At the heart of the structures.

CIVIL AND INDUSTRIAL ENGINEERING

BOUYGUES
TRAVAUX PUBLICS

The strength of experience.

For over 40 years, Bouygues Travaux Publics has been a major international player in civil engineering.

Our business lines cover the design, construction, rehabilitation and operation of infrastructure projects that meet the challenges and needs of society and the inhabitants of the areas where we are involved.

Proficient in all construction methods, we have built our reputation on our capacity to design and build complex projects that can include a wide range of structures, and to offer tools and solutions adapted to the expectations of our clients and the context of the environments in which we operate.

Bouygues Travaux Publics draws upon the collective intelligence of its network of industrial and academic partners and provides expertise across the entire construction value chain.

←

N'Kossa Barge [France, 1995]

Standing up to the test of time.

From Finland to Australia, from Canada to Mauritius and the United Kingdom, Bouygues Travaux Publics has played an active role in some of the most significant projects of the past three decades, contributing to the evolution of countries throughout the world.

Some of these projects stand out as historic records, such as the Chernobyl New Safe Confinement arch, the largest terrestrial structure ever built. Others are remarkable because of their scale, the technical expertise involved, their importance for the future of a region or a country, or the extreme context in which they were built.

Energy production or storage, waste management, mobility development... All of these have one thing in common: their contribution to the building of a sustainable future.

Today, we are ready to take up the challenges of tomorrow: building the infrastructure that will underpin the development of our societies, consistent with the sustainable management of the planet's resources. As a responsible builder, we are constantly improving the durability of the structures we construct and optimising them in order to preserve these resources and control man's impact on the environment.

←

Chernobyl New Safe Confinement Arch [Ukraine, 2019]

Orchestrating complex projects.

Civil engineering is the envelope that houses a process which sets in motion a large number of areas of expertise and know-how that serve the execution of ever more complex projects. The orchestration of all trades and their specificities, as well as the management of projects in constrained environments, make civil engineering an art of coordination.

Bouygues Travaux Publics has demonstrated its ability to successfully complete outstanding projects, delivering quality at every stage, from design to operation, while constantly striving to control the environmental footprint of its activities and to create functional structures that will serve their communities for many years to come.

It is this quest for the perfect balance between use, resources and sustainability that drives the multidisciplinary teams set in motion by the technical department on a daily basis.

←

Flamanville EPR [France, 2015]

Nuclear civil engineering

For over 40 years, Bouygues Travaux Publics has been using its expertise to serve the development of the nuclear energy sector. From the construction of the very first power plants in France to the latest generation of reactors (EPRs) and the development of future technologies such as small modular reactors (SMRs), the history of Bouygues Travaux Publics is one of a pioneering builder contributing to the development of this **decarbonised energy**.

Today, as an acknowledged leader in civil engineering for these infrastructures, the Group has developed a unique know-how geared to these projects, which require a heightened degree of safety, planning, cost control and constant vigilance. EPR projects are a perfect example of this combination of demanding standards and excellence, and of Bouygues Travaux Publics' capacity for innovation.

These projects, of rare complexity, call for recognised expertise in project management, safety and technical skills.
But nuclear power is not just about energy production. Bouygues Travaux Publics is proud to be taking part in projects that mobilise nuclear civil engineering technology to serve other equally essential objectives, requiring us to imagine, design and build **custom-made** structures that are often unique.

↓ Flamanville EPR [France]

FRANCE **2015**

Flamanville EPR

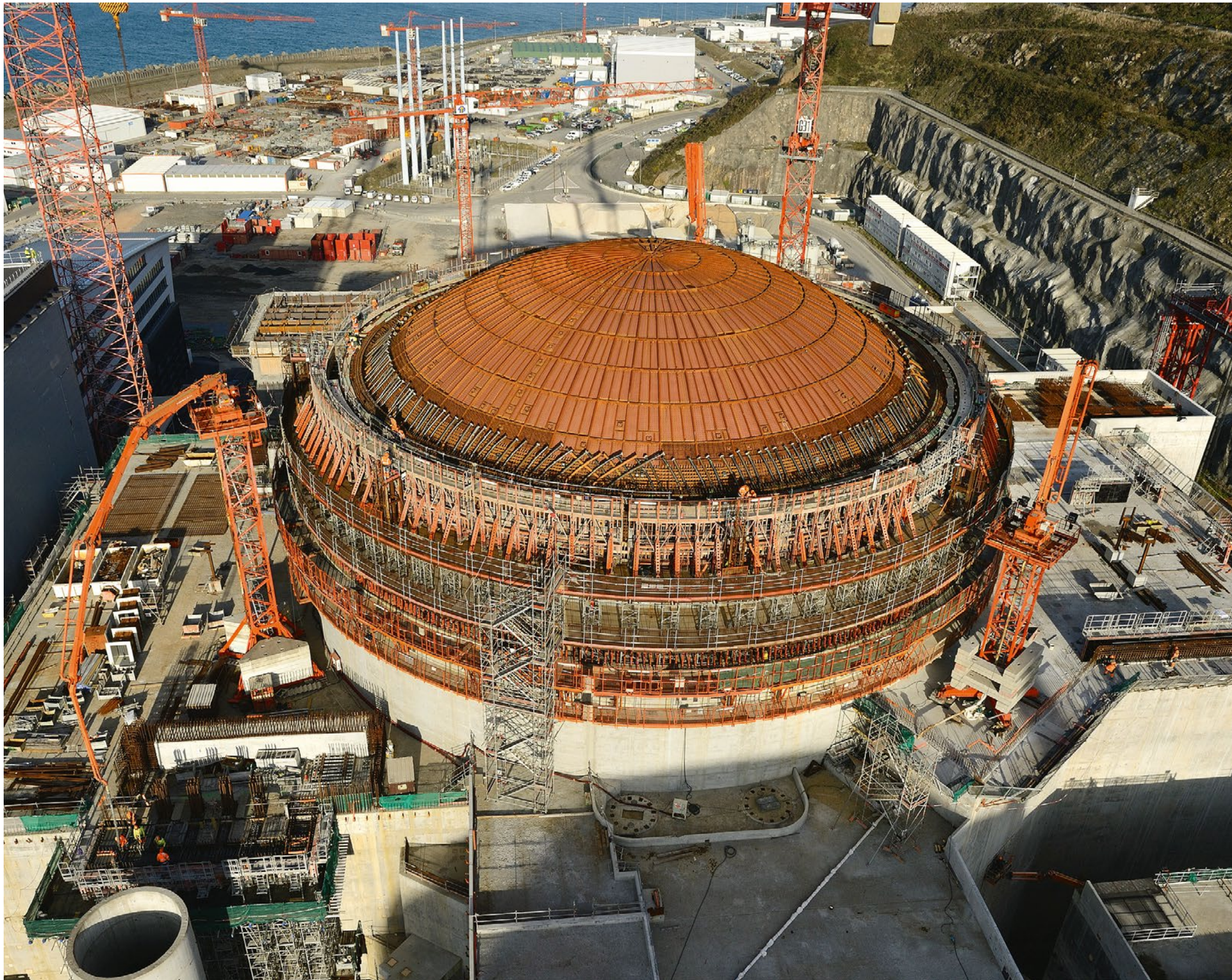
Earthworks and civil engineering
for the EPR

On the Flamanville site in the Manche department, Bouygues Travaux Publics carried out the civil engineering works for EDF on **the first third generation pressurised water reactor** (EPR) in France. This cramped site, measuring 100 metres on each side and located between the cliffs, the sea and the first two reactors of the existing power plant, is home to some 10 buildings, including the power room and the reactor building. This exceptional construction site is particularly noteworthy for the specific features of the construction of a dual enclosure shell: a structure 54 metres in diameter and 60 metres high, "lined" with an inner steel liner capable of withstanding the pressure resulting from a core meltdown, and topped by a 240-tonne dome installed by one of the largest cranes in the world. The power room houses a 1,600-megawatt turbine. To meet the most stringent nuclear safety requirements, the building notably incorporates two new items of equipment: a **core catcher**, which can contain the reactor core in the event of a meltdown, and a **plane-protection shell** that can withstand the impact of an airliner.

∅ EXTERNAL DIAMETER
54 M

HEIGHT
60 M

WEIGHT OF THE METAL DOME
240 T



UNITED KINGDOM **2028**

Hinkley Point C EPR

Construction of two nuclear reactors

To the south west of Bristol, England, is the site of the first nuclear power station built on British soil in 20 years. When its two **new-generation** reactors are commissioned, this gigantic project involving extraordinary feats of organisation and methods for its construction will supply 7% of the country's electricity consumption and power nearly 6 million homes. This project, commissioned by the British government from NNB, a company majority-owned by EDF Energy, was entrusted to Bouygues Travaux Publics, in partnership with Laing O'Rourke within the Bylor consortium. It brings together structures of rare complexity, condensing all the developments in the sector in terms of technicality and safety. To optimise the project and better manage construction deadlines, Bylor relied in particular on the prefabrication of heavy concrete elements. Some of these massive elements require the mobilisation of the SGC250 "**Big Carl**", the largest land-based crane in operation, capable of lifting slabs of up to 1,100 tonnes, up to a reach of 100 metres.

REACTORS
2

WEIGHT OF A RING
347 T

DIAMETER OF A RING
47 M

FINLAND **2011**

Olkiluoto EPR

Construction of nuclear reactor buildings

Areva awarded Bouygues Travaux Publics the civil engineering contract for the **nuclear island** of the world's first EPR, including the reactor buildings and fuel and its protection systems. On the shores of the Baltic Sea in western Finland, where winter temperatures can drop to -28°C, the number 3 reactor at the Olkiluoto power plant now stands as a technical and engineering feat. This fortress of imposing dimensions has an **outer shell** of reinforced concrete 1.80 metres thick and an inner containment structure of pre-stressed concrete 1.30 metres thick, lined with a steel sealing skin.

