D4.4 | Selected country analysis of sustainable biomethane

Deliverable:	Selected country analysis of sustainable biomethane
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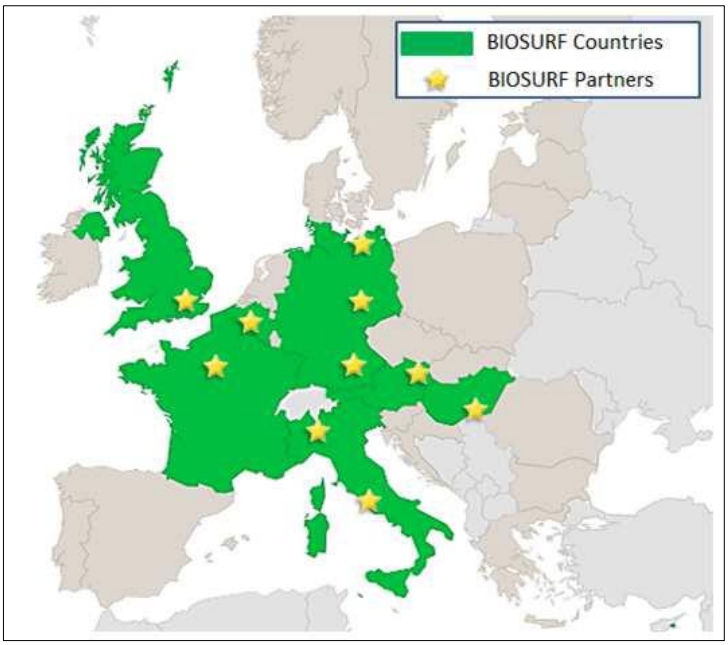
BIOSURF IN A NUTSHELL

BIOSURF is an EU-funded project under the Horizon 2020 programme for research, technological development and demonstration.

The objective of BIOSURF (BIOmethane as SUstainable and Renewable Fuel) is to increase the production and use of biomethane (from animal waste, other waste materials and sustainable biomass), for grid injection and as transport fuel, by removing non-technical barriers and by paving the way towards a European biomethane market.



The BIOSURF consortium consists of 11 partners from 7 countries (Austria, Belgium, France, Germany, Hungary, Italy and United Kingdom), covering a large geographical area, as indicated in the figure on the left.

The intention of the project is:

- To analyse the value chain from production to use, based on territorial, physical and economic features (specified for different areas, i.e., biofuel for transport, electricity generation, heating & cooling);
- To analyse, compare and promote biomethane registering, labelling, certification and trade practices in Europe, in order to favour cooperation among the different countries and cross border markets on the basis of the partner countries involved;
- To address traceability, environmental criteria and quality standards to reduce GHG emissions and indirect land-use change (ILUC), as well as to preserve biodiversity and to assess the energy and CO2 balance;
- To identify the most prominent drivers for CO2-emissions along the value chain as an input for future optimization approaches and to exchange information and best practices all across Europe with regard to biomethane policy, regulations, support schemes and technical standards.

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1. Introduction

In the BIOSURF report Benchmark and gap analysis of C&I (D4.3), an overview is given on the European and national legislations, regulations and voluntary schemes that include sustainability criteria relevant for the biogas and biomethane production. Furthermore, a gap analysis on the completeness and practicability of stipulated and implemented sustainability requirement has been performed. This has allowed to identify the current state of the art of sustainability considerations that influence the biomethane production in Europe.

The sustainability criteria for biofuels and bioliquids, especially as defined in the Renewable Energy Directive, have been transposed into national legislation by all six BIOSURF partner countries - in some cases without any major modification of the European standard (e.g. Hungary, Italy, and Austria), in other cases with certain modification by adding specific national requirements (e.g. Germany, France, UK). Those additional requirements may, in some cases, lead to significant burdens for the cross border trade of biomethane.

This report will firstly summarise the state of the art of relevant sustainability requirements in Europe, and specifically in the BIOSURF partner countries. Furthermore an informative analysis and evaluation of the current national conditions regarding the practical implementation of the stipulated sustainability requirements is performed. Statements on the completeness and practicability of the discussed sustainability criteria eventually lead to recommendations regarding future amendments of the respective European and national regulations.

Thanks to the participation of six national biogas and biomethane associations in the BIOSURF project, it was possible to accumulate first hand experiences of the national biogas/ biomethane operators regarding the implementation of sustainability requirements and, hence, to base the analysis and the evaluation on those. The most important barriers, restrictions and challenges from the stakeholder's perspective are highlighted and suggestions for improvement are being made.

Finally, the report will summarise some recommendations for future developments in this field to guarantee an easier management of sustainability criteria for national biogas and biomethane stakeholders to overcome current barriers for the cross border trade of biomethane in Europe.

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2. Overview of legal sustainability requirements for biomethane production in Europe

Within the bioenergy sector, more and more attention is paid to the stipulation and implementation of sustainability requirements at the European and consequently also at national level. This is especially the case for the production of biofuels. Concerning the biomethane production and use, the BIOSURF report "Benchmark and gap analysis of C&I" (D4.3) has shown that several sustainability criteria and indicators are already in place[1].

The sustainability criteria for biofuels and bioliquids, as specifically defined in the Renewable Energy Directive **(**RED)[2], have been transposed into national legislation by all six BIOSURF partner countries (Austria, Germany, France, Hungary, Italy, United Kingdom). These are:

- Mitigation of Green-House-Gas (GHG) emissions;
- Protection of biodiversity;
- No conversion of land with high carbon stock;
- Sustainable farm management and protection of soil, water and air quality.

In most of the countries the report is focusing at, i.e.Austria, Germany, Hungary, Italy and Great Britain, biomethane is recognised as biofuel and, hence, all these criteria could be used. A different situation can be found in France where these criteria are not used for biomethane because is not recognised as biofuel.

Table 1: National Regulations on Biodiversity/ Land use/ Sustainable farm management in the focus countries

COUNTRY	Biodiversity/ Land use/ Sustainable farm management
GERMANY	Same as EU regulations
AUSTRIA	Same as EU regulations
FRANCE	Biomethane producers have to respect the criteria described in the French regulations for biomethane production, These criteria are not linked to EU regulations applied to biofuels because biomethane is not recognized as biofuel Producers need to: • develop a preliminary study on the safety and agronomic value of the digestate (with its characteristics: quantity, production rhythm), the capacity of the soil to receive it and the techniques used to spread it. • Drafting of a spreading plan with a map showing the possible spreading zones and the zones were spreading is forbidden (according to the French legislation on nitrates). • keep a notebook on spreading for 10 years.

1 http://www.biosurf.eu/wordpress/wp-content/uploads/2015/07/BIOSURF-D4.3.pdf

2 http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32009L0028&from=EN

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	• Spreading of digestate must occur 50 meters away from watercourses (unless there is a grass strip or hedge 10 m large on the border of the watercourse). • If water protection needs to be reinforced, the administrative authority can define additional thresholds for phosphorus and nitrogen.
GREAT BRITAIN	Same as EU regulations
HUNGARY	Same as EU regulations
ITALY	Same as EU regulations

Table 2 : National GHG saving targets in the focus countries

	GHG savings		
COUNTRY	**% 2016**	**% 2017**	**% 2018**
RED	35%	50%	60%
GERMANY	35%	50%	60%
AUSTRIA	35%	50%	60%
FRANCE	35%	50%	60%
GREAT BRITAIN	60%	60%	60%
HUNGARY	35%	50%	60%
ITALY	35%	50%	60%

For what regards the GHG saving targets, almost all the project countries have adopted the specifications stipulated in the RED except of Great Britain, which imposed stricter limits than the RED. Great Britain determined to reach the 60% GHG saving target already in 2016 – two years earlier than what has been defined in the other countries.

