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Can Pellet Factories Make Money in the Current Markets with their Legacy Offtake Agreements?

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There has been much discussion recently about the offtake pricing relationships between pellet producers and pellet buyers.

Many years of near zero inflation resulted in some complacency in how offtake price adjustments were defined in the bilateral contracts between the pellet fuel producers and buyers. It became common to define an annual fixed adjustment to the sales price of the pellets; often in the range of 1.5% to 2.5%. With hindsight, it is obvious that this exposed producers to risk if the average cost of production increased faster than the price[1].

This brief white paper will set the foundation for the reader to use the dashboard that complements this analysis. The dashboard is based on a specific support scheme; the contract-for-difference (CfD) in the UK. The CfD supports one of the 650 MW boiler/turbine units at the Drax power station and the 420 MW turbine at the Lynemouth station (supplied by three power boilers). The Drax and Lynemouth units can consume nearly 4 million tonnes per year of pellets. While the analysis in this white paper uses the UK's CfD scheme to set the revenue from power sales when biomass is used to replace coal, the cost buildup analysis can be applied to any supplier and any buyer.

What are the Critical Inputs for Pellet Production?

Wood costs are the majority of the cost of producing wood pellets. Figure 1 below shows a breakout of costs for pellet production for a hypothetical plant[2].

[1] See the FutureMetrics white paper on the impact of a mismatch between production and logistics inflation rates and offtake price adjustment rates HERE. The paper uses Monte Carlo simulation to show the potential estimated production costs under persistent high inflation rates.
[2] Note that every pellet plant will have different costs and thus the percent values for a specific project will not exactly match those in Figure 1.

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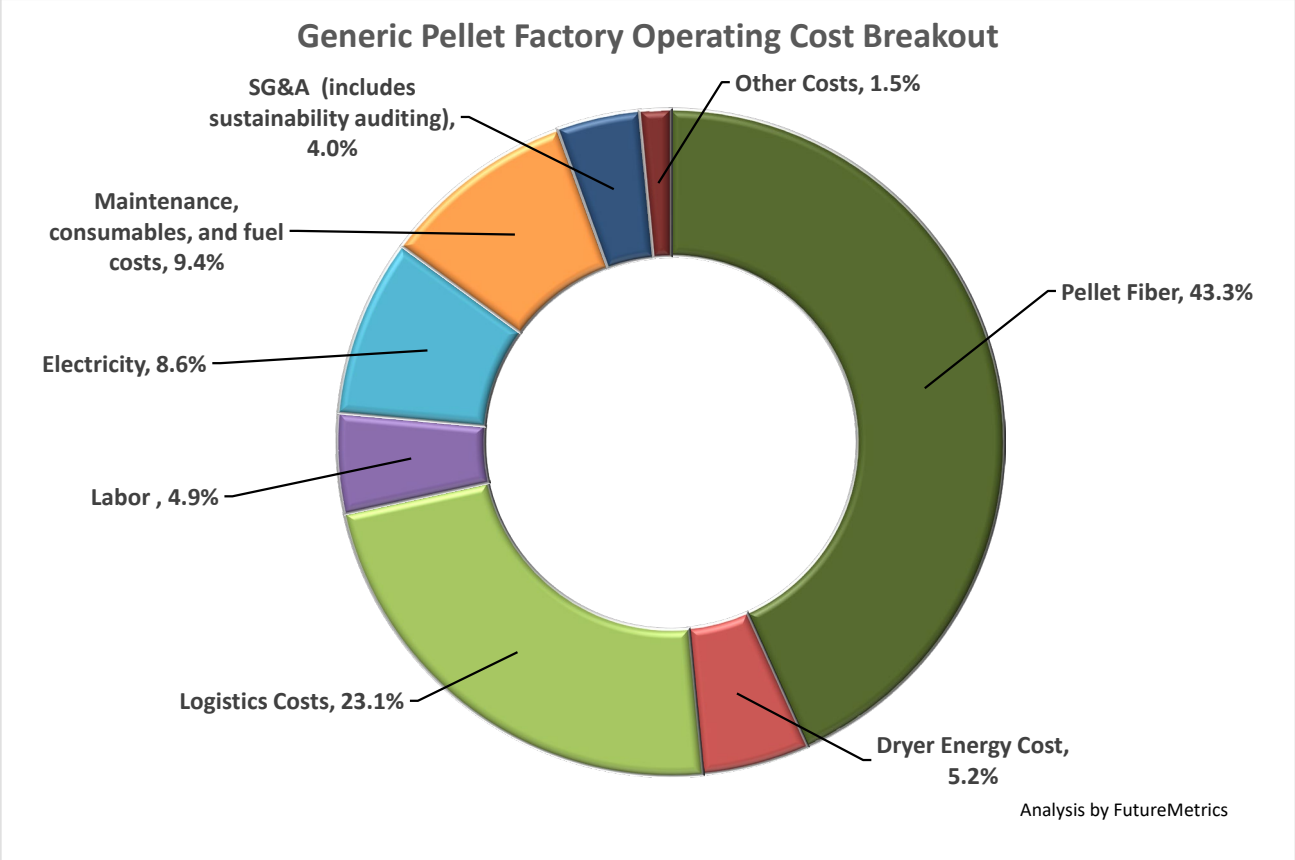

