Executive Summary

Biogas and biomethane as a key lever in the decarbonization of the Spanish economy

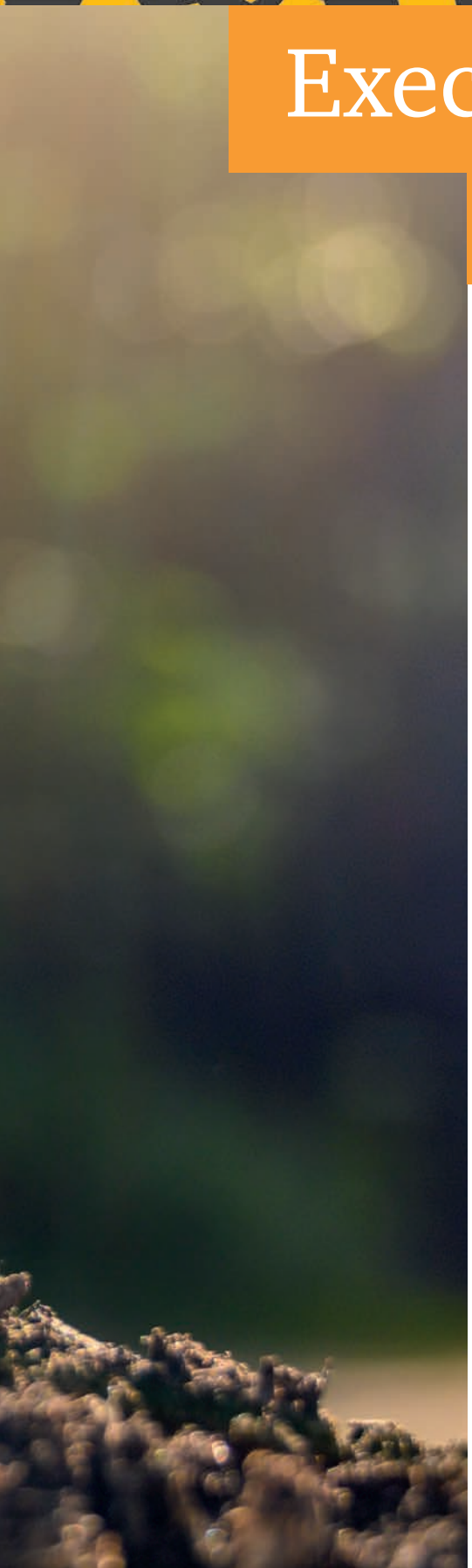
The development potential of biogas and biomethane in Spain and its impact on carbon footprint reduction.

pwc

Ciemat

Fundación Naturgy

This report has been edited by PwC Spain, in accordance with the request made by the Naturgy Foundation, with the aim of analyzing the potential development of biogas and biomethane in Spain and its impact on the reduction of the carbon footprint, to jointly make a more aware and responsible society. The CIEMAT (Center for Energy, Environmental and Technological Research) –a Public Research Organization attached to the Ministry of Science and Innovation through the General Secretariat for Research– has also collaborated to edit this document.



Executive Summary

Society is becoming more and more aware that climate change is a reality that we all have to take responsibility for, with our principal aim being to reduce the greenhouse gas (GHG) emissions generated by our everyday lives. This is why the international political agenda prioritises the fight against climate change and considers this fight to be a fundamental part of our objectives after the adoption of the Paris Agreement in 2015. Implementing a new energy model, one which progressively replaces energy derived from conventional fossil fuels by clean energy from renewable sources, is absolutely vital if we are to reduce GHG emissions and decarbonise the economy.

In this field, **renewable gases, and in particular biogas and biomethane, have an important role to play in achieving the decarbonisation goals established for the European Union**. Those goals include both improving air quality and increasing the integration of renewable energies into our final energy consumption, but also a reduction of CO_2 emissions.