The GHG emissions can either be calculated with the formula using the default values defined by the RED) or by using the “BioGrace GHG calculation tool”, which is a voluntary scheme recognised by the EC.

Referring to the RED, only 3 substrate categories have dedicated default values:

- 23 gCO2eqMJ - for biogas produced from organic fraction of municipal waste;
- 16 gCO2eq/MJ - for biogas produced from liquid slurry;
- 15 gCO2eq/MJ - for biogas produced from manure.

Only in Italy, additional default values have been defined. The default values are listed in the following tables. Other partner countries have not defined any additional default values.

Table 3: Default values for GHG calculation in the focus countries

COUNTRY	DEFAULT VALUE FOR GHG CALCULATION

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RED	23 gCO2eq/MJ organic fraction of municipal waste; 16 gCO2eq/MJ for biogas produced from liquid slurry; 15 gCO2eq/MJ for biogas produced from manure.
GERMANY	Same as RED
AUSTRIA	Same as RED
FRANCE	No default value for feedstocks used for biomethane production because is not recognized as biofuel
GREAT BRITAIN	Same as RED
HUNGARY	Same as RED
ITALY	If at European level there are no specific default value, it is possible to use the default values reported in table 4

Table 4: Default values for GHG calculation in Italy

SUBSTRATE			DEFAULT VALUE FOR GHG CALCULATION (gCO2eq/MJ biomethane)
manure	open storage of digestate	without off-gas combustion	26.2
		with off-gas combustion	5.2
	closed storage of digestate	without off-gas combustion	-75
		with off-gas combustion	-96
mais silage	open storage of digestate	without off-gas combustion	77.3
		with off-gas combustion	56.3
	closed storage of digestate	without off-gas combustion	54.6
		with off-gas combustion	33.6
mais silage + ryegrass	open storage of digestate	without off-gas combustion	78.3
		with off-gas combustion	57.3

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	closed storage of digestate	without off-gas combustion	55.6
		with off-gas combustion	34.6
organic fraction of waste for recycling (MSW)	open storage of digestate	without off-gas combustion	76
		with off-gas combustion	55
	closed storage of digestate	without off-gas combustion	40.3
		with off-gas combustion	19.3
leftovers	open storage of digestate	without off-gas combustion	76
		with off-gas combustion	55
	closed storage of digestate	without off-gas combustion	40.3
		with off-gas combustion	19.3

There are a few other voluntary schemes, which have been recognised by the European Commission like ISCC and NTA8080. These voluntary schemes provide relevant definitions – always in reference to EU legislation - and guidelines for sustainable biofuel production and use aiming to facilitate sustainability verification by an independent body. They also define additional sustainability requirements going beyond the ones stipulated in EU legislation, for instance NTA8080, which defines additional requirements for the protection of biodiversity and the protection of soil, water and air (Grope, Scholwin, and Sternberg 2016).

As already mentioned, the Renewable Energy Directive defines sustainability criteria for biofuels and bioliquids. For biofuels, corresponding criteria are further stipulated in the Fuel Quality Directive[3]. They apply to biofuels/bioliquids produced in the EU as well as to imported ones. Member states are obliged to ensure that the sustainability criteria are met by stakeholders, when biofuels/ bioliquids are taken into account for the purposes listed in the Renewable Energy Directive, the Fuel Quality

3 Fuel Quality Directive (FQD), number 2009/30/EC has been published on 23/04/2009 and implemented on 13/05/2009. The legal act can be found under the following link
http://eur- lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32009L0030

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Directive, the Community Guidelines on state aid for environmental protection and the Regulation on CO_2 from passenger cars.

Requirements regarding the feedstock for sustainable biomethane production set out by EU regulation and legislation are only defined in the co-called ILUC directive[4]:

- Limitation of the share of energy from biofuels produced from cereal and other starch-rich crops, sugar- and oil crops and from crops primarily grown for energy purposes on agricultural land to a maximum of 7 % of the final consumption of energy in transport in the member states as off 2020
- Indicative 0.5% target for advanced biofuels[5] as a reference for national targets, which will be set by EU countries in 2017
- Double Counting for biomethane from certain materials (mainly waste & ligno-celluosic/non-food cellulosic biomass)

For what regards the double counting from certain materials there are several differences in the focus countries (table 5).

Table 5: Feedstocks considered for double counting in the focus countries

COUNTRY	Feedstock considered for double counting
ILUC	Mainly waste & ligno-celluosic/non-food cellulosic biomass
GERMANY	Double Counting for biofuels from the following substrates: waste as defined by the "Kreislaufwirtschaftgesetz" (law on lifecycle management), except used cooking fats and oils, residues (raw glycerine, tall oil pitch, wet and dry manure, oils and fats from vegetables), cellulosic non-food material, ligno-cellulosic material
AUSTRIA	Mainly waste & ligno-celluosic/non-food cellulosic biomass
FRANCE	Waste and residues & ligno-celluosic/non-food cellulosic biomass (not applicable to biomethane because it is not recognized as biofuel)
GREAT BRITAIN	Although biofuels from wastes and residues are double counted under the RED when calculating progress towards meeting renewable transport targets, in the UK they do not count twice for the purposes of meeting the UK's overall renewable energy target
HUNGARY	Mainly waste & ligno-celluosic/non-food cellulosic biomass
ITALY	By-products of animal origin not destined to human consumption Classified in Cat.3 and Cat. 2; By-products of farms, breeding, green and forestry waste; By-products from food and agro-industrial activities;

4 officially called "amendments to Renewable Energy Directive (RED) and Fuel Quality Directive (FQD), number DIRECTIVE (EU) 2015/1513"

5 Biofuels produced by *advanced processes from non-food feedstocks (e.g. wastes, agricultural & forestry residues, energy crops, algae). The end product may be equivalent to fuels produced by first generation technology (e.g. ethanol or FAME), or may be a different type of advanced biofuel (such as, BioDME or biokerosene). Generally, these "next generation" biofuels are considered more sustainable as the feedstock and processes used offer greater levels of GHG reduction and do not compete with food crops for land use.(European Biofuels Technology Platform 2016)

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	By-products of wood processing and furniture processing with their components; several annual and perennial herbaceous species (for detail see Table 1.A – LIST OF BY-PRODUCTS, WASTE SYSTEMS USED IN BIOMASS AND BIOGAS in the decree in the ministerial decree 06/07/2012)

Austria and Hungary are the only countries that have adopted, the ILUC Directive without making any additional national specifications. Germany, Great Britain, and Italy have published their own national regulations recognising different types of feedstock for double counting.

Similar to the feedstocks that are recognized for double counting, there are country specific differences regarding the definition of feedstocks that are not being credited in the sense of the national biofuel production quota (table 6).

