Study on Biomass Combustion Emissions

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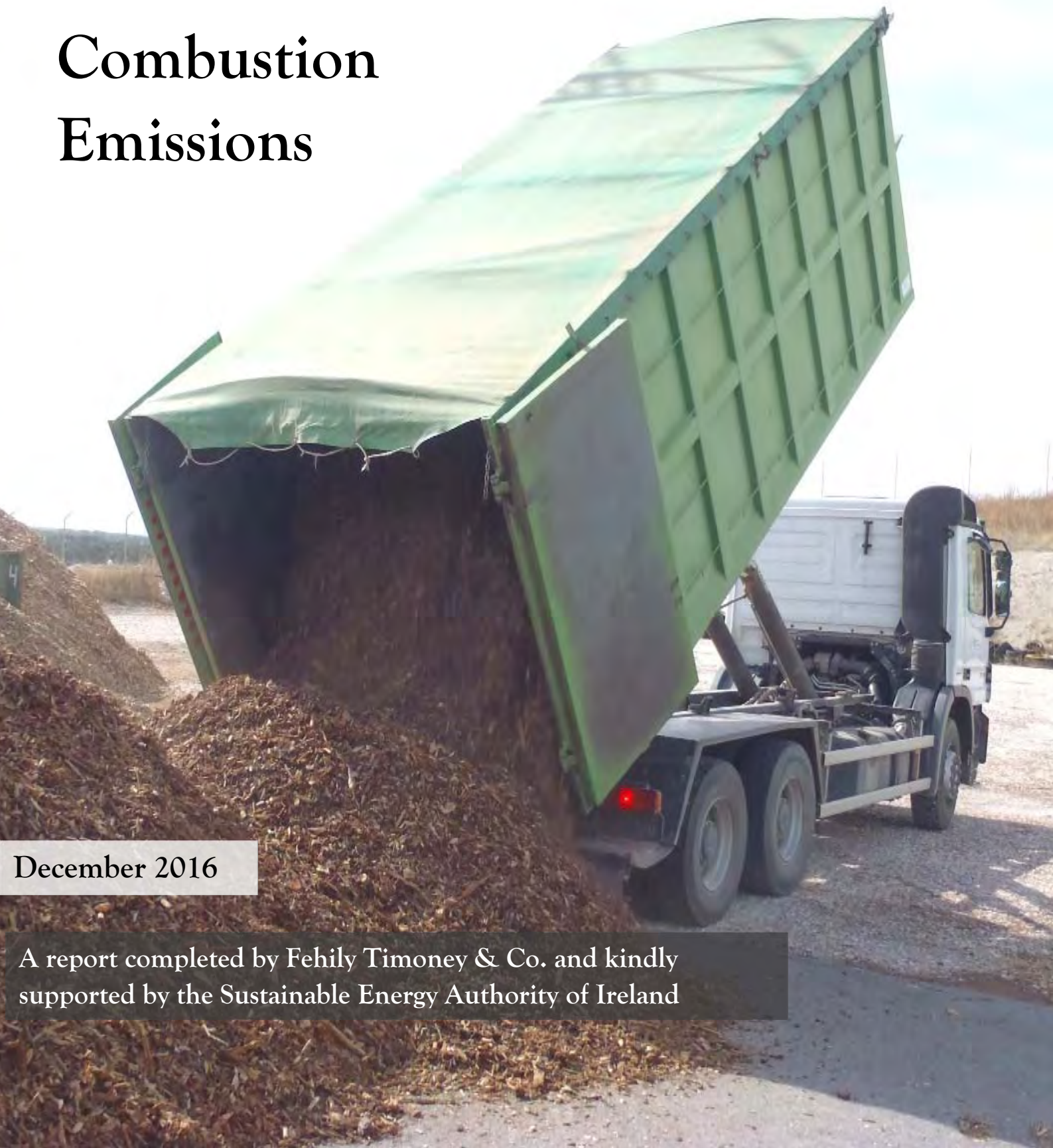

December 2016

A report completed by Fehily Timoney & Co. and kindly supported by the Sustainable Energy Authority of Ireland

IRISH BIOENERGY ASSOCIATION (IrBEA)

PROJECT REPORT FOR BIOMASS COMBUSTION EMISSIONS STUDY

December 2016

Keywords: emissions, PM_{10}, $PM_{2.5}$, NOx, design, wood fuel, quality, installation, combustion, RHI, ecodesign, ELVs

Abstract: This report presents the findings of a study undertaken by Fehily Timoney & Company (FT) on behalf of the Irish Bioenergy Association (IrBEA) in relation to emissions from biomass combustion and identifies a number of recommendations for implementation that could beneficially mitigate the impact of these emissions. A Technical Literature Review, that provides an overview of the relevant technical aspects of biomass combustion and emissions, is provided as Appendix 1 to this document.

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Foreword

Michael Doran, President of the Irish BioEnergy Association

Ireland is committed to reducing its dependence on fossil fuels, and reducing its carbon emissions under many European and international agreements. The global issue of climate change is considered one of the most important of the era and one that requires changes in our economy and our society to reverse the reliance on high carbon fossil fuels. European and international agreements from the National Renewable Energy Action Plan, to the Paris Agreement, place a responsibility on Ireland to act, to reduce carbon emissions, to replace fossil fuels, to become more efficient and to switch to renewable energy.

The largest source of renewable energy in Europe is bioenergy. Everything from the combustion of firewood, to turning waste food into biogas, to powering our vehicles on diesel and petrol derived from plant material, is part of the bioenergy industry. In Ireland bioenergy does feature, however its potential has yet to be fully explored or utilised. Biomass in its most basic forms of woodchip, wood pellets, firewood or indeed straw or miscanthus, is an excellent replacement fuel for oil and kerosene heating fuels. We can produce these fuels in Ireland, creating value for the grower, employment for processing, fuel cost savings, and reduced carbon emissions. The full socio-economic value of switching from fossil fuels to biomass, is considerable and must be considered in its full impact.

Technology for the combustion of biomass around Europe and Ireland has advanced greatly in the past 30 years, improvements to automation, efficiency, reliability and controllability have ensured that biomass can readily replace fossil fuels while being as convenient and reliable as the technology that has built up around oil and gas over the last century. It is now possible to purchase “plug and play” biomass systems and for fully automated fuelling systems to ensure the minimum of input from the heat user. However, the capital costs of these systems are higher than their fossil fuel counterparts, and unless the user gets value for the carbon and societal benefits, then the role-out of biomass will not occur fast enough for Ireland to meet its commitments.

Over the past 3 years the Department of Communications, Climate Action and Environment (formerly DCENR) have been working on the implementation of a Renewable Heat incentive. The purpose of the RHI is to financially incentivise the installation of renewable heating systems such as biomass, and for the state to then benefit from the reduced carbon emissions through our reduced reliance on fossil fuels. Biomass brings benefits in terms of reduced carbon emissions, and enhanced local benefits to the economy (circa 80% of the spend on biomass fuels stays in the local economy as opposed to less than 10% from fossil fuels).

However, the question has been raised about other emissions to air. If we are to start to burn increasing amounts of biomass for heating, could this effect air quality and have an effect on health and the local environment. This is an important question and one that needs to be answered. For this reason, in March 2016, the Irish BioEnergy Association approached SEAI and sought assistance in answering this question. SEAI agreed to fund a study into the Emissions from Biomass Combustion, and IrBEA retained the expertise of Fehily Timoney & Co. to conduct a detailed report on the topic. All combustion creates emissions of some form or another, this report however concentrates on emissions associated with biomass, and on the technology available to mitigate emissions

The report itself is brief and does not answer all the questions, nor was it designed to, in the time available. However, it does offer an excellent opportunity for policy makers and stakeholders to better

understand emissions, the cause of and how they are controlled and can be mitigated. It will be an important tool in the development of future policy and we hope it will assist, to guide sensible and sustainable development into the future.

All future development must be conducted in a manner that protects our environment, whether that is with regards to the effects on health, air, water, terra-firma or ecology. The bioenergy industry is committed to this task, indeed it is one of our founding principles and it is one that we will continue to fully embrace in the years to come.

Finally we would like to thank the Sustainable Energy Authority of Ireland, the voluntary stakeholder group, industry members and public bodies who have supported this report with their time, expertise and guidance.

