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Recommendations for future actions regarding EU legislation/policy and upgrading the guideline to an international standard

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Introduction

The insight that the fossil fuel reserves are limited, together with concerns over security of supply (*i.e.* the oil crises), initiated the first upraise of interest in biomass (and all other renewable energy forms) in the 1970s. However, continuously low fossil energy prices and the discovery of new fossil fuel reserves had long impeded the development of biomass technologies. In the 1980s the concern grew that global warming and the resulting climate change were enhanced (if not caused) by CO₂ emissions resulting from fossil fuel consumption. This concern resulted in the Kyoto protocol in which objectives to reduce the anthropogenic CO₂ emissions are documented. To achieve the Kyoto objectives, the share of renewable energy in the primary energy consumption has to increase significantly. Based on this history and the fact that Energy demand – particularly also in industrialized countries – is steadily rising leads to a refocusing on suitable and sustainable energy sources. Nowadays the interest in biomass was renewed, as biomass is considered to be one of the most important renewable energy sources for this century (Shell International, 2001) (Johansson, Kelly, Reddy, & Williams, 1992).

EU Commission set targets based upon the Kyoto Protocol for the period 2008 to 2012 and by 2008 these targets were renewed as follows (European Commission, 2008):

- carbon dioxide emissions shall be lowered until 2020 by an amount of 20% compared with 1990
- the share of renewable energy shall cover up to 20% of the energy consumption by 2020
- the share of “Renewables” in transportation fuels shall raise to 10% until the year 2020
- Savings of 20% of the total energy consumption by improving energy efficiency should be accomplished compared to present numbers

To reach this ambitious “2020” aims, renewable energy resources need to be more heavily used and respective technologies need to be developed.

Sometimes the legal framework or the currently applied standards seem to tackle the attainment of the already challenging energy aims.

Scope of the report

The Gasification Guide project deals with small and medium scale biomass gasification, which is an emerging technology for the efficient conversion of renewable energy sources into electricity and heat.

Discussions have been held within the project team and with stakeholders in order to identify actions which may be suitable to reduce the perceived inconsistencies in the legal framework. The underlying idea has been to minimise non-technical market access barriers for biomass gasification plants while maintaining a high level of health, safety, and environmental protection.

This work therefore should underline the main outcome of the two European and three regional workshops as well as the input gained from discussed within the project Team or brought to this team by the addressed community in consideration of the legal frame or the usability of current or presently drafted standards.

Moreover it again brings up topics from the deliverables D5 "Listing of gaps in legal frame between European level and national levels" and Deliverable D6 "Listing of actions to harmonise the legal frame for biomass gasification" if this topics gained new actuality through the workshop feedback or through the surveillance of the practical appliance in the EC over the last three years.

1. Recommendations for future actions regarding EU legislation/policy

Emission limit values and the legislation progress concerning the IPPC directive have been identified as potential main challenging factors for the further distribution of gasification technology.

1.1 Emission limit values

1.1.1 Current Legal Framework

As described in the draft Gasification Guide (deliverable D10), one problem with emission limits for biomass gasification plants in EU Member States (except for Denmark) is the general lacking of emission limits introduced specifically for gas engines which are operating on producer gas from biomass gasification. In many cases, limits for gaseous emissions have been imposed which have originally been defined *for other activities*, in particular for gas engine combustion of biogas, and which are based on the state of the art (or on best available techniques "BAT") with respect to these other activities.

It is questionable whether such emission values adequately reflect the state of the art (or best available techniques, BAT) *with respect to BGPs*. These circumstances have already been underlined in D 6.

It is worthwhile to note that emission limits may result from two different targets,

- "Protection against Harmful Effects on the Environment" (= immediate protection against hazardous immissions) and
- "Precautions against Harmful Effects on the Environment" (= minimising the environmental impact, irrespective of immediate hazards for persons or objects).

The first target results in mandatory requirements for the limitation of emissions from plants, irrespective of economic considerations.

The second target calls for a fair balance between environmental benefits, technical possibilities and economic constraints. Typically, emission limits associated with the second target for combustion installations will depend *inter alia* on the size of the installation (thermal rating), on the type of feedstock/fuel, and on the type of combustion device.