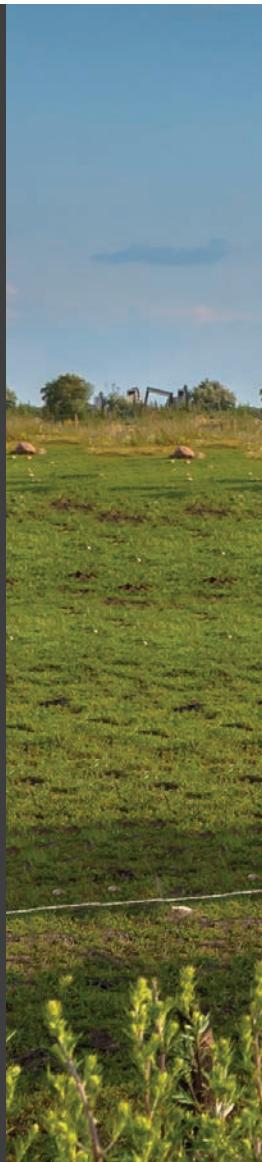
Promoting the production of renewable gases has clear advantages that are not limited to environmental benefits. It also offers our energy system socioeconomic and technical advantages by making it more reliable and flexible, as well as reducing our dependence on energy imported from abroad. Moreover, it will allow for the decarbonisation of sectors that are difficult to electrify, such as farming, domestic heating and transport, with special emphasis on the freight transport sector and specific production processes in energy-intensive industries.

It is crucial to reiterate the importance of biogas and biomethane in **reducing the energy dependency of the European Union**; more than ever when we consider the current sociopolitical context. As a consequence, **the European Commission has recently set itself the target of boosting biomethane production to 35 billion m³ by the year 2030, within the REPowerEU plan**. This plan aims to reduce the use of fossil gas by at least 155 bcm: precisely equivalent to the volume of natural gas imported from Russia in 2021. This will require an additional capacity of 18 bcm with respect to the objective established for 2030 in the "Fit for 55" package of measures.

Biogas and its subsequent transformation into biomethane clearly constitute one of the renewable gases with the most potential for development in Spain at present. Moreover, consuming biogas or biomethane would not only make it possible to combat GHG emissions since, in many cases, economic activity is currently associated with the production of significant amounts of organic waste which needs to be disposed of. This includes biodegradable organic waste, the organic fraction of household refuse, sludge from wastewater treatment plants, organic waste from the food industry, manure and slurry from livestock production, and the remnant from agricultural and energy crops. The management and treatment of this organic waste has become a problem of great importance.

Both the treatment and our current management of such organic waste have a vast impact on the environment. It is in this context that biogas can be seen as a versatile disposal alternative that favours the valorisation of raw materials and improves the lifecycle of processes. When this waste is transformed, it generates a highly versatile fuel similar to methane that is suitable for use in any industrial application. Thus, **the use of organic waste to obtain biogas and biomethane would create a key benefit for the environment, but would also support and promote the circular economy**: one of the pillars on which the policies of the European Union are constructed.

The production and consumption of biogas and biomethane have been widely developed and implemented in several European countries, such as Germany. Spain, in contrast, has not yet integrated this fuel into its energy system or taken full advantage of its potential and is still not very advanced in this area. The recently published **Biogas Roadmap proposes multiplying production by a factor of 3.8 by 2030, to exceed 10.4 TWh** (this target was established for 2030 by the INECP 2021-2030) and it estimates that this will prevent the emission of approximately 2.1 Mt CO_2-eq into the atmosphere per year. Additionally, **the Roadmap also envisages that at least 1% of the gas consumed via the natural gas network will be biomethane by 2030**. However, although the Spanish Institute for Diversification and Saving of Energy (Instituto para la Diversificación y Ahorro de la Energía: IDAE) **calculates a current available potential of close to 34 TWh/year** (over 3 times the production target established by the INECP 2021-2030), **other later reports have raised that estimate to as much as 137 TWh/year** (over 10 times the INECP 2021-2030 production goal) by taking energy crops into account and including them in the calculation.



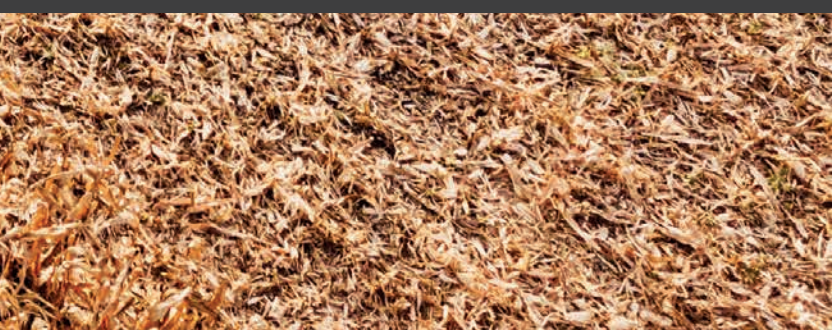
The use of organic waste to obtain biogas and biomethane would create a key benefit for the environment, but would also support and promote the circular economy. Biomethane is similar to natural gas (but with renewable sources) which allows its injection into existing gas infrastructures.

