



GRAVELINES

(FRANCE)

Construction plan for a pair of EPR2 reactors

Public debate under the aegis of the
National Commission for Public Debate (CNDP)
from 17 September 2024 to 17 January 2025

SUMMARY OF THE PROJECT OWNERS' FILE



EPR2
Gravelines

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Introduction

EDF is submitting to public debate a plan to construct a pair of EPR2 reactors on the site in Gravelines (Hauts-de-France). This project is the second in a new nuclear reactor programme, the principles and the first project in Penly in Normandy were subject to a public debate in 2022-2023.

The focus of the project is an EPR2 reactor, an optimised and industrialised version of the EPR reactor, intended to be deployed in a series as part of a plan consisting of several pairs. From one site to the other, the basics remain the same, which explains the technical similarity of the Gravelines and Penly EPR2 projects. However, adaptations have been made to suit the specific environment of each site, for example, the reinforcement of the ground at the Gravelines site.

The Gravelines EPR2 project is being built close to a fully operational nuclear power plant in an industrial and port area of a region that has seen unprecedented momentum for many years in terms of the decarbonisation of its industry and the industrial redevelopment of the country.

This is a summary of the project owners' file. The aim of this document is to share with the public all the information about the two EPR2 reactor construction plan on the site in Gravelines and the connection to the power supply.

Thus, this summary does not include all the sources on which the file is based. To consult this file and all its accompanying resources, the reader is invited to go to the platform for public debate:



Project owners

EDF is the project owner of a construction plan for a pair of EPR2 reactors in Gravelines and of the new nuclear reactor programme. EDF is the global leader in the production of low carbon electricity with a diversified mix of nuclear energy and renewable energies (hydropower, wind power and solar energy). In line with its raison d'être -building a Net Zero future with electricity and innovative solutions and services, to help save the planet and drive wellbeing and economic development- EDF is part of the goal set by the French Government of becoming carbon neutral by 2050. EDF currently operates 57 nuclear reactors.



RTE is France's electricity transmission system operator and it provides a public service: to supply electricity around the clock, providing the same quality of service across the country with the support of its 9,500 employees. RTE manages power flows in real time while constantly balancing supply and demand. RTE maintains and expands the capacity of the high and ultra-high voltage grid. RTE must guarantee a fair connection and access conditions to the public electricity transmission network for all electricity producers. It is on this basis that it will supply the power connection to the EPR2 reactors planned for Gravelines.



What is the aim of the public debate?

EDF and RTE referred to the National Commission for Public Debate in accordance with Articles L. 121-8 I and R. 121-2 of the French Environmental Code on 23 November 2023, concerning the plans to construct a pair of EPR2 reactors on the site in Gravelines. **On 10 January 2024, the CNDP decided to arrange a public debate¹, under the aegis of a Specific Commission for Public Debate (CPDP).**

Having considered the challenges the project presents for the territory, **EDF expects that the public debate is, above all, a chance to deal with the following subjects in depth:**

- > **The opportunities the project** presents as a part of the area's industrial transformation and its alternatives;
- > **Adapting the project to suit the Gravelines region** while maintaining maximum standardisation and replication in order to take full advantage of the programme's series effect;
- > **The effects of the project on the region**, particularly the environment;
- > **Training and employment** for the ten years of works, the minimum 60 years of operation and the knock-on effects of the construction on land development particularly housing, mobility, services, etc;
- > **Ongoing public participation** following the debate if the project goes ahead.

For RTE, the public debate will provide the opportunity to debate and inform the public of the connection specifications planned for the public electricity transmission network.

The public debate will be followed by a report drawn up by the CPDP and a review issued by the chairman of the CNDP. Projects owners (EDF and RTE) will draw lessons from the debate and will make a decision on the next steps to take and will respond to the CPDP's recommendations. Lastly, the CNDP will evaluate the completeness of the answers given by the project owners and give their opinion in response.

In addition to the project owners' decision, the share of the different electricity production modes is also indicated in the national framework documents, the Multi-Year Energy Programme (PPE) and the National Low Carbon Strategy (SNBC). These documents are regularly reviewed and are subject to public consultation.

1 - CNDP decision to arrange a public debate on the Gravelines EPR2 project:



> LOOKING BACK: PUBLIC DEBATE 2022-2023

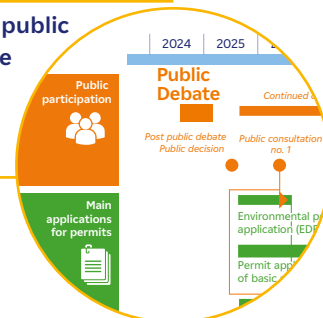
From 27 October 2022 to 27 February 2023, a public debate was organised about the new nuclear reactor programme put forward by EDF, and about the first pair of EPR2 reactors on the Penly site (Normandy). A wide range of subjects were on the table: the opportunities provided by the new reactors, the foundations of the programme including feedback on the EPR in Flamanville, the cost and funding challenges and the potential effects of the first pair of EPR2 reactors in Penly.

To find all the information about this debate, particularly the CPDP's report and EDF's post-public debate decision, see:



Place of the public debate in the provisional project timeline

See details of the timeline on page 13



What are the principles of the new nuclear reactor programme?

The plan to build a pair of EPR2 reactors in Gravelines (Hauts-de-France) is part of the second project in the new nuclear reactor industrial scheme led by EDF.

The first project is located in Penly (Normandy) and the third project planned is in close proximity to the Bugey site (Auvergne-Rhône-Alpes).

This industrial programme uses **EPR2 technology, an optimisation of the EPR reactor** (EPR stands for European Pressurised Reactor). The EPR2 reactor retains the EPR's strengths, its safety first and foremost, and is simpler to build. It will also rely on the **standardisation and industrialisation** of the deployment of the EPR2 reactor in successive pairs if it is to see the benefits of the **series effect** that has made the construction of the existing stock so successful.

Series effect: the execution of several projects in succession to allow for a gradual reduction in costs and construction times.

Location of the sites for the three pairs of EPR2 reactors



Preparation for the new EPR2 reactor programme continues in anticipation of a **final investment decision**

Preparation for the new nuclear reactor programme encompasses all the works executed in the aim of reaching all the conditions necessary in terms of quality, timelines and cost before undertaking the EPR2 projects.

Since the 2022-2023 public debate, the funds allocated by the French Government, EDF and the nuclear industry in this preparatory phase are growing:

- > **Established in November 2022, the Interministerial Delegation for New Nuclear (DINN)** supervises the programme by regularly reviewing its progress and maturity while supporting different EPR2 projects across the territories;
- > **The “Université des métiers du nucléaire” proposed a “skills” action plan** for the nuclear industry in June 2023, in order to ensure a balance between the availability of skills and the sector’s needs;
- > **EDF’s nuclear activities have been enhanced** since 1 April 2024 so that the Group is ready to meet the industrial challenge posed by the new nuclear reactor programme;
- > **The design of the EPR2 is being gradually consolidated** by way of EDF’s studies and a regular review led by a multi-stakeholder committee;
- > **The costs of the EPR2 programme are gradually being updated and optimised**, this work will continue until the end of 2024.