Figure 1 - Generic Operating Cost Breakout for a Pellet Factory

The cost of delivered wood maps to the cost of making a metric tonne of pellets through the moisture content of the incoming feedstock. Higher moisture content for a given cost per "green" tonne increases the cost of wood per tonne of pellets produced. It also increases dryer fuel demand in order to evaporate the higher amounts of water in the incoming wood.

Figure 2 on the next page shows an image of a FutureMetrics dashboard that calculates the quantity and cost of woody feedstock (a link to the dashboard is below the screenshot). In the example, given the moisture content assumptions, it takes about 1.79 tonnes of incoming woody biomass to make one tonne of pellet fuel. In the example, biomass is used for dryer fuel and thus the total demand for feedstock per tonne of pellets is about 2.10 tonnes. As the dashboard shows, the cost of pellet making woody feedstock (and its moisture content), may be different than the cost and moisture content of biomass dryer fuel.

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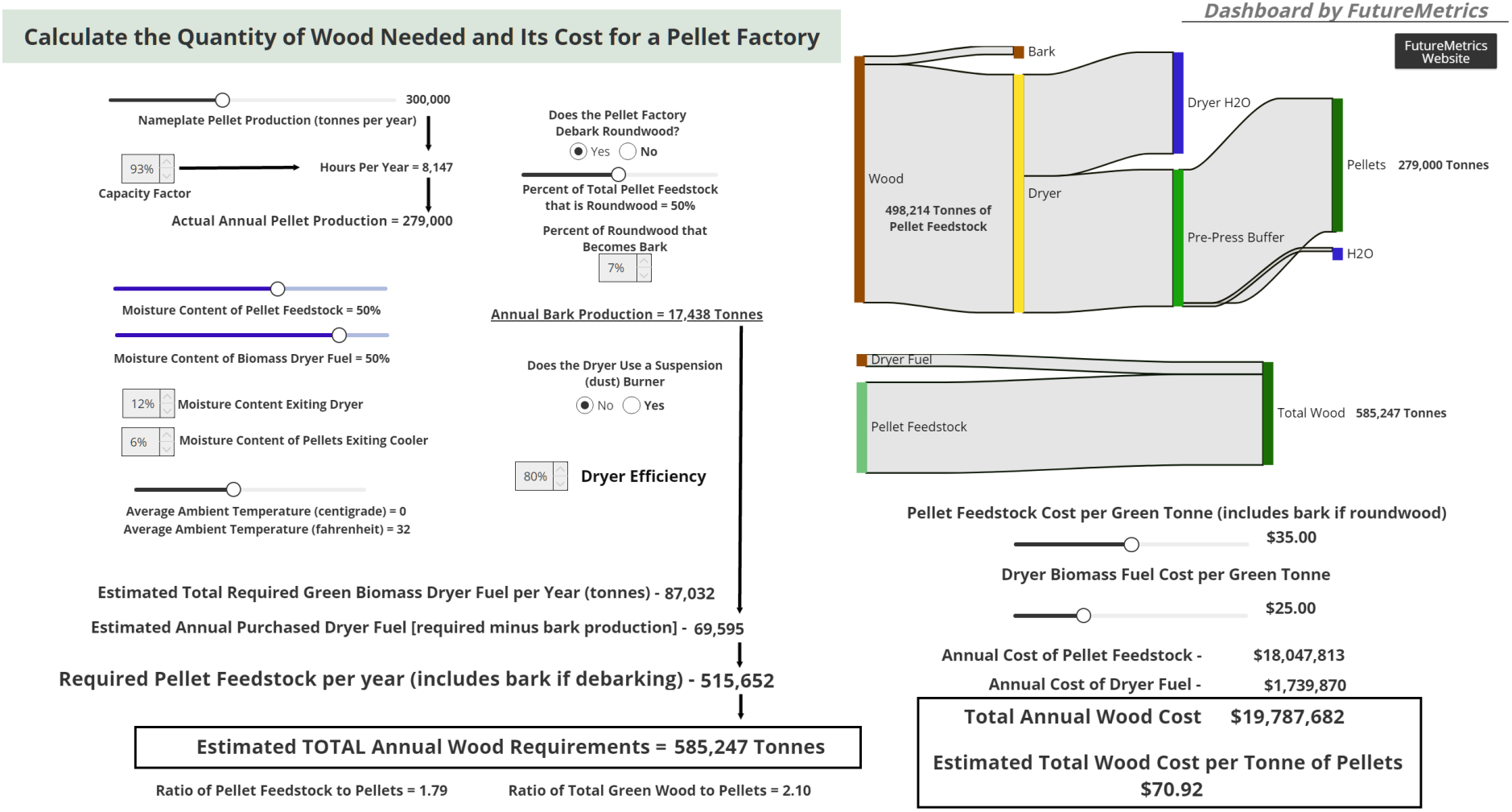