Table 6: Feedstock not counted for biofuel production quota in the focus countries

COUNTRY	Feedstock not counted for biofuel production quota
GERMANY	Biofuels, which are purposefully produced from animal fats and oils are not accepted to fulfil the biofuel sustainability ordinance; Biomethane from the following materials, which potentially contain animal fats is not excluded from the biofuel sustainability ordinance; the contamination with animal fats and oils is negligible; fats and oils which have been used for cooking in a common practice; certain waste material containing animal fats and oils; separately collected biowaste; Biomethane partly produced from substrates containing animal fats and oils (except the cases as described above) and partly containing vegetable substrates are completely excluded from the biofuel quota
AUSTRIA	Following feedstock will be not counted as sustainable for biofuel production: • biomass from areas which are protected by conservation laws besides those feedstock where the laws directly indicate the need of use of the growth • land which is converted for agricultural use after 01.01.2008
FRANCE	Soon an amendment of the regulation of substrates will be implemented (presumably in May 2016), which determines the general use of substrates for biogas respectively biomethane production aiming to guarantee a sustainable use of raw materials in the biogas/biomethane sector. Among others it specifies that the use of energy crops needs to be limited to 15% (in tonnage) over a year or over three years on a sliding scale (this is yet to be determined). An exception will be possible for energy crops coming from contaminated soils and which have not been put on the food market for sanitary reasons. Further, intermediate or so-called catch crops will be authorized
GREAT BRITAIN	There are no restrictions in terms of feedstocks as long as these are sustainable i.e. meet GHG emission and land criteria. Future restrictions or reductions may be placed by the Government on payments for biomethane made from feedstocks that are not wastes or residues (e.g. from energy crops). DECC consulted on these changes

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	during March and April 2016 and changes may come into effect in Spring 2017
HUNGARY	Not regulated
ITALY	The article. 8, paragraph 9 of biomethane decree provides that, pending the entry into force of the European regulations for the specific quality of biomethane for transport and of technical specifications for the injection of biomethane in the grid, to be issued by CEN TC 408 in the implementation of the mandate M / 475 EC, in order to protect the health of populations and ensure the optimal functioning of motor vehicles, are permitted only the injection into the natural gas network of biomethane produced from biogas resulting from the anaerobic digestion of organic products, by-products and the organic fraction of waste for recycling (MSW). Therefore, is not allowed to inject into the natural gas grid the biomethane derived from biogas produced by thermochemical (gas pyrogasification processes), landfill gas, residual gases from purification processes and fermentation of sludge and other waste from MSW. it is important to underline that in the above mentioned decree the meaning of grid is broad so it includes natural gas grid, private grid, CNG trucks and filling stations

In Great Britain and Hungary there are no restrictions regarding feedstocks that are not allowed for being credited to the biofuel production quota. France actually intends to pass a new regulation, which includes a list of raw materials that are not allowed as feedstock with regard to the biofuel quota. Austria, Germany, and Italy have published their own national lists of feedstocks that, when used for producing biofuels, are not being credited to the respective quota.

These requirements mainly address a favoured use of advanced biofuels in order to minimize the biofuel production from crops, grown primarily for energy purposes on existing agricultural land, which could also be used for the production of food and feed.

A challenge in that context is the absence of a harmonised European waste and residues product list. Consequently, the definition of a product as waste, residue or as material eligible for double-counting and the request for specific verification procedures is within the responsibility of the individual EU member state.

Further information on the sustainable feedstock supply for biomethane production can be found in BIOSURF's report "Report on current and future sustainable biomass supply for biomethane production" (D4.2) (Sternberg et al. 2016).

Besides the adoption of mandatory European regulations into national law, some member states have additionally defined their own specific sustainability criteria that are relevant for biogas respectively biomethane production. To analyse and evaluate these national conditions in the selected BIOSURF countries will be the main focus of the following chapter.

The following table summarises, if the BIOSURF partner's countries have adopted the European specifications regarding sustainability criteria for biomethane that is not only used as biofuel but also for heat and electricity generation.

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Table 7: Existence of sustainability criteria for biomethane used as biofuel for transport and for electricity and heat generation in the focus countries

	Sustainability criteria for biomethane as	
COUNTRY	**BIOFUEL**	**ELECTRICITY/ HEAT**
GERMANY	YES	YES
AUSTRIA	YES	NO
FRANCE	NO	NO
GREAT BRITAIN	YES	YES
HUNGARY	YES	NO
ITALY	YES	NO

Only Germany and Great Britain have published their national regulations that include sustainability criteria for biomethane used as biofuel as well as for electricity and/or heat generation. Austria, Hungary and Italy have to respect sustainability criteria only when they use biomethane as biofuel. In France, biomethane is not considered as biofuel. In consequence the sustainability criteria defined in the RED and FQD neither have to be respected for biomethane used as biofuel nor for biomethane used for electricity and /or heat generation.

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3. Analysis and Evaluation of sustainability standards relevant for biomethane production and their practical implementation in selected European countries

With Directive 2009/28/EC (RED), the European Union has defined sustainability requirements for bioliquids and biofuels produced from biomass. These apply for operations along the entire production, processing and supply chain. All operations engaged in the production and supply chain of biomass (for the energy sector) have to comply with these defined requirements. They may use one of the voluntary schemes recognised by the EC to verify the production of the biofuels in accordance to the defined requirements[6] (Grope, Scholwin, and Sternberg 2016). More information about sustainability verification and certification schemes in the biomethane sector can be found in BIOSURF's report "Benchmark and gap analysis of C&I" (D4.3).

This chapter will shortly describe to what extent the afore mentioned sustainability requirements are transposed into national law and how the county-specific practical implementation and possible incentives look like. Again the focus will be on the six countries represented in the BIOSURF project.

The chapter will further provide a short evaluation of the implemented sustainability management practices in the respective countries.

The representatives of national biogas associations that participate and collaborate in the BIOSURF project share their experiences by providing analytical comments and evaluations of the national situations regarding quality and completeness of the implemented sustainability measure, their compliance with the RED, and partly also by comparing it to other countries, resulting in recommendations for further improvements.

3.1 Analysis of the sustainability standards relevant for biomethane production in Austria

3.1.1 Current Sustainability regulations and management practices in Austria

Green Electricity:

Renewable electricity production is regulated under the Austrian Green Electricity act (Ökostromgesetz) where, each year, the Ministry of Commerce publishes Feed-in Tariffs for renewable electricity, called Green Electricity Feed in Tariff Ordinance (Ökostromeinspeisetarifverordnung). Additionally, there are feed in tariffs for biogas which was

6 One scheme (Biograce) is also relevant to biomethane, but is a ,'non-typical' scheme. 'Non-typical' schemes may have different forms such as maps showing that certain geographical areas are compliant or not compliant with the criteria, calculation tools for assessment of greenhouse gas savings or regional agricultural greenhouse gas values associated with a particular feedstock. [COM 2010] Some of the other schemes could also handle biomethane but - according to the Information available - they have not been Involved with biomethane yet.

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upgraded and fed into public gas grid before application in a high efficient CHP station. The Green electricity Act sets no requirements on sustainability for feedstocks used for electricity production from biogas. It only makes a differentiation in feed in tariffs between agricultural feedstock and non-agricultural feedstock. Sustainability criteria will be introduced within the next bigger amendment of the Green Electricity act.

Heating and cooling:

There are no sustainability criteria in force for the use for heating/cooling only. The ordinance for agricultural raw materials for biofuels explicit applies to biofuels for the transport sector and liquid biofuels for heating/cooling but not for biomethane.

Transport fuel:

There are two laws through which the production of biofuels for the transport sector are regulated (besides permission for the plant and grid access etc.).

1) Act on agricultural raw materials for biofuels

In reference to the chapter 3.1.1 of the RED, Austria introduced the Act on agricultural raw materials for biofuels (Ausgangsstoffe für Biokraftstoffe und flüssige Biobrennstoffe) in 2010.

According to this Act, all agricultural crops that come from areas that have already been in agricultural use before 2008 and that have not been declared as nature conservation sites, can be considered as being sustainable. However, if the feedstock comes from maintenance work carried out at nature conversation sites, then this biomass is also regarded as being sustainable.