Michael Doran

December 2016

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GLOSSARY

CAFE Directive	The Cleaner Air for Europe (CAFE) Directive (2008/50/EC) is an EU Directive that aims to improve ambient air quality in Europe. Limit values for ambient concentrations of various pollutants are set by this Directive.
Competent Person Schemes	UK schemes which allow individuals and organisations to self-certify that the installation work they carry out is in compliance with the relevant regulations.
ELV	Emission Limit Values (ELVs) are limits, often enforceable through legislation, on the maximum permissible concentration of an air pollutant.
EN*plus*	A European approved fuel quality certification scheme that is managed by the European Pellet Council and relates specifically to part 2 of the EN ISO 17225 standard (for wood pellets).
HETAS	The Heating Equipment Testing and Approval Scheme (HETAS) is a UK based organisation that operates within the biomass and solid fuel heating sector. It provides recognition to high quality biomass heating appliances, installers and biomass fuels, while it also provides a number of appliance installer training courses.
IED	The Industrial Emissions Directive (IED) is an EU Directive that aims to reduce emissions from industrial production processes. ELVs for the concentrations of various pollutants from large combustion plants are set by this Directive.
MCP	A Medium Combustion Plant (MCP) is a plant that falls under the MCP Directive and has a total rated thermal input of ≥ 1 MW and < 50 MW.
MCP Directive	The Medium Combustion Plant Directive (MCP Directive) is an EU Directive that aims to protect human health and the environment across the EU by regulating pollutant emissions from MCPs. ELVs for the concentrations of various pollutants from MCPs are set by this Directive.
MCS Scheme	The Microgeneration Certification (MCS) scheme is a UK scheme that provides recognition to both high quality microgeneration appliance technologies and high quality microgeneration appliance installers.
METAC	The Midland Energy Training and Assessment Centre (METAC) is a provider of energy training and assessment in Ireland. It provides solid fuel training courses that are directly relevant to biomass combustion.
NOx	Oxides of Nitrogen (NOx) are emissions which may include Nitric Oxide (NO), Nitrogen Dioxide (NO_2) and Nitrous Oxide (N_2O).
PAH	Polycyclic Aromatic Hydrocarbons (PAHs) are intermediated products which may be formed as a result of PM formation. PAHs are hazardous air pollutants such as benzo(a)pyrene, anthracene, benzaldehyde, chrysene, ethylbenzene and others.
PM_{10}	Coarse particulate matter, including all particles that have an aerodynamic diameter that is ≤10 micrometres.
$PM_{2.5}$	Fine particulate matter, including all particles that have an aerodynamic diameter that is ≤2.5 micrometres.

QualiCert	'Common quality certification and accreditation for installers of small-scale renewable energy (RE) systems' (QualiCert) was an EU project that reviewed the quality certification and accreditation schemes in place for small scale RE appliance installers in countries throughout the EU.
Registered Gas Installers Register	An Irish scheme put in place so as to ensure the safe installation of gas appliances in Ireland.
Renewable Installers Register	A SEAI implemented register which identifies installers in Ireland who are suitably qualified to carry out the installation of renewable energy technologies.
RHI	A Renewable Heat Incentive (RHI) is a system which encourages the generation of heat from renewable technologies by providing a fixed payment to the owners of such technologies.
SOx	Oxides of Sulphur (SOx) are emissions which may include Sulphur Dioxide (SO_2) and Sulphur Trioxide (SO_3).
Thermal Input	The design rating of an appliance, based on the amount of energy inputted.
Thermal Output	The realised energy (heat) that is produced from an appliance.
Triple E Products Register	The Triple E (Excellence in Energy Efficiency) Products Register is an initiative introduced by the SEAI which aims to gives recognition to renewable energy products within Ireland that are 'best in class' in terms of energy efficiency.
WFQA	The Wood Fuel Quality Assurance Scheme (WFQA) is an Irish scheme that aims to ensure consumer confidence in the purchase of wood fuels throughout Ireland. It does so through the application of the fuel requirements outlined in EN ISO 17225, parts 1-5.

1 INTRODUCTION

The Irish Bioenergy Association (IrBEA) retained Fehily Timoney & Company (FT) to undertake a study to assess the potential impacts, in terms of air quality, of an increase in biomass combustion in Ireland, along with the mitigation measures which may be put in place to limit these impacts. This study, which is funded by the Sustainable Energy Authority of Ireland (SEAI) RD&D programme, is titled the 'Biomass Combustion Emissions Study' and is being overseen by a Steering Committee selected by IrBEA, made up of policy makers, appliance manufacturers, consultants, fuel suppliers and other interested parties.

The requirement for this study is driven in no small part by the intended development of a renewable heat incentive (RHI) in Ireland, which is expected to be the catalyst for increased community, commercial and industrial scale biomass development and utilisation in this country. In addition, a general increase in residential wood fuel consumption is being reported nationally. In such a situation, positive impacts will result to the country in terms of increased renewable energy generation and contribution to the achievement of renewable heat targets, as well as the economic benefits resulting from increased demand for indigenous wood fuel products and related services.

However, a potential negative impact may result from increased biomass utilisation, in the form of increased pollutant emissions, particularly particulate matter (PM) and oxides of nitrogen (NOx). Emission of these pollutants is an issue when it comes to biomass combustion (as well as combustion of other fuels), with the potential for impacts on air quality (and hence human health) resulting from an increased, wide-scale, uncontrolled uptake of biomass. There is an evident need to ensure that these impacts are mitigated against.

The recent Residential Solid Fuel and Air Pollution Study[1], published by the North South Ministerial Council (NSMC) in March 2016, identified some trends and issues in relation to biomass. It is identified that, between 2010 and 2013, biomass combustion contributed c. 10% of PM emissions across Ireland in each of those years, representing an increase from c. 5% in 2000. Almost all of these emissions were classified as $PM_{2.5}$.

The potential negative air quality impacts arising from increased biomass utilisation may result in stresses between the national policy objectives of clean air versus renewable energy generation and climate change policy. In this context, this study aims:

- to provide a technical overview of the generation of emissions from biomass combustion and the factors that influence the extent and magnitude of these
- to examine mitigation measures which may be adopted in terms of biomass combustion emissions to limit the impacts of these emissions
- to identify for policy-makers some of the key factors to be considered in the development of appropriate policy measures that effectively balance the requirements to maintain a high level of national air quality while ensuring the promotion and uptake of high quality biomass fuels, in order to realise it's economic, sustainability, energy security and climate change benefits
- to make recommendations for specific policy measures and/or to identify specific actions to be undertaken or areas where further investigation or consideration is required, with the aim of satisfying the required balance identified

The technical overview of biomass combustion emissions is provided in a standalone report in Appendix 1 to this main Project Report. This report addresses the technical aspects of biomass emission under the headings of:

- relevant legislation, guidelines & standards
- biomass utilisation support scheme
- biomass combustion process
- recognition of quality biomass combustion appliances, servicers and installers
- biomass as a low carbon fuel
- emission from biomass combustion
- factors influencing emissions from biomass combustion

[1] Abbott et al. (2015) *Residential Solid Fuel and Air Pollution Study*. North South Ministerial Council (NSMC)

The following sections of this report identify the factors that can influence biomass combustion emissions and how they interact with the framework of current legislation, guidance and standards, existing schemes and how improvements can be made to the factors and issues that positively influence biomass combustion emissions. In addition, a number of recommendations are identified in Section 6 of this report.

Note:

It should be noted that, due to budgetary limitations and timeline restrictions, the scope of this study is limited to an overview assessment of the relevant factors related to biomass combustion and emissions and is not intended as the definitive, detailed position for each of these factors. For the most part, the study relates to community, commercial and industrial scale biomass development and how this development might relate to the proposed RHI. However, domestic scale biomass development has also been considered and this has been reflected in the relevant sections of this report and the Technical Literature Review Report. Recommendations outlined herein can, where applicable, be taken as 'starting points' and can be revised or reviewed based on further assessment, input and consideration.

2 OVERVIEW – FOCUS AREAS FOR EMISSIONS CONTROL

The Technical Literature Review Report, included in Appendix 1, identified a number of areas which have the potential to influence biomass emissions, namely:

- fuel type & quality
- appliance design, type, operation and abatement
- appliance installation

It is under these three headings that the potential for influencing biomass combustion emissions is discussed in the following sections of this report. A brief overview of the type of emissions generated from biomass combustion, which summarises the information presented in Appendix 1, is presented in this section, as well as reference to the type and nature of biomass combustion appliances.

2.1 Emissions from Biomass combustion

The principal emissions which may be released from biomass combustion are:

- Particulate Matter (PM) including; salts, soot, condensable organic compounds (COCs), volatile organic compounds (VOCs) & intermediate products – e.g. tars and polycyclic aromatic hydrocarbons (PAHs)
- Oxides of Nitrogen (NOx) including; nitric oxide (NO), nitrogen dioxide (NO_2) & nitrous oxide (N_2O)
- Oxides of Carbon (COx) including; carbon monoxide (CO)& carbon dioxide (CO_2)
- Oxides of Sulphur (SOx) including; sulphur dioxide (SO_2) & sulphur trioxide (SO_3)
- Dioxins/Furans

Of these, PM (and its intermediate products) and NOx are considered to be the most relevant emissions when considering biomass combustion.

2.1.1 Particulate Matter (PM)

PM is considered to be one of the most significant pollutants produced from biomass combustion. PM measured in the ambient air is a combination of primary aerosols, directly emitted from both natural and anthropogenic sources, and secondary aerosols, formed in the atmosphere from the conversion of other gaseous compounds such as SO_2 and ammonia (NH_3).