BUILDINGS
6

DIAMETER AND HEIGHT
55 M

THICKNESS OF THE OUTER SHELL MADE OF REINFORCED CONCRETE
1.80 M

NIGERIA **1987**

Egbin thermal electric power plant

Construction of a thermal electric power plant

In Lagos, the capital of Nigeria, Bouygues Travaux Publics was awarded the contract, as part of a consortium, to build the Egbin thermal electric power plant, the largest in the country, on a 30-hectare site. The plant, which is fuelled by natural gas and heavy fuel oil, comprises **six 220 MW units**, with a total capacity of 1,320 MW. Each unit is a complete power plant in itself with a steam production unit and a power generation unit and is thus able to operate **independently**. The works consisted of the design and construction of all the structures, covering all the specificities of civil works, including the civil engineering part of the infrastructure. Bouygues Travaux Publics also supervised the installation of **peripheral industrial equipment**, including a cooling water pumping station and water production and storage systems.

UNITS
6

POWER PER UNIT
220 MW

TOTAL POWER
1,320 MW

FRANCE 1987

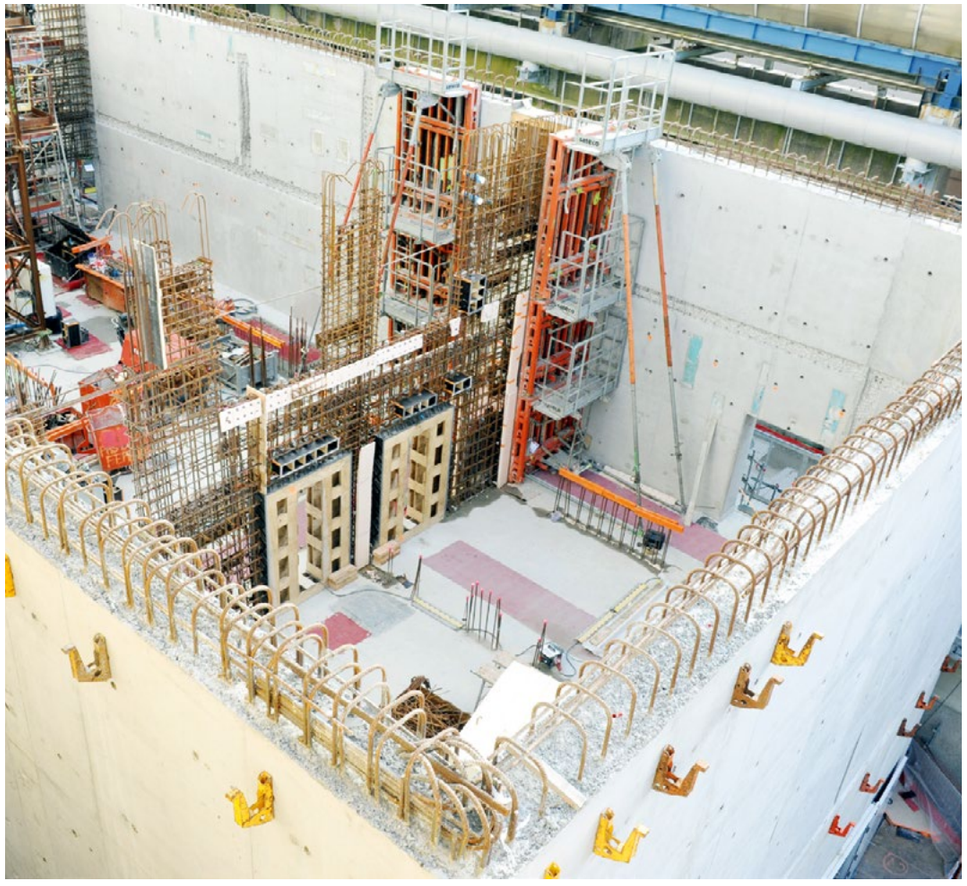
Nuclear fuel reprocessing - Workshop R1

Construction of the R1 workshop at the La Hague reprocessing plant

MAIN BUILDING
1 (in 2 blocks)

LEVELS
11

In the 1980s, Bouygues built numerous workshops for COGEMA (now known as ORANO) in the UP2 and UP3 units of the nuclear fuel **reprocessing** plant at La Hague, in the Manche department. Once the first stage of transfer and storage of these used fuels in the pool has been completed, the elements are transported to a first series of workshops, R1 and T1. In these automated workshops, the operations of cutting the fuel elements and dissolving the nuclear material are carried out remotely. The R1 workshop was built by Bouygues in 1987. The works consisted of the execution of the civil engineering with the construction of two blocks comprising 11 levels founded on a 2.60-metre general slab and comprising biological walls of more than one metre with dense reinforcement. The teams had to face a major challenge: the fact that the workshop site was **surrounded on all sides** by other buildings.



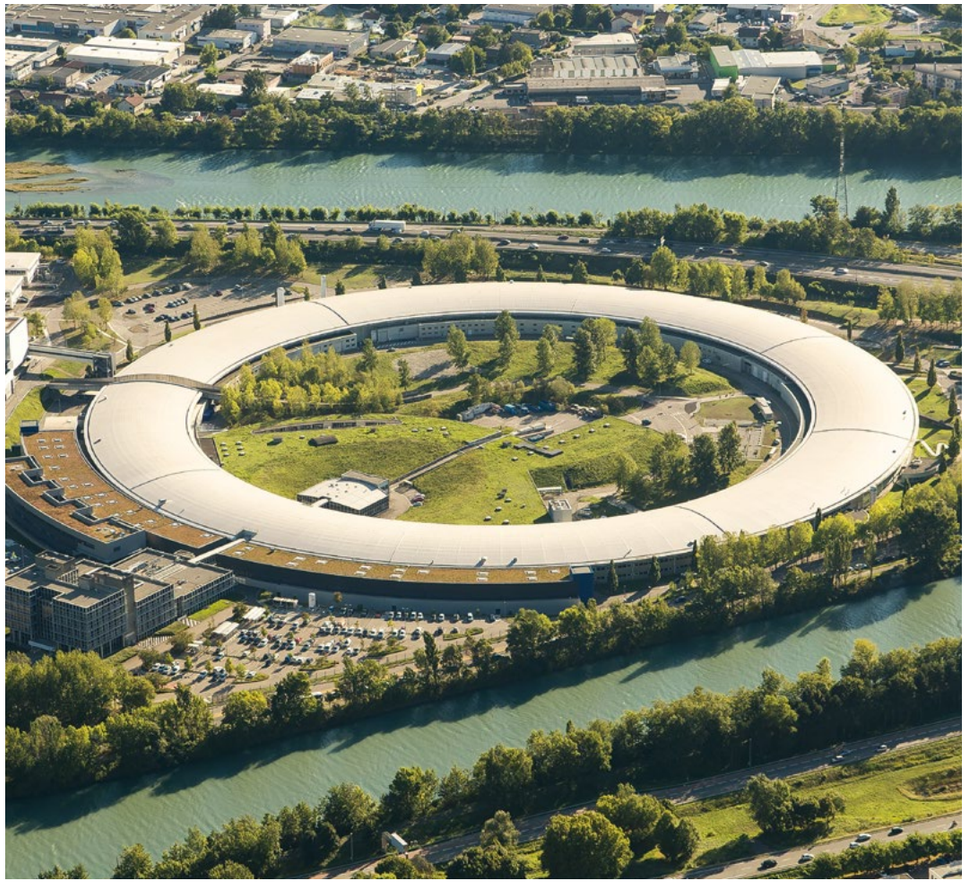
FRANCE 2021

NCFPs (new concentration of fission products) - Workshops R2 and T2

Building annexed to the R2 and T2 workshops at the La Hague reprocessing plant

SEMI-UNDERGROUND CONCRETE STRUCTURES
2

As part of the replacement of the evaporators needed to concentrate the fission products, Bouygues Travaux Publics carried out the civil engineering works for **two semi-underground structures** designed to house them. These annexes to the workshops are part of the spent fuel reprocessing chain and are located after those at the head of the plant, consisting of the R1 and T1 workshops. The spent nuclear material is dissolved in nitric acid, then the uranium and plutonium are extracted by a chemical process. The remaining part is made up of "fission products", transferred to the R2 and T2 workshops, where they are concentrated by means of evaporators that heat them in order to evaporate the acid, which is recycled. The work was carried out in a very constrained environment: a construction site on an operational ORANO site and in cramped spaces requiring complex manoeuvres.



FRANCE **1990**

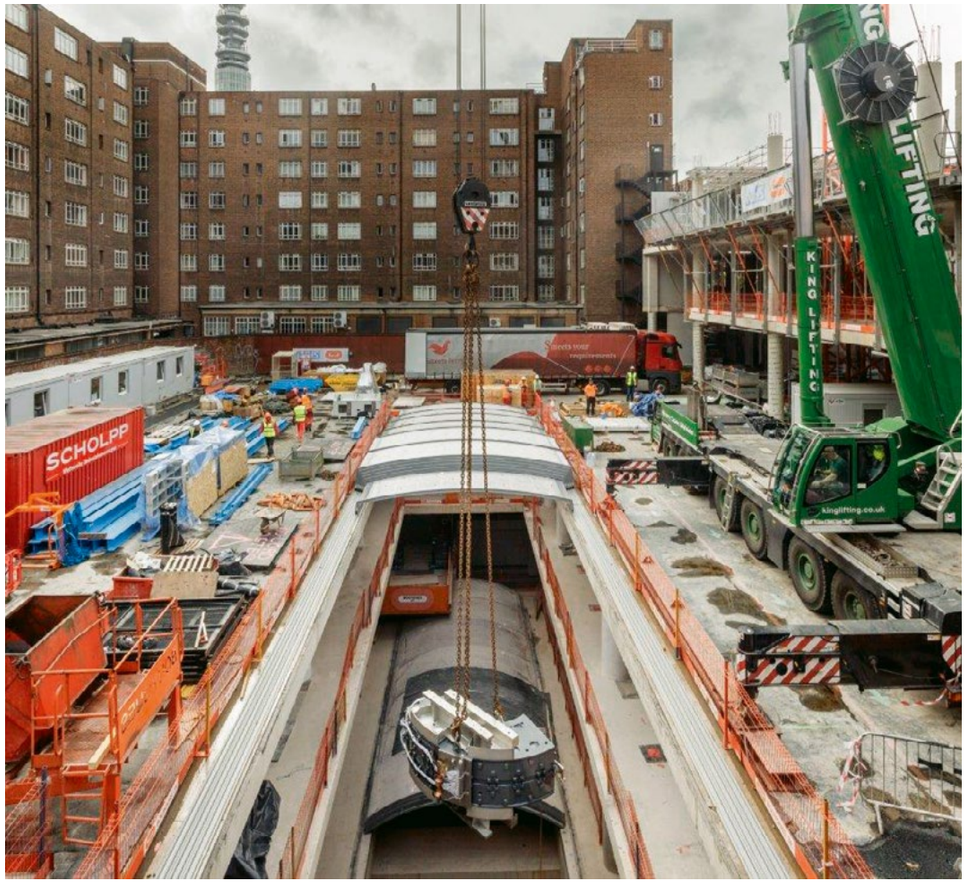
European Synchrotron Radiation Facility (ESRF)

Civil engineering works for the Synchrotron in Grenoble

STORAGE RING
1

CIRCUMFERENCE OF THE RING
850 M

On a peninsula between the Drac and Isère rivers stands a strange circular structure: the ESRF-Synchrotron, the world's most powerful particle accelerator. Conceived in 1988 and financed by 11 countries, it hosts some of the most important research programmes in X-ray science and counts four Nobel Prize winners among its users. The Synchrotron is a super generator of X-rays: they are produced by accelerating electrons to the speed of light. Bouygues Travaux Publics was chosen for its construction. The structure consists of a **linear accelerator complex** and its **storage ring** with a circumference of 850 metres and a diameter of 300 metres. Around there are dozens of laboratories where experiments are carried out.



