



Summary:

Onyx – a subsidiary of Riverstone Holdings – wants to convert its power station in Wilhelmshaven to biomass, with the help of subsidies created to facilitate the coal phase out. If the plant was converted, it would burn up to 2.9 million tonnes of wood pellets every year, almost as much as Germany's entire pellet production. The power station's design and technology prevent the use of anything other than the highest-quality of wood pellets, from slow-growing trees and with a low content of bark from being burned, which excludes a large component of sawmill and logging residues (brush or slash).

Riverstone Holding is a major shareholder of the world's largest pellet company, Enviva. Enviva currently operates nine large pellet plants in the Southeastern USA and is continuously expanding its production. It appears to be the most likely future pellet supplier for this plant. Enviva

regularly sources large-diameter wood from the clearcutting of highly biodiverse and carbon rich forests in the Southeastern USA. However, if pellets were sourced from within Europe as well or instead as from that region, this, too, would contribute to a worsening trend towards forest degradation, destruction of wildlife habitats and thus biodiversity, and loss of carbon sinks and carbon sequestration.

For the climate, running the power station on wood pellets would be no better than running it on coal. Both are incompatible with the urgent need to address the climate emergency, which requires such plants to be shut down. For the climate, running the power station on wood pellets would be no better than running it on coal. Both are incompatible with the urgent need to address the climate emergency, which requires such plants to be shut down.

Background:

Several coal plant operators in Germany are looking at the possibility of replacing some of that capacity with forest biomass as part of the coal phase out. At the same

time, pellet producers – above all the world's largest pellet company, US-based Enviva – are lobbying for coal-to-biomass conversions and for the subsidies required to make this

possible, because they want to open up a new multi-million tonne market for their wood pellets in Germany.

Onyx Power, who acquired Engie's Wilhelmshaven coal plant together with four others coal power stations in November 2019, wants to convert the plant to biomass, i.e. wood pellets.¹ Onyx Power is fully owned by Riverstone Holdings, who own

around \$547 million worth of shares in Enviva.

Even though this is an electricity-only power station, it will be eligible for subsidies paid under coal phase out legislation, although the company will likely try to obtain additional ones to make a conversion to biomass profitable.²

How much wood is required in order to run the Wilhelmshaven power station on biomass?

Based on information available about the plant's technology and efficiency, we estimate that the power station would require around 2.9 million tonnes of wood pellets to operate at maximum capacity (see the Technical Annex for details of how we have calculated that figure).

One tonne of pellets is made from around 2 tonnes of green wood (i.e. freshly cut wood); therefore, a future converted Wilhelmshaven power station would be burning the equivalent of 5.9 million green tonnes (between 5.16 and 5.79 million cubic metres)³ of wood per year.

What type of wood could be burned in the coal plants for which conversions are being considered?

This is an ultra-supercritical pulverised fuel coal power station. This means it is a power station which burns pulverised coal under very high pressure and temperatures in order to power a steam turbine. The great majority of coal power stations are pulverised fuel plants. If they are converted to biomass, then they need to be fired with wood pellets that are then pulverised, i.e. ground into fine particles before being fed into the boiler.

The world's largest converted coal power station is Drax power station in England. Drax burns more than the equivalent of the UK's entire annual wood production every year. Trials

conducted before Drax converted its first unit showed that the only type of biomass which such converted power stations can burn are wood pellets made from ***clean, virgin wood, sourced from slow-growing trees.*** Fast growing trees or crops from short-rotation coppicing cause serious damage to the boilers. For the same reason, it cannot burn wood pellet containing a lot of bark⁴ – which rules out a lot of sawmill residues. Pellets made from hardwood or from pine can be used – but pellets made from eucalyptus almost certainly cannot.⁵

Compared to Drax power station, the one in Wilhelmshaven operates at far higher temperatures and pressure.