The public participation stages in EPR2 projects, including the public debate on the Gravelines project, contribute to the considerations of EDF and the other stakeholders involved in the programme’s preparation.

> THE FINAL INVESTMENT DECISION IS STILL TO BE MADE

The EDF programme for new nuclear reactors is at the preparatory stage but has not been decided yet. In fact, the final investment decision is still to be taken. It depends on the outcome of several actions (including cost optimisation and updating - see initial cost estimation on page 10). It also depends on the programme’s financing arrangements which were set out and discussed during the 2022-2023 public debate.

EDF has promised to publish updated information on the cost and financing once it is available. These elements will be discussed within the guaranteed framework of the continued dialogue following the 2022-2023 public debate.

Developing new nuclear reactors to enhance low carbon electricity production: **an opportunity more relevant than ever**

In the context of climate change, carbon-free energy is necessary. By both reducing the country’s energy consumption (estimated to be between 40 and 50% in the National Low Carbon Strategy) and phasing out fossil energies, we can reach net zero. **Several actions must be taken simultaneously: sobriety, energy efficiency and massive electrification of uses** (substitution of CO₂ emitting-energies for electricity).

In this context, **EDF believes that new means of producing nuclear energy are more necessary than ever** if we want to meet the challenges of increased electricity consumption because:

- > **They produce low-carbon electricity**, along the same lines as renewable energies (less than 10 grams of CO₂ equivalent per kWh produced), and well below those of gas (around 400 g CO₂ eq/kWh) and coal (over 1,000 g CO₂ eq/kWh);
- > **They are dispatchable. They contribute to the stability of the electricity transmission network and are complementary to intermittent production methods such as solar and wind power;**
- > **They can be used to create a diversified energy mix** that is more resilient and less costly (RTE Energy Pathways to 2050, Volume 11) than energy mixes consisting exclusively of renewable energies;
- > **They contribute to France’s energy sovereignty plan** and the vitality of the national economy because the nuclear sector is the country’s third biggest industry in terms of job numbers.

Low-carbon energy will have to increase to support the development of electric mobility, industrial decarbonisation and the fitting of heat pumps, etc.



What is the regional context of the project?

The two planned EPR2 reactors will be located in the industrial and port area of the Grand Port Maritime of Dunkirk (GPMD) in the town of Gravelines (department of the Nord), halfway between Dunkirk and Calais in the region of the Hauts-de-France.

A highly dynamic region with a growing need for energy

Dunkirk is France's third largest port. Because of its ideal location and infrastructures, it is home to many energy intensive companies (production of steel and aluminium, petrochemicals, etc.), making it highly attractive.

For years now, the region has been experiencing an unprecedented dynamic, representative of France's net zero goals and industrial redevelopment aims. In a low carbon industrial area (ZIBaC), several large industrial projects are under development. They imply a considerable increase in energy needs into the bargain (concerning both existing industrial businesses that need to decarbonise their processes as well as new, recently established businesses).

Thus, according to RTE's estimations, **the energy needs in the Dunkirk area will triple and the increase in the power required is expected to reach 4,500 Mwe² by 2040.**

To support this transition, it seems appropriate :

- > To maintain the low carbon production means already existing like the six current reactors;
- > To develop new means like the two EPR2 reactors and the offshore wind farm off the coast of Dunkirk.

> A SITE IN CLOSE PROXIMITY TO THE GRAVELINES NUCLEAR POWER STATION (CNPE)

The site of the Gravelines EPR2 project is located in close proximity to the Gravelines nuclear power station.

Gravelines is France's leading nuclear power station in terms of power, with six 900 MWe reactors commissioned between 1980 and 1985. In 2023, it produced 28.8 TWh³ of zero-carbon energy, covering the equivalent of the needs of 60% of the Hauts-de-France's annual energy consumption. In total, almost 2,000 EDF employees and 1,800 employees of partner companies are present on site.

EDF is spearheading large-scale works on the Gravelines nuclear plant, including an industrial programme with 4 billion euros of investment earmarked for between 2014 and 2028. The investment is going towards the local roll out of the "Grand Carénage", a national operation to refurbish and modernise existing nuclear power stations. This industrial programme coincides with the fourth periodic review, undertaken every 10 years to evaluate the conditions for the operational continuance of nuclear facilities for the next ten years.

The six existing reactors in Gravelines will continue to operate for as long as possible, provided they meet the required safety needs, separately from the two EPR2 reactors in the pipeline.

2 - The watt (W) is the unit of basic power. An 'e' is added to distinguish electrical power from thermal power. A megawatt (MW) is one million watts.

3 - The watt hour (Wh) is a unit of energy measuring the electricity produced in one hour. One kWh would be enough to run one washing machine cycle. A terrawatt hour (TWh) is a unit of energy representing one billion watt hours.

A site brimming with numerous advantages when it comes to installing new nuclear reactors

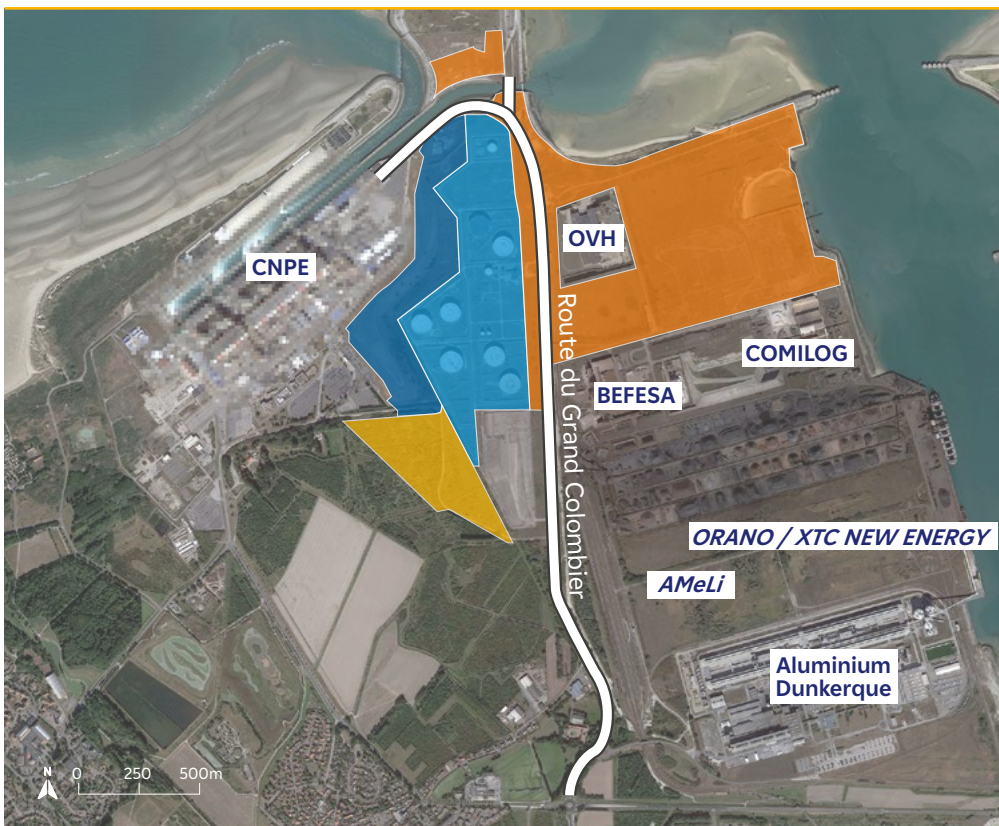
Gravelines is an appealing site for new reactors because there is:

