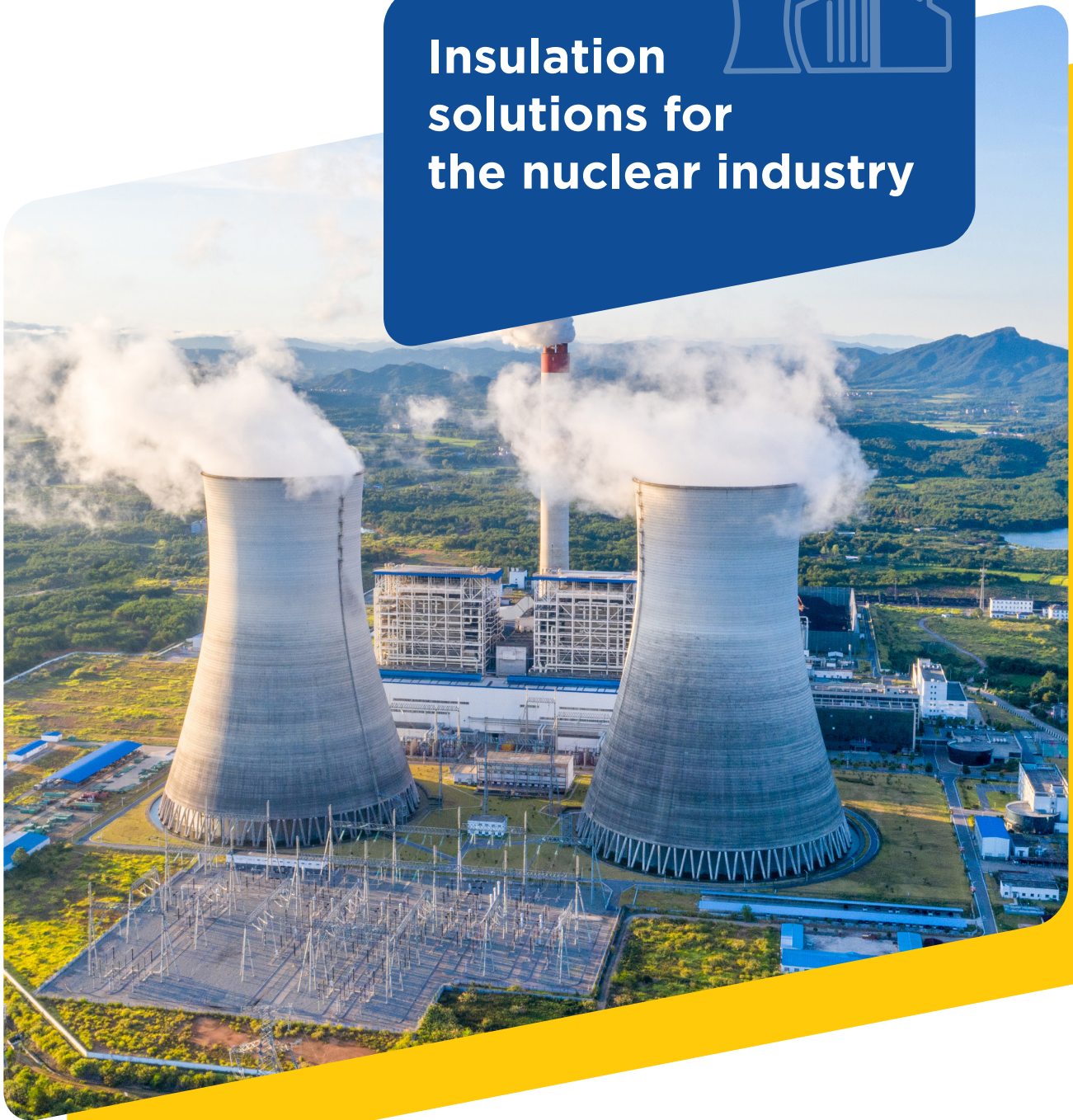
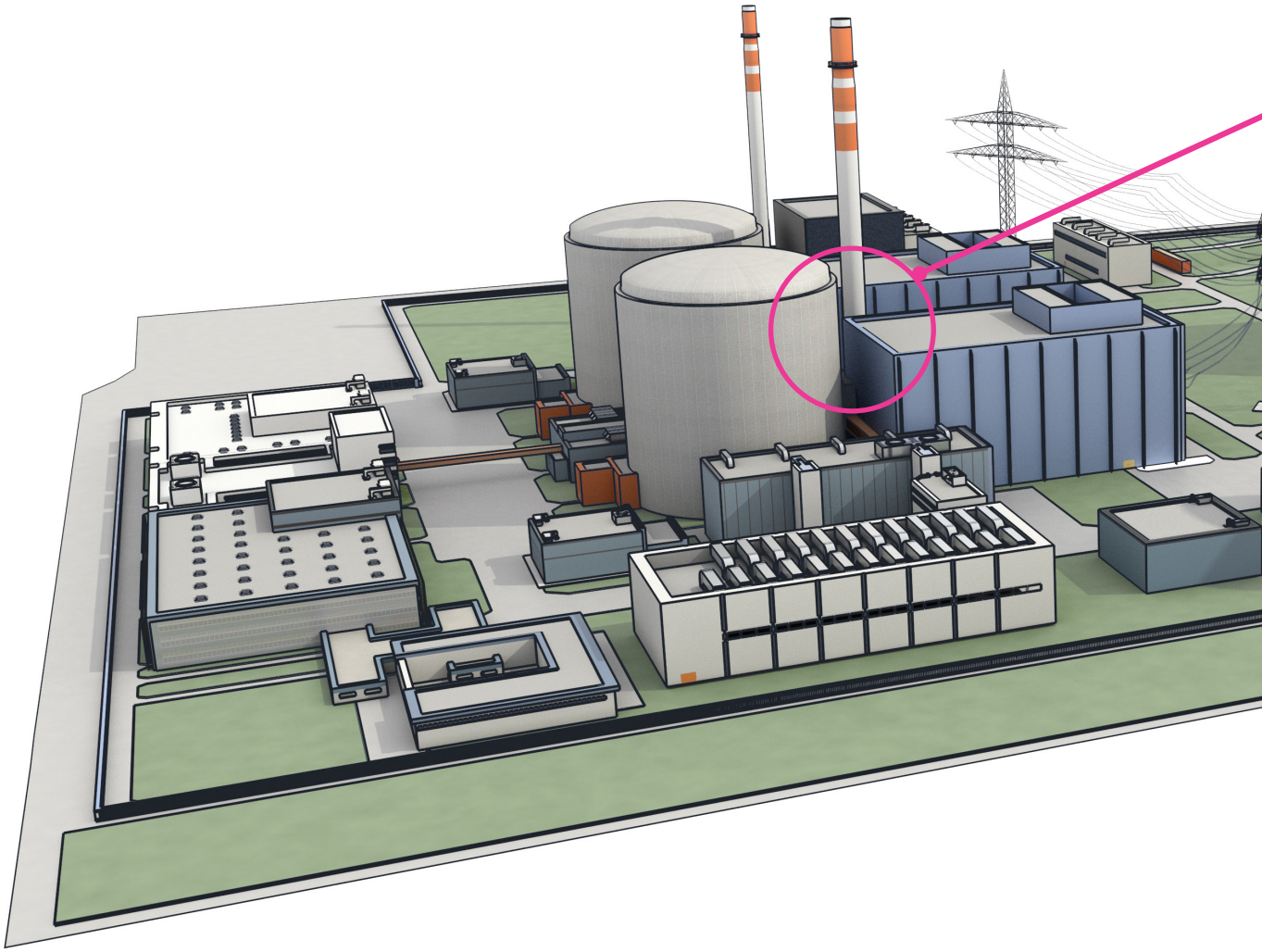
isover
SAINT-GOBAIN

