D3.1 | Comprehensive guidelines for establishing national biomethane registries

Deliverable:	Comprehensive guidelines for establishing national biomethane
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1. PURPOSE OF GUIDELINES

Deliverable 3.1 is be a comprehensive guideline for the establishment of national biomethane registries where they don't yet exist in Europe. It describes the structure and operation of a biomethane registry based on the experience of existing European registries.

The major task of a domestic biomethane registry is to generate confirmations for upgraded and injected biogas. This is done through so called Guarantees of Origin (GoO) which serve as a proof of quality and quantity of the produced biomethane volume. The GoO can be freely split in different parts, can be transferred and furthermore cancelled within the registry when final consumption has happened. The registry shall document the final consumption through a registry excerpt handed over to the owner of the biomethane and cancel the GoO in the registry to prevent multiple usage of GoO.

After biomethane is injected into the gas grid, biomethane molecules blend with natural gas molecules and are unable to be traced physically furthermore. GoOs are created for the injected gas and may be transferred to gas suppliers and consumers who are willing to pay a premium to qualify their gas consumption as biomethane based. The biomethane GoO contains all information/documents concerning the injected biomethane volumes. Even when transferred or split into parts the GoO is not separated from its documentation. The intrinsic value of "green gas" may differ depending on the feedstock injected "biomethane" was produced from.

GoOs of biomethane document the production and injection of "green gas". GoOs offer opportunities to market biomethane cross Europe and open the possibility of business cases where biomethane has its role.

The establishment of national biomethane registries in all European member states is the ultimate goal. Biomethane registries are an important tool for the development of a biomethane market as they document upgraded and injected biogas. This document focuses on the establishment and operation of registries. Description of transfer of Guarantees of Origin (GoO) between registries is discussed in a different part of the project. So far, there are some bilateral projects between national registries to facilitate GoO transfer. These bilateral initiatives show already the strong motivation of European registries to create a European biomethane market.

The set-up of already existing biomethane registries in Europe has followed given schemes of national and European legislation. The Austrian biomethane registry for example was inspired by the European CO2 allowances model. AGCS, as the operator of the Austrian registry, has developed its biomethane registry based on the technologies and processes of the CO2 model. The biomethane registry issues GoO for biomethane which can then be transferred and cancelled by registry users (producers, suppliers, consumers, or others). The model separates the attribute "green gas" from all physical elements of the gas chain (commodity, capacity, and transport) and opens the path to a European biomethane market. To raise biomethane from the domestic to the European level it is necessary that standardised interfaces are in place to execute the transfer of biomethane GoOs between European registries.

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Biomethane registries are the key for the development of domestic biomethane market and will lead to a European biomethane market as soon as capability to transfer GoOs between registries is available at the registries. The GoO transfer process has to be a standardized and well defined process. This transfer process must facilitate the transfer of GoOs even if the registries legal framework and the organizational processes and IT-systems are different.

The Mass Balancing Criteria and its interpretation needs a clear definition for the use of biomethane. Under Directive 2009/28/EC Article 18 (1) ("Mass-balance") a mass-balance system is defined as an electronic registry which is used to trace the chain of custody (injection – trade – offtake) of biomethane injected into the natural gas grid. Feed in of biomethane injection is recorded but withdrawal is of course not recordable because there is no second biomethane grid separated from the natural gas grid. The end consumers does not meter two gas offtakes (biomethane and natural gas) on their consumption side. Due to the fact that there is not a separate biomethane grid, GoOs provide the only solution to differentiate between biomethane und natural gas.

The last owner of a GoO should be a gas supplier who provides a mixed product (biomethane + natural gas) or a gas consumer. Suppliers or consumers may only claim volumes of consumed gas to be biomethane volumes equivalent to the GoOs they own.
Guarantees of origin also have an additional value, which reflects the intrinsic value of "green gas". This mark-up reflects the market value for "green gas" and does not necessarily correspond to production costs.

Each European country shall have one national registry or one contact point for the generation and the exchange of GoO. This does not exclude the existence of more than one registry in a country. Existing biomethane registries have contributed to the guideline by providing an overview of their registry and their tasks.

The goal of this document is to provide guidelines for the development and operation of a domestic biomethane registry for organizations/authorities in countries not having established a biomethane registry yet. To set up a registry various preliminary work and objects have to be taken into account from the planning until the Go Live and operation of a biomethane registry. These guidelines provide a recommendation for those actions and processes. The guideline is built up on the knowhow and input from existing biomethane registries partially already cooperating together on European level.

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2. GLOSSARY

1. Guarantee of Origin (GoO)

The Guarantee of Origin is an electronic document of the intrinsic ("Green") value of biomethane. The GoO serves as a proof for the quality and transparent documentation. It includes country specific attributes like injection period, volume, substrate, etc. which are carried with from the generation of the GoO until the decommissioning.

2. Biogas

Biogas is a pre-stage of biomethane. It can be produced out of various sources. The most used process for the generation is anaerobic digestion. Biogas in the sense of this document is the key for the GoO generation. Biogas has a variable amount of properties that are included as attributes in the Guarantee of Origin. As soon as biogas is upgraded to biomethane and injected into the natural gas grid, the generation of GoO can be started.

3. Biomethane

According to D3.2: "Biomethane" is a gaseous biofuel, a blend of gases consisting predominantly of methane produced from biomass with quality corresponding to the national standards valid in the country of production or to the European standard prEN16723-1 (in preparation). Biomethane in sense of this document is upgraded biogas that is blended with natural gas when injected. Biomethane therefore consists of a physical value (natural gas) and an intrinsic value covered by the GoO (Guarantee of Origin).

4. Biomethane registry

A Biomethane Registry is an organization that documents the full chain of custody for the injected biomethane. The registry is operated on a domestic market. The major task is to provide harmonized and transparent documentation of injected biomethane including the variable properties and attributes it brings with during the generation of biogas and the upgrading process. The registry is provider of a platform for market actors to generate, exchange and decommission (in case of use of biomethane) Guarantee of Origin.

5. European National Gas Network

"European natural gas network" is the system operated on the territory of the European Union consisting of the natural gas transmission system (as defined in Article 2.3. of Directive 2009/73/EC) together with the natural gas distribution system as defined in Article 2.5. of Directive 2009/73/EC.

6. Mass Balancing

Mass balancing is the documentation of the mass. Related to biomethane the mass balancing methodology is applied in two ways: a) in the production phase raw materials (substrates) of different quality are balanced with the corresponding biomethane volumes b) in the pipeline transportation phase injected and withdrawn volumes of biomethane (blended with natural gas) are mass balanced.

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7. Decommission / Cancellation

The final usage of biomethane needs a confirmation over the end consumer that the amount biomethane including its properties has been explicitly used for that end consumer and no double counting (multiple usage) can happen. Therefore the biomethane owner has to decommission or cancel the Guarantee of Origin in the biomethane registry. Only by doing that the owner will be granted a confirmation (see Glossary “registry statement / registry excerpt”.

8. registry statement / registry excerpt

The registry statement or registry excerpt is a confirmation of the domestic biomethane registry over decommissioned biomethane. It can be made available to market participants, which are finally using the biomethane (off take from the grid). It serves as a proof to end consumers that the biomethane volume has been taken off the biomethane registry. The confirmation includes the respective attributes of the generated biomethane and is usually available in written form (as pdf or physical document).

9. Balancing group

Balance group means the combination of shippers, wholesalers, retailers and consumers in a virtual group within which incoming energy and outgoing energy are balanced.

10. Market area

Market area means the area covered by the networks of several (transmission and distribution) system operators within which grid users can freely allocate booked entry and exit capacity, supply consumers, input gas volumes into balancing groups or transfer them into other balancing groups. The market area is not a physical entry/exit point but enables grid users to transfer energy from one balancing group to another, within the market area, without the need to book capacity. Traders and grid users can sell and buy in the market area without holding capacity rights. The market area may cover a whole country.

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3. BUSINESS CASES BIOMETHANE

The possible end-use of biomethane does not differ from those for natural gas.
Biomethane is fully miscible in all proportions with its fossil counterpart, and fully interchangeable from the end user's perspective.

Raw biogas may be directly transformed into electricity or upgraded to biomethane and injected into the gas grid. The feeding in of biomethane increases the flexibility dramatically, as this injection allows for the geographical separation of the production and use of biomethane.

Current biogas plants primarily focus on subsidy schemes of power production but rarely provide a heat utilization. Having entered the gas grid, biomethane can be converted into electricity at places where the cogenerated thermal energy can be utilized.

Benefits of biomethane are:

- It may use an already existing gas grid infrastructure
- It substitutes fossil fuels
- It is a weather independent green energy source
- It may provide necessary flexibility in form of control energy
- It does not consume (or if extremely small) control energy in an energy supply system
- It uses waste materials and gives these waste elements a value
- It does not require back up generation like weather dependent power sources
- Biomethane is green energy that can be stored like natural gas
- Biomethane supports the goal of GHG emission reduction
- Biomethane may have its role in the field of energy efficiency.

The process of biomethane generation is a continuous and controllable process versus the production of green energy from photovoltaic and wind. Furthermore the biomethane plants can provide flexibility for the system, be it for the gas or power system, whereas wind and photovoltaic require control energy.

With all the benefits that biomethane offers, the question why it currently does not play a bigger role in the European energy system remains. The benefits of biomethane overtop the risks of low political support: a still unreliable not yet harmonised framework in Europe, risks of increasing feedstock prices, fears of intensification of agriculture. Political support could be won, a framework can be harmonized and price risks can be managed.

Biomethane registries are very important logistic elements of a domestic biomethane system. Such registries allow the exchange of biomethane via GoOs, which is much easier to handle than the physical exchange of biomethane. Thus these registries reduce the complexity of the biomethane market and the GoOs allow the natural gas and biomethane market to merge and create blended products. The GoOs help to simplify and standardize the contractual relationships.

In the European countries the production and use of biomethane is at varying stages. A good framework and harmonisation is necessary to push biomethane development forward.

We can identify several subsidy or market schemes in the field of biomethane like: exemption from tax, feed in tariffs for electricity, or direct feed in tariffs for injection into the grid, feed in tariffs for heat, investment incentives by reduced interest on loans, reduction or exemption of

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grid tariffs, obligation of grid operator to take over connection costs, exemption for penalties for balance energy, quota systems in different applications (biofuels, heat, electricity,….) and so on. The following paragraph describes such cases.

3.1. Market driven business cases

The idea of this paragraph is to describe already implemented market driven business cases and motivate the biomethane and gas industry to be creative.

The following cases are built on the readiness to pay a premium for biomethane compared to natural gas or motivate the use of biomethane through the avoidance of any penalties for not meeting national or state fixed target values for CO2, bio fuel quota, etc.

3.1.1. Labelling

The tagging of the renewable source of energy plays a key role in the European electricity market model. The creation and the transfer of green energy certificates is a common process in Europe. The so called “Labelling” is an established element in the European energy market and has already started to expand into the gas business. Labelling could drive the biomethane market forward. GoOs of biomethane registries could be used for labelling if national regulations permit such labelling.

Using GoOs to blend natural gas with biomethane and create green gas is not yet very common. The GoOs issued by a biomethane registry make such blending possible.

Cost of biomethane production is normally 2 to 3 times higher than the presently low market price for natural gas. Due to this fact only a small biomethane quota as part of gas consumption will be accepted by gas consumers. The quota of the biomethane added to the natural gas depends on the willingness of customers to pay a higher price for their product.

Still, the market to sell biomethane comprises all European gas customers (household, industry, small companies, etc.) with a connection to the European gas grid (100 million export points). We don’t assume the industry to pay a fix “green” premium for gas as this would create distortions of competition. By the way we assume that there are many companies out there who are willing, on a voluntarily basis, to pay a premium to use green gas (biomethane) for their energy supply to reduce the company’s CO2 footprint or accomplish internal sustainability requirements.

3.1.2. Bio fuels

Biomethane as a fuel can be promoted in various ways:

- Mandatory (defined by law) or voluntary (company’s decision) company car pools can promote the usage of biomethane.
- Tax deductions for using biomethane or natural gas cars could motivate buyers.

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- The automotive industry itself has the obligation to go green with its cars continuously. The building of gas vehicles is an option.

All three business cases of bio fuels are targeted towards an increase in gas vehicles in Europe. The increase of gas vehicles escalates the usage of biomethane and could become a self-driving force for biomethane.

National targets for renewable quota of fuels do exist in European countries. The quota is fulfilled by liquid biofuels in most countries. Gaseous biofuels like biomethane play a minor role. The automobile industry has therefore to develop concepts most likely without the support of national governments. For example by buying a gas vehicle with the confirmation to fuel the car with a specific percentage of biomethane over a defined distance (for example 15,000 kilometres) there will be reduction on buying the car or the fuel. The other way would be that by using biomethane for gas vehicles there is no need to pay any fine due to CO2 emission savings when purchasing the car.

3.1.3. Energy efficiency

Biomethane can replace fossil fuels in several applications. If biomethane is not subsidized, its usage could be credited as an action in the field of energy efficiency.

Austria for instance has implemented fines of 200 EUR/MWh in its energy efficiency legislation for those suppliers who don't reach the consumption reduction goal of 0,6% per year. The burden of a reduction of consumption lies on the shoulders of supplier who themselves have to motivate consumers to take measures for a consumption reduction. The penalization of not undertaking energy efficiency measures brings a quite hefty cost to those who don't comply with.

In such economic environment, the usage of biomethane could be accepted and credited as an energy efficiency measure. At a fine of 200 EUR/MWh per legislation, or a market value even at half of this for energy efficiency measures, biomethane could kick in and provide value as a marked driven business case.

3.1.4. Control Energy

The development of renewable power generation has increased over the last decade in Europe. The decentralized generation has also led to the need for more control energy in the electricity system. Control energy covers the gap between production and actual consumption. The demand for control energy will further increase with the instalment of more wind and solar power production units. The provision of control energy is needed to provide security of supply in the gas and electricity market.

The European guidelines for control energy generally distinguish three types of control energy: primary, secondary and tertiary. Due to the stable production of biomethane it can be used for positive (increasing production of electricity) balancing energy or negative balancing energy (reducing production of electricity). Biomethane could provide energy for tertiary and secondary control.

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Providing control energy is a potential additional income source for biomethane producers. The opportunity for biomethane producers in cooperation with a CHP plant to participate in the auction mechanisms for control energy is evident.

The Transmission System Operators (TSO) performs such auction mechanisms, whereas the auction results are published on the TSOs webpages. The balance energy mechanism could be an additional business for biomethane producers and would not influence the generation of GoOs. The generation of GoOs or biofuels is not critical in terms of time, so the biomethane producers can provide balancing energy for specific volumes and times provided.

3.2. Subsidy driven business cases

Subsidisation of biomethane would provide the strongest support for biomethane. Hence, the production costs for biomethane do require in most cases a stakeholder to subsidize the difference between the market price and the production costs. The following business cases are a selection of the subsidisation schemes. The subsidies have to be based on reliable data that should be documented and provided by national biomethane registries.

3.2.1. Biofuels

In addition to the market driven use case, there is also concepts of subsidising biomethane as a fuel. Buying a gas vehicle could be supported by a one-time up-front payment or exemption from tax when buying the car or when fuelling the car. The GoO can document the chain of production and fuelling at biomethane fuel station.

Another option of subsidizing biomethane is the direct payment of injected biomethane into the national gas grid. The biomethane producer is directly supported via a feed in tariff for using biomethane as a biofuel. The subsidy will be paid as soon as the receiver of the subsidy proofs production of biomethane, the injection, the transport to a fuelling station and the usage as fuel.

A good example for biomethane as a fuel is provided by Italy. Italy is one of the first countries to embrace biomethane as a fuel to support sustainable mobility. A biomethane registry and GoOs could support the achievement of national goals.

3.2.2. Electricity production

The versatility of biogas and especially the unbundling of production and consumption was the primary reason for the application of this gaseous product.

Today biogas is produced and directly transformed into electricity at the location of biogas production. The subsidy is paid out for the produced kWh of electricity.

With a GoO system it is possible to inject biomethane into the main gas grid, take off gas from the grid at another point to produce electricity. The GoO transferred and cancelled to electricity

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producer's account in the national biomethane registry proofs the usage of biomethane to the sponsor of the subsidy.

3.2.3. Biomethane Injection

Another way to push the production of biomethane and other downstream technologies is through paying a feed in tariff for the direct injection of biomethane into the main gas grid. The subsidy for directly injected biomethane is the most efficient promotion for the projects developers, investors and producers because feed in tariffs eliminate risks for the plant operator. The market risk is eliminated and only the feedstock risk remains to be managed.

3.2.4. GoOs as a basis of subsidies in different areas

Beside the known subsidy driven business cases, there are individual city/county driven subsidy programs connected with biomethane.

Subsidies may be given for heating of living space with biomethane.

Individual subsidies may be provided for transport vehicles which use biomethane.

The receiver of the subsidy usually has to provide proof of the usage of biomethane (gas supplier). Today either locally established systems with generation of GoO or just individual forms are used. The standardised GoO scheme of a domestic biomethane registry could kick in to support these individual GoO schemes.

Conclusion

Biomethane offers various subsidy and business cases in the fuel, heat and power generation sectors. The applications can be based on a subsidy scheme or market model. These schemes and models rely on transparent and trustful documentation from the biomethane injection till the end usage and have to include the title tracking of GoOs. These tasks should be managed by national biomethane registries established exactly for that purpose. GoOs are the reliable documentation to facilitate the biomethane market.

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4. STATUS QUO OF OF BIOMETHANE IN EUROPE

4.1. Biomethane Status

The upgrading of raw biogas to biomethane is in an early stage of development in Europe. There are about 300 biogas upgrading plants, which is merely 2% of the total number of 14.600 biogas producing installations (including sewage and landfill gas). The majority of the existing biogas plants generated electricity as the main product and not biomethane.

Biomethane is being produced in 15 European countries (AT, CH, DE, DK, ES, FR, FI, HU, IS, IT, LX, NL, NO, SE, UK), the total biogas upgrading capacity is about 1,2 billion m3/year of methane.

The injection of biomethane into the national natural gas network is directly supported in UK, FR, DK and IT in form of fixed feed-in-tariffs or feed-in-premiums (paid above the market price of natural gas). In all 4 countries the financial incentive is granted to domestic producers and is not available for biomethane imported from another EU member states.

The usage of biomethane as biofuel in transportation is supported by different means (tax benefits, GHG emission reduction commitments, blend-in commitments, certificates traded on the market etc.). Although some of these financial incentives are available for imported biomethane, such cross-border movements are still very low. This is due to the fact that biomethane (like liquid biofuels) is subject to mass-balancing if it is counted against the national biofuel commitments. On the other hand, the mass-balancing of biomethane transported through the European natural gas network is not yet solved. Under this situation, only direct physical movements (mostly by trucks) can be accounted for as biofuel supplies. This limitation to direct (trackable) cross-border movements results in small trade volumes mostly out of Germany to the Netherlands and Sweden.

Thus the European biomethane market today is sporadic, characterized with small volumes and lack of transparency. A major breakthrough can be achieved only after the administrative preconditions for the use of the European natural gas network as biomethane distribution system are provided.

A special case is the import of biomethane from Germany to Switzerland which is based on the application of the Swiss “Naturemade biomethane” labelling system. Under this system, the individual German biomethane producing installations are audited and certified, the sustainability of the biomethane production is properly certified and the physical cross-border movements are tracked. Although this works between the South of Germany and Switzerland, this – due to its complexity – cannot be a workable scheme for the rest of Europe.

4.2. Biomethane Guarantee of Origin – GoO

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Guarantees of Origin are the basis for a harmonized documentation of generated biomethane volumes injected into the gas grid. As the GoO carries a multitude of attributes/documentation, its value may depend on the origin, the feedstock source, the upgrade technology and many other criteria. This differentiation opens for different schemes of utilization of GoO. Some uses may entitle for support schemes, some not and so these GoO may go into utilization via market schemes.

GoOs are the perfect tool for bringing biomethane in the market.

The common process of a biomethane GoO is divided into following parts which will be illustrated in detail in the guidelines:

- Generation
- Handling (auditing, splitting, transfer, etc.) and
- Cancelling.

The GoOs have to be generated and handled via an independent, harmonized and transparent mechanism. This task shall be executed by national biomethane registries. These registries are the tool to track the chain from biomethane production to the consumption via biomethane GoOs.

4.3. Laws & regulations

Basic Legislative Process

In accordance with the hierarchy of legislation, European laws and regulations are predominant. These legal acts can essentially be divided into regulations and directives. National legislatures are in certain cases required to adapt national regulations which stand contrary to EU regulations. Therefore European regulations take precedence over national laws. This in contradiction to directives, which have to be implemented into national law to become effective. Each member state is free to follow its own implementation method for these directives, often leading to differences between member states. Differences arise on the one hand due to room for interpretation granted to member states, and on the other hand because respective national laws vary in many areas. For example, in order to implement some European directives, member states must change parts of an already existing national law, and for others an entirely new law must be created. Signification differences arise because each provision must be seen in the light of its overall legal context.

Most national laws are categorized into one of the following classifications: Constitutional Law, Basic Law, and National Legal Acts.

As for the case of Austria, the constitution states that the federal government is responsible for the legislation and execution of law in the gas industry. Detailed provisions are provided in such national law called the GWG 2011. On the basis of this federal law, the national authorities such as the regulatory body for power and gas have adopted a number of directives which are also directly applicable (for example market regulations).

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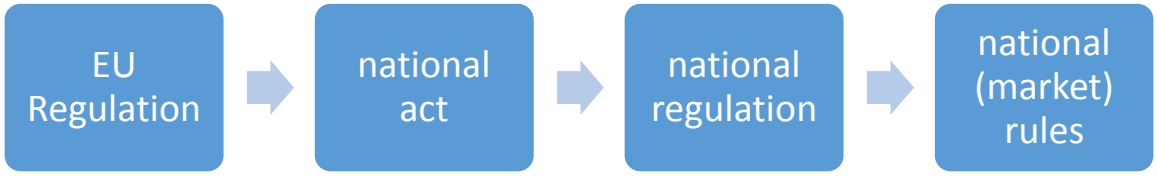

Figure 1: legal framework establishment process

Relevant European Provisions

Third EU Legislative Package for the Internal Gas Market: **DIRECTIVE 2009/73/EC** OF THE EUROPEAN PARLIAMENT AND EUROPEAN COUNCIL of 13 July 2009 concerning common rules for the internal market in gas and repealing Directive 2003/55/EC:

Due to insufficient competition in the energy sector, the EU decided to provide clear provisions with regard to the admissibility of integrated energy companies with the third legislative package. This became necessary because the connection between the network operators, the suppliers and the producers has been identified as an obstacle to the development of the internal gas market of the EU. Therefore the EU stipulated in Directive 2009/73/EC to implement a clear separation between system operators, producers and suppliers. Different models have been introduced which are intended to ensure the independence of network operators. This separation of the different areas should ensure non-discriminatory network access and lead to greater competition. Furthermore, the member states were obliged to set up independent regulatory bodies monitoring the implementation of the guidelines set out in the regulation.

Directive 2009/73/EC has not only led to profound changes both in the legal framework and the structure of energy companies, but also was the basis for significant changes in national legislations with respect to gas industry laws or electricity laws. The unbundling requirements for the energy companies led to a significant need for adjustment to the existing structures of the network operator.

Directive 2009/28/EC of the European Parliament and the European Council of 23. April 2009 to Promote the Use of Energy from Renewable Sources and to Amend and Subsequently Repeal Directive 2001/77/EC and 2003/30/EC.

Directive 2009/28/EC defines mandatory national targets for the overall share of energy from renewable sources in terms of gross final consumption. Agricultural materials such as manure and slurry along with other animal and organic waste are already used for purposes including the production of biogas and biofuel to be used as heat and electricity. Due to the decentralized nature and regional investment structure, biogas facilities can contribute significantly to sustainable development in rural areas and offer farmers new income opportunities.

In accordance with the directive, it is necessary to promote strategic cooperation between member states and, where appropriate, involve regional and local authorities. Member states should be encouraged to pursue all appropriate forms of cooperation in order to achieve the

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objectives of this directive. This cooperation can take place on all levels bilaterally or multilaterally.

Guarantees of Origin, which are issued for the purpose of this directive, are intended exclusively for a final customer of the electricity grid; they prove that a certain percentage or a certain amount of energy was produced from renewable sources. A guarantee of origin can be transferred from one owner to another regardless of the energy to which it relates. Double counting and double designation of guarantees of origin should be avoided in order to ensure that a unit of electricity that has been produced from renewable sources can only be transferred one time. It is important that green certificates, which are used by the funding agency, can be differentiated from guarantees of origin.

Directive 2009/28/EC also constitutes an important basis for the legalization of a mass balancing method in Europe. In principle, the directive stipulates, that according to the mass balance method, a physical connection exists between the production and the consumption of biofuel and bioliquid in the community. This task is interpreted very differently among EU member states. For example, Germany has chosen a very restrictive approach in which gas quantities and the corresponding guarantee can only be traded together as a bundle. Trading a guarantee separately from the actual gas quantity is not possible. This makes the cross border trade of biogas problematic because the border capacities to prove this must be available at the exact time and place of the border crossing.

Biogas and bioliquids will only be considered for the assessment of compliance with national targets and for the possibility of financial support if certain sustainability criteria are met. These biofuels may not be the product of raw materials taken from land where there is a high value placed on biodiversity. These include for example primary forests, conservation areas and highly biodiverse grasslands. A mass balance system with strict requirements is to be used as criteria for verifying sustainability.

For a cross border exchange of biogenic fuel it is essential that the entire European gas network is recognized as a closed mass balance system. This is important because it leads to an accessible European wide exchange of injected biogas and ensures a liquid market. Clarification with regards to the mass balance system and other major issues in connection with the international exchange of biogas would result in increased demand and supply of biogas and might even lead to new production capacities.

REGULATION (EU) Nr. 994/2010 of the European Parliament and European Council of 20. October 2010 Concerning Measures to Safeguard the Security of the Gas Supply and Repeal Directive 2004/67/EC of the Council.

This regulation aims for the security of the gas supply in Europe. As an analysis of the security of supply of a member state, the failure of the largest natural gas infrastructure, the so called N1-principle, should be examined as a benchmark for what member states should be able to balance. This will be accomplished by expanding of natural gas infrastructure in the various member states, improving integration of individual Member States with each other, and by

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diversifying the energy supply. Through these steps the necessity of integrating renewables into the natural gas network infrastructure will be facilitated.

This regulation brought about many changes in the national legislation, among others the national implementation of the control measures and the creation of preventative and emergency planning. In Austria the regulation led to a change in GWG 2011 and a revision of the Energy Intervention Powers Act of 2012.

Directive 2014/94/EU of the European Parliament and European Council of 22. October 2014 on the Construction of Infrastructure for Alternative Fuels.

This directive establishes a common framework for the construction of infrastructure for alternative fuels. The goal is to decrease dependence on crude oil as much as possible and to limit the environmental impact of transportation. According to Article 2, biomethane is an alternative fuel. The directive requires each member state to define a national strategy framework for the development of the alternative fuel market in the transport sector. This strategy framework includes an inventory of the existing infrastructure and information on how this can be further improved, to be forwarded to the Commission on 18 November 2016.

Conclusion

The European legal framework includes many regulations regarding biological energy sources but nothing with respect to biomethane registries. Therefore it can be assumed that biomethane is subject to the mass balancing system but since the regulations in the member states vary considerably and there exists no European-wide legislation for an exchange, the international transfer faces many challenges. As illustrated above, the exchange of biomethane is not only subject to mass balancing, but also to other requirements, such as the regulations concerning the guarantee of origin, the sustainability criteria as well as the unbundling of producers. These however are interpreted and implemented differently depending on the member state, thus making the establishment of a national biomethane registry more difficult.

Furthermore, differences in national provisions affect the transfer of biomethane; in some member states, the entire legal framework for the establishment of a biomethane registry is missing.

National Legislation and the Regulation of Biomethane: the Austrian example Gas Act 2011 (GWG 2011)

Austria implemented the balance group model with GWG 2011. This means that each participant in the Austrian natural gas market must be assigned a specific balance group.

The liberalized gas market is characterized by the emergence of new market actors with the following roles and responsibilities in order to ensure the functioning of the gas market:

- Network Operator – Operators of transmission and distribution networks
- Distribution Area Manager – Responsible for the balancing of the distribution area. In Distribution Area East, AGGM is responsible for the technical balance.
- Balance Group – Grouping of suppliers and customers in a virtual group, within which occurs a balance between gas collection and gas delivery. Responsible for the balance

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group to market participants is the balance group representative. Clearing agencies in Austria are set up for both Distribution Areas East and West. The operator of the clearing house is the clearing and settlement agent.

This principle also applies to biogas producers, who must be registered with the Austrian biomethane registry in order to track the injection of produced biomethane with the purpose of generating electricity and receive a subsidy in case of electricity generation. Furthermore, § 130 GWG provides for the labelling of the gas guarantee of origin. In accordance with § 130 GWG 2011 the supplier, who delivers the natural and/or biogas to the final consumer in Austria, is required to show the supply mix on the gas bill. The basis for this labelling is documented by the supplier. In the documentation the delivered gas quantity, broken down by biogas, landfill gas, sewage gas and natural gas, must be represented conclusively.

Green Electricity Act 2012 in Austria (ÖSG 2012)

The ÖSG 2012 regulates, among others, guarantees of origin for electric energy from renewable sources, green energy guarantees of origin and the recognition of guarantees from other EU member states. A system for guarantees of origin was set up so that green energy certificates can be transferred independently of the transmission of currents. According to the definition, a “guarantee of origin” is a certificate showing from which energy source the injected quantity of upgraded biogas injected with the purpose of generating electricity was produced. § 11 ÖSG 2012 regulates with respect to green power guarantees of origin – green power located in a different EU member state or EWR contract state qualifies as a guarantee of origin when it satisfies Art. 15 of Directive 2009/28/EG. In case of doubt E-Control can determine whether or not the prerequisites for recognition exist. According to § 21 ÖSG, the clearing and settlement agency (AGCS) is to issue monthly confirmations with a unique identification code for the injected biogas amounts. For this purpose AGCS established the biomethane registry.