The production of biomass feedstock for biofuels has to be registered through the AMA (Agrarmarkt Austria www.ama.at). The registration is regulated also in the Act on agricultural raw materials for biofuels and can be done electronically.[7]

The Act on agricultural raw materials for biofuels also includes an article that defines the recognition of certified raw materials from other countries (article 5): in this context, the sustainability certification systems from Germany, Hungary, Slovenia and Czech Republic are recognized. The acceptance of foreign certification systems is also regulated by the Agrarmarkt Austria (Grope, Scholwin, and Sternberg 2016).

2) Transport fuel ordinance

The transport fuel ordinance regulates primarily the quality of transport fuel, additionally the requirements for GHG mitigation and minimum percentage of biofuels in the transport sector. For the latter also requirements on GHG mitigation and counting are included. These points are directly linked to RED.

7 http://www.ama.at/Portal.Node/ama/public?gentics.am=PCP&p.contentid=10007.131695

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Each biofuel producer needs to be registered under the federal environment agency GmbH (Umweltbundesamt GmbH) and are allowed issue sustainability certificates if following points are reached:

- Agricultural feedstock has to fulfil requirements of the ordinance for agricultural raw material for biofuels
- Federal environment agency GmbH (Umweltbundesamt GmbH) has to issue certificates for all other feedstocks. This certificate includes specific description of used feedstock.

The registration can be done electronically (http://www.umweltbundesamt.at/umweltsituation/verkehr/elna/elna_registrierung/). If biofuels come from other member states the federal environmental agency has to recognize them if those certificates are also recognized by the responsible organization from the original member state.

3.1.2 Analysis and Evaluation of the situation in Austria

The transport fuel ordinance was developed for liquid fuels and, later on, has been adopted for additional purposes. This is to say that gaseous fuels and particularly biomethane used as transport fuel are not well included (similar to the RED).

Having a look on registration efforts, this becomes directly obvious. Austrian biomethane producers who want to get credits for the productions of biofuels, need to be registered under the transport fuel ordinance (carried out by the Umweltbundesamt GmbH). In case they use agricultural feedstock, they have additionally to register in the context of the Act on agricultural raw materials for biofuels.

The achievement of the biofuel quota is indirectly regulated by a tax differentiation in the law for taxation of transport fuels (Mineralölsteuergesetz). This law defines different tax rates for gasoline and diesel depending on their direct blend with biofuels. As this can technically only be done with liquid biofuels, it is not applicable for biomethane. Biomethane gets only tax exemption if it is not blended with natural gas before application.

So far no biomethane producer has registered under the ordinance for transport fuels.

3.2 Analysis of the sustainability standards relevant for biomethane production in France

3.2.1 Current Sustainability regulations and management practices in France

Anaerobic digestion (AD) is fully regulated by national legislation: there are specific feed-in tariffs for electricity and biomethane and furthermore, AD plants are under the scope of the legislation focusing on installations classified under environmental protection (ICPE). Most French environmental laws have been revised since 2011. These amendments demonstrate a strong commitment to energy transition in France but also the increasing amount of EU legislation that has gradually been adopted by the respective national legislative framework.

Different support measures have been determined for biomethane production: tax exemptions, feed-in-tariffs and premiums, subsidies. The feed-in-tariffs depend on the size of the installation and the

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feedstock used: the tariffs decrease with the size, and there are different premiums according to the substrate mix. The higher premium goes to agricultural residues, manure, intermediate crops and waste from food industries. The lowest premium goes to the use of biowaste (city waste and catering waste). The recovery of biowaste is now compulsory for those who produce more than 10 tons of biowaste per year, anaerobic digestion being one of the main recovery options (with composting).

In France, at the moment, there is no separated counting of the raw material quality used for biomethane production. This is due to the fact that biomethane is not yet counted as biofuel in France. This has a direct impact on the taxation applied to biomethane, since it is not admissible to the favourable taxation applied to biofuels. Furthermore, biomethane is subject to the same taxation as fossil energy. A different tax is applied to injected biomethane ("TICGN") and bioNGV[8] ("TICPE"), which is nevertheless similar to the corresponding fossil fuels: natural gas and NGV.

Another main characteristic of French incentives for biomethane production is the difference in the value of the guarantee of origin recovered by the supplier depending on the final use: the supplier obtains 25% of the value of the Guarantee of Origin (GoO) after sale whereas 75% goes to the state. Alternatively, when used as biofuel (bioNGV), 100% of its value can be recovered. On the other hand, there is obviously no additional feed-in tariff for biomethane, when it is used as transport biofuel instead of using it for grid injection.

At present, biomethane is not included into the French biofuel production report to the European Commission, since it is not handled administratively (in the spirit of RED and FQD) as a biofuel and it doesn't represent a high volume (only 17 sites injecting presently).

Soon an amendment of the regulation of substrates will be implemented (presumably in May 2016), which determines the general use of substrates for biogas respectively biomethane production aiming to guarantee a sustainable use of raw materials in the biogas/ biomethane sector. Among others, it specifies that the use of energy crops needs to be limited to 15% (in tonnage) over a year or over three years on a sliding scale (this is yet to be determined). An exception will be possible for energy crops coming from contaminated soils and which have not been put on the food market for sanitary reasons. Further, intermediate or so-called catch crops will be authorized.

The public agency for the environment currently sets criteria for subsidies such as the distance of the feedstock (90% coming from less than 50 km), the kind of feedstock used (less than 25% of energy crops), the kind of recovery, etc. The energy efficiency of biomethane production projects must be over 80% (compared to 55% for electricity production). Priority is given to projects treating waste usually destined to landfills, incineration or spreading.

3.2.2 Analysis and Evaluation of the situation in France

Biomethane benefits from various incentives: a feed-in-tariff for injected biomethane (but not for non-injected biomethane), a complementary revenue for gas suppliers for the sale of guarantees of origin

8 BioNGV is biomethane used as vehicle fuel

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(100% in case of injected biomethane used as a fuel, 25% for injected biomethane not used as a fuel), tax exemptions (for on-farm installations), subsidies, etc. One of the strongest requests of French stakeholders is to allow non-injected biomethane to benefit from a feed-in-tariff and guarantees of origin, like injected biomethane.

There is a clear political signal in favour of injected biomethane.

Nevertheless, biomethane would benefit from stronger incentives, especially a more favourable taxation. Biomethane is subject to the same taxation as fossil energy. Proposals have been drafted by stakeholders to make a distinction between fossil and non-fossil fuel and to make the respective calculations from “pump to wheel” and not from “well to wheel”.

There is no specific criteria for sustainability of biomethane used as a biofuel as defined in the RED, and no specific criteria in relation to biomass used for generating electricity, heating/cooling – similarly to biofuels, as recommended by the European Commission.

Biomethane is not included into the French biofuel production report to the European Commission, since it is not handled administratively (in the spirit of RED and FQD) as a biofuel and it doesn’t represent a high volume (only 17 sites injecting presently). Hence, it does not benefit from the favourable taxation applicable to biofuels responding to the sustainability criteria. Indeed, distribution of biofuels allows the fuel supplier to benefit from a reduced taxation - the reduction being proportional to the share of biofuels in the total fuel amount (until 7% for petrol and 7.7% for gasoil). The grid operators (GRDF) and stakeholders are actively working on the integration of biomethane in the calculation of achieving RED biofuel targets and also on a certificate scheme for biomethane production, in order for fuel suppliers to benefit from the tax reduction.

