Biomass and air quality
The UK experience
Biomasse et qualité de l'air
L'expérience anglaise

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During 2008, discussions about air quality in the UK have been dominated by one subject: biomass. No air quality conference, workshop or regional event has been complete without a session providing an update on the biomass situation, with attendance at such meetings up significantly such is the desire of air quality practitioners to hear the latest on biomass. Put simply, after many years of steadily diminishing emissions from vehicle and static sources, air quality practitioners are concerned that biomass will introduce a significant new source of air pollution in towns and cities across the UK.

Air quality problems caused by wood burning (the most popular form of biomass) are of course nothing new. Several Scandinavian countries suffer air quality problems caused by domestic wood burning. In the USA, domestic wood burning in rural areas emits 420,000 tons of $PM_{2.5}$ each year** prompting the US Environmental Protection Agency to initiate a successful programme to replace old, inefficient wood stoves. Wood heating is, however, far less popular in the UK, and in our towns and cities domestic heating is almost entirely accomplished using natural gas and electricity.

Policy Drivers for the Use of Wood Fuel

The UK's main driver for the greater use of biomass is the country's desire to reduce emissions of greenhouse gases, principally CO_2. The Kyoto protocol commits Britain to keeping annual greenhouse emissions during the period 2008-2012 to 12.5% below 1990 levels. Internal UK targets are far higher than this, however, and the UK's long-term commitment is a 60% cut by 2050. In the field of large-scale energy generation this has led to an increase in the amount of electricity generated from renewable sources, including large wood burning electricity generation and combined heat and power (CHP) plants. However, these larger plants tend to be well regulated in terms of emissions to air, and also in remote locations.

Renewable energy has also found its way into new housing and commercial developments. Many local authorities have adopted the so-called "Merton Rule", which requires that major new developments generate a percentage (typically 10%) of their energy requirements using on site renewables. Typically a range of renewable energy options are considered, however combined heat and power from biomass burning is currently the most popular choice, as it is far more cost effective than renewable technologies such as wind turbines and solar panels.

Additional policy drivers for biomass energy include the 2007 UK Government announcement that all new UK housing would have to be "carbon neutral" by 2016, and new European Renewable Energy targets which mean that the UK must source 15% of its energy needs from renewable sources by 2020. These drivers have two implications. The first is that wood burning, as one of the most cost effective renewable energy technologies, will increase significantly over the next 12 years. The second is that much of this new wood burning will be development-driven, that is incorporated into new housing and commercial developments.

UK Concerns Around Biomass and Air Quality

Some proposed biomass plants are very large. For example a £400 million wood burning power station has recently been approved for Port Talbot, Wales. As previously described these tend to be well regulated under IPPC controls and be situated away from homes and work places. Of greater concern are the smaller biomass plants, which are being installed in large numbers. In 2007 air quality officers in local authorities began to notice an increase in planning applications containing these type of plant. This led to London Councils (a consortium of London local authorities) commissioning a report to help them understand the potential local impact of biomass burning. The report "Review of the Potential Impact on Air Quality from Increased Wood Fuelled Biomass

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** *Source : US Environmental Protection Agency.*

Use in London" was released late in 2007. The report concluded that the effect on PM_{10} levels could be significant, and under certain scenarios could prevent PM_{10} objectives from being met at many background locations in London.

The report was criticised for the high emission factors used, and for the "unrealistic" wood fuel uptake scenarios used (although the authors used the best available information). Nevertheless, air quality officers in local authorities across the country were concerned, and developers soon reported that many planning applications that included wood burning plant were being turned down on air quality grounds.

Direct emissions to air have not been the only concern raised regarding the environmental impact of a proliferation of biomass plant. Deliveries of fuel will involve vehicle movements, and a consequent increase in congestion and emissions from vehicles. Regular maintenance of wood burning plant and correct storage of fuel are also essential to ensure emissions are kept to a minimum, however regulation to ensure this is thought to be inadequate. Finally, many people have raised the issue of fuel sustainability, particularly with regard to where wood fuel is sourced. The UK's forests may be inadequate to provide the amount of wood fuel needed, meaning wood will have to be imported from abroad with consequent increases in carbon dioxide (and other) emissions from transport.

Environmental Controls on Wood Burning

In common with other European countries, air quality standards in the UK are driven by European air quality objectives. The UK, however, adds some objectives of its own, for example the Scottish Government has introduced stricter PM_{10} and $PM_{2.5}$ objectives for Scotland. Also unique to the UK is the system of "Local Air Quality Management (LAQM)", which obliges local authorities to periodically review and assess air quality and, where air quality breaches UK objectives, declare an "Air Quality Management" area with an action plan for improvement.

Regulation of wood burning plant falls into Pollution Prevention and Control regimes for plant above 20 MW capacity, with a commitment to meet Best Available Techniques (BAT) to reduce emissions. Below 20 MW regulation falls to local authorities *via* the UK Clean Air Act, legislation that dates from the days of coal smoke smogs. The Clean Air Act does little to provide local authorities with the means to control installations of wood burning plants, and the emissions limits it sets are inadequate to ensure modern air quality standards are met.