UNITED KINGDOM 2019

UCLH - Centre for Cancer Treatment and Surgery

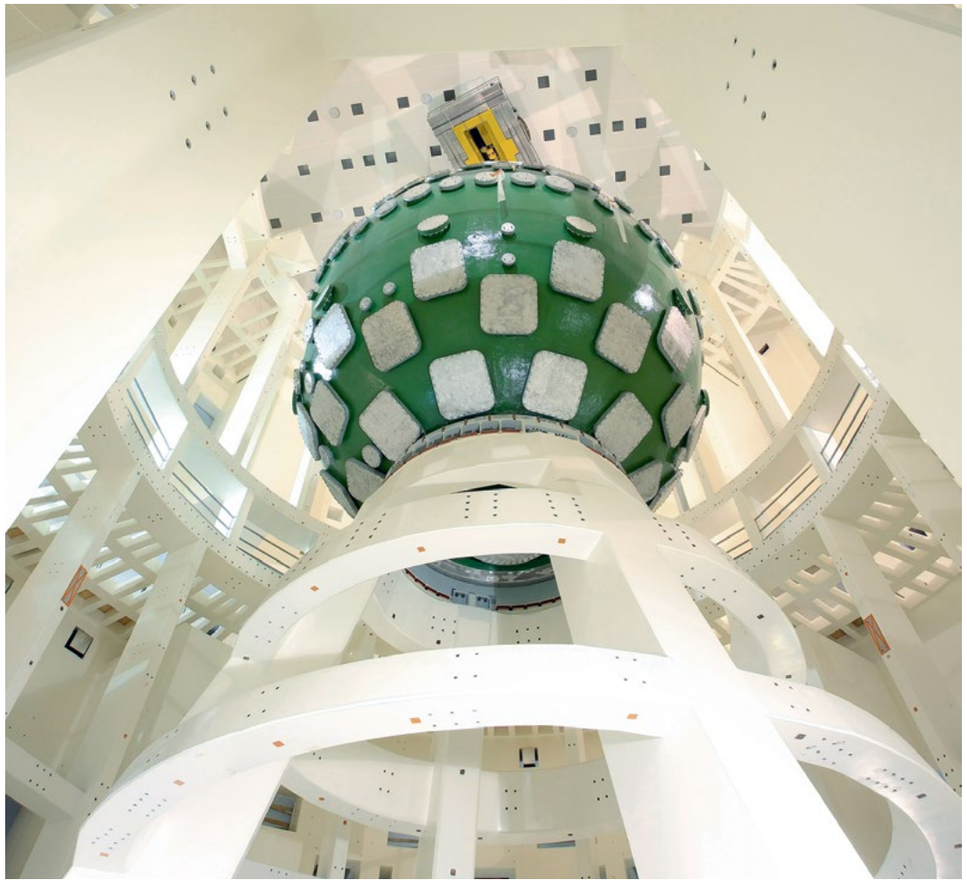
Construction of the proton therapy equipment bunker-like basement

DEPTH
22 TO 28.50 M

THICKNESS OF WALL AND CONCRETE SLAB
1.80 TO 4 M

THICKNESS OF STEEL PLATE
1.40 M

In the heart of London, Bouygues UK and Bouygues Travaux Publics were chosen by NHS England to build one of the world's proton therapy centres. Hosted by University College London Hospital, the centre will use a cutting-edge technique that can target cancers with extreme precision, thereby minimising damage to surrounding tissue. While medical innovation is at the heart of the project, the construction aspect is not to be outdone: consisting of five levels underground and six above ground, the centre was the subject of the largest **excavation** in the British capital, involving a 3,600 m^2 dig at depths of 22 metres to 28.5 metres, in an extremely constrained urban environment. The underground installation of a state-of-the-art proton therapy facility imposed heavy constraints in terms of **radiation shielding**: this was ensured by the thickness of concrete walls and slabs ranging from 1.80 metres to 4 metres, as well as by steel plates 1.40 metres thick.



FRANCE **2008**

Laser Megajoule

Civil engineering and secondary works for the Megajoule nuclear test simulation centre

WALL THICKNESS
UP TO 2 M

DEPTH OF DIAPHRAGM WALLS
NEARLY 30 M

CONCRETE USED
150,000 M³

South of Bordeaux, the town of Le Barp is home to an extraordinary building, the Laser Megajoule, an exceptional research tool managed by the French Atomic Energy and Alternative Energies Commission (CEA). It is one of the main elements of the programme designed to ensure the continuity of France's nuclear deterrent after the definitive cessation of nuclear tests in real conditions: 240 laser beams seek to trigger a nuclear fusion reaction. This implies a high degree of precision, which required a very sophisticated level of construction, to the nearest tenth of a millimetre, on a plot of land known for its complexity. Three Bouygues Construction companies, including Bouygues Travaux Publics, were responsible for the civil engineering and secondary works. Located in the centre of the building, the experiment room is surrounded by two halls housing the laser beams. To meet the high **stability** requirements, the building's foundations were designed to prevent vibrations that could be caused by certain geological phenomena. **Diaphragm walls** were built to a depth of nearly 30 metres.

FRANCE **2018**

Ultimate Diesel Generators

Construction of eight Ultimate Diesel Generator units

UNITS
8

CONCRETE USED
15,000 M³

ELECTRICAL POWER PER UDG
3 MW

Following a post-Fukushima nuclear safety audit, EDF launched an action plan to deal with major accident situations. The resulting improvement programme includes the construction of Ultimate Diesel Generators (UDGs) for all of the 58 reactors in the French nuclear network. Bouygues Travaux Publics was awarded a civil engineering package for **eight units** on three major sites: Flamanville (50), Paluel (76) and Penly (76). The principle is to have an additional power supply in case of failure of the two external power supplies and the two existing internal power supplies. This last-resort power source makes it possible to further secure the power supply for refrigeration of the fuel deactivation pool. In addition to the thickness of the walls and the density of the reinforcement used in the nuclear industry, the need for robustness required the construction of buildings on **earthquake-resistant blocks** (at Paluel and Flamanville), the setting of the lower floor above the reference flood level, and a metal structure equipped with anti-tornado and anti-projectile nets to protect the external equipment.

Production of renewable energies

For decades, Bouygues Travaux Publics has been a leading partner in the construction and maintenance of all types of structures linked to the production of electricity from **renewable sources**, thanks to its quality of execution and thoroughness.

⊙ **Dams:** structures that are part of a hydroelectric complex (or that may also provide a reservoir for crop irrigation and water consumption)

⊙ **Offshore wind turbines:** that may be placed on the sea bed (gravity-based foundations) or floating

The company possesses a wide range of expertise enabling it to operate throughout the entire life cycle of these infrastructures, and uses its production industrialisation capabilities to improve schedule efficiency and reduce the footprint of its works.

As a recognised player in the field of river and maritime works, Bouygues Travaux Publics offers integrated, tailor-made solutions based on an innovative combination of proven technologies. It is also developing its activity in the technologies of the future, as with the exclusive acquisition of floating base technology (OO-STAR).

↓ Fécamp offshore wind farm [France]

CANADA **1992**

James Bay Dam

Construction of a dam

From the top of its 58 metres, it proudly towers over the Grande Rivière basin in northeastern Quebec. Located 37 kilometres from the mouth of the river, the James Bay Dam, whose construction began in 1973, is the most downstream point of a large **hydroelectric** structure. In this subarctic region, where temperatures regularly border on -40°C in winter, this titanic construction site, delivered in 1992 by Bouygues Travaux Publics, within a consortium, is still a major human and technical exploit. To build this 350-metre-long dam, on a site located more than ten hours from the first city, no less than 355,000 m^3 of concrete and 16,000 tonnes of steel were needed. Operations were carried out at breakneck speed in order to meet the very tight deadlines (32 months) and to carry out the civil engineering works for twelve **groups of alternators** with their water intakes, a roof structure, a gravity dam and a service area.

HEIGHT
58 M

LENGTH
350 M

CONCRETE USED
355,000 M^3

MAURITIUS **2003**

Midlands Dam

Construction of a rock-fill dam and a damping basin

HEIGHT
25 M

LENGTH
2.5 KM

CONCRETE USED
48,000 M³

A 25-metre-high dam and 2.5 kilometres long: the Midlands Dam was, upon delivery, the largest in the Indian Ocean. With a capacity of 25 million m^3, it serves as a **reservoir** for crop irrigation and water consumption, supporting the development of tourism, the leading economic sector in Mauritius.
The structure is made up of rock-fill, a reinforced concrete spillway and a damping basin. Its plastic concrete **watertight wall** goes down to the sound rock, under the body of the dam, and crosses a decomposed basalt with numerous boulders. It is anchored 0.50 metres into the basalt or placed on the top of the rock and adapts to the deformations of the ground. Its construction mobilised nearly 300 people, including 260 local staff.