According to § 5 Abs. 1 Z 6 ÖSG 2012, the definition of “biogas” is as follows: biogas is any combustible gas produced from fermentation of biomasses in a biogas facility and used to produced energy; gas extracted from a gas grid is considered biogas as long as the heat equivalent of the extracted gas is equal to the amount of gas produced from biomass added at another point on the gas grid, in accordance with the scope of the law.

According to this provision a guarantee of origin is only valid in Austria because this law only covers the Austrian gas grid. Gas injections in foreign grids by local plants are not recognized as biogas as defined by iSd ÖSG 2012.

Fuel Act 2012 in Austria

This act defines the technical specifications for automobile fuel. Biofuel is defined as fluid or gaseous fuel produced from biomass and used for transportation. According to the Fuel Act 2012, biomethane is a biofuel. This is according to the legal definition of biogas produced from pyrolysis or fermentation and purified to natural gas quality. The Fuel Act stipulates a substitution requirement for all gas and diesel fuel in Austria of 5.75%. Depending on the share of biofuel in the product, the buyer can be subject to an identification or labelling requirement.

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A credit of biofuels to the substitution requirement is independent of whether or not the biofuel was produced in the European Union, as long as legal prerequisites are met. The sustainability of biofuels must be proven and documented. Austrian operations must register with the Federal Environment Agency GmbH. The issuing of sustainability certificates is conducted by the operation itself and then transmitted to the Federal Environment Agency. Once registered with the FEA, Austrian operations are themselves qualified to issue sustainability certificates. § 15 und § 16 of the Fuel Act 2012 regulates the recognition of certification systems and inspection bodies in third countries. The FEA is responsible for this recognition, which can take place for a maximum of 12 months. Sustainability certificates from other member states must be examined for recognition by the FEA.

4.4. Overview of Existing Registries

There are several biomethane registries established and in operation in Europe. Some of them have given an overview in the following chapters like Austria, Germany, United Kingdom, Denmark, Switzerland and Finland. Beside them biomethane registries also exist in France and Netherlands.

4.4.1. Austria – Biomethane Register Austria (AGCS)

AGCS is a settlement agent (clearing house) for the Austrian gas market and has been in existence since the full liberalization of the Austrian gas market in 2002. As such, AGCS has built the Austrian biomethane register in 2012 and operates this registry continuously. The gas-injections into the gas grids are registered in the biomethane registry for the biomethane producers who have opted for a registration. GoO (Guarantees of Origin) are issued only for injected biomethane production volumes.

Since the amendment of the Green Electricity Act 2012, AGCS is the settlement agent responsible for issuing confirmations with a unique identification for injected biomethane volumes on a monthly basis.

Faced with the task of providing a GoO system in accordance with the law on one hand and balancing the needs of the biomethane industry for the development of a biomethane market in Austria on the other, AGCS opted for a registry system.

The IT-system of the biomethane registry was specified by AGCS and implemented by SMART Technologies GmbH. The system is based conceptually on the system of the CO2 registry for which until 2012 ECRA Emission Certificate Registry Austria GmbH was responsible. The Clearing System of the AGCS (gas clearing agency) registers the metered values of biomethane injected into the gas grid and provides this data to the biomethane registry which generates the GoOs.

The creation of the biomethane registry was prompted by the Green Electricity Act. The generation of electricity from biomethane feed into the natural gas network is subsidized by the green energy agency (OeMAG). Electricity generated from injected biomethane is subsidized in Austria.

The Clearing System of the AGCS (gas clearing agency) registers all the volume feed into the gas grid and cooperates with the biomethane registry as well as the green energy agency.

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This example shows that a registry must be ready to integrate several institutions and companies which deal with biomethane.

The biomethane registry itself has become the central part of the biomethane chain. As a key element, it provides the possibility to generate and transfer biomethane GoOs.

In 2015 there are 14 biomethane plants that inject biomethane into the natural gas grid. Not all of the plants receive a national funding for the production. Some plant operators only sell the additional value to end suppliers charging a premium from end consumers.

The injection volumes have risen over the years:

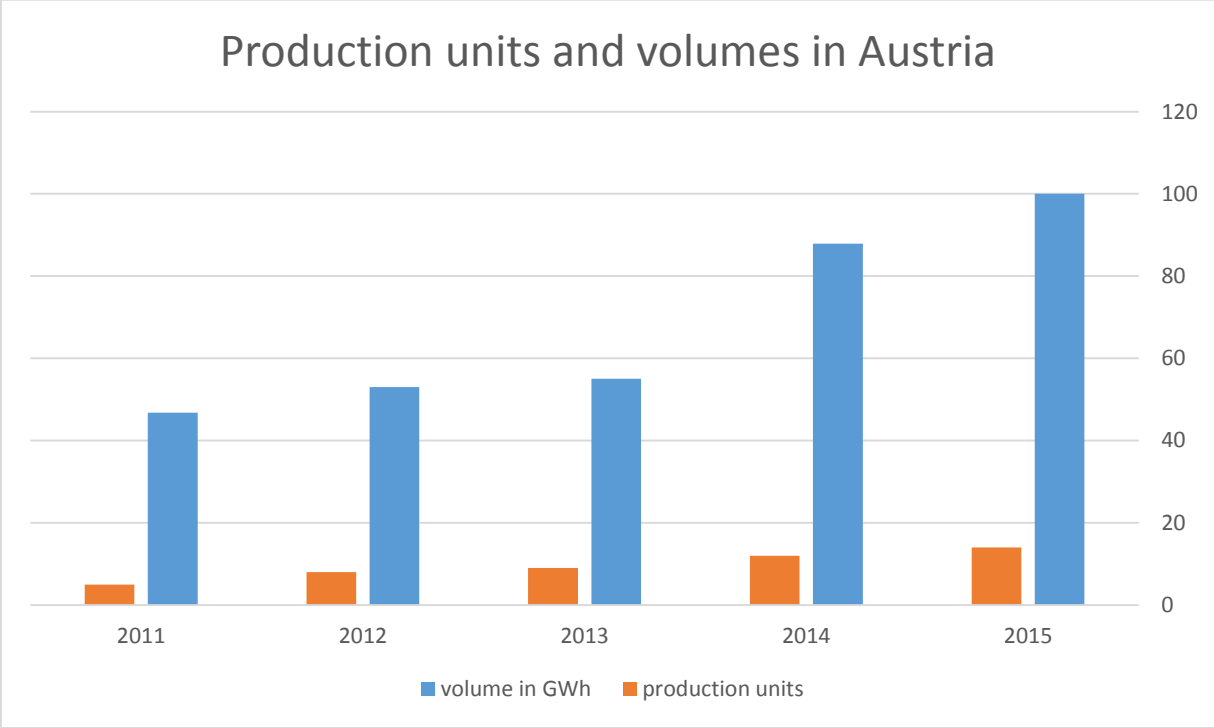

Figure 2: production units and volumes in Austria

The biomethane GoO system should satisfy two needs:

- provide GoOs as a basis to subsidize green electricity (electricity from biomethane)
- provide a traceable and secure transfer of ownership of biomethane for the Austrian gas industry.

The possibility to exchange GoOs with other European registries should benefit the Austrian biomethane producers and consumers. Implementing the transfer process with foreign registries is thus a key element for the success of biomethane.

Market Roles

The Austrian biomethane registry distinguishes between the following registered users:

- Biomethane plant operators
- Biomethane electricity plant operators
- Registered users

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- Authorized Auditors
- OeMAG (in a special role).

Generation of the GoO

Once a month AGCS takes in metering values from the gas grid operator and books these values in the corresponding biomethane balance group of the biomethane operator. These meter values are then transferred to the biomethane registry and form the basis for the generation of the GoOs.

The gas volume (including additives) entering the biomethane balance groups is transferred into the biomethane registry. It is the responsibility of the plant operator to record the additives directly and manually in the registry each month. These values for additives are subtracted from the metering values to be sure that only GoOs for biomethane are issued.

After a monitoring process that ensures the correct GoO generation, the GoO is subsequently entered into the account of the biomethane plant operator.

The monthly preparation of the GoO and its availability in the system follows one of AGCS' fixed calendars, which are available on the biomethane registry website. Also included is the preparation date, date of generation and date of availability.

The GoO contains the following information:

- Production period (from/to on monthly basis)
- Original amount in kWh
- Any remaining amounts (some parts possibly already transferred)
- Name of plant without details
- Evaluation conducted (Yes/No)
- If yes, evaluation available with files (possible to download yes/no)
- Status of GoO
- Owner of GoO
- Date generated
- Date of report marks
- Date of cancellation.

Market Participant Processes

After each monthly entry, the GoO can be transferred between accounts in the registry. The biomethane registry has a capacity intended for such transfers. Each registered user in the system (except the experts) can be chosen as a recipient of the GoO. During the launch of the transfer, the amount transferred can be changed (reduced) unless the entire quantity is being transferred. The GoO can be split into any number of steps in "1 kWh".

The authorized auditors fill an important role in the biomethane registry. They are responsible for inspecting all of the GoOs at their assigned plant. The authorized auditor can mark the GoO as inspected and attach the corresponding report. The inspection of more than one GoO without attaching a report is also possible. The authorized auditor's main task is to check the original GoO.

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It is up to the buyers if they accept a GoO that has not been inspected. OeMAG in its special role for green energy accepts only inspected GoOs.

Cancellation of GoOs

GoOs are used for different applications; the biomethane registry generally does not track these uses.

Market participants can use GoOs for their own purposes. However a cancellation of the GoO, effectively removing it from circulation must take place in the biomethane registry prior to any use.

Due to the wishes of the Austrian industry, the validity of GoOs in the registry is at the moment unlimited. It is the choice of the recipient as to whether or not they will accept a GoO with a known lifespan. The green energy institution in Austria only accepts GoOs from the present year.

4.4.2. Germany - Biogas Registry Germany (dena)

Mandate/Mission

DENA is the competent organism for energy efficiency, renewable energies and intelligent energy systems in Germany. It supports the implementation of an energy transformation in politics, business and society. It looks at the energy system as a whole and is committed to make the generation and use of energy as efficient, safe, affordable and climate friendly as possible on both a national and international scale.

The concept for the biogas registry in Germany was developed by DENA in 2009 with the support of the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety; and with a dialogue between market participants and political and economic experts. The registry has been supported since the onset by 14 leading companies from the biogas and energy sector. The German biogas registry provides a platform for the generation and transfer of biogas GoOs. Use of the biogas registry in Germany is voluntary. This registry is able to document the transfers of biomethane GoOs and provide a mass balance sheet of biomethane delivery. By means of the biogas registry criteria catalogue, the GoOs can be created and documented for many different ways of subsidies.

The documentation is done completely independent of the physical natural gas balance group management. However cooperation exists between the biogas registry and the balance group management indirectly because certain laws (EEG, EEWärmeG) require a mass balancing.

Registered auditors, acting as neutral experts, evaluate plants and the gas produced at these plants based on criteria of the biogas registry's fixed structure. These auditors are required to present their qualifications and satisfy certain criteria. These criteria are available to the public and can be found under "Terms and Conditions for Auditors".

Audit Documents

The producers of biomethane document the necessary information about the origin and qualities in the so called audit documents in the biogas registry. For this purpose, a registered auditor inspects the production plant and prepares a report in accordance with the catalogue criteria. Within the registry, the producer will enter information which is then to be confirmed

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by the auditor so that the report is also provided electronically. After the validation of the data through a report by DENA, the GoO is completely recognized. Upon completion of procession the audit documents are accessible in the archive.

There are two types of audits:

- Audit of the facility and
- Audit of the business operation.

In each case, the company audit is administered only for one facility at a time in which technical conditions are evaluated. The second type of audit is concerned with one or more assigned production quantities. Generally this audit is conducted on the quantity of biomethane produced in an entire calendar year.

The biomethane producing plant is accepted in the system upon completion of the audit. After this step and once the plant is entered into the system, the employees of this plant may record biogas quantities and create operational audit documents.

Registered employees can request a "Grünstellung" (green marked) for their own companies with the produced quantity with an operations audit. Following the successful plausibility by the administrator, the quantity is "grüngestellt" (marked as green).

Accounts System

Each company has biogas and GoO certificates. These accounts display the quantity of GoOs in the form of "charges". These can be shared, transferred to other companies or cancelled. A transfer documents the handing over of the quantity within the natural gas network. A decommissioning documents the withdrawal of the quantity from the natural gas network.

Generation of Registry Statements

The responsibility of generating registry statements lies with the system user. Further inspection by the administrator does not take place. The registry statement is set up on a certain quantity. Information (qualities and origins) about the quantity comes from the provided audit documents. The recipient data, intended purpose of, period of use and location of transfer are entered personally by the "*Ausbucher" (person who cancels) through a mask.* Thus the quantity will be postmarked for a certain purpose and certain timetable.

Statements issued by the German Biogas Registry.

In the German biogas registry, two types of biogas registry statements (origin and purpose) are distinguished. They can be distinguished by the title, which is displayed on each page of the statement:

- Biogas registry statement on the biogas delivery (mass balancing)
- Biogas registry statement on the biogas GoO (without mass balancing).

In the first case, the biogas quantity will be delivered from the plant to the user and with that any transfer of rights within the natural gas network documented. Thus, the German design of a mass balancing is satisfied.

In the second case, the gas property is separated from the other biogenic properties during the transport. The properties are rejoined upon arrival to the consumer. In this case, the mass balancing terms are no longer satisfied.

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Content of DENA Registry Statements

The registry statement summarizes all relevant data about the consumed biogas quantity, especially the following information:

Part 1: Information about the production and injection

In the first part the documented facility and injection data is reproduced, which includes the following points:

- The facility in which the biogas was produced (incl. commissioning)
- The quantity
- Injection point and timetable.

This data comes from the facilities – and operations audits. The biogas quantity refers to quantity consumed, not produced.

Part 2: The documented criteria from the criteria catalogue (Biomethane quality). It follows a listing of the criteria from the German biogas registry. These criteria show the quality of the biomethane. The criteria catalogue refers without exception to the demands which are presented by the German legislative framework. In theory personal responsibility can also be worked in to the criteria catalogue.

Part 3: The company's usage of the biomethane is documented in this part especially who is the receiver of the biomethane and the respective GoO.

Content of GoO Germany

DENA divides the GoO into 3 parts (Production and Extraction Information, Detailed Criteria and Withdrawal i.e. Consumption Information), see under (in German language only):

https://www.biogasregister.de/startseite/informationen/biogas-nachweise/registerauszug/inhalte.html

4.4.3. United Kingdom - Green Gas Certification Scheme

Background information and the company

Renewable Energy Association (REA) represents over 900 members involved with the renewable energy sector in the UK. Renewable Energy Assurance Limited (REAL) is a subsidiary of the Renewable Energy Association, with the role of developing and running assurance schemes in the renewables sector. The Green Gas Certification Scheme (GGCS) was launched in 2011 to assist in establishing a renewable gas market in the UK. The scheme is voluntary and run on a not-for-profit basis providing Guarantees of Origin (GoO) for grid injected biomethane.

Producers of biomethane receive the Renewable Heat Incentive (RHI) at the point of injection. The RHI is managed and paid for by the regulatory body - Ofgem (Office for Gas and Electricity Markets). Ofgem provide GoO for renewable electricity but are not required to provide GoO for renewable gas. Therefore REAL has worked with the industry to develop the GGCS to provide GoO for renewable gas – Renewable Gas Guarantees of Origin (RGGO).

The system

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The GGCS is a web based tool that provides the RGGO for each kWh of biomethane injected. Each kWh is assigned a unique identifier that includes information on the technology type, production site, volume of gas injected and the month of injection.

RGGOs are produced when a producer on the scheme registers the gas they have injected for a particular month. Gas is registered on a quarterly basis in line with the RHI registrations. Producers can transfer the RGGO's into the accounts of Suppliers on the scheme. Suppliers can transfer the RGGO's to the accounts of other Suppliers or can retire the certificates out of the system.

At the point of retiring the RGGO, a certificate is produced in pdf format which includes the name of the end customer and the range of RGGOs that have been retired. Customers can check the validity of their certificate by visiting the GGCS website (https://www.greengas.org.uk/certificates/validate).

RGGOs can remain in the system for 36 months from the month of injection, before they are automatically retired.

Registration on the scheme

The GGCS has been aligned to the RHI processes to minimise the burden on producers. All producers must be registered on the RHI with Ofgem before they can complete their registration on the GGCS. Producers must provide the following information:

- Company name
- Company registration number
- Company address
- Company phone number
- Plant name
- Plant address
- Primary contact details
- Secondary contact details
- AD plant technology e.g. Anaerobic digestion
- Principal feedstock type. Select from food waste; agricultural activities; domestic wastewater treatment; industrial wastewater treatment; municipal solid waste; other permitted feedstock.
- Maximum plant capacity (kW)
- Maximum plant output per month (kWh)
- Registered meter number.

This information is used to create a producer account that can generate RGGO. Each RGGO will have the above information and only change in the date and volume of injection. If the plant makes a significant change to their feedstock they will need to notify us to change the feedstock type that will appear on the certificate.

There are currently 16 producers registered on the scheme with an injection capacity of 0.5 TWh per annum. About 50 biomethane injection plants to be in operation by the end of 2015 with an annual injection capacity of over 2 TWh. There are 16 suppliers registered on the GGCS and there are over 50 licenced suppliers in the UK.

Currently RGGO are used to demonstrate to end customers that a unit of renewable gas has been injected into the gas grid and that it was not been sold to another customer. The GGCS

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is working to get RGGO's recognised by regulators and Government departments under different policies. With the reduction in the support for new plants under the RHI, RGGO may become important in supporting the development of new biomethane plants in the UK. As the GGCS is run on a voluntary basis there is opportunity to make alterations to the scheme where appropriate. There are proposals to include a carbon emission factor on the certificates and also to include information on the sustainability of the feedstock used.

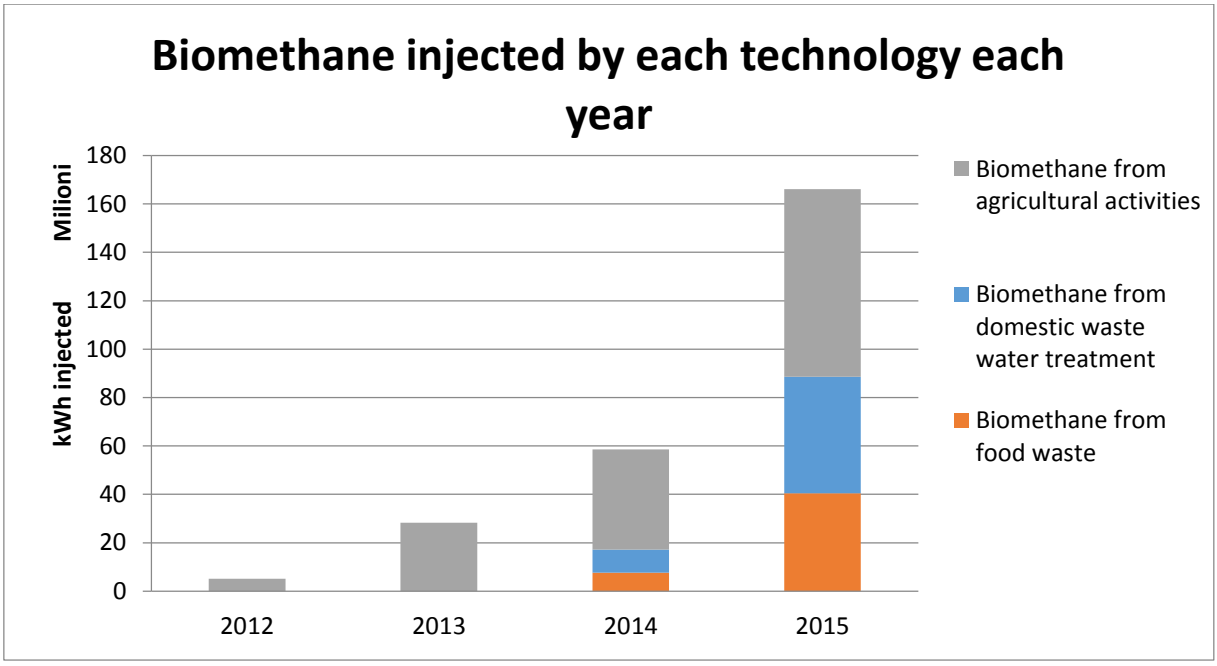

Figure 3: biomethane volumes UK

4.4.4. Denmark – Danish Biomethane Registry (Energinet.dk)

Energinet.dk is the Danish transmission system operator and owns the Danish electricity and gas transmission systems. Energinet.dk's main task is to maintain the overall short-term and long-term security of electricity and gas supply. Energinet.dk is an independent public enterprise owned by the Danish state as represented by the Ministry of Energy, Utilities and Climate.

The Danish register for biomethane GoOs was established in 2011. A number of players on the Danish natural gas market requested a GoO scheme for biomethane sold via the Danish natural gas system for heating purposes. Unlike what applies to electricity produced on the basis of renewable energy, Energinet.dk is not required to provide a GoO scheme or issue GoO for the production of biomethane.

To meet the market players' request for GoO of biomethane, Energinet.dk has agreed to manage the GoO register and to issue biomethane GoO on behalf of the market players. The GoO scheme is based on electronic and paperless registration. No GoO in paper form are issued. So far, the use of the GoO scheme is free of charge.

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The main purpose of issuing biomethane GoO is for the sellers of biomethane to be able to document to the end-consumers that a given amount of biomethane has been produced from a renewable energy source. More information about the certificate scheme is to be found on Energinet.dk's website:
http://www.energinet.dk/EN/GAS/biogas/Gascertifikater/Sider/default.aspx

The biomethane GoO are not linked to any subsidies, taxes or duties. The GoO can therefore not be used as documentation in relation to subsidises, tax advantages or duty cuts.

The Danish GoO register

To be registered in the GoO register, and thereby become a GoO account holder, the applicant must provide the following information:

- Company identification number (VAT, GLN or similar)
- Company name, address, postal code, city, country and CVR number, if any
- Contact information (name, telephone number and e-mail address of contact person)
- Name of person authorised to sign for the GoO account holder.

If the applicant is also a RE-gas producer, his production facility will automatically be linked to the GoO account and, in that case, additional information regarding the production facility must also be provided:

- Identification of the production facility
- The production facility's address, postal code, city, country and CVR number, if any
- Production technology applied (biogas, thermal gasification, landfill gas, synthetic gas etc.)
- Capacity of the production facility in kWh/year
- Commissioning date of the production facility
- Metering point, GSRN
- Meter operator of the production facility (contact person, company name, address, telephone number and e-mail address)
- Description of how metered data have been obtained, including whether propane has been added to the gas
- Production subsidies.

Biomethane GoO

The actual issue of biomethane GoOs is carried out by Energinet.dk at the request of the GoO account holders on the Danish natural gas market and is as such a voluntary scheme.

Only GoO account holders can receive biomethane GoOs.

The biomethane GoOs are issued on a monthly basis and each for a standard amount of 1 MWh. The biomethane GoOs are issued automatically on the basis of the metered data received from the Danish distribution companies. The number of whole MWh_{gross} determines the number of biomethane GoOs issued, and biomethane GoOs are only issued for whole amounts.

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Energinet.dk has issued biomethane GoOs for all amounts of upgraded biogas injected into the Danish gas system so far:

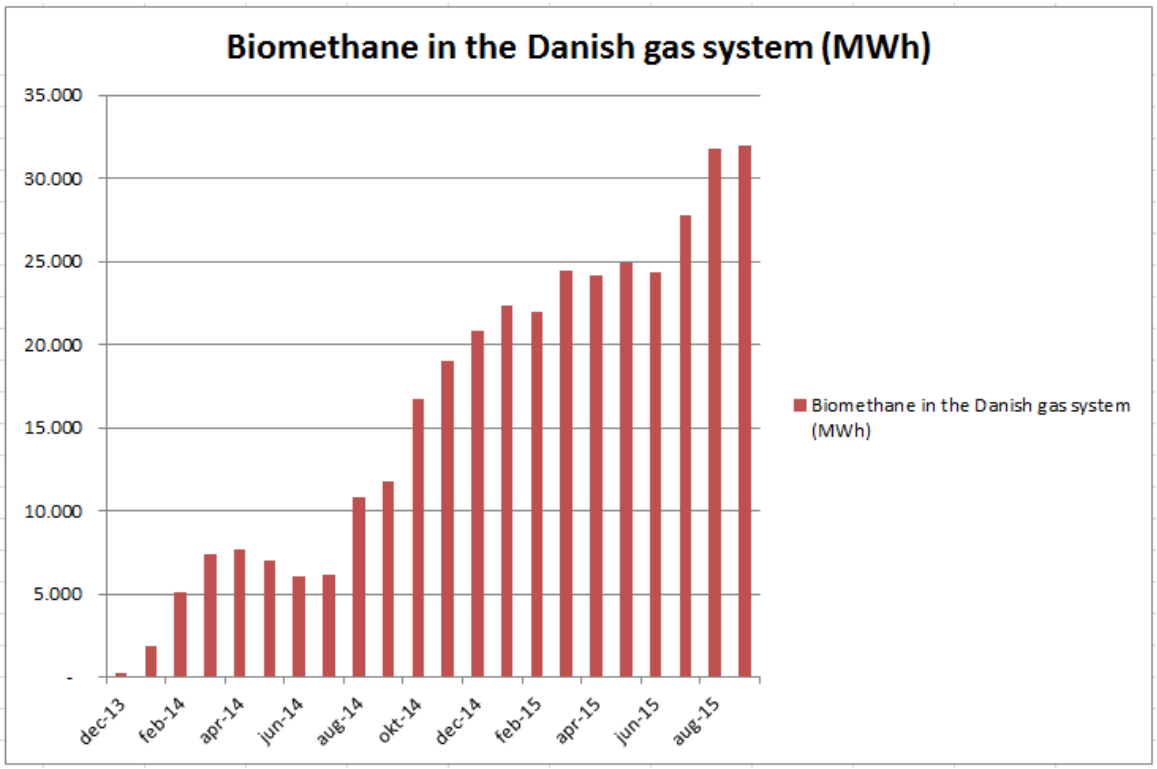

Figure 4: biomethane in the Danish gas system

The certificate account holders may transfer biomethane GoOs among themselves. Energinet.dk's only task in this connection is to register the transfer.

Energinet.dk will cancel biomethane GoOs, whenever the relevant GoO account holder requests cancellation, because the biomethane GoO in question has been disposed off by sale of an amount of energy. A cancelled biomethane GoO is no longer in circulation and can therefore not be transferred to any other GoO account holder or sold to any other consumer.

Transfer or cancellation, including for export purposes, of a biomethane GoO must take place not later than 12 months after the calendar month in which the relevant amount of biomethane was produced. After 12 months Energinet.dk automatically changes the status of issued biomethane GoOs to “expired”.

4.4.5. Switzerland – Swiss Biomethane Registry (Swiss Association of Gasindustry)

Mandate/Mission

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Federal law (Art. 12b Mineralölsteuergesetz) provides for the exemption of biomethane from the mineral fuel tax, so long as certain criteria (sustainability) are met. All amounts of biomethane meeting these criteria, whether injected into the gas grid or directly sold at fuelling stations, are to be registered with the clearing agency, which is operated by the Swiss Association of Gasindustry (Verband der Schweizerischen Gasindustrie, VSG). Not subject to registration with the clearing agency are biomass plants for direct local electricity production.

Regulation and Supervision by the Federal Customs Authority

Operation of the clearing agency is governed by regulations of the Federal Customs Authority (Oberzolldirektion OZD) and is under its supervision. The following market participants are required to register and file the relevant amounts within certain deadlines:

- Producers of biomethane (amounts to be registered monthly)
- Traders and distributors of biomethane (amounts to be registered quarterly).

In order to participate, producers, traders and distributors need to register and are then issued an individual login for www.biogasclearing.ch. Since the production of biomethane needs to comply with federal legislation, producers have to additionally apply for an authorization with the OZD, prior to the registration with the clearing agency.

Data recorded in the clearing agency

The following data is recorded in the clearing agency, individually for all producers, traders and distributors as well as in the aggregate:

- Amount of Biomethane injected into the gas grid or directly sold at fuelling stations. As provided by applicable law, the amounts are given in kilograms.
- Confirmation that all applicable criteria under the Mineralölsteuergesetz are met.
- Tracking of biomethane trade. Trades have to be registered both by the seller as well as the buyer, which allows for matching of the respective amounts.
- For each amount, end use (transportation fuel, heating, electricity production) has to be specified.
- Contact data (master data) for producers, traders and distributors is updated on an ongoing basis.

All data is recorded electronically only. No separately tradeable Guarantees of Origin (GoO) are issued on paper.

The following table shows the development of the monthly production of biomethane for the time period 2013 to the third quarter of 2015:

YEAR	JAN	FEB	MAR	APR	MAY	JUN
2013	535'574	502'732	749'166	605'877	634'919	809'662
2014	989'823	1'056'444	1'188'424	1'138'411	1'183'189	1'154'486
2015	1'240'916	1'339'397	1'629'658	1'299'640	1'412'558	1'438'308

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YEAR	JUL	AUG	SEP	OCT	NOV	DEC
2013	775'095	861'597	1'065'830	1'071'639	863'605	1'505'400
2014	1'218'957	1'179'249	1'263'131	1'369'733	1'306'538	2'014'383
2015	1'420'939	1'488'986	1'481'533			

Monthly biomethane production (in kilograms)

International trade

While the regulations in principle provide for the possibility of cross-border transactions, the authorities currently do not recognize international trade of biomethane through the gas grid. Such transactions therefore cannot be registered with the clearing agency at present. However, such transactions may be filed with the VSG and are kept in a separate record. This also enables the statistical reporting of the development of cross-border trade. The topic is an ongoing issue in the federal parliament, which awaits a report by the government on how international trade in biomethane may be further developed:

http://www.parlament.ch/d/suche/seiten/geschaefte.aspx?gesch_id=20133004

4.4.6. Finland Biogas Certificate System (Gasum)

Gasum is a Finnish expert in methane gases. The company imports natural gas to Finland, and upgrades biogas and injects it into the gas grid. The company transmits and supplies natural gas and biomethane for energy production, industry, homes and land and maritime transport.

The company is the leading supplier of biomethane in Finland. Gasum feeds biogas into the gas network from three plants in Espoo, Kouvola, and Lahti.