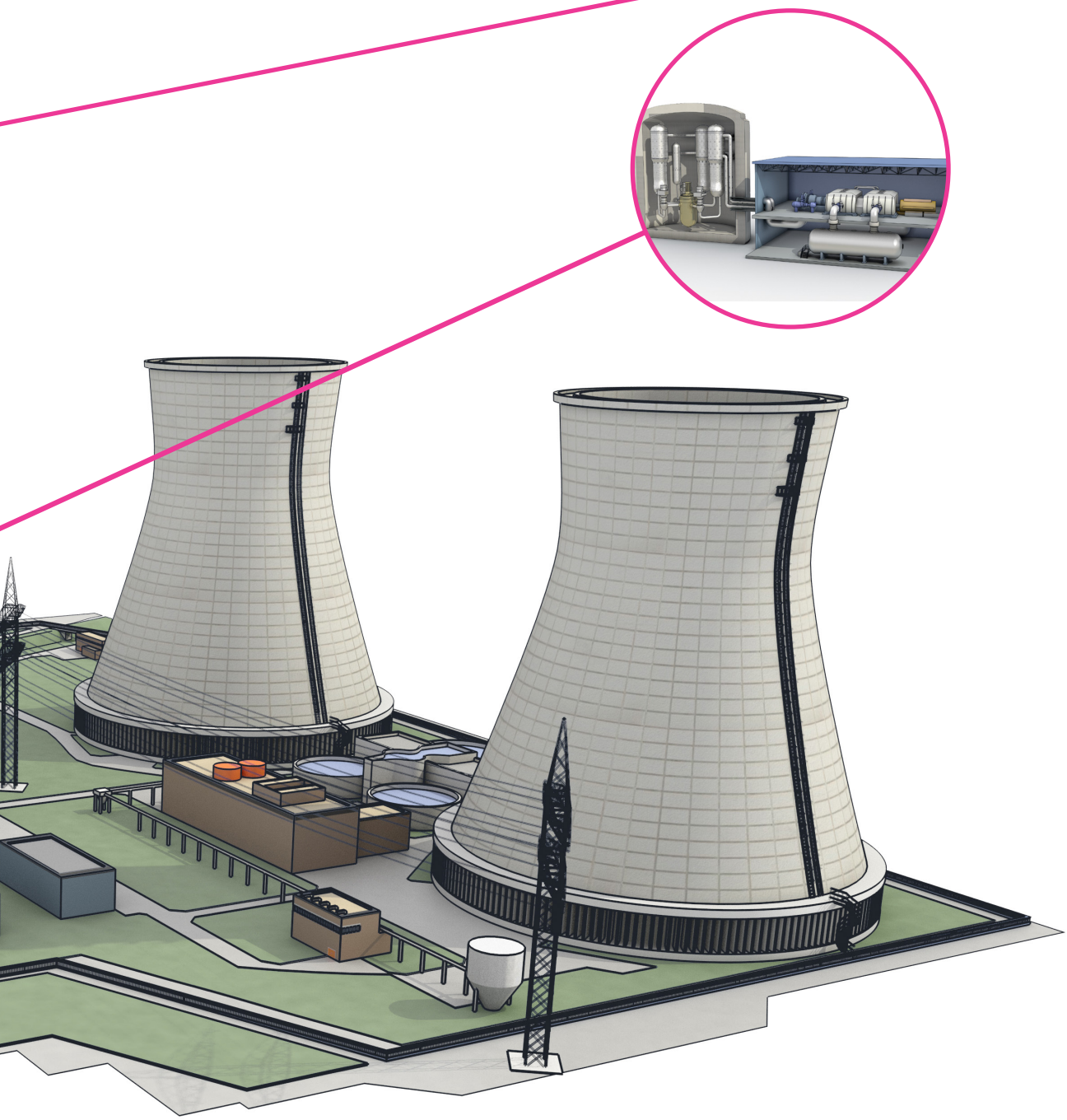
Insulation solutions for the nuclear industry