FRANCE **2010**

Pragnères penstock

Dismantling and reconstruction of a penstock

DIAMETER
1.60 M

LENGTH
800 M

LENGTH OF THE DROP
500 M

The most extensive hydroelectric complex in the Pyrenees, the Pragnères power plant, built in 1954 and operated by EDF, is perched at an altitude of 2,200 metres at the tip of a complex stretching over several valleys and including 40 kilometres of tunnels, 5 dams and 30 water intakes.
With a production capacity of 185 MW, it can alone provide for the power consumption of a town of 135,000 inhabitants. In 2010, Bouygues Travaux Publics Régions France carried out major **demolition** and **reconstruction** work on the lower part of the Pragnères penstock, which supplies the power plant's turbines from the water reservoirs located at altitude. The section concerned is 500 metres high and 800 metres long, including 100 metres in a tunnel, and is held in place by nine **reinforced concrete blocks** rebuilt to anchor the conduit to the cliff.

FRANCE 2022

Fécamp offshore wind farm

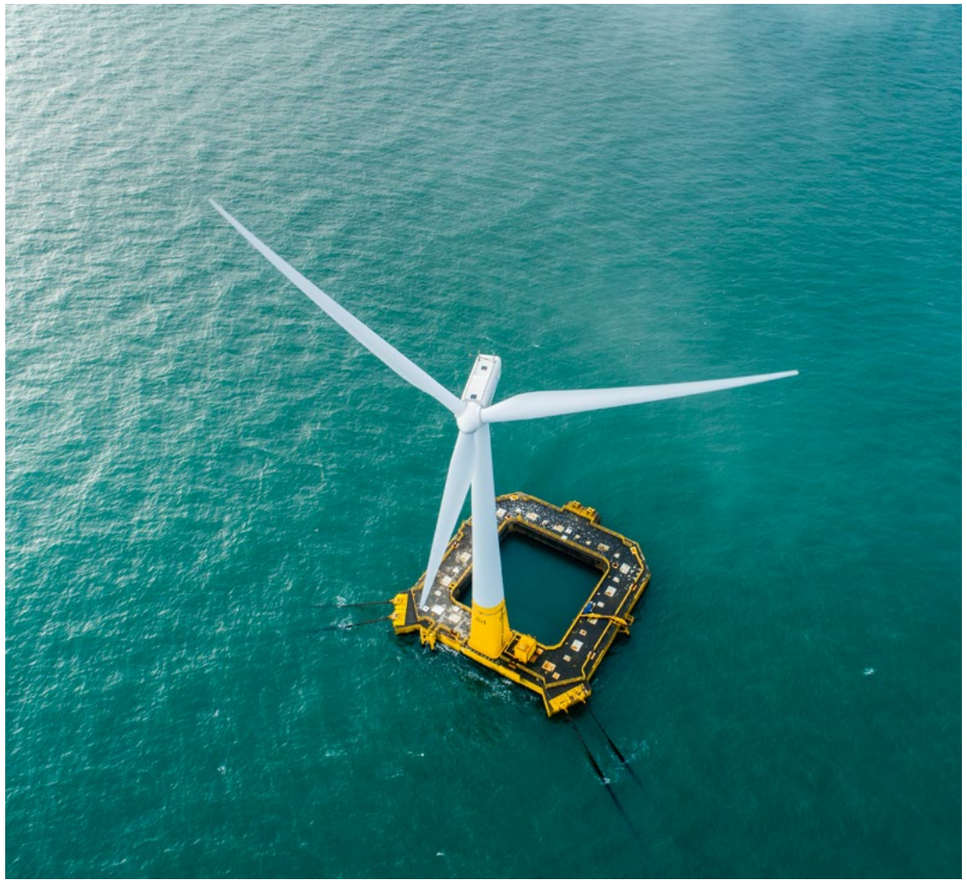
Design, construction and installation of 71 offshore wind turbine gravity-based structures (GBSs)

Off the coast of Fécamp, the first offshore wind farm in Normandy that will be connected to the French electricity grid has been unveiled. With a total capacity of 500 MW, it is designed to produce the equivalent of the domestic electricity consumption of 770,000 people. As part of this major project to diversify France's energy mix, Bouygues Travaux Publics built the **gravity-based** foundations, a technique used for the first time in France and adapted to the depth range and geotechnical conditions of the area. The 71 pre-stressed concrete GBS foundations were built on land, at the Bougainville quay, a 27-hectare area located within the Grand Port Maritime du Havre. The implementation of four **parallel production lines**, as well as the movement of formwork tools and teams from one line to another, allowed for the industrialisation of the construction process of the foundations. Once completed, the foundations were transferred to a barge using Kamags and then placed on the seabed at a depth of 25 to 40 metres by a crane ship. The GBS foundations ensure the stability of the wind turbines after they have been filled with ballast material.

WEIGHT OF A GBS FOUNDATION
5,000 T

HEIGHT
BETWEEN 48 AND 54 M

DIAMETER
31 M



FRANCE 2017

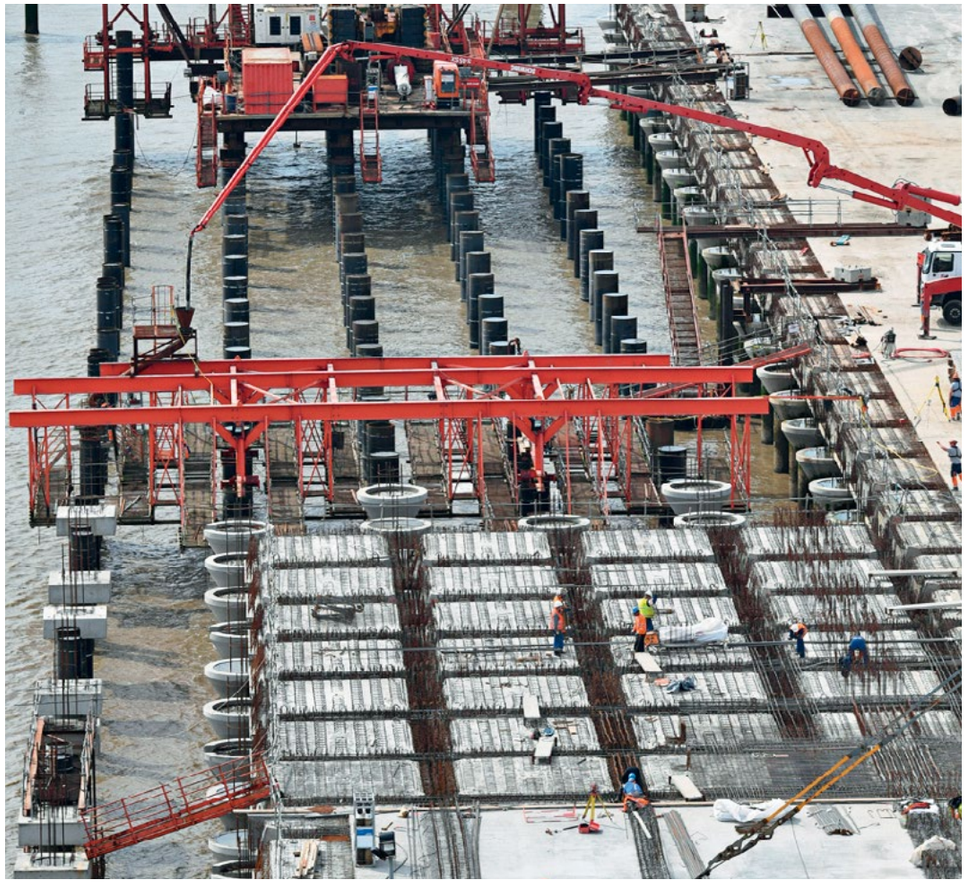
Floatgen

Construction of the float for the first floating offshore wind turbine in France

FOUNDATION WEIGHT
5,000 T

HEIGHT
9.50 M

When Floatgen was set afloat 22 kilometres off the coast of Le Croisic in August 2017, a new generation of offshore wind power emerged: the floating wind turbine. Installed at the SEM-REV test site of the École Centrale Nantes, the first floating wind turbine in France, with a capacity of 2 MW, provides the equivalent of the annual electricity consumption of 5,000 inhabitants. Since 2013, this **experimental project** coordinated by BW Ideol has brought together seven European partners. Bouygues Travaux Publics built the Damping Pool **floating foundation**, patented by BW Ideol, in the port of Saint-Nazaire, using a special formulation of lightweight concrete made from porous aggregates. A real technical feat, this 36-metre square buoy, 9.50 metres high and made of pre-stressed concrete, is lightened to weigh about 5,000 tonnes. The self-compacting concrete was poured in a homogeneous way using a pumping system. The structure then started to float when the barges on which it was built were ballasted. Connected to the national power grid, Floatgen has been operational since September 2018.



FRANCE 2017

Montoir-de-Bretagne berth

Construction of the terminal extension

EXTENSION OF THE QUAY
350 M

STEEL PILES
580

PREFABRICATED REINFORCED CONCRETE ELEMENTS
1,157

In 2015 the Grand Port Maritime de Nantes Saint-Nazaire decided to make major investments to support regional industries in the renewable energy sector. Bouygues Bâtiment Grand Ouest had previously built two offshore wind turbine nacelle assembly plants in Montoir-de-Bretagne for Alstom. To support the development of this activity, the consortium led by Bouygues Travaux Publics Régions France was asked to extend berth 4 at the Montoir-de-Bretagne terminal from 250 to 600 metres. The 350 metres of new quay are supported by 580 steel **piles** driven into the bed of the Loire. 1,157 **prefabricated reinforced concrete elements** are positioned on this mesh structure in order to constitute the covering slab of the quay. Two hundred metres of the new quay have been reinforced to permit the handling of heavy loads, such as the wind turbine nacelles, weighing up to 500 tonnes. An additional feature is that the quay is equipped with **sensors** to analyse its behaviour over time and monitor its resistance to various constraints (tides, passage of heavy loads, etc.).