Biomethane Certificates provide customers with flexible access to the benefits of biomethane

Gasum is the transmission network operator with system responsibility for the Finnish natural gas transmission system. As part of the development of the gas market, Gasum has created a Biomethane Certificate system for the market. The system is based on good practices including biomethane certificate systems already in use in other countries. Gasum Biomethane Certificates are issued for biogas produced and injected into the gas network in Finland. Biomethane Certificates are one way of selling biomethane, and they help provide gas customers with flexible access to the benefits of biomethane.

Biomethane Certificates are created when biogas that is upgraded to correspond to natural gas in terms of its properties is injected into the gas network. These certificates can be sold and bought independently of the physical supply of gas. The total volume represented by the issued certificates aren't more than the total volume of biomethane injected. Gas users connected to the gas network can "retire" certificates bought by them, and this represents proof that the gas used is biogas injected into the network. This enables gas users to utilize the many

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excellent benefits of biomethane, such as that there is no excise duty on biomethane, in their operations. Gas users can buy and retire the available certificates flexibly in accordance with their needs.

The certificates are administered through the Biomethane Certificate system maintained by Gasum Transmission Services. Biogas producers that inject biogas into the gas network and meet the qualifying criteria can as well as gas users that wish to utilize Finnish biomethane in their operations can join the system.

The Biomethane Certificates have unique identification codes, and their transfers between the parties are entered into the Biomethane Certificate Registry, creating a verifiable chain of information concerning the origin of the certificate. When certificates are used, they are retired, which ensures that a claim on a unit of biomethane produced can only be made once.

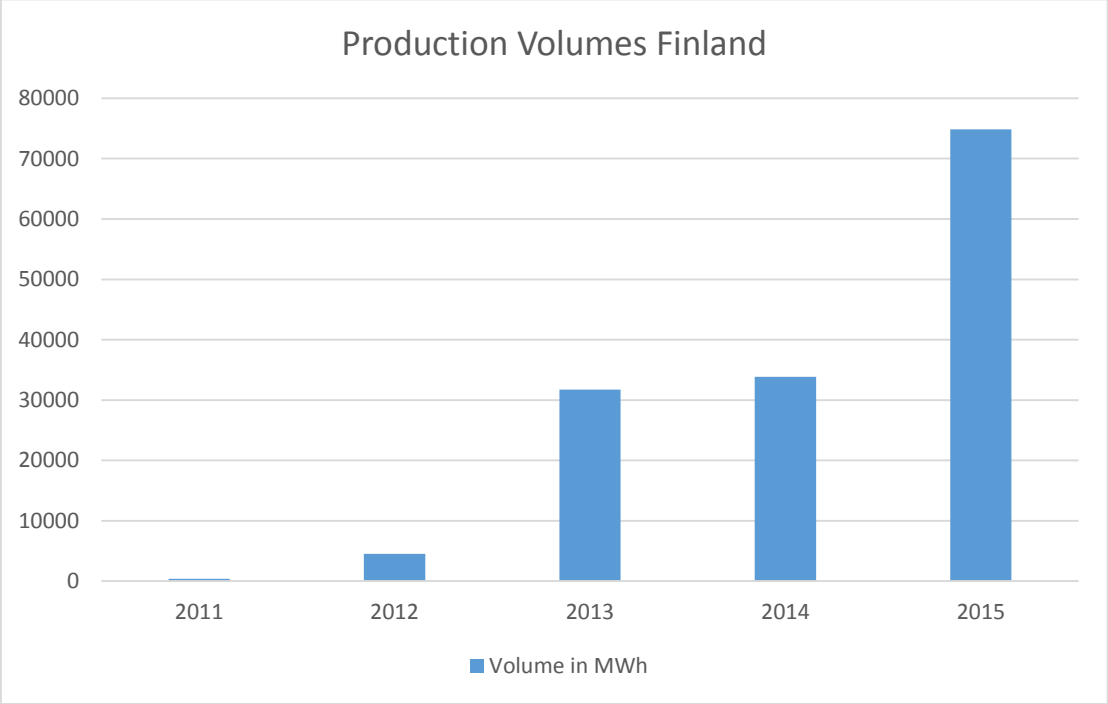

Figure 5: production volume in Finland

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5. BIOMETHANE & THE GAS MARKET MODEL

5.1. Integration of biomethane

In order to feed biogas into an existing natural gas grid, it must be cleaned and conditioned before. After this process of upgrading biomethane to quasi natural gas quality, it may enter the grid where it mingles with the volumes already in the grid.

A great advantage of biomethane injection is that biomethane is entering an already existing transportation infrastructure. Taking a biomethane production plant "online" and inject biomethane does in general not imply an investment in transportation infrastructure (beside a gas network connection).

Biomethane entering the grid adds to the value of biomethane because it can be either used to generate electricity, is burned for heating purposes or can be withdrawn from gas grid for bio fuel for transportation. The optionality in the usage of biomethane increases when injected into the grid compared to the option of generation power at plants site.

A biomethane production plant is usually connected to a distribution grid and the plant operator has to apply for access capacity towards the grid operator. But there are cases (e.g. in UK and FR) where biomethane is injected into the transmission network directly.

Metering the volumes and quality is the responsibility of the grid operator, who may reject injection if quality criteria is not met. The metering point meters the injected quantities. Metering data at injection point are the essential information to generate GoOs.

5.2. Biomethane & balancing

Biomethane is part of the domestic gas market model. In Europe different gas market models with several characteristics exist and these models differ substantially. Market participants are just as diverse. Several entities may have certain roles in a market area (market area manager, distribution area manager, operator of virtual trading point, balance group coordinator, gas exchange trader).

As market models are different, network codes and European regulations are working towards better market integration and harmonization of market rules. The European Regulation therefore sets out harmonized Union-wide rules on balancing which have the objective to give network users the certainty that they can manage their balance positions in different balancing zones throughout the Union in an economically efficient and non-discriminative manner. Cross border cooperation is an important point for the European gas market.

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The transmission system operators coordinate the technical operation of the entire grid in the domestic market area and are responsible for physically balancing the gas market area.

The market area's balancing mechanism keeps the system in balance thus the TSO takes permanently care of injecting or withdrawing gas volumes to keep the system in balance.

In some countries the TSO is running the clearing activities or theses activities are performed by a balance group coordinator. Such own independent entities exist where the domestic jurisdiction sees a necessity to manage commercial data separately from technical data in an own fully unbundled organization.

Apart from TSO or balance group coordinators in such market area, several players are active: balance group responsible parties, suppliers, traders, grid operators, balance energy providers, gas exchanges, OTC platforms, storage operators, producers of natural gas, last but not least producers of biomethane.

For all these parties, metering data (consumption, production, grid to grid, grid to storage, etc.) and schedules are registered on an hourly basis at either the TSO or the balance group coordinator. TSO or balance group coordinator run an account system with a credit and debit side where all the injected, withdrawn, sold volumes within the market area are booked on either credit or debit side of an account (balance group). This System of volumes and balance energy allows to calculate and settle all credits/debits differences on these accounts (balance groups) hourly or daily. Balance energy is settled with the so called balance responsible parties.

A market area or virtual trading point is like a lake of gas where injection and withdrawal is metered and change of ownership of volumes is registered centrally.

Each grid user must be registered with a TSO or balance group coordinator and is subject to the applicable balancing rules. There may be a distinction in balancing between different groups (households, industry, grid, cross border, control energy providers, biomethane, etc.). Each grid user must be member of a balancing group. There are no exceptions; membership of balancing groups is not optional. There is an obligation to contract. Balancing groups that supply consumers will inevitably need to balance the differences between supply and actual demand. This means that also for biomethane a balance group (in form of an account) is registered at the Clearing Organization (TSO or balance group coordinator). The balance group responsible party is the company/person who is responsible for the biomethane account. This balance group responsible party registers its balance groups and enters into a contractual relationship with the TSO or balance group coordinator.

Meter data from the biomethane injection point are sent by the grid operator to the TSO or imbalance settlement responsible party (balance group coordinator).

After injection the physical flow of biomethane is treated the same way as all other natural gas volumes. At time of injection gas volumes enter the balance group system whereas the attribute biomethane enters the system of the biomethane registry. From thereon gas and attribute

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"travel" separately and have different value, the attribute biomethane (the GoO) may be a few times more expensive than the physical natural gas volume.

Legal frameworks for the "biomethane market model" and the "gas market model" are different. The general terms and conditions of TSO or balance group coordinator define the rights and obligations of the balance group responsible parties. The balance group responsible party may be a supplier or trader of natural gas.

The balance group is an account with a debit and credit side. If natural gas is produced and injected into the grid, the metered volume per time unit (hour) is booked at the credit side of a balance group. If gas is transferred from the balance group to another balance group, there is a booking of the sold volume on the debit side.

If volumes on credit and debit side are not identical in an hour, than there is an imbalance for that hour. The balance group may be over or undersupplied. This difference is balance energy that is charged by the TSO or balance group coordinator. If more gas was sold then was produced, the balance group is undersupplied and part of the sold volume is obviously stemming from a different source. The imbalances on biomethane may be determined on an hourly or a daily basis. Prices may be dependent on a reference price (market price) where the imbalance price may be a marginal price, an exchange traded price with or without surcharges.

5.3. Balancing biomethane production

Biomethane is an element of the gas market area and its regulation and has to be fully integrated into the domestic gas market model. Besides of defining the biomethane registry, it is therefore essential to define biomethane as part in the domestic gas market framework.

Due to the size of biomethane or lack of support, there is the danger that biomethane, as an element of the domestic gas market model, is overlooked and no provisions are taken to integrate biomethane injection.

It is fair to require that the regulation for biomethane balance groups should not hinder but promote green energy. The regulations should furthermore be advantageous to promote green energy versus fossil energy.

Before biomethane is allowed to enter the grid, there is a registration procedure for a biomethane plant. Registration process is coordinated by the TSO or/and balance group coordinator. In that registration procedure contracts are signed and a balance group is set up for the biomethane injection plant in the clearing system. It should also be possible to add a biomethane plant to an already existing biomethane balance group. The balance group responsible party manages the balance group and the transfer of physical gas to third parties. The balance group responsible party has to pay for the differences between its balance groups credit/debit sides.

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5.3.1. Imbalance price mechanisms

The question has to be answered if biomethane should be daily, hourly or even yearly balanced and what the imbalance price mechanism of biomethane should be. The best solution for the biomethane market is that biomethane should be balanced on a daily basis and that the imbalance price should be the exchange traded price for natural gas (reference price) for the day. Thus the biomethane balance group pays the market price of gas and no additional penalties for being imbalanced. Balance energy should be at zero risk for the biomethane balance group. In Austria balance energy for the gas grid and balance energy for biomethane is charged the same price, whereas balance energy for commercial balance groups is more expensive.

The main purpose of the daily imbalance charge mechanism is to incentivize shippers to balance their inputs and offtakes. The objective is to induce shippers to trade as close to a balanced position as possible, in order to limit their individual exposure to a daily imbalance charge. The daily imbalance charge mechanism is calculated taking into account the sales and purchases of title products thereby determining a marginal sell and buy price of a given day plus a small adjustment. In cases where the marginal sell and buy prices cannot be calculated, a default rule can be applied.

Within day obligations is a tool that can be applied to securely operate the network. The balance network code provides for specific rules and their consequences relating to shippers' inputs and off-takes, which are derived to ensure flows consistent with those necessary to maintain system integrity during the gas day. WDOs may comprise either specific obligations or incentivize mechanisms on shippers' behaviour to minimize the need for balancing actions for keeping the system within operational limits during the day. Within day obligations should not be implemented for biomethane balance groups.

The transmission system operator is entitled to take necessary measures including financial security safeguards to reduce default in payment for the imbalance charges. As the safeguard measures have to be on an equal basis, the balance group responsible party running the biomethane balance group will be obliged to provide bank guarantee or cash as collateral to cover the risk of its default on an imbalance invoice.

5.3.2. Gas Market Model Integration Example: Austria – Balance Group Model

A balance group model exists in all countries with different country-specific expressions. Injected biomethane must be an element in each balance group model. The following describes how the biomethane flows are to be handled in the Austrian balance group model and the Austrian gas market model.

The biomethane injection into the Austrian gas grid is regulated as follows: Biomethane injections are located in the distribution area and the injecting plants are registered with AGCS. AGCS in its role as a balance group coordinator sets up a balance group for the

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injection plant. On one side of the account (credit), the production and on the other side (debit) the sale of the gas is registered. This so-called balance group responsible (BGR) also receives the invoice between production and sale of gas.

Once the renewable gas has been fed into the grid, it becomes indistinguishable from the other gas volumes. The transactions relating to this quantity of gas do not differ from other gas quantities. The individual biomethane molecules are not treated differently and there is no second biomethane grid.

The biomethane injected into the grid is accounted for just like normal natural gas on a daily basis. Gas production is forecasted for the next day and the corresponding sale schedules have to be made in advance.

Grid Capacity for entry of quantities of biomethane into the gas grid is necessary. The plant operator has to apply for this access capacity which is provided by the grid operator in advance. Plant operator pays for the access capacity.

Austria consists of several so-called "control zones" (one distribution area in the east, two market areas in the west) between which physical biogas transportation is not possible. So how does biomethane move from west to east?

As far as the registry is concerned, only the property of injected biomethane is recorded and may be transferred via GoO (including expert statement) from the biogas plant to traders, to suppliers, to consumers. The step from injection to the GoO is as follows: At the end of the month all grid operators transmit the metering values of biomethane injected into their grid on an hourly basis. The metered values are recorded in the biomethane balance group run by the balance group coordinator. These values are then taken over by the biomethane registry and the registry generates a monthly block of GoO per plant.

This block can be transferred or split at any time. This GoO, however, does not travel parallel to the gas to the end user.

The injected biomethane is valued corresponding to the other gases in the network. The value of natural gas may be x EUR/MWh, whereas the production cost of biomethane is about x + y EUR/MWh. Hopefully the GoO has a value of more than y EUR/MWh in the market.

The biomethane registry run by AGCS does not track prices paid for a GoO, or if the GoO is used to obtain a subsidy. The GoO represents a value which can be monetized but the GoO itself is not a document which can be sold for money.

The term mass balancing system of biomethane from AGCS perspective means that the injected biomethane is metered and the claim of biomethane is allowed only by those who possess the GoO. When a household is located a few hundred meters from the biomethane injecting plant this household is not automatically a biomethane consumer that may claim it

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had consumed biomethane. To be supplied with biomethane the commercial consumer has receive a GoO and pay the full biomethane price (gas price and GoO price).

5.4. Mass Balance

The mass of biomethane is recorded when injected and as a result a GoO is generated for the plant operator. Further on the GoO may be transferred in the domestic registry to be finally cancelled by a supplier or an end user. The GoO serves as proof of the mass of biomethane produced at production site and is the proof for the consumption of biomethane at consumption site. Consequently the physical biomethane volumes remain part of the domestic energy regime.

In order to facilitate cross-border biomethane trade it is essential to solve the issue of mass-balancing on the European level. Similar to the prevailing practice in Germany and Austria, where the natural gas pipeline network within the national borders is recognized as a single, closed mass-balancing circle (Bilanzkreis), the European natural gas network should be recognized as a single, closed, European mass-balancing circle. This would mean that the mass-balancing requirement is fulfilled as soon as volumes of biomethane are injected into the European natural gas network and withdrawal from the European natural gas network is documented.

Imagine following interpretation for mass balancing: Biomethane guarantees of origin have to be bundled with the physical gas flow and therefore would stick with the physical gas flow from the biomethane plant to the end consumer of biomethane. All transport rights on the respective transit pipelines and the transfer points (cross border point) would have to be contracted to transport biomethane. In this case the cross border transfer of GoOs can only be enabled by booking cross-border capacity, payment of that capacity, verification of a physical cross border gas flow, and submission of corresponding biomethane schedules by shippers. This model is very restrictive and would clearly not be the model to develop a European biomethane market. We have to exclude this version from further considerations here. If a country requires a physical gas flow cross border in connection with the transfer of a GoO due to specific reasons registries should also be ready to deal with such requirement.

Our interpretation of mass balancing is: The mass (gas volume) of injected biomethane is documented in the form of a guarantee of origin at the domestic biomethane registry. Gas can be taken out of the gas grid at every gas offtake point across Europe. A physical flow of the biomethane over different entry/exit points does not take place. This seems to be the feasible model for cross-border biomethane transfer. If GoO fail to fulfil country-specific criteria then this GoO should be excluded from transfer. By using this model which separates the physical flow from the attribute, transfers of GoO between all registries in Europe will be possible. In addition an appropriate administrative system is needed to balance the injected and withdrawn volumes of biomethane on the European level.

Deliverable 3.2 “Technical-administrative proposal to the European Commission for declaring the European natural gas network as a single, closed mass-balancing system with regard to

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injected biomethane" emphasizes the needed steps towards the reduction of hurdles and enable a cross border trade under given EU biofuel legislation.

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6. BIOMETHANE PRODUCTION UNIT

Biomethane is the product of raw biogas material which is made mostly from different agricultural or animal substances. The term biomethane production plant encompasses a biogas production plant with a downstream "upgrade" installation, or a technical unit for processing.

The production of biomethane begins with the generation of biogas. Biogas, which is a result of fermenting biomasses such as plants, waste, or other biogenic substances, is processed and turned into biomethane by means of an "upgrade" installation. Biomethane is physically equivalent to the gas in the gas grid.

The production unit may apply for registration at the biomethane registry by providing forms, documentation (gas grid operators, authorised auditors,…) and signing a contract with the registry administrator. The registry administrator sets up accounts for the plant operator and provides the plant operator with a log-in to the registry.

The quantity of biomethane produced and injected by the plant operator is metered by the grid operator. Metering data is sent to the balance group coordinator or TSO (transmission system operator). The metered values are used for grid control actions at TSO level and are booked on a credit side of a balance group on balance group coordinator level. Biomethane plants that are injecting into the gas grid are fully integrated elements of the gas market models.
The dimensions of the plants are usually built on the basis of the maximum amount of materials that are available for the use of biogas production.

6.1. Production

The production of biomethane and biogas is a process with many steps. The production is flexible, allowing the use of a wide range of materials that can be brought into the process. Aside from the use of diverse plants, animal waste and unusable (expired) food play a very large role. There are also other materials described in detail in other work packages and deliverables that can be used for the production of biomethane.

The production of biomethane and the generation of GoOs require reliable documentation. Such GoOs contain various attributes, which on the one hand have information about the quality of injected biomethane, its sources, auditor's statement and on the other hand information about the biomethane production plant.

The following attributes play a primary role in the product information and should be attached to the biomethane GoO:

- Generated Quantity
- Production Period
- Materials Used

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- CO2 Saved
- Experts Inspection Information
- Balance group Information.

The list of information can be expanded or reduced at any time. The attributes mentioned above represent a consenting solution for the exchange between registries and is therefore used as a foundation for future discussions.

The plant information should include at least the following:

- Name of Plant
- Country of Plant
- Address Information
- Maximum Capacity
- Raw Materials for Production.

Clearing and Settlement of biomethane in the balance group model

A biomethane production plant has an injection point, whose meter values are recorded in the biomethane balance group of the biomethane producer. The metered physical production and injection of biomethane is recorded in the biomethane balance group. Gas Grid operators are responsible for metering these values on an hourly interval and to transfer the values to the balance group coordinator.

The balance energy of the biomethane balance group is calculated as the difference of metered physical injection (measurement from network operator) and the nominated (sold gas) values. The balance energy consumed in the biomethane balance group is charged to the BGR (balance group responsible party). The balance energy price should be a gas market price. As a result the balancing costs for the biogas/biomethane balance groups is at a market level price and therefore constitute no risk for the biomethane balance group.

6.2. Initial plant approval

In order for a biomethane plant to be recognized and allowed to operate in the market, various tests and registrations are necessary. Assuming that the plant exists, is close to operational and has access to the gas grid, the following steps must be completed (national variations are possible).

a) National permission for the biomethane plant operation, in some countries additional certificates are necessary to be labelled an “eco-plant”
b) Allocation of injection metering point by the operator
c) Registration by the distribution area manager for the physical clearing and settlement of the injection
d) Registration as balance group at the responsible body for the settlement of the physical injection, or balancing energy quantities
e) Registration of the biomethane plant in the national biomethane registry.

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Ad a) Because the biomethane injection plants and biogas preparation plants are scattered, the regional authorities are often responsible for issuing permits as well as granting recognition as an eco-plant. Permissions can be granted by either regional or national institutions, for example the regional or the national environmental department. Due to plants being scattered as they are, it is more common to see regional agencies granting permits.

The appropriate state agency sends an expert to inspect the plant according to set standards and if the standards are met, the plant is granted a permit and labelled as an eco-plant. This test follows criteria set by regional laws, but often is equal to a national recognition. With this permit the plant is prepared for further steps in the registration process with the clearing and settlement agency as well as prepared to receive funding for biomethane injection.

Ad b) The gas grid operators are responsible for establishing a gas grid connection. The cost distribution is uneven in Europe. All connection costs are paid either by the grid operator (limited or unlimited duration) or by the applicant. In between there may be other gradations concerning cost distribution.

The grid operator is in most European countries responsible for the connection regardless of who covers the costs. The operator of the plant can carry out the next registration steps after the installation of a meter and the assigning of the corresponding meter as a result of the network connection. The meter code usually is the unique identifier for the biomethane production plant.

Ad c) Each biogas injection plant has special registration steps as the physical injection has an effect on the grid, and thus an effect on the physical flow in pipeline. This is projected by the distribution area operator and in the case of failure, handled and controlled (in coordination with the grid operator). Registration with the national distribution area manager is essential. Aside from the technical information about the plant and grid information, the registration also includes instructions for the mention of projection and production data, which are necessary for the daily business interactions of the national gas market.

Ad d) The balance group coordinator (BGC) is responsible for the clearing and settlement of the gas market, that means the offsetting between the projection inaccuracies and physical production. The offsetting of the cost for balance energy, which accrues each month, and other relevant system costs are distributed among and monthly accounted for the market participants according to a defined formula. There are a number of reasons why there is inevitably going to be a difference between the projected and actual production at the injection plant, e.g. an unexpected disturbance. The registration of a balance group at the BGC is necessary, where the physical quantities are shown on the balance sheet. This balance sheet carrying the costs for all energy balancing. Registration is also coupled with data sharing, or coordination with the distribution area manager so that the establishment of the plant for the physical injection is completed and all market participants have the necessary information.

Ad e) Registration with the biomethane registry can take place once the biogas plant has completed the national registration for the actual injection. Points a) to d) should be a requirement for registration with the biomethane registry.

The setup of a national biomethane registry is not clearly defined, therefore existing registries are either in place voluntarily or through national legislation. If there is national legislation, it is

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likely there is also a designated body charged with issuing GoOs. In countries where there is no national legislation for registries, voluntary registries may exist.

The biomethane registry checks each plant with regards to access to the national gas market and their status as an eco-plant. Upon completion of a successful examination, GoOs can be automatically or manually issued into registry accounts.

6.3. Continuous plant control processes

The GoOs are issued by the biomethane registry. GoOs issued by the registry are usually specific to the plant, time and quantity. In order to check all of the qualities of the GoO, it should be inspected by an independent auditor as this is not the task of the biomethane registry. This inspection is carried out in coordination and agreement with the plant operator. The results maybe be assigned to the registry in the form of a report, where all corresponding attributes are recorded directly into the GoO.

This examination is a standard procedure and is conducted once a year usually after the GoO registration for the previous calendar year. The expert examines the facility and the ingredient monitoring book including further parameters. The result of the inspection is an expert statement from an authorized auditor. This expert statement is a part of the GoO and is never separated from the GoO. The expert statement is documented in the biomethane registry in electronic form and is an attachment to the GoO.

The expert statement, which could be several documents, “travels” with the GoO if the GoO is transferred domestically or internationally.

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7. SET UP OF A BIOMETHANE REGISTRY

7.1. Introduction – Purpose of registry

The development of the biomethane a market is difficult and requires the proper experts and tools in order to not only establish trust in the market but also expand production. Some of these requirements include but are not limited to the construction of a production facility, production of the biomethane itself, tracking of the biomethane and bringing the product into the market. The establishment of a biomethane registry is essential for the tracking of biomethane. The registry has a responsibility to participants in the market of being a neutral and trustworthy settlement agency of GoOs. More specifically these responsibilities entail necessities such as registration process and preparation of a unified platform for the settlement process within the registry. This also includes the generation, inspection and transfer of GoOs when necessary. Various technical and organizational steps must be taken to establish a facility and bring it in into operation.

The following chapters will provide an overview of the specific organizational and technical aspects required to establish a successful biomethane registry. The following information is meant to be of assistance to European countries in their mission to establish biomethane registries. The information is based on six existing European biomethane registries currently in operation and therefore contains valuable content that should be considered in the biomethane registry establishment process.

7.2. General Principles of a registry

General Principles

This description of the biomethane registry functions explains the general principles of the operation. The individual participants are aware and take notice of the following, predefined roles:

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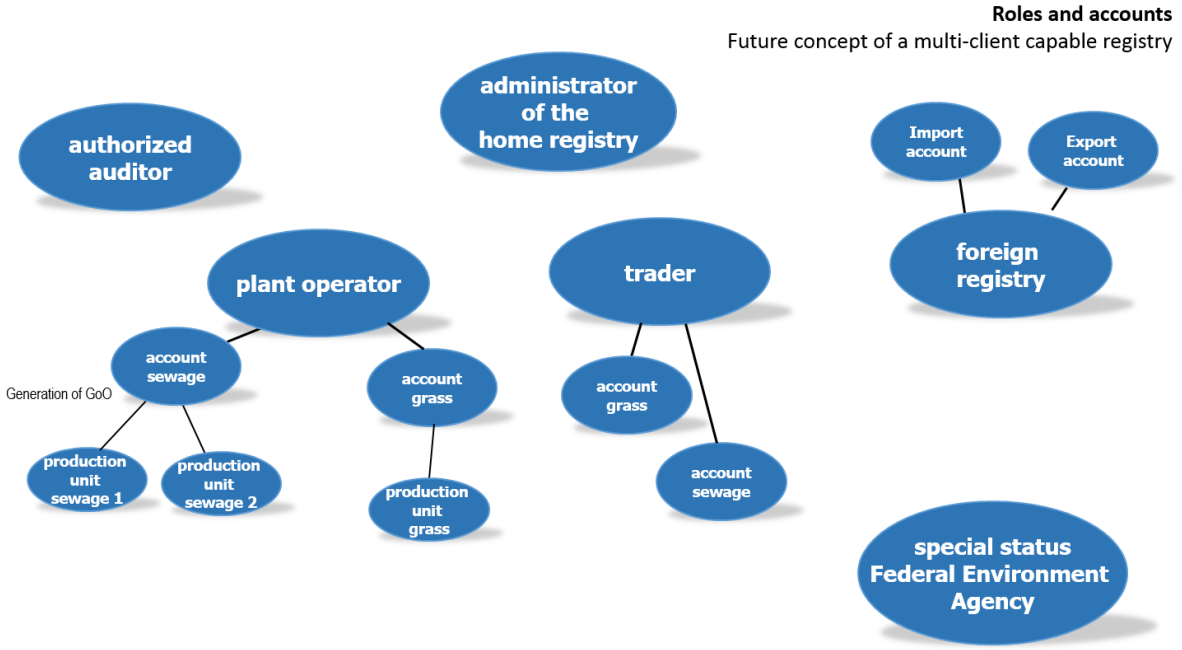

Figure 6: roles and accounts of a biomethane registry

The participants are given a log in and an account to the biomethane registry by the administrator. The biomethane registry should be an electronic account based system for the registration of biomethane quantities fed into the gas network, allowing the generation of a corresponding GoO, as well as the transfer of GoOs between registered account holders and subsidy agencies, among other institutions.

The biomethane registry offers its users the opportunity to manage biomethane GoOs in terms of scope, quality and origin in a central IT-supported documentation system. Through the account system of the registry, the produced biomethane volume can be separated into more than one GoO to be passed along. The buyers and sellers of GoOs operate the transactions in the registry themselves without the assistance of administrators.

The production unit and the already created GoOs are evaluated by authorized auditors who are registered within the registry. With their expert statement, they incorporate and attach notes to the GoOs. In some registries the GoO generation process is based on the auditor statement and therefore interlinked.

The registry may individually adapt to national demands when it comes to roles and authorities. This is necessary allowing registry entities to have individual rights, views and actions within the registry. Due to the continuous development of a market, its processes and tasks such flexibility is very important.

At the request of authorized participants, the registry also generates printable confirmations of the cancelled GoOs, which can then be used by the participants in business with third parties (business partners, other recipients). The confirmation features a structured documentation

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about injected biomethane quantities and identifies which marks or notes an authorized auditor has made on the corresponding GoO.

Two layers must be distinguished:

The physical layer shows the feeding into the gas grid and the volume of biomethane in a balance group. In the target model the physical gas flow is metered by grid operator, booked into the biomethane balance group by balance group coordinator and transferred to the biomethane registry.

The second layer shows the accounts of the biomethane registry. This layer is represented by the biomethane registry.

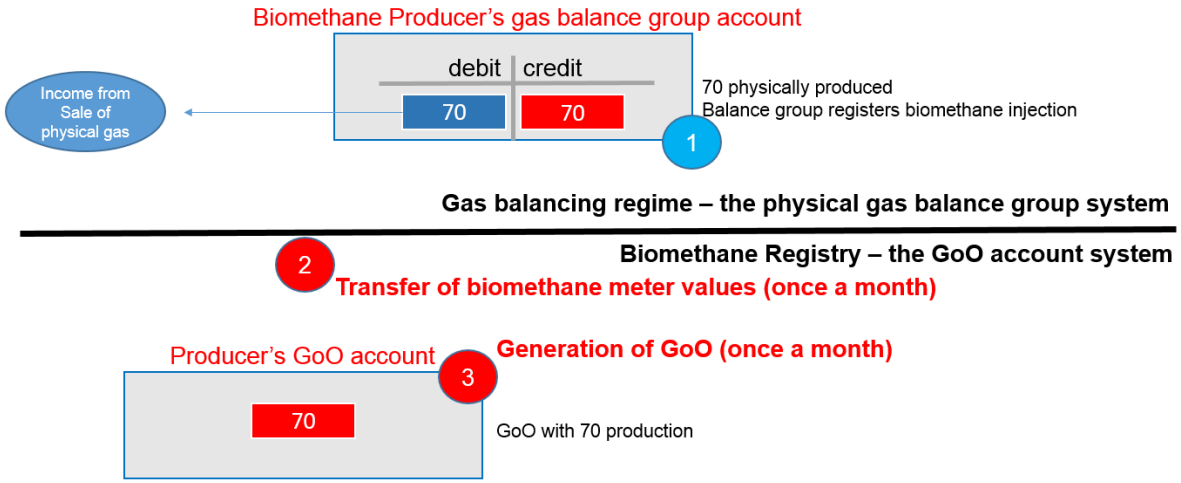

Figure 7: biomethane layers

Balance Group Accounts

Produced quantities of biomethane are fed into the natural gas grid. The injection of biomethane will be recorded in specially established balance groups by the respective balance group coordinator or the national Transmission System Operator (TSO). The biomethane intermingles with natural gas as soon as it is brought into the natural gas grid.