- > Land availability in an area for industrial use;
- > The proximity to the sea for reactor cooling;
- > The public electricity transmission network, used to carry away the electricity produced by the reactors.

The project site is divided into two major parts, on either side of the Route du Grand Colombier. To the west (in blue and green), the EPR2 reactor site, between the Route du Grand Colombier and the Gravelines Nuclear Power Station. To the east (in orange), the temporary works area for all associated activities, particularly prefabrication activities. The last part (in yellow) is for extra easements reserved for works.

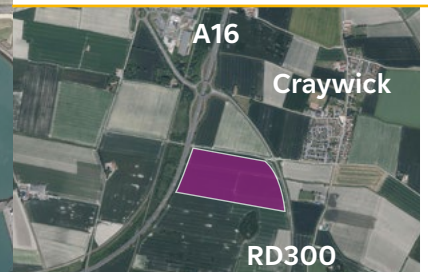


Installation site structure



Base map: BD ORTHO® IGN

Relay car park - Craywick



- EPR2 reactor installation site
- Temporary works area
- Relay car park

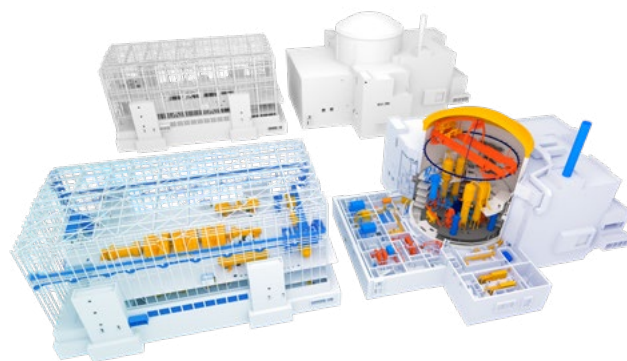
What does the Gravelines EPR2 project and its power supply connection involve?

A pair of EPR2 reactors...

Just like all operating reactors, including the Flamanville EPR, the EPR2 reactor is a pressurised water reactor. **Designed to run for at least 60 years, its main features are:**

- > **A third generation reactor** (in contrast to the operating reactors, which are second generation) with a high level of safety;
- > **A high capacity for low-carbon electricity production:** two times 1,670 MWe compared to the 900 MWe of each of the 6 existing reactors in Gravelines;
- > **A dispatchable reactor** designed to become part of the energy mix of tomorrow alongside renewable production methods;
- > **Taking climate change into account in the design phase** by way of margins (e.g., for a reactor by the sea, a much higher water temperature than the current averages);
- > **Integration of the fuel cycle** and radioactive waste management scheme into French politics.

In addition, the EPR2 reactor is designed to be commissioned as part of a programme with several pairs, to help with cost control and the construction schedule. In fact, from one site to the other, the EPR2 projects are founded on the same technical basis. The design of the Gravelines EPR2 project is thus similar to the Penly EPR2 project: the nuclear facilities, the engine rooms and the pumping stations are the same.



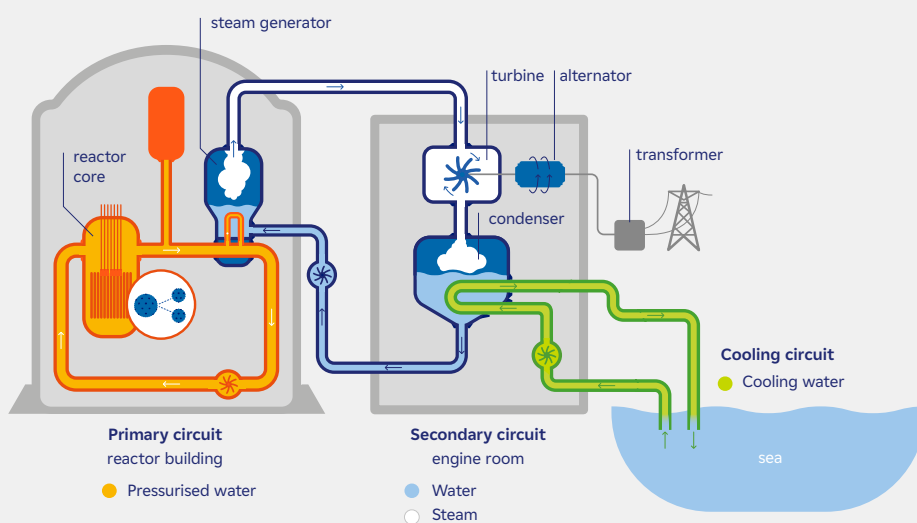
The EPR2 is designed to operate for at least 60 years.

> PRINCIPLE OF OPERATION: A PRESSURISED WATER REACTOR BY THE SEA

1) Heat is produced from uranium based nuclear fuel. In the primary circuit, pressurised water moves the heat to the steam generators.

2) The heat received transforms the water into steam. The movement of the steam along the secondary circuit triggers the rotation of the turbine, helping the alternator to produce power.

3) Cooling is carried out by seawater. It is recovered from the pumping stations, heated upon contact with the circuits and returned in its entirety to the sea.

