

QUALITY INNOVATION AWARD 2023

The maximum length of the completed application is about 2-4 pages and max 5 attachments / 10 pages. Please send the completed application form to your local innovation competition partner. Please note that this form is for your reference only and that you should check which form is used in your country from your local competition partner. You can find the details here:

<http://www.qualityinnovation.org/participate-now/>

The official name of the organisation ORMAZABAL Y CÍA, S.L.U.		
Postal address	Postal code 48140	City Igorre
Street address Basauntz 2, 48140 Igorre Bizkaia Spain		VAT-number
Competition category (please check mark the category of innovation. An innovation may only participate in 1 category).		
☐ Potential innovations: For all innovations that are "still on paper" and have not been tested in the market yet		
☒ X Circular economy and carbon neutrality innovations - For innovations that have a clear environmental focus		
☐ Health care sector innovations - For innovations in the health care sector		
☐ Education sector innovations: For innovations in the education sector		
☐ Public services innovations: For innovations in the public / municipal service sector		
☐ Business innovations (Micro & startup): For companies with turnover less than 2 million EUR and less than 10 employees		
☐ Business innovations (Small and Medium): For companies with turnover less than 50 million EUR and less than 250 employees		
☐ Business innovations (Large): For companies with turnover more than 50 million EUR and/or more than 250 employees		
Has the innovation taken part into Quality Innovation Award in the past? If yes, which year and what are the main improvements made after that? NO		
Total number of employees 570		
The name of the quality innovation (max. 100 characters) cgm.zero: sustainable medium-voltage (MV) switchgear that uses only air as insulating means at very low pressure		
A short description of the quality innovation (max. 200 characters) Innovative technological solution for metal-enclosed MV switchgear that replaces SF6 (a gas with GWP100 of 24300) with air, without increasing the current overpressure and helping to meet some of the UN's SDGs		
Description of the innovation (Explain the essence of this innovation, starting point, steps taken, resources used - human and financial - and a description of how the innovation has made a difference financially or environmentally) Sulphur hexafluoride (SF6), an artificial fluorinated gas, has been widely used in medium-voltage (MV) switchgear since the 1980s, and represented a major step forward in terms of technology and reliability in electrical distribution networks thanks to its insulation and electric current breaking capabilities. The downside to SF6 is its global warming potential (GWP), which is 24,300 times higher than that of CO2 over a 100-year period. The total number of units installed worldwide could reach approximately 30 million, with each one containing between 0.5 and 1 kg of SF6. Fortunately, the SF6 is housed in a sealed enclosure at low overpressure (<0.5 bar, so it is not considered a pressure vessel), and manufacturers have made efforts to reduce gas leakage over the course of the equipment's life cycle. However, decarbonising the electricity industry is imperative in the current context of climate change, and this is further emphasised by the clear global trend towards increased electrification. The key point in this technological environmental challenge is that there is currently no gas that can replace SF6 and exhibit the same dielectric and arc extinguishing properties. This has prompted different manufacturers to develop a range of completely new technological solutions. All solutions available in the market until now have compromised certain achieved and valued attributes hitherto. Some manufacturers have presented solutions that have exceeded the filling pressure thresholds over the current ones, converting them into pressurized compartments (pressure vessels). Meanwhile, others have developed medium-voltage circuit breakers switches with complex internal mechanisms that are impossible to verify in the field once installed, as a consequence decreasing its reliability and safety. These seemed to be the only alternatives without fluorinated gases, until ORMAZABAL developed the cgm.zero technological solution.		

The new technology developed by ORMAZABAL is the outcome of 19 years of research and development projects, having received (once duly approved) support and funding from a range of organisations, including SPRI, BEAZ and MINECO, as well as the STES, NUGER and NODUS projects. This is further evidence that this is a safe, innovative alternative that allows the use of natural industrial air (a natural resource available in abundance), which is easy to manipulate and does not have any environmental impact. It is therefore a sustainable technology that helps play a part in the distribution of renewable electricity, avoiding the use of fluorinated gases and contributing to the achievement of SDGs 3, 7, 9 and 13.

INNOVATION

Self-assessment of the innovation's novel features. How the innovation does ~~fulfill~~**fulfil** and/or exceed the customers, society's or the environment's needs in a new or significantly revised way?

The cgm.zero technological solution maintains the valued attributes of the switchgear while eliminating the use of SF6 fluorinated gas (which is to be banned) in order to further reduce greenhouse gas emissions throughout the whole switchgear's life cycle.

It provides an alternative to the current SF6 medium-voltage switchgear unique, offering a solution that is ethically, socially and environmentally friendly.

This has been achieved by developing a technological solution with natural industrial air and low overpressure, which maintains the same attributes, safety levels and reliability as current switchgear. This allows end users to have a safe, reliable and more environmentally friendly power grid since, by using air and not increasing the overpressure of current equipment, it allows lighter containment vessels that reduce the carbon footprint compared to other SF6 filled equipment and alternatives in the market.