Figure 2 - Calculating How Much Wood is Needed to Make Pellet Fuel

The link to this dashboard is HERE.

In general, the impact on the cost of producing a tonne of pellets of an increase in wood costs is around two to one. The exact ratio depends on the moisture contents and costs per green tonne of the pellet feedstock and the dryer fuel.

The dashboard shown in Figure 2 clearly illustrates how a pellet factory's cost to produce pellets is sensitive to changes in wood costs and the average moisture content of the wood. Raising the cost per green tonne from $35 to $40 and increasing the average moisture content from 50% to 53% increases the cost to produce a tonne of pellets by almost $15. The reader is encouraged to experiment with the wood cost dashboard to see how small changes can have large consequences.

Wood costs for pellet producers in most jurisdictions have increased and thus the cost of producing pellet fuel has increased.

Diesel fuel costs are a significant part of the cost of harvesting and delivering wood. Diesel fuel costs in the US remain high but have moderated since a record high peak in late spring of 2022 (see Figure 3). Nonetheless, harvesting and transport costs are higher than they have been since 2014 and some of those costs find their way to the cost to the pellet factory for purchasing feedstock[3].

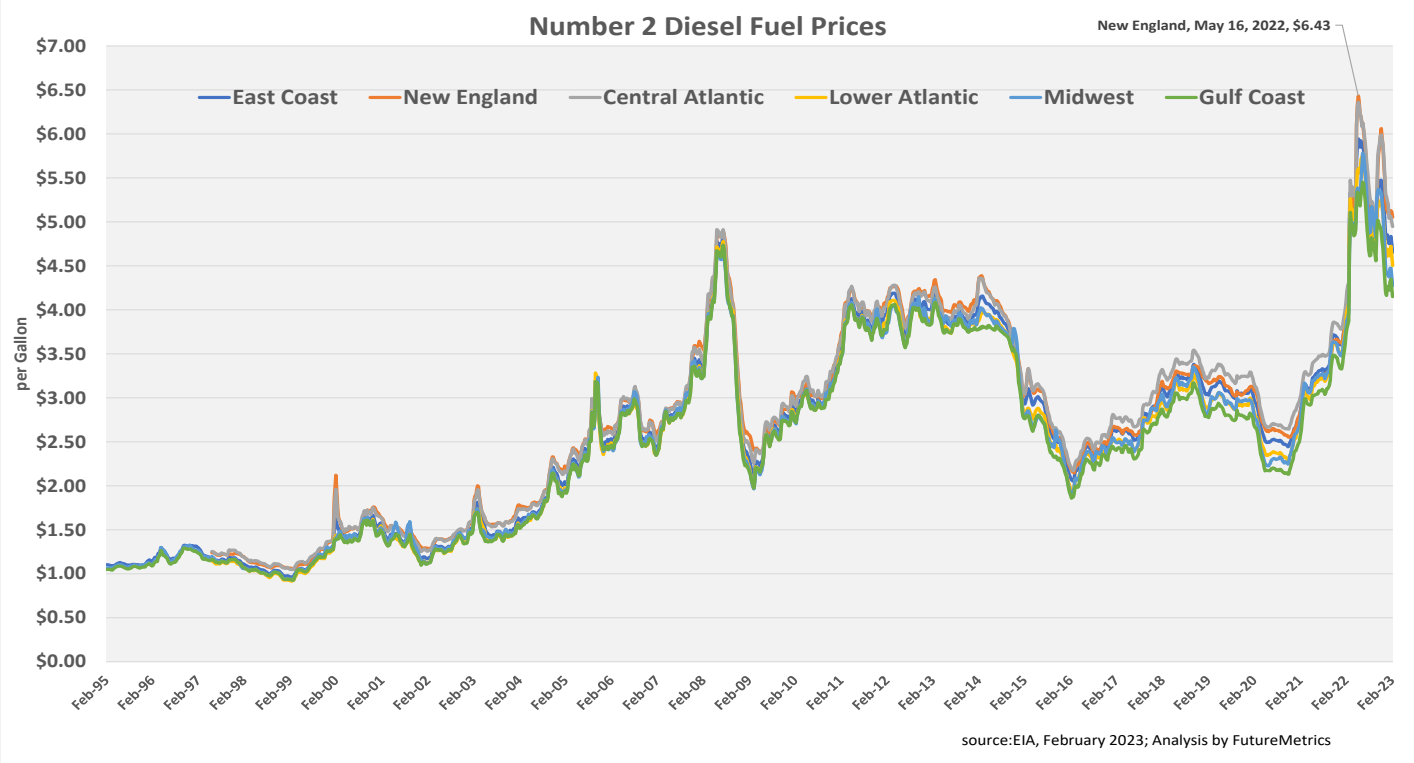

Figure 3 - Diesel Fuel Prices

[3] See the FutureMetrics white paper describing, in part, how harvested trees are optimized by economics value: HERE

One top of fundamental operating costs, supply and demand influences the price of feedstock. As noted in the white paper referenced in footnote 3, the demand for sawlogs by sawmills fluctuates with the housing markets and the demand for lumber. Figure 4 shows that housing starts have dropped by 27.5% in less than a year. Not only is the supply of sawmill residuals impacted, but if there are fewer sawlogs needed, harvest residual supply is also impacted. Again, see the white paper referenced in footnote 3 for more on those dynamics.