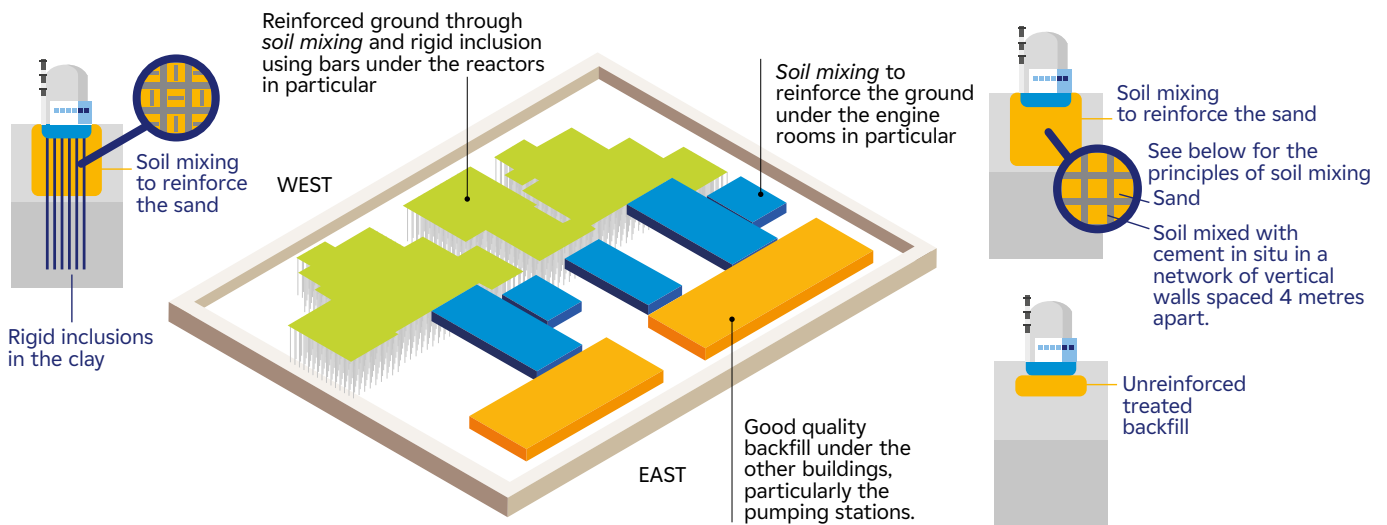


...Specific features

Within the framework of new nuclear reactors, EDF is seeking maximum replication: EPR2 projects are as similar as possible from one site to the next. However, adjustments to the design remain necessary given the different features of each site. There are a number of types of adaptations required for the Gravelines site.

Firstly, its soft ground must be reinforced to guarantee that the buildings constructed there will be stable. Initial studies identified a combination of technical solutions.

Summary of the ground reinforcement solutions chosen for the Gravelines EPR2 project



Then, several works will be devised for cooling the planned EPR2 reactors:

- > An inlet channel ① with its source in the Dunkirk Western Outer Port, bringing seawater to the EPR2 reactors' pumping stations;
- > Underground pipes ② sending heated water from the EPR2 reactors to the discharge point ③ in the existing discharge channel at the Gravelines Nuclear Power Station.

Finally, the Gravelines site is located in an industrial and port area, with activities that present industrial risks (explosions, fires, discharge of hazardous substances, etc.). So, the EPR2 project design integrates specific protection mechanisms, particularly against possible explosions on neighbouring sites.

Cooling system works



Power supply connection

In response to EDF's demand, RTE is planning a number of works to connect the EPR2 reactor power supply to the electricity transmission network:

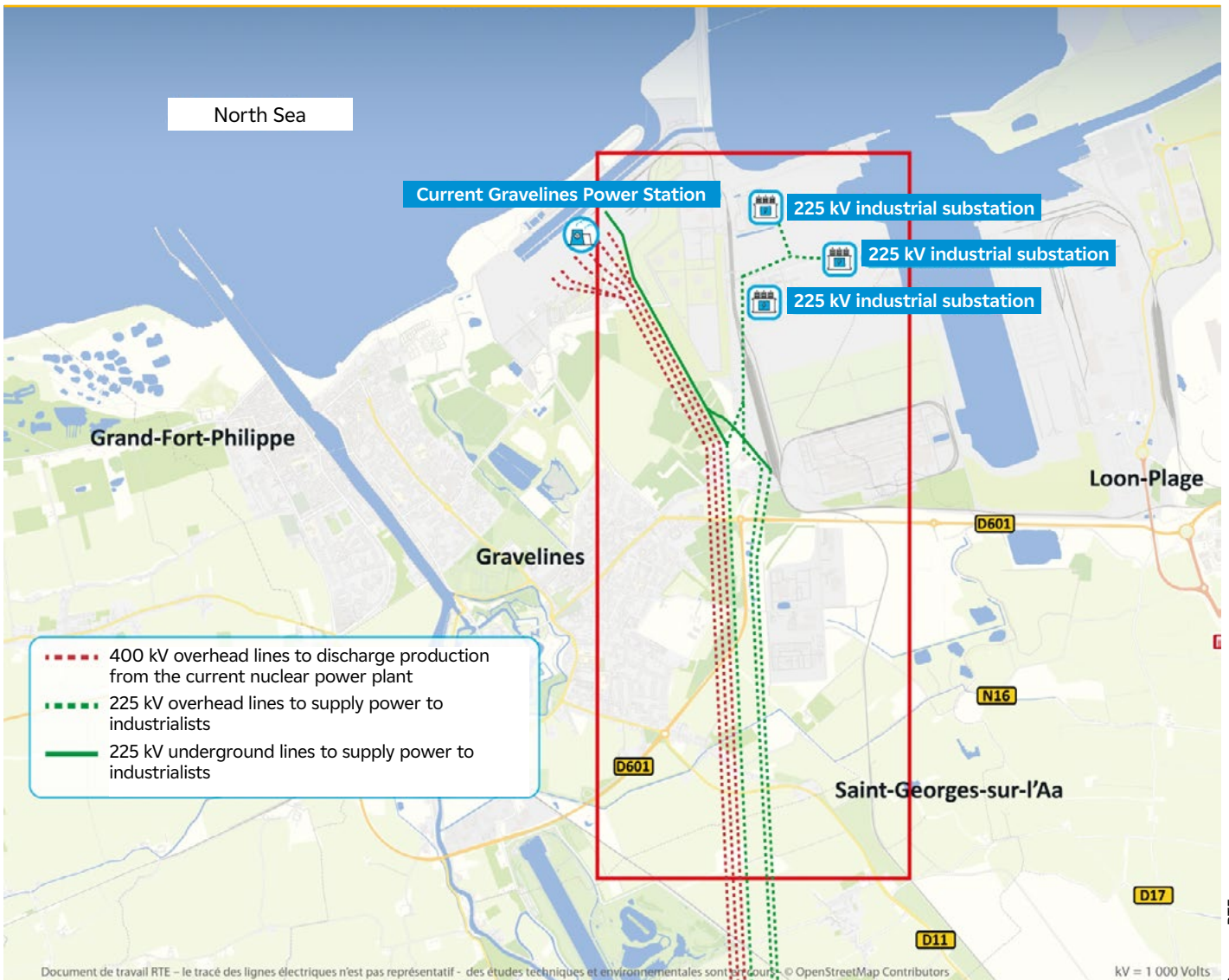
- > **Two 400,000 volt overhead power lines** to discharge the production of each of the two EPR2 reactors.
- > **Two 400,000 volt underground power lines to supply power to the auxiliary structures of the two EPR2 reactors.**
- > **Two 90,000 volt underground power lines to provide power to the site.**

The EPR2 project installations will then be connected to the **future RTE Flandre-Maritime substation** (undertaken separately from the EPR2 reactor power supply connection). This substation will be located in the town of Saint-Georges-sur-l'Aa, around 6.5 kilometres from the Gravelines site. The substations receive electric energy and then transform it from one voltage to another, before sending it across other lines to distributors and industrial customers.