Under those conditions, corrosion becomes an even more serious problem, putting even the special materials used in such plants under increased stress.⁶ So far, no power station of this type has been converted to biomass anywhere in the world, but it is clear that, compared to Drax, such

plants will be even more sensitive to the quality of wood pellets burned. Operators are highly unlikely to risk burning pellets with a high bark content, any wood from fast-growing plantations, or brash or slash logging residues.

Where are the pellets most likely to come from and how will forests be affected?

If Onyx's Wilhelmshaven power station was converted to biomass, it would burn almost as many pellets as Germany currently produces in total. Total German pellet production is currently 3 million tonnes of wood pellets a year, and those pellets are in high demand, mostly for domestic heating.⁷

According to the industry magazine *Bioenergy International*, "*pellet production is particularly interesting for forestry, as it creates a new market for unmerchantable wood such as wood that has been damaged by fire or insects*". Yet, as we have seen, this power station would require the highest quality of pellets made from clean wood. It is highly questionable whether "unmerchantable" damaged wood could be burned at all. Burning the wrong type of pellets, after all, could lead to major boiler damage and potentially the closure of the plant.⁸

Onyx's parent company, a major shareholder in Enviva, will have no problems sourcing pellets from that company's pellet plants in the Southeastern USA.

Enviva operates nine large pellet mills in that region and is aggressively expanding its capacity – which is

already far larger than that of any other pellet producer worldwide. The company has been reporting to investors that they expect a substantial new demand for pellets to result from the German coal phase out.⁹

Enviva regularly sources wood from the clearcutting of wildlife rich coastal hardwood forests located in a Global Biodiversity Hotspot, the North American Coastal Plain.¹⁰ Large quantities of whole trees and other large-diameter, high-carbon wood are entering Enviva's supply chain. This has been revealed by regular investigations by US conservation NGOs since 2015¹¹ and is backed up by media investigations from the Washington Post, Climate Central, Channel 4 in the UK, and TV2 in Denmark, amongst others.¹²

The hardwood forests being clearcut are habitat for large number of plants, amphibians and other species, many of them endemic to the region. Some 30% of plants in the North American Coastal Plain are not found anywhere else. The same is true for 57 of the 122 species of amphibians.¹³ The forests are also home to black bears, bob cats and many other mammals. Even when pellets come from pine

plantations in the region, more demand for plantation wood is causing more of the biodiverse forests to be cleared in order to grow more pine monocultures annually.

If, on the other hand, some or all of the pellets were to come from within Europe, the most likely sourcing region would be the Baltic States, which are the largest exporter of wood pellets in Europe. Across the Baltic States, logging has become significantly more intensive in recent years in response to the growing demand for biomass energy. Most of the forests in the region are secondary or semi-natural forests, important for wildlife, including many endangered and threatened bird species. Estonia's

logging volumes have almost trebled since 2008,¹⁴ and Latvia recorded its highest logging volume since 2000 last year.¹⁵ As confirmed in a recent study in the respected scientific journal *Nature*,¹⁶ tree cover loss caused primarily by logging, and the extent and scale of clearcutting have significantly increased since 2016. The research states that these increases are linked to European demand for forest biomass energy.

In October 2020, 25 environmental organisations from the USA and Estonia wrote to German policymakers to raise their concerns about what they expect the impacts of coal-to-biomass conversions in Germany on their forests to be.¹⁷

What would a conversion to biomass mean for carbon emissions?

The smokestack emissions of CO₂ from burning wood pellets in this plan will at best be equal per unit of energy to those from coal; in virtually all existing plants, they are even higher.

This CO₂ released will have been sequestered by trees over a period of decades, which means that, in the most optimistic scenario, it will still take decades for it to be re-absorbed by new trees. However, when forests are converted to plantations, a lot of carbon is lost to the atmosphere forever. And clearcutting forests releases additional carbon from soils, which, again, will not be restored for a long period, if at all.