The biomethane GoO moves in the national biomethane registry, the physical methane quantity is handled separately from the biomethane GoO. The price for the physical gas quantity is left to be agreed upon by the participants themselves, the administrator has no influence; the price is neither documented nor shown in the registry.

On the balance group level the production volumes are set against the sales volumes. Deviations correspond to a balance of energy, and the accounts are settled by the balance group coordinator. The balance group coordinator is outside of the national biomethane registry and is not a signee of the contract between the administrator and corresponding biomethane registry participants.

GoO Level

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The national biomethane registry works only with the GoOs and not with physical volumes. GoOs can be transferred between participants and decommissioned by owner. The national registry records the corresponding GoO transfers for each participant. For cancelled GoOs, a

Biomethane injection facilities will be inspected by experts/auditors before operation begins and as a consequence of any facility changes (for example repowering). In the case that a subsidy agency conducts their own inspection, the expert/auditor will conduct the inspection in accordance with the criteria of that agency. The national biomethane registry allows inspectors to grant approvals/reports for certain biomethane batches of each injection period. The approval remarks for each partial quantity and GoO generated by the facilities are automatically transmitted. The registry itself does not add the data of the participants or inspectors, remove anything or evaluate anything. The registry merely takes the data provided and documents the results. The registry also offers the account holders a report so that they may see and understand what has taken place.

Biomethane Marketing Options

According to the registry administrator, the operator of a facility is free to market the biomethane together with the GoO or separated from the physical quantity. In any case, regardless of the intended purpose, the pricing is determined by the participants. Because the administrator also has no influence on the pricing, the price is neither documented nor shown in the registry.

Advantages for Market Participants

The GoOs facilitate the trade of biomethane. The buyer of a GoO, which is a registry user, can trust that the GoO represents data and documents describing volumes and attributes of biomethane actually injected. The GoO of the registry replaces the personal knowledge of the contract partner and production circumstances. The biomethane registry is not a trading platform.

7.3. Set Up “Voluntary” vs. “Mandatory”

The biomethane registry can have different functions depending on the country. The national legal frameworks are quite different. Registries have to operate in accordance with national laws and regulations. However the primary task of a biomethane registry is a harmonized generation of Guarantees of Origin for injected biomethane in the national gas grid. Registries can be of a voluntary (private companies) or mandatory (public body) type. Both types have advantages and disadvantages which will be illustrated in the following sections.

Voluntary Registry

The establishment of a voluntary registry is primarily oriented towards the benefit and demands of market participants and does not have the supervision of a neutral or supervisory authority. Therefore during the construction a high level of transparency and communication with the market participants is a requirement. The operation of the registry should be carried out by a neutral body. In a voluntary registry, the costs are to be covered by the registry users. An

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appropriate business plan with a structure of fees is to be established. Emphasis should be placed on achieving an effective structure with low costs.

The Pros and Cons of a Voluntary Registry:

PRO

- Market oriented registry design
- Changes take place according to market developments
- Quick implementation and decision making
- No direct subordination (to government agencies)
- Little political emphasis required
- Substantial flexibility

CONTRA

- Costs covered by market participants
- Trust must be gained (because of potential of self-interest)
- Extensive transparency is necessary
- Liquidation of registry is possible at any time (for economic reasons)
- Minimal external control (no inspections by supervisory agencies)
- there may be several registries competing with each other and this does not help confidence.

Mandatory Registry

The mandatory registry is legitimized through national laws and regulations. The regulation clearly states that the issuing of GoOs is among the tasks of the registry. The government agency or legislature related third party has authorization for the activities that are being conducted by the registry. For example a funding agency or responsible body for the national gas settlement, distribution area manager or operator of the virtual trading market. However it is also possible that the body or agency is assigned through a national tender. In this tender process (varying from state to state) the best bidder is selected and granted a contract for the construction and operation of the registry.

In most cases the national legislation and the requirement of an activity is connected with the recognition of costs by the relevant state. This means that the expenses of the creation, operation and activities of the registry are paid by a public authority and that the market participants have low or no costs to bear. Therefore entry into the market, provided it is not mandatory by law, is possible with very lost costs to bear. The existence of the registry is regulated by the legitimacy of the law and any influence on the registry is possible only through a supervisory body or a change in the law, which can lead to sluggish structures.

Again a high emphasis should be placed on trying to keep bureaucratic hurdles, such as the provision of GoO, as low as possible during the establishment and operation of the registry. It is important to provide market participants with efficient processes and structures within the registry so that they remain involved in the processes and procedures. These measures should ensure a high approval rate from the market participants and build trust in the market.

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The Pros and Cons of a mandatory Registry:

PRO

- All market participant must use it
- Mission and tasks of registry are clearly set by national legislation
- Supervisory control of the registry
- Existence of the registry is regulated by national law (periodic amendments)
- Low or no distribution of costs to the market participants
- More services available due to lower cost burden (cost does not have to be covered by revenues), for example marketing, expansion of functions, etc.

CONTRA

- Market participants have less influence
- Less flexibility
- Usually limited to state-subsidized business cases
- Not necessarily market oriented.

7.4. Stakeholder Analysis

When setting up a registry, it is important to take the different interest groups and organizations into consideration.

Communication is essential to ensure a smooth establishment and operation of the registry project from the very beginning.

The pros and cons from the perspective of a stakeholder should be analysed. The potential of positive or negative influence from the stakeholders should be evaluated. The results of this analysis should show which parties would vote positive, negative or remain neutral. It is important to attempt to sway the negatively minded parties through personal meetings etc. so as to convince them to vote at least neutral.

The following parties should be considered in the stakeholder analysis for the establishment of a biomethane registry at least:

- Ministries, National agencies involved in green energy.
- Interest groups from the gas and energy sector
- Producers of facility equipment (suppliers, manufacturers)
- Producers of the biogas (plant operators)
- Suppliers (waste industry, farmers interest group)
- Gas suppliers
- Ultimate customers (representatives)
- National and international Biomethane Registry

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- Previous international partners and projects (for example green gas grids project partners).

Below is an illustration of the stakeholder analysis, including groups and parties with potential interest in a biomethane registry. This illustration is fictional as the analysis varies at each registry. The parties have to be added to each section according to their mind set by each registry differently:

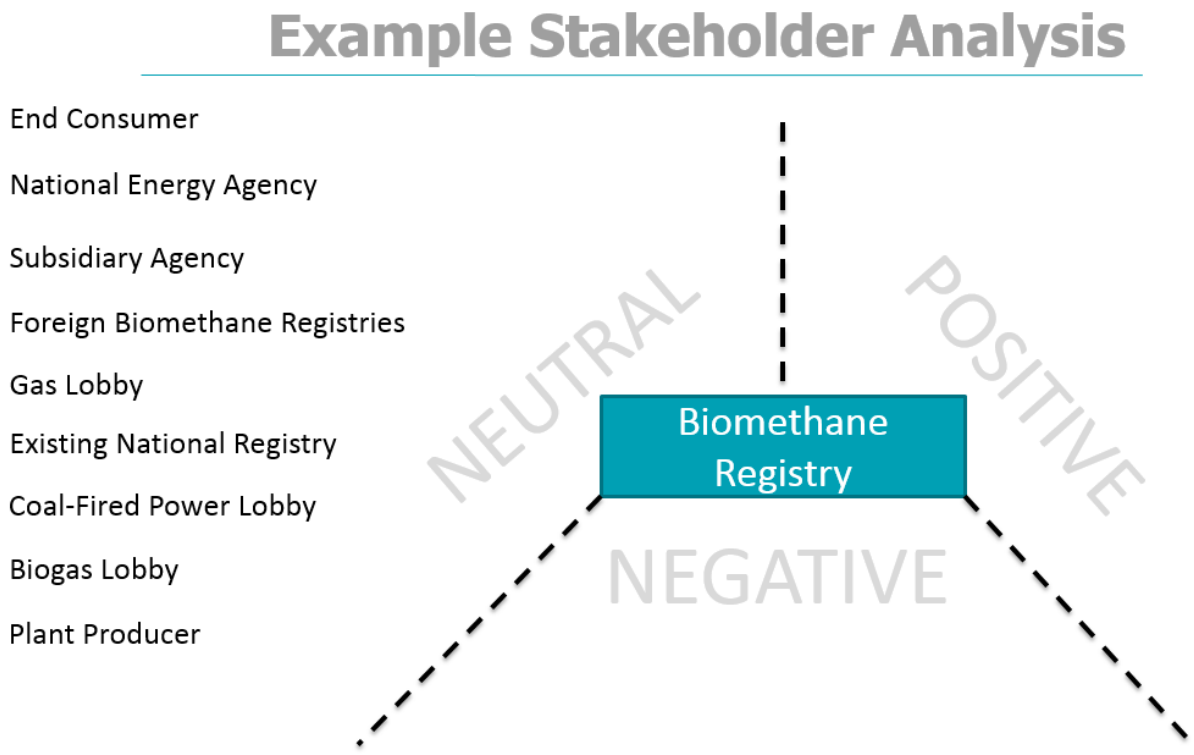

Figure 8: stakeholder analysis

The negatively minded parties require special attention. Their opinions and influence should be carefully examined and a plan of communicating with them should be prepared. Most of the time the negative vote stems from a lack of information or a misunderstanding, both of which can be easily remedied through the following actions:

- Personal meetings and conversations
- Hold events to answer any open questions and provide further information
- Involvement in the establishment and development of the registry (observational role without decision making ability)
- Publication of newsletters and emails
- Internet website to allow for easy access to information.

Stakeholder analysis should take place on a regular basis. It is more important that they take place more often during the development of the registry rather than later in the process. These

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parties can develop varying opinions and new groups can come into play at any time. The analysis is a helpful tool in keeping track of the groups and where they stand on the issues.

7.5. Time Schedule

It is essential for the success of the biomethane registry project that its workflow is careful planned. Communication with market participants, integration through system tests, and registration of users, all happen according to a coordinated timetable. The involvement of parties depends on the prepared project phase and the timetable should be followed very closely.

The timetable should consider at least the following project phases:

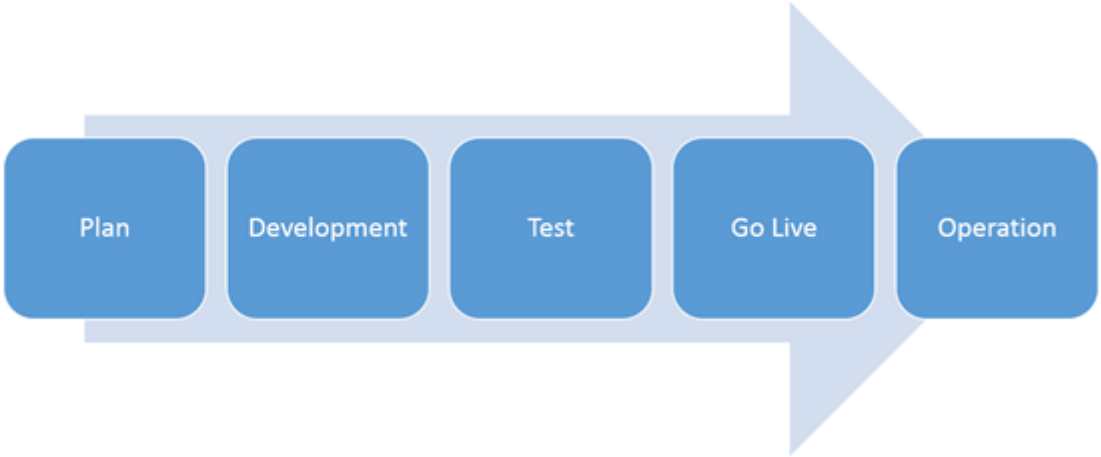

Figure 9: timetable with work packages

Planning Phase: 2-6 months

The tasks of the planning phase are to record all steps/milestones and resources necessary. A detailed plan of the project schedule and communication must be created, which is to be agreed upon with the most important stakeholders. The registry relies on the support of key stakeholders.

The project leader (PL) on side of the registry is responsible for making sure the prepared plans are followed and implemented. This requires excellent communication and management skills as so many parties are involved. The selection process of the project manager is essential and it should be clear from the beginning that the project manager is accepted by involved parties. The PL should be well integrated and linked with the biomethane industry. As the biomethane market is a niche it is of high value to know the market actors and theirs interest from the beginning.

The project manager must have the ability to manage quickly and adapt to adjustments, for example in the case of delays or changes in decisions. The project leader has to create periodically reports to the steering committee which supervises the progress. In case of deviations the project manager has to report immediately and decisions have to be taken by the steering committee.

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Defining the biomethane IT system is an important step in the planning project phase. The business processes form the basis for the software specifications. For the software specifications the know-how of IT-Experts should be called in.

Development: 3-12 months

The development is aimed especially at the organization of the registry administrator which includes customer service (people responsible for the operation of the registry) and the IT system of the registry. During the development process, an invitation for the tender should be offered to an IT-provider. This is already organized in the planning phase. The process of a public tender may incur extra expenses, as there are many points that must be considered. Among them a long deliberation period can occur in which the tender may be accepted or rejected, which may delay the decision.

The IT system develops primarily according to the specifications of the registry. The length of the development phase depends on the complexity of the IT system. If a basic system is already in place and only has to be adapted, the process can last just a few months. If a new IT system must be created with special requests and difficult programming, this can take over a year. Also, experience shows that the better the description in the planning phase, the better the IT result. Unfortunately, in an IT project, the majority of the work has to be done in the back end before customers get to see the front end. Therefore, if then you realize potential mistakes or misunderstandings, it may be a lot of work and take quite some time and financial resources to remodel. It is therefore advisable to invest considerable time in the planning phase and reserve some additional time and budget.

When choosing the IT partner, also keep in mind who will own and who and how you will be able to operate the system later on. If these things aren't specified right from the start, you may end up with very high maintenance costs or pay additional fees for user rights.

There already exist various IT systems for biomethane registries in 2015 for example in Austria, Germany, Netherlands and Switzerland.

The customer service team of the registry should be fully integrated during the development phase. Within this phase the processes of the customer service team are designed as well. Therefore the processes of the service team should be in line with the IT system. The processes applicable in the IT system should be developed in coordination with the customer service team.

The result should be a verifiable IT system operated by IT professionals of the biomethane registry with experience and knowledge in the field. The experts should be also well known to the business processes needed to operate the biomethane registry as a whole (with the support of the IT system).

Test: 1-4 months

Various tests should be carried out during the test phase. Among these should be internal tests, which take place during the development phase, and official tests with market participants, other interested parties, funding agencies and others. Once these tests have been completed, a final test of the entire system takes place. The amount, length and depth of tests

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depend highly on the complexity and size of the IT system. A small registry with very little functionality can be tested on short notice and with little effort.

The test phase is planned in detail, meaning the input, the implementation and the results are clearly specified. The definition of participants involved, test scenarios and the communication is a prerequisite for each test phase. The goal of implementation is the completion of both required and voluntary tests (depending on the test phases).

The expected results are clearly specified before the tests are carried out. Only through stating the expected results before the testing weak points can be identified and corrected. It is important that the expectations are achieved and that the correct results are incorporated into the project. Also of great importance is communication with participants. They should be able to provide anonymous feedback for example through online survey or online forms.

Go Live: 1 month

Once the tests have been passed, the system and customer service can go live. With this step the development phase is finished and the daily operations begin, so it is important that any remaining issues in the development phase are addressed and remedied in a timely manner. This phase also includes the registration of market participants.

Aside from the operations mentioned in the phase above, which are aimed at establishing services and building the IT system, numerous administrative tasks are required. Among these tasks are the creation of contracts, the creation of forms for registration, and if necessary, the accounting of fees.

Operation:

Daily operations include all tasks and processes which are necessary for the flawless operation of the biomethane registry and its IT system. These tasks and processes include but are not limited to the generation, processing and inspection of GoOs, the registration of market participants, processing of customer service and market participant inquiries, supervision of the IT system, the generation of statistics, ongoing maintenance of the website, providing training and depending on the registry.

The duration of each phase is not generally defined, but a strong planning phase is the key to an efficient implementation. However, a call for tender can extend the duration, as this may take up to a few months. If there is no call for tender and the structure and expectations are clearly defined from the beginning, a biomethane registry be completely planned and developed in approx. 9 to 18 months (maximum half a year to two years).

7.6. Resources

There are two types of resources necessary for the development and operation of a biomethane registry. First human resources and second infrastructure resources. The

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resources of a registry depend on the work carried out by the registry. Also it has to be distinguished between the development phase and when the registry is operational.

Human Resources

More human resources are required for the setup and starting process because this is the phase when most of the coordination, communication, specifications, tests and business processes definitions take place. At least one project team with a project leader is necessary in the development phase of the registry. Of course it is preferable for continuity that the same team remains at the registry from the development phase through the going live phase. The average personnel resources in the project phase is 0.5-1.5 fulltime equivalents (number is based on registries from DE, AT, CH, DK, UK).

At least two people should be capable to operate the registry. In the operation phase, the efforts and costs will depend on the activities of the registry. Telephone support during office hours may be time consuming. A so called 4 eye principle should be used for special actions such as the generation of GoOs or the recording or changing of sensitive information. This reduces errors and the chance of entering false information into the system. At least two different people are required for this process.

For example the biomethane registry can be operated in an existing organisation like a clearing agency, network provider or national energy agency. A stand-alone organisation to run a registry may be too costly to run and there is high risk that income from fees will not cover costs.

If the registry is operated within an existing organisation synergy effects may be high and it is estimated that registry operations of a small or middle sized registry can be executed with 0.2 – 0.7 persons per month. The values are based on input from existing registries in Europe.

Bear in mind, though, that the efforts needed may vary in the course of the year. Some subsidies demand GoOs by a certain deadline. Around that time all customers might have very urgent needs while during other months the demand is far less.

By founding a new organisation (registry on the green field) it is necessary to employ at least two persons. A telephone hotline requires at least 0.5 full time equivalent. Further on there must be backup in case of sickness or vacation of employees. Not taken into account any back office tasks which have to be executed as well.

Generally the operation of a registry includes following tasks:

- Generation respectively administration of GoO (according to type of registry)
- Telephone support
- Customer service requests
- Registration of market participants
- Change of master data
- System support
- Maintenance of website
- Charging of fees
- Cost allocation within the registry (with external parties for software, hosting, licenses, etc.)

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- Adaptation of IT system to changes in regulation
- Back Office tasks.

The current practice is that the tasks of a biomethane registry are executed within existing national entities. This way is the most efficient on a cost and resource level. In parallel the staff responsible for the operation of the biomethane registry has different tasks within the organisation which are normally in the areas of gas or renewables.

Infrastructure Resources

Besides human resources the operation of a registry demands a certain amount of infrastructure. Necessary infrastructure that has to be considered can be seen in the overall office infrastructure for the employees of the registry, as well as the information and communication infrastructure that is necessary to administrate the registry and to execute the tasks seen in the human resources. Also the hosting of the platform demands a computer and server infrastructure.

Similar to the human resources the creation of the infrastructure by founding a new organization seems to be very demanding. The integration of the registry within an established organization reduces the initial effort to a minimum hence office and ICT-infrastructure is already available within the most organizations. The resources like, licenses, standard software and hosting can be shared with the organization the registry is integrated.

The overall costs should hence be related to the size of the share, e.g. if the registry needs 0.5 persons per month only this amount of the ICT-system and office space should be costs for the registry. Nevertheless these costs differ widely from country to country.

For both, human resources and infrastructure the integration within an established organization has the advantage of flexibility and scalability. Resources can be easily added or released to handle peak times or special events.

7.7. Costs and Financing

The revenue side is needed for the financing of the registry costs. Financing can come either from government agencies or from fees to be paid by registry users.

On the other hand there are different costs to be considered. Following types can be at least distinguished:

Setup costs:

1. Project costs
2. Travel, Meetings
3. Infrastructure
4. Salaries
5. Legal
6. Cost of software specification
7. Tender.

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Operational costs:

1. Depreciation
2. Software
    a. licence
    b. Hosting
    c. Maintenance, Repairs
    d. Change Requests
3. Salaries
4. Legal
5. Marketing
    a. Events
    b. Web Hosting
    c. Domains
6. Office
    a. Rental
    b. Office IT infrastructure, network
    c. Furniture, Equipment
    d. Office Supplies
7. Travel, Meetings
8. Insurance
9. Other costs (including third party costs).

In the operational phase yearly registry costs, expending on the size and complexity of the IT system, can run from some ten thousand EUR up to some hundred thousand Euros. An operation in a secure data centre (automatic back-up and recovery system) is recommendable. A smaller system which is integrated into a pre-existing structure could have far lower costs.

At that point a price indication for software licence cannot be given. It is highly advisable to tender the system. With more offers to be chosen from, the likelihood of price competition and therefore lower purchase costs increases.

The basic IT system cost structure is:

	one time	1. year	2. year	3. year	4.year	n.year
Set-Up Costs	X					
Project Management	X					
Milestone 1 (Approval Specification)	X					
Milestone 2 (Acceptance IT-System)	X					
Milestone n (Go Live)	X					
Licence costs		X	X	X	X	X
Hosting		X	X	X	X	X

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Maintenance and Support		X	X	X	X	X
Adaptations and Change Requests		time and effort	time and effort	time and effort	time and effort	time and effort

Personnel costs refer to the costs required for the hiring of employees necessary for the establishment and operation of a biomethane registry. These costs vary widely between different countries and different registries. For the operation of a small to medium registry, roughly 0.2-0.7 full time employees should be hired.

For the phase between the building of the registry and going live, about 0.5-1.5 full time employees should be employed. This number can of course be increased in proportion to the size and operation of the registry. Furthermore the number of employees depend on what is done by the registry team (just project management or also legal stuff, etc.) and what is outsourced.

The operational costs are strongly dependent on the activities of the registry and can include various types of costs, for example:

- Infrastructure costs (facility, computer, telephone, internet, etc.)
- Marketing costs (brochures, accessories, etc.)
- Travel costs (tickets, hotels, etc.)
- Allowable expenses (participation at meetings, events, business meals)
- Third party services (insurance, law, back office, accounting, controlling etc.).

Apart from the cost side the revenue side must be ensured. The registry can be financed either through a government agency or through yearly fees or transaction fees. We do not consider registries as profit centres.

The following costs can be offset when the registry is supported by market participants:

- Annual fees for companies
- Annual fees for accounts
- Annual fees for individuals (ex. RSA tokens)
- Transaction fees (per transfer or per kWh)
- Administrative fees (changes to master data, return of transfers, issuance of written GoOs).

An adequate fee structure has to be developed to safeguard the financing of the establishment and operation of the registry. There are different scenarios possible depending on the expected numbers of users and companies participating the registry.

The fees should create a reliable and not volatile revenue stream as the operational cost base is quite stable. Fees should not create a barrier for potential registry users nor should the fee structure be complex. The fees should be acceptable for the potential registry users. Proposals from the user side should be considered in defining the fee structure to increase acceptance. Before the project is started it is recommendable to ask for a commitment of interested parties/stakeholders to register to guarantee a user base at the beginning.

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7.8. Contractual Framework

7.8.1. General Conditions

Each market participant must enter into a legal contract with the registry. The registry administrator must have a contract available, which all market participants must sign regardless of their role.

The general conditions should illustrate at least the following points:

Definitions

Biogas	reference to the specific domestic regulations on biogas
Biomethane	reference to the specific domestic regulations on biomethane
Time of Transfer	The point in time at which the guarantee of origin is transferred from one registry user to another
Registry System	The technical system operated by the biomethane registry for the transfer and storage of guarantees of origin
Registry Participant	Registry user who has signed the Contract and is therefore subject to the general terms and conditions
AGCS	exemplary for the registry in the specific country
Contract	Agreement between AGCS and the Registry Participant, which is to be concluded based on the general terms and conditions.

Preamble

Description of the legal basis of the registry in the specific country and the legal rights and obligations of the registry in the specific country.

Contractual object

Description of the scope of services covered by this contract. This scope is substantially determined by the legal basis and therefore the rights and obligations of the registry in the specific country.

Condition for admission to the registry

This also mainly depends on the national regulations. In many countries, the regulations vary depending on the operation conducted by the registry user. For instance, the process of withdrawing biogas for the production of subsidized electricity has very strict regulations.

Rights and Duties of the Registry

- To be at the disposal of the users
- To communicate information about changes in the registry
- To communicate changes with respect to international and national regulations
- To protect data against the access of third parties.

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Rights and Duties of the Registry Users

The rights and duties of the registry users vary by registry but the following general principles should be maintained:

- To protect individual log in data
- To perform no actions that may cause harm
- To ensure the accuracy of data (master data, facility data)
- To meet the standards of the Data Protection Act.

Guarantee and Liability.

AGCS is liable to the notification requirement in the framework of the use of the registry system under the agreement for any damages, only if intent or gross negligence by their institutions or assistants is proven. Liability for consequential damage or lost profits is excluded and exists only in the case of intentional conduct. AGCS is not liable for no-fault damage, operation disruptions resulting from force majeure or events for which they are not responsible. AGCS is liable for damage, which disrupts the operation when caused through intent or gross negligence.

All services offered by AGCS are provided with the utmost care. AGCS will put forth its highest personal effort to provide a quick and flawless delivery of the agreed upon services. Furthermore, in this agreement warranty claims of the customer, for whatever legal reason whatsoever are excluded.

Data Protection/Use of Data

All information and data which AGCS receives pursuant to this contract, and which is not to be forwarded to third parties, is to be treated confidentially. AGCS and its contract partners are committed to the proper handling confidential information. Access to this confidential information is granted only to employees who require it to fulfil a task outlined under the agreement.

This confidentiality obligation does not pertain to information which has been communicated to AGCS or its contract partners by third parties without restrictions.

Confidential information made available by AGCS is to be used only for the fulfilment of tasks outlined under this agreement.

Registry participants hereby give consent that confidential information and data may be transmitted to a regulatory body or any other body or company by AGCS if AGCS is obliged to transmit this information by law or due to a legal notice of a court or other legal bodies.

Payment Accounting/Billing

Depending on the registry, a fee structure can exist which is constituted of various components. This structure can range from a one-time payment to an annual overuse-based charge. In such cases, diverse additional internal and administrative processes are required, for example accounting and invoicing.

Billing is done depending on the fee structure once a year or in more regular intervals. In this case the registry must issue an invoice.

The registry user is under the obligation to meet its financial obligations including taxes arising from their membership.

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Payment is due within three banking workdays from the date of the invoice via SEPA business-to-business direct debits. The registry user is under the obligation to assign and communicate the mandate for the required SEPA business-to-business direct debit to AGCS and to send a copy of this SEPA business-to-business direct debit mandate to its bank, with the respective documents required to be received by the respective recipient by the latest when the contract is executed. The registry user is permitted to refuse keeping bank accounts with individual banks only for objective reasons. An objective reason is deemed given, in particular, if the bank of the registry user is not capable of executing the SEPA business-to-business direct debit in line with the due dates and payment periods pursuant to these General Terms and Conditions.

In the case of an automatic debit of a payment due via a SEPA business-to-business direct debit transaction, AGCS is obligated to inform the registry user of the automatic debit of the amount due at least three workdays prior to the due date of the respective receivable. This notification must include the amount to be automatically debited and the date of the execution, and may be sent in by letter or electronically (e.g. E-Mail, Fax). Invoices shall be considered notifications in the meaning of these provisions provided these include the amount to be debited automatically and the date of execution.

In the event of delay in payment, interest on arrears shall by charged in the amount of the base interest rate (*depending on national legislation*) plus eight percentage points p.a.

Guarantee of Origin Transfer of Ownership

The guarantee of origin transfer of ownership is initiated by the seller in the registry. The transfer is completed with confirmation from the buyer and the corresponding identification code in the registry.

Entry, Duration and Termination of Contract

This contract enters into force with the signatures of both parties and is concluded for an indefinite period of time.

The contract can be terminated by any party by means of a letter for any reason with one month notice. Furthermore the contract can be terminated immediately if a valid cause arises. A valid cause for termination is the ongoing violation of contractual obligations despite written warning.

In the case of termination under compliance with the contract, no party is entitled to compensation from resulting damages or compensation for costs despite the termination due to a valid cause.

Written form and working language

Contracts and communications of involved parties must come in written form. A waiver of this requirement must also come in written form. This also applies to electronic communications with electronic signatures or faxes.

The contract is written in [Language] and business will also be conducted in [Language]. All communications by the contract parties must be presented in country-specific languages, as long as there is no other agreement with the respective country.

Governing Law and Jurisdiction

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This contract is subject to [country] law (except for the international private law provisions). The contract parties agree to exclusive jurisdiction of [name of court] for all disputes relating to the contract, including the validity of the contract.

Severability Clause

The invalidity of one provision of the contract does not void or effect the validity of other provisions. Parties to the contract are obligated to replace invalid provisions with valid replacement provisions with equal content.

Changes to the Terms and Conditions

In the case that changes to the terms and conditions are necessary, AGCS will immediately notify the contract party of the amendment of the contract appropriately, publishing this on the internet so that the party to the contract has access.

Changes to the terms and conditions enter into force at a predetermined time, at the earliest 14 days after the change has been noticed to the registry user as long as the registry user does not presents a written objection to the changes within this 14 day period. In the case of an objection, AGCS reserves the right to terminate the contract within 1 month of the objection.

Other

The registry reserves the right to utilize third parties in the pursuit of fulfiling its contractual obligations. AGCS has the right to exchange such third parties or to make use of new third parties without giving notice to the registry user.

Additional agreements, changes and additions to this contract must be submitted in writing. This also applies to the waiver of this requirement.