The number of biomethane production projects has dramatically increased over the past months (nearly 60 projects currently in development), which makes it harder to justify that biomethane is not recognised as a biofuel and does not contribute to the RED biofuel targets.

Moreover, other countries such as UK and Germany have included biomethane used as a biofuel into the RED biofuel targets, and have implemented the sustainability criteria.

Finally, the upcoming regulation on substrates should limit the use of energy crops to 15% (in tonnage) over a year or over three years on a sliding scale (this is yet to be determined), with a possible exception for energy crops coming from contaminated soils and which have not been put on the food market for sanitary reasons. Further, intermediate or so-called catch crops will be authorized. This is in line with the French biomethane production model, which is mostly based on the use of waste and manure.

This limitation should not compromise the development of biomethane in France, provided that the support (feed-in-tariffs, subsidies) for biomethane production, mostly based on waste and manure, is sufficient. There are upsides and downsides to the use of both waste and crops. The downsides of the use of waste is the transportation cost (unlike crops which do not need to be transported when they are produced on-site), and the cost of the treatment of the waste. Projects based on a mix of feedstock have to face a more complex process and treatment costs. On the other hand, when using waste instead of energy crops, the producer does not support costs linked to the production and treatment of crops. All in all, we could say that energy crops represent a higher production cost and waste represents a higher transportation and treatment cost. The final balance is never the same and depends on the project and its characteristics (processes, crop production costs, distance from waste resources, etc.). Nevertheless, the 15% limitation on the use of crops is consistent with the

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civil society's will to have a waste and manure-based biomethane production not competing with food crops.

3.3 Analysis of the sustainability standards relevant for biomethane production in Germany

3.3.1 Current Sustainability regulations and management practices in Germany

The basis for the production of sustainable biomethane in the fuel sector in Germany are the laws and regulations which represent the implementation of RED (Biofuel Quota Act, Biofuel Sustainability Ordinance, and Ordinance for Implementing the provisions of the Biofuels Quota). The main focus is ensuring a high GHG avoidance and, since biomethane basically causes a high GHG avoidance, achieving the set targets is quite possible.

In Germany, management practices concerning compliance with sustainability standards for biomethane differ between biomethane which is used as biofuel for transport and as biofuel for generating electricity and/or heat or cold.

If biomethane is used as biofuel for transport and is taken into account for the biofuel quota, the registration at the database **Nabisy** (Nachhaltige Biomasse System) is obligatory. Nabisy is managed by the federal office for agriculture and food (BLE - Bundesanstalt für Landwirtschaft und Ernährung) an agency of the federal ministry of food and agriculture.

All rules, including the sustainability criteria, for the certification of sustainable biomass used for the production of transport fuel are defined in the biofuel sustainability ordinance and the ordinance for implementing the provisions of the biofuels quota. Furthermore, sustainability certification of biomethane is also being recognised by two voluntary certification systems: REDcert and ISCC. Furthermore, the BLE defines the accepted certification bodies, such as TÜV Süd.[9] and the rules for the documentation of the fulfilment of the sustainability criteria in detail[10]. More information on that topic can be found in the report "Benchmark and gap analysis of C&I" (Grope, Scholwin, and Sternberg 2016):

Biomethane, which is not being used as biofuel for transport,(but used for generating electricity and/or heat), needs to prove the fulfilment of certain sustainability criteria, especially when being used for renewable electricity generation as defined in the Renewable Sources Energy Act (EEG), which is associated with receiving subsidies under certain condition, or for generating heat in order to be taken into account to fulfil the requirements of the Act on the Promotion of Renewable Energies in Heat Sector (EEWärmeG) (Grope, Scholwin, and Sternberg 2016).

9 A list of the actually accepted certification systems and companies can be downloaded under the following link:
http://www.ble.de/SharedDocs/Downloads/02_Kontrolle/05_NachhaltigeBiomasseerzeugung/Anerkennung_de.pdf?__blob=publicationFile

10 The rules are described (only in German) under the following link:
http://www.ble.de/SharedDocs/Downloads/02_Kontrolle/05_NachhaltigeBiomasseerzeugung/LeitfadenNachhaltigeBiomasseherstellung.pdf;jsessionid=F22DA725786492C9685B593E8A797028.1_cid325?__blob=publicationFile

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An accredited environmental auditor[11] monitors and certifies the biomethane production. The certificate can be directly handed to an end-user of the biomethane (e.g. CHP operator). Alternatively, a voluntary registry, like the "*biogasregister*", operated by the German energy agency, can be used to pass on the verified certificate between the different stakeholders. It is not mandatory to make use of the registries in case of a bilateral exchange (only between the producer and the end user of the biomethane). Only in case of trading biomethane between more stakeholders (not bilateral), using a registry becomes mandatory in order to fulfil the requirements on mass balancing of the traded biomethane (Grope, Scholwin, and Sternberg 2016).

Germany has implemented a GHG saving based calculation of the biofuel quota instead of energy based quota. It came into force 1 January 2015. The GHG savings can be calculated based on the methodology as defined in the RED and FQD. Biofuels made of animal fats and oils are not accepted for the biofuel quota.

Ordinance for implementing the provisions of the Biofuels Quota: **Double Counting for biofuels from the following substrates:**

- waste as defined by the "Kreislaufwirtschaftgesetz" (law on lifecycle management), except fats and oils used for cooking
- residues (raw glycerine, tall oil pitch, wet and dry manure, oils and fats from vegetables)
- cellulosic non-food material
- ligno-cellulosic material

3.3.2 Analysis and Evaluation of the situation in Germany

A practical problem is that RED and therefore also the resulting national rules are designed for liquid biofuels.

Since default values for calculating GHG savings in case of using biomethane as biofuel only exist for three categories of substrates (organic fraction of municipal waste, liquid slurry and dry manure), as indicated in the RED and the COM 2010/C 160/01, the administrative efforts for determining the GHG savings of biomethane from other substrates are very high. For other substrates which are widely used in Germany, such as maize, whole crop silage and grass silage, these standards do not yet exist and must be calculated individually by the operator of the plant, which is associated with considerable efforts. For the calculation, for example, the entire cultivation process of the biomass must be considered (fertilization, plant protection, fuel use ...).

To make matters even worse, the production of biomethane is a multi-input process in which various substrates are mixed in the fermenter and processed into fuel.

11 A list of accredited environmental auditors can be found under the following link: http://www.biogasregister.de/fileadmin/biogasregister/media/Auditoren_und_Hinweise_Gutachten/Liste_der_registrierten_Pruefunternehmen_und_Auditoren_160210.pdf

The DAU (Deutsche Akkreditierungs- und Zulassungsgesellschaft für Umweltgutachter mbH is responsible for the accreditation and control of the environmental auditors.

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The issue makes mass balancing very complicated when we take into consideration that the necessity of mass balancing arises already with the trade of raw biogas that has been produced from raw materials with different qualities regarding their GHG emission characteristics.

The above mentioned separation could cause a very complicated situation in case of injecting the upgraded biogas (biomethane) into the natural gas grid: the total volume of biomethane produced in a given installation (and subsequently injected into the natural gas network) has to be split into as many separate consignments as the number raw materials with different GHG characteristics that have been used for its production.

The complexity of probing the GHG reductions from biomethane also represents a challenge for the national systems (as RedCert), since the examination of the respective plausibility extensively fails. In updating RED, it is an urgent need to expand the standard values and to align the calculation methods for biomethane. Only then, Germany can reduce administrative burdens in the national implementation.