Energy storage

Whether constructing oversized concrete barges or gigantic tank complexes, Bouygues Travaux Publics takes on the most complex **technical challenges** to make energy production and storage possible. The N'Kossa barge, launched in 1995, made a lasting impression thanks to the **design and construction feats** required to create the largest floating hydrocarbon production unit in the world at that time. More recently, the gas tanks at the Dunkirk LNG terminal have given rise to one of the largest industrial projects in France. Among the special features of the construction of these infrastructures is the need for **safety**, which is similar to that of nuclear facilities, and also the need to **protect the environment**, which requires exemplary practices right from the design phase.
As a pioneering, rigorous and innovative company, Bouygues Travaux Publics is able to meet the many challenges involved.

↓ Dunkirk LNG terminal [France]

FRANCE 2015

Dunkirk LNG terminal

Design-build of three liquefied natural gas tanks

The LNG terminal now on the Dunkirk coastline comprises three tanks measuring 90 metres in diameter and 50 metres high. The construction of these three giants was one of the largest projects in Europe, making this site a truly international and strategic gas hub. Designed and built by Bouygues Travaux Publics and Entrepose Projets, the tanks store liquefied natural gas brought in from LNG methane carrier ships at very low temperatures (- 160°C), regasify it and then inject it into the French and Belgian networks. The walls of these tanks are made of **pre-stressed concrete**, 80 centimetres thick and produced on site. The interior of the tanks under construction is lined with a **skin of cryogenic steel plates** and they are topped by gigantic 700-tonne domes that were put in place by increasing the air pressure inside the tanks. Particular attention was paid to the preservation of the coastal environment, especially during nesting periods.

DIAMETER
90 M

HEIGHT
50 M

WEIGHT
OF A DOME
700 T

FRANCE **1995**

N'Kossa Barge

Design, construction and delivery of a pre-stressed concrete barge for a hydrocarbon production unit

When it left the port of Marseille, where it was built, in the spring of 1995, the N'Kossa barge was the largest pre-stressed concrete barge in the world. A technical feat that required a year and a half of engineering studies and eight months of construction works. Custom-designed to accommodate the world's largest floating hydrocarbon production unit, it is anchored at a depth of 170 metres off the coast of the Republic of Congo. Its design called for innovative approaches and methods never used in this context before. Some were inspired by the containment systems used in nuclear power plants, others by shipbuilding, all to ensure the **safety** and **watertightness** of the structure, particularly with regard to collisions on the outer hull, as well as its durability in the marine environment for a theoretical period of 30 years.

LENGHT
220 M

WIDTH
46 M

Containment, treatment and storage of water and waste

Bouygues Travaux Publics is involved **throughout the life cycle of wastewater treatment infrastructures**. Whether this involves building the entire structure to house the treatment plant process (earthworks, services networks, technical premises, watertight basins, fittings), extending existing facilities in extremely constrained environments or digging a tunnel to drain rainwater, Bouygues Travaux Publics puts all its expertise to work for these structures, which are essential for the smooth operation of the water sector. The company is also involved in unprecedented projects that require an **even more stringent safety approach**, such as the containment of materials stored in potash mines in Alsace. It also applies its exacting standards and skills to the operation of nuclear sites, covering their entire lifespan, from design and construction to dismantling and management of production waste. Bouygues Travaux Publics has also risen to the challenge of such extraordinary events as the accident at the Chernobyl plant. The company took part in the construction of the New Confinement arch of the damaged reactor, a **colossal project** carried out to ensure the safety of the site over the next century and to enable it to be dismantled.

↓ Evry wastewater treatment plant [France]

UKRAINE **2019**

Chernobyl New Safe Confinement Arch

Design and construction
of a steel confinement structure

Twelve years, 10,000 workers and 33 million man-hours were needed to complete the construction of the confinement structure of Chernobyl reactor No. 4, 33 years after the disaster. It is **the largest mobile structure** ever built on land, with a span of 257 metres, a width of 162 metres, a height of 108 metres and a total weight of 36,000 tonnes. Designed and built by the Novarka consortium, which includes VINCI Construction Grands Projets and Bouygues Travaux Publics, it will ensure the safety of the site for a century and allow the dismantling of the damaged reactor and its initial sarcophagus. This **steel dome**, built 300 metres from the reactor and then **slid** up to it, contains an annular vacuum system between the layers of cladding that allows the air to dry out to prevent corrosion and contain any possible contamination. The enclosure withstands temperature swings from -40°C to +40°C, earthquakes, and tornadoes, to ensure the meticulous work of dismantling the sarcophagus carried out by advanced robots.

SPAN
257 M

HEIGHT
108 M

WEIGHT
36,000 T

FRANCE 2003

Andra Laboratory

Construction of an access shaft, an auxiliary shaft and a network of underground tunnels

SHAFTS
2

DEPTH
500 M

LENGTH OF THE UNDERGROUND PASSAGEWAYS
1 KM

At a depth of 500 metres beneath the town of Bure, in the Meuse department, ANDRA (the French national agency for radioactive waste management) has installed its underground laboratory to study the capacity of clay to retain radioactive elements from long-lived nuclear waste. The work carried out by Bouygues Travaux Publics consisted of the construction of an access shaft, a 508-metre-deep auxiliary shaft and a network of underground tunnels over a total length of more than one kilometre. The investigations carried out by ANDRA on the **argillite layer** of this experimental site have led to the conclusion that **geological storage** of nuclear waste is scientifically feasible, an important step for the design of Cigéo (the Industrial Centre of Geological Storage).

FRANCE 2026

MDPA - Permanent containment of the Stocamine underground storage site

Construction of 12 concrete barriers and grouting of the interior of the underground chamber

DEPTH
550 M

WEIGHT OF FINAL WASTE TO BE CONTAINED
42 000 T

CONCRETE AND GROUT
100,000 M^3

In Wittelsheim, on a site that is unique in the world, located at a depth of 550 metres, Bouygues Travaux Publics Régions France has been awarded the contract for the permanent containment of a storage site for 42,000 tonnes of **end waste** from the potash mines of Alsace, prior to its definitive closure in 2030. Two concrete plants have been installed on the site, as well as a special plant for drying aggregates for the mixing of concrete with **brine water**. The project includes the construction of **12 watertight barriers** made of brine concrete anchored in rock salt by drilling with a road header excavator as well as the filling of empty galleries and blocks in the containment with cement grout. Among the particularities of this unusual site, the mining work environment in a potentially explosive firedamp atmosphere means that the materials and equipment have to be fully compatible with the existing installations and to working in the mining zone.

HONG KONG **2011**

DSD - Hong Kong West Drainage Tunnel

Design-build of a rainwater collection tunnel

LENGTH
10.5 KM

DIAMETER
BETWEEN 6.25 AND 7.25 M

DROP SHAFTS
32

To solve the problem of seasonal flooding in western Hong Kong, Bouygues Travaux Publics, as part of a consortium, was awarded the design and build contract for a 10.5-kilometre-long rainwater collection tunnel between Tai Hang and Pokfulam. This structure drains water and channel it directly to the sea. Two hard rock tunnel boring machines (TBMs) were used, each with a different diameter on its respective section, to accommodate the complex geology of the terrain composed of both **granitic and volcanic rocks**. Thirty-two rainwater collection shafts were also built, using different construction methods due to environmental constraints. For some of them, located in a highly urbanised sector, the "**raise boring**" technique, a drilling method usually used in mines, was employed, making it possible to dig quickly to great depths in hard rock.

FRANCE **2009**

Evry wastewater treatment plant

Extension of a wastewater treatment plant

NEW OR RENOVATED BUILDINGS
4

INHABITANTS SERVED
250,000

In the town of Evry, located in the Essonne department, at the wastewater treatment plant built in 1974 and already restructured in the 1990s, four wooden-clad buildings have, since 2009, constituted the new facilities which have been installed to increase the handling capacity of the region's wastewater treatment plant, which serves the equivalent of 250,000 inhabitants. This work was carried out as part of a larger restructuring project carried out by Bouygues Travaux Publics on behalf of the agglomeration community. The work involved demolishing or covering existing structures, building watertight basins, constructing architectural and industrial buildings, and carrying out earthworks, embankments and underground piping, all within an operational environment. All of this has now made it possible to **connect** the city to the Seine, by providing an educational tour that spotlights the cycle of water and its many associated professions.

FRANCE 2007 AND 2013

Les Grésillons 1 and 2 wastewater treatment plants

Extension of a wastewater treatment plant

In Triel-sur-Seine, located in the Yvelines department, Bouygues Travaux Publics participated in the design and construction of a wastewater treatment plant in two phases, on behalf of the SIAAP, the interdepartmental parisian water treatment authority. The works enabled the delivery of a complex that meets **High Environmental Quality** standards to serve the treatment needs of urban wastewater produced by nearly 2 million inhabitants. The first phase involved civil engineering works to treat 100,000 m^3 of water daily: earthworks, foundations, backfill, buildings, roads and services networks. When it was handed over in 2007, Les Grésillons wastewater treatment plant had already replaced the Carrières-sous-Poissy plant, which had become obsolete, and relieved pressure on the Achères plant, thus modernising the treatment system of the Paris conurbation. The second phase, delivered in 2013, increased the treatment capacity to 300,000 m^3 per day and was carried out while the plant was in operation. In addition to **tripling** the capacity, this work made it possible to increase quality levels to meet European requirements, reduce the final quantity of sludge produced and improve the energy balance of the system through the production of biogas.

DURATION OF THE WORKS
7 YEARS

TREATMENT CAPACITY WITH PHASE 1
100,000 M^3 OF WATER/DAY

TREATMENT CAPACITY WITH PHASE 2
300,000 M^3 OF WATER/DAY

FRANCE 2004

Seine-Amont wastewater treatment plant in Valenton

Extension of a wastewater treatment plant

RECTANGULAR BASINS
2

CIRCULAR BASINS
10

DAILY TREATMENT CAPACITY (IN RAINY WEATHER)
1,500,000 M³

The Seine-Amont wastewater treatment plant in Valenton (Val-de-Marne) is a key component of the wastewater treatment system for the Paris conurbation, operated by the SIAAP, the interdepartmental parisian water treatment authority. Its extension has increased its treatment capacity from 300,000 to 600,000 m^3 per day in dry weather. Carried out by a consortium of which Bouygues Travaux Publics was a member, the civil engineering works for this operation involved, among other things, the construction of two 200-metre long and 80-metre-wide **rectangular basins**, 10 **circular basins** with a diameter of 60 metres, and eight **technical buildings** for water treatment. This meticulously coordinated project was carried out over 60 hectares by 750 site workers at the peak of operations. Since this work was completed, the plant has had the daily capacity to treat 1,500,000 m^3 of excess water in rainy weather, considerably improving the quality of the water discharged into the Seine.