The size of PM varies, with two categories commonly identified when analysing the impacts of PM on human health and the environment; PM_{10} and $PM_{2.5}$. PM_{10}, or coarse particles, includes all particles that have an aerodynamic diameter that is ≤10 micrometres, while $PM_{2.5}$, or fine particles, includes all particles that have an aerodynamic diameter that is ≤2.5 micrometres. Estimates indicate that >90% of PM emissions from the efficient combustion of wood fuel fall within the PM_{10} category, while >75% fall within the $PM_{2.5}$ category. Along with the increasing levels of interest in $PM_{2.5}$ in recent years, there is also an increasing focus on the portion of PM known as 'black carbon' which are the light absorbing fine soot like particles that are released from the incomplete combustion of fossil fuels. Black carbon is present in the ultrafine fraction of PM ($PM_{0.1}$) and is known to be a significant component of diesel soot, a substance that the WHO has identified as being carcinogenic.

2.1.2 Oxides of Nitrogen (NOx)

Alongside PM, oxides of nitrogen (NOx) are the pollutants that are of highest concern when considering emissions from biomass combustion. NOx emissions relevant to biomass combustion include nitric oxide (NO), nitrogen dioxide (NO_2) and nitrous oxide (N_2O). N_2O is generally less commonly produced from the combustion process than NO or NO_2.

NO_2 is an irritant in the lungs that is known to have direct negative respiratory impacts on human health. NOx emissions can have significant adverse impacts on the environment. N_2O, while not commonly produced from biomass combustion, is a greenhouse gas which contributes directly to the impacts of climate change. The various gaseous forms of NOx can react with SO_2 and other substances to form acid rain which can be damaging to vegetation and buildings, as well as contributing directly to eutrophication.

2.2 Biomass Combustion Appliances

There are a variety of biomass combustion appliances that can be utilised, depending on the scale of application and the fuel type to be combusted, including:

- Fireplaces (open, closed or partly closed)
- Wood pellet and log stoves
- Wood pellet and log boilers
- Wood chip boilers
- Stoker burner boilers
- Underfed stoker boiler } typically automatically fed
- Moving grate boiler

Further details and references to others sources of information in relation to biomass combustion appliances are presented in the Technical Literature Review Report provided in Appendix 1.

For this report, appliances have been referenced as being of "domestic" scale and of "community, commercial and industrial" scale, where domestic scale appliances are typically fireplaces, wood pellet and log stoves or boilers, and appliances utilised at the community (e.g. municipal swimming pool), commercial (e.g. hotel) and industrial (e.g. large scale heat and/or power generation) scale typically being wood chip or pellet boilers and automatically fed boilers of stoker burner, underfed stoker burner or moving grate type.

Biomass combustions appliances can be further categorised as operating within a regulatory approvals regime i.e. a licencing or permitting regime, or not. An appliance may be installed at a facility that operates within the Industrial Emissions (IE), Integrated Pollution Control (IPC) or waste licencing regimes of the Environmental Protection Agency (EPA) or within the waste permitting or (potentially) the air emissions licencing regimes of the local authorities.

It should be noted that the Medium Combustion Plant Directive (Directive 2015/2193) which is yet to be transposed in national legislation, is likely to result in the introduction of a further licencing or permitting regime, under which biomass appliances of between 1 MW and 50 MW will be regulated.

Appliances operating within a licencing or permitting regime have air emission limit values applied as part of the licence/permit requirements and often require either continuous monitoring of emissions or adequate spot check tests to ensure compliance with their licence/permit. Appliances that do not operate within such approval regimes generally do not have such requirements. Therefore, the fuelling of an appliance with an appropriate quality fuel and the correct installation of an appliance is of significant importance for appliances that do not operate within a licence/permit regime, when considering emissions control. These issues are discussed further in the remainder of this report.

3 FUEL TYPE & QUALITY

3.1 Potential to Influence Emissions

Both the type and the quality of a fuel that is used for biomass combustion can have potentially significant impacts on the levels of emissions that are produced from a biomass combustion appliance.

Emission levels vary according to the specific type of wood based fuel used for combustion, with wood pellets typically producing lower levels of PM and NOx than wood chips and wood logs.

While emission levels do vary according to the type of fuel used for combustion, a more suitable focus area in which to influence levels of emissions, is fuel quality.

The quality of a fuel that is used for biomass combustion has a direct influence on the levels of emissions that may be produced. Various fuel properties may impact on emissions, but it is often the moisture content, and by association, the calorific value, of a fuel which have the greatest level of influence. This is particularly the case for wood based fuels. Biomass appliances are generally designed on the basis of fuel moisture content, so the appropriate matching of fuel to appliance type is an important consideration also.

The use of an appropriate quality fuel for biomass combustion is vital in ensuring the control of emissions and potential resultant impacts on air quality, particularly for biomass appliances with limited or no abatement and/or monitoring of emissions. As such, the existence of an approved fuel quality certification scheme which is effective at ensuring the appropriate quality of a high proportion of the biomass fuel feedstock in Ireland, is of considerable importance and value.

Emission control in combustion plant can be controlled by many methods with all appliances requiring fuel of predictable quality, with smaller appliances being more sensitive. It is of particular importance that smaller appliances receive appropriate fuel for their design to ensure correct combustion and low emissions. Larger combustion plants, of large commercial and industrial scale, can accommodate fuels of greater variation in quality terms and also tend to have better inbuilt stack monitoring and abatement control. Therefore, the focus of ongoing control in smaller biomass appliances is best achieved through input fuel quality and plant servicing, maintenance etc., while control in larger plants is generally achieved through compliance with air emissions licence/permit requirements by methods such as combustion emissions monitoring, active combustion control and the use of abatement technologies.

An overview of a current approved fuel quality certification scheme in Ireland and how such a scheme, or a similar scheme, may be supported so as to ensure that it has the desired effect in the use of high quality fuels and the subsequent impact on emissions, is presented in the following section.

3.2 Fuel Quality Certification Schemes

Approved fuel quality certification schemes are currently in place both at the national level in Ireland and at the wider European level. The use of standardised fuels is an important emission control method for combustion appliances not operating within an approvals regime.

3.2.1 Current Situation

The Wood Fuel Quality Assurance (WFQA) Scheme is an Irish scheme that comprises wood fuel suppliers who provide high quality wood fuel in Ireland. Of central importance in any approved fuel quality assurance scheme is that all fuels covered under the scheme meet appropriate quality standards. The WFQA scheme ensures that the quality requirements outlined in parts 1 to 5 (relating to wood based fuel) of the quality standard EN ISO 17225 are met for all wood fuel provided by suppliers that are approved by the scheme.

Further to this, all wood fuel covered under the scheme is required to be accurately described and to be produced in compliance with EU Timber Regulations. Certified members of the WFQA are subject to external audits of the wood fuel that they supply to ensure that it meets the requirements of the scheme. Currently, there are 16 wood fuel suppliers certified by the WFQA in Ireland, with membership on a voluntary basis at this moment in time.

The further development of the WFQA scheme in an attempt to increase the share of the market that it currently holds for wood fuel products in Ireland would have a significant positive effect in increasing the use of high quality fuels in Ireland, and subsequently mitigating potential impacts from emissions produced from biomass combustion.

In addition to the WFQA scheme in Ireland, an approved fuel quality certification scheme is also currently in place at the European level which relates to part 2 of the EN ISO 17225 standard (Solid biofuels: fuel specifications and classes). This scheme is managed by the European Pellet Council and is called EN*plus*[2].

The scheme relates specifically to the quality of wood pellets and was put in place to ensure that consumers across Europe could easily identify wood pellets which meet the quality requirements of EN ISO 17225-2 and fall within the EN*plus* A1 (highest quality), EN*plus* A2 or EN*plus* B1 quality class.

The requirements of the EN*plus* quality classes are often stricter than those presented in EN ISO 17225-2. All wood pellet fuel that is certified to EN*plus* standards is specifically labelled as such. At present, there are just two certified producers of EN*plus* wood pellets on the island of Ireland.

The WFQA incorporates the EN*plus* scheme into its functioning. Prior to any wood pellets being approved by the WFQA, they must first meet the standards set by the EN*plus* scheme.

3.2.2 Interaction with the Proposed RHI

The Renewable Heat Incentive (RHI) which is proposed for implementation in Ireland in the near future provides a significant opportunity for increasing the uptake of the WFQA or similar scheme, which is currently offered on a voluntary basis. It may be the case that the WFQA scheme could require amendment to its current guise if incorporated into any proposed RHI, which could be readily facilitated.

The UK RHI provides a good example of how wood fuel quality is incorporated into such a scheme. In order to participate in the UK RHI, individuals must procure wood based fuel that meets certain sustainability criteria, in terms of lifecycle greenhouse gas emission value and land use criteria. A Biomass Suppliers List (BSL)[3] has been developed in the UK through which RHI participants can locate fuel suppliers that have demonstrated the sustainability of their fuel as per the identified requirements. While primarily a fuel sustainability scheme, the BSL supports the use of high quality wood fuel produced in accordance with the UK Woodsure scheme (equivalent of the WFQA) and EN*plus*.

While a technical review consultation of the proposed RHI in Ireland was launched by the Irish government in July 2015, the proposed RHI has yet to be implemented. As part of its development, it would be beneficial to link qualification for the proposed RHI with a requirement to purchase wood fuel from a supplier certified by the WFQA, or similar scheme.