During the public debate, a **study area** was identified to assess the challenges at hand and identify possible technical solutions. Following the debate, if the EDF project goes ahead, a study area will be defined to which power lines will be fitted.

The power lines will be constructed gradually as the different phases of the EPR2 project progress.

The EPR2 connection project study area and the existing works of the electricity transmission network



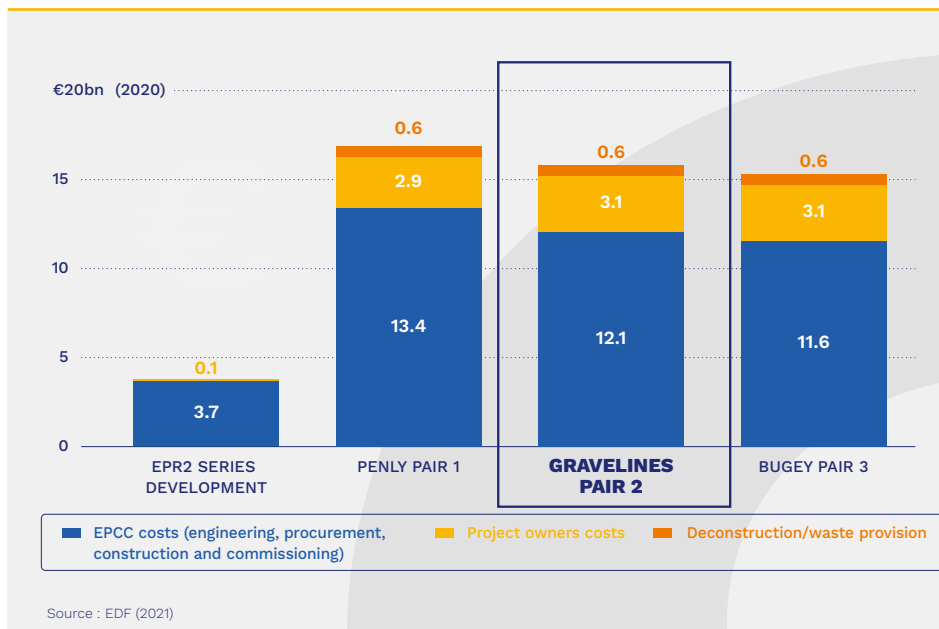
Initial assessment of the cost of the Gravelines EPR2 project

The cost of the six new nuclear reactor programme amounts to 51.7 billion euros (base October 2020). A new assessment is pending.

In fact, although the logic of an industrial programme does not lend itself to isolating costs by pair, particularly because the majority of contracts are for all six reactors, the second pair of EPR2 reactors in Gravelines is currently estimated at **15.8 billion euros (including the cost of the connection to the power supply)**.

Thanks to the series effects, the second pair is built quicker than the first one. The cost of the second pair is thus reduced. Furthermore, the cost of the construction project is higher given the more extensive preparatory work to be undertaken (particularly the ground reinforcement).

Distribution of the cost of a series of 3 pairs of standard EPR2s, excluding financing costs



The Gravelines Nuclear Power Station and the Grand Port Maritime of Dunkirk



What are the alternatives to the Gravelines EPR2 project?

Failure to execute this project will have local and national consequences

A failure to execute this EPR2 project in Gravelines will have consequences at many levels.

Nationally, failure to execute the EPR2 project in Gravelines would mean depriving ourselves of a massive capacity to produce very low-carbon, dispatchable electricity. It seems thus **vital to take all the measures available as quickly as possible, including sobriety as well as the increased production of low-carbon electricity**. Furthermore, withdrawing the Gravelines project would **call into question the industrial programme for three pairs of EPR2 reactors** as currently planned. Assuming that the programme could indeed be maintained without the Gravelines project, the series effect would be heavily compromised.

Locally, failure to execute the project would lead to a **loss of socio-economic benefits** (linked to job creation and the economic activity generated) over the short-, medium- and long-term. Furthermore, it would be possible to use the land currently reserved for the Gravelines EPR2 project to set up other businesses there.

Alternative energy production on the proposed site

RTE's "Energy Pathways to 2050" shows an interest in the complementary development of renewable energies and nuclear production methods. **The position of each of these modes must then be considered on the most appropriate site for the technology in question.**

Thus, installing another method of production (e.g., solar panels or wind turbines) on the site envisaged for the pair of EPR2 in Gravelines would not be optimal as it wouldn't be as suitable as the other sites given the technical specificities around these methods of production. In addition, the EPR2 reactor provides a much higher density of electricity generated per square kilometre than other low-carbon technologies.

When it comes to setting up new nuclear reactors, the Gravelines site has a whole host of benefits.

> TECHNOLOGICAL ALTERNATIVES PRESENTED AND DISCUSSED DURING THE 2022-2023 PUBLIC DEBATE

By exiting the programme drawn up by EDF, it would be possible -theoretically- to consider other nuclear technologies for the production of electricity on the Gravelines site: reactors using foreign technology, less powerful reactors than an EPR2, older generation reactors, etc.

These alternative technologies, their pros and cons were presented and discussed at the 2022-2023 public debate. It has been concluded that there was no credible European alternative to the EPR2 reactor, with the same level of safety and power for a third generation reactor.

What are the major phases of the project?

Following the public debate, if the project goes ahead, the applications for administrative permits will be finalised and filed with the appropriate authorities.