SAINT-GOBAIN

Inside
YOUR NUCLEAR POWER PLANT





Towards
A RELIABLE ENERGY TRANSITION

At a time when the effects of climate change are becoming more and more tangible and when, at the same time, States have become aware of the importance of their energy independence, we understand that we must succeed in the energy transition towards low-carbon energies.

Achieving net zero greenhouse gas emissions by 2050 requires rapid and complete decarbonisation of electricity and heat generation. Hence the interest of low-carbon energies as alternative modes of energy production that release less carbon dioxide (CO_2) into the atmosphere, such as wind, solar, hydraulic, or nuclear power.

Renewable energies such as wind, solar or hydro rely on natural resources that never run out, so they are considered green energies. But where they have the limit of being intermittent because they depend on the wind or the sun, nuclear power is a reliable and efficient complementary energy source in the low-carbon energy mix.

Today, nuclear energy contributes about 10% of global electricity production. It is the second-largest source of low-carbon electricity, with currently 436 reactors in operation and 59 reactors under construction, in 32 countries around the world. In 2021, the sector provided 2653 TWh of electricity.

However, in advanced economies, nuclear power has started to slow down, with some countries opting to phase it out altogether, particularly for safety considerations.

The nuclear fleet in advanced economies is on average 35 years old, which means that many plants are approaching the end of their expected lifetime. In theory, 25% of existing nuclear capacity is expected to close by 2025.

IN VIEW OF THE ENERGY CRISIS, NUCLEAR POWER IS ON THE OTHER HAND RETURNING TO CENTER STAGE.

According to new projections from the IAEA (International Atomic Energy Agency), reflecting an evolution and growing concerns in the global debate on energy security and climate change, nuclear energy could provide around 14% of the world's electricity by 2050.

Not only will new reactors be built in many parts of the world, particularly in Asia, but refurbishment will play a major role.

EFFECTIVELY INSULATE THE AGING NUCLEAR FLEET

As it is less expensive to extend the life of an existing reactor than to build a new plant, significant investments will be made in the coming years to sustain the sector.

If you are in charge or concerned with the renovation of a nuclear power plant, you will certainly have to replace the insulation system.

ISOVER offers a complete range of insulation solutions for the nuclear industry, meeting all your needs, from thermal or acoustic insulation, to fire safety or corrosion prevention.

DID YOU KNOW

Over the past 50 years, the use of nuclear power has reduced CO_2 emissions by over 60 gigatons – nearly two years' worth of global energy-related emissions. (source IEA)

Add value at
EVERY STEP OF THE PROJECT

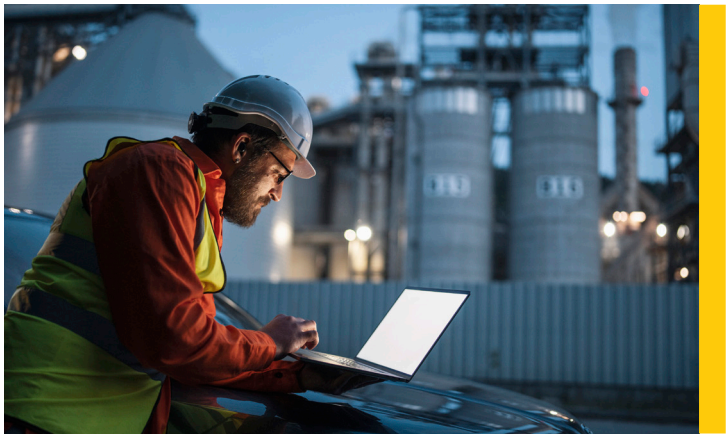
Trust ISOVER insulation solutions for the nuclear industry and add value throughout the life of your projects.

AS A PLANT OWNER

- Make sure your process is at the right temperature and running safely
- Optimise the energy efficiency of your installations
- Do your bit for the environment by reducing CO_2 emissions