The linking of the WFQA (or similar scheme) with the proposed RHI would likely result in a significant increase in the volume of wood fuel consumed in Ireland that is WFQA certified through the scheme, as the biomass market develops, driven by the RHI. Therefore, while an RHI may result in increased biomass consumption, resulting in increased biomass related emissions overall, the certification of wood fuel through the WFQA (or similar) scheme would ensure the minimisation of emission related impacts from this increased biomass consumption, to the extent this can be influenced by appropriate fuel quality.

It is understood that the proposed RHI in Ireland is likely to initially cover primarily the installation of community, commercial and industrial scale appliances, rather than the installation of domestic scale appliances. It is considered therefore that mandating of a wood fuel quality assurance scheme to the RHI will not initially have a significant impact on increasing the uptake of the WFQA scheme among producers who are currently producing wood fuel for the residential market and who are not currently members of a wood fuel quality assurance scheme.

[2] http://www.enplus-pellets.eu/
[3] http://biomass-suppliers-list.service.gov.uk/

3.2.3 Other options for increasing quality assured fuel uptake

In an effort to increase the quantity of high quality wood fuel that is produced and consumed by domestic scale appliances in Ireland, along with the increased quantity that would likely be purchased for community, commercial and industrial scale appliances through the linkage of the proposed RHI with the WFQA scheme, it would be of significant benefit to consider placing the WFQA scheme, in its current or revised guise, or a similar quality assurance scheme, on a mandatory footing for installations not covered under an air emissions licence/permit.

Direct placement of a wood fuel quality assurance scheme on a statutory footing through legislation would be the most directly effective means of increasing WFQA uptake, such that wood fuels produced in Ireland must be certified through the scheme in order to be placed on the market. This would require the drafting, review and making of appropriate legislation to facilitate this, as well as the identification of support and funding for the increased administration of the scheme. In addition, enforcement of any legislation developed would be required, albeit with potential scope for incorporation of same within current enforcement activities undertaken by local authorities for solid fuels, for example.

As an alternative to adopting a legislative route, uptake of wood fuel quality assurance scheme(s) should be promoted at every available opportunity by all relevant government departments and agencies. For example, the National Clean Air Strategy which is currently in development, could act as a useful driver for WFQA or similar scheme uptake, through the development of policies that promote or stipulate the requirement for WFQA certified fuel use.

Government policy in relation to 'green' public procurement, outlined in *Green Procurement: Guidance for the Public Sector,* produced by the EPA in 2014, presents no reference to procurement of wood fuels and represents a missed opportunity to require the WFQA scheme in instances of public sector wood fuel purchase. This is exemplified by an instance, at the time of writing of this report (September 2016), of a local authority tendering for the procurement of woodchip and wood pellet fuels for 2 no. local authority buildings without any reference to quality, other than a maximum moisture content, in the case of the woodchip supply and reference to EN17225, but not in the context of the WFQA, or any other quality assurance scheme, in the case of wood pellet supply.

There is considerable scope for the undertaking of a specific body of work related to WFQA scheme promotion, promoted by relevant government agencies, to increase the profile of the WFQA among wood fuel retailers and end users, should a legislative route not be adopted. This would require administrative support and funding and could be targeted at, *inter alia*, internal government agencies, local authorities, forecourt retailers, garden centre retailers and other outlets known to place large volumes of wood fuel on the market. However, such a body of work would generate its maximum impact if carried out in the context of a legislative instrument or a clear policy environment supporting WFQA scheme uptake.

When considering the regulation of wood fuel producers and suppliers, it is important to take into account both the 'traded' and the 'non-traded' (not officially traded) sectors of wood fuel production and supply in Ireland.

The traded sector may be identified as the sector in which wood fuel is traded in the commercial arena (i.e. by commercial entities in direct sales to residential and non-residential customers), whereas the non-traded sector may be identified as the sector in which wood fuel is traded at a smaller scale in a more private arena (i.e. by individuals – sources of wood may include fallen trees, etc.).

While any legislative or policy measures introduced may seek to address both the traded and the non-traded sectors, it is likely that oversight of the non-traded sector would be significantly more difficult to enforce and this is likely to remain a challenge for the sector in the coming years.

However, by addressing from the outset the quality of wood fuels produced by large scale wood fuel suppliers and retailers placing significant quantities of wood fuel on the market, such that coverage of scheme uptake is maximised, any subsequent improvement in quality wood fuel use in Ireland, will ultimately contribute to the maintaining of high level of air quality.

4 APPLIANCE TYPE, DESIGN, OPERATION & ABATEMENT

4.1 Potential to Influence Emissions

Section 10 of the Technical Literature Review included in Appendix 1 presents detail on the means by which the type, design and operation of biomass combustion appliances and the application of abatement technologies to these appliances, have the potential to influence emissions generation across the range of appliances commonly utilised in domestic, community, commercial and industrial applications.

All of these factors come together to ensure, in most cases, that emissions for a range of parameters come within specific emission limit values (ELVs) applied by various legislative instruments and standards, relevant to the size of the appliance, such that the ELVs act as a 'first step' in the minimisation of potential impacts on air quality. Section 5 following identifies further influencers on air quality in terms of biomass appliance installation, with flue design identified as an important factor.

The application of appropriate ELVs can vary depending on the nature and scale of a biomass appliance, and the regime under which an appliance may be installed e.g. at an EPA licenced facility.

ELVs may be applied to biomass installations through the application of European legislative requirements, typically transposed through relevant national legislation, e.g. EU Directive 2010/75/EU on industrial emissions or EU Directive 2015/2193 on medium combustion plants (yet to be transposed in national legislation), or through the manufacture of appliances to operate in accordance with relevant standards, e.g. EN 303-5:2012. A number of European countries have adopted their own national emission limit standards, implemented through their national legislation.

In Ireland, ELVs are applied to biomass installations if they come within the regulatory regime of the EPA, i.e. if the biomass installation is part of a facility operating under an industrial emissions (IE), an integrated pollution control (IPC) or a waste licence, or would require an IE or IPC licence on its own. An installation may come under a local authority regime if it forms part of a facility requiring a waste facility permit or (potentially) an air emissions licence. In these instances, there is a legislative requirement for the appliance to operate within the relevant ELVs applied.

ELVs are also applicable where appliances are designed to operate in accordance with relevant standards, such as EN 303-5:2012. However, in Ireland, these standards are voluntary and do not have any legislative footing.

The current situation relating to ELVs applied to biomass appliances in Ireland is summarised as follows:

- ELVs for large scale plants (i.e. >50 MW thermal input) are applied by the Directive 2010/75/EU and transposed through S.I. 137 and 138 of 2013, and thus have a legislative footing
- ELVs for medium scale plants (i.e. ≥1 MW to <50 MW thermal input) will be applied by the transposition of the Directive 2015/2193/EC ('the MCP Directive'), and will have legislative footing when transposed (required by December 2017) – it is likely that the majority of future commercial and industrial scale biomass development would fall within this bracket, dependent on the structure of the proposed RHI (note existing plant in this scale may have ELVs applied through licence conditions, with ELVs being determine on a case by case basis)
- The voluntary standard EN 303-5:2012 sets ELVs for appliances up to 500 kW (rated by heat output)
- The Ecodesign Directive 2009/125/EC, through Commission Regulations 2015/1185 & 1189 (both transposed into national legislation) set ELVs for solid fuel local space heaters ≤50 kW and solid fuel boilers ≤500 kW respectively – however, these do not come into force until January 2022 and January 2020 respectively

Biomass appliances of ≥1 MW have (or will have upon transposition of the Directive 2015/2193) legislative ELVs applied to their operation. Appliances ≤500 kW may be currently designed in accordance with EN 303-5:2012 and thus will operate within the remit of the ELVs required by that standard. From 2020 and 2022, local space heaters and solid fuel boilers up to 500 kW will be required to comply with the ecodesign requirements of Directive 2009/125/EC.

Therefore:

- A 'gap' currently exists between the approximate 500 kW and 1 MW range ([4]see note) in terms of there being no legislative instrument or design standard in place that sets ELVs for biomass appliances in this range – it is understood that this gap is temporary until such time as further relevant standards are developed at European level to cover this range

- Until 2020, there is no legislative instrument in place to set ELVs for solid fuel boilers ≤500 kW, nor any similar instrument in place until 2022 for local space heaters ≤ 50 kW, other than EN 303-5:2012, which is currently voluntary

4.2 Domestic Scale Appliances

4.2.1 Current situation

The vast majority of domestic scale biomass appliances, typically stoves and small scale boilers, operate within the ≤50 kW range, which is currently 'covered' within EN 303-5:2012, and which will come under the remit of Commission Regulations 2015/1185 & 1189 when these are in force in January 2022 and January 2020 respectively.

Commission Regulation 2015/1185 is of more direct relevance in a domestic context in relation to local space heaters (open and closed face heaters), yet formal ELVs will not apply to these appliances until January 2022, approximately 5 years from the time of writing of this report.

The North-South Ministerial Council Residential Solid Fuel and Air Pollution Study[5] references an International Institute for Applied Systems Analysis (IIASA) study that utilises the 'Greenhouse gas Air pollution Interactions and Synergies' (GAINS) model that assessed the impact of the application of the Ecodesign Directive requirements (in terms of emission limit values for the appliances identified) to the domestic sector projected future emissions of PM_{10} and $PM_{2.5}$, showing a demonstrable reduction in future PM emissions in Ireland (and the UK).