Positively solved in Germany is the examination of compliance to the other sustainability criteria of RED for growing biomass. In a self-declaration from the farmers, the compliance with the requirements is confirmed through cross-compliance. Overall, the rules represent high standards, which ensures a positive climate and environmental impact.

If electricity and/or heat are produced from biomethane, other regulations regarding the sustainability are relevant. Above all, the Renewable Energy Sources Act (EEG), which formulates allowable emissions for biogas upgrading and specifications for gas-tight storage tanks. Since these requirements were known before the construction of the plant, these are well implemented. Only in the area of gas-tight storage tanks conflicts exist since the regulations in the EEG are not always consistent with the regulations in licensing law. It could also be problematic, if newer versions of EEG demand higher requirements retroactive.

Regarding the input materials, the Ordinance on the Generation of Electricity from Biomass and specifications in the Renewable Energy Sources Act are relevant. The compliance with these requirements has proved to be possible to implement. Even the restrictions for maize cultivation in the RED are usually not a problem.
Larger challenges arise especially when a gas generation plant is replaced with a CHP, since then compliance with the criteria must be re-examined.

3.4 Analysis of the sustainability standards relevant for biomethane production in Great Britain

3.4.1 Current Sustainability regulations and management practices in Great Britain

In the framework of the *Renewable Heat Incentive Scheme Regulations 2011,* the biogas/ biomethane plant operators need to provide a declaration of feedstock at the point of commissioning. This will also show the feedstock volumes used.

In the framework of *The Renewable Heat Incentive Scheme (Amendment) Regulations 2015,* a biogas/ biomethane plant operator can use voluntary schemes or collect evidence to demonstrate

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land use involved in biogas/ biomethane feedstock production. This is reviewed as part of annual sustainability audit.

Installations with a capacity of over $1MW_{th}$ or biomethane installations must report using the actual value method (no default values) on a quarterly basis. In addition, an annual sustainability audit is also required. Heat installations below $1MW_{th}$ can report using default values.

In the framework of *The Renewable Transport Fuel Obligation (Amendment Order) 2011/2012,* suppliers submit annual carbon reports and sustainability reports on a monthly basis.

Voluntary schemes can also be used to provide evidence of compliance with the sustainability criteria. As of 1 October 2015, suppliers are also eligible to conduct their own RTFO Biodiversity Audits to demonstrate compliance with the biodiversity criteria.

According to the *Renewables Obligation Order 2013 - England & Wales,* a monthly GHG reporting should be carried out, which is supported by an annual sustainability audit.

Voluntary certification systems recognised by the European Commission (ISCC, RBSvs, NTA 8080, Abengoa, Ensus) are used to verifying the compliance with the sustainability requirements. There are no biomethane specific sustainability criteria regulations in the UK for biomethane used as vehicle fuel (for gaseous biofuel). At present, the only rules are those that already apply to liquid biofuels in accordance with the RED.

3.4.2 Analysis and Evaluation of the situation in Great Britain

There are a number of issues within the methodology for reporting GHG emissions savings specified under the Renewable Heat Incentive (in line with the one specified in the RED). These are problems specific to biogas and biomethane and are outlined below.

Fertiliser value of digestate

Emissions are allocated to co-products based on their energy content. This means that digestate is only recognised for its energy content and not for the GHG saved by displacing mineral fertilisers. In other words this approach downplays considerably the likely contribution from digestate in displacing mineral fertilisers.

Digestate should be appropriately recognised as a valuable resource as it allows most of the nutrients to be returned to the soil, with significant saving in terms of GHG emissions and also has wider benefits for farmers. Energy allocation could be used but without the use of 'latent heat of vaporisation' of the water content within digestate. However a much more sensible approach would be to look at the displaced emissions of the NPK quantities within the digestate.

Averaging of consignments

The UK Government is very strict on the interpretation of the consignment approach. Operators are currently required to report sustainability information on a per consignment basis. This is determined by various characteristics such as biomass type and form, country of origin, classification of fuel and compliance with the land criteria. Where consignments are mixed, operators need to implement a system that tracks individual consignments and the associated sustainability information. In practice it is very difficult to trace consignments through an AD facility.

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In addition, it is not possible to average savings between consignments of biogas and biomethane from wastes and non-wastes (crops). This means there is no way to hedge against the risk that a specific crop consignment fails to pass the GHG criteria due to factors outside the control of the AD operator or its supplier e.g. a particularly low crop yield due to poor weather conditions. As a result, there is no incentive to maximise the use of wastes or residues to manage uncertainties around GHG savings from crops. Being able to average between consignments would help and would encourage the use of wastes and residues. As stated by the EC's Joint Research Centre (JRC), 'the use of manure in combination with maize is essential to achieve GHG savings higher than 70%'[12]. Policies are required to encourage wastes to be mixed with crops so greater GHG savings are attainable.

The EC working document published in July 2014 recognises that on biogas/biomethane, GHG savings appear to be understated if the consignment/mass balance approach is applied strictly. More guidance should be provided to Member States on how the consignment/mass balance approach should be implemented and this should enable averaging out of consignments of biogas/biomethane from different feedstocks (e.g. wastes and non-wastes).

Nitrogen inhibitors and precision farming techniques

The current methodology used to calculate GHG emissions under the sustainability criteria under the RHI, in line with the RED methodology, applies the IPCC methodology for N2O emissions from soil to calculate emissions from the use of Nitrogen fertilisers. There is no apparent recognition of different farming techniques that are utilised to reduce soil carbon loss, or reduce N2O emissions from soil. Precision farming also allows for savings of farming inputs and improved soil carbon and quality. These should therefore be recognised in the methodology to incentivise the lower impact cultivation of feedstocks.

Fossil fuel comparator

GHG savings are calculated by using a fossil fuel comparator value. For biomethane this is currently EU heat. Because the fossil fuel comparator used is for heat much cleaner than in the case of electricity (the latter is significantly more carbon intensive), GHG emission savings for biomethane are much harder to achieve than for biogas used to generate electricity, notwithstanding biomethane is a more efficient use of biogas.

Once biomethane has been injected into the grid, the gas could be used for power, transport, or heat, so considerations should be given on whether the average end-use of gas should be taken as a comparator or whether another more appropriate comparator should be used, so that there is a level playing field with other end use applications.

With reference to the requirements of the Renewable Transport Fuel Obligation (RTFO) it can further be stated that currently no or only very small amounts of biomethane is currently going to transport in the UK under the RTFOs, so it is hard to make an evaluation on whether the criteria are reasonable or not.

12 http://iet.jrc.ec.europa.eu/bf-ca/sites/bf-ca/files/files/documents/eur26696_online_final_v3.pdf

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Sustainability criteria defined under the Renewable Obligation Order on the other hand are mainly relevant to biogas plants, and not to plants that produce and inject biomethane into the grid, as most biomethane plants are supported through the Renewable Heat Incentive.

3.5 Analysis of the sustainability standards relevant for biomethane production in Hungary

3.5.1 Current Sustainability regulations and management practices in Hungary

The Government Decree 343/2010 on regulating the implementation of Law CXVII (2010) introduces the mandatory registration scheme operated by the nominated government body but also allows for sustainability verification by voluntary schemes (in accordance with the RED). Nevertheless, consignments with sustainability verification done by a voluntary scheme must also be registered at the "BÜHG" (body appointed by the government for maintaining the GHG emission register for biofuels) (Grope, Scholwin, and Sternberg 2016).

The Hungarian Law XXIX. (2011) about the modification of the Electricity Law (LXXXVI. 2007) corresponds to Directive 2009/28/EC, regulates the issuance of „green" certificates, respectively Certificates of Origin by the Hungarian Energy Agency for confirming the volumes of electricity generated from renewable sources but does not make these Certificates of Origin conditional on meeting sustainability criteria in relation to the biomass used.