Moreover, mature forests keep sequestering carbon, so when they are cut down, more of the carbon emitted from fossil fuel burning stays in the atmosphere for decades to come. If we

want to have any hope of keeping global warming to 1.5 or even 2 degrees, we cannot afford to burn coal, nor to cut down large numbers of trees for burning.

Finally, forests also play a vital role in regulating rainfall cycles and protecting communities from the droughts and flooding.

800 scientists have warned in an Open Letter to the European Union: *"Even if forests are allowed to regrow, using wood deliberately harvested for burning will increase carbon in the atmosphere and warming for decades to centuries – as many studies have shown – even when wood replaces coal, oil or natural gas. The reasons are fundamental and occur regardless of whether forest management is 'sustainable'."*¹⁸ Similar warnings have been issued by the

Technical Annex:

The Wilhelmshaven power station is an ultra-supercritical coal power station with a net capacity of 726 MW²⁰ and a gross capacity of 800 MW²¹ of electricity. This means that the plant generates up to 800 Megawatt hours per hour, however 74 of those are needed to keep the power station itself running at full capacity, and the remaining 726 can be exported to the electricity grid. According to the operators, the plant is 46% efficient. We assume that this is the gross efficiency, i.e. the difference between the amount of energy contained in the fuel that is burned and the amount of electricity produced (including the proportion of electricity needed to continue operating the plant).

Based on a typical net calorific value of wood pellets of 4.8 MWh per tonne,²² generating 800 MWh of electricity at 46% efficiency requires an energy input of 1739 MWh which, in turn, requires 362 tonnes of wood pellets. Assuming the power station operates at full capacity for a maximum of 8000 hours per year, 2,898,551 tonnes of wood pellets per year will be required.

This calculation is based on the assumption that there will be no loss of efficiency compared to coal combustion. If there was a loss of efficiency then the pellet requirement would be higher.



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¹ See for example weser-kurier.de/bremen/bremen-wirtschaft_artikel,-kraftwerk-in-wilhelmshaven-soll-mit-biomasse-betrieben-werden-arid,1917939.html – and Riverstone Holding’s statement that they were looking at such a conversion at the time they acquired the plant: riverstonerel.com/portfolio/onyx-power/.

² gesetze-im-internet.de/kvbg/_54.html

³ See forestresearch.gov.uk/tools-and-resources/statistics/forestry-statistics/forestry-statistics-2016-introduction/sources/timber/conversion-factors. The two different figures are for hardwood and softwood respectively, assuming that bark would not be burned.

⁴ biofuelwatch.org.uk/docs/DECC%20FoI%20EIR%2013-0340%20Q1%20Documents%20Drax%20etc%209May%202013.pdf

⁵ Eucalyptus wood has an ash content that is around twice as high as that of pine wood: researchgate.net/publication/328615917_Pinus_Pinaster_and_Eucalyptus_Globulus_Energetic_Properties_and_Ash_Characterization.

⁶ usea.org/sites/default/files/122013_Status%20of%20advanced%20ultra-supercritical%20pulverised%20coal%20technology_ccc229.pdf

⁷ bioenergyinternational.com/markets-finance/all-time-high-h1-2020-pellet-production-in-germany

⁸ This happened at Thunderbay Power Station in Ontario, where black pellets from Norway were burned which ended up causing such severe corrosion that the plant had to be shut down for good:

[cbc.ca/news/canada/thunder-bay/thunder-bay-gs-close-1.4764057](https://www.cbc.ca/news/canada/thunder-bay/thunder-bay-gs-close-1.4764057)

⁹ [envivabiomass.com/enviva-partners-lp-reports-financial-results-for-the-fourth-quarter-and-full-year-2019-and-announces-new-off-take-contracts/](https://www.envivabiomass.com/enviva-partners-lp-reports-financial-results-for-the-fourth-quarter-and-full-year-2019-and-announces-new-off-take-contracts/)

