figure 11 - Thermal Coal Price CIF NW Europe

Adding to the technical and economic challenges from curtailing pellet fuel use and increasing coal use are environmental ramifications in terms of the increased carbon emissions if more coal is used to generate power.

Conclusion

By definition, a supply shock cannot be forecasted. Similarly, it is not possible to know when (if!) Russian supply will return.

There is, unfortunately, no easy short-term solution to the sudden loss of 15% of the global trade in pellets, most of which went into western Europe's heating markets. The short and even medium-term consequences of the supply shock will not magically disappear.

The burden of high prices will fall hard on lower income households that have depended on low-cost pellets for heat.

As 2022-2023 winter progresses, governments may produce policies that redistribute how, and who in the supply chain, carries some of that burden.

But sadly, there is no short-term solution that will make everyone happy.