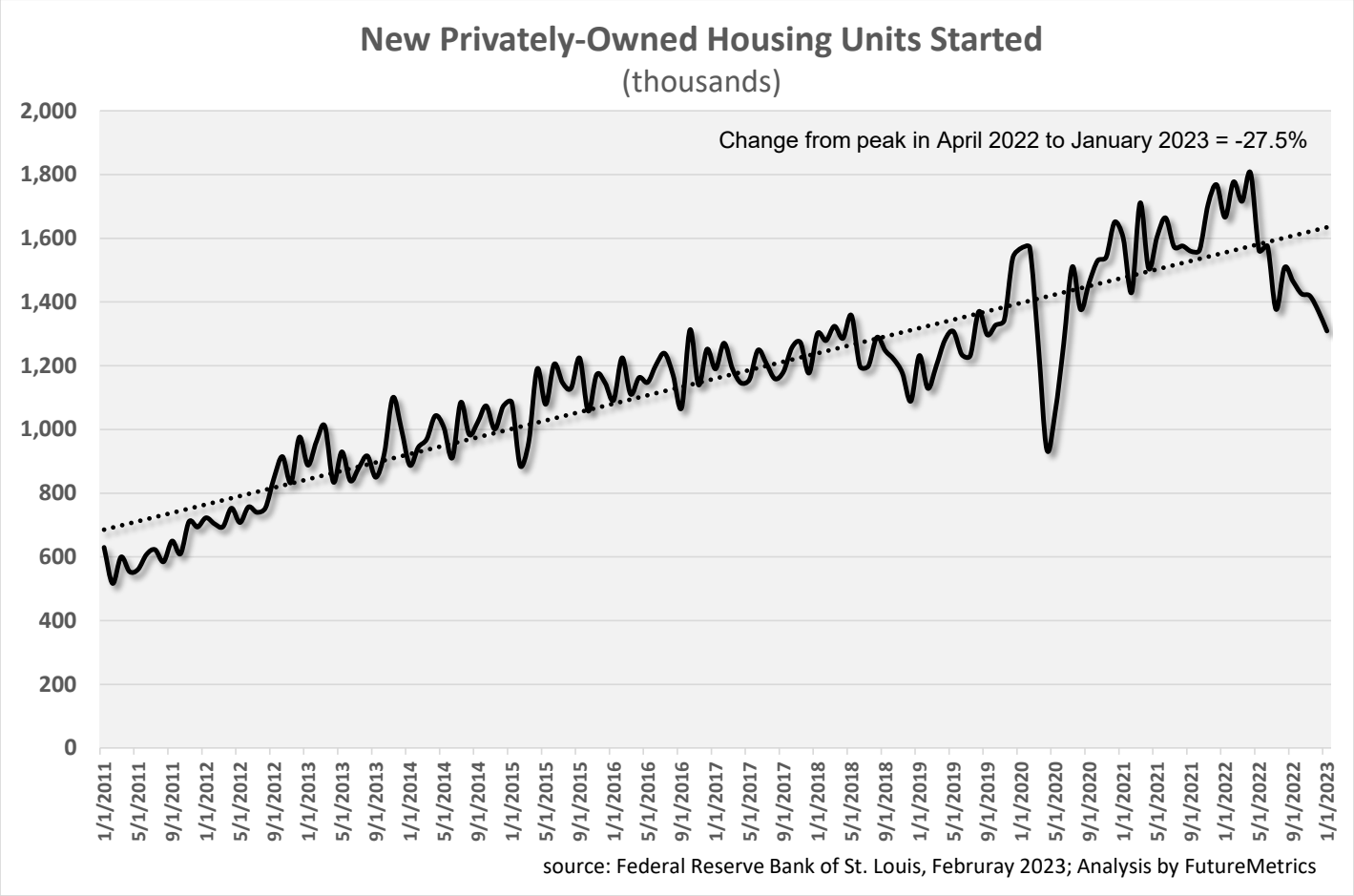

Figure 4 - Housing Starts

North America is not alone in seeing pressure on wood costs for pellet production. Compounding a slowdown in lumber demand and a reduction in domestic sawmill by=products, in the Baltic states the sanctions on Russia have impacted what has been a significant flow of residuals from Russian sawmills to pellet plants in Estonia and Latvia.

Pellet factories are therefore being impacted by wood cost increases that often result in increasing the cost of producing wood pellets well beyond the fixed annual prices escalator in offtake agreements.

What Impacts the Utility's Ability to Pay?

Using the UK CfD scheme as the basis, Drax's unit #1 and Lynemouth have a guaranteed revenue in British pounds per MWh (called the "strike price"). Pellet fuel from North America is sold in dollars per tonne and the dashboard is normalized to dollars across the entire pellet fuel supply chain. Thus, exchange rate fluctuations can have a strong impact on the effective cost per MWh of the imported fuel. The dashboard that compliments this white paper allows the user to see the impact of changing the foreign exchange rate. A stronger dollar will effectively lower the dollar value of the CfD strike price and tighten the generator's margins.

The dashboard assumes that the offtake deal is FOB and thus the buyer is paying shipping costs. Figure 5 below shows the historical shipping cost per tonne (blue line). The yellow line is from FutureMetrics' shipping cost model based on several commonly forecast macroeconomic variables. The chart shows the extreme impacts on shipping cost of the pandemic and then the Russian invasion of Ukraine. Forecasting those types of price variations is not possible. Depending on how the offtakers have hedged shipping costs, they may be exposed to those unexpected changes in shipping costs that dramatically increased the cost of delivered fuel. Fortunately shipping costs per tonne have returned to expected levels.