With regard to the application of BAT requirements to small and medium biomass gasification plants, the key questions have been found to be,

- Are small and medium BGPs in the scope of BAT requirements at all?
- If BAT requirements apply, which techniques can be regarded as "best available" for biomass gasification?
- Which emission limit values are associated with BAT in this case?

The analysis of the legal framework for the construction, putting into service, and operation of biomass gasification plants in the Gasification Guide project (Deliverable No. 4) has revealed that small and medium BGPs, while not in the scope of the IPPC directive, may still be covered by national regulations transposing the IPPC directive.

As a result, the application of BAT will generally be required in those Member States where small and medium BGPs are subject to permit requirements derived from the IPPC directive. If a specific BGP activity is not in the scope of such regulations, there will generally be no requirements for that activity to meet BAT standards.

Due to the different transpositions of the IPPC directive into national law of the Member States, a certain type of BGP may need to fulfil BAT requirements in some Member States but not in others.

Therefore, it seems advisable to suggest the elaboration of a description of available techniques for the prevention and reduction of environmental impact of BGPs that can be used as a basis for emission limits.

This could now be realised by an integrated view on the handling of benzene as an indicator for the handling of emission limits.

1.1.2 Benzene – How to beat the emission limit

Benzene dissolves fats and proteins and in consequence parts of the human body and its nervous system, it does cause cancer. Hence, the limits set in regulations as the German Technical Guide for Air (TA-Luft)¹ have to be observed.

In Germany, benzene was detected in the exhaust gas of several BGPs in concentrations which could be taken as hazardous to health of employees and the neighborhood. These facts already have led to the close down of several plants.

First measurements confirm most of the limits fixed by the Technical Guide for Air might be observed. Nevertheless, the rate of benzene in exhaust gas of gasification gas fired engines exceeds the limits of BAT where applied. Overall a continuous operation with a constant emission level below 1mg/m³ seems to be challenging.

Up to now, only some clear differences are known in benzene formation during the gasification process. It depends on whether the product gas is generated by a relatively low temperature process (below 900 to 1000°C) or in hot zones above this temperature range. The influence of the gas cleaning is hardly investigated. It is

¹ BMU Federal Ministry for the Environment, Nature Conservation and Nuclear Safety: [First General Administrative Regulation for the Federal Pollution Control Act (Technical Instruction on Air Quality – TI Air), (GMBI. p. 511), from the 24/07/2002]

known in the internal combustion engine technology, that by a few changes in filling the cylinder capacity and in ignition, the benzene output can be varied. Major expectations for the reduction of benzene are anticipated in the combination of engines with oxidation catalysts.

It has to be clearly underlined that the lack of a standard method for benzene measurements really is a threat to the biomass gasification technology. To this topic an European initiative is needed to accord the European targets by approvable analytic methods and a realistic legal frame.

1.1 Further potential restrictions caused by the IPPC

European Commission proposal COM(2007) 843 of December 2007 on a new IPPC directive, in its list of activities subject to an integrated permit procedure, specifies the activity "Gasification or liquefaction of fuels" without any reference to a threshold value regarding capacity. If this proposal passes the legislative process unchanged,

- this will in a few years subject all new BGPs in EU Member States to licensing under integrated permit procedures, and
- emission limit values (ELVs) for new BGPs will have to be based on best available techniques (BAT).

Annex I of the IPPC Directive² currently in force addresses activities that can have a significant impact on the environment, which is reflected *inter alia* in threshold values for some of these activities. Section 1 of that annex ("Energy industries") comprises four activities:

- 1.1 Combustion installations with a rated thermal input exceeding 50 MW
- 1.2 Mineral oil and gas refineries
- 1.3 Coke ovens
- 1.4 Coal gasification and liquefaction plants

It is evident that the activities 1.2 – 1.4 are performed at large industrial scale only (for economic reasons), and therefore there has been no need to define a threshold value for these activities.