By choosing a carbon-fluorinated gas-free solution, it not only prevents environmental contamination, especially of rainwater, but also mitigates the potential impact on the entire food chain caused by the degradation of these gases, which are long-lasting substances whose long-term effects on the environment and human health have not been thoroughly evaluated as yet.

Self-assessment of usability. How is the innovation applied in practice? Is it done ~~done~~**systematically** and according to a plan within the organisation? Is the innovation usable?

Having completed the validation tests in accordance with current IEC standards, it can be assured that this technology can meet the goal of eliminating SF6 fluorinated gas in medium-voltage metal-enclosed switchgear up to and including 24 kV. The tests have shown that the technological challenge of removing SF6 and other fluorinated gases from medium-voltage switchgear has been effectively resolved, preserving the existing technology and its desirable attributes (which are highly appreciated by users), while also eliminating any uncertainty about the new technological solution.

This has been achieved by developing an innovative medium-voltage switchgear capable of interrupting the electrical current using only air as extinguishing medium.

This feasibility has been tested for voltage levels of up to 24kV, therefore covering the majority of the medium voltage electrical distribution networks. On the other hand, pilot installations have been or are already being deployed in order to test its correct performance in the field with Europe's most important utility companies (Iberdrola, Endesa – Enel, Enedis, eON, etc.).

Learning. Is the innovation based on a new idea or discovery? Is the innovation based on a systematic development process? Does the innovation extend an existing knowledge or practice?

ORMAZABAL has solid, extensive experience in process management, as recognised with the Gold A award in 2017. Management of the Innovation and New Product Development processes was also recognised with the Basque Management Award for Innovation in 2019, thanks to its implementation of best practices known as Pairing, where product development is always carried out in consultation with customers.

A range of alternatives to SF6 have been developed since 2004, reaching the solution presented as cgm.zero.

All known alternatives to SF6 have been studied, tested and analysed, with certain options being chosen by different competitors for their equipment that is either in development, undergoing experimentation or already available in the market. All the alternatives studied have undergone testing in high-power laboratories to replicate field conditions over the course of their service life, checking their electrical performance and analysing the various by-products generated during the tests. Several of these alternative gases have successfully met the current IEC standards for MV switchgear. This work has served to offer a clear vision of the technical possibilities and limitations of all known alternatives and to contrast them with the current and future needs of customers and users.

QUALITY

Self-assessment of customer orientation. How does the innovation correspond to stakeholders' and customers' current and/or future needs? How does the innovation meet and exceed their requirements and expectations?

This innovation has been checked to meet the attributes most valued by ORMAZABAL's main customers, namely Europe's leading electrical utility companies (Iberdrola in Spain, Endesa – Enel in Spain and Italy, EDP in Portugal, Enedis in France, NetzeBW and eON in Germany, etc.), confirming that the attributes currently required will continue to be important in the future, and that none of them will be diminished by any potential technological changes. These attributes are:

- High-voltage parts insensitive to environmental conditions.
- Similar dimensions and weights to allow installation in existing facilities.
- Safe technology for users, both under normal and fault conditions.
- Use of non-corrosive, stable, safe gases (CMR, toxicity, etc.), both in their original composition and throughout their service life (30–40 years).
- Low overpressure, as in current SF6 equipment, allowing for installation in the same locations as existing equipment without the need for additional safety measures. Maintain safety conditions for operators and the general public.
- Same likelihood of leakage by maintaining the filling pressures of current equipment, with the same capacity as present in order to keep the network operational in the event of leakage. The reliability of the equipment and of electrical networks is therefore guaranteed.
- The same operating procedure in the electrical network, including reliable verification of breaker status in the field before operation.
- Maintenance-free live parts.

Self-assessment of effectiveness. How has the innovation improved technological and commercial performance with regard to the customer and environmental/ social responsibility?

Some of the gases studied and tested by ORMAZABAL have been selected as alternatives by competitors for their equipment. There are currently two main groups of alternatives:

- 1.– Fluorinated mixed with different vector gases: Most of these mixtures still need to undergo testing in order to be registered under REACH, with the toxicity and CMR documentation required for the quantities of product that the market demands.
- 2.– Based on natural gases (such as air), but with different overpressure values depending on the technology and voltage level: these options imply heavier equipment (greater environmental impact), the need for special requirements for the installation of pressurised equipment, etc.

The cgm.zero technological solution based on natural industrial air (technical-grade dry air) with low overpressure is therefore a unique technological solution that stands out from other alternatives on the market, responding better to environmental needs and the requirements of both users and the general public, while covering the same level of safety, requirements, reliability and maintenance as provided by current solutions with SF6.

As main qualitative indicators of the solution's success, we can mention the acceptance and received feedback in its presentation and commercial launch in CIREC congress (International Conference on Electricity Distribution) 2023 in Rome, in addition to collaboration projects based on this technology carried out with leading European electricity companies, which have shown their conformity with the technology.

As quantitative indicators we have the fact that two utilities have opened tenders for pilot installations of SF6-free switchgear in Europe (Enedis and Enel), and ORMAZABAL, with its cgm.zero technological solution, is the only company that has been awarded in both projects.