Thus, the Ecodesign Directive requirements are the focus of the approach to be taken, at a European level, to biomass emissions reduction at the domestic scale across Europe. The delayed benefit as a result of the 2022 implementation of the relevant regulations is acknowledged by the Commission but is identified as being required until agreement is reached in relation to the harmonisation of testing methodologies for PM, given the variation that has been observed across the EU[6] - three test methods are currently allowed under the relevant regulations and the Commission is currently developing a harmonised standard that can be applied to PM emissions testing. In addition, there are technological challenges for manufacturers in developing fully compliant appliances that require an appropriate time period to be worked out.

In the interim, until such time as the implementation of Commission Regulation 2015/1185 in particular, only the ELVs that are specified in EN 303-5:2012 are 'available' as a means of influencing the emissions regime in the domestic sector in Ireland.

It is the Sustainable Energy Authority of Ireland (SEAI) that will have the responsibility for surveillance and enforcement of these regulations, as the market surveillance authority in relation to ecodesign and energy labelling in Ireland, while The Department of Jobs, Enterprise & Innovation (DJEI) has ultimate responsibility for the implementation of the Ecodesign Directive.

[4] Note: Directives 2010/75/EU & 2015/2193/EC are categorised per the 'total rated thermal input' which refers to the design rating of the plants in question, based on the amount of energy inputted, while Directive 2009/125/EC refers to 'total rated thermal output', which relates to the realised energy (heat) produced. This difference in classification means that the operating ranges identified in the different Directives are not directly comparable, and therefore the 'gap' identified is not clearly between 500 kW and 1 MW, but for the purposes of this report, it is taken as an approximation.

[5] http://www.housing.gov.ie/sites/default/files/attachments/northsouth_residential_solid_fuel_and_air_pollution_study_1.pdf

[6] http://www.cefacd.eu/news - 'Ecodesign regulations & standardization request' presentation

4.2.2 Options to influence domestic scale ELVs

The question therefore arises as to whether it is worthwhile or of benefit to take measures to attempt to influence domestic scale biomass emissions in the intervening c. 5 year period until Regulation 2015/1185 is enforceable.

The potential benefit is obvious, in terms of the positive air quality impacts that may be realised from a 'formalising' of ELVs for domestic scale biomass appliances sooner rather than later. However, dependent on the measures that could be taken, there is potential for generating an unnecessary administrative burden and added costs on appliance manufacturers.

There are a number of initiatives that could be undertaken to influence future domestic scale biomass emissions without embarking on a legislative or significant administrative undertaking, such as:

- Development of an 'early engagement' programme with relevant appliance manufacturers by DJEI and/or SEAI, at an appropriate duration in advance of the relevant regulation enforcement dates (e.g. 24-36 months), such that the measures being taken by manufacturers[7] to ensure that their products will be compliant by the enforcement date, are identified well in advance. This programme could take the form of an industry discussion forum with quarterly or biannual meetings or could be carried out on a one to one basis

- Creation of specific policy measures through the development of the National Clean Air Strategy that promotes, at the very least, the application of the EN 303-5:2012 standard for biomass appliances

- Given the role that appliance installation can play in emissions; introduction of flexibility in the Building Regulations 2014 so as to ensure that the recommendations of manufacturers and installers of domestic sized biomass appliances can be implemented

4.3 Community, Commercial & Industrial Sized Appliances

In terms of influencing emissions from the scale of biomass appliances that may be utilised in the community, commercial and industrial sectors, i.e. biomass appliances of 50 kW to ≥50 MW, the presence of existing and imminent legislation with applicable ELVs, as identified, ensures ELVs will have a legal footing for appliances ≥1 MW.

It is as yet unclear as to when the transposition of the MCP Directive to Irish legislation will exactly occur, who will have responsibility for the application of these ELVs, i.e. the EPA or local authority, and how it will be implemented, e.g. through a permitting or licencing regime. In any event, it's transposition will be welcomed as a definitive means of influencing emissions for appliances at this scale.

The proposed RHI also provides a significant opportunity to influence emissions from biomass appliances at this scale.

4.3.1 Interaction with Proposed RHI

As required by the UK RHI, the implementation of an emissions certification system for those larger scale biomass combustion appliances which are not subject to air emissions licencing/permitting in Ireland is a step which may be taken to ensure that appliances of the scale likely to be relevant in the proposed RHI, are adequately designed, operated and incorporate sufficient abatement technologies, if necessary. This in turn helps maintain control of pollutant emissions released from these appliances.

In considering the implementation of an emissions certificate system for biomass combustion appliances as part of an Irish RHI, thought must be given to the extent to which the certification held by appliance manufacturers, which may be compliant with the UK RHI, can or should be incorporated or adopted into any Irish RHI.

[7] Where 'manufacturers' also mean authorised representatives or importers, as per S.I. 454 of 2013.

The UK has embedded an emissions certificate system as part of their RHI, whereby emissions certificates for biomass combustion appliances are required to be submitted upon application to both the domestic and the non-domestic RHI. These emissions certificates must be approved by Ofgem prior to acceptance onto the RHI scheme. Prior to appliances being installed, appliance manufacturers must ensure that they meet the following emission limits set by the UK RHI:

- 30 g/GJ net thermal input for PM
- 150 g/GJ net thermal input for NOx

The emissions certificates required for submittal to Ofgem are required to be completed by an accredited testing laboratory and need to include the following information:

- Details of the testing laboratory and confirmation of accreditation to ISO 17025
- Detail of the appliance, including installation capacity, nature of feed and draught
- Fuel type used during the testing and the range of fuels that can be used in compliance with the relevant limit values (as derived from the testing)
- Maximum allowable moisture content of the fuels that can be used
- Details of testing and relevant test standards
- Measured emission of PM and NOx

As the emissions certificate system has now been in place in the UK for a number of years, a dedicated website[8], which is administered by the Heating Equipment Testing and Approval Scheme (HETAS), a UK based organisation operating within the biomass and solid fuel heating sector, has now been developed which lists all appliances provided with RHI emissions certificates that have been approved by Ofgem.

In considering an emissions certificate system for an Irish RHI, options for implementation of such a system may include:

1. 'Straight' adoption of the ELVs and parameters stipulated by the UK RHI and acceptance of emission certificates that appliance manufacturers currently have for the UK RHI

2. Development of different ELVs (and potentially parameters) for an Irish RHI, requiring the undertaking of laboratory testing as evidence of an appliances ability to meet these values

A third option may be removed from the emission certificate based system and could be based around emissions monitoring versus identified limit values. While this is likely to be a requirement of any emissions permit or licence that may be applicable to a biomass installation, it could also facilitate the 'grandfathering'[9] of any currently planned, under construction or existing biomass installation through the demonstration of compliance with the relevant ELVs through an emissions monitoring programme.

In terms of the most expedient means of development of an emissions certificate based system, it is considered that adoption of the UK system would result in the least administrative burden for the Irish RHI administrators, as well as ensuring that appliance manufacturers do not have to undertake a further round of laboratory testing to potentially different parameters and limit values, which would have the potential to impact the timeline of RHI uptake nationally. This could take the form of submission of proof by the appliance manufacturer that their appliance is approved by Ofgem in the UK, or there could be direct interaction with Ofgem by the Irish RHI administration team

Were this approach to be taken, it is considered however, that it should be supported by a separate body of work to assess or confirm the appropriateness of the relevant ELVs in an Irish air quality context. While it is assumed that this will be the case, verification of same would be beneficial.

A further point of consideration in relation to the proposed RHI relates to the potential for impact on emissions resulting from the 'banding' of appliances, such that different financial incentives apply to different sized biomass installations, if this approach is taken within the proposed Irish RHI.

[8] http://rhieclist.org.uk/
[9] 'Grandfathering' means that any eligible renewable installations (incl. biomass), completed during the period from the date of the announcement to the date that the proposed RHI becomes operational, will benefit from the new support as if the installation had been completed on the date the relevant scheme launches

There is potential here for biomass appliances to be sized to 'fit' the banding rather than the actual energy demand, resulting in appliances which may not operate at their optimal performance or which are shut down/started up more frequently than necessary. Sub-optimal operation of frequent shut down/start up can result in increased emissions generation and so this issue should be contemplated closely as part of RHI emissions certificate consideration.