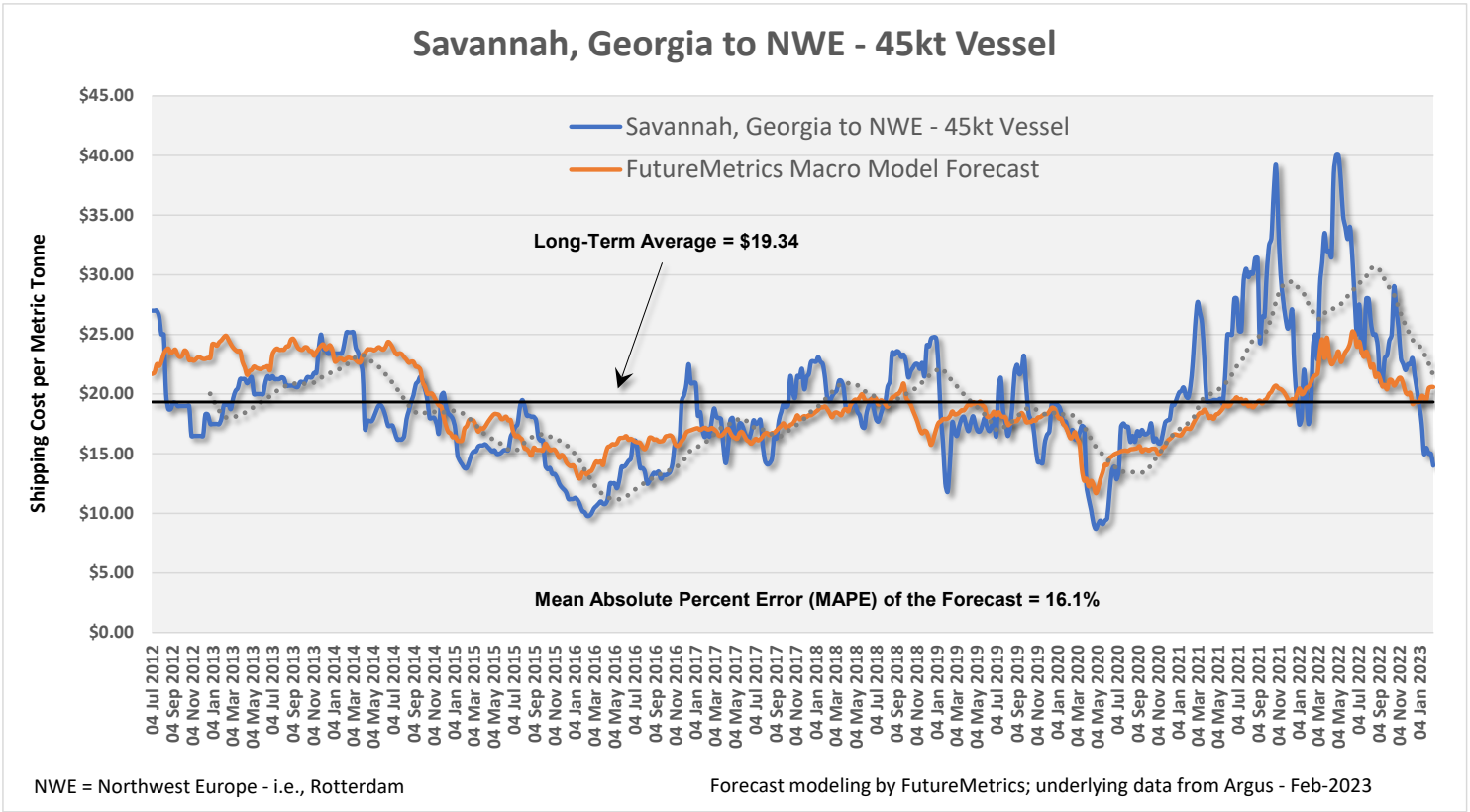

Figure 5 - Shipping Cost Savannah Georgia to Rotterdam for a 45,000 Tonne Load

Experimenting with Critical Inputs to the Supply Chain Cost Buildup

The dashboard, shown in its default settings on page 9, allows many of the important inputs to be changed by the user.

On the pellet factory side, see what happens if the costs of production go up but the sale price of the pellets does not. Producer margins will, of course, shrink.

Conversely, see what happens on the power station's side when the delivered prices of pellet fuel increases but the top line revenue remains at the CfD British pound strike price. Also see what happens if the dollar value of the strike price reflects a stronger dollar. Generator margins will, of course, shrink.

Conclusion

The supply and demand sides of the market had been in a sweet spot for many years. Both the pellet fuel suppliers and the users have been able to generate positive cash flows.

But recent events have stressed markets. The UK CfD scheme has had challenges independent of pellet fuel costs given that the wholesale price of power has been greater than the strike price.