AS A SPECIFIER OR EPC

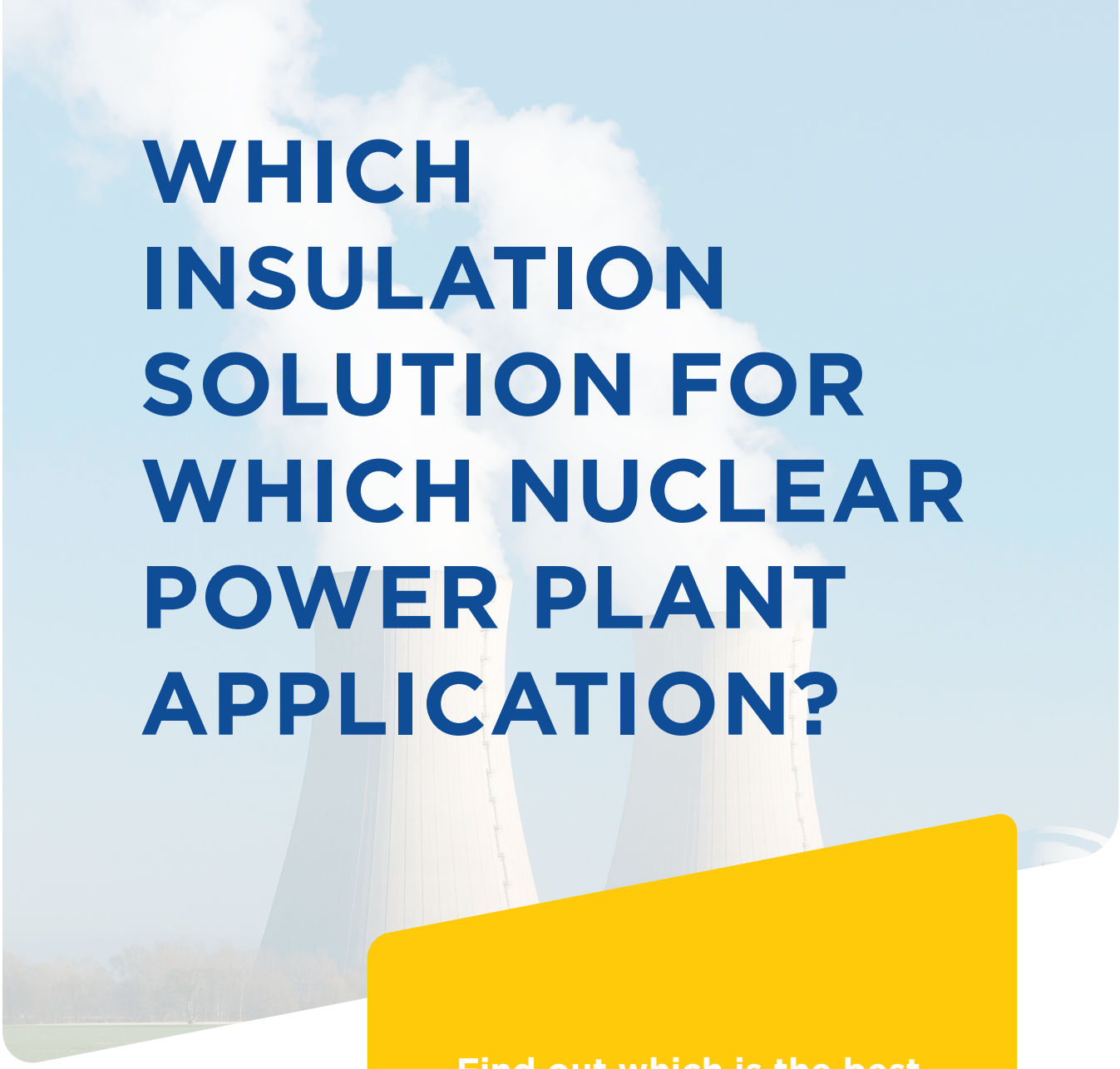
- Design high-performance insulation systems
- Bring key benefits to your customers
- Address the most stringent regulations (thermal, acoustic & fire performance)
- Meet the specific requirements of the nuclear industry



AS A CONTRACTOR

- Provide insulation solutions, approved for the nuclear industry
- Benefit from easy-to-use insulation solutions for maintenance or new construction
- Reduce installation time and labour costs
- Rely on a partner, locally or globally

WHICH INSULATION SOLUTION FOR WHICH NUCLEAR POWER PLANT APPLICATION?



Find out which is the best insulation solution, whether for the nuclear island or the conventional part of the plant.

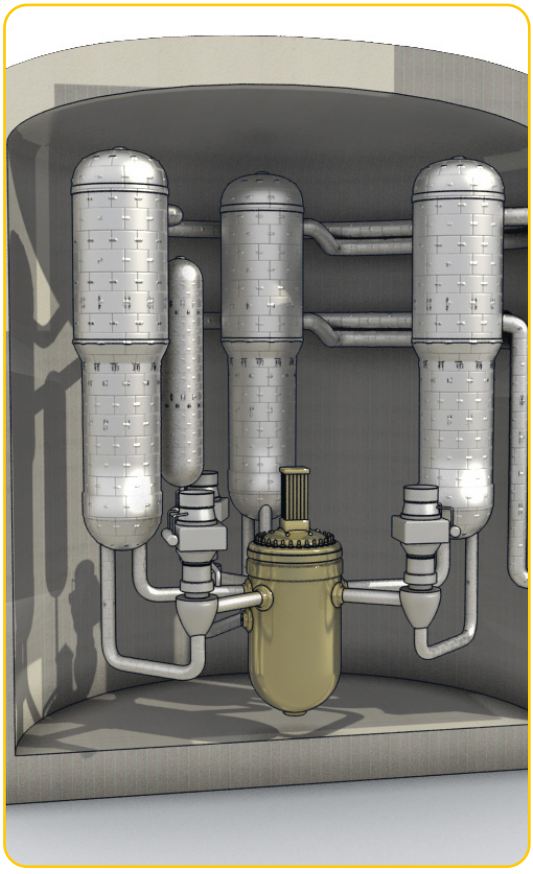
Insulation solutions for all
NUCLEAR INDUSTRY APPLICATIONS

A nuclear power plant is a thermal power plant in which a nuclear reactor generates large amounts of heat which in turn generates steam. The steam drives a steam turbine connected to a generator which produces electricity.