4.3.2 MCP Directive ELVs compared with the UK RHI Values

In addition, the means by which the MCP Directive, when transposed, will 'tally' with the RHI emission certificate values, should the UK values be adopted, should be considered. The UK RHI presents ELVs for PM and NOx in units of g/GJ, whereas the MCP Directive presents ELVs in mg/Nm^3 (calculated at a standardised O_2 content of 6% for solid fuels). The conversion between g/GJ and mg/Nm^3 is based on the emission concentration at a specified O_2 content[10]. On that basis, the MCP Directive ELVs compared with the UK RHI ELVs are shown in the following table:

Table 4-1: MCP Directive ELVs compared with UK RHI ELVs

Parameter	UK RHI g/GJ	UK RHI as mg/Nm^3 @ 6% O_2	MCP Directive ELVs
PM	30	85 mg/Nm^3	20 – 50[1] mg/Nm^3 (expressed as 'dust')
NOx	150	423 mg/Nm^3	300 – 650[2] mg/Nm^3

[1] Existing MCPs ≥1 & ≤20 MW: 50 mg/Nm^3
Existing MCPs >20 & <50 MW: 30 mg/Nm^3
New MCPs ≥1 & ≤5 MW: 50 mg/Nm^3
New MCPs >5 & ≤20 MW: 30 mg/Nm^3
New MCPs >20 & <50 MW: 20 mg/Nm^3

[2] Existing MCPs ≥1 & <50 MW: 650 mg/Nm^3
New MCPs ≥1 & ≤5 MW: 500 mg/Nm^3
New MCPs >5 & <50 MW: 300 mg/Nm^3

Therefore, when compared in common units, the ELVs of the MCP Directive are seen to be more stringent in terms of PM (or dust). For NOx, the ELVs are more stringent for new MCPs with a high total rated thermal input, but less stringent for new MCPs with a low total rated thermal input and for all existing MCPs.

Whether or how the two regimes can 'co-exist', in terms of potentially being applicable to the same appliances in the same installation, should be considered.

It may simply be a case of adopting the UK RHI ELVs as previously discussed, in terms of application to the RHI, with a separate requirement for the biomass installation to comply with the requirements of the MCP Directive, in whatever means it is transposed, e.g. through licence or permit conditions.

4.3.3 500kW to 1 MW 'gap'

The application of an emission certificate system to the proposed RHI could, dependant on the structure of the RHI in terms of applicability to biomass appliance thermal capacity ranges, play a beneficial role in 'filling the gap' that exists for appliances between ~ 500 kW and 1 MW, as previously identified, in terms of applying ELVs to this range of appliances.

4.3.4 Triple E Register

The Triple E (Excellence in Energy Efficiency) Products Register is an initiative introduced by the SEAI which gives recognition to products within Ireland that are 'best in class' in terms of energy efficiency. Under the European Communities (Energy Efficient Public Procurement) Regulations 2011 (S.I. 151 of 2011), it is a requirement that public bodies must purchase products that are specifically listed on the register.

[10] AEA (2012) – *Conversion of biomass boiler emission concentration data for comparison with Renewable Heat Incentive emission criteria*. Available from: https://uk-air.defra.gov.uk/assets/documents/reports/cat07/1205310837_Conversion_of_biomass_boiler_emission_data_rep_Issue1.pdf

In this regard, the emission limits of the Triple E register, which refer to dust emissions, should also be reviewed in the coming years to ensure that the Register reflects the requirements of the MCP Directive and/or the Commission Regulation 1189 in regard to emission limit values.

This ties in with the previous point made in relation to public procurement in Section 3.2.3, such that public bodies that are required to procure products from the Triple E Register will thus be acquiring compliant products in terms of ELVs.

5 APPLIANCE INSTALLATION

5.1 Potential to Influence Emissions

In addition to its operation within relevant ELVs, as discussed in Section 4, the appropriate installation of a biomass appliance is important in ensuring that elevated levels of emissions are not encountered at ground level at nearby locations to the appliance installation, such that no or negligible impacts on air quality result.

When considering the installation of a biomass appliance, the siting of the appliance in relation to its surroundings and the design of the appliance flue needs to be taken into account to ensure that high ground level emissions are avoided. Ideally, the installation of a biomass appliance should consider:

- the flue design
- the flue height relative to the appliance
- the flue height relative to nearby buildings
- the proximity of nearby buildings
- the topography of the locality surrounding the appliance &
- the existing background air quality

Biomass appliance installation is a focus area for emissions control which can be influenced by an increased level of training, education and awareness for all players involved in design and installation, as well as those determining and assessing the location of a biomass appliance installation.

Options may include considering the implementation of a mandatory certified installer/competent person scheme and an emissions calculator assessment tool, as well as the delivery of targeted training for relevant decision makers, e.g. local authorities.

It is also important to consider the role of commissioning (and subsequent maintenance) as part of the installation process, such that the term "installation" should be taken as also referring to the commissioning phase – in some cases, a biomass installation could be installed by one entity and commissioned by another, with potential for incorrect set up of an appliance during commissioning, should the commissioning individual/organisation not be trained or certified in an appropriate manner.

5.2 Certified (Accredited) Installer/Competent Person Scheme

5.2.1 Current Situation

In order to influence emissions from biomass combustion appliances, there is scope for improvement of the means by which appliance installation is overseen in Ireland. Poor appliance installation that does not take into consideration the siting of the appliance in relation to its surrounds and/or the design of the appliance flue, has the potential to lead to significant ground level emissions, particularly for the installation of domestic or small community/commercial/industrial scale appliances, with resultant negative impacts on local air quality.

There is currently no "centrally approved" certified (or accredited) installer/competent person scheme in existence for biomass combustion appliances in Ireland. Such a scheme would be a positive development in ensuring the appropriate installation of appliances throughout Ireland and the subsequent minimisation of emission impacts resulting therefrom.

While no centrally approved certified installer/competent person scheme is currently in place, training is provided for the installation of appliances by recognised providers. Training courses (H003: Dry Appliance Installer Course, H004: Wet Appliance Installer Course, H006: System Chimney Course) that are approved by HETAS are provided by Oriel Flues at the Ardee Enterprise Centre in Ardee, County Louth.

In addition, HETAS approved training courses are provided in Ireland at the Midland Energy Training and Assessment Centre (METAC), based in County Laois. These are specific dry solid fuel and wet solid fuel stove installer courses and are independently certified and verified, as well as being recognised by organisations such as SOLAS, QQI, City & Guilds, UKAS, Bord Gais and OFTEC. METAC also provides solid fuel awareness training for retail and sales staff, which is a one day course developed to raise awareness for retail staff when dealing with customers in choosing the correct solid fuel appliance and to recognise the installation and fuel requirements for this appliance.

The above training courses could act as potential starting points for the implementation of a centrally approved certified installer/competent person scheme in Ireland. When considering the functioning of such a scheme, it would be of benefit that, for any individual/organisation to be certified as a member of the scheme, there is a legislative requirement for them to have completed an appropriate approved biomass appliance installer training course and to provide detail of same through a self-certification process, for example.

5.2.2 Case Studies from Ireland, the UK and Europe

Some certified installer/competent person schemes are already in place in Ireland, the UK and Europe. While not directly relating to biomass, the Registered Gas Installer (RGI)[11] scheme was initiated by the Commission for Energy Regulation (CER) in 2006 so as to ensure the safe installation of gas appliances in Ireland. It is illegal for individuals not registered on this scheme to install gas appliances in Ireland. This scheme could be used as a useful guide in implementing a biomass specific certified installer/competent person scheme. Alternatively, it could be a biomass specific scheme could potentially be incorporated into the RGI scheme in its current form.

The renewable installers register[12] is a further Irish certified installer/competent person scheme currently in place. This is a SEAI developed register which identifies installers in Ireland who are suitably qualified to carry out the installation of renewable energy technologies. In addition to other technologies, small scale biomass boilers and stoves are covered by this register. In order for installers to be included on this register, they must provide the SEAI with proof that they hold qualifications relating to the installation of the appropriate technology. While the SEAI ensures that all individuals listed on the renewable installers register are appropriately qualified, it does not assess the work of the installers included on the register.

In the UK, a number of competent person schemes are currently in existence which allow individuals and organisations to self-certify that the installation work they carry out is in compliance with the Building Regulations. Seven competent person schemes, each accredited by the United Kingdom Accreditation Service (UKAS), are presently identified by the UK Department of Communities and Local Government (DCLG) to cover the installation of solid fuel (including biomass) combustion appliances[13]. Of these schemes, the most specialised in terms of the certification of installers of biomass appliances is commonly considered to be the HETAS competent person scheme. In order for installers to be certified by this scheme, they are required to have completed the appropriate HETAS approved installation training course and to complete refresher training courses a minimum of every five years to ensure that their skills are up to date.

The Microgeneration Certification (MCS) scheme[14] is a separate UK scheme that was introduced by the (now disbanded) Department of Energy & Climate Change) DECC in the UK in 2008 to provide recognition to both high quality microgeneration appliance technologies and high quality microgeneration appliance installers. This scheme covers a range of renewable energy technologies, including biomass. For installers to be MCS certified, they are assessed by one of eight certification bodies according to the quality of both the installation and the commissioning of an appliance. MCS certification is linked to financial incentives that are available for renewable energy use in the UK, with all domestic appliances and all non-domestic appliances below 45 kW in size required to be installed by an MCS approved installer to qualify for the RHI.

[11] http://www.rgii.ie/
[12] http://www.seai.ie/Renewables/Renewable_Installers_Register/
[13] https://www.gov.uk/guidance/competent-person-scheme-current-schemes-and-how-schemes-are-authorised
[14] http://www.microgenerationcertification.org/

A number of additional certified installer/competent person schemes, or similar, are in place in other countries within the EU. The majority of these schemes are not biomass specific and typically relate to a wide range of renewable energy technologies. In an effort to gauge the presence and the functioning of all certified installer/competent person schemes relating to renewable energy within the EU, a project entitled 'QualiCert'[15] was recently carried out at the European level. QualiCert stands for "common quality certification and accreditation for installers of small-scale renewable energy (RE) systems". This project reviewed the quality certification and accreditation schemes in place for small scale RE appliance installers in countries throughout the EU. It did not address the presence of similar schemes for large scale RE appliance installers. Findings of the QualiCert project are presented in the Technical Literature Review Report, included in Appendix 1.