FRANCE 2015

Reservoir R7 in Villejuif

Construction of a semi-subterranean drinking water reservoir

TANKS
2

TOTAL CAPACITY
50,000 M³

HEIGHT
12 M

Contracted by the SEDIF, the Ile-de-France water authority, Bouygues Travaux Publics completed the construction of a semi-subterranean drinking water reservoir, called R7, consisting of two **tanks** with a capacity of 25,000 m^3 each. The new reservoir, designed to replace three structures that were too old to be renovated, is located at the foot of the "flûtes", nine water towers in Villejuif. It was built to minimise its visual impact, with an above-ground section of no more than six metres high. The work also includes the construction of a 4,000 m^3 buffer basin and an underground rainwater basin. This new reservoir is entirely built of **concrete**.

Transport infrastructure

As a key player in transport infrastructure, Bouygues Travaux Publics is involved in a number of major projects around the world that will contribute to the development of communities while meeting the challenges posed by climate change. Railway, metro and tramway stations are lively places of connection serving **low-carbon transportation**. They are also anchors at the very heart of the city in terms of land-use planning and urban development.

Bouygues Travaux Publics is involved in these large-scale projects, from digging tunnels to building metro, tramway stations and railway stations, whether the structures are above or below ground.

Most of these complex projects are constructed in highly constrained urban environments, close to existing operational infrastructures. This is the case for the Porte Maillot station forming part of the EOLE project, the Fort d'Issy-Vanves-Clamart station and the T2A and T3A stations for the future Grand Paris Express network. Bouygues Travaux Publics is also involved in traditional methods of transportation for which **new uses** have been developed, as is the case for the urban cable car projects in Brest and Toulouse.

↓ TÉLÉO, Toulouse's southern urban cable car [France]

FRANCE 2024

EOLE - Porte Maillot Station

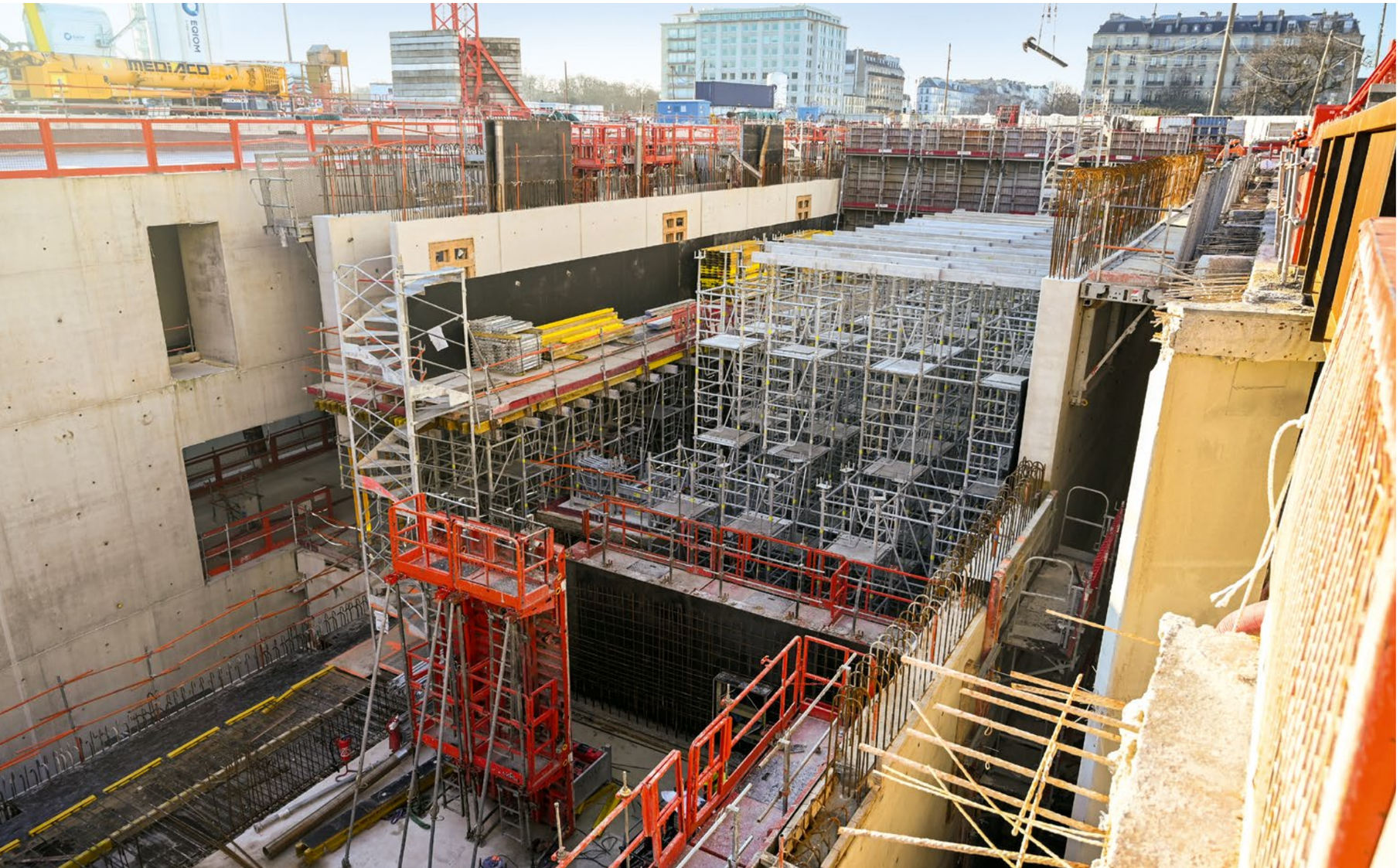
Execution of the civil engineering works for the new Porte Maillot station

When it comes into service, the western section of the RER E line will link Haussmann-Saint-Lazare station with Mantes-la-Jolie, thus relieving the pressure on RER lines A, B and D and doubling passenger transport capacity in western Paris. As leader of a consortium, Bouygues Travaux Publics is responsible for the GC-TUN batch of the EOLE project, for the construction of a 6.1-kilometre tunnel between Courbevoie and Saint-Lazare, as well as for the civil engineering works at the Porte Maillot station. This station represents a **real technical and organisational challenge** in terms of design, as it adjoins several infrastructures in an extremely dense urban environment. Built within an enclosure using the **diaphragm wall** technique, it consists of an open-air hall 155 metres long by 25 metres wide and 35 metres deep, and an underground section 70 metres long by 15 metres wide and 14 metres high. It also includes a hall linking the station to the RER C and the Palais des Congrès, as well as a connecting hall between metro line 1, the RER C and the T3 tramway. The station will be bathed in light all the way to the platforms thanks to its 110-metre-long surface glass roof.

LENGTH
225 M

DEPTH
35 M

CONCRETE USED
107,000 M³



FRANCE **2023**

Stations of the T2A and T3A batches, line 15 South of the Grand Paris Express

Execution of the civil engineering works for six underground stations

With the Grand Paris Express, the largest urban project underway in Europe, 68 stations and four new lines covering 200 kilometres will be built by 2030. To the south of the capital, Line 15 South which will link the Pont de Sèvres station to the Noisy-Champs station, crossing 22 municipalities and four departments, is divided into 8 batches, 3 of which have been handled by the consortium headed by Bouygues Travaux Publics. The company is responsible for the **T2A** section located between Villejuif-Louis Aragon and Créteil-L'Échat, and section **T3A**, located between Pont de Sèvres and Fort d'Issy-Vanves-Clamart. The T2A batch includes the construction of 6.6 kilometres of main tunnel and the civil engineering works for four underground stations, Créteil-L'Échat, Le Vert-de-Maisons, Les Ardoines and Vitry-Centre. Batch T3A includes a 4.2-kilometre section of tunnel and civil works for the Pont de Sèvres and Issy RER stations. As part of these two batches, exceptional operations were carried out at the Vert-de-Maisons and Issy RER stations: **ground freezing**. This cutting-edge technique consists of increasing the mechanical strength of the ground and its impermeability by freezing the water naturally present, in order to secure the excavations. As showcases for the new metro and the focal point of the new districts, these stations will be the visible part of a section that crosses **complex geological** formations in 2025.

UNDERGROUND STATIONS
6

DAILY PASSENGERS ON AVERAGE
95,000

FRANCE 2023

Fort d'Issy-Vanves-Clamart station, batch T3B, line 15 South of the Grand Paris Express

Execution of the civil works of the station

SLAB WEIGHT
7,000 T

SLAB LENGTH
80 M

UNDERGROUND LEVELS
4

The very first station of the Grand Paris Express and the third batch won by the consortium led by Bouygues Travaux Publics, the Fort d'Issy-Vanves-Clamart station launched the largest urban project in Europe currently under construction. The company was awarded the civil engineering contract for this complex structure, part of which was designed under the existing tracks of the Transilien line N. Its peripheral walls were built using the **diaphragm wall** technique and its upper reinforced concrete slab, weighing 7,000 tonnes (80 metres long and 25 metres wide), was pre-constructed and, over a three-hour period, **slid** into its final location. The underground part of the station, consisting of four levels, was then excavated underneath the ground and temporary **bracing girders** were placed as and when needed, in order to reinforce the walls of the structure, which were subject to great pressure from the surrounding terrain. Once these operations were completed, it was possible to build the internal structures from the bottom to the top, constituting each level of the station.

EGYPT 2022

Cairo Metro

Design and execution of civil engineering works for line 3, phase 3

LENGTH OF NEW LINE
17.7 KM

STATIONS
15

For over 40 years, as part of a Franco-Egyptian consortium, Bouygues Travaux Publics has been contributing to the development of North Africa's largest city through the design and construction of the Cairo metro. More than 80 kilometres of metro lines are already in service. Lines 1 and 2 linking the north and south of the capital have been completed, while line 3 is still partially under construction. The latter will eventually link the left bank of the Nile to Cairo airport, crossing the capital from east to west, and will complement the existing network. In 2015 and 2016, the National Authority for Tunnels renewed its confidence in the consortium for the construction of phase 4A, now completed, and phase 3 of this new line. Line 3 includes the civil works for 17.7 kilometres of new line as well as 15 new **stations**, including eight underground, five aerial and two ground stations. Built in several stages and **phases**, the Cairo metro brings together the contemporary challenges of TBM tunnelling: a dense urban area with overlapping services networks, varied terrain, and numerous passages under the Nile.