In the December 2007 proposal for a new IPPC Directive, the definition of activity 1.4 has been changed from "Coal gasification and liquefaction plants" to "Gasification or liquefaction of fuels". It is highly probable that the European Commission, when drafting that proposal, has not been aware that gasification or liquefaction of fuels may be economically performed at a scale which is by orders of magnitude smaller than the scale for coal gasification or liquefaction. This applies in particular to

² Directive 2008/1/EC concerning integrated pollution prevention and control

renewable energy plants which utilise biomass in gasification or liquefaction processes, especially small and medium-scale biomass gasification plants.

The suggested new definition for activity 1.4 would subject a great number of small and medium-scale renewable energy plants to the new IPPC Directive, which (most probably) has never been intended. Therefore, it seems advisable to provide an indication to the European Commission about this (unwanted) result of the new definition and to suggest adding a threshold value to that definition, which could be similar to the new threshold value for combustion installations (20 MW). Such a more detailed definition would help to keep the requirements towards gasification activities appropriate to the potential environmental impact and save emerging renewable energy technologies from another non-technical market barrier.

1.2. Decentralized/small and medium scale Renewable energy compromised by regulations

Discussion with biomass gasification plant manufacturers and operators in various European countries has revealed that there is considerable uncertainty about the application of some European Directives according to Article 95 of the EC Treaty to biomass gasification plants. The situation has been elucidated in deliverable D5.

One issue concerns complex products in general, particularly process plants, placed on the market as independent products which are *installations* that comprise *equipment* in the scope of Art. 95 Directives (e.g. machinery, low-voltage equipment, pressure equipment), whereas some parts of the product (and hence the product as a whole) are excluded from the scope.

Some of the consequences of this situation are:

- It is legally not possible for a manufacturer to declare conformity with EC Directives for the process plant as a whole (but only for parts of the plant).
- Placing on the market and putting into service of such process plants may be restricted or impeded with reference to national provisions regarding the protection of workers or others. These provisions may lead to the requirement to modify the product (process plant) before putting into service.

As there is still some uncertainty about the correct interpretation of European Directives based on Article 95 of the EC Treaty with regard to complex products like process plants, an official Guideline on this topic issued by a competent European body would be helpful.

It could be worthwhile to investigate at European level

- Whether the scope of existing New Approach Directives, e.g. the Machinery Directive 2006/42/EC, can be extended to comprise process plants as a whole, which are currently excluded from the scope, or
- Whether a new Directive aiming in particular at complex products like process plants would be a reasonable means to fill this gap.

Nevertheless it has to be noted that uncertainty is for sure a major barrier for further investments in this technology.

Also the enlargement of area of validity of specifications because of the lack of more specific ones, e.g. from Large scale energy industry onto small gasifiers, endanger the technique and do not supply the generation of new innovative strategies.

2. Upgrading the Guideline to an International Standard

2.1 Background

One major target within the Communication and Dissemination workpackage (WP5) is to ensure impact of the project results on a wider scale. In the work description a comparison is made with the experience gained in recent years developing first a Guideline and subsequently an International Standard on tar measurements in producer gas (EU contract ENK5-CT2002-80648]. The following performance indicator was formulated which can be considered as a criteria for the success of the project: “Roadmap for standardization of the Guideline”. This chapter describes the activities performed of this future action.

2.2 Performed Action

Key Performance Indicator no. 1 as described in the Grant Agreement was discussed during various project meetings. Main discussion issue was whether a Guideline as developed in this project can be upgraded into a normative Standard like the Tar Standard. The outcome of the Gasification Guide project is basically a Guideline giving a qualitative description of the HSE issues, and these can hardly be quantified. As coordinator, BTG discussed this issue with NEN, the Dutch normalization institute.

In April 2009, a meeting was organized between BTG and NEN in Delft, the Netherlands to exchange ideas and explore the possibilities. This timing was also chosen because within the EACI Call of 2009, there was a Key Action 9.5.7 called “Product Standards Initiative”. A proposal could probably fit into this specific action.

2.3 Documented approached

According to Mr. Pauwels from NEN, a Guideline as such has little status, it is a voluntary document; perhaps it would be better to call it “Approved Guideline” to increase the status level.