5.2.3 Interaction with the Proposed RHI

The linking of eligibility for the proposed RHI with a requirement to demonstrate that an installation has been installed, commissioned and maintained by an appropriate qualified or certified individual/organisation, is an appropriate recommendation for the development of the RHI scheme.

However, as it is understood that the proposed RHI is likely to be initially focussed towards larger scale commercial and industrial non-emissions trading scheme (non ETS) scale development, any installers associated with the design and installation of biomass appliances of that scale are likely to be competent in their ability to appropriately design and install appliances, such that they undertake the installation in a manner that meets all appropriate technical standards and guidance.

In this case, it could be argued that specifying the requirement for linking a certified installer/competent scheme to the proposed RHI may be of negligible impact or benefit at the initial stages of RHI roll-out.

Nonetheless, it is considered that the proposed RHI scheme should, from the outset, specify a requirement in relation to the means by which RHI eligible biomass (and other) installations must be installed by an appropriate qualified and certified individual/organisation and through any adopted or approved certification scheme.

As identified, while initial benefits in terms of ensuring appropriate installation may not be realised during the early phases of the RHI, the requirement for certification of installers is an important principle to incorporate into the RHI from the outset, such that this requirement remains a part of the scheme should it be expanded during its lifetime to capture a wider range of installations beyond larger scale non ETS installations.

In addition, further to the point previously made in relation to commissioning being considered as a part of installation, the requirement for the submission of a commissioning certificate, similar to the UK RHI, should be a requirement of the proposed RHI, whereby it should be demonstrated that the commissioning phase has been undertaken by an individual/organisation that is part of a certified installer/competent person scheme. Similarly, proof that an installation is or will be maintained by an appropriate certified/competent individual/organisation would be beneficial.

5.2.4 Status of Certified (Accredited) Installer/Competent Person Scheme

As identified, there are a number of organisations in Ireland, such as Oriel Flues and METAC, that currently provide appropriate training related to biomass appliance installation. This is evidence of the efforts undertaken to date by the wider industry to address installation related issues in terms of biomass combustion emissions, as well as safety related to biomass appliance installation.

However, no mandatory scheme is in place to ensure that installer of biomass combustion appliances, from domestic to large scale industrial, are appropriately trained and qualified to install, as well as commission, biomass appliances.

[15] https://ec.europa.eu/energy/intelligent/projects/en/projects/qualicert

The placement of such a scheme on a mandatory footing would be an important mitigation measure for any resultant impact on air quality (as well as health and safety) that could result from increased or widespread implementation and uptake of biomass. While schemes to date may have had benefit in terms of those installations carried out by installers trained under them, it is considered that their voluntary nature limits the extent to which they can have impact, and that a mandatory footing for such a scheme is necessary to ensure the maximum benefit in terms of the protection of air quality is realised.

The most direct means of ensuring the mandatory nature of such a scheme is its enactment on a statutory basis through legislation, in a similar manner to the RGI scheme previously referenced. While this would clearly enshrine the requirement for such a scheme, the timeline for implementation of same would be influenced by the timeline required for legislative drafting, review and implementation, followed by the period required to identify the appropriate body for certification of the scheme. In addition, the administration required for such a scheme may not be warranted for the scale of scheme that may actually result.

A more expeditious approach to develop such a scheme could see the engagement of all relevant stakeholders through a consultation process, overseen by an appropriate body, with the subsequent development of such a scheme and tendering for its oversight and operation, along with significant promotion of same through appropriate government and sectoral organisations, such that any scheme developed would adopt a non legislative, yet 'quasi-mandatory' status as the scheme which must be complied with.

A further approach may be the incorporation of such a scheme into the existing RGI scheme. The exact method of this incorporation would need to be considered, given the current legislative footing on which the RGI scheme is placed.

5.3 Development of an Emissions Calculator Assessment Tool

The development of a national emissions calculator assessment tool is another measure which may be taken to influence emissions from biomass combustion in Ireland. Such a tool would take into consideration mean background air quality concentrations of specific pollutants and seek to determine the impact that emissions from appliances will have on air quality at the location of appliance installation.

The use of an emissions calculator assessment tool in Ireland would help assess the impact from the installation of biomass combustion appliances in areas where they could have a significant impact on mean background air quality concentrations, resulting in exceedance of limit values for these concentrations. Limit values for the mean background concentration of PM_{10}, $PM_{2.5}$ and NO_2 in Ireland, as set by the EU CAFE Directive, are identified in the Technical Literature Review Report, which forms Appendix 1 to this report.

A national emissions calculator tool has been developed and is currently in operation in the UK. An overview of the functioning of this tool is provided in Section 5.3.1, with potential options for implementing a similar tool in Ireland outlined in Section 5.3.2.

5.3.1 DEFRA Case Study, UK

The Department for the Environment, Food and Rural Affairs (DEFRA) in the UK has developed a biomass emissions calculator tool[16] which is used to screen emissions from biomass combustion appliances to ensure that such emissions do not result in exceedances of mean background air quality concentrations limit values.

This tool determines the effective stack height of an appliance and subsequently the maximum emission rate (target emission rate (TER)) that is permissible from an appliance for specific pollutants before mean background concentration limit values for these pollutants are exceeded. In order to calculate the TER for each pollutant, values for the following are required:

- Building height (i.e. the height of the tallest building within 5 stack heights of the stack)
- Stack diameter
- Stack height
- Location of the appliance
- Annual mean background concentration of the pollutant being analysed in the above location

[16] http://laqm.defra.gov.uk/review-and-assessment/tools/emissions.html#biomass

An outcome of the design of this tool is that lower TER values are required in areas with high mean background concentration values than those that are required in areas with low mean background concentration values.

In determining the annual mean background concentration of a pollutant in a specific location in the UK (identified by local authority area), this tool makes use of background air quality concentration maps[17] which are published by DEFRA and provide estimates of background concentrations for specific pollutants on a measured (historic) and modelled (future) basis. These maps contain estimates for the pollutants PM_{10}, $PM_{2.5}$, NOx and NO_2 and are spatially detailed, with maps presented in 1km x 1km grid squares throughout the UK.

A similar approach in utilised in Scotland but is based on Scottish specific emissions data for PM_{10}, NO_X and NO_2 only.

5.3.2 Potential Options for Implementation

In considering the implementation of an emissions calculator assessment tool for biomass combustion appliances in Ireland, the tool implemented by DEFRA in the UK provides a very useful starting point. The development and implementation of a similar tool in Ireland would likely bring significant benefits in terms of emissions control through ensuring that an assessment step is undertaken to determine the potential impacts on air quality, especially in circumstances where a more formal air quality assessment (for example through the environmental impact assessment (EIA) process) is not required, dependent on the scale of the installation.

While the tool in the UK is well designed and operates effectively, the implementation of an exact replica of this tool in Ireland would not be possible at this moment in time. As outlined in Section 5.3.1, the UK tool makes use of spatially detailed background air quality concentration maps which present information according to 1km x 1km grid squares throughout the UK. Detailed background concentration data at that scale (i.e. 1 km x 1 km) is not currently available in Ireland.

Should an emissions calculator assessment tool be implemented in Ireland in the future, it would likely need to be in the form of a modified, less spatially detailed version of the UK tool. Given that the EPA has responsibility for the monitoring of air quality in Ireland, there is also a potential role for the EPA in the development of the emissions calculator assessment tool. Background air quality concentration values from EPA air quality monitoring stations located throughout the country, that are used to inform the four national Air Quality Management Zones (AQMZs) and the six national Air Quality Index for Health (AQIH) regions, could be incorporated into the functioning of this tool.

In implementing a biomass emissions calculator assessment tool in Ireland, its utilisation could be ensured in a number of ways:

- In assessing development comprising a biomass emissions element, that would require approval from the EPA, through applications for waste, industrial emissions (IE) or integrated pollution control (IPC) licences, such development could be assessed in accordance with the requirements of the emission calculator assessment tool as part of the licence application assessment process

- In assessing development comprising a biomass emissions element, that would require approval from a local authority, i.e. planning permission, a waste facility permit or an air pollution licence approval, the calculator assessment tool could be utilised in the assessment of such development applications

- In assessing development comprising a biomass emissions element, that may require a future permit or licence from the EPA or local authority, to ensure compliance with the MCP Directive, the calculator assessment tool could be used in such development assessment

In developing such a tool, consideration should also be given to providing training in its utilisation, particularly to local authority staff, as considered in the following section.

[17] http://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html

5.3.3 Training for Local Authorities

When considering the installation of larger sized biomass combustion appliances at the community, commercial and industrial level, it is important to take into account potential planning and other approval requirements associated with these installations.

Planning permission will typically be required for larger sized biomass combustion developments but these developments may not be of a scale that warrants a mandatory environmental impact assessment (EIA), in accordance with Part 10 of the Planning & Development Regulations 2001, as amended. In addition, they may not specifically require an approval from the EPA.