Nuclear power plants (PWR*) typically consist of two main parts:

- The nuclear island houses the nuclear steam supply system (NSSS) with the nuclear reactor, as well as a pressurizer, reactor coolant pumps, steam generators and other equipment and piping. This part is also referred to as the primary cycle.
- The conventional part houses the turbine generator which converts thermal energy into electricity. This part is referred to as the secondary cycle.

**PWR or pressurised water reactors constitute the large majority of the world's nuclear power plants.*



THE NUCLEAR ISLAND

Nuclear reactors use the thermal energy that is released when splitting atoms of certain elements to generate electricity.

For safety reasons, nuclear reactors are placed in airtight containment buildings, usually made of steel-reinforced concrete. They are intended to prevent or mitigate the release of radioactive material into the environment.

The nuclear steam supply system (NSSS) has an extremely high net positive heat load. This heat must be removed by containment cooling. To maintain a constant process temperature, and to ensure the amount of heat released does not exceed what the cooling equipment can remove, hot service piping and equipment require efficient thermal insulation.

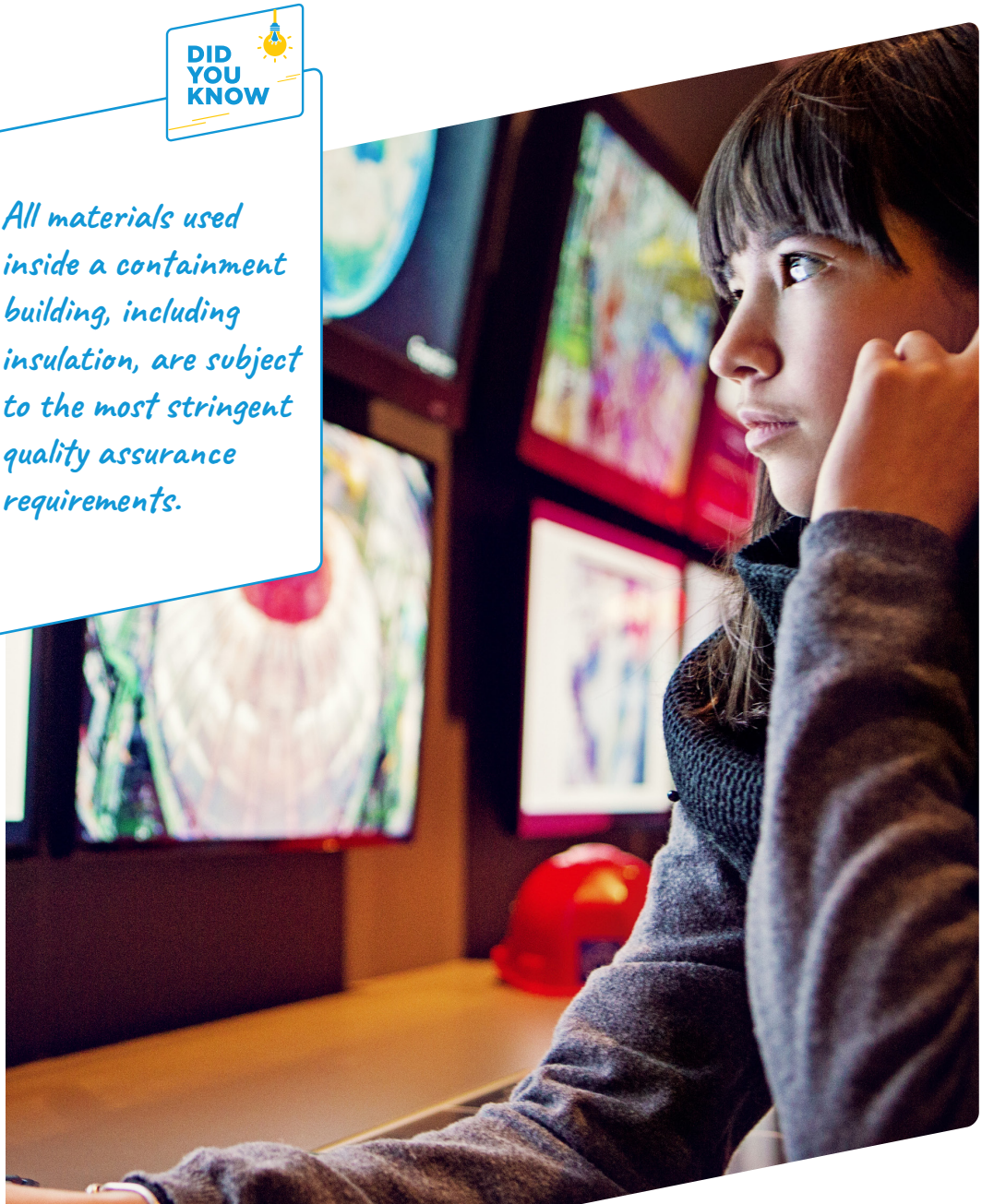
MEET THE SPECIFIC QUALITY REQUIREMENTS OF THE NUCLEAR SECTOR

System safety and reliability are more important than in any other industrial sector to protect people and the environment – even more so in the nuclear island part of the plant. Many owners or operators of nuclear power plants have established specific certification procedures for products intended for use in nuclear power plants.