Therefore, taking this maximum potential for biogas generation, it could replace up to 32% of the 2021 demand for natural gas at the Spanish national level. This would be accompanied by a decrease in the GHG emissions associated with the gas sector of between 20% and 56%. Moreover, even by simply **making use of the potential recognised by the IDAE of 34 TWh per year**, as mentioned above, **the carbon footprint would be reduced by between 8.6 and 13.3 Mt CO_2-eq per year. This would represent a 3%-5% reduction of total 2019 emissions or a reduction of 4%-6% of 2020 emissions**. If energy crops are included in potential biogas generation, the reduction in emissions could reach 15% considering total 2019 emissions or 18% for 2020.

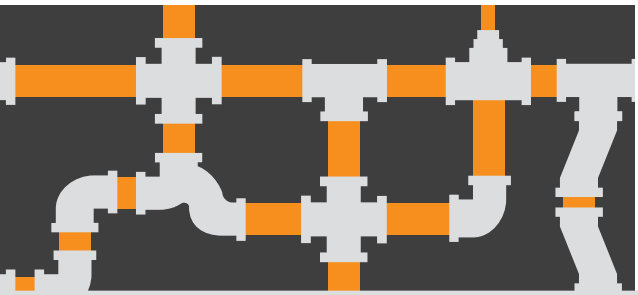
The versatility that biomethane currently offers in its final use compared to that of biogas means that **every year more European countries become committed to incentive schemes that promote the generation of biomethane** rather than the production of biogas. Biomethane consumption can increase through the use of the existing infrastructure, which favours fast and competitive deployment. Consequently, a rapid increase in the development of the biomethane industry is taking place and in many cases existing plants that generate biogas are being transformed to produce biomethane.

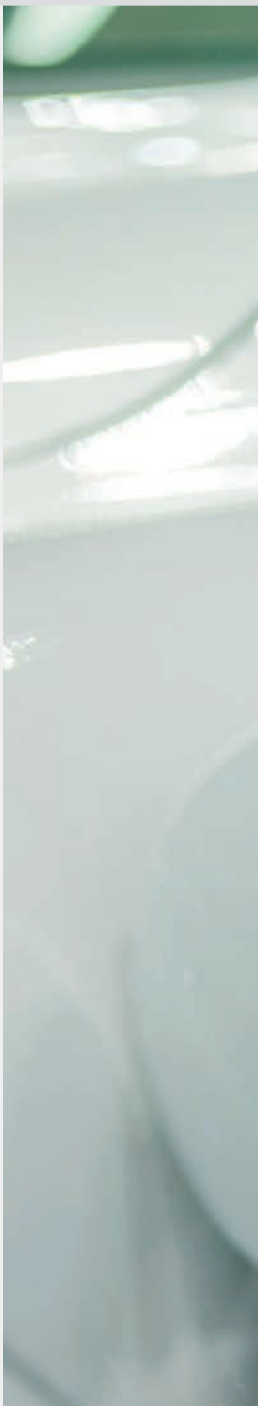
As can be observed in European countries which lead the production of biogas and biomethane, **institutional support is crucial to facilitate and maintain progress in this technology and thereby for countries to benefit from the energy and environmental advantages it offers**. Government incentive schemes are proving to be a key tool in the development and promotion of biogas and biomethane. Indeed, such mechanisms are essential for these energy alternatives to be economically competitive, thus allowing their full potential to be deployed during the current energy transition. Therefore, if Spain is not to be left behind in the development of this new renewable energy, it is essential that **mechanisms which increase investor opportunities and help the sector grow** are created and implemented. Another key to the development of these renewable gases in Spain lies in the **definitive development of a system of guarantees of origin for renewable gases**.

The obligatory quota for biomethane in leading European countries is around 10% of final gas consumption by the year 2030, with Germany notably having set a quota of 20%.