ISCC is offering its sustainability documentation system (as one of the EC recognised voluntary schemes) but does not carry out verification with own staff, instead it relies on the services by Bureau Veritas - as an independent auditor (Grope, Scholwin, and Sternberg 2016).

Regarding the requirements for sustainable farm management and the protection of soil, water and air, the EC refers to the standards for good agricultural and environmental conditions as defined in COUNCIL REGULATION (EC) No 73/2009 - "common rules for direct support schemes for farmers", also known as 'cross compliance'. These have to be fulfilled for all biofuels and bioliquids under the RED and FQD (Grope, Scholwin, and Sternberg 2016).

In Hungary, these EU regulations are fully followed for the production of liquid biofuels. However, they are not applied in relation to the existing biomethane production: the biomethane produced in Hungary is not reported, but is directly consumed in Hungary (Grope, Scholwin, and Sternberg 2016).

In Hungary, there are very strict requirements regarding placing the digestate on agricultural land but these are not linked to receiving the feed-in-tariff for generated electricity. Biogas plants not meeting these requirements can be shut-down by the environmental authorities as long as the failure is not corrected.

The above mentioned requirements are valid for all biogas plants independently whether they upgrade biogas to biomethane or not.

3.5.2 Analysis and Evaluation of the situation in Hungary

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Relevance of GHG saving requirements for biomethane from certain substrates

As in reported from other countries (e.g. UK and Germany) the missing default values for other substrates than manure, slurry and waste complicates the calculation of GHG savings for biomethane used as biofuel in the transport sector considerably. Consequently this will limit the potential of biomethane production from other substrates then the ones coming with default values, because of the very high administrative and therefore economic effort. Naturally this also influences the mass balancing of produced and traded biogas/ biomethane and will consequently also effect potential cross border trade.

This will also cause a problem for future biomethane producers in Hungary. Currently, this is not a problem for the only Hungarian biomethane producer, since nearly all production is based on processing a single substrate (sugar beet press residue). However, this would cause serious problems for any new biomethane plant processing a number of different substrates.

Requirements regarding the feedstock for sustainable biomethane production set out by EU regulation and legislation are only defined in the co-called ILUC directive[13] (Grope, Scholwin, and Sternberg 2016):

Some member states have defined additional requirements regarding the used feedstock for biomethane production. That is not the case for Hungary, i.e. for instance the processing of energy crops in biogas plants is not limited by regulations – however, in practice it is limited due to national feasibility considerations.

3.6 Analysis of the sustainability standards relevant for biomethane production in Italy

3.6.1 Current Sustainability regulations and management practices in Italy

The RT 31- Rev.02 sets requirements for the accreditation of bodies issuing certificates of conformity in respect of the National System of Certification of the sustainability of biofuels and bioliquids.

UNI/ TS 11567 defines the qualification scheme for all organizations, here called "stakeholders", which operate in the supply chains of production of biomethane and its intermediate products in a sustainable manner, as defined by the European and national legislative framework, which guarantee traceability and transparency. The stakeholders who apply the qualification scheme described in the technical specification guarantee that:

- sustainability criteria relating to land are still respected as it is possible to trace the product along the chain of custody
- the allocation of emission saving values per batch is issued in accordance with the criteria indicated in RED and FQD
- every batch is traceable

13 officially called “amendments to Renewable Energy Directive (RED) and Fuel Quality Directive (FQD), number DIRECTIVE (EU) 2015/1513”

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It also defines the requirements for the implementation of a traceability system that allows meeting the requirements and describes the requirements of the accounting management of the mass balance. It is applicable to both single organisations for the whole qualification of the chain of custody and can also be used for qualifying groups and more subjects at the same time in line with the legislation.

For the good management of the mass balance the operator must establish a system of traceability and operate so that the information about the sustainability characteristics and sizes of the consignments remain assigned to the mixture.

The mass balance must respect these parameters:

- to allow the raw materials with differing sustainability characteristics to be mixed,
- to make sure that the information about the sustainability characteristics and sizes of the consignments (indicated above) remain assigned to the mixture,
- to ensure that the sum of all consignments withdrawn is described as having the same sustainability characteristics, in the same quantities, as the sum of all consignments added to the mixture.

Additional national requirements regarding the feedstock:

In addition to decreasing the sizes of plants, the Ministerial Decree 2012 also stipulates that the share of silage used in the substrate mix for anaerobic digestion plants has to be reduced in favour of manure, agro-industrial by-products and waste whose use is more encouraged than the one of dedicated crops. This performance will be repeated in the coming years due to the new decree that encourages a greater use of renewables from manure, waste and by-products. Also with regard to the legislation on biomethane (DM 5 DECEMBER 2015) the use of agro-industrial by-products, manure and waste is favoured by offering a premium on the usual incentive rate. Hence, a sharp increase in the use of these materials for biogas/ biomethane production is expected in the coming years.

3.6.2 Analysis and Evaluation of the situation in Italy

As mentioned earlier, like in Hungary, there is currently no biomethane market in Italy. Still missing regulations and unclear rules impede the beginning of a functioning biomethane market. Consequently, the following considerations are assumptions of what could be the main obstacles for the sustainability based on the current legislation in Italy.

The main problem that is expected in Italy is on the calculation of GHG emissions. As mentioned in previous chapters, in the Renewable Energy Directive, default values for GHG calculation only exist for biomethane from municipal waste, liquid slurry and dry manure. In case biomethane is produced from other and different feedstocks, though, it is not possible to proceed with the simplified and standardised calculation of the emissions. As reported by Germany's stakeholders the administrative effort of calculating the actual GHG emissions of every single feedstock in the substrate mix and from every single producer is too big. There is an urgent need to simplify the process by introducing default values and allowing the averaging of GHG values. In the Italian technical specification units 11567 there is a list of other feedstocks with default values that Italian biomethane producers could use. Even if it is a "step forward" in terms of extending the biogas feedstock portfolio characterised by having defined default values, it is not sufficient. It is necessary that there will be an adequate

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and complete list of default values for GHG calculation for all the feedstocks used by biomethane producers to reduce their administrative efforts.

For what regards the creation of a European market of biomethane, there are some possible problems that could arise.

The Italian regulation for biomethane is very complex and totally based on the final use of the biomethane. There are different rules, feed-in tariffs and different designated authorities for certification and control of the production depending on the use of biomethane: for transport, for power-heat cogeneration or for injection into the grid. At the moment the biomethane producer only has to respect the sustainability criteria defined in the RED when the biomethane is used for transport and it could be very difficult to find a common method to control and certify biomethane also when used for other purposes.

Another possible problem could be the value used as fossil comparator. Since during the last years Italian regulations tend to be very restrictive, Italian stakeholders are concerned that, if the sustainability criteria will be extended to all the biomethane injected into the grid, the value of the fossil comparator might also change from the current value of 83.8 gCO2eq/MJ to a more restrictive one based on the GHG value of natural gas. Consequently it could be more difficult to respect the sustainability requirements.