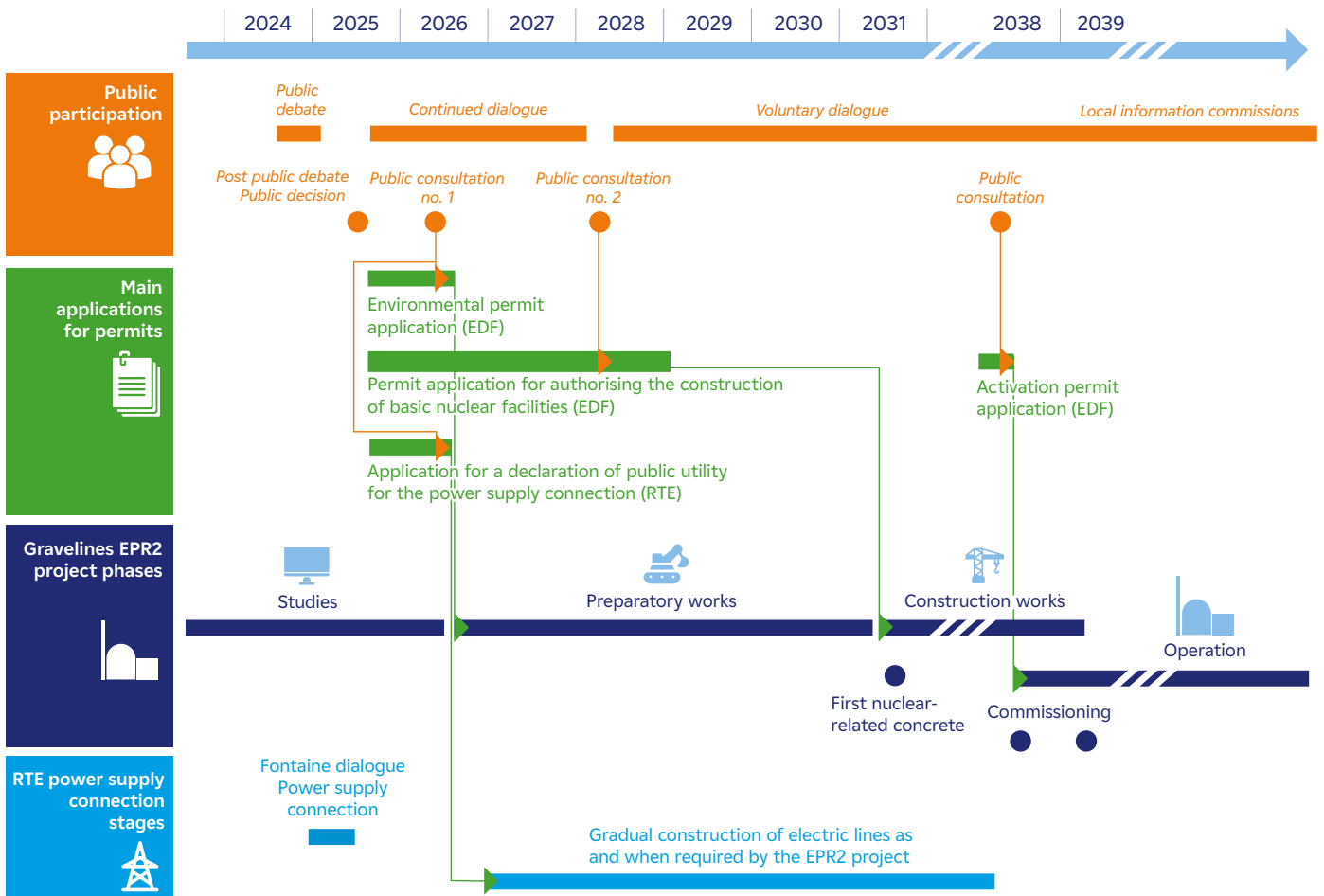
After investigations and public enquiries, these authorities make a decision on the permits requested by the project owners. At the same time, continued dialogue will be held under the aegis of guarantors appointed by the National Commission for Public Debate.

Once these permits are granted, the different phases of the Gravelines EPR2 project can be launched:

- > Second half of 2026: once the **environmental permit** is granted, the preparatory work can start. At the same time, once a declaration of public utility is granted the power connection works can begin;
- > Second half of 2028: once a **decree authorising the construction** of a nuclear facility is granted, building on the EPR2 reactors can start, with the “first nuclear-related concrete” being laid in 2031 to 2032;
- > 2037: Receiving an **activation permit** would be required to commission the reactors in 2038-2039.

Preparatory works correspond to all the operations that can be undertaken once the environmental permit is granted, without waiting for the decree authorising the construction of a nuclear facility which is, itself, required to begin construction on nuclear facilities.

The “first nuclear-related concrete” corresponds to the first concrete cast for the invert around the base of the reactor building.



Preparatory works

They include the arrangements and levelling of the project area, prior to the construction of the EPR2 reactors themselves. Subject to decision to go ahead with the project following the public debate, the preparatory works will start once the environmental permit is granted in 2026.

In addition to the preliminary arrangements needed to prepare the ground before construction, important works are required for the levelling and reinforcement of the sandy soil. This explains why these preparatory works in Gravelines are so lengthy compared to the Penly EPR2 project.

According to the first studies about the organisation of the preparatory work, material management could be fully guaranteed within the perimeter of the site.

Preparatory works on the Hinkley Point C site in 2015



© EDF



> KEY FIGURES FOR THE PAIR OF EPR2 REACTORS

In the region of:
1,000,000 m³ concrete

Almost
200,000 tonnes
of iron framework

At least **300 kilometres**
of pipes for nuclear and conventional
islands

Around **3,000 kilomètres**
of control/command and electrical wiring

Construction works

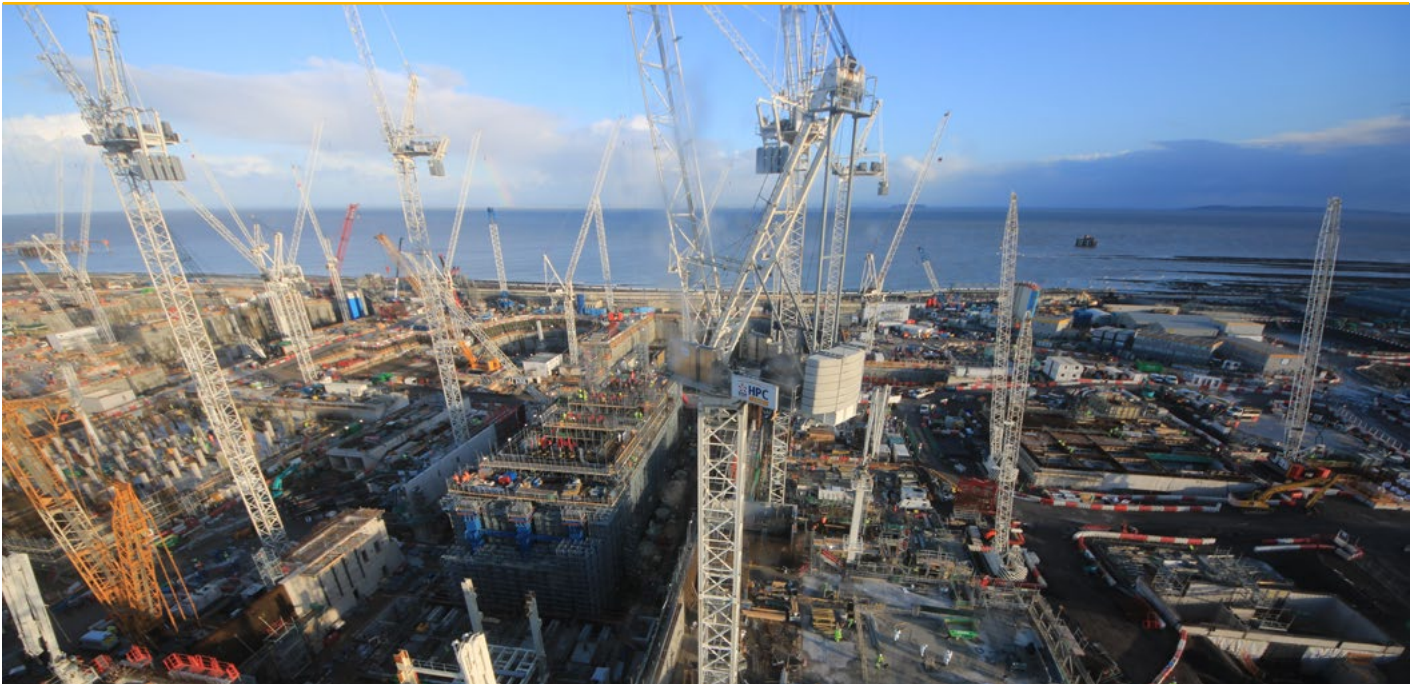
Subject to receiving the permit for the construction of a nuclear facility, construction works on the EPR2 reactors will start in the first half of 2031 with the first “nuclear-related concrete” being cast in the nuclear island.