¹⁰ [cepf.net/our-work/biodiversity-hotspots/north-american-coastal-plain](https://www.cepf.net/our-work/biodiversity-hotspots/north-american-coastal-plain)

¹¹ [dogwoodalliance.org/2019/06/caught-in-the-act/](https://www.dogwoodalliance.org/2019/06/caught-in-the-act/)

¹² [washingtonpost.com/national/health-science/how-europes-climate-policies-have-led-to-more-trees-cut-down-in-the-us/2015/06/01/ab1a2d9e-060e-11e5-bc72-f3e16bf50bb6_story.html](https://www.washingtonpost.com/national/health-science/how-europes-climate-policies-have-led-to-more-trees-cut-down-in-the-us/2015/06/01/ab1a2d9e-060e-11e5-bc72-f3e16bf50bb6_story.html), reports.climatecentral.org/pulp-fiction/1/, [imdb.com/title/tt8288424/](https://www.imdb.com/title/tt8288424/), [nyheder.tv2.dk/samfund/2019-09-09-tv-2-afsloerer-fejl-i-klimakontrol-helt-sort-siger-ekspert](https://www.nyheder.tv2.dk/samfund/2019-09-09-tv-2-afsloerer-fejl-i-klimakontrol-helt-sort-siger-ekspert), files.nc.gov/governor/documents/files/NC_Clean_Energy_Plan_OCT_2019_.pdf

¹³ [cepf.net/our-work/biodiversity-hotspots/north-american-coastal-plain](https://www.cepf.net/our-work/biodiversity-hotspots/north-american-coastal-plain)

¹⁴ [andmebaas.stat.ee/index.aspx?DatasetCode=MM03](https://www.andmebaas.stat.ee/index.aspx?DatasetCode=MM03)

¹⁵ [ymd.gov.lv/valsts-meza-dienests/statiskas-lapas/publikacijas-un-statistika/publiskais-parskats?nid=1808#jump](https://www.ymd.gov.lv/valsts-meza-dienests/statiskas-lapas/publikacijas-un-statistika/publiskais-parskats?nid=1808#jump)

¹⁶ Abrupt increase in harvested forest area over Europe after 2015, Guido Ceccherini et.al. Nature, 1st July 2020, [nature.com/articles/s41586-020-2438-y](https://www.nature.com/articles/s41586-020-2438-y)

¹⁷ [biofuelwatch.org.uk/wp-content/uploads/Offener-Brief-Biomasse-Deutsch.pdf](https://www.biofuelwatch.org.uk/wp-content/uploads/Offener-Brief-Biomasse-Deutsch.pdf)

¹⁸ [pfpi.net/wp-content/uploads/2018/04/UPDATE-800-signatures_Scientist-Letter-on-EU-Forest-Biomass.pdf](https://www.pfpi.net/wp-content/uploads/2018/04/UPDATE-800-signatures_Scientist-Letter-on-EU-Forest-Biomass.pdf)

¹⁹

[easac.eu/fileadmin/PDF_s/reports_statements/Carbon_Neutrality/EASAC_commentary_on_Carbon_Neutrality_15_June_2018.pdf](https://www.easac.eu/fileadmin/PDF_s/reports_statements/Carbon_Neutrality/EASAC_commentary_on_Carbon_Neutrality_15_June_2018.pdf)

²⁰ [engie.com/en/journalists/press-releases/sell-german-dutch-coal-assets](https://www.engie.com/en/journalists/press-releases/sell-german-dutch-coal-assets)

²¹

search.abb.com/library/Download.aspx?DocumentID=9AKK106103A4947&LanguageCode=en&DocumentPartId=&Action=Launch

²² [forestresearch.gov.uk/tools-and-resources/biomass-energy-resources/reference-biomass/facts-figures/typical-calorific-values-of-fuels/](https://www.forestresearch.gov.uk/tools-and-resources/biomass-energy-resources/reference-biomass/facts-figures/typical-calorific-values-of-fuels/)