In concrete terms, the insulation must be free of chemical impurities, and have very limited concentrations of chlorides, fluorides, sulphates, as these could cause corrosion of equipment or facings, generally made of steel or nickel-based alloys. This is essential to eliminate any risk of degradation of the critical containment barriers of the nuclear process.

DID YOU KNOW

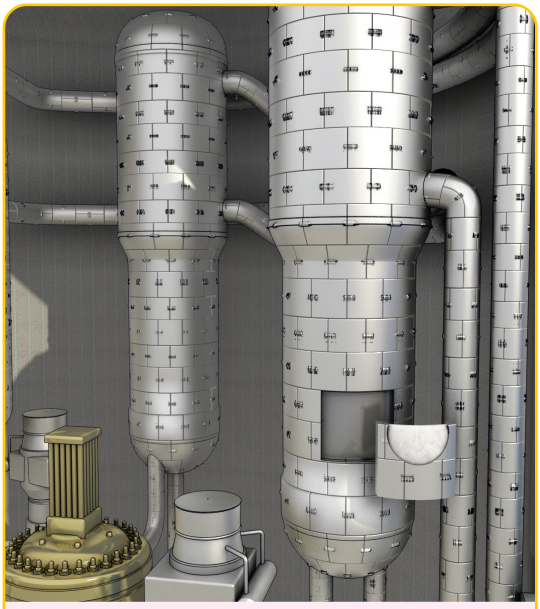
All materials used inside a containment building, including insulation, are subject to the most stringent quality assurance requirements.



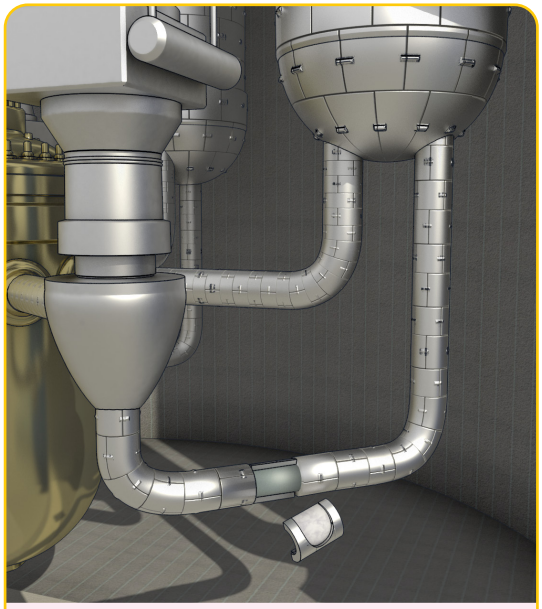
ENSURE EASY MAINTENANCE WITH REMOVABLE INSULATION

Regulations are strict regarding the work of people near a reactor, including the length of time a person is allowed to work there. This is to avoid prolonged exposure to radiation. It is therefore important to limit maintenance operations as much as possible, and if necessary, to be able to intervene quickly and efficiently.

Thermal insulation is used on components and pipes of the primary coolant circuit, as well as for safety relevant systems of the emergency cooling and secondary circuits. All insulation used in the nuclear island comes generally in specially designed metal cassettes, both to prevent the insulation from obstructing the strainers in the event of LOCA (loss of coolant accident), and above all to facilitate the maintenance of the system.



Insulation cassettes on a steam generator

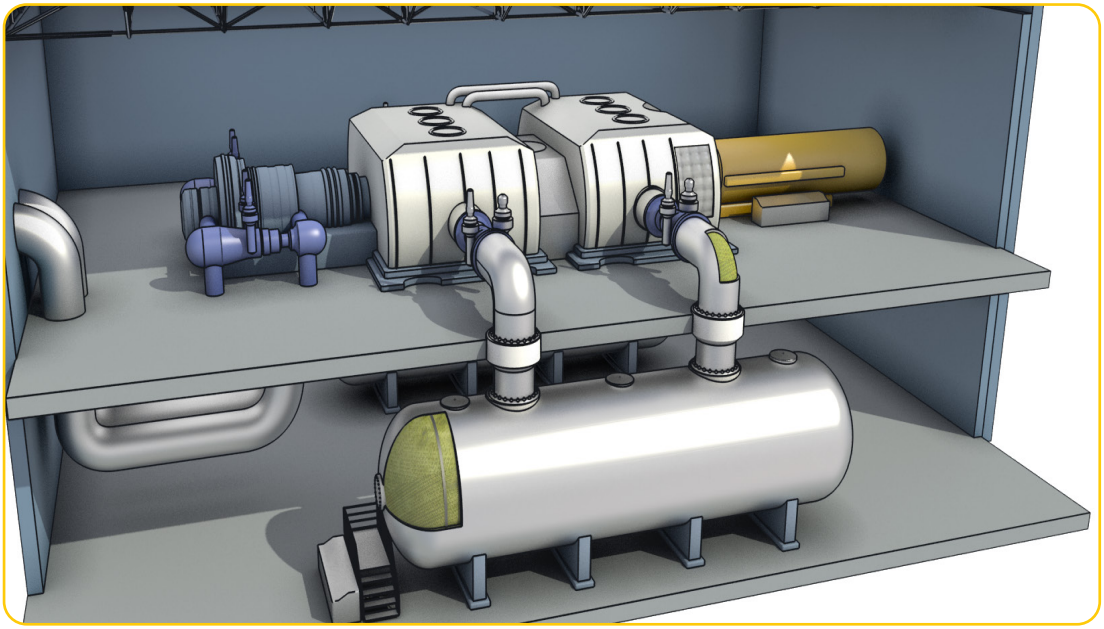


Insulation cassettes on coolant pipes

These cassettes (usually filled with mineral wool) are easy to install, dismantle and reinstall, they can be replaced many times and are usable during the whole life of a nuclear plant.