7.8.2. Additional agreements

The legal framework can include in addition to general conditions further agreements which have to be accepted by the registry participants. This might be the case for chapters or passages which are abstracted of the general conditions due to the necessity to have this clearly differentiated. This is the case for documents or areas of the framework which are subject to be changed on a regular basis (for example fee structure). Additional agreements could be for example:

- Security agreement (necessary for the clear definition of users obligations according to the usage of their account or credentials)
- IT treatment agreement (this is to oblige the user to examine the IT-system in an appropriate manner)
- Fee structure (accepting the fees published and accounted by the registry)
- Individual agreements (necessary due to the provision stipulated by the national legislation which are the registry users subject to, for example data archiving regulation).

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7.8.3. Forms

The registry participants have to give the administrator respective information on their company, users and respective biomethane plants.

This information is usually transmitted via forms within the registration process of the entity to be registered. The form can be either a document which has to be filled out manually or directly (online). The online form is to be preferred due to a normative entering of data.

Following forms are applicable in most of the registries:

- Application Form
- Company Registration Form
- User Registration Form
- Assignment Form (authorized auditor to plant)
- Acceptance Form (acknowledgment of additional agreements)
- Request Form
- Termination Form.

7.9. Registry Users

Registry Users – Description of Roles

The process of biomethane injection into the natural gas grid is one in which many different actors have roles to fulfil. In the simplified picture, biomethane is produced in a biomethane production plant where it is injected into the natural gas grid. Once injected into the natural gas grid biomethane is usable at locations other than the place of production. Guarantees of Origin (GoO) are issued to prove that biomethane has in fact been injected into the grid. These GoOs are issued by the national biomethane registries and have been inspected by authorized auditors. The inspection report of the authorized auditors helps to create an atmosphere of trust in the market. The GoO can be acquired from the producer and used by various registry users. The GoO can also be delivered to buyers and/or sellers or used as a means to receive funding from appropriate funding agencies.

The Austrian and German biomethane registries for example include a role concept. The roles which users may occupy defines their obligations and rights within the registry. It is also possible to assign multiple roles to a user. Another advantage of this concept is that new roles can be created at any time, allowing to adapt easily to future developments.

Only administrators may register users and grant access rights.

Each biomethane registry must clarify in advance which roles and corresponding rights and obligations exist. The registries should at least provide the following roles:

- Biomethane Producer
- Biomethane Trader
- Inspector/Authorized Auditor
- Administrator.

Additional roles can be created, for example a “special purpose user” who is not a trader but a representative of a state authority or institution involved in green energy providing subsidies or grants.

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In the following pages the interaction between actors and the specific roles will be described in detail.

7.9.1. Biomethane producer

The role of the biomethane producer is to operate the biomethane plant and to submit information on operation to the registry. Each plant operator has an account in the registry where GoOs are generated according to his physical injection of biomethane into the natural gas grid.

A biomethane producer can operate one or more plants, therefore it must be possible to register each plant separately but link each plant to an account. GoOs are generated on the credit side of producers account.

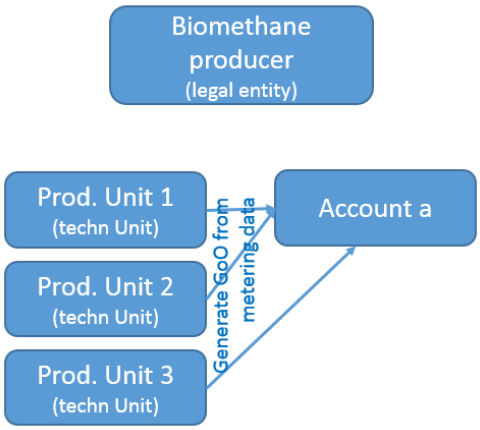

Figure 10: One account for three biomethane production plants

Figure 10: One account for three biomethane production plants shows three production plants and one account. In this example the plant operator has decided for such a set up as it was his decision that all injections are booked on one account. The number of GoOs generated is based on the quantity of biomethane injected into the grid by the individual plants. The GoOs differ as each GoO carries the information of its production plant and also the authorized auditor expert statement.

Each biomethane registry decides for itself which additional information is carried by the biomethane registry. It is of course recommended to carry such information as name and location of the production plant. However it is also recommended that information about the injection line, materials used and other various quality characteristics are documented. The authorized auditor opinion is part of the GoO and is carried with during transfer of GoOs.

There is necessity to offer flexibility to plant operators to organize their GoOs within the registry. We assume that for multi-plant operators there may be the need for more than on account.

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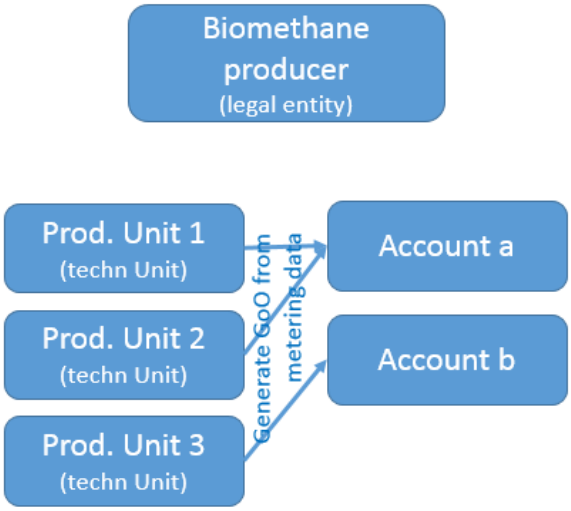

Figure 11: production units linked to different accounts.

In the example above the plant operator can choose which production plants are assigned to which one of his two account. A system which allows multiple accounts per plant operator or trader provides flexibility. Flexibility in the account structure is also needed when changes of corporate structures take place.

In order to generate a GoO the injected biomethane quantity must first be registered at the biomethane registry. This registration can be done by the plant operators themselves, through an independent body or through the locally responsible network operator. The injected biomethane quantity is indicated in MWh (registries using kWh will enhance due to European standard MWh) and can be reported in different ways.

The simplest way of registration of the biomethane production volumes is a form. The plant operator submits the filled out form to the biomethane registry, after which the administrator manually records the received amount into the system. The accuracy of the data must afterwards be inspected by an authorized auditor. After a successful inspection, the GoO is available in the account of the plant operator and can be transferred, cancelled, etc.

The most efficient way of generation is that the injected quantity of biomethane is metered by the grid operator and meter values are directly forwarded to the biomethane registry, or is forwarded to an organization like balance group coordinator (AUT) or TSO (DK) and further on forwarded from one of these organizations.

In Denmark, the national TSO, in Germany, the registry user or auditor, in Austria, the balance group coordinator registers the injected biomethane quantity which is an element within the national balance group model. The grid operator meters the quantity injected and communicates the meter readings to the balance group coordinator. In Austria the balance group coordinator is also the biomethane registry administrator. At the one hand the balance

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group coordinator receives the metering values to calculate and charge the balance energy for the biomethane balance group, on the other hand this data are used to generate the corresponding GoO. In Austria the generation of GoOs automatically occurs in the month following the production period (the period can vary from daily to yearly or just a time from / to). Thus a transfer of GoOs among registry users is possible following their generation in the biomethane registry. A subsequent verification of further attributes of the GoO is also possible and may further influence the value of the GoO.

The method of registration or uploading the injected biomethane depends on the individual biomethane registry and its rules.

7.9.2. Biomethane consumer

A biomethane consumer is not a role in the biomethane registry. A Biomethane consumer is a gas consumer who owns cancelled GoOs or whose supplier owns cancelled GoOs. The cancelled GoO provides proof of quantity of biomethane consumption.

There is no need for consumers to register at the biomethane registry if they buy a biomethane product directly from a supplier (for example gas with 5% biomethane).

However an end users information (name, address, etc.) should be possible to be entered into the system and generated as a GoO on PDF by the biomethane supplier before the GoO is cancelled. This personalized GoO can be transferred to the consumer through the supplier if consumer wishes to have such GoO document which is also a kind of proof.

In some cases big gas consumers, who don't want to buy a biomethane product from their gas supplier, will purchase GoOs for themselves to label their natural gas consumption. In that case they have to register with the biomethane registry.

The owner of a GoO should also have the option of verifying the authenticity of the GoO. This should be possible directly via the homepage of the biomethane registry or at least via a customer service request. For this purpose a mechanism should be created that ensures each GoO has a unique identification number with which its validity can be verified.

7.9.3. Biomethane registry trader

The role of a biomethane trader is limited exclusively to trading of GoOs within the registry. In reality the company registered as a trader within the registry may act on the market in different roles (trader, supplier, consumer…). The trader may in reality be a legal entity which is absolutely focused on trading or a supplier who trades GoOs or cancels GoOs for his gas consumption.

For example: Trader enters into a contract with a producer to buy GoOs. This bilateral contract is not known or registered at the registry. The trade of GoOs and any associated financial compensation takes place outside of the registry. Only the transfer of ownership of the GoO is recorded.

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The transfer is executed by a booking on two accounts. A debit booking for the GoO on producers account and a credit booking of the GoO on traders account. The action of booking is initiated by the two parties without intervention of the registry administrator.

After the GoO has been transferred into the account of the trader, the trader is the owner of the GoO and is free to use it for any desired purpose (splitting, cancellation, further transfer etc.).
The transfer process changes ownership. The detailed description of the process of these functions is outlined in section 7.10.5.2.

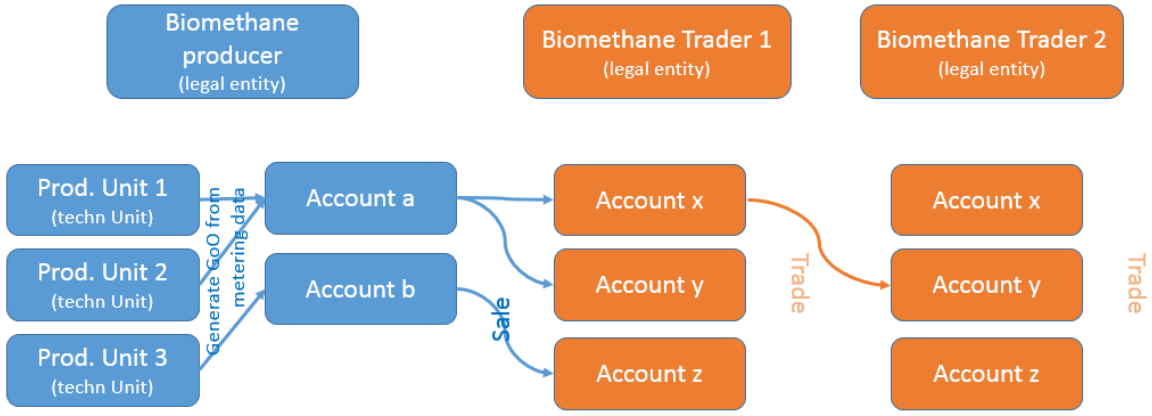

Figure 12: sales of a GoO to a trader

If trader sells a certain amount of biomethane volume to an end consumer (end consumers are not registered) no GoO transfer takes place in the biomethane registry. Instead, the biomethane quantity is cancelled by trader and written proof if required may be generated for the biomethane consumer or chartered accountant of supplier or consumer.

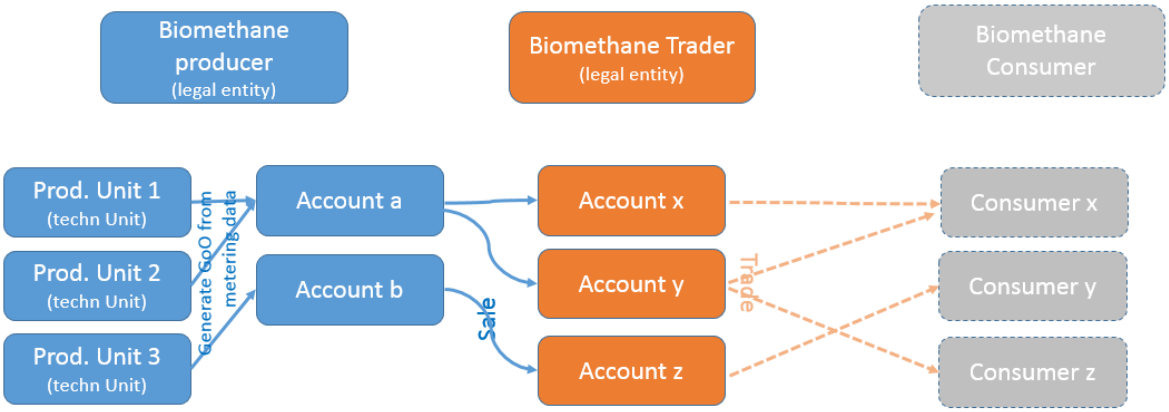

Figure 13: transfer of GoO to end consumer

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7.9.4. Authorized Auditor

Authorized auditors should check biomethane production plants in certain time intervals (once a year) to validate the quality and quantity of biomethane together with the generated GoO.

In the run up to being registered in the registry, it is important to clarify which requirements the authorized auditor has to fulfil. In Austria, for example, natural and legal persons which are certified accountants, sworn and judicially certified experts, civil technicians, certified experts or technical offices in special areas defined by national law are accredited.

In Germany, inspection companies can register with the registry administrator. Each of these companies must name at least one inspector who can perform the required inspection. Only the registered inspector with the necessary qualifications can carry out any actions in the registry on behalf of these companies. The inspectors from the German accreditation authority (DAkks), the Chamber of Commerce (IHK), the approved inspection agency (ZÜS) as well as environmental experts and accountants meet the necessary qualifications.

The authorized auditors must present their qualifications (especially accreditations) before registration at the biomethane registry takes place.

The authorized auditors should be assigned to the biomethane production plants they are authorized/contracted to audit. The biomethane administrator links the authorized auditor to the plant on behalf of the plant operator.

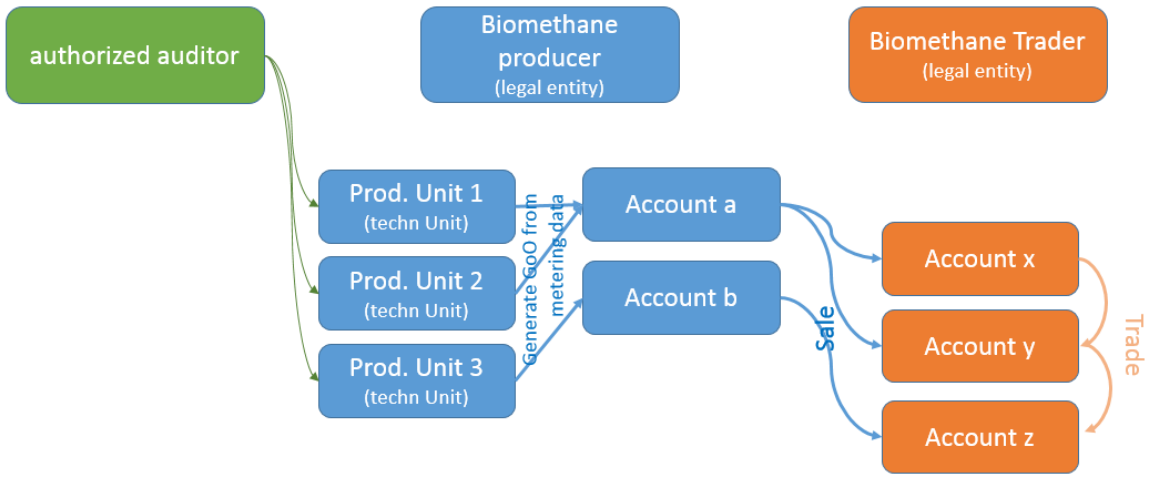

Figure 14: assignment of the authorized auditor to biomethane production plant

The area of responsibility of the authorized auditors is limited to entering and uploading of reports and assigning remarks upon inspection of a GoO.

In order to preserve time and effort, it should be possible to upload reports for multiple GoOs at one time.

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Since audit reports in principle can vary in content and scope, it could be supportive to have standardized audit reports where specific criteria are outlined. This form of a kind of standardization of the audit report could help to make audit reports easier to read and GoOs more readable.

7.9.5. Special purpose users

The biomethane registry can also serve as a platform for special purpose users who are linked to the biomethane market. As an example, national funding agencies can become involved with the biomethane registry in order to obtain GoOs directly from a trusted source.

Another function for the so called special purpose user could be the monitoring of the data, where such a special purpose user could be a regulatory authority, a national ministry or other public authorities. These special purpose users could demand special access rights to the biomethane registry.

7.9.6. Administrator of registry

The administrator has a special role – oversight of the management and assignment of user rights and permissions. The administrator also follows and observes the processes and can make modifications. For this purpose the administrator is granted global rights, in other words has all reading and writing permissions.

The administrator has a great amount of responsibility with regard to the registry. The administrator must not only possess the proper qualifications and education but also the ability to handle and assess risk. The administrators within the registry should be nominated by the management of the biomethane registry.

Aside from the aforementioned responsibilities, the administrator is also active in the customer service area. The administrator creates an interface to be used between the users and the biomethane registry.

7.9.7. European registries

In the future the biomethane registries should be able to participate in the cross border transfer of GoO. Before cross-border transfer of GoOs is possible registries to transfer GoOs have to enter into a contractual relationship and enhance their registry system by the necessary interface to be ready for the transfer of GoOs. After having entered in the contractual relationship, foreign registries are also registered in the home registry for the purpose of transfer.

Import and export accounts for foreign registries have to be set up in the home registry. An import account is created for the incoming GoOs and an export account established for the outgoing GoOs. The cross border exchange takes place through these external accounts.

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A GoO transferred from a foreign biomethane registry to the home biomethane registry is booked in the corresponding import account, from where it will be transferred to buyers account. Vice versa, if the GoO is transferred to the foreign biomethane registry, it is booked in the export account of home registry from where it is forwarded to the corresponding foreign registry.

The graphic shows the transfer of GoO between registries.

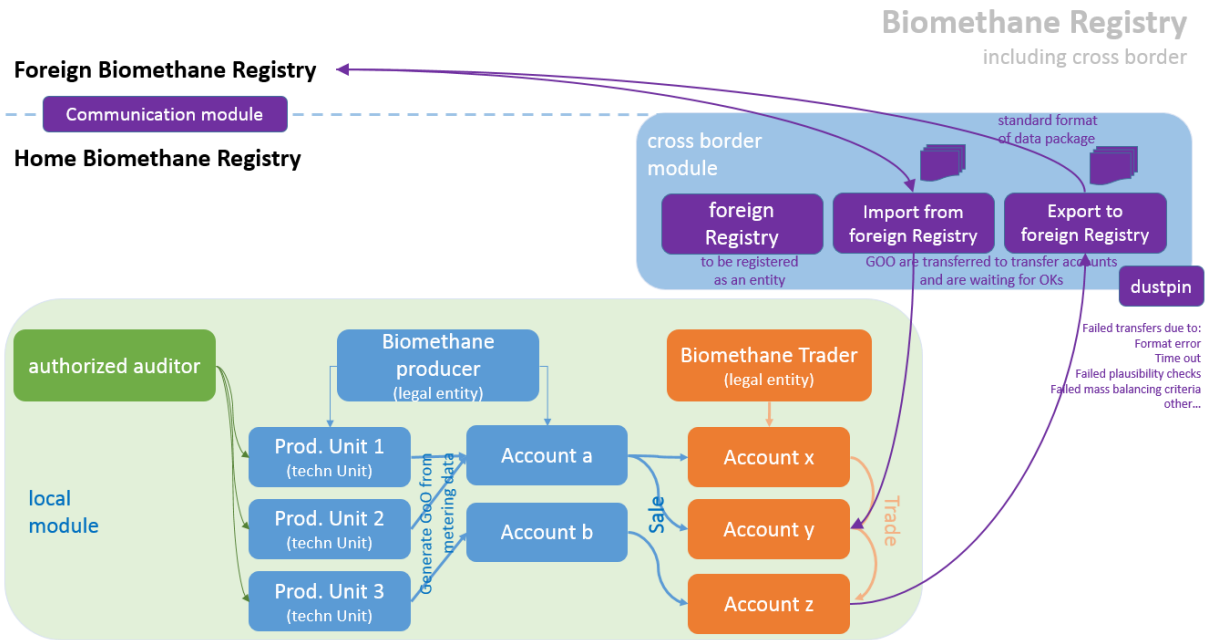

Figure 15: approach to cross-border exchange of biomethane GoOs

Section 7.10.5.2 contains a detailed description of the transfer process.

Furthermore there is the option of a central institution for facilitating the European GoO transfer. This central hub could be kind of a single platform for cross border GoO transfers. Such a hub would form an own legal entity and would be financed by all registries connected. At this point we don't yet see a justification for such a hub.

7.10. Business processes

The following chapters will describe the main processes of a biomethane registry. Even if the registries differ there are core processes and functionalities which exist in nearly every registry. These core processes are described below.

7.10.1. Registration of entities

Description of Accounts

Before registration of account holders each legal entity, according to its role, has to fill out a registration form and present documents in order to establish his role and account. Accounts

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that hold the GoOs are set up for registry users (plant operator, trader, special purpose companies, etc.).

After a detailed examination of the original application documents by the registry administrator, an account is created in the IT-system. The examination should include at least the following:

1. Verification that documents are complete
2. Verification that documents are readable
3. Verification of the identification of the applicant
4. Verification that applicant has the authority to sign
5. Examination of additional documents, such as:
    a. Decisions from funding agencies or ministries
    b. Competence approval for the permission of an auditor review
    c. Internal authorization for big enterprises via an authority to sign.

Market participants receive a personalized access, which is assigned to the corresponding company. It is possible that one person is assigned to multiple companies. The assignment is performed by registry on basis of an application form. For example authorized auditors can be assigned numerous accounts/biogas production plants. Furthermore persons could be employed at the production unit and another entity for example a trading company of biomethane. Therefore a person could be assigned to more than one entity in the IT-system.

The biomethane registry registers various types of registry users:

- Plant operator
- Registered user
- Inspector/auditors
- Funding agencies or other agencies/ministries.

A detailed description of a possible registration process for all participants can be find in Appendix 2.

7.10.2. Contracts

In order to cover the legal framework in the biomethane registry, it is recommended that the registry user agree to the general terms and conditions when signing the application form. If changes are necessary, it's only necessary to adapt the general terms and conditions. Changes to the terms and conditions must be released publicly for all account holders, and if an account holder objects to the proposed changes he can terminate his account within a time period.

Further details are described in chapter Contractual Framework and its sub chapters.

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7.10.3. Update of Master Data

Master data should be updated according to a standardized process. For an update of sensitive master data such as company name or billing address, a similar process to the registration of the whole entity should be established. The changes in the system are executed only by the registry administrator.

Minor master data changes, such as the user's telephone number, can be changed via a written user request for example email notification to the registry administrator.

7.10.4. Generation of GoO

GoOs for the production of biomethane should be generated at a defined day. If the generation is done by the national clearing authority (like Denmark or Austria), the GoO are generated at a specific day within a calendar month. In cases the generation is done manually by a registry user, the generation time is individual (also in terms of injection period of biomethane production for example in Germany).

The metering of biomethane production data is done by the national grid operators. Either grid operators directly transmit the production data to the registry, or production data is provided by a central organization like TSO or balance group coordinator to the registry. Based on this production data, GoOs are generated at a certain calendar day in the following month.

One possibility could also be that an authorized operator would enter the yearly production quantity into the registry.

After the generation of the GoOs, they can be transferred between registry users. The smallest amount is MWh (with 3 commas = kWh). For more specifics see Section Handling of GoO.

Import of Biomethane production data

The biomethane production data are sent to the biomethane registry by either the grid operator, the balance group coordinator or more likely the plant operator. The data transmission takes place via an electronic interface (e.g. web service or e-mail). As a back-up alternative, a manual process of uploading the data should be available.

The unit of measurement used is MWh. In order to get a sum of biomethane in MWh per period and plant, a GoO is generated in registry's database and credited to the account of the plant operator. The assignment is done according to the master data of the biomethane registry. The attributes of each GoO have to correspond to the existing power plant details.

After the inspection / expert statement by an authorized auditor, the generated GoO can be changed or altered due to a difference between the reported and the actual injected biomethane volume. In this case GoOs can be reduced due to auditor's inspection. The reduction would cover all split GoO sub blocks adequately and would apply to all legal entities being in ownership of such GoOs.

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Allocation and Disposition of Biomethane GoO

The registry administrator assigns the amount of GoO to the plant operator's account depending on the meter value of production of the biomethane injection plant.

This amount is substantiated through the GoO. The GoO should be created with a unique serial number and stored with details such as plant information, date of issue, etc. Each period a GoO *block* (once per production period and plant) with a corresponding number is generated and available for processing by the registry users. The serial number makes it easy to keep track of generated GoOs. The GoO *blocks* can be split into smaller *blocks* so that parts of the GoO can be decommissioned or transferred.

Certain feedstock from which biogas is produced may be a precondition for the grant of subsidies. Details concerning feedstock are an information element of the GoO provided by the plant operator/auditor. This information is permanently attached with the GoO. This information report contains all details that would be necessary for possible subsidies from funding agencies. These reports must be entered manually into the system by the registry administrator, and are linked with the GoO. It should also be possible to manage multiple reports.

Specification GoO

The unique identification number for all generated GoOs within a registry is essential. Information of the power plant for example can be incorporated in this ID.

A GoO ID could include following information:

- General Identification
- Production Country
- Production Period
- Information on plant (for example name)
- Unique number.

For example a German GoO ID of the dena biogasregister is composed of:

1. Identification on production country
2. Identification on the power plant (number)
3. Unique number.

The Austrian GoO ID is composed of the following:

- General Identification
- Production Period
- Information on plant (name)
- Unique number.

The number of digits in the serial number is dependent on the amount of plants registered in the biomethane registry and the amount of generated GoOs in the registry.

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In order to allow for a reliable European wide GoO documentation system, each registry must place high value on the quality and security of the registry structure and the generation of GoO.

Registries should focus on quality, security and user friendly IT-interfaces, on reliable efficient registry processes. This is a precondition for the development of a European biomethane market.

Hence, the GoO identification scheme is not harmonized in Europe yet. It is not necessary to have the same ID generation principle in all registries as the ID is a unique identification without the need to have the same structure. Nevertheless it is a future goal to harmonize it European wide.

Validity time of GoO

There are different ways to approach and handle the validity of GoOs. The definition of validity also differs between countries, but a uniform intra-European standard should be established.

Because biomethane injected into the natural gas grid can be stored, it is recommended that GoO don't have an expiration date. The GoOs should only be cancelled when required by law. Otherwise the price of the GoOs can be adversely affected, possibly leading to a decrease of interest and stagnation in the market. Because the information about the production period is published, the buyer is aware of the period in which the GoO is bought. Therefore it is the responsibility of the buyer to know which GoO was generated in which period of production.

Appendix 3 describes the generation process of biomethane GoO on the example of the Austrian Biomethane Register.

7.10.5. Handling of GoO

The biomethane registry has many procedures that make the interaction of exchanging GoOs very simple, including splitting, transferring and cancellation.

All registries generate GoOs on a regular basis (month, year,…). A functionality of a registry is that a GoO may be split into smaller parts to satisfy demand for certain quantities.

Transferability of GoOs within a registry is an important functionality and corresponds to a transfer of ownership of GoOs between two registry users.

Another functionality is the cancellation of GoOs because after cancellation a GoO is taken out of circulation.

As a neutral body the biomethane registry has to make sure that GoOs are not used more than once and duplicating is impossible. The registry has to undertake efforts to exclude misuse and to be granted trust and confidence of market participants. In case of misuse certain security measures and legal steps have to be followed to prevent risks for market participants and the registry.

The procedures mentioned above will be described in the following paragraphs.

7.10.5.1. Splitting of blocks of GoO

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The splitting of GoO volumes is necessary to define the specific GoO volume dedicated for transfer to a different account (could be an own account, a buyers account, a traders account, funding institution, etc.).
This is illustrated in Figure 16: splitting of biomethane GoO.

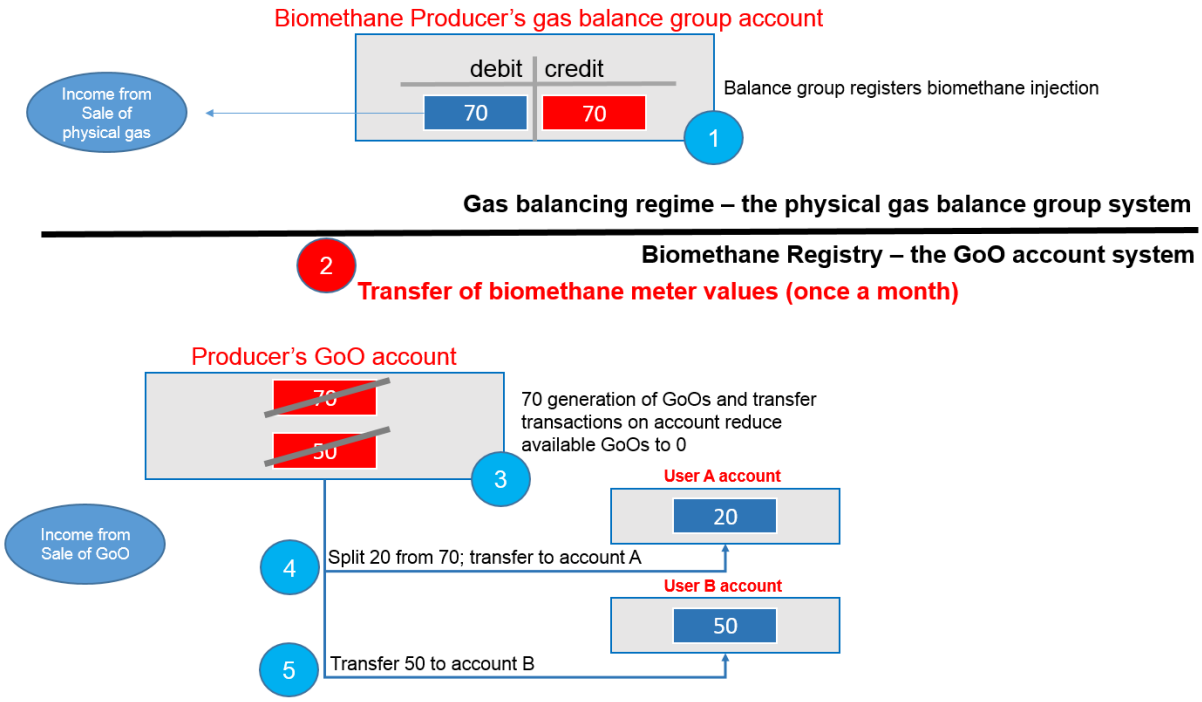

Figure 16: splitting of biomethane GoO

The number of GoOs generated per month/year is based on how much biomethane has been injected into the grid. After injection GoOs are assigned to an account of a biomethane producer. In Figure 16: splitting of biomethane GoO, 70 MWh where injected.

