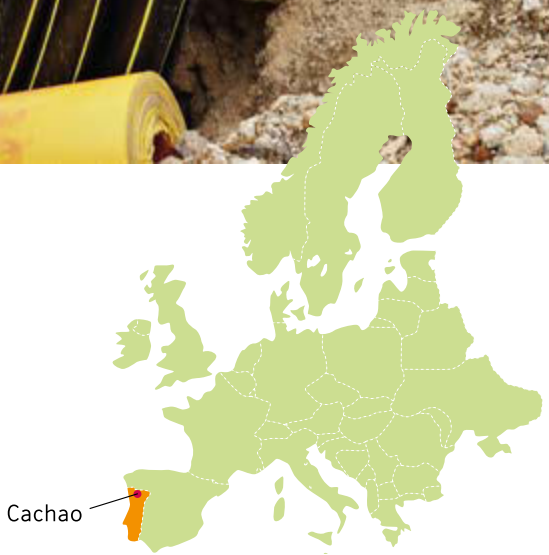
Construction work is underway for the supply of biomethane in Cachao.

Manuel Coreia displays the connection box for biomethane. It is waiting to be connected to the biomethane network.



Portugal's First Biomethane Village

So far, biogas has been a rarity in Portugal, found almost exclusively at landfill sites and wastewater treatment plants. However, this is set to change. In mid-January 2024, the government unveiled a Biomethane Action Plan aimed at tapping into the country's potential. The goal: to replace nearly 20 per cent of natural gas imports by 2040.

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Cachao-Vilaeste is the first community in Portugal to receive biomethane.

A blanket of fog rests over the Douro River and its tributaries in northern Portugal. It casts a milky light over the valleys – and also over the villages. One such village is Cachão, located in the district of Bragança, around 12 kilometres from the town of Mirandela, consisting mainly of a main road with a few side streets, a modest cafeteria serving lunch, and an industrial area that has clearly seen better days. Many of the former factory buildings are in a state of decay, and the advertising has peeled off from what was once a restaurant. Below, the dark waters of the Tua River, which gives its name to the nearby natural park, meander through the landscape.

At first glance, there is little to suggest that this sleepy village is home to an innovative energy project. But the few inhabitants who are out and about on the streets know all about it. "Biomethane? Yes, that's in the new neighbourhood," says a woman strolling through the industrial area. "Just head up the hill," she says.

The neighbourhood is called Vila Nordeste and winds its way up a hill. It consists mainly of narrow single-family homes with small verandas. A man playing with the dogs outside his house can give more details on where the construction work is taking place. He also mentions that the workers are taking a break – after all, it's lunchtime, and everyone's at the restaurant.

Actually, both the excavator and the delivery van are standing idle on the street he mentioned. The excavator has dug a trench at the edge of the pavement – one and a half meters deep and barely a meter wide. A rolled-up hose lies ready to bring biomethane to the houses in the future.

Biomethane for the Kitchen

Like Manuel Coreia, who lives one street up the hill and is waiting for it. In his late sixties, he came back to his home village two years ago. He spent more than 30 years in Germany, in Münster and Pinneberg. Now, he explains, he is growing olives. "I have 4,000 trees," he says proudly. A local cooperative processes the harvest into olive oil.

The sprightly retiree points to the connection box in front of his house. The new supply pipe is still sealed for now. He estimates that his property will be connected to the local distribution grid later this year. In other streets, biomethane is already flowing into the homes. The plan is to supply the entire neighbourhood with renewable gas. "For the kitchens," as Coreia puts it. So far, he and his wife have been cooking with natural gas and electricity.

Portugal's First Community with Its Own Biomethane Grid

With roughly 500 residents, Cachão is a unique project. For the first time, a community in Portugal is being equipped with its own dedicated biomethane grid. The system is set to supply not only 80 households but also businesses, namely those still operating within the industrial estate. Even the local football club may receive a connection.

Manuel Coreia is about to take out the rubbish and says goodbye. With that, the circle is complete. His waste – along with that of tens of thousands of other residents in the region – will continue to secure the community's biomethane supply in the future. The source of the biogas is the Urjais landfill site, located less than two kilometres away as the crow flies.

Landfill Supplies the Gas

A narrow country road winds its way uphill, passing a few villages. Olive trees line the route on both sides, occasionally interrupted by a cork oak stretching its sturdy branches into the sky. The view extends across a mountainous landscape with meadows reaching to the horizon. The fog is still in the valley. There is no sign of the district's central landfill – until the road dips back down into the mist and the smell becomes obvious. Soon, garbage trucks appear, and with them, the operations yard of the waste management company Resíduos do Nordeste.

A little further there is a Dourogas-branded filling station, flanked by a large photovoltaic field. It supplies fuel (compressed natural gas = CNG) for gas-powered vehicles. The biomethane processing plant is clearly visible in large lettering. It stands behind a heavy metal fence. According to a Resíduos ▶

Portugal produces a large proportion of its biogas with sewage gas. This photo shows the Frielas plant, which also processes the biogas into biomethane.

do Nordeste employee who monitors the facility, it has been in operation since 2022. Since then, the landfill gas has been purified of all components except methane and fed into the grid. From here, it also flows to Cachão.

