

A BIOMASS GASIFIER AT FIDDLERS REACH, GRAYS, WEST THURROCK: A HIGH-RISK EXPERIMENTAL TECHNOLOGY FOR BURNING CHEMICALLY TREATED WASTE WOOD AND TREES

WHAT IS PROPOSED?

Procter & Gamble, Balfour Beatty and a Canadian company, Nexterra, have submitted a planning application for a biomass plant expected to burn 110,000 tonnes of waste wood a year, much of it chemically treated. The plant is to supply heat and electricity to Procter & Gamble's factory as well as electricity to the grid.

This would not be a conventional power plant but a gasifier: A conventional biomass power plant simply burns wood in order to power a steam turbine. A biomass gasifier exposes wood to high temperatures with limited oxygen, which produces a gas and that gas is then burned (in this case also to power a steam turbine).

WHAT ARE PROBLEMS WITH THE PROPOSAL?

Biofuelwatch has identified four main areas of concern:

1) An unproven and risky technology: Biomass gasification for electricity production remains an unproven, experimental technology. So far, Nexterra has built three such gasifiers worldwide, all of them in North America: One of them was closed after a 'potentially lethal' explosion, another one failed soon after it opened and the third does not appear to have started working successfully. Although there are risks of fires and explosions associated with storing and handling large quantities of woodchips for any power plant, there are special fire and explosion risks associated with gasifiers.

2) Bad for public health: Burning virgin wood causes similar levels of air pollution as burning coal, with more of some pollutants and less of others being released. The plant proposed at Fiddlers Reach is to burn chemically treated waste-wood and this will result in more different toxins being emitted and in some toxins being emitted in greater quantities. Technical problems associated with biomass gasifiers result in a high risk of emission spikes and breaches of legal emission limits.

3) Low efficiency levels: The gasifier proposed for Fiddlers Reach would be a combined heat and power plant with around 33% overall efficiency. This is less than half the efficiency which a high-efficiency conventional combined heat and power biomass plant could achieve. Low efficiency means that more wood will have to be burned (resulting in more air emissions and more traffic) than would be necessary if the same amount of energy was produced from a more efficient plant.

4) A threat to forests: The plant would burn 110,000 tonnes of woodchips made from waste wood every year. Demand for this type of collected waste wood is fast exceeding supplies and the UK is already a net importer of waste wood. There is a high risk that this plant would reduce wood recycling and force other industries to resort to virgin wood, i.e. to more logging of forests.

UNPROVEN AND RISKY TECHNOLOGY

Nexterra has built 8 biomass gasifiers in North America so far but only three to supply electricity. The first of those three was installed at the University of South Carolina in 2007. Between December 2007 and June

2009, three accidents described as 'potentially lethal' by a university spokesperson occurred, at least one of which was an explosion [1] - the plant was then closed down. A second such Nexterra plant was fired up at the University of British Columbia in October 2013 but by 2013, key components had failed and the gasifier has been idle since then [2]. Nexterra was to open a third combined heat and electricity plant in Michigan in March 2014, but this does not appear to have happened, suggesting either delays during construction or technical problems discovered when trying to run the plant. **This means that no Nexterra gasifier designed to produce electricity has ever been operated without serious incidents.** The other five gasifiers installed by Nexterra were designed to supply heat only – which would make them technically much simpler, easier to operate and less prone to breakdown. Yet even of those five gasifiers, one had to be closed down because key parts had become corroded and started to break down in less than a year [3].

A report commissioned and published by the Department for Energy and Climate Change in 2011 stated:

“Gasification and pyrolysis are still considered to be emerging and unproven technologies for the treatment of waste biomass fuel. To our knowledge, there are very few commercial scale gasification and pyrolysis plants operating in Europe and world-wide. .. [Such] plants face, or have faced, significant technical challenges in terms of treating heterogeneous waste streams, and there are several cases where plants failed to achieve their design throughput or air emission standards.” [4]

Guidelines for Biomass Gasification funded by the European Commission warn:

“During operation of a biomass gasification plant there is an increased hazard potential due to the fact that a potentially explosive, toxic and combustible gas mixture is produced and consumed. The producer gas and residues (ash, liquids, exhaust gases) may cause the following major hazards/risks:

- + an explosion and/or fire;***
- + health damage to humans (poisoning, danger of suffocation, noise, hot surfaces, fire and explosion);***
- and***
- + pollution of the environment and plant vicinity.”***

PUBLIC HEALTH CONCERNS

Burning virgin wood emits the same range of pollutants as burning coal, albeit less of some (mainly sulphur dioxide and mercury) and more of others (mainly Volatile Organic Compounds and fine particulates). Pollutants include oxides of nitrogen (NO_x), carbon monoxide (CO), small particulates (PM₁₀, including PM_{2.5}) and sulphur dioxide (SO₂) and, in smaller quantities, Antimony, Arsenic, Cadmium, Chromium, Copper, Dioxins and Furans, Lead, Manganese, Mercury, Nickel, Polycyclic Aromatic Hydrocarbons (PAHs), Selenium, Vanadium and Zinc.