Questions raised by NEN:

- Is there a similar initiative? Probably not, perhaps on biogas?
- Can such project be part of an existing TC Technical Committee?
- Can we disseminate the outcome to countries outside the EU to achieve a higher impact?
- Health & Safety Guidance is different from Environment impact (HSE)

Furthermore, NEN suggested to check what are the remaining discussion issues that needs further research or clarification: this could help to identify a further set of standards. Some examples:

- Several countermeasures may be applicable for one hazard; should we select one “preferred” countermeasure or

- One potential hazard can lead to more consequence in parallel and/or serial (one after the other)
- How to deal with different countermeasures? These can be technical issues, process control related or organisational in nature.
- How to deal with selecting or choice of materials?

NEN suggested that the focus of a Standardisation project should be to develop a “package of standards”:

- A European terms and definitions standard
- A standard on the system: A system standard most of the time includes the following requirements in the scope; Requirements on design, manufacturing, installation/construction and testing of the "system (in this case the biomass gasification plant). Operation, safety procedures, documentation often is a part of such standard. This depends on the number of details we would like to include
- Separate standard for Occupational Health and Safety could be beneficial.
- Also separate one on operating and maintaining biomass gasification plants could be beneficial but could also be included in the above system standard
- One or more test standards on for example gas tightness the gasification plants (specific test methods, e.g.) seems logical. (only necessary when no international standard is available).
- One on safe start-up and shut-down of biomass gasification plants
- Possibly an approval manual could be developed based on the package of standard. This approval manual could help all involved to get the necessary permits: (one on Instructions to manufacturers, operators, end-users, authorities)

Involvement of NEN:

Both the WHO and the EU look upon international standardization as a major promoter of international trade. It can lower the barriers built by different regulations, standards and assessment criteria.

NEN, the Dutch Standardization Institute, can provide such standardization knowledge. As a member of both ISO and CEN, it combines the standards processing ability and the technical know-how, whereas its two parent-organizations are more administratively focused. NEN has access and knowledge of all standards of the major standardization bodies. Furthermore, it can provide fast-track standardization processes within CEN and ISO, once a stakeholder or a project requests registration of agreements to continue development of a process, a product or a market.

2.4 Follow-up activity

Based on this positive outcome of the meeting, BTG prepared a pre-proposal check to the EACI in Brussels; Mr. J. Hernandez, who is also the project officer of the current Gasification Guide project considered the idea positive but the proposal, does not fit very well in the Call 2009 (see also the documented communication in the annex). He explained that gasification and producer gas are not in the priority list for this call, see the response in *Italic* below. At the moment the Call 2010 is in preparation and perhaps gasification will become one of the priorities for the next call. If the proposal for standardization of the Guideline fits well in the Call text, the current project team will consider to prepare and submit a proposal for next year. The suggestions made by Mr. Hernandez below, will then be taken into consideration.

Conclusions

Generally, poor awareness and lack of understanding of health safety and environment (HSE) hazards in development, planning, design, engineering, construction, operation and maintenance of gasification plants is recognized a major non-technical obstacle to the market penetration of small-to-medium scale biomass gasifiers for power generation. The project "Guideline for Safe and Eco-friendly Biomass Gasification" aims to effectively tackle this barrier and try to accelerate the market penetration of small-to-medium scale biomass gasifiers by the development of a Guideline and Software Tool for easy and simple assessment of HSE risks.

Anyhow, the development of such a guideline and the promoting of the usability through several dissemination activities have to be accompanied by an advancing harmonization of the legal frame within integrated considerations to fulfill the 2020 goals respectively not to make them even more challenging by unconsidered effects caused by exorbitant legal requirements.

Suggestions for actions that have emerged from these discussions have been summarised in the present report. Overall the need to harmonize the emission limits and to consider requirements of decentralized strategies as well as to try to focus with an integrated view over all energy supplies while designing the legal frame are clearly underlined by the described facts. Especially the IPPC and other axiomatic regulations have to be verified on their suitability for technologies on the border from research to "normal" operation and even more if they only affect the addressed industrial branch by means of definition irregularities.

In summary, the "Roadmap" for standardisation of the Guideline consists of a few steps. First of all, such effort for standardisation needs financing. As the standardisation process is a non-technical issue, only the EACI program will be able to make funds available. Therefore, we have to analyse the content of work programme in the next Call for proposals in 2010. If gasification is on the priority list in this Call, some of the current project partners will start preparing a proposal, most likely with a central meeting. At such meeting, also representatives of CEN will be invited. The outcome of the meeting is to discuss the workplan (work packages, budget indication, duration) and the consortium (the partnership will be different from the current partnership).