It is important to recall that Spain's **Integrated National Energy and Climate Plan 2021-2030** already includes specific proposals to promote and enhance this renewable energy resource. Specifically, **it establishes that measures will be adopted that set annual objectives for the market share of renewables** in the sale or consumption of gas. It indicates the types of products that are eligible to be considered for meeting these obligations, as well as who is so obliged. It specifies that **a certification system must be developed that allows those obligations to be suitably overseen. Finally, it establishes the need to approve regulations that favour the injection of renewable gases into the gas network**. In the same way, in the recently published Biogas Roadmap, the Spanish government considers that gases of renewable origin are clearly part of the solution to the challenge of achieving carbon neutrality in 2050. Moreover, it states that renewable gases contribute to meeting the goals proposed for Spain in terms of emissions reduction and market share of renewable energies by the year 2030. Similarly, the document identifies and elaborates on the numerous environmental benefits of the development of biogas in Spain, emphasising that it allows for the emergence of synergies with local industries through its use in locations close to where it is produced.



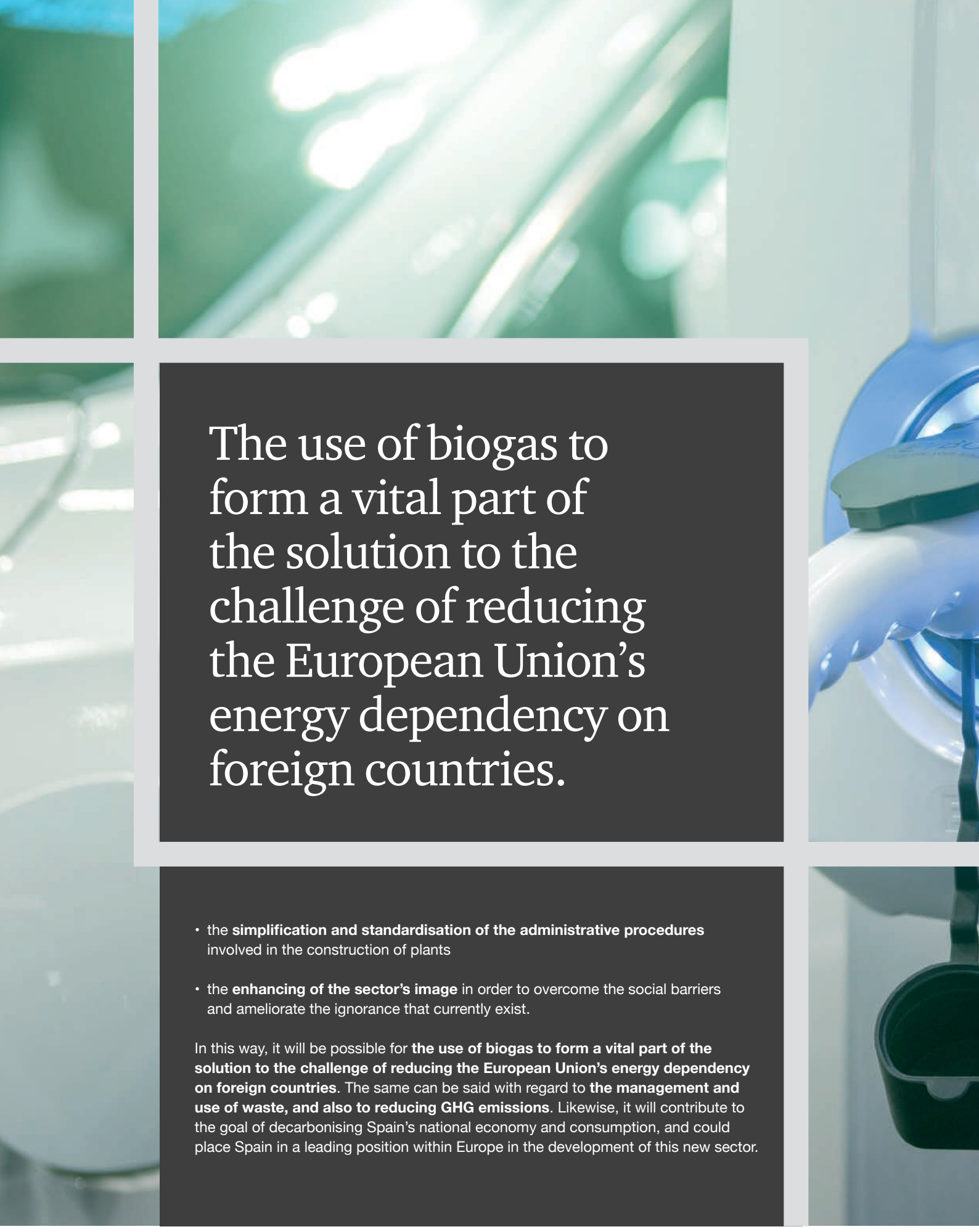


Despite highlighting the importance of biogas and biomethane for the energy transition and the new energy model, the Roadmap does not set ambitious targets for biogas production or consumption, like those established in some neighbouring countries. Currently, the biogas production objectives are very low compared to Spain's production potential. Moreover, the lack of support for the localised use of biogas or the promotion of biomethane at the regulatory level do not allow Spain's full production potential to be exploited in any real way. **The obligatory quota for biomethane in leading European countries is around 10% of final gas consumption by the year 2030, with Germany notably having set a quota of 20%**. In the case of Spain, however, the government's Biogas Roadmap has set a goal for biomethane of only around 1% of the gas consumed via the natural gas network by 2030. This is still very far from established European objectives.