The CfD support sets a guaranteed price for power sales. If the wholesale price is below the strike price, generator is paid the difference. That had been the power market situation in the UK for many years. But as Figure 6 shows, the wholesale price has been higher than the strike price for most of the last few years. Both Drax and Lynemouth's CfD units are limited to the strike prices for their power sales and thus both have to pay the difference! Both power producers have generated less with the CfD units as a result.

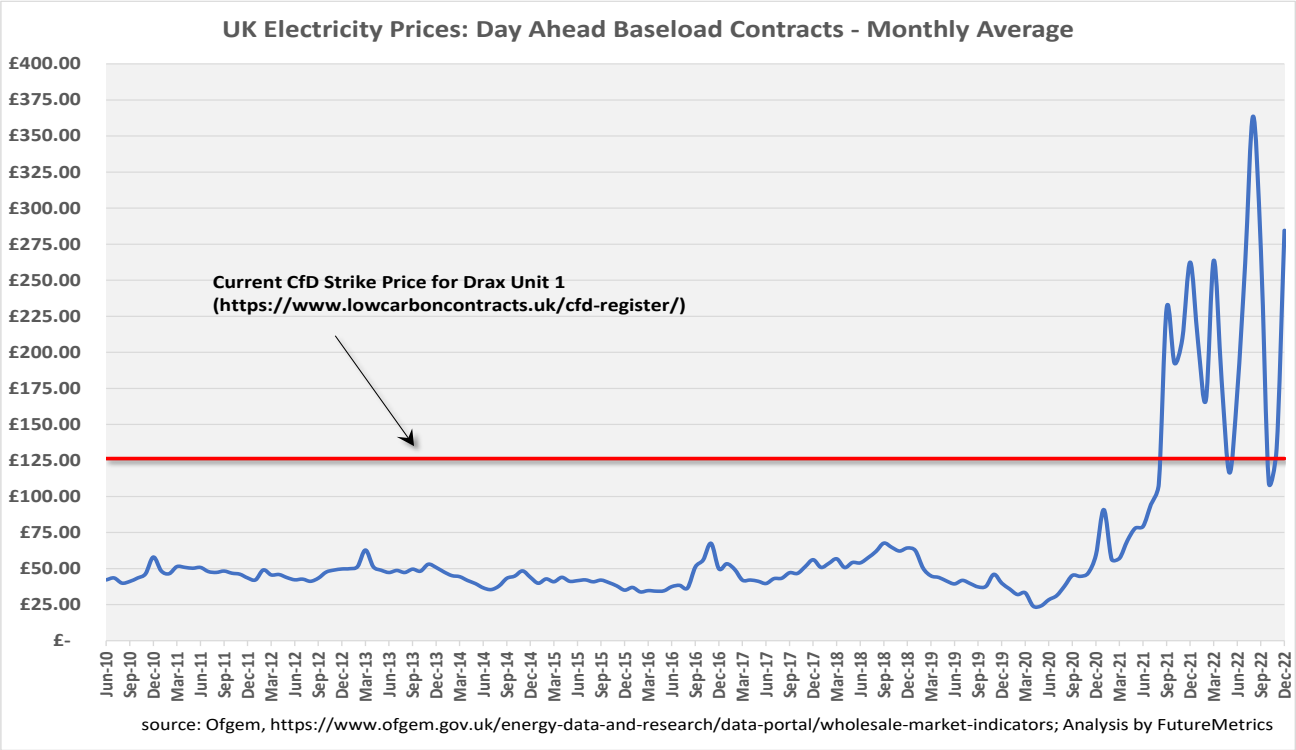

Figure 6 - UK Power Prices and CfD Strike Price

The UK power market will likely correct at some point. But this also illustrates how critical it is for the supply chain to have costs and prices that are favorable to both producers and users.

Independent of the upside-down UK CfD scheme, there are still many potential areas in which the cash flows to producers and buyers can create potential failures for maintaining what has been business-as-usual.

The reader is encouraged to click on the link to the dashboard on the next page and experiment with changing inputs. As will quickly be seen, the sweet spot is not very robust.

What is the solution?

If decarbonization of the power sector is the primary objective of policy, then policy needs to evolve to match the challenges presented by the shocks to the economics system and what may be the "new normal". Otherwise, the symbiotic relationship between producers of carbon beneficial renewable solid fuel and the generators of baseload carbon beneficial power will fail.