The figure shows the two layers balance group, and registry account system.
After being entered in an account the GoO may be transferred by account owner to a different account. Let's assume the plant operator sells 20. This amount of 20 MWh is split within the transfer process from the 70. The 20 are transferred to account A. Transfer is executed. Owner of A accepts the transfer. 50 MWh are still on plant operator's account. Later on the rest, 50MWh is transferred to account of owner B. Trader A and B can transfer further on or utilize the GoO. A utilization of a GoO is only possible after it has been cancelled. Utilization means using the GoO as proof for biomethane consumption.

The IT implementation of a transfer is explained in section 7.10.5.2 – Transfer of GoOs.
When a GoO is split, all of the information of the original GoO is copied to the newly generated GoOs. Both GoOs (the original and the new one) carry the same information content except for the GoO-Identification-number and the GoO-Volume.

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The information of a GoO includes among others: Volume, injection period, injection point, specific attributes of the plant. Every GoO whether it is the original with the entire production amount or just a part of the original, contains the same attributes and is guided by a unique identification number. This allows the registry to trace the GoO from its generation on.

7.10.5.2. Transfer of GoO

With a GoO transfer a transaction takes place between two accounts within the same registry or between two different registries. A transaction between two different registries is a cross border transfer. In this section the focus is on the GoO transfer process within the same biomethane registry.

Owners of GoOs can transfer GoOs from their account to the account of their respective trading partner within the registry.

A biomethane registry has to provide a user friendly interface that gives registry users a transparent overview of his accounts and GoOs so that registry user may select GoOs for transfer.

This basic GoO information includes, for example the ID, the period of production, the status (active or decommissioned), the production plant, the quantity (original and remainder available) and the report from the inspection by experts/auditors.

User access depends on user's role. Users with administrator access have unrestricted access to the overview of all GoOs, biomethane plants and biomethane traders. Biomethane traders, or users that are assigned to one plant, only have access to their own account and the GoOs which they own.

In the case that a GoO has already been split and part of it has already been transferred, this information is available in the rubric of original quantity or quantity available. As the name says, the original quantity is that which was generated in the registry and the available quantity is the amount which is available after a part has already been transferred. This remaining quantity can be transferred again or decommissioned.

The transfer process is started by the seller, who selects the GoO from the aforementioned overview. GoOs may be transferred with or without the inspection report.

Seller and Buyer have to be aware that the GoO may not have been inspected. GoOs that do not have inspection report attached pose a risk to the buyers because they do not have a guarantee of accuracy of attributes. However, the buyers can decide individually whether or not this is an important factor.

Once the GoO has been chosen out of the overview to be transferred, the seller must provide the details of the transfer. The seller must specify who the trading partner is and the amount that will be transferred. The splitting process could take place manually before transfer or take place automatically within the transfer process.

7.10.5.3. Cancellation of GoO

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In order to utilize a GoO, it is essential that it is first cancelled in the biomethane registry. This process ensures that the same GoO cannot be traded again. Thus the GoO is effectively removed from circulation. This is a very important process in the effort to gain trust and integrity in the market. Only after cancelling the last owner should have the option to print the GoO on paper.

GoOs can be cancelled in the biomethane registry by GoO owners themselves. For this purpose an appropriate overview should be available to the GoO owner displaying all his records.

It is also important to note that both GoOs that have been inspected by an auditor and those that have not, can be cancelled. After a GoO has successfully been cancelled the status in the overview will be changed. The status change means that the cancellation is confirmed and the GoO cannot be transferred again. The owner of the cancelled GoO may view the confirmation as a PDF in the registry.

As mentioned in section Generation of GoO, there is the possibility of automatically cancellation of a GoO after a certain time period has expired. After a period of n (12 or more) months for example the GoO booked in the account but no transferred, could be marked with a special status for example “unused GoO”. The other GoOs that have already been transferred, but not cancelled, will be cancelled at the respective date and no longer be available for transfers.

7.10.5.4. Approval/Adjustment of GoO by expert/auditor

The registry administrator checks the plausibility of GoO information and documents submitted for the GoOs.

Market participants are free to have the GoO inspected by an auditor. In order for the auditor to carry out inspection and provide a report on the GoO, the person/company performing inspections of GoOs must register in the role as an auditor within the biomethane registry.

Registered auditors can inspect the GoO information in the registry directly and make their respective notes confirming the origin and the quality. The experts are also free to upload their inspection reports, or sections of their reports, directly into the registry, where the owners of the GoOs have access to them.

In Austria, the authorized auditor’s opinion is optional. It is clear that missing auditor’s opinion may substantially influence the value, transferability and utilization of the GoO. It is buyer and seller’s decision to transfer GoOs with missing auditor’s opinion. Therefore a generated GoO in the Austrian Biomethane Registry can be transferred without waiting for inspection by an auditor. If the GoO is inspected, the auditor may attach his audit report to the GoO and it will remain with it even when the GoO is split in subparts.

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7.10.5.5. GoO electronic certificate

After a GoO is cancelled, an electronic statement should be automatically generated in the registry. GoO owners can see this cancellation document in PDF form, which also serves as proof that the statement of cancellation exists. The PDF can be printed.

Each of these statements should have a unique ID number so that the validity of the GoO can be checked. For this purpose a model can be implemented on the homepage that allows that the validity of a GoO is checked with the ID number. The validity can also be checked by contacting the administrator, or customer service. The ID number must be provided by email, after which the administrator or service team can provide information on the validity of the GoO. In addition, the registry should summarize the following information about the GoO:

- The plant in which the biomethane was produced
- The quantity of biomethane used
- Injection location and production period
- A list of the documented qualities of the biomethane quantity.

Additional information may also be included in the registry extract. For example, in the German registry statements the following information is included:

- Name of plant
- Registry statement recipient
- Place of transfer
- Purpose of use
- Time of use.

Figure 17: registry excerpt of Austrian biomethane registry (AT) and Figure 18: registry excerpt of German biogas registry (DE) provide visuals of what the registry statement looks like. The standard statements of both the Austrian and German registries are used as an example. The documents can be downloaded as PDF after cancellation in each registry.

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BIOMETHAN
AGCS BIOMETHAN REGISTER AUSTRIA

Bestätigung der Stilllegung

Report-Nr.: *0000000000156*
Ausstellungsdatum: *31.07.2012*

Diese Betätigung der Stilllegung ist nur dann gültig, wenn sie von zumindest einem Mitglied des Vorstandes der AGCS Gas Clearing and Settlement AG als Registerführer des Biomethan Register Austria gefertigt und mit deren Firmenstempel versehen ist.

1. Produktion und Einspeisung

Gemäß den vom jeweiligen Netzbetreiber der jeweiligen Verrechnungsstelle übermittelten Daten hat die nachfolgend bezeichnete Biomethananlage die nachfolgend angeführte Biomethanmenge im nachfolgend angeführten Zeitraum in das öffentliche Erdgasnetz eingespeist:

Name der Anlage:	*Musteranlage*
Standort der Anlage	*1000 Ort*
	Muster Straße 123
Anlagentyp:	*Einsatz landwirtschaftlicher Substratstoffe*
Produktionsperiode:	*06/2012*
Beginn des Einspeisezeitraumes:	*01.06.2012, 00:00*
Ende des Einspeisezeitraumes:	*30.06.2012, 23:59*
Energieäquivalent der eingespeisten Biomethanmenge in kWh:	*1.392.043*
Einspeisepunkt:	*AT9001230000000000000000ORTRZIMP*
Übergabekomponente:	*AT 00500 10000 00000 00000 00000 12345*

2. Bestätigung des Nachweises

Auf Grundlage der unter Punkt 1 dieser Bestätigung angeführten Daten hat die AGCS Gas Clearing and Settlement AG als Registerführer des Biomethan Register Austria den nachfolgenden Biomethanherkunftsnachweis ausgestellt:

Eindeutige Identifikationsnummer.:	*BMN--042014--Musteranlage 00001*
Energieäquivalent der eingespeisten Biomethanmenge in kWh:	*1.392.043*
Inhaber zum Zeitpunkt der Stilllegung:	*Musterfirma GmbH*
	Muster Straße 12/46
	FN 23456x

AGCS Gas Clearing and Settlement AG
Alserbachstraße 14-16, 1090 Wien
Sitz Wien, FN 217593 x Handelsgericht Wien
DVR 210 86 42
ATU63721502

Seite 1 von 2

BIOMETHAN
AGCS BIOMETHAN REGISTER AUSTRIA

Diesem Nachweis sind folgende Meldevermerke angeschlossen:

Gutachter:	*Peter Mustermann*
	Adresse 5
Meldevermerk erstellt am:	15.07.2012
Anmerkung des Gutachters:	Die Musteranlage wurde unter Berücksichtigung aller erforderlichen und betriebsrelevanten Faktoren begutachtet.
Name Begutachtungsdokument:	kein Begutachtungsdokument beigefügt

3. Stilllegung

Die Stilllegung des unter Punkt 2 bezeichneten Biomethanherkunftsnachweises im Biomethan Register Austria erfolgte am: 30.07.2012

Hinweise des Registerführers

Mit dieser Bestätigung der Stilllegung bestätigt der Registerführer lediglich, dass der unter Punkt 2 bezeichnete Biomethanherkunftsnachweis zum Zeitpunkt der Ausstellung dieser Bestätigung im Biomethan Register Austria existent und stillgelegt war. Der Registerführer bestätigt mit der Ausstellung dieser Bestätigung der Stilllegung nicht die Richtigkeit der vom jeweiligen Netzbetreiber, Teilnehmer oder Gutachter an den Registerführer übermittelten oder gegenüber diesem gemachten Angaben, auf deren Grundlage diese Bestätigung ausgestellt wurde, und ist eine diesbezügliche Haftung des Registerführers jedenfalls ausgeschlossen.

Mit der obig angeführten Report-Nummer kann die Ausstellung dieser Bestätigung durch den Registerführer und der Status des obig bezeichneten Biomethanherkunftsnachweises im Biomethan Register Austria auf Anfrage beim Registerführer überprüft werden.

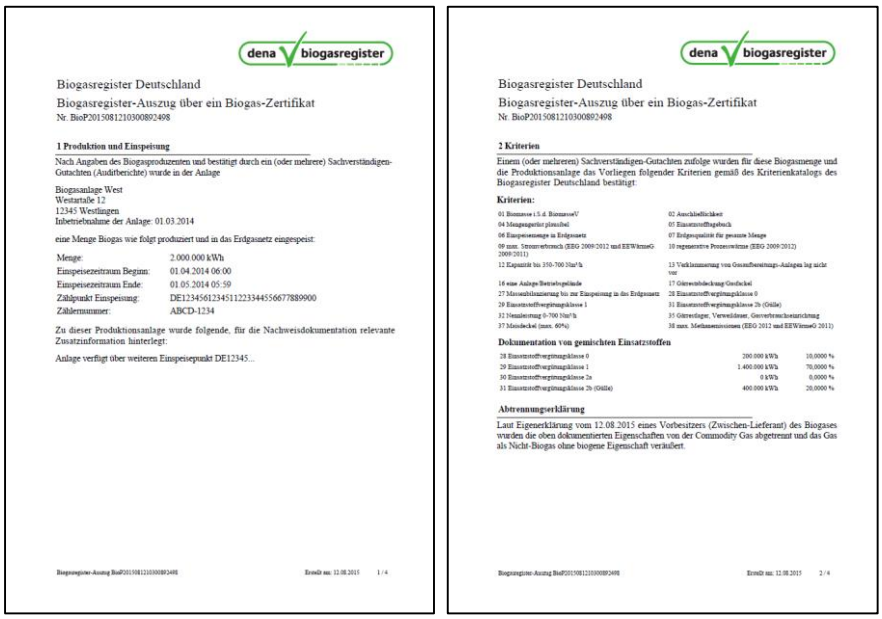
Sachbearbeiter/In

AGCS Gas Clearing and Settlement AG

AGCS Gas Clearing and Settlement AG
Alserbachstraße 14-16, 1090 Wien
Sitz Wien, FN 217593 x Handelsgericht Wien
DVR 210 86 42
ATU63721502

Seite 2 von 2

Figure 17: registry excerpt of Austrian biomethane registry (AT)



dena biogasregister

Biogasregister Deutschland

Biogasregister-Auszug über ein Biogas-Zertifikat

Nr. BioP201508121030089249 8

1 Produktion und Einspeisung

Nach Angaben des Biogasproduzenten und bestätigt durch ein (oder mehrere) Sachverständigen-Gutachten (Auditberichte) wurde in der Anlage

Biogasanlage West
Weststraße 12
12345 Westlingen
Inbetriebnahme der Anlage: 01.03.2014

eine Menge Biogas wie folgt produziert und in das Erdgasnetz eingespeist:

Menge:	2.000.000 kWh
Einspeisezeitraum Beginn:	01.04.2014 06:00
Einspeisezeitraum Ende:	01.05.2014 05:59
Zählpunkt Einspeisung:	DE12345612345112233445566778899 00
Zählernummer:	ABCD-1234

Zu dieser Produktionsanlage wurde folgende, für die Nachweisdokumentation relevante Zusatzinformation hinterlegt:

Anlage verfügt über weiteren Einspeisepunkt DE12345...

Biogasregister-Auszug BioP201508121030089249 8 Erstellt am: 12.08.2015 1 / 4

dena biogasregister

Biogasregister Deutschland

Biogasregister-Auszug über ein Biogas-Zertifikat

Nr. BioP201508121030089249 8

2 Kriterien

Einem (oder mehreren) Sachverständigen-Gutachten zufolge wurden für diese Biogasmenge und die Produktionsanlage das Vorliegen folgender Kriterien gemäß des Kriterienkatalogs des Biogasregister Deutschland bestätigt:

Kriterien:

01 Biomasse i.S.d. BiomasseV	02 Ausschließlichkeit
04 Mengengerüst plausibel	05 Einsatzstoffnachweis
06 Einspeisemenge in Erdgasnetz	07 Erdgasqualität für gesamte Menge
09 min. Stromverbrauch (EEG 2009/2012 und EEWärmeG 2009/2011)	10 regenerative Prozesswärme (EEG 2009/2012)
12 Kapazität bis 350-700 Nm³/h	13 Verklammerung von Gesamtbemessungs-Anlagen lag nicht vor
16 eine Anlage/Betriebsgelände	17 Gärrestabdeckung/Gasdichtheit
27 Massenbilanzierung bis zur Einspeisung in das Erdgasnetz	28 Einsatzstoffvergärungsklasse 0
29 Einsatzstoffvergärungsklasse 1	31 Einsatzstoffvergärungsklasse 2b (Gülle)
32 Hemmleistung 0-700 Nm³/h	35 Gärrestlager, Verwendeart, Gerrerbemischeinrichtung
37 Methanschlupf (max. 60%)	38 max. Methanemissionen (EEG 2012 und EEWärmeG 2011)

Dokumentation von gemischten Einsatzstoffen

28 Einsatzstoffvergärungsklasse 0	200.000 kWh	10,0000 %
29 Einsatzstoffvergärungsklasse 1	1.400.000 kWh	70,0000 %
30 Einsatzstoffvergärungsklasse 2a	0 kWh	0,0000 %
31 Einsatzstoffvergärungsklasse 2b (Gülle)	400.000 kWh	20,0000 %

Abtrennungserklärung

Laut Eigenerklärung vom 12.08.2015 eines Vorbesitzers (Zwischen-Lieferant) des Biogases wurden die oben dokumentierten Eigenschaften von der Commodity Gas abgetrennt und das Gas als Nicht-Biogas ohne biogene Eigenschaft veräußert.

Biogasregister-Auszug BioP201508121030089249 8 Erstellt am: 12.08.2015 2 / 4

This project has received funding from the European Union's Horizon 2020 research and innovation programme.

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Biogasregister Deutschland

Biogasregister-Auszug über ein Biogas-Zertifikat

Nr. BioP201508121030089249 8

3 Entnahme und Verbrauch

Die Ausstellung dieses Biogasregister-Auszugs wurde von folgendem Nutzer des Biogasregister Deutschland vorgenommen (Ausbucher):

BioProd GmbH
Bio-Produtr. 7
12345 Bio-Prodnau

Gemäß der Angaben dieses Nutzers wurde dem Empfänger

Therme Baden GmbH

Badenweg 12
66780 Baden
am Ort der Übergabe

Therme Baden GmbH
GASPOOLBK1234545667890

die oben dokumentierten Eigenschaften im Umfang der genannten Menge Biogas für den folgenden Zeitraum und mit folgendem Verwendungszweck zugeordnet:

Verwendungszeitraum Beginn: 01.01.2015
Verwendungszeitraum Ende: 30.06.2015

Verwendungszweck: Grüngasprodukt -Biogas Beimisch Produkt 10%

Diese Eigenschaften wurden gemäß Abtrennungserklärung von der oben dokumentierten Menge Biogas abgetrennt.

Biogasregister-Auszug BioP201508121030089249 8 Erstellt am: 12.08.2015 3 / 4

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Biogasregister Deutschland

Biogasregister-Auszug über ein Biogas-Zertifikat

Nr. BioP201508121030089249 8

4 Hinweise des Registerführers

Dieser Biogasregister-Auszug wurde am 12.08.2015 um 10:30:08 erstellt und trägt die Nummer BioP201508121030089249 8. Mit Hilfe dieser Nummer können die Existenz und der Status dieses Biogasregister-Auszuges unter www.biogasregister.de überprüft werden. Zudem erlaubt sie eine eindeutige Rückverfolgung durch den Registerführer.

Dieser Biogasregister-Auszug dokumentiert die Angaben des Biogasproduzenten und ggf. weiterer Nutzer des Biogasregisters sowie die Angaben der Gutachten eines oder mehrerer Sachverständigen. Unter www.biogasregister.de finden Sie weitere Informationen hierzu, insbesondere in Form der "Allgemeinen Grundsätze zur Funktionsweise" des Biogasregister Deutschland (in ihrer aktuellen Fassung).

Die Nutzer des Biogasregister Deutschland haben sich verpflichtet, bei einer Vermarktung von Biogas mit Hilfe des Biogasregister Deutschland keine weiteren Nachweis- oder Dokumentationssysteme zur Vermarktung derselben Biogasmenge zur Erlangung von Vergütungs- oder Nachweisstatbeständen gemäß EEG und EEWärmeG zu nutzen. Weiterhin haben sich die Nutzerunternehmen des Biogasregister Deutschland zur Einhaltung der Anforderungen an das Doppelvermarktungsverbot gemäß §56 EEG 2009/2012 verpflichtet.

Dieser Biogasregister-Auszug ist kein Gutachten über biogene Eigenschaften und kann die unmittelbare Vorlage eines Gutachtens als Nachweis über Biogaseigenschaften nur ersetzen, wenn dies zwischen den Handelspartnern vertraglich vereinbart wurde. Die Einsicht in die diesem Auszug zugrunde liegenden Gutachten kann beim Registerführer beantragt werden.

dena biogasregister
Nachgewiesene Qualität

Biogasregister-Auszug BioP201508121030089249 8 Biogasregister-Auszug erstellt am: 12.08.2015 4 / 4

Figure 18: registry excerpt of German biogas registry (DE)

7.10.5.6. GoO on paper

Owners of cancelled GoOs may ask for a written registry statement as a proof that the GoO has in fact been cancelled.

Upon request of the written statement, the registry will print out the PDF form on “special paper”. The document is then signed by a clerk and/or the director of the biomethane registry. The process of manually signing the document should guarantee the quality of the GoO. The registry should also provide on demand of owner of cancelled GoOs a report of cancelled GoOs to third parties (company auditors, etc.).

7.10.6. Operative Tasks of the Registry

7.10.6.1. Daily processes

Daily activities within a biomethane registry include, depending on the administrator and account holder, the following:

Task in Registry	Administrator	Account Holder
System check	✓	X
Latest Communications	✓	X

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Transfer List Inspection	✓	X

Table 1: Daily activities

System check at start of workday

At start of a work day and later on users should have no problems to access the registry system. Therefore it is important that before start of working day, the administrator makes sure that all technical resources (system connection, website accessibility, technical infrastructure, phone, email) are functioning.

Latest Communications

Continuous Inspection of communication inboxes (post and email) that could affect the operation of the registry. Additionally information channels can be actively read by the registry administrator periodically. These sources can be different depending on national sources and must be defined by each registry, for example news agencies, insolvency pages, emails, etc.

Transfer List Inspection

A daily inspection of the transfers takes place.

If a transfer is not accepted by the buyer within 48 hours it is automatically rescinded. Error messages pertaining to transfers must be handled in time by the administrator.

7.10.6.2. Monthly processes

Monthly activities within the registry are, depending on the administrator and account holder, the following:

Task in Register	Administrator	Account Holder
Input of additives in GoO	X	✓
Input of produced quantity	✓	X
GoO generation	✓	X
Statistics	✓	X
Transfer volumes	X	✓
Publications	✓	X
Billing	✓	X

Table 2: Monthly activities

Input of additives in GoO

If the power plant operator is using additives, volumes of additives must be entered in the registry by plant operator. The input of additives must be conducted by the account holder before the creation of the GoO.

Input of produced quantity

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Entering the produced quantity into the biomethane registry can be done by the account holder or the administrator. The generation of GoOs is a very sensitive process and is established by each registry individually. However in all cases it is the administrator's responsibility to monitor these processes and make sure that deadlines are met.

GoO generation

The generation of GoOs is taken care of by the administrator or, depending on national regulations, the account holder or even the authorized auditor. This process must however in any case be monitored by the administrator.

Statistics

The amount of information made available for published statistics is left to the discretion of the administrator due to legal requirements, national interests, privacy policies and etc.

Statistic or graphical representations should show, the biomethane volume injected.

Transfer volumes

The account holder has the possibility to transfer its volumes at any time within a month.

Publications

All publications on the registry website. For example account holders, facilities, contact persons, statistics etc. require regular updating and maintenance.

The decision of the registry as what information is released is dependent on the legal requirements of the registry, national interests, privacy policies, etc.

Billing of fees

Fees are charged periodically.

Note: Depending on the registry, the generation of GoOs take place at defined times. For example in the German Biomethane Registry the account holder, or authorized auditor, can submit a GoO for any time.

7.10.6.3. Periodical processes

Recurring tasks within the registry are, depending on the administrator and account holder, the following:

Registry tasks	Administrator	Account Holder
Inquiry Processing	✓	X
Access Management	✓	✓
Account Management	✓	✓
System Updates	✓	X
Confirm Cancellation	✓	X

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GoO Inspection	✓	✓

Inquiry Processing

Any inquiries to the register must be answered/processed and are usually the first step to start non-periodic activities.

Access Management

Data and access changes can be performed by the account holder or an authorized representative.

This includes the following activities:

- Establishment of first application
- Assignment of accounts
- Direct user access
- Processing of user inquiries concerning access
- Error processing
- Change in user data
- User lock out by order of account holder.

Account Management

Each new account in the registry also can only be carried out by the account holder or an authorized representative.

This includes the following activities:

- Establishment of first application
- Assignment of account to authorized user
- Processing of user inquiries regarding accounts
- Change of account master data
- Change of master accounts data in assigned facilities
- Block or cancellation of account by order of account holder or regulator (authority/ministry).

System Updates

Software updates are necessary for ongoing operations and the technical infrastructure of the registry operator. These updates should take place without disruption and outside of operating hours. The coordination and inspection of these updates must be organized by the registry administrator.

Confirmation of cancellation

Confirmation of a cancelled GoO is a non-periodic activity that is carried out by the registry administrator. Identification numbers can be attained individually.

This includes the following activities:

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- Inspection owner of GoO
- Inspection of GoO within registry
- Identification of GoO as “confirmed”
- Note in registry as confirmed.

The handling of the original or the copy of such confirmation must be clearly defined. For the last user/owner of the GoO, but also the registry it is essential that the confirmations are only created once. It should not be possible to generate confirmations individually more often. An original statement with a signature or stamp could be a secure solution.

GoO Inspection

The check of GoO is normally done by the registry administrator. It is his responsibility to confirm the cancellation of a GoO. But it can also be important for the owners of the GoO (account holders) or even not registered entities which were given a GoO by an account holder (process of selling GoO to end consumers which are not registered in the biomethane registry).

7.10.7. Publication of information – transparency

Transparency is the foundation of any functioning market and therefore presents a key challenge for the biomethane GoOs market. The public availability of information is very important to ensure the necessary trust in the market. As an independent body, the biomethane registry has to provide information. It is essential that information pertaining to participation in the registry and functions of the registry be made transparent Transparency can be achieved through the publication of manuals, system descriptions and registration documents. To this end there should be an area on the registry homepage where company names are listed with corresponding contact data. Due to data protection laws, approval must be obtained in order to make this contact information public. Approval can be obtained from users directly or by integrating the proper language into the terms and conditions. Some account holders may not wish to have their information available to other account holders. In the context of transparency, the rights and wishes of the users are very important and must be given attention.

The following information should be made available if the biomethane GoO market is to be made as transparent as possible:

- News about the biomethane market and the registry
- Statistics (ex. Injection quantities, generated GoOs, number of participants, etc.)
- Reports
- Rules and regulations.

The biomethane registry holds private information that should be handled with the highest confidentiality. This can be information about account balances or individual transactions between account holders. Without the consent of the account holder, this information may not be published or used in any way. In addition, each registry has country specific data protection laws which must be obeyed.

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7.10.8. Functionalities

Uniform processes are necessary for the successful and efficient operation of a registry. This is possible only when the processes are defined and therefore all market participants are treated the same way. Processes should be supported by an IT-based system. It is necessary to respect different requirements and functionalities of a system to get sufficient support of the market participants. The biomethane registry IT-system has to include general, specific and registry specific requirements. Mentioned below are the technical requirements which are essential to the registry system:

- General:
  - System structure (offline, online, web applications
  - Security features
  - Operations
  - User friendliness
  - Rights and roles.

- Specific Applications:
  - Login/Logout
  - Logging
  - Data import/export
  - Master data
  - GoO management
  - Reports
  - Transfer market
  - Whiteboard.

- Registry specific applications:
  - Market participant registration
  - Master data management
  - Settings configuration
  - Communication changes (interface adaptor)
  - GoO Generation
  - GoO properties
  - GoO inspection
  - Transfers
  - Whiteboard.

7.10.9. Quality Assurance

The following mechanisms are in place to ensure quality assurance in the registry:

Quality Assurance must be implemented in accordance with an international standard for example ISO Standard 9001:2008 or equivalent.

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All processes and tasks in the registry are documented and carried out only by authorized persons. An essential part of the quality assurance certification (for example ISO) process is that all processes are regularly monitored both internally and externally. Any changes in process or adjustments due to new business procedures must be implemented and updated in the system by authorized persons. All processes and documents are internally controlled through certification protocols. The final control can be either done on specific results, for example if you have an industry product with clear measures and data to be controlled. Or on the other hand the control via a second instance, a so called 4 eye principle which checks the entering of data or the general application process.

The goal of the certification process is to document ongoing activities and maintain a high standard of quality in the registry. As a result, when risks arise they can be evaluated and avoided in the future through changes in the system.

Quality Assurance Recommendations

Certification for example ISO is highly recommended for biomethane registries.

The following points should be present in the operation of a biomethane registry regardless of certification:

- Documentation of all processes and activities
- 4 Eye Principle for critical processes
- Activity verifying protocols
- Monitoring of ongoing processes to their completion with implementation of any necessary changes
- Risk identification and minimization
- Defined roles and tasks for authorized persons.

Quality Assurance is guaranteed in Several Ways:

- The GoOs are generated by the registry. Generation of GoOs is based on the metering value from the grid.
- Before the GoO can be generated, the registry administrator must approve the quantity
- The biogas plants and GoOs are also inspected by independent auditors.

Safety Regulations and Helpdesk

Contract partners should be at all times obliged to comply with all provisions of the conditions defined by the registry. The helpdesk of the biomethane registry will assist all parties at any time if they are able to identify themselves accordingly.

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8. FURTHER DEVELOPMENT

8.1. Cross-border Trade and Future Steps

The primary purpose of establishing and operating a national biomethane registry is to enable free trade of biomethane injected into the national natural gas network within the national borders. Nevertheless, the national biomethane registries will also play a key role in providing administrative solutions for the free cross-border trade of biomethane through the virtual transfer within the European natural gas network.

The following three pillars are essential for the European biomethane cross-border documentation system:

a) recognition of the European natural gas network as a single logistical facility,
b) cross-border transfer of sustainability verification,
c) mass balancing in the European natural gas network.

Ad a)
The key step for establishing the European biomethane market is the recognition of the European natural gas network as a single, closed logistical facility in which the injected and withdrawn volumes of biomethane can and should be properly mass balanced.

Deliverable 3.2 of the BIOSURF project suggests that the European Commission recognises the entire natural gas network operated on the territory of the European Union and the European Economic Area as a single, closed logistical facility with regard to mass-balancing of biomethane injected into the system.

Ad b)
The sustainability verification of biomethane must cover the full chain of custody (from raw material supplies until the end-user) as stipulated in the RED, FQD and other relevant EU documents. This is valid also for biomethane injected into the natural gas pipelines. Nevertheless, the use of the European natural gas network makes it necessary that the sustainability verification consist of two steps:

1) the first part of the chain of custody – from raw material supplies through production/upgrading till grid injection – is to be covered by one of the established sustainability verification procedures (by national governmental agencies or typical voluntary schemes), exactly like in case of liquid biofuels,

2) the second part of chain of custody – from the moment of grid injection till the withdrawal by the end-user – can be covered by a new voluntary scheme applying the mass balancing methodology in relation to biomethane blended with natural gas in the grid.

Ad c)

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A new, “non-typical” voluntary scheme under the provisional name European Biomethane Certification Scheme (EBCS) is foreseen as a tool for administration of cross-border mass balancing of biomethane injected into the European natural gas network while ensuring the exclusion of double sale and/or double counting.