Action to Address Air Quality Concerns

Three main points could sum up the biomass and air quality situation at the beginning of 2008:

1. The research base available to assess the potential air quality impacts of biomass burning plants was inadequate, making it extremely difficult to make both national and local policy decisions on the use of wood fuel;

2. There was no consensus between air quality and climate change professionals as to an acceptable level of deployment for biomass burning plant;

3. Existing regulatory controls on wood burning plant (particularly below 20 MW capacity) were felt to be inadequate.

As 2008 has progressed work has taken place to address each of these issues, with a wide range of organisations working together to ensure progress. These organisations have included Government departments and agencies, trade associations, local authorities and, of course, Environmental Protection UK. Although there is a great deal more work to be done, progress has been made over the past year.

Research work has focused on modelling potential air quality impacts using more realistic emission rates and deployment scenarios than the 2007 report "Review of the Potential Impact on Air Quality from Increased Wood Fuelled Biomass Use in London". A study re-examining the situation in London will be available in late 2008, which should provide local authorities in London with a clearer picture of the potential air quality effects of biomass plant. Similar work has been commissioned for the UK as a whole.

Many local authorities are essentially asking "what should we do about biomass? ", a question that will be addressed by guidance being developed by Environmental Protection UK and the local authority support body LACORS. This will aim to bring together current information on biomass in one concise document for local authorities, and provide a basis for them to make planning decisions. The guidance will be available by the end of 2008, and will also be accompanied by a shorter information leaflet aimed at developers.

Fuel specification is very important in terms of emissions from biomass plant. Work to establish CEN (European) standards for a range of biomass fuels was nearing completion at the time of writing, codifying fuel qualities such as size, moisture content and heavy metals. Draft standards for woody fuels will be the first to be finalised.

Over the summer of 2008 the UK Government released a draft renewable energy strategy for the UK. The strategy aims to implement the UK's target set under European law that 15% of all energy consumed must be provided from renewable sources by 2020. Biomass features heavily within the strategy, and clearly a large increase in biomass use (and wood fuel in particular) will be needed to reach the target.

The strategy did, however, examine the air quality issues in detail, and included the following recommendations:

- Production of emission standards for biomass boilers, which could see a two-tier system allowing different standards for different geographical areas;

- Provision of better controls for local authorities, to allow them to set and enforce standards for smaller (<20 MW) biomass boilers;
- A requirement for regular checks to ensure biomass boilers are appropriately maintained and emissions to air are within set limits; and
- More research to investigate where and where not biomass boilers represent a threat to air quality standards, to help set appropriate uptake targets on both a national and local basis.

On the technical front improvements are being made on cost effective emissions abatement equipment for smaller biomass fuelled plant. This is a very important development, as currently there is no way of providing emissions abatement on smaller plant except at prohibitive cost.

Outstanding Concerns

Whilst there has been significant movement over the past year to address air quality concerns around biomass burning, Environmental Protection UK and other air quality specialists still have some major concerns. Principally these relate to the likely scale of the increase in biomass burning suggested by the draft UK Renewable Energy Strategy, and focus around two main issues.

The first is the $PM_{2.5}$ exposure reduction targets that have now been set at both UK and EU levels. There has been little attention paid to $PM_{2.5}$ exposure reduction within the evolving policy on biomass burning, with the focus resting on the effects on PM_{10} limit values. We believe that work needs to be undertaken to ascertain the effects of a large increase in biomass burning on the exposure reduction target, and, if it is deemed to be significant, how geographical targeting can minimise this.

The second is how deployment of wood fuel burning plant will be geographically targeted. To date, the vast majority of smaller biomass plant installations have been development driven, that is they are included in new housing, office and industrial developments. Development tends to occur in urban areas, which drives biomass-burning plant into the areas that commonly experience air quality problems. The draft strategy seems to miss this fact. It is also contradictory, stating in places that it may be best to target biomass deployment in rural areas and/or areas with no mains gas, and elsewhere conceding that these opportunities simply aren't big enough to meet the likely amount of biomass heat needed.

Conclusions – Lessons from the UK Experience

Policies to encourage the use of biomass in the UK can perhaps be held up as an example of how not to develop integrated environmental policy. The UK has considered the air quality effects of biomass burning only after putting in place policies that will hugely increase the amount of biomass burning plant that will be installed. Whilst these issues are now being addressed, it will be some time before a satisfactory framework will be in place. The current situation is not a positive one for all involved – air quality practitioners, climate change policy makers and the wider biomass industry.

For clean air organisations such as Environmental Protection UK and our European counterparts there are essentially two lessons to take away. The first is that we have to raise our sights to look for potential threats to air quality from wider policy measures, and flag up potential concerns at the earliest opportunity. It is easy to focus on the job in hand (for example emissions from vehicles) and miss developments further afield.

Secondly, and most importantly, we have to offer our own solutions to wider environmental challenges. Climate change is likely to remain the dominant global environmental issue for decades to come; clean air agencies need to understand this and put forward low carbon solutions that offer strong synergies with air quality. The alternative is for policy makers to see air quality standards and clean air agencies as a barrier to progress towards a low carbon economy, rather than a positive source of solutions.