We are not so naïve as to discount the pressures that policymakers feel to avoid policies that increase costs to consumers and taxpayers. But as the consequences of climate change are becoming more frequent and more severe, the pathways to decarbonization must be followed even if internalizing the cost of CO_2 pollution while maintaining grid reliability and stability with carbon beneficial baseload power means that the cost of generation may be higher.

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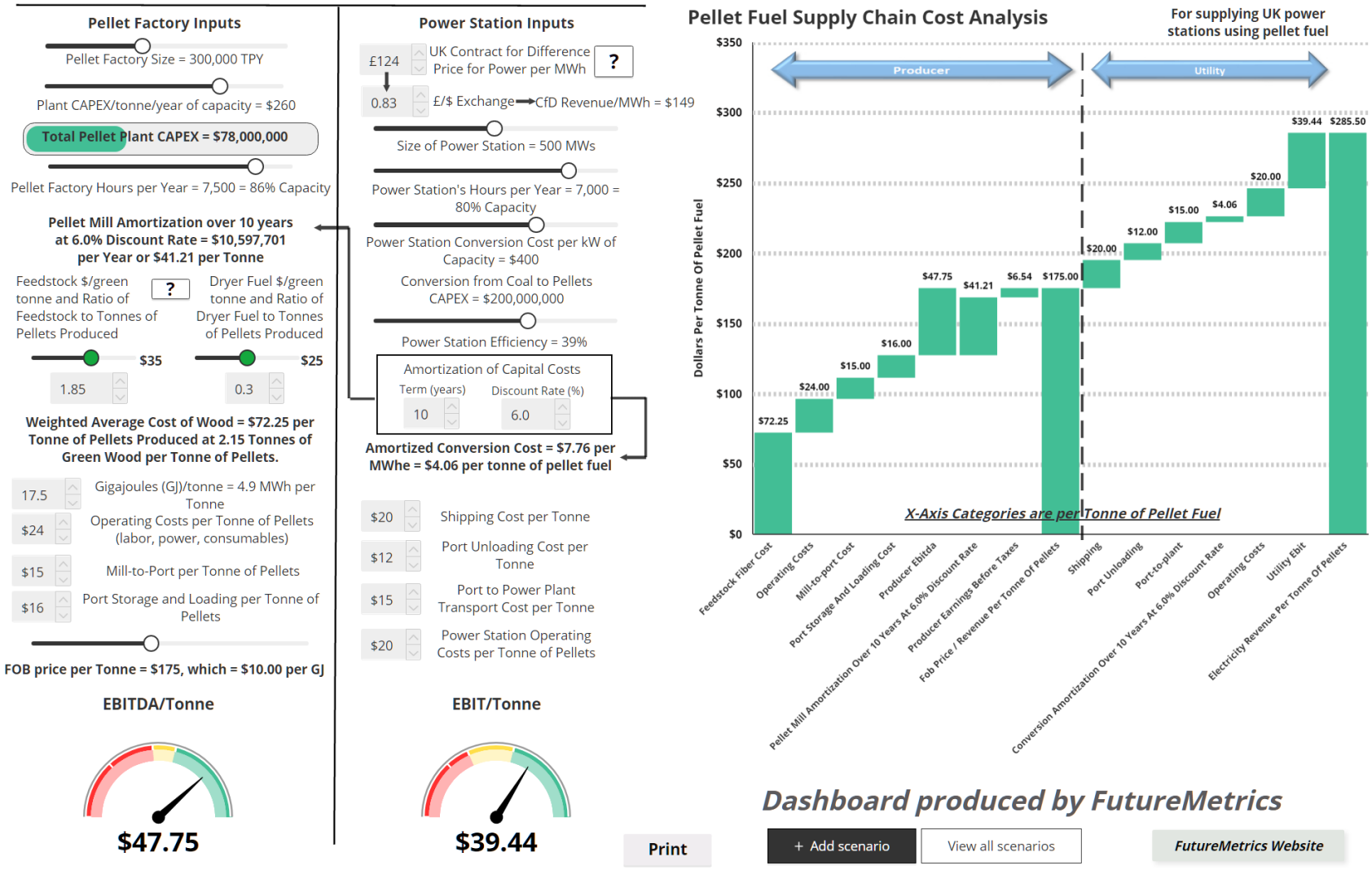

Figure 7 - Pellet Fuel Supply Chain Cost Analysis

Link to this dashboard is [HERE]