In conclusion, **realising the entire potential of these energy alternatives depends, to a large extent, on overcoming different obstacles that stand in the way of progress** (obstacles that may be regulatory, administrative, economic, social, etc., in nature). To do this, it will be necessary to devise mechanisms that can respond to the challenges and that allow for new investment to be attracted, and for confidence in this new market to be generated together with the necessary security.

Along these lines, certain measures have been identified that **would help the development of the biogas and biomethane sector** in Spain, notably they include the following:

- the **setting of binding targets** for the market share of renewable gases in the national energy mix
- the creation of a system of **guarantees of origin** and the issuing of **green certificates**
- the establishment of **different support mechanisms and a regulatory and fiscal framework to govern applications of biogas other than electricity**; mechanisms that, among other aspects, are focused on **financing injection costs, compensating the value of emission rights and guaranteeing sale at a price resulting from a competitive auction**
- the **digitisation of gas networks** to reduce the need for upgrading



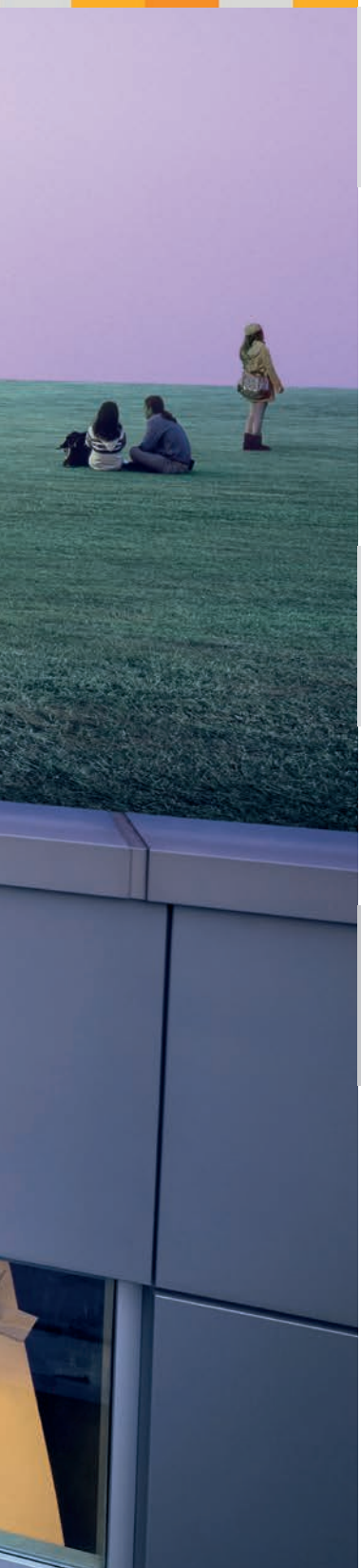
The use of biogas to form a vital part of the solution to the challenge of reducing the European Union's energy dependency on foreign countries.

- the **simplification and standardisation of the administrative procedures** involved in the construction of plants

- the **enhancing of the sector's image** in order to overcome the social barriers and ameliorate the ignorance that currently exist.

In this way, it will be possible for **the use of biogas to form a vital part of the solution to the challenge of reducing the European Union's energy dependency on foreign countries**. The same can be said with regard to **the management and use of waste, and also to reducing GHG emissions**. Likewise, it will contribute to the goal of decarbonising Spain's national economy and consumption, and could place Spain in a leading position within Europe in the development of this new sector.

Contacts



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