However, the owner, Dourogas, has declined to provide further or technical details. Repeated requests from Biogas Journal for a dialogue went unanswered. What is clear is that the company, based in Vila Real in northern Portugal, operates a network of natural gas filling stations across the country and entered the biomethane business three years ago.

Biogas at Filling Stations

The fuel sold at most stations is typically fossil-based CNG. However, biogas also plays a role at some Dourogas filling stations. One example is Carregado, an industrial town not far from Lisbon. There are also mobile biogas containers from Gecrio, a company that equips CNG and LNG filling stations. According to the company, these contain bottled biogas, which is upgraded to biomethane on site and blended with the remaining methane. Judging by the external condition of the containers, however, biogas does not appear to play a major role at that particular station.

Back to Urjais to the landfill site, which processes its landfill gas into biomethane. Resíduos do Nordeste has been producing biogas there since 2011, making it more than ten years of operation. A 716-kilowatt gas engine is in place to convert the gas mixture into electricity and heat. Until now, the company has fed the electricity into the regional grid – enough to supply 1,500 households, as stated in a press release at the time.

Portugal's Feed-in Tariff

In the mid-2000s, Portugal introduced a kind of feed-in tariff for biogas – applicable to all plants that could not make use of the electricity and heat they generated. This incentive was utilised almost exclusively by waste management companies, such as Resíduos do Nordeste, and wastewater treatment facilities. According to the relevant 2007 regulation, the average tariff for electricity generated from landfill gas ranged from €102 to €104 per megawatt hour (MWh). Other types of biogas were entitled to €115 to €117 per MWh. An additional environmental coefficient was also applied. The regulation specified a duration of 15 years.

That grant has now expired. Companies must either sell the electricity on the market or find alternative solutions. In the case of the Urjais landfill, the new option for the organic fraction of the waste is biomethane. Besides Urjais, there is at least one other biomethane plant in operation in Portugal that feeds gas into the grid. It is located at the Frielas wastewater treatment plant, less than half an hour's drive from Lisbon Airport.

Wastewater specialist Águas de Tejo Atlântico has been producing biogas there from sludge for many years. In mid-2021, the facility was converted to biomethane production, again in partnership with Dourogas. The technology was supplied by Portuguese company Sysadvance. According to a press release, Dourogas also plans to produce hydrogen and e-fuels at the site in the medium term.

At the official inauguration of the Urjais project in summer 2022, Portugal's environment minister, Duarte Cordeiro, travelled all the way from Lisbon and was full of praise. It was, he said, "a signal to the entire country" to collect more bioresources and convert

Photo top left: Aguas Tejo Atlantico

One of the first biomethane projects for feeding into the grid is located at the Urjais landfill site.

There are mobile biogas containers at this filling station. The bottled gas can be processed into biomethane on site and added to the other CNG.

them to biogas and eventually biomethane. This, he noted, would enable Portugal to reduce future imports of natural gas.
In mid-January 2024, Lisbon clarified how this vision will take shape. The National Laboratory for Energy and Geology (LNEG) presented a draft action plan for biomethane, outlining how biomethane could play a significant role in Portugal's gas supply from 2024 to 2040. Consultations on the plan were scheduled to conclude in early February 2024.

Biomethane to Reduce Natural Gas Imports

The plan specifically identifies the potential to reduce the demand for fossil natural gas by 9.1 per cent by 2030 and by 18.6 per cent by 2040 through the use of biomethane upgraded from biogas. At present, Portugal imports all of its gas from abroad. Due to its reliance on pipeline supply via Spain, the country has been using liquefied natural gas (LNG) for many years. LNG arrives at the Atlantic port of Sines from Nigeria, for example, which provides an important part of the demand. According to the EU, Portugal imports a total of around 5.5 billion cubic metres of natural gas annually.
However, for biomethane to eventually take over, Portugal must first develop its biogas sector. According to the action plan, the country produced just 87 million cubic meters of biogas in 2023. This corresponds to less than two percent of natural gas imports. Portugal currently has an estimated 70 plants. The action plan is aware of the dilemma, noting that there is not yet a national industry. At the same time, it stresses that biomethane is essential for Portugal to decarbonise the gas demand of its industry, transport sector, and energy supply.
The plan sets out two phases: The market must be built up over the next two years until 2026. In the subsequent phase, up to 2040, it must be scaled up and professionalised. Twenty measures have been proposed to ensure sustainable production and distribution. The initial focus is on upgrading existing biogas capacity. This primarily concerns facilities such as those in Urjais and Frielas.
As things stand, the majority of biogas still comes from municipal solid waste (resíduos sólidos urbanos – RSU) and sludge. The potential for waste in particular could be further increased through more consistent separation and collection. The potential at wastewater treatment plants, on the other hand, is largely exhausted. At the same time, new plants are to be added at both existing and new sites. ▶

Portugal wants to use biomethane to reduce imports of natural gas, which is handled via the port of Sines (pictured).

Portugal is a major wine producer. In the future, the residues are to be used for biogas production.

Biomethane (in the background in the fog) and photovoltaics at the Urjais landfill site.

The local football club could also become a biomethane customer.