However, Balfour Beatty and Nexterra want to burn chemically treated waste wood at Fiddlers Reach. This would result in the emission of additional toxic pollutants and also in some pollutants – such as dioxins and furans and also oxides of nitrogen – being emitted in greater quantities than would be the case for virgin wood burning only.

Some of those toxins are linked to respiratory and cardiac disease and to strokes, others to cancer, birth defects and hormone disruption. For more details about the public health impacts of biomass plants, see <http://biofuelwatch.org.uk/2014/biomass-aq-briefing/>.

Some companies and research institutes elsewhere in the world are trying to develop biomass gasifier which would thoroughly clean the gas from the gasifier before burning it to generate energy. If such a plant was to operate without any technical problems (which no operator anywhere seems to have achieved so far, at least for the first year or two) then the emissions would be lower than those of a conventional biomass power plant. But this does not apply to the plant proposed at Fiddlers Reach: There are no plans for cleaning the gas before burning it. The 'best case' scenario would be for it to be as polluting as a waste wood incinerator. Judging from the experience with other similar plants, it could be significantly more polluting:

Firstly, experience with gasifiers elsewhere shows that they cannot be expected to operate smoothly. And that means, they can be expected to be shut down and started up many times. Shutting down and then restarting a power plant results in major emission spikes, including of dioxins and furans [5]. And secondly, if pressure builds up inside a gasifier, the only option for preventing an

explosion is to vent the dirty gas straight into the atmosphere, without filtering out any pollutants. Operators of a waste gasifier in Scotland 88 such incidents as well as hundreds of breaches of emissions limits overall. The plant's permit was eventually withdrawn following an explosion and fire [6].

LOW EFFICIENCY LEVELS

Biomass gasifiers that power a steam turbine are almost always less efficient than comparable conventional biomass plants. One peer-reviewed study [7] found:

“Biomass gasification can be combined with a steam turbine and boiler, which burns the fuel gas to generate high temperature and high pressure steam. This, however, achieves only 10-20% electrical efficiency. This, together with high capital cost, lead to this technology being avoided“.

Figures contained in the planning documents for the Fiddlers Reach plant suggest that this plant would be around 33% efficient overall, when heat and electricity are considered. However, an efficient combined heat and power plant of the same size could achieve 70% or more efficiency.

WHAT CAN RESIDENTS DO ABOUT THIS APPLICATION?

+ You can find a link to and object to the application at http://biofuelwatch.org.uk/2015/grays_gasifier_objection;

+ You may wish to write to your local Councillors to express your concerns about the plans. To find out who your Councillors are, please go to <https://www.writetothem.com/>;

+ To find out more about the proposal and about how to help campaign against it, please contact biofuelwatch@gmail.com.

REFERENCES

[1] <http://www.thestate.com/news/business/article14396069.html>

[2] <http://www.nrcan.gc.ca/energy/funding/current-funding-programs/cef/4971>: As the document explains, this combined heat and power plant remains operational but the university is burning a very different fuel – biogas from anaerobic digestion – purchased from another company in gas engines, with Nexterra's gasifier remaining shut down for the time being.

[3] <http://www.washingtontimes.com/news/2014/aug/25/oa-k-ridge-biomass-steam-plant-already-closed/>

[4] <https://www.gov.uk/government/uploads/system/upload>

A THREAT TO FORESTS

Waste-wood burning power plants are usually only permitted to burn waste wood classed as 'non-hazardous' – although many would argue that the paints, glues and other chemicals contained in such wood are far from non-hazardous when burned. In 2012, Defra published a report which warned that burning supposedly 'non-hazardous' waste wood for energy competes with other industries – especially the panel board industry, animal bedding and landscape uses of woodchips. It also pointed out that the UK is already a net importer of wood waste. Furthermore, Tilbury Green Power already has planning permission to burn 270,000 tonnes of waste wood from the same local sourcing region [8]. Meeting a new demand for 110,000 tonnes of wood will, whether directly or indirectly, push up the demand for virgin wood and thus for logging and wood imports to the UK.

s/attachment_data/file/147863/3237-cons-ro-banding-arup-report.pdf

[5] <http://www.biofuelwatch.org.uk/2014/power-plant-startup-emissions/>

[6] http://www.ukwin.org.uk/files/pdf/sepa_dargavel_june_2013.pdf

[7] http://www.ieatask33.org/app/webroot/files/file/publications/Fact_sheets/IEA_What_is_gasification.pdf

[8] <http://www.letsrecycle.com/news/latest-news/tilbury-waste-plant-gets-70m-funding-boost/>