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4. Conclusion and recommendations

Conclusion

In general, it can be summarised that all of the six analysed countries have transposed the European sustainability regulations that are relevant for the biogas and biomethane sector into respective national law (see chapter 2). However, the 6 countries are quite different in regard to the level of development of a functioning biomethane market. Germany is certainly at the forefront in that respect, but also in France, the UK and Austria, a consistent further increase of biomethane production and its use - and consequently the adaptation of relevant national regulations - can be observed. In those four countries, national specificities, in terms of further sustainability criteria in addition to what is stipulated in the mentioned European regulations, have been identified and are summarised in chapter 2 in table form. Besides, the way of (financially) supporting and promoting this market branch is quite different in those countries (also see the BIOSURF report "Benchmark and gap analysis of C&I", where more specific information on the named countries can be obtained).

Hungary and Italy are a slightly different case since, so far, they don't have a functioning biomethane market.

In both cases the main reason is the confusion created by too many and sometimes inconsistent regulations. Regulatory measures often change hastily and agencies supervising the biogas industry are numerous and their actions are frequently uncoordinated.

The result is that the biogas industry in general and biomethane production in particular are in their infancy in Hungary and Italy. There is a need for further supportive legislative measures, regulations and incentives. The countries have well developed natural gas distribution grid, but the technical standards for biomethane injection to the grid need to be developed.

The GreenGasGrid project revealed yet another problem: The interest and the awareness level of the general public are low in renewables and biogas. This should be elevated in order to gain more widespread public support for the implementation of the relevant technologies (GreenGasGrid 2013).

Additional requirements at national level have mainly been identified concerning the use of feedstock for biomethane production. Particularly in France, limitations have been defined regarding the use of energy crops and, in Germany, regarding the use of corn and cereal grain as well as animal fats and oils when the biomethane is used as transport fuel.

Those additional requirements may in some cases lead to significant burdens for the cross border trade of biomethane across Europe. Further, limiting, penalising or excluding certain feedstock categories (e.g. limits defined by the ILUC directive, double counting of waste and residue based biofuels, exclusion of certain biomass types in France and Germany) obviously has a direct effect on the overall production potential of biomethane. These restrictions might reduce the availability of sustainably produced biomass feedstock for biogas plants considerably. The BIOSURF "Report on current and future sustainable biomass supply for biomethane production" (D4.2) specifically focuses on this aspect. In this report it is stated, for instance, that the exclusive use of waste and residue materials - even considering their still unused potentials - would not be sufficiently available to meet the feedstock needs of the existing and additional future biogas/biomethane plants since they are

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also finite and already have diverse competing uses. Consequently a considerable increase in biogas/biomethane-based energy supply will not be possible when sustainably produced energy crops are not included in the feedstock portfolio (Sternberg et al. 2016). This should be taken into account when imposing respective restrictions without a direct link to (scientifically proven) sustainability requirements.

Regarding sustainability aspects linked to the topics biodiversity, land use change, farm management and the protection of soil, water and air, no additional requirements could be identified by analysing the relevant national regulations of the six partner countries. All national regulations regarding these topics seem to refer to the definitions of the European legislation-mainly the ones defined by the RED. An exemption in that regard is, in some member states, only the treatment and use of digestate.

Recommendations

This and previous BIOSURF reports have revealed that most of the problems and constraints that arise related to compliance with the stipulated sustainability criteria for biomethane production originate fromthe greenhouse gas (GHG) saving requirementsand their calculation respectively.

In accordance with the prevailing EU regulations (in particular in reference to COM 2010/C 160/01[14]), the raw materials used for biogas production have different values regarding their greenhouse gas emissions depending on many different aspects (for more information please refer to the previous BIOSURF reports[15]). When using a substrate mix as feedstock for biogas/ biomethane production, every single included raw material from every single feedstock producer needs to be considered separately. It is not allowed to average the values when calculating the GHG emissions in order to show compliance with the sustainability requirements. Only substrates can be averaged if they have an officially allocated default value. However at European level, that is only the case for three categories of substrates: the organic fraction of municipal waste, liquid slurry and dry manure, as indicated in the RED and the COM 2010/C 160/01. This results in tremendous administrative efforts when determining the GHG savings of biomethane produced from other substrates (e.g. energy crops). It has been reported by German and British stakeholders, that this issue limits the potential of biomethane production from other substrates then the ones, coming with default values, because of very high administrative and therefore economic efforts.

These conditions make mass balancing very complicated when we take into consideration that the necessity of mass balancing arises already at the production of raw biogas – where usually a substrate mix (i.e. different GHG values) is used as feedstock (also see the BIOSURF report D.3.2*Proposal on cross-border biomethane administration).*

The above mentioned separation could cause a very complicated situation in case of injecting the upgraded biogas (biomethane) into the natural gas grid: the total volume of biomethane produced in a given installation (and subsequently injected into the natural gas network) has to be split into as

[14] Communication from the Commission on voluntary schemes and default values in the EU biofuels and bioliquids sustainability scheme, 2010; http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:2010:160:0001:0007:EN:PDF

[15] Report on current and future sustainable biomass supply for biomethane production; Benchmark and gap analysis of C&I

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many separate consignments as the number of biogas raw materials with different GHG characteristics. It cannot be expected that the future European biomethane trading system can handle the above outlined situation for thousands of biomethane producing units in a cost effective and transparent manner, the administrative burden would be not acceptable for the operators (Grope, Scholwin, and Sternberg 2016).

Even the admission by EU regulations to use only a single GHG value when using a substrate mix does not have the positive effect that is needed. The reason is that only the worst, i.e. highest, GHG value of all the used feedstock types can be used for any further calculations. This may simplify administrative burdens, but it does not motivate the plant operators to process an increasing amount of substrates with low GHG emission values, since if they already use one feedstock with a high GHG emission value (for example energy crops) in their substrate mix, this value will be applied for the whole biogas production. Instead, being able to average the consignments of different substrates would help and would encourage the use of wastes and residues.

Cross border biomethane trade is getting more complicated, the more country specific criteria (in addition to the ones, defined by the EC for biofuels) regarding biomethane quality exist. This can become a significant hurdle, if national authorities do not trust in verification procedures, which are applied in other countries in order to verify these criteria. This problem of course does only exist for sustainability criteria, which the countries define in addition to the ones defined by the EC, as the latter have to be accepted by every Member State through the recognised voluntary schemes (Grope, Scholwin, and Sternberg 2016).

A solution could be a strict separation of sustainability requirements for biomethane as traded product and for additional aspects relevant for, for instance, the operation of the production plants (including upgrading and injection facilities), the conversion of biomethane into an end product and the treatment of digestate accumulated by the production process (Grope, Scholwin, and Sternberg 2016). These additional requirements like noise, odour emissions, etc. could be defined by every Member State individually and should never be linked to the biomethane use or the subsidies paid for it. As the BIOSURF report "Benchmark and gap analysis of C&I" (D4.3) has revealed, an existing gap with regard to this proposal are the missing mandatory sustainability criteria for gaseous biomass, particularly when using biomethane for the generation of electricity and/or heat, for all member states (Grope, Scholwin, and Sternberg 2016). This is an important prerequisite for implementing the suggested measures regarding the sustainability certification of biomethane.

If those would exist, member states would and should neither define additional sustainability criteria regarding biomethane as traded product nor for the biogas production itself, particularly in regard to the biomass supply, but rather sustainability criteria concerning the technical and process relevant requirements associated with biomethane production (e.g. efficiency of the conversion/ upgrading process) and the handling of the digestate.

The exclusion of certain feedstock on a national level also complicates the cross border biomethane trade, as it would lead to different biomethane qualities, which would also affect the international biomethane trade. Besides, it might also be possible that some national authorities do not accept such specific requirements that were imposed in the country of the biomethane's origin. That is yet

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another reason for recommending to define sustainability requirements for biomethane production solely at a European level (Grope, Scholwin, and Sternberg 2016).

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