EBCS will not:

- act on domestic biomethane markets,
- issue European Guarantees of Origin,
- be involved in certification of sustainability of biomethane production,
- issue Certificates of Sustainability,
- be a trading platform of GoOs.

In practice EBCS will rely on the information provided by the national biomethane registries in the form of “European Biomethane Guarantee of Origin”. These GoOs will be issues for individual biomethane consignments by the national biomethane registries upon the following conditions:

- The consignment is declared for export and correspondingly the domestic Guarantee of Origin issued for the same consignment (if any) is cancelled (this equals to the fact that the related biomethane consignment has not been delivered to the domestic market and has not received financial support in the country of production);
- The fact of injection into the European natural gas network is confirmed by either a transmission system operator (as defined in Article 2.4. of Directive 2009/73/EC) or by a distribution system operator (as defined in Article 2.6. of Directive 2009/73/EC).
- The fact that the related biomethane consignment has been produced in accordance with the prevailing EU sustainability requirements is confirmed in form of a Certificate of Sustainability issued in accordance with Directive 2009/28/EC (RED) and Directive 2009/30/EC (Fuel Quality Directive) COM 2010/C 160/01 (in practice this means that the party declaring the biomethane consignment for export must provide the copy of the respective Certificate of Sustainability to the national biomethane registry and the identification number of such certificate is recorded in the European Biomethane Guarantee of Origin);
- Any other regulatory requirements prevailing in the country of destination are fulfilled.

One of the next tasks of the BIOSURF project will be the elaboration of harmonised criteria and attributes for the “European Biomethane Guarantee of Origin” mentioned above. It will be reasonable and advisable that the national authorities, organisations and companies involved in establishing the national biomethane registry take into the consideration the requirements of the future cross-border biomethane trade administration. This will enable the issuing the “European Biomethane Guarantees of Origin” without additional administrative burden, applying the information and data processing system introduced for the domestic market.

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8.2. Cooperation among the National Biomethane Registries

A functioning European biomethane market is highly dependent on a transparent, reliable and effective system of comprehensive information transfer among the national biomethane registries across national borders. A cooperation between the national registries is needed to create the necessary framework conditions for such a transfer of information. For this purpose the national registries cooperating in the creation of the European biomethane trading scheme should agree on a coordinated set of criteria/attributes all of them apply in the same way and should harmonise their procedures.

The broad cooperation and coordination among national biomethane registries will be the first important step towards creating the conditions for a free cross-border biomethane trade in Europe.

Key issues of cooperation among the national biomethane registries:

- to create the best possible, most efficient conditions for transfer of information related to biomethane transactions among the national biomethane registries,
- to establish a harmonised methodology by which the complete information pertaining to biomethane "Guarantees of Origin" is transferred between each registry,
- to ensure highest possible compatibility between the national registration systems,
- to set the conditions for mutual acceptance of Guarantees of Origin for biomethane (at the start on bilateral, later also on multilateral basis),

The criteria/attributes represented and documented by a "European Biomethane Guarantee of Origin" should correspond to the criteria/attributes that must be fulfilled by imported biomethane in order to be qualified for "import" in individual member states of the European Union and European Economic Area.

The Partners in the international cooperation of national biomethane registries should agree on minimum criteria to be included in the European Guarantees of Origin.

Each registry must ensure that its users will exclusively utilise the particular registry for international transactions.

The cooperation among the national biomethane registries may take different forms:

a) bilateral agreements regulating the conditions for mutual acceptance of Guarantees of Origin,
b) trilateral agreements regulating the conditions for mutual acceptance of Guarantees of Origin on regional level in three neighbouring countries,
c) all national biomethane registries joining the proposed "non-typical" voluntary certification scheme applied in cross-border transactions,
d) biomethane registries establishing a central European biomethane registry, which later can be developed into a trading hub for biomethane consignments moved around in Europe in the European natural gas network.

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APPENDIX 1 - SET UP OF BIOMETHANE REGISTRY IT-SYSTEM

Introduction

The secure handling of business processes is essential to avoid risk. A user friendly IT system with login capabilities for registry users is recommendable. Market participants should be able to initiate processes for themselves. A process that is controlled by the registry user is preferable to one which is dominated by the administrator.

Aside from the importance of market participant involvement, strong emphasis should also be placed on the user friendliness and simplification of system functionalities. The advantages of a simple and efficient IT system are numerous. Acceptance from market participants will rise and new business processes will be created.

In order to create such a system, various administrative processes are necessary. These will be explained in greater detail in this chapter. Aside from acquiring an IT system, which can take place through issuing a tender, there are many phases which must be completed leading up to the Go Live phase.

Specification IT-System

An IT system that is easily maintainable and without errors requires detailed and understandable specifications which should be established by the biomethane registry. There are currently many biomethane registries in Europe which have been developed through implementing different IT systems. There are experience with many IT systems which will be explained in the following chapter.

The IT system must offer availability, security, data confidentiality, web presence, and flexibility. The development of biomethane production and the properties and application areas of biomethane are continuously growing. Therefore a flexible, adaptable and easily expandable IT system is necessary.

Also relevant is that the exact business processes of the specification are mapped. The IT provider must implement these business processes as securely and user friendly as possible and in compliance with the standard requirements of the IT system.

In the following the basic content of a biomethane registry IT system is described. Difference in IT functionalities may arise out of legal or regulatory requirements. However the details described below can be found in most European biomethane registries.

IT specification content, or expectations for the response to the requirements specification by the biomethane registry:

- Procedures and tasks (project structure)
- Services and responsibilities
- Basis functions
    - Architecture
    - User friendliness / performance
    - Scalability
    - Expandability

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  - Release management
  - Security concept
- Customer specific functions
  - Rights and roles
  - Business processes
  - Reports
  - Etc.
- Hardware and hosting
- Test management
- Documentation
- Training
- Maintenance
- Timetable, milestones and resources.

In the following the points named above are explained:

Procedures and Tasks (Project Structure)

The IT contractor must clearly communicate the form in which the project will be completed, as well as the people from IT contractors side involved in the project. This allows the registry administrator oversight of employed persons and their qualifications. An efficient and rapidly implementable project is only feasible with the hiring of competent and market experienced personnel (CV required).

IT contractor's personnel has to sign a confidentiality agreement to prevent loss of technical know-how as well as private and commercial sensitive information of third parties.

The project sponsor should assign a steering committee which should be charged with making strategic decisions, monitoring project progress and granting final approval and handling any disputes. Members of this committee should be from both the client and contractor sides.

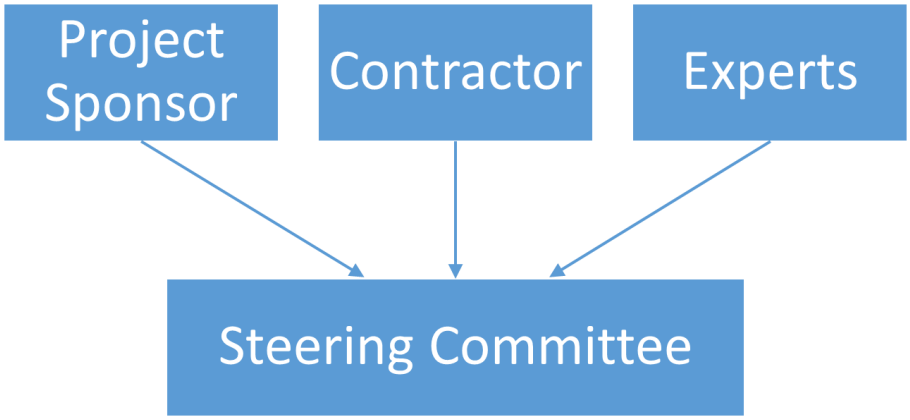

Figure 19: steering committee members

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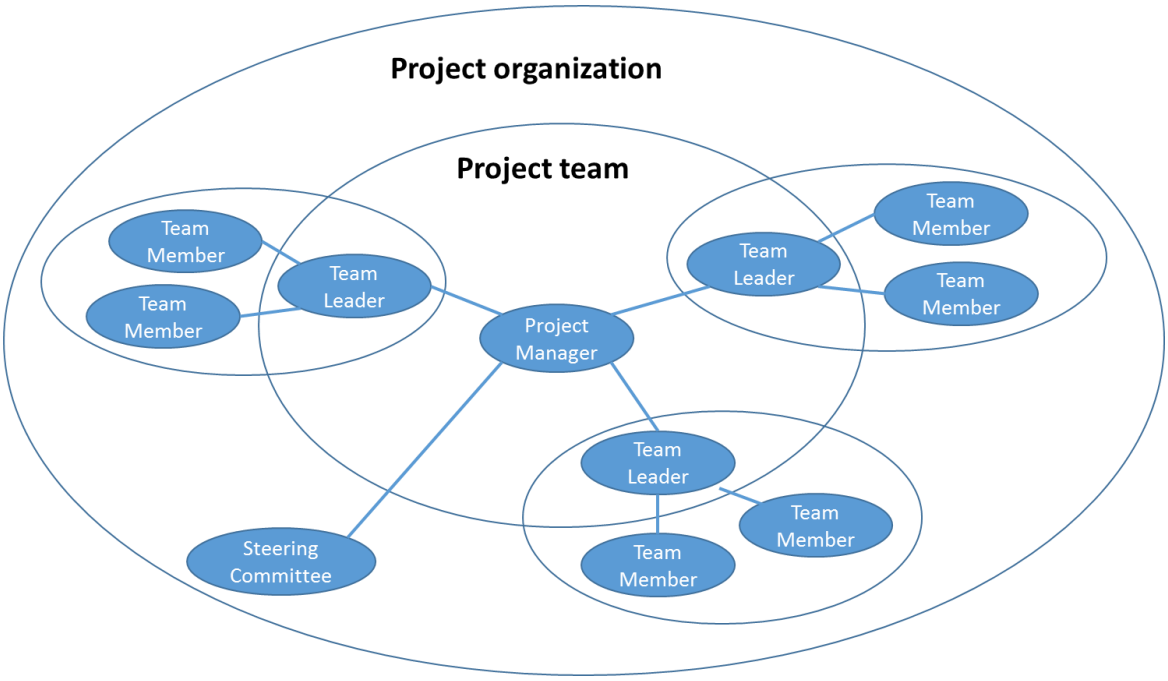

Figure 20: overall project organization

The overall project structure could look as follows:

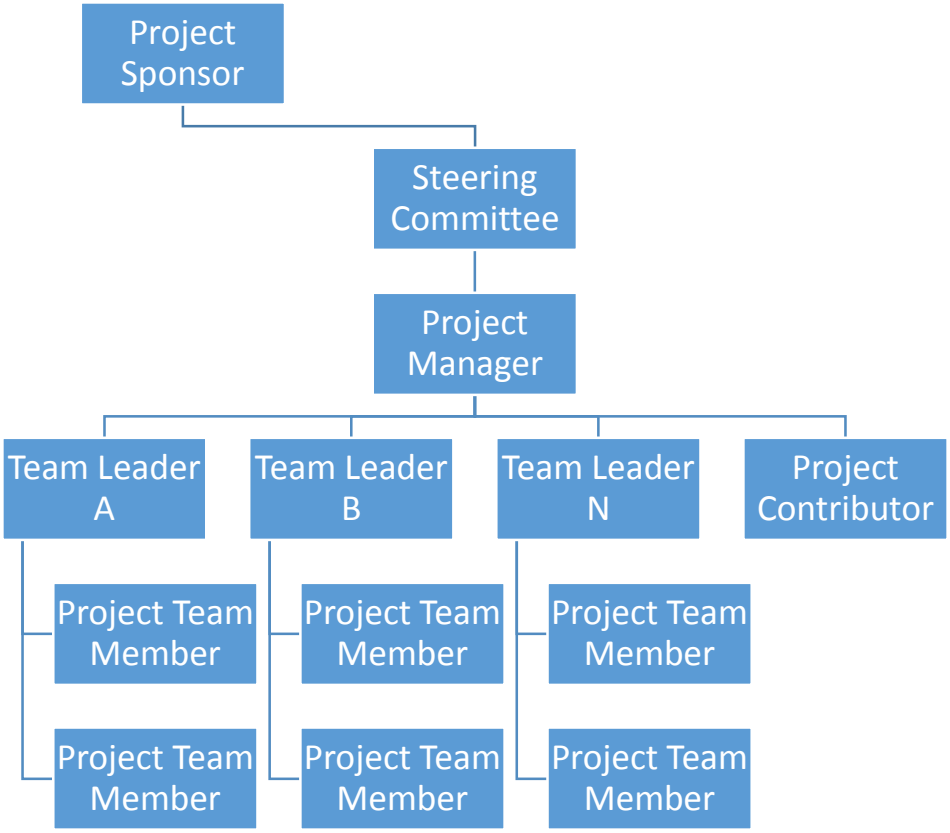

Figure 21: project hierarchy

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The project structure portrayed here is built so that the representative of each party in the committee is represented.

Meetings:

The software supplier must provide a communication concept which guarantees a constant exchange of information for a larger group in the form of meetings. These meetings should take place at least once a week via telephone or video conference and at least once every two weeks face to face. The face to face meetings should be held by the client. Meetings are included in one package (travel expenses, allowances, etc.). Location and equipment such as projectors, laptops and writing materials are provided by the registry administrator so that no costs are incurred on the contractor.

In addition to meetings the software supplier should provide the registry administrator once a week with an overview of the activities provided in a newsletter.

Services and Responsibilities

For a successful project, the objectives and the results should be clearly defined. To this end the following services/benefits should be provided. The benefits are contractual, or in the form of specifications, which are to be clearly structured and carried out by the contractor. If possible, a simple and clear presentation allows the contractor to submit an adequate and low risk offer with regards to time and money. If there are too many ambiguities or options, the project will likely face more delays.

The responsibilities are also very clearly structured (who is responsible for what and who makes certain decisions). Clear decisions are necessary to avoid delays and insure that the project is implemented in a timely manner.

Basis Functions

A quick and affordable implementation of the IT project is possible if existing components of the system are prepared by the administrator. This means the use of the existing system or existing parts of the system. This provides the client with confidence that risk is reduced because everything does not need to be reprogrammed. This information is important to consider in the tendering phase of choosing an IT provider.

Architecture

The architecture is in the hands of the contractor. Adequate infrastructure and hardware/software architecture must be chosen based on the requirements of the registry. The contractor must make sure that as few risks as possible exist with the architecture. Possible risks include:

- Different uses of data centers
- Use of a large number of hardware components
- Different use of software developers and components
- No backup possibility
- High complexity in the communication between hardware components

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The architecture should also provide a test system, so that new functions or errors can be tested by market participants. This test system can remain in place even after and even operate parallel to the Go Live phase.

User Friendliness/Performance

A user friendly system is very important in streamlining an efficient process. The user friendliness properties of the existing system should be outlined in the contract tender. Additionally, user friendly features such as highlighting of actions, color markings, actions and menu displays, etc. are to be generally defined and agreed upon between the contractor and client in the framework of implementation.

The biomethane registry must operate at a satisfactory level so that the market participants may use the system efficiently and without errors.

The following are some specific performance criteria which will be clearly defined with the contractor during development:

- All data entry menu displays must load within 2 seconds
- All data entry requests must be completed within 2 seconds
- All general menu displays of the user interface, for example login screen or help screen, must load within 1.5 seconds

Response time should also be followed as specified.

If delays occur, they must be proven to be related to specific cause.

The software supplier should provide a concept for measuring the response time, taking into account the operation and maintenance of equipment by the biomethane register. Programs for measuring response time in intervals, for example once per minute, should be included in this concept.

Scalability

The system should be designed so that a large number of parallel actions from various users is possible. There are about 200 users and 100 parallel actions. However with smaller registries, these numbers are difficult to reach. It is important that multiple users can work parallel in the system without any loss of performance. The indicative amount must be determined from registry to registry.

Expandability

The architecture of the system should make expandability possible with regard to hardware and software. This means, for example, that an extension to the system resulting from requests for change can be simply and quickly implemented. A complete reprogramming of the system should avoided. This reduces the cost to the registry with respect the implementation of the IT system and therefore is prioritized in the tender phase.

Change Management/Release Management

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Change management includes the handling of all changes to the project or system from the definition or approval to the implementation and commission. A clear structure set between the contractor and client, just as between the responsibilities and time sequences, which must be respected. For example a client should not more than two weeks for an offer in response to a change request.

An important aspect of the development and ongoing operation is release management. This includes the details of how a new system release will take place. Details include the scope, a detailed timetable, documentation, management and quality control. A new software version should have many automatic tests that assure the new version is free of errors. The use of these tests is planned so that the version can be tested before the software is installed.

Security Concept

The contractor must present a security concept which allows the registry administrator to understand all transactions in the system. This concept must also clarify how the data is protected from unauthorized access. This is possible through the following steps:

- Audit reports must be conducted for all changes to the system
- The system must be able to log and track all user transactions
- The query of the data audit must be subject to a security process
- Audit reports must subdivided and/or role specific; and directly available for access
- According to security policies, reference to a user (who has carried out the transaction) must be replaced after a predetermined duration (regulations in the Data Protection Act are regarded)

Customer Specific Functions

The core processes of the system are summarized under customer-specific functions, or use cases. Here it is important that the registry administrator has a vision of how future business processes should look and which results should be achieved. The IT supplier in in charge of the implementation, but under conditions of the client.

Details include which roles and processes should exist. The combination of these two aspects should be guaranteed by the appropriate rights and be as flexible as possible.

Rights and Roles

User Concept:

Access to the biomethane registry is based on a system of roles. According to the role assigned to the user, different menus and processes are available. Assignment of roles is managed in the registry and the rights that are associated with each role are specified. The registry also handles such administrative duties as the management of reports, master data, and logs.

The functions and rights of each role must be designed in a global framework.

Role Concepts:

The following roles must exist in the biomethane registry:

- Administrator
- Biomethane Producer

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- Biomethane Trader
- Auditor
- Special purpose user for example subsidy agency

Business Processes

The business processes mainly include the specific processes that are necessary for the settlement in a biomethane register and are described in Chapter 7 of this document. These include:

- Registration of entities such as firms, users and plants
- Generation of GoOs
- Inspections of GoOs
- Decommissioning of GoOs
- Transfer of GoOs

In addition there are various administrative and organizational processes which the registry must carry out, including:

- System checks
- Generation of Reports
- Master data changes
- Change of rights
- Statistics management

The processes in the IT system are clearly described so that they are not misinterpreted by the contractor. With the help of clear guidelines and descriptions, complex tasks can be implemented without confusion or difficulty.

Ad) Reports

The biomethane registry should be designed so that as many reports as possible can be easily and individually collected, therefore reducing the role of the contractor. A generic reporting system would be preferred where the users / administrators can generate, store and share report templates. Additional effort for the creation of a new report or for each new inquiry must be avoided. If the IT-System cannot provide such a generic tool all needed reports must be defined within the specification phase. An example for a report could be, transfers per period and the volume of the volume of the transfers.

Ad) Etc.

If additional customer specific processes which are not essential to the operation of the registry are requested, they should be evaluated in a separate section of the registry. Among these request are support processes or administrative processes such as:

- Direct interface to website including transmission of data.
- Use of special systems or software components (ex. 3d effects) within the IT system
- Specific backup solutions
- Special archive solutions for data storage

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These special processes usually come at a high cost because they must be individually programmed and there is no standardized solution. Therefore it must be decided case by case whether or not the cost and effort is justified.

Ad) Hardware und Hosting

The biomethane registry must operate in accordance with international and national data protection laws. This includes operating with the proper infrastructure and with system availability. The system should be available to market participants (at least 99%) Monday through Friday. This demands no additional costs as it is standard operating procedure.

The hardware should fulfil the following system quality standards:

- Should support at least the following operating system version:
  - Up to Microsoft Server 2012
  - Up to Red Hat Enterprise Linux or Debian
  - Varying operation systems according to arrangements
- Support at least the following data banks:
  - Up to Microsoft SQL 2012 or
  - Oracle 11g
  - Varying operating systems according to arrangements
- The possibility of operating in a virtual environment must be supported
- The protocol and direction of the necessary ports must be agreed upon
- Gigabyte network and throughput rates as lower bound
- Internal and external areas with physical separation

The following base system configurations must be made uniform in the system:

- Date and time not displayed in integers (represented by localized settings on the computer system)
- Currency in €
- Other recurring units in the system
- Saved data and time tasks must be in UTC.

Ad) Test Management

The Contractor shall, depending on the architecture and implementation method, supply different test requirements for the client. These are planned during the specification phase and tested on their developed functions. The software tests for the client takes place through 2 stages. The first stage includes automated tests by the client which must be performed correctly before the testing by the contractor. These automated tests are essential to implement so that the contractor can be certain that the basic components continue to function properly.

Test management includes the corresponding tests with the market participants, or the final inspection and approval. These are further explained in their own chapter.

Ad) Documentation

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Documentation is an essential project. The client must clearly define which documentations are not required and provide a list of documentation which may be required. It is important to note that each documentation is provided with time, effort and cost. High value is placed on the cost and benefit analysis:

- Hardware and Software:
  - Catalogue of demands from the software supplier for hardware and software including specification of the manager, makes and versions
  - Delimitation of powers and processes
  - Access requests for hardware through software suppliers
- Instances of the biomethane registry:
  - Description of hardware from supplier
  - Business Process Documentation of the compilation, installation and commissioning
- Rollout
  - Time table and plan of action for the entire project
  - Manuals (at least a user manual, administrative manual and implementation manual)
    - At least 1 manual per roll with screenshots including the following:
      - Roll description and function
      - Process explanation
      - GUI-Surface description
  - Change log (ongoing documentation)
  - Versions log – each version with documentation of changes and reason for change
  - Acceptance concept and protocols
- System of market participants
  - System concept
  - Interface specifications for data imports
- Implementation/Introduction System
  - Resource plan
  - System description
  - Technical description of biomethane registry
  - Archive concept with security details
  - Documentation of databank design
  - Suggested data structure plan:
    - An overview of all databank tables
    - Each database table with a detailed list including fields, types and properties
    - An overview of all databank views
    - Each database view with a detailed list including fields, types and properties as well as SQL statements and commands
    - An entity relationship diagram (ERD)
    - A list of all stored procedures with detailed descriptions
    - Source code of all stored procedures
  - Gradual (in steps) implementation plan
  - Interface and communication specifications
  - User interface description

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- General test documentation including strategy, procedure, scripts, reports and test data
- User manuals (administrator, producer, distributor, inspector)
- Configuration plan (detailed plan for Go Live phase)
- Quality and security plan for registry
- Development and implementation plan
- Check list (generated by software supplier in cooperation with the registry)
- Plan for operation (generated by software supplier in cooperation with the registry)
- Emergency Plan (generated by software supplier in cooperation with the registry)
- Disaster Recovery Plan (generated by software supplier in cooperation with the registry)

Ad) Training

Sufficient training and documentation for the commissioning of the system must be provided by the software supplier.

Training during implementation:

With every shipment/delivery, the software supplier must provide a workshop during the implementation phase in which all changes can be evaluated in detail and tested by the administrator. In these workshops, the supplier must also provide necessary documentation to the administrator in conjunction with the roll out phase (according to release management). Workshops are included in a total packet (travel costs, expense allowance, etc.) and must take place at least 5 times. The premises and technologies such as a projector, laptop, writing materials etc. are provided free of charge by the registry administrator so that no costs fall on the supplier.

In order to achieve lasting success in the training process, the software supplier should provide the following documents in addition to the necessities such as the manual:

• Overview of the training workflow
• Detailed description of changes
• Videos of business processes (in mp4, avi or wmv) if possible

Training in operations

Training similar to the implementation training should be followed during operations training. The conditions and procedures are identical to the above, except the number of workshops is not predetermined. Depending on the complexity and cycles of the software update, the software supplier must conduct the training with the administrator.

Ad) Maintenance

The operation and maintenance should be conducted in a data centre in compliance with universal standards. The relevant details are to be defined with the IT provider in a separate maintenance contract. Maintenance includes the latest software updates as well as availability of personnel in case of system errors. Maintenance time is time at which contractor feedback

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is provided and personnel is available for assistance. It is important to pay attention to these hours because maintenance may not be available during night time, weekends or on holidays. However quick availability during working hours is necessary as well as a timely response to errors (30-60 minutes).

Schedule, Mile Stones & Resources

In the framework of the implementation project, the resources available to the registry must be calculated and used according to according to the plan drawn up by the registry administrator. Especially with regards to tests and communication with market participants is an exact amount of resources necessary in the time plan in order to maintain an efficient test phase.

Milestones which reflect the completion of a specific part of the project must be defined for the conclusion of the project phase, or the delivery of large software components. This also includes partial payments and penalties.

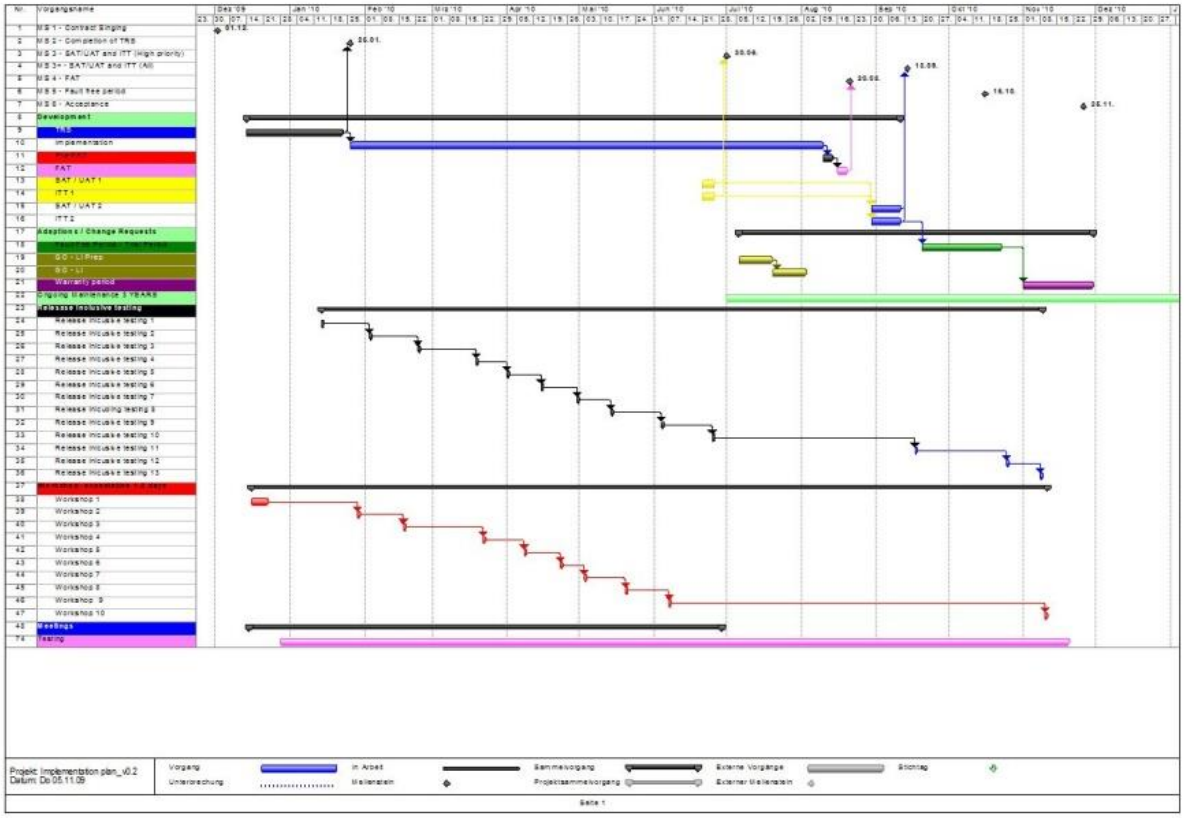

Figure 22: example of the project schedule and milestone plan

IT-Security

Security is a very important aspect within the organization with special emphasis on the handling of data. Protection against attacks from outside on software modules also plays a critical role in IT security. According to statistics, attempts to hack websites and applications occur millions of times per day. Therefore it is necessary that the applications and all systems connected through the internet have a very high security standard.

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In addition to comprehensive definitions and requirements in the framework of specifications, strong emphasis should be placed on an annual safety audit by external auditors. An audit can identify holes or points of weakness in the system. This principle also applies to the internal business processes with respect to the handling, the storage and especially the disclosure of data.

In addition to the system itself, the security of the interfaces of the system and the communications carried out must be checked and monitored. Especially in the case of GoO exchanges between systems (national and international), electronic communications must be securely set up so that no safety concerns arise. Encrypting a message is an effective method to ensure a high level of security during the exchange of information. Only through using secure methods in the exchange of GoOs can trust be built with market participants.

As a consequence the used communication methods should be as secure as the IT system. This has to be secured from the specification phase onwards. The requirements and the used methodology should be continuously monitored. The specifications as such should be as secure as the used programming code and not public available.

Procurement -> go live

There are many project phases that must be completed between procurement and Go Live. At this point the creation of the specifications should be completed because this input is essential for the potential contractors offer.

Generally the entire process occurs through the following phases:

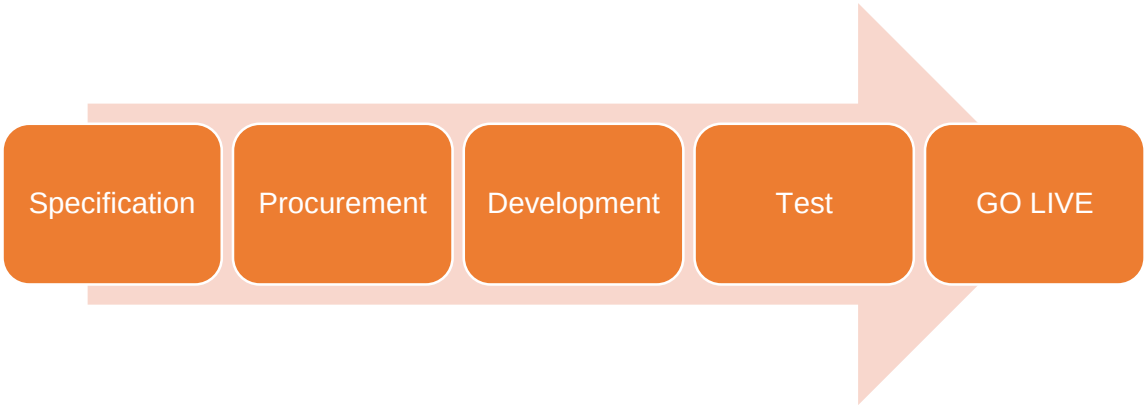

Figure 23: phases of IT system development

The specification and the necessary details have been described in the chapter before.