The first half of the construction involves **civil engineering**: it includes fitting the iron framework and pouring the concrete. The use of prefabrication will be leveraged to facilitate the site work.

Electrical and mechanical installations are the second main construction activity. Firstly, the different components of the reactors (tanks, steam generators, etc.) and all the corresponding pipework need to be assembled before the electrical installation required for the reactor’s command and control system.

The simplified and optimised design of the EPR2 reactors will facilitate their construction. **Prefabrication** will be widely used: this solution involves making complete pieces of equipment or modules (sometimes large) in a factory. Then, once the site has been completed, they will be installed straight into the buildings.

General overview of the Hinkley Point C EPR reactor site in 2021



© EDF Hinkley Point C EPR

Mechanical installations on the Flamanville EPR site in 2014



Electrical installations on the Flamanville EPR site in 2014



© EDF Flamanville

Operation phase

The two EPR2 reactors in Gravelines, with a power of two times 1,670 MWe, will produce at least 20 TWh of low-carbon electricity each year, for at least 60 years. They will be operated according to EDF provisions for existing nuclear reactors, concerning safety, security and environmental impact and monitoring control.

As for the CNPE's reactors that are currently in operation, the EPR2 reactors will be subject to **continuous monitoring of discharges and environmental surveillance** by EDF, in accordance with regulatory requirements. These controls will be used to check that the limits set by the Nuclear Safety Authority are being adhered to. In addition, the operator will undertake environmental surveillance to ensure the discharges and intakes from its facility do not cause any health or environmental impacts over the long term.

Every 18 months on average, the reactors will be halted for maintenance and replacement of part of the fuel. In addition, every ten years, a **periodic review**, including an update to the environmental impact study, will be carried out. These periodic reviews are an opportunity to carry out the works required to integrate the acquired experience of safety as well as the progress made in risk awareness. At the end of these in-depth inspections, the Nuclear Safety Authority will approve the permit to continue operating the reactor.

Provisional overview of the finished project



Existing infrastructures and installations
Planned infrastructures and installations



EPR2 reactors

Inlet channel

Reactors in operation at the Gravelines CNPE

Discharge channel

Inlet channel

Discharge point

What effects will the project have on its host region?

The Gravelines EPR project integrates measures to minimise its environmental impact across all its phases, taking into account the foreseeable effects of climate change and maximising the socioeconomic benefits.

Specific challenges during the works

There are environmental challenges on the project area, although human activity has already significantly transformed it. It is already a focal point at present. For example, the plant has been developed to accommodate Europe's largest colony of Common terns. The EPR2 project can build on existing knowledge and **complementary studies will be conducted to precisely evaluate the risks in question**, both on land and sea, in order to take appropriate environmental measures.

Furthermore, numerous on-site activities during construction are likely to cause interferences. **EDF gains valuable feedback from its different sites.** Environmental measures and «good practices» are likely to limit the impact of works on the neighbouring area. The aim is to preserve the local way of life as much as possible.

Finally, the site's logistics pose a major challenge. The project location makes it possible to consider to deliver by rail and/or by sea the material and components necessary for the construction of the facilities. **EDF would like the public debate to be an opportunity to discuss this topic.**

Up and running: similar to nuclear power stations already operating in France

As a pressurised water reactor, the EPR2 causes environmental impacts similar to any other nuclear reactor already up and running in France. All the waste (radioactive and non-radioactive), and the associated methods of monitoring, are supervised by the Nuclear Safety Authority. In Gravelines and other EDF nuclear power stations, **this monitoring shows that nuclear power stations represent a very weak source of radioactive exposure compared to natural radioactivity** or ad hoc exposures, for example, when an individual undergoes an X-ray.

EPR2 reactors produce radioactive material and waste which, generally speaking, would be **similar to those produced by the current stock of reactors currently up and running. As a result, the material and waste would be sent** to the same facilities or the same types of facilities as those, existing or under development, required for the current stock.

Provisional overview of the site from the Route de l'Aquaculture to Gravelines



Specific regional features to be considered

A strong choice for protecting local water resources during the operating phase

Aside from the seawater used to cool the reactors, a much lower amount of freshwater is needed for the reactors to run. Thus, the EPR2 reactors will use up to 1.2 million m³ of freshwater every year. Freshwater is used, for example, to produce deionised water, in order to fill primary and secondary reactor circuits.

EDF plans to use industrial water (non-drinkable) from the Bourbourg canal as the supply source. To preserve this resource and not generate or aggravate conflicts of use, EDF has worked with local stakeholders to find alternatives. This has led them to identify a **direct synergy between the project and Gravelines used water treatment plant**: the treated used water (non-drinkable) from the plant will cover up to 54% of the EPR2 reactors' freshwater needs, which will decrease the need for industrial water by the same amount.

Flooding risk control taken into account for the design of the EPR2 reactor

A seaside site like Gravelines is exposed to a risk of flooding. Feedback following the Fukushima nuclear accident in Japan and the need to take climate change into account have led stronger protection of the Gravelines Nuclear Power Station between 2020 and 2022.