THE CONVENTIONAL PART

The conventional part or turbine island houses the electricity generation facilities. It is very similar to a conventional thermal power plant, such as a coal, fuel, or gas plant.



This part of the process is also called the secondary cycle because it is the continuation of the primary cycle: a turbine generator extracts thermal energy from the pressurised steam that is produced during the primary cycle and converts it into electricity. In the conventional part, we will find all the equipment of a conventional power plant, including a steam turbine, a generator, a condenser, and a cooling system.

The nuclear process requires strict quality assurance criteria – also for the conventional part

The big difference with conventional power plants is that in the conventional area of nuclear power plants, too, specific specifications apply regarding quality assurance and control, and any materials used. These conventional parts of the nuclear plant are an integral part of the nuclear process, and therefore have a significant impact as well.

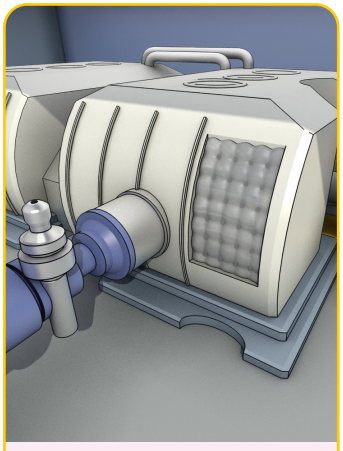
The insulation must meet the same (or similar) criteria as in the nuclear island, and have very limited concentrations of chlorides, fluorides or sulphates, to avoid any risk of corrosion on the insulated equipment.

Ensure process safety and personal protection
As in other power plants, insulation is used primarily for thermal insulation, aimed at ensuring fire safety, controlling process temperatures, and protecting staff working in the plant. Thermal insulation may be required on different types of equipment, such as tanks, containers, pipework, and others.

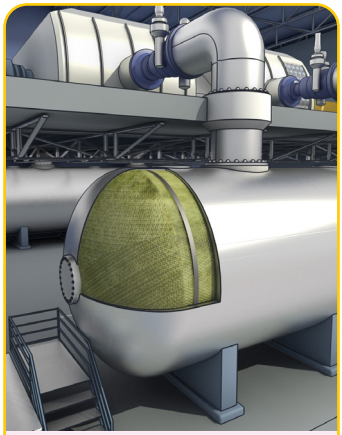
Drive energy efficiency and limit CO_2 emissions
As contradictory as it may seem, the energy sector is also a very energy-intensive sector. The energy crisis has highlighted the urgent need to reduce energy consumption everywhere. At the same time, industry players are fully aware of the challenges of climate change and are making more and more efforts to reduce their carbon emissions. Thermal insulation can play a key role in these efforts, as it helps reduce heat loss.

Control noise at the workplace
Whenever people are working alongside machines or motors, effective noise protection solutions are needed. Insulation can contribute to significantly reducing noise and creating an optimal acoustic environment.

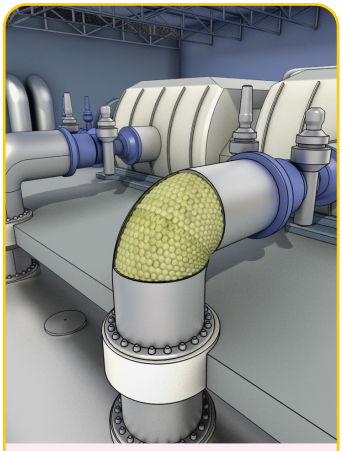
On the turbine, and to facilitate maintenance, the insulation is often applied with a mattress system (i.e. mineral wool type insulation integrated into mattresses), while other equipment and pipes are insulated in the traditional way, with wired net mats or pipe sections.



Insulation mattresses on a turbine



Equipment insulated with wired net mats



Pipe insulated with wired net mats

CHOOSE FROM A FULL RANGE OF INSULATION SOLUTIONS

Discover our range of products tested and approved for the nuclear industry and find the right solution whatever your insulation need.

Long-lasting insulation solutions for A HIGHLY SENSITIVE INDUSTRY

We offer products that are virtually free of organic content and therefore do not contribute to corrosion – and are approved by major industry players!

When they are used in the nuclear island, insulation products are generally integrated in metal cassettes which prevent the insulation from obstructing the strainers in the event of LOCA, and facilitate maintenance. Product flexibility and resilience are therefore essential.

TECH TELISOL 5.0 QN

ROLL OF WHITE GLASS MINERAL WOOL STITCHED ON STAINLESS STEEL WIRE MESH

TECH TELISOL 5.0 QN is a thermal insulation solution in rolls, specially designed to meet the severe requirements of the nuclear industry and for use inside the nuclear island. It can be used for example for the insulation of the heat exchanger and the steam pipes.

TECH TELISOL 5.0 QN is nearly free of organic content, **does not contribute to corrosion of stainless steel** (acc. ASTM C795/871) and is stitched with yarn to an austenitic stainless wire mesh to allow flexible bending. The hexagonal meshes compensate for the absence of binder by joining the rolls to the devices.