- **Procurement**

The procurement process of an IT system differs depending on the company or institution. The tendering process of an IT system is the most transparent and effective. However with the

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process of granting a tender comes great use of resources, technical expenses, internal preparatory work as well as time.

The advantages and disadvantages of a system procurement are explained below:

- Direct assignment
- Assignment after bid selection
- Tender (self)
- Public tender (standard)

Ad) direct assignment

Under this alternative the administrator commissions the IT system based directly on the offer from one supplier. This is often the case when an organization has their own IT department or if the IT is outsourced to an external company.

Pro:

- Simple contract process
- Known company
- Known structure
- Simple communication
- Possbility to begin quickly

Contra:

- Unable to choose between different offers
- New approaches and persepctives may be missing
- Likely delay due to other tasks
- Usually a less restrictive contract

Ad) Assignment after bid selection

Under this alternative of awarding the contract, it is necessary that the specifications and all other contract offers are made available so that the administrator can choose between various offers. It is important to place a strong emphasis on value in choosing the best offer.

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Pro:

- Prompt commissioning
- Good comparability
- Competition between the suppliers

Contra:

- Unable to become familiar with suppliers due to time restraint
- "blind" trust is necessary
- Prior selection of providers necessary

Ad) tender (self)

This alternative allows the individual selection of various needs, approaches and processes. The process can therefore be shaped efficiently and offers many possibilities. In comparison to the other alternatives, this is the most detailed in terms of internal guidelines and processes. The duration of the tender can take very long through different phases within the tender which can't be shorten.

Pro:

- Individual contract awarding process
  - Individual phases reduce inefficiency
  - Presentations by the potential supplier and by the registry
  - Possible to adjust offer after bidding rounds
- Comprehensive knowledge of suppler
- Good comparability
- Competition between potentials suppliers
- Unlimited number of applicants
- Personal contact with applicants

Contra:

- Longer lasting process requiring a great deal of energy and effort
- Infrastructure necessary to receive supplier

Ad) public tender

This is the most complex of the alternatives and if possible should be avoided because of high costs. Conducting a public award for tender (national or international) comes with many processes, great amounts of documentation and resources, strict regulations and high financial cost. In addition, a very high number of bidders should be expected because there is no limitation on the number of applicants allowed. Such hassle is unnecessary for a small IT firm tender. The advantages and disadvantages of this alternative must however still be explained.

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Pro:

- Comprehensive knowledge of applicants
- Good comparability
- Competition between bidders
- Personal contact with IT suppliers

Contra:

- Extremely long process
- High number of applicants
- English language necessary with EU tender
- Infrastructure necessary to receive supplier
- Predefined structure for tender awarding process
- Must follow European and national laws and regulations

In brief, the application of an own tender is the most reasonable alternative because the number of applicants and the number of rounds is at the discretion of the individual registry. With this process a clear and fair decision on an IT supplier is possible. While this requires more effort than a direct commissioning, it is most reasonable when no IT supplier is already provided.

➢ **Development**

The development of an IT system can be conducted through various methods. Among these methods are the classic waterfall method or a dynamic method such as Scrum, an iterative, incremental development. The chosen method depends on the IT provider and should not be dictated by the registry administrator. The administrator must however be involved so that the necessary resources can be allocated when needed.

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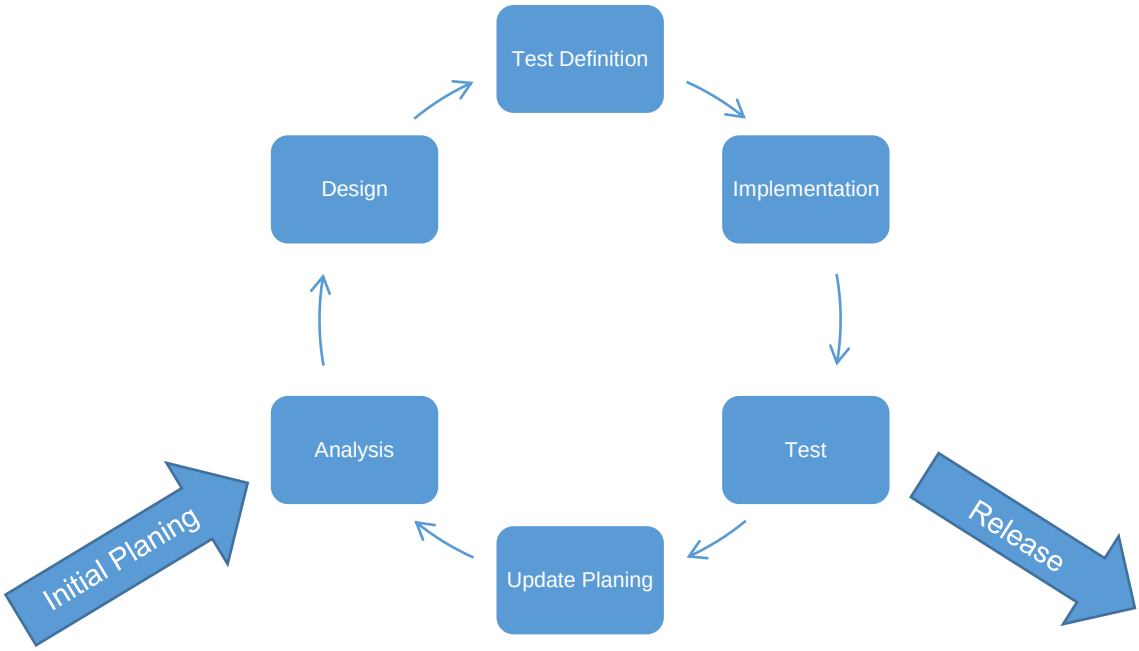

Figure 24: example of an iterative development process

The development of the IT system is carried out directly by the provider with the results presented to the registry administrator in the form of a software version. An "onside" development of the IT system is also possible, where the IT provider carries out the development with directions from the administrator. This is common in cases where a great amount of communication is required and the office locations are far apart, or when some employees are integrated by the administrator according to their job specifications. In any case this type of development demands regular communication between the client and the contractor.

- **Testing Phase**

Effective management of the testing phase is essential for a flawless transition into the Go Live phase. Only through numerous tests with numerous participants and the "fitness" of the system be proven. The following tests are necessary to meet this goal:

- Client tests
- Mass tests
- Market participant tests
- Acceptance tests

The client tests are system tests carried out by the registry administrator. These are mostly tests which concern the administrator the tasks which must be carried out by this role in the registry. In this phase the administrator will also test the functions of other roles in the system. No external participants are involved in these tests.

The mass tests are conducted in order to test the performance and scalability of the system. For example, the IT provider will create a scenario in which the maximum performance is demanded so that the clients can see that the system can handle the most difficult situations.

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This is usually an automated test, it is not necessary that several hundred people physically take part in this testing phase.

Market participant tests are essential for inspection and approval. In this phase the participants come in contact with the system for the first time, thus it is important to make sure that the system runs as smoothly as possible. The participants receive a description of the system and list of the processes which are to be carried out during testing and the administrator receives direct feedback.

The afore mentioned tests can all be carried out in the framework of acceptance testing, which will be further explained in the next section. Tests can also be conducted in the development phase so that clients and participants can be engaged with the process throughout the development. It is important to involve these parties from the beginning in order to create lasting success.

- **Acceptance**

All functionality and requirement specifications must be individually tested and approved. Therefore additional emphasis must be placed on the preparation of the test phases by the administrator. Before the beginning of the described testing phases, the contractor and the administrator should clearly define the conditions and expected results (depending on implementation). The next phase of testing can only be started once the previous phase has been completed. It is critical that problems and errors in operations and data security and patches be addressed during these tests. The following phases should take place in order to provide an adequate inspection and approval concept:

- Pre-FAT
- FAT (Factory Acceptance Testing) tests all functionalities and processes of the registry
- Integration tests in order to show that all interfaces function successfully
- UAT (User Acceptance Testing) tests the functions and processes of the registry from the user and stakeholders' perspective
- Error free period in which users simulate operations under real conditions
- GO LIVE preparation
- GO LIVE acceptance

Ad Pre-FAT)

This test must be carried out by the supplier. All processes, functions, menus etc. should be tested in detail by the supplier. The steps of this test are to be accepted pre-FAT by the administrator and should be carried out in accordance with the wishes of the administrator.

There should not be any gross errors. If errors are present, they must be communicated to the registry after which the actual FAT process will be decided.

Ad FAT)

After a successful pre-FAT the administrator will conduct an acceptance test taking into consideration all tests which have already been conducted and all errors encountered so that the functions can be confirmed. A maximum number of errors for which a successful FAT-phase may not exceed will be agreed upon with the supplier.

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Ad) Integration Tests

In order to begin this phase, all interfaces must be completely implemented. This includes those of the suppliers and the market participants.

The tests will be carried out by the registry administrator and market participants. The software supplier is to be available for support during this phase.

Ad UAT)

The UAT phase includes all function and process tests by the market participants. As a prerequisite for this phase, the supplier, in cooperation with the registry administrator, is to create an adapted acceptance manual from the pre-FAT phase which is to be used by the market participants.

Other integration tests can be conducted parallel to the UAT phase.

The registry administrator will conduct official performance monitoring for the first time during this phase.

A maximum number of errors for which a successful FAT-phase may not exceed will be agreed upon with the supplier.

Ad) Error Free Period

After a successful completion of the test phases, the error free period begins, which can last up to 30 days. In this phase, the system is used under real operating conditions by the market participants.

In the case that a big error is encountered, the test phase will be paused and the error will be analysed and fixed. Once the error is resolved, the clock will be reset to 0 and a new 30 day error free trial period will begin.

Ad) GO LIVE preparation

Upon completion of all acceptance and inspection phases, a two week preparation period for the Go Live phase is scheduled in which the software supplier and registry administrator discuss all necessary requirements for a trouble-free start, address any errors which may be present and make any final adjustments which may be necessary.

Ad) GO LIVE acceptance

After this preparation period the registry administrator provides the final OK for the Go Live phase to begin, meaning everything up to this point has been inspected and approved and the system is officially ready to operate.

For the development of a smaller IT system this process can be shortened by combining some of the phases listed above.

- **Go Live**

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The Go Live phase demands special requirements of an IT system which must be taken into account and planned for ahead of time. This includes the cleaning up of the production system and data banks as well as the adjustment of interfaces for communication with market participants and with other systems. These precautions are to be discussed and planned in detail ahead of time between the client and the contractor.

The date for Go Live should be chosen so as to incorporate as many market participants at the same time as possible and provide opportunity for immediate feedback. The contractor is responsible for providing resources in a timely manner in the event that problems arise.

As long as the Go Live phase is well planned, it should be a standard process with no surprises and represent the completion of software development. There should be no operational errors at this point.

- **Further Development Steps**

Within the operation of the registry it will be necessary to further develop the registry system. Based on market needs and standard developments regarding usability, graphics and handling the registry system will be continuously developed. In the run phase of the system it will be applicable if the system is as flexible as it has been ordered. Due to necessary changes it will be viewable how long and intensive (cost level) the new requirements need to be developed. In a flexible order system most of the changes are quiet small and require minor effort.

How deep and often such adaptations of the registry system take place can't be known in advance. Nevertheless there should be a budget available or in the contract with the software provider a pool of hours for development agreed.

The users of the system, traders and production units for example, will have a big influence on the adaptations as well. For such developments the biomethane registry could establish some kind of "advisory group" which would consist of the biomethane registry users. The users would mention in such advisory group meetings their concerns, wishes or development views for the future. This enable the biomethane registry to act closely to the market and according to actual development needs. The registry just have to get sure not to have the obligation to execute a wish list for the market. It should be fair and future oriented, but with a positive cost-benefit ratio.

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APPENDIX 2 – DETAILED REGISTRATION PROCESS OF MARKET PARTICIPANTS

- **Registration of Biomethane Producer**

The owner of the biomethane plant will have at least one account. This account is assigned to the plant, and to the users authorized by the plant operator.
The following forms are required:

- Registration from for the opening of the account,
- Assignment form for the plant to which the account is assigned,
- User form for those who are authorized on the account

With the opening of an account the contract with the registry administrator comes into force. The authorized users may access data and use their capabilities in the registry.

Functions/Rights of the biomethane account and its authorized users in the biomethane registry:

- Inspection of the GoO found in the account
- Transfer of the GoO from his account to a third party account
- Cancellation (closing) of the GoO in the account
- Inspection of the transfer list
- Inspection of the account master data.

Required certificates for the registration of a biomethane plant:

- Business Certificates

In order to verify company information such as name, address, and representatives, it is necessary to present proof from a locally responsible authority or from a legal issuing authority. This should be done with close attention paid to the quality and integrity of the data so as to avoid any fraudulent interest.

- Natural Gas Grid Connection

During the process of registration, it should be checked to see if the biomethane plant is technically connected with the natural gas grid. In the Austrian Biomethane Registry, the registration of the plant within a balance group at the clearing agency is required. In any case, proper measures and inspections must be defined that make sure that only biomethane plants with a physical injection point into the natural gas grid receive GoOs from the biomethane registry in registration.

- Governmental Facility Approval

During the registration process the registry administrators must make all documents available. The form and quality of these documents are defined according to national conditions and legal provisions.

This project has received funding from the European Union's Horizon 2020 research and innovation programme.

- Further Prerequisites/Certificates

The registry administrator can demand more documents, which may be necessary for the registration, the form and quality of these documents are defined according to natural conditions and legal provisions. It is a prerequisite in Austria that the biomethane account of the plant operator is registered with the balance group coordinator. This registration is conducted through the BGR (the plant operator or some third party), which is responsible for the biomethane balance group.

➢ **Registration of Biomethane Trader**

For companies that do not have a biomethane production plant but would like to participate in the trade of GoOs in the biomethane registry, an account in their name can be opened. The account is assigned to the users authorized by the company.

The following forms are required:

- for the opening of the account,
  The application form for the creation of a contract for the user is to be filled out by the applicant
- for those who are authorized on the account
  The application formula for the activation of the users account is to be filled out by the applicant.

With the opening of an account the contract with the registry administrator comes into force. The authorized users may access data and use their capabilities in the registry.

Functions/Rights of the distributors account and its authorized users in the biomethane registry:

- Inspection of the GoO found in the account
- Transfer of the GoO in the account
- Cancellation (closing) of the GoO in the account
- Inspection of the transfer list
- Inspection of the account master data.

Required certificates for registration of traders account

- Business Certificates

In order to verify company information such as name, address, and representatives, it is necessary to present proof from a locally responsible authority or from a legal issuing authority. This should be done with close attention paid to the quality and integrity of the data so as to avoid any fraudulent interest.

- Further Prerequisites/Certifications

This project has received funding from the European Union's Horizon 2020 research and innovation programme.

The registry administrator can demand more documents, which may be necessary for the registration, the form and quality of these documents are defined according to natural conditions and legal provisions. A prerequisite for the registration of a distributors account in the Austrian registry for example is that the company is accepted by the Austrian Regulator as an energy and natural gas trader, which acts as supervisory authority.

- **Registration of authorized auditors**

Authorized auditors responsible for auditing biomethane production and GoOs are registered by registry administrator. Authorized Auditors are assigned to plant operator's account on request of plant operator. The assignment of an auditor to a plant happens exclusively upon application by the plant operator.

The following forms are required:

- for the opening of the account,
  The application form for the creation of a contract for the user is to be filled out by the applicant
- for those who are authorized on the account
  The application formula for the activation of the users account is to be filled out by the applicant.
- for the account of the assigned plants
  The plant operator has to nominate the authorised auditor to his plant via an assignment form. Only after this nomination the auditor is assigned to the plant.

With the opening of an account for the auditor the contract with the registry administrator comes into force. The authorized users may access data and use their capabilities in the registry. After assignment of the authorized auditors to plants inspections can be carried out in the registry system.

Functions/Rights of the inspectors account and its authorized users in the biomethane registry:

- Inspection of the account of the plant operator
- Auditor has access to his master data
- Inspection of the GoO
- Upload of GoO report.

Required certificates for registration of authorized auditors

- Business Certificates

In order to verify company information such as name, address, and representatives, it is necessary to present proof from a locally responsible authority or from a legal issuing authority. This should be done with close attention paid to the quality and integrity of the data so as to avoid any fraudulent interest.

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- Certificate of Competence

The applicant is to send a copy of this certificate (business license, legal certificate etc) to the registry administrator.

Further needs and evidence

The registry administrator can demand more documents, which may be necessary for the registration, the form and quality of these documents are defined according to natural conditions and legal provisions.

➢ **Registration of Biomethane electricity plants (special role)**

In some EU countries the production of electricity from injected biomethane is subsidized. The subsidy is paid to the producer of electricity according to the amount of the GoO which are transferred to the subsidy agency in the registry. In order to do so the electricity plant, including its attributes, must register. An account will be opened in the name of the facility owner, with assigned access to authorized persons.

The following forms are required:

- for the opening of the account,
  The application form for the creation of a contract for the operator of the electricity plant is to be filled out by the electricity plant operator
- for those who are authorized on the account
  The application form for the activation of the authorized users is to be filled out by the electricity plant operator.

With the opening of an account the contract with the registry administrator comes into force. The authorized users may access data and use their capabilities in the registry.

Functions/Rights of the plant operator's account and its authorized users in the biomethane registry:

- Inspection of the GoO found in the account
- Transfer of the GoO in the account
- Cancellation (closing) of the GoO in the account
- Inspection of the transfer list
- Inspection of the account master data.

Required certificates for registration of biomethane electricity plant account

- Business Certificates

In order to verify company information such as name, address, and representatives, it is necessary to present proof from a locally responsible authority or from a legal issuing authority.

This project has received funding from the European Union's Horizon 2020 research and innovation programme.

This should be done with close attention paid to the quality and integrity of the data so as to avoid any fraudulent interest.

- Governmental Facility Approval

During the registration process the registry administrators must make all documents available, usually in copy form. The form and quality of these documents are defined according to national conditions and legal provisions.

Further prerequisites/certificates

The registry administrator can demand more documents, which may be necessary for the registration, the form and quality of these documents are defined according to natural conditions and legal provisions. In Austria it is a requirement that the locally responsible government confirms that the electricity plant complies with the eco energy law (ÖSG).

➢ **Registration of a funding agency**

The prerequisites for the registration of a funding agency in the biomethane registry follows national legal requirements which are different actually in all European member states. There is no harmonized process for this purpose whether by the market nor by European legislation. Individual requirements and registration processes will normally also have an influence on specific IT requirements which have to be considered. In any case these requirements must be examined, defined and accomplished by the national biomethane registry.

Here is a description how the Austrian funding agency for renewable electricity (OeMAG) uses the GoOs as a proof of usage of biomethane in a cogeneration plant (in German language):
http://www.oem-ag.at/fileadmin/user_upload/Dokumente/rohstoffzuschlag/Leitfaden_-_Biomethan_und_%C3%96kostromf%C3%B6rderung.pdf

This project has received funding from the European Union's Horizon 2020 research and innovation programme.

APPENDIX 3 – GOO GENERATION PROCESS ON THE EXAMPLE OF AUSTRIA

Austrian Biomethane Register Approach

Below is a more detailed description of a generation and transaction process of GoOs on a monthly basis by a clearing agency and in cooperation with the network operators, balance group coordinator and biomethane registry. The example is based on the Austrian principle. It should illustrate a possible solution for the establishment of a European biomethane registry.

Generation of GoOs

This process is carried out monthly by the balance group coordinator based on the metering value of the biomethane injected into the gas grid. A GoO is created for the owner of the biomethane plant on a monthly basis.

Entering and Control of additives

In accordance with the disclosure of the biomethane registry, the plant operator is to enter into the registry in the following month (no more than 5 days in) the propane quantity mixed and injected into the grid.

All producing plants must be checked at a designated time to make sure the correct amount has been recorded.

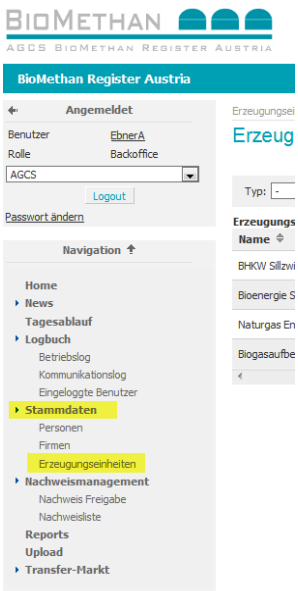

Figure 25: control additives – master data

This project has received funding from the European Union's Horizon 2020 research and innovation programme.

Figure 26: control additives – power plant units

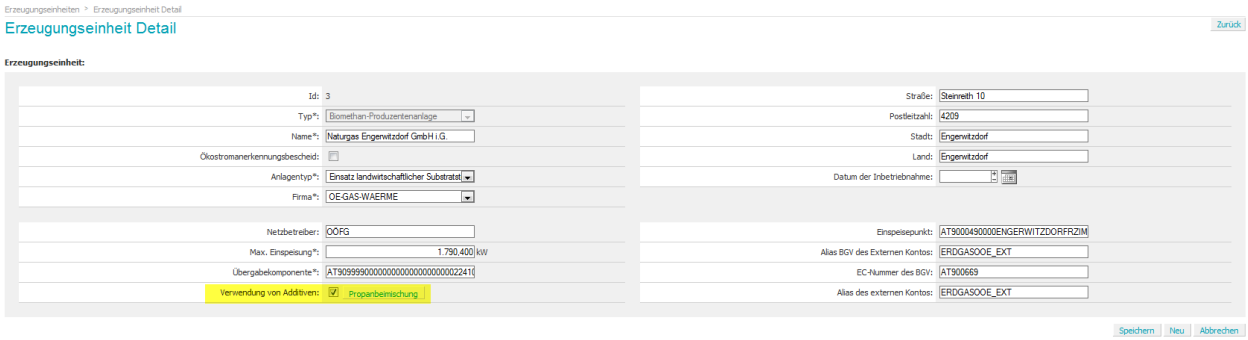

Figure 27: control additives – propane admixture

Figure 28: entering of additives

If the entry by the plant operator has not yet been completed, this should be communicated by telephone or email. The quantity of propane is subtracted from metered grid injection value before the final GoO volume is determined.

The monitoring of the propane mixture amounts (additives) is noted in the process protocol.

Generation of GoO

In accordance with the publication of the Austrian Biomethane Registry homepage, the biomethane injection meter values are transferred to the registry to generate a GoO. This takes place in the middle of the following month.

Download metering values

This project has received funding from the European Union's Horizon 2020 research and innovation programme.

The injected quantity is exported from the Clearing System of the BGC and imported into the biomethane registry.

The download of the injected quantity of the biogas plants is possible in the Clearing System of the balance group coordinator.

The upload of the quantity is possible in the biomethane registry.

GoO Upload

The upload can be done via a simple upload of a file folder on the computer or any other storage used by the biomethane registry. Just select the file to be uploaded and press the respective button in the biomethane registry.

Another alternative is an automatic interface from the clearing system to the biomethane registry via web services, SFTP or just email.

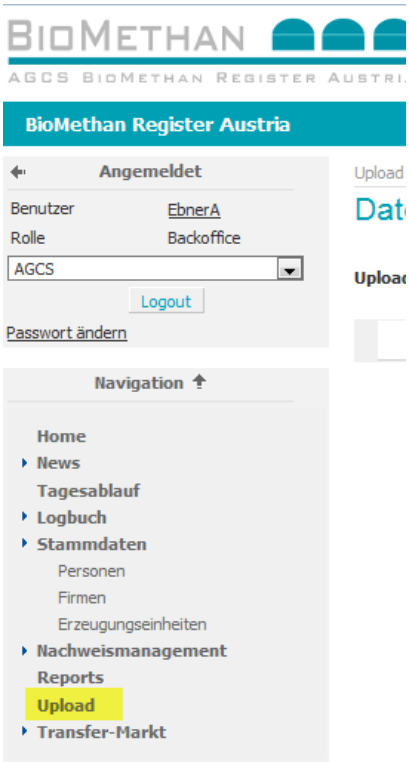

Figure 29: upload injected biomethane volumes

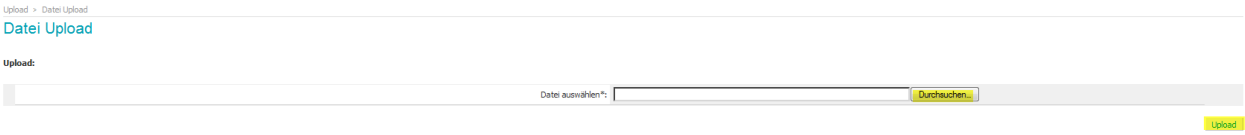

Figure 30: upload injected biomethane volumes – direct upload

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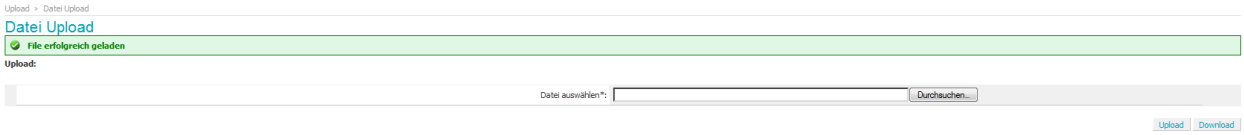

Figure 31: upload injected biomethane volumes – successful upload

Error messages inform about the cause of the error. In case of problems the upload has to be repeated

Release of GoO

This release of generated GoOs follows the 4-eye principle and is conducted by an employee who did not generate the GoOs.

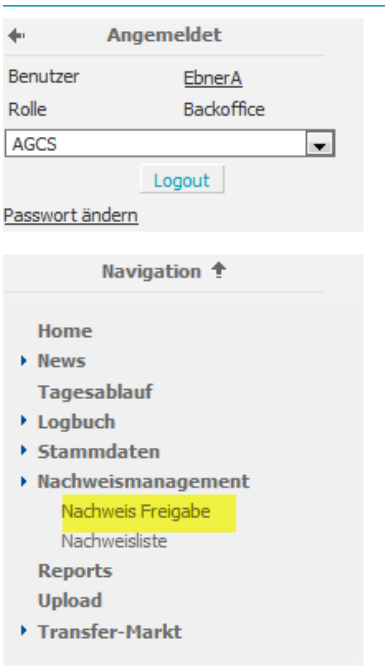

Figure 32: release of GoO

The release of the final generation of the GoO is done after the GoOs have been checked against the metering values received by the network operator.

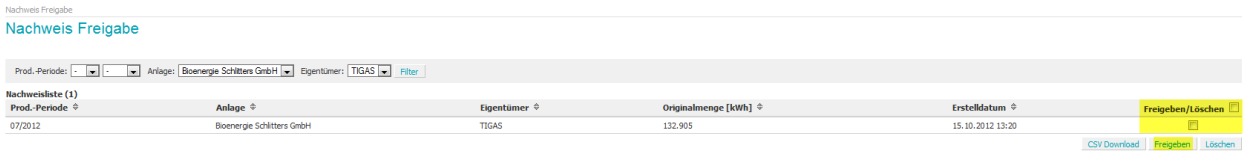

Figure 33: release of GoO – selection

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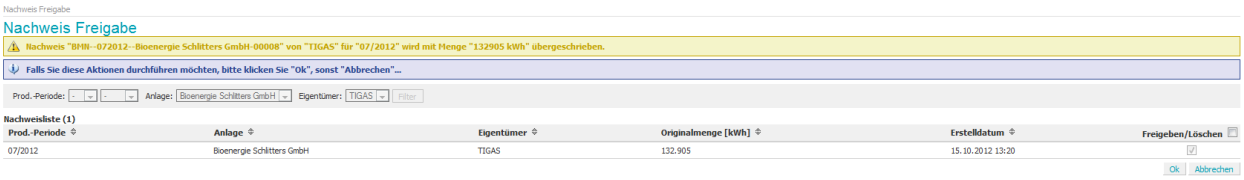

Figure 34: release of GoO - check

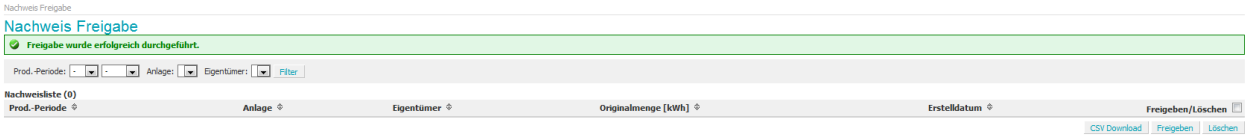

Figure 35: release of GoO – release OK

The release must take place by a designated day of the following month (in Austria no later than the 13th day) in accordance with the publication on the homepage.

If faulty GoOs are generated they can be deleted with the **Erase** function. After this the upload of files with the correct production values can be continued.

After the final release of the GoO the accuracy of the amount booked on the account of the plant operator is checked. This is displayed in the registry system under a specific view.

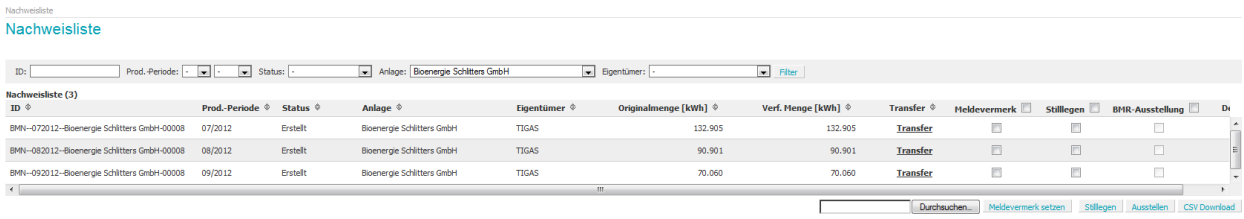

Figure 36: control GoO

Documentation

All work processes are marked in the process protocol of the registry administrator. After work is finished, the process protocol is printed, signed by the respective co-workers and physically stored in a file.

The documentation is part of the ISO certification (9001: 2008), which is subject to the Austrian biomethane registry.

This project has received funding from the European Union's Horizon 2020 research and innovation programme.