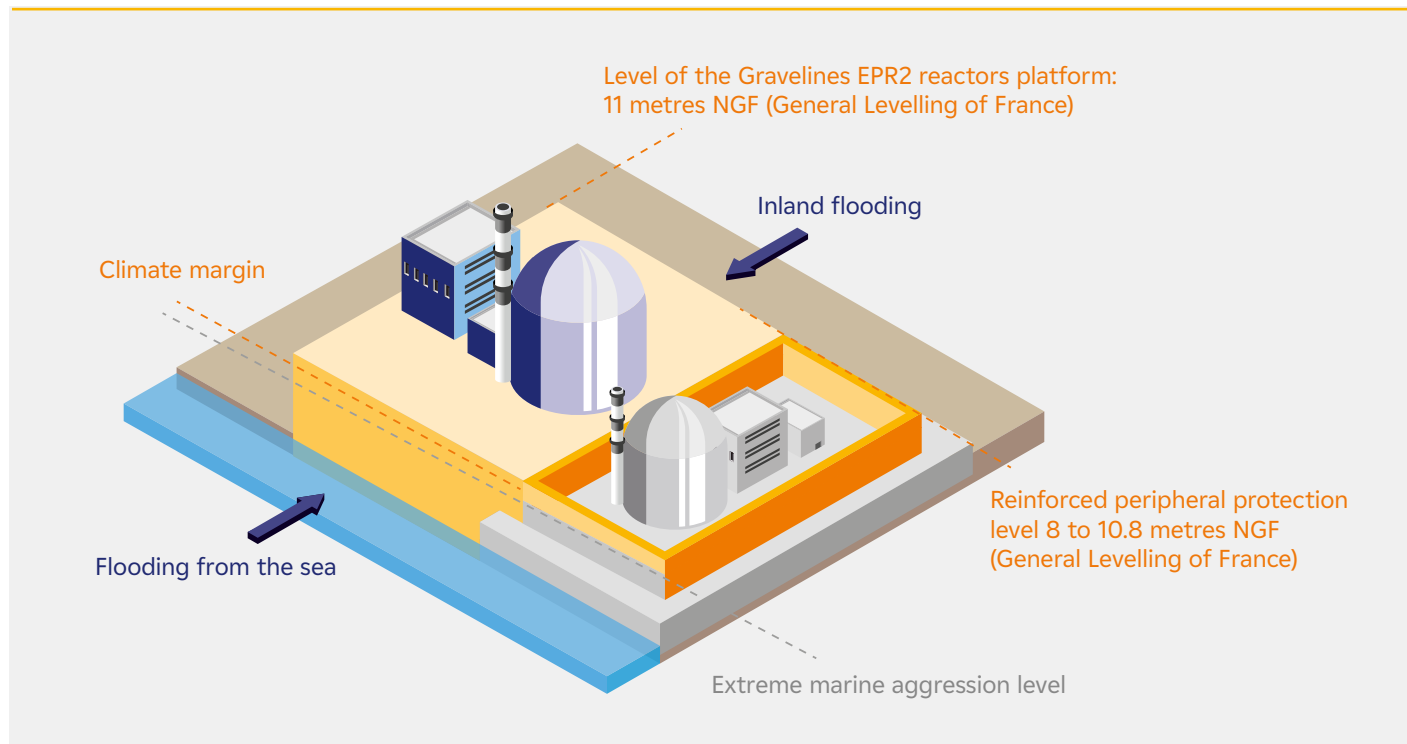
The design of the EPR2 reactor integrates extreme events as well as the foreseeable effects of climate change. For example changes in sea levels and temperatures.

The Gravelines EPR2 project involves the creation of a **platform located 11 metres NGF (General Levelling of France)**⁴. It is the main measure to protect the reactors from flooding.

Adapting the design to the project's industrial environment

The project is located in an industrial and port area with a significant number of facilities classified under the title "Environmental Protection Plants" - ICPE⁵, some of which are also classified as Seveso (lower and upper tier)⁶. The design of the EPR2 reactor has been adjusted to consider these different risks. For example, explosion cut-off valves are provided to protect ventilation ducts in the event of an explosion on a neighbouring industrial site.

Gravelines EPR2 project and the risk of flooding



4 - The General Levelling of France (NGF) is a network of level benchmarks in mainland France and Corsica, now overseen by the Institut Géographique National. In mainland France, 0m NGF level corresponds to the average sea level at Marseille.

5 - Installation Classified for the Protection of the Environment (ICPE) is administrative classification reserved for industrial operations likely to create risks or cause pollution or nuisance, particularly for the health and safety of local residents.

6 - Seveso is an administrative classification of an industrial facility based on the quantity of hazardous products stored there. There are two types of facility depending on the total quantity of hazardous material on site: Seveso upper-tier facilities and Seveso lower-tier facilities.

The many challenges of setting up the project in the region

Numerous jobs and skills mobilised

As the works progress, EDF expects a **gradual increase in the workforce over seven years, starting from 2026 and reaching a peak of at least 8,000 workers in 2033**. For the minimum 60 years of operation of the two EPR2 reactors, around 1,000 EDF employees on average will work there each year and there will be just as many jobs for industrial partners.

EDF, industry stakeholders and interested parties are already making arrangements in order to **find all the partners necessary, and safeguarding other economic activities**. The EPR2 project can tap into the Gravelines CNPE ecosystem, the Nucléi Hauts-de-France (the regional economic development programme for local businesses in the nuclear sector) and the Université des métiers du nucléaire, which is spearheading many local projects.

In addition to job creation and just like the Gravelines CNPE, the EPR2 reactors **will provide continuing support for economic activities** through a long-term industrial programme with indirect impacts. Furthermore, they will contribute significantly to the local tax system.

Anticipating the consequences of the project on the region's land planning: multiple challenges

The scale of work involved in the construction of a pair of nuclear reactors means that the region's land planning has to take into account temporary issues specific to the construction timeline and the permanent needs related to how the production facilities operate over several decades. In November 2023, the **regional stakeholders⁷ committed to a regional action plan**, piloted by the Pôle Métropolitain de la Côte d'Opale (PMCO), to arrange and support the Gravelines EPR2 project, particularly in the following areas:

- > **Training and employment** to find all the partners necessary with the right skills, at the right time, while mobilising the local economic fabric;
- > **Accommodation** to meet the needs of the parties in the different phases of the EPR2 project;
- > **Adaptation of public services;**
- > Development of **alternatives to the car** so the region does not become overcrowded.

If the Gravelines EPR2 project goes ahead, EDF will ask the public authorities to implement a **Major Project procedure**, just like the procedures put in place for the Flamanville EPR and the Penly EPR2 project. This procedure will help to meet the challenges set out above in line with the regional action plan.

The impact of the Gravelines EPR2 project is expected to affect an area encompassing several interconnected communities of the Nord and the Pas-de-Calais, from Calais to Hazebrouck, and from Saint-Omer to Dunkirk.

7 - The prefect of the Nord, the Hauts-de-France region, the Grand Littoral Greater Dunkirk Urban Council, the Pôle Métropolitain de la Côte d'Opale, in partnership with the Académie de Lille, the Nord Department, the Grand Port Maritime of Dunkirk, the MEDEF, the Littoral Hauts-de-France Chamber of Industry and Commerce and the UIMM.





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