Thanks to its elastic fiber structure, **TECH TELISOL 5.0 QN** retains its long-term performance even when exposed to mechanical stress.

TECH TELISOL 5.0 QN is non-combustible (acc. to EN 13501-1 and ASTM E84):

- **Euroclass A1**
- **Fire Spread Index = 0**
- **Smoke Development Index < 20)**

TECH TELISOL 5.0 QN has excellent thermal performances across a wide range of temperatures:

Thermal conductivity	**T**	**[°C]**	50	100	150	200	300	EN 12667 EN ISO 13787
	λ	**[W/(m.K)]**	0.038	0.045	0.052	0.062	0.083	

TECH LOOSE WOOL QN

LOOSE WHITE GLASS MINERAL WOOL

TECH LOOSE WOOL QN is a non-bonded, resilient white glass mineral wool, specially designed to meet the severe requirements of the nuclear industry and for use inside the nuclear island. It can be easily integrated into insulation cassettes or mattresses and can also be used for the insulation of dead spaces or joints.

It is produced without the addition of silicone and therefore almost free of organic content to ensure that the product **does not contribute to the corrosion of stainless steel** (acc. ASTM C795/871).

The high resilience of its glass wool fibers guarantees a durable and long-lasting performance.

TECH LOOSE WOOL QN is non-combustible (acc. to EN 13501-1 and ASTM E84):

- **Euroclass A1**
- **Fire Spread Index = 0**
- **Smoke Development Index < 20)**

TECH LOOSE WOOL QN has excellent thermal performances across a wide temperature range:

Thermal conductivity*	**T**	**[°C]**	50	100	150	200	300	EN 12667
	λ	**[W/(m.K)]**	0.038	0.045	0.052	0.062	0.083	

**Indicative values for a homogeneous density of around 60 kg/m³. Values may vary according to density and stuffing quality.*

A COMPLETE RANGE TO INSULATE ANY NUCLEAR APPLICATION

Beyond these two flagship products, we offer a whole range of products tested and approved for use in the nuclear industry, all characterised by a low (or very low) organic content.

Depending on the application to be insulated, you can choose from different formats, from loose wool to wired mats, slabs, and pipe sections.

Format	Product Name	Material	Organic content	Application			
				Pipe	Wall	Equipment	Cavities
LOOSE WOOL	TECH Loose Wool QN	Glass Wool	Very low	x*		x	x
	TECH Loose Wool	Glass Wool	Very low			x	x
	TECH Loose Wool HT	Stone Wool	Very low	x*		x	x
WIRED MATS	TECH TELISOL 5.0 QN	Glass Wool	Very low	x	x	x	
	TECH Wired Mat MT 3.0	Stone Wool	Low	x	x	x	
	TECH Wired Mat MT 5.1	Stone Wool	Low	x	x	x	
SLABS	TECH Slab 2.1	Stone Wool	Low		x		
	TECH Slab MT 3.1	Stone Wool	Low		x		
	TECH Slab MT 5.1	Stone Wool	Low		x		
	TECH Slab HT 6.1	Stone Wool	Low		x		
PIPE SECTIONS	U TECH Pipe Section MT 4.0	ULTIMATE™ Stone Wool	Low	x			

** inside cassettes*

DID YOU KNOW

Our range of solutions meets all the insulation needs of a nuclear power plant, whether in the nuclear island or in the conventional part.

ABOUT US

Discover the Saint-Gobain Group, and read more about Saint-Gobain Technical Insulation, the world leading supplier of sustainable insulation solutions.

MAKING THE WORLD A BETTER HOME

Saint-Gobain designs, manufactures and distributes solutions for the construction, mobility, healthcare and other industrial application markets. Developed through a continuous innovation process, they provide wellbeing, performance and safety while addressing the challenges of sustainable construction, resource efficiency and the fight against climate change.

This strategy of responsible growth is guided by the Saint-Gobain purpose, “MAKING THE WORLD A BETTER HOME”, which responds to the shared ambition of the women and men in the Group to act every day to make the world a more beautiful and sustainable place to live in.

SAINT-GOBAIN

Aligned with this commitment, Saint-Gobain Technical Insulation has been delivering sustainable insulation solutions to customers since 1937. Across all technical markets - from Marine to Industry, HVAC, automotive and household appliances - and with a worldwide presence deployed locally, we support our customers at every step of the project, from design to installation. This means customising our approach based on specific needs. This means adding value through high levels of comfort, health, safety and performance. This also means helping limit environmental impact of each project, while managing costs.

With expertise in an array of insulation materials, we are constantly pushing the limits of our solutions. These unwavering R&D efforts also enable us to reduce the carbon footprint of each product, whether through high levels of recycled content, recyclability or lower energy consumption.

Drawing on a unique combination of global resources, local deployment and multi-material expertise, Saint-Gobain Technical Insulation strives to always be more efficient and responsible. Together with our customers, we are making this an everyday reality.

Saint-Gobain Technical Insulation

PUSHING THE LIMITS OF SUSTAINABILITY TOGETHER.

Saint-Gobain ISOVER

Tour Saint-Gobain
12 place de l'Iris
92096 La Défense Cedex - France

www.isover-technical-insulation.com

The information given in this brochure is based on our current knowledge and experience. If any information is incorrect this is not deliberate or grossly negligent. This document is not continually updated and we cannot be held responsible for any unintentional errors. For the most up-to-date information, please visit our website: www.isover-technical-insulation.com

Graphic design : Délicate Essence - www.delicate-essence.fr - 2023