In such cases, the processing of these applications by local authorities in Ireland may not take sufficient consideration of the impacts that poor biomass appliance installation and/or operation can have on air quality. In particular, it is considered unlikely that the relevant departments of most local authorities in Ireland have developed sufficient expertise on how the siting of a biomass appliance in relation to its surrounds and the design of an appliance flue can impact on ground level emissions, given the relatively low level of biomass utilisation to date in Ireland.

As such, it is important that relevant individuals within the relevant departments of local authorities throughout Ireland are appropriately trained in these issues so as to gain a thorough understanding of them, which they can subsequently make use of to ensure the adequate assessment of planning applications for larger sized biomass combustion appliances, as and when the need may arise.

The delivery of such training should be carried out by a recognised individual or organisation with appropriate knowledge of the above issues. For ease of delivery, it may be best that such training courses are provided by the Environment Services Training Group (ESTG)[18], a subsidiary of the Local Authority Services National Training Group (LASNTG). The ESTG was established in 1996 for the provision of environmental training courses for a broad range of disciplines for staff within both local authorities and the private sector, with five regional training centres in Ireland which deliver these courses.

5.4 Further consideration regarding Planning Permission

The issue of 'exempted development' in a planning context and in relation to the assessment of emissions from biomass installations developed in this manner, requires consideration.

Class 56 of Part 1 of Schedule 2 of the Planning & Development Regulations 2001, as amended, provides a number of exemptions for 'small scale' renewable energy installations such as biomass installations, CHP installations and wind turbines, as outlined in Section 3.5 of the Technical Literature Report included in Appendix 1.

While such exemptions are considered very beneficial to the promotion and utilisation of renewable technologies from the point of view of facilitating the easier development of same, a case could arise where a relatively sizeable biomass appliance installation can be undertaken without having to enter the planning or any other approval process, with the resultant potential implications for local air quality not having been assessed (notwithstanding the future means by which the Medium Combustion Plant Directive 2015/2193 could be implemented).

For example, a biomass fuelled CHP occupying a structure of up to 500 sq. metres, 10 m in height, with a flue height of up to 20 m, can be developed in an industrial building, as an exempted development[19]. A structure of this size would likely be suitable for housing an appliance of several MW capacity, which in the context of emissions, should enter a process whereby potential impacts on local air quality are assessed.

[18] http://www.estg.ie/

[19] Class 56 (a) Part 1 of Schedule 2 of the Planning & Development Regulations 2001, as amended – '*the construction, erection or placing within the curtilage of an industrial building of a structure for the purposes of housing a fully enclosed Combined Heat & Power system*'

While not wishing to dilute or remove this exemption, as it serves a very positive purpose in terms of facilitating biomass technology roll-out, and should be maintained, it is considered that, in the event of the development of a biomass emissions calculator assessment tool as described previously, there is scope for the revision of this legislation to incorporate a requirement for exempted development to either:

- require utilisation of the calculator assessment tool as part of the development process, through undertaking the relevant assessment as part of the design process and the submission of this assessment to the local authority by the developer (or other engagement with the local authority that achieves the same result) or

- at the least, align the applicability for the identified exemptions with data from local EPA air quality monitoring stations such that an air quality assessment using the emissions calculator assessment tool must be undertaken based on the applicable development being located in known areas of low background air quality

As identified above, these suggestions are made in the absence of knowing the means by which the MCP Directive will be implemented, such that any resultant permitting or licencing programme resulting from its implementation may address this issue, for appliances of greater than 1 MW thermal capacity. However, for sub 1 MW installations, this issue remains.

6 RECOMMENDATIONS

The following summarises the information presented in the preceding sections, such that a number of recommendations are made, with the expressed objective of contributing to the improvement of a number of factors and situations that can directly and positively influence potential impacts resulting from emissions generated from biomass combustion in Ireland. Following each recommendation, the organisation(s) which are suggested as having a role in the implementation of these recommendations are identified.

Recommendation 1

Link qualification for the proposed RHI with the requirement to demonstrate adequate operational control of emissions through:

- fuel quality assurance e.g. WFQA or similar, and servicing/maintenance in accordance with the manufacturers requirements (predominantly for non-domestic smaller scale appliances) and;
- appropriate fuel supply and monitoring, combustion emissions monitoring and active combustion control, or other methods as deemed appropriate (for larger scale appliances not operating under an appropriate air emission licence/permit).
- in the first instance, compliance with appropriate air emission licences/permits.

Suggested Organisations: Department of Communications, Climate Action and Environment (DCCAE) & Department of Agriculture, Food and the Marine (DAFM)

Recommendation 2

(a) Consider the broadening of the WFQA scheme, or a similar approved scheme, and placement of the same on a legislative footing, with quality approved fuels being required for utilisation at biomass facilities which are not covered by an appropriate air emissions licence/permit.

(b) Consider the mandating of wood fuel purchase through Green Public Procurement by appropriate public bodies[20] as being WFQA, or similar, certified, where the biomass facility is not covered by an appropriate air emission licence/permit.

Suggested Organisations: DCCAE & DAFM

Recommendation 3

Develop an 'early engagement' programme by SEAI and/or DJEI with biomass appliance manufacturers to facilitate and encourage adoption of the Eco-design related Commission Regulations 2015/1185 and 2015/1189.

Suggested Organisations: SEAI, DJEI & Enterprise Ireland

[20] Where public bodies refer to local authorities, government departments, educational organisations etc.

Recommendation 4

Develop specific policy measures that promote the EN 303-5:2012 standard and Ecodesign requirements for biomass appliance design and the WFQA scheme, or a similar approved scheme, for wood fuel quality.

Suggested Organisation: DCCAE, DJEI, Department of Housing, Planning, Community and Local Government (DHPCLG) & Enterprise Ireland

Recommendation 5

Consider the development and implementation of a national communication and awareness campaign (for example, through the proposed National Clean Air Strategy) which presents information on issues relating to biomass combustion that are deemed pertinent for public knowledge (e.g. the use of an appropriate fuel, the correct operation of biomass combustion appliances).

Suggested Organisations: DCCAE, DAFM, DHPCLG & DJEI

Recommendation 6

Introduce flexibility in the Building Regulations 2014 (particularly in relation to flue sizing) so as to ensure that the recommendations of manufacturers and/or installers of domestic sized biomass combustion appliances can be implemented.

Suggested Organisation: DHPCLG

Recommendation 7

Link qualification for the proposed RHI with the requirement for compliance with an appropriate air emissions permit/licence where applicable, or the provision of an emission certificate, in absence of same. Consider the adoption of the existing UK RHI emission certification system, for biomass installations which do not have an appropriate air emissions permit/licence, as part of the RHI. Support this recommendation by verifying applicability of the UK RHI emission limit values in an Irish context and assessing the interactions of these values with requirements of the Eco-design and MCP Directives.

Suggested Organisation: DCCAE

Recommendation 8

Ensure that any scaling or banding applied within the proposed national RHI considers potential impacts on emissions and energy efficiency resulting from same.

Suggested Organisation: DCCAE

Recommendation 9

Revise the SEAI Triple E Register at an appropriate time to ensure it reflects the requirements of Commission Regulation 2015/1189 when in force.

Suggested Organisation: SEAI

Recommendation 10

(a) Ensure that as part of the proposed RHI, RHI applicants are required to provide a certificate of competency in accordance with the manufacturers installation requirements, indicating that their installation and commissioning of appliances is carried out by a suitably trained individual/organisation.

(b) In a non-RHI context, develop and implement a biomass[21] appliance installers certification or accreditation scheme (to include commissioning) based on existing or new scheme(s), as required, preferably placing same on a mandatory footing – consider potential for incorporation of same within the existing RGI scheme.

(c) Consider means of developing a mandatory scheme for the inspection and cleaning (if required) of the flues of biomass[22] combustion appliances at an appropriate interval, at a minimum at the community and commercial scales and at the domestic scale, should this be considered appropriate.

Suggested Organisation: DCCAE, DAFM & DJEI

Recommendation 11

(a) Develop appropriate guidance to support the assessment of potential air quality impacts resulting from individual biomass installations.

(b) Consider the development of a national Emission Calculator Assessment Tool (similar to the UK DEFRA tool) to support the assessment of potential air quality impacts resulting from individual biomass installations for use by local authorities.

(c) Develop and provide training on the use of same to relevant authorities.

Suggested Organisations: EPA & Local Authorities

Recommendation 12

Consider means of addressing the absence of assessment of potential air quality impacts resulting from biomass installations developed as 'exempted development'.

Suggested Organisations: DCCAE, DHPCLG, EPA & Local Authorities

[21] While the original scope of this project was to focus solely on biomass appliances, it is recommended that an overall solid fuel appliance installers certification or accreditation scheme is developed, implemented and preferably placed on a mandatory footing, should this be considered appropriate.
[22] While the original scope of this project was to focus solely on biomass appliances, it is recommended that means of developing a mandatory scheme for the inspection and cleaning of the flues of all solid fuel appliances, at an appropriate interval, is considered, should this be deemed appropriate.