Annex

- Pre-proposal check for IEE-II 2009 call, deadline 25 June 2009
- Communication between BTG and the EC project officer, Mr. J. Hernandez, on the outcome of the pre-proposal check of suggestion contributed to the EACI in Brussels

Pre-proposal check for IEE-II 2009 call, deadline 25 June 2009

Title:

Standardization of the Guideline on Health, Safety and Environmental aspects associated with small scale biomass CHP gasification plant.

Key Action:

Product Standards Initiative

Background:

Poor awareness and lack of understanding of the Health, Safety and environment (HSE) hazards in the project development, planning, design, construction stage and during operation and maintenance of gasification plants is recognized as a major non-technical obstacle. At the moment, a European consortium is executing the project "Guideline for Safe and Eco-friendly Biomass Gasification" under IEE contract no. EIE-06-078 to effectively tackle this barrier. The objective of this project is to accelerate the market penetration of relatively small scale biomass gasification systems (< 5 MW thermal) by the development of a Guideline and Software Tool for easy and simple risk assessment of HSE. The project is on schedule and will be completed by the end of 2009.

Objective

A Guideline has no legal status and is basically a voluntary document. Therefore one of the key performance indicators in the current project is to develop a roadmap for standardization of the Guideline. Based on the good progress in the project, the project consortium intent to go a step further and not only develop a roadmap, but prepare a full follow-up proposal to actually develop the standard.

Consortium

The proposed consortium will be based on the current partners in the project, but with the involvement of NEN, the Dutch normalization institute. As a member of both ISO and CEN, NEN combines the standards processing ability and the technical know-how, whereas its two parent-organizations are more administratively focused. NEN has access and knowledge of all standards of the major standardization bodies. Furthermore, it can provide fast-track standardization processes within CEN and ISO, once a stakeholder or a project requests registration of agreements to continue development of a process, a product or a market. Most likely some other organizations like branches organizations or regional networks active in the field will be invited to participate.

Reviewers: a selected number of organisations (including from countries outside the EU) from the stakeholders will review the work produced within the project.

Work packages

The following WP are foreseen:

WP1: Project coordination and management

WP2: Technical development work and input for the Biomass gasification system standard (as basis for and input for standardization process)

WP3: Definitions and terminology (as a basis and input for standardization process)

WP4: Development work programme of a European Standard(s), initiation standards process and CEN/CENELEC Standardization process

WP5: Dissemination (cooperation with JRC, IEA, relevant CEN/ISO Technical committees.../workshops within new EU member states)

Communication between BTG and the EC project officer, Mr. J. Hernandez, on the outcome of the pre-proposal check of suggestion contributed to the EACI in Brussels

[Quote]

Dear Mr. Knoef,

Thank you for your project idea. In the 2009 Call for proposals, gasification is not among of the priorities.

Note however that in section 3.3 of the text of the Call 2009 (http://ec.europa.eu/energy/intelligent/call_for_proposals/doc/call_2009_en.pdf) it is mentioned that exceptionally, and if properly justified, proposals that meet the eligibility criteria but do not directly respond to the priorities defined in the Call may also be considered.

Some additional remarks:

- While the title of the project idea mentions the application in CHP plants -which might have fitted under the RES-H/C priorities- the description of the idea only refers to the gasification plant/ process.*
- The IEE programme focus is on proven, commercially available technologies. You would hence need to motivate that the sector has reached this status.*
- Standardisation work should preferably have heavy involvement from the industry and members from the relevant CEN working group. You can consult relevant standardisation initiatives on solar thermal collectors/systems to check the teams involved: Solarkeymark II (http://ieea.erba.hu/ieea/page/Page.jsp?op=project_detail&prid=1733) and QAIST (http://ieea.erba.hu/ieea/page/Page.jsp?op=project_detail&prid=1840).*

Should you have questions on the above listed remarks, do not hesitate to give me a call.

Best regards,

Jose-Manuel Hernandez

[End quote]