SOUTH AFRICA **2011**

Gautrain Rapid Rail System

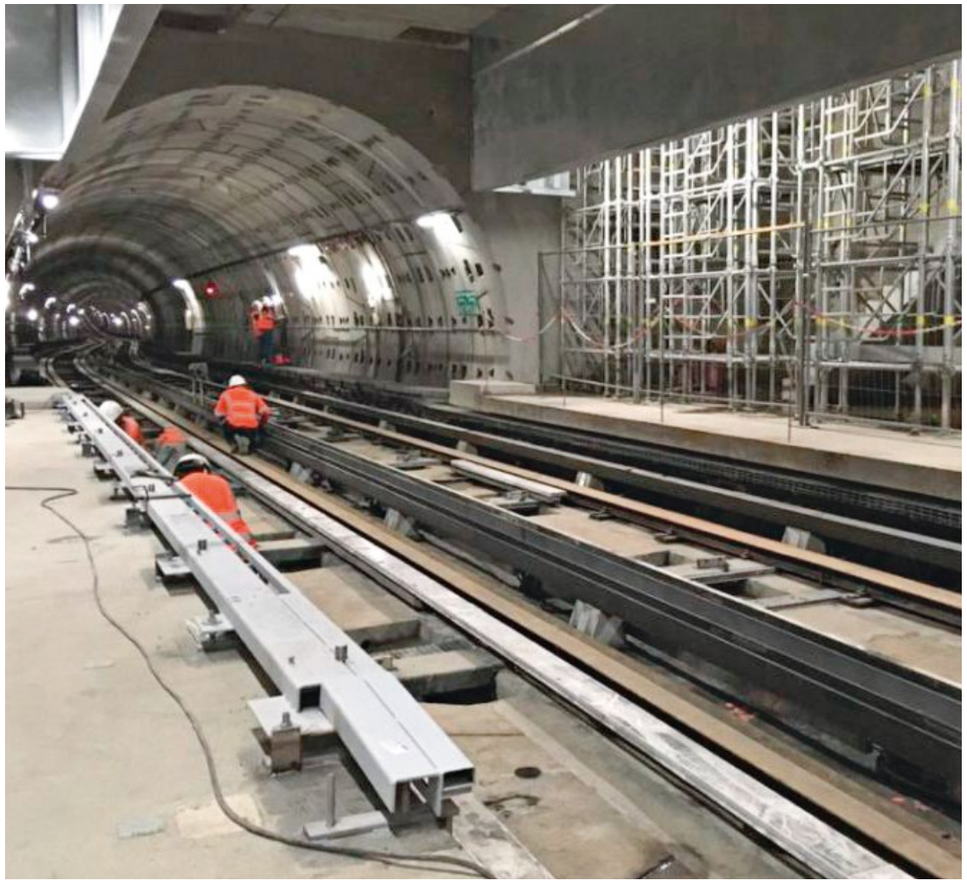
Financing-design-build-operate and maintenance of a high-speed rail line as part of a concession project

STATIONS
10

LENGTH OF TUNNELS
15 KM

LENGTH OF ENGINEERING STRUCTURES
10.5 KM

Delivered in time for the Football World Cup of 2010, the fast rail line linking Pretoria to Johannesburg was the culmination of the largest concession in which Bouygues Travaux Publics has ever taken part on the African continent. With 54 months of work, 15 kilometres of tunnels dug, 10 stations built and 10.5 kilometres of engineering structures, this colossal project was also the first **integrated rail project** carried out by Bouygues Travaux Publics. In addition to the technical challenges met, particularly in unusual terrain such as the complex geology of the dolomites, this project stood out because of its **environmental** commitment: conservation of displaced trees, limitation of noise pollution, recycling of water and mining waste. This comprehensive approach was honoured at the Green Supply Chain Awards in 2009.



FRANCE **1992 TO 2005**

Toulouse Metro stations, lines A and B, batch 4

Execution of the civil engineering for the underground stations

METRO LINES
2

STATIONS
11

The 28 kilometres and 37 stations of Toulouse's first two metro lines have accompanied the development of the city over the past 30 years. Bouygues Travaux Publics was involved in the construction of the first line, the 10-kilometre-long line A, with the construction of a 3.1-kilometre underground section comprising a two-track tunnel and the civil engineering for six **underground** stations, and then with the eastern extension of the line in 2000. For line B, Bouygues Travaux Publics was entrusted with the construction of batch 4 as part of a consortium, comprising a 3.8-kilometre two-track tunnel and five underground stations, delivered in 2005. Several construction techniques were used, depending on the work site. Where the site permitted, the entire diaphragm wall "box" was built and the earthworks carried out in the open air. In the more confined areas, the work was carried out in **half stations**, with traffic being switched over. The interconnection between the two lines and the upgrading of Jean Jaurès station, as well as the interior fit out of the stations, were carried out by Bouygues Travaux Publics Régions France.

FRANCE **2019**

Nice tramway stations

Execution of the civil engineering for the underground stations of the west-east tramway line

UNDERGROUND STATIONS
4

CONCRETE USED
100,000 M³

MAIN LEVELS
3

Since 2019, they have highlighted the 3 kilometres of a tunnel that has made it possible to lighten the load on the city of Nice: the four underground stations on the west-east line of the Nice tramway are the culmination of a challenge taken up by the Bouygues Travaux Publics teams. Built in an extremely **dense** urban environment with a complex geological subsoil, they required constant risk management to limit the settlement of the buildings to less than 10 millimetres. The stations are designed like underground car parks, with diaphragm walls and **"top-down"** earthworks under a covering slab. **445,000 tonnes** of spoil were excavated by the slurry pressure balance tunnel boring machine to build the tunnel and **100,000 tonnes** for the stations. This was transported to a **treatment plant** in the port of Nice, the majority of it was then transferred by conveyor belt to barges for removal by sea. All of this was done in accordance with very strict environmental protection and nuisance limitation requirements.

FRANCE **2022**

TÉLÉO, Toulouse's southern urban cable car

Design, construction and maintenance of a cable car linking the Oncopole to Paul Sabatier University

CAPACITY
8,000 PASSENGERS/ DAY

STATIONS
3

HEIGHT OF THE PYLONS
70 M

Inaugurated in May 2022, Téléo is, at 3 kilometres in length, the **longest urban cable car** ever built in France. Capable of operating in winds of up to 108 km/h, it links the Oncopole to Paul Sabatier University via Rangueil Hospital in just 10 minutes. Bouygues Travaux Publics Régions France, as part of a consortium led by Poma, completed the infrastructure works, including all the civil engineering and equipment for the three stations and the garage workshop, and is responsible for its maintenance. Between the three stations on the route, only five pylons support cables using **3S disengageable technology** (two carrying cables, one tractor), ensuring the safety of passengers suspended 70 metres above the ground. This technology was chosen because of its stability, its simplicity and its suitability for the topography of the site: a complex environment requiring the crossing of the Garonne River and a difference in level of over 100 metres. With its small ground footprint and direct route, this cable car will relieve the road traffic around this business center and facilitate connections with the public transportation network.

AUSTRALIA **2012**

Glenfield Junction

Reconstruction of a station

CAPACITY
12,000 PASSENGERS/ DAY

CONCRETE USED
9,000 M³

Glenfield station in Sydney's south-west is a key hub where train and bus networks serving the New South Wales metropolitan area intersect. Originally built in 1869, it underwent a major **renovation** project led by the Glenfield Junction Alliance (GJA), in which Bouygues Travaux Publics took part, between 2008 and 2012. The new station includes an upgraded rail/bus interchange, separated level crossings, improved platforms and platform canopies, multi-story car parking, bus and taxi ranks, a covered walkway and an expanded rail corridor to serve the 12,000 passengers who use the station each day. GJA had to carry out its operations in record time and in a very restricted environment, with very cramped site geography sandwiched between operating freight and passenger lines, a gas pipeline, a dump, a flood plain, and protected forest areas.

AUSTRALIA **2023**

Melbourne metro stations

Design and execution of the civil engineering works for 5 metro stations

STATIONS
5

CAPACITY
800,000 PASSENGERS/ DAY

EXCAVATED MATERIAL
OVER HALF A MILLION M³

Bouygues Construction Australia is a partner in the Cross Yarra Partnership consortium, which has been selected to design and build the Melbourne Metro project. The contract covers the financing, design, construction and operation of the future metro, which will consist of a nine-kilometre-long twin-tube tunnel and five new stations (Arden, Parkville, State Library, Town Hall and Anzac), as well as the development of parks, footbridges, pedestrian areas and shops in the public spaces surrounding these stations. Two of the five stations are referred to as "**trinocular**" and are excavated by road-header machines. The "trinocular" method consists of segmenting the construction of the station into three phases: excavation of the central tunnel to house the passenger access platforms, and the lining, then, once this is in place, excavation of the two external lateral tunnels, which will house the tracks. The construction of the metro will **relieve congestion** on the existing network and transport more than 800,000 passengers daily.

Airports

Bouygues Travaux Publics has been involved in the aviation sector for many years, having worked alongside Airbus to build the A320 factories in the 1980s, and in the **construction, maintenance and modernisation** of airport infrastructures throughout France. The civil engineering work required is substantial in order to support the weight or allow the construction of gigantic aircraft like the A380. The expertise acquired on these projects has made Bouygues Travaux Publics a **trusted partner** recognised for its excellence by the sector.

This recognition has also enabled Bouygues Travaux Publics to be entrusted by the Ministry of Defence with several projects to modernise military air bases.

↓ Orléans-Bricy Air Base [France]

FRANCE 2023

Avord Air Base

Renovation of the aeronautical areas of an air base

LENGTH OF RENOVATED RUNWAY
4 KM

WIDENING OF THE RUNWAY
7.50 M

East of Bourges, in the Cher department, Avord Air Base 702 is one of the most strategic air bases in France, used for territorial defense and surveillance, as well as for training Air Force pilots. The first aircraft took off from Avord in 1912, and the last renovation project, in 1964, enabled the base to operate for the past 50 years at the core of numerous important missions. But with time having taken its toll, Bouygues Travaux Publics was commissioned to renovate the **aeronautical areas**: the four kilometres of runway (thanks to its proficiency in the concrete flatwork technique), the taxiways and the beacon lighting. The creation of a large dedicated **parking apron** will, from 2023 onwards, enable the base to accommodate four A330-MRTT Phénix, large multi-purpose aircraft that will revolutionise the Air Force's refuelling and transport capabilities.

FRANCE 1999

Paris-Charles de Gaulle airport, runway 4

Construction of a runway

LENGTH
2,700 M

WIDTH
60 M

CONCRETE LAYERS
2

Bouygues Travaux Publics built runway 4, in the south of the complex, for France's largest airport and one of the ten largest in the world in terms of traffic. Operating **in conjunction** with runway 2, it is 2,700 metres long and 60 metres wide, and was completed in a few months. This allows one runway to be dedicated to take-offs and the other to landings, thus improving air traffic management. The runway structure consists of a 10-centimetre-thick porous concrete layer below and a 39-centimetre-thick concrete pavement layer above, which has been precisely designed and admixed to provide better resistance to freeze-thaw. Two types of machines were used to make these **layers of concrete**: a works team consisting of two conventional road paver finishers, followed by a compactor, laid the porous concrete, while a slipform paver produced the dowelled slabs of the surface concrete.

FRANCE **1990-2004**

A320 and A380 assembly factories

Construction of buildings for the assembly of the A320 and A380 aircraft

FACTORIES
2

A380 FACTORY HEIGHT
46 M

Bouygues Travaux Publics has been working with the aircraft manufacturer Airbus for decades. As early as the 1990s, Bouygues Travaux Publics was involved in the construction of the first assembly factories for the A320, the world's best-selling airliner, with 15,000 units sold. Then came the A380, the world's best-selling commercial aircraft. In 2002, Bouygues Travaux Publics Régions France, as part of a consortium, built the **paving** and **slabs** of the Toulouse plant dedicated to the super-jumbo jet: a building of gigantic proportions called the Arch, topped by a monumental roof resting on 46-metre-high beams. This imposing **steel framework**, made up of more than 8,000 tonnes of steel tubes and 60,500 m^2 of roofing, took a whole day to be hoisted up in its entirety, in one go, by VSL France (a division of Bouygues Travaux Publics Régions France), to the top of the building's skeleton.

FRANCE **2014**

Orléans-Bricy Air Base

Extension of aeronautical paved surfaces

EARTHWORKS
200,000 M^3

To the north-west of Orléans, the French Ministry of the Armed Forces awarded Bouygues Travaux Publics a contract **to extend** its aeronautical paved surfaces, parking aprons and taxiways, including drainage, lighting beacons and fuel supply pipes under the parking aprons. The parking aprons were constructed using a **slipform paver** for the concrete. As a result of this work, the air base is now home to most of the Air Force's Airbus A400M and military transport aircraft, as well as a training centre for European pilots.

Shared innovation.

Innovation is at the heart of our culture and our efficiency. Far from just being a trend, we are convinced that creativity in the commercial phase or serving the work sites, is a competitive and technical factor that makes us stand out.

By building a pool of ideas and encouraging continuous improvement, innovation strengthens the reliability of our solutions, the quality of our structures and the safety of all those involved on the construction sites.

As players in the digital transformation, more than 600 engineers and technicians specialising in concept studies, detail design and methods as well as in R&D and creativity, are looking towards a more open and mobile world.

Dominique is the first launching girder equipped with a datalogger that allows live and remote monitoring of production. A Big Data algorithm is used to reconstruct segment laying cycles, and will be deployed on VSL launching girders in Australia and Singapore.

Innovate, What for?

To adapt to the functional requirements of the structures

To reduce the environmental footprint of our activities

To respond to complex technical constraints

To be different and more competitive

GEOMATIC MONITORING OF BUILDINGS +

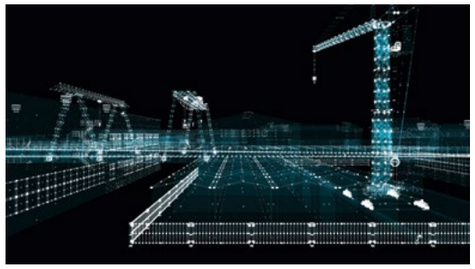
SCHEDULE +

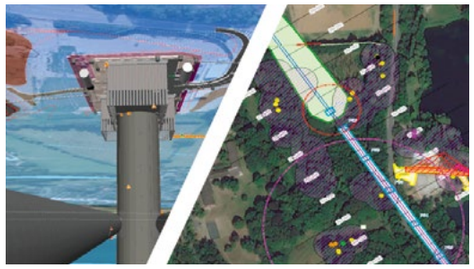
Monitoring and instrumentation solution

Uby (a company owned by Bouygues Travaux Publics and Colas) offers a digital solution based on sensors and signal processing algorithms that measure **the impact of the construction site on its direct environment**, in particular the management of settlement and displacement. The solution is also deployed for the monitoring of engineering structures to better understand **the evolution of their structural state** over time. The solution is a tool for managing investments by project owners. It has been deployed on the Grand Paris Express construction sites, the Fécamp offshore wind farm, and for the supervision of the Paris Airports construction site.

R&D serving the nuclear industry

The SCHEDULE R&D project, consisting of the construction of **a full-scale replica of a nuclear building** with steel modules (with the dual function of permanent formwork and reinforcement, filled with concrete on site), **minimises activities on the site and reduces construction time**. It has allowed this new technology to be validated and feedback to be obtained. SCHEDULE was funded by a grant from the European Commission's Coal and Steel Research Fund (grant agreement number 800732).





CONNECTED CONSTRUCTION SITES +

BIM +

FLOATING WIND SOLUTIONS +

Big Data serving construction sites

Digitalisation and data collection, true drivers of performance. Thanks to LabTP, connected cranes are at work on the Hinkley Point C EPR project in the United Kingdom and the Fécamp offshore wind farm, enabling optimal use and anticipation of their saturation point. With Omniscient, data is also being collected on construction equipment **to optimise its operational efficiency**.

Information modeling

BIM (Building Information Modeling) is a method of managing construction projects based on a **collaborative approach** that relies on a **digital model**, capable of covering the entire life cycle of the project. Used on construction sites such as HS2, Trunk Road T2, Central Kowloon Route and Hinkley Point C, BIM makes it possible to build complex structures and facilitates the work of operators on site, by guaranteeing **the reliability of information** (single source) for decision-making.

Floating wind turbines

A semi-submersible concrete float, based on an exclusively acquired technology, with many advantages: hydrodynamic and structural behavior ensuring optimal turbine performance, reduced carbon footprint, durability, compatibility with O&M (operation and maintenance) requirements, scalability and high deployment capacity in many environments.

COMMITMENT

We love life.

Protecting the health and safety of our staff, as well as that of all those working on our sites, is our primary responsibility.

On all its construction sites, Bouygues Travaux Publics deploys the best standards in the world while also addressing the specific risks associated with civil engineering activities: lifting operations, site machine-pedestrian interaction, manual and/or repetitive handling, chemical risks and exposure to hazardous products, falls from height and falling objects, etc.

Safety is everyone's business: with the deployment of the Safety Culture, every member of staff is involved in safety (see pages 74-75).

Objective:
0 serious or fatal accidents

- Deploy a strong Safety Culture through leadership at all levels of the company
- Ensure the control of our major risks that could lead to a serious or fatal accident
- Ensure the implementation of our standards and fundamentals in all our activities and with all our stakeholders

36 %

of the hours provided as part of the company training programme are dedicated to health and safety.

HEALTH & SAFETY FUNDAMENTALS +

A strong commitment

Protective equipment, traffic flow, risk analysis, ergonomics... Twelve standards are applied on all Bouygues Construction sites to ensure the safety of all. At Bouygues Travaux Publics, **specific operating procedures** for elevation work (formwork, pre-casts, walls, columns, etc.), support footings, stringer beams, cross-beams and underground pedestrian passageways (PASO) work complete this shared set of standards.

SAFETY CULTURE +

A vision shared by all

Launched in 2019, our Safety Culture initiative is now in its concrete implementation phase on our projects. This initiative gives our staff a central role in the tools and procedures that have been developed. By working on the theme of leadership, managing the unexpected and taking into account our major risks, we have established a coherent strategy that enables everyone to be a key participant on a daily basis. Just one goal: **0 serious or fatal accidents!**

MAJOR RISK MANAGEMENT +

Lifting operations: the n° 1 major risk

Lifting is a key operation in civil engineering, requiring specialist skills, dedicated preparation and a high level of operational expertise. Bouygues Travaux Publics has deployed a set of **lifting standards** on all its operations in order to achieve the objective of zero serious or fatal accidents. In general, standards are deployed to **ensure the safety** of staff and to reinforce vigilance in the face of our major risks: lifting operations, falls from heights, site machine-pedestrian interaction, etc.

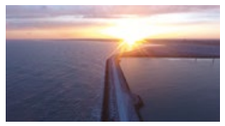
ERGONOMICS INITIATIVE +

Optimising workstations

The ergonomics initiative helps **to protect the health** of staff by guaranteeing compliance with ergonomic principles and the optimisation of workstations. Modernising and industrialising our work processes, beginning with the design phase to limit or even eliminate risks, training and raising awareness, analysing and innovating are all measures implemented within Bouygues Travaux Publics to reduce the strains of working life and change the day-to-day lives of our site workers.

A subsidiary of Bouygues Construction specialised in civil engineering and related works, Bouygues Travaux Publics is **a global leader in the construction of sustainable public infrastructure enhancing regional development.**

TUNNELS
& UNDERGROUND
STRUCTURES



RIVER
& MARITIME WORKS

BRIDGES, VIADUCTS
& FOOTBRIDGES

CIVIL
& INDUSTRIAL
ENGINEERING

LINEAR
PROJECTS

REFURBISHMENT
& REINFORCEMENT

EARTHWORKS

OPEN
CAST MINING

At the heart of the structures was designed and written by the Bouygues Travaux Publics Communications Department.

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