RÉPUBLIQUE FRANÇAISE
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DKarbonation

ADEME AGENCE DE LA TRANSITION ÉCOLOGIQUE

EXPERTISES

Preliminary design study for the high-voltage electrical connection of the new

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FRANCE 2030

AAP ZIBAC – Power supply for low-carbon steel production at the ArcelorMittal Dunkirk site

Background to the study

As part of its decarbonisation programme, ArcelorMittal's Dunkirk plant aims to replace the use of fossil fuels with electricity. Indeed, the area benefits from favourable access to an electricity grid whose generation comes from low-carbon sources.

As part of the transition to a low-carbon industry, securing and strengthening the electrical infrastructure is essential in order to:

- Integrate new energy uses through the electrification of processes
- Accommodate new low-carbon industrial equipment
- Reduce dependence on fossil fuels

The increase in electrical power involved is in the region of 300 MW, in addition to the site's current consumption.

The study focuses on the creation of a 400 kV high-voltage substation (HVS) designed to strengthen the grid and anticipate future needs related to decarbonisation.

Objectives:

With a view to installing an electric arc furnace with a capacity of 300 tonnes of steel, the study involved integrating these new electrical power requirements whilst taking into account the site's current operations.

The main objectives were:

- To define the modifications required to the industrial site's connection to the electricity grid
- To identify the optimal location for the high-voltage substation, taking into account land, environmental and technical constraints
- To assess the connection capacity to the public electricity transmission network (RTE)
- Identify the measures required to comply with the disturbance limits in force on the electricity grid
- Estimate investment costs and completion times
- Assess environmental impacts and propose mitigation measures

Details of the study

The study was carried out with the support of an engineering firm with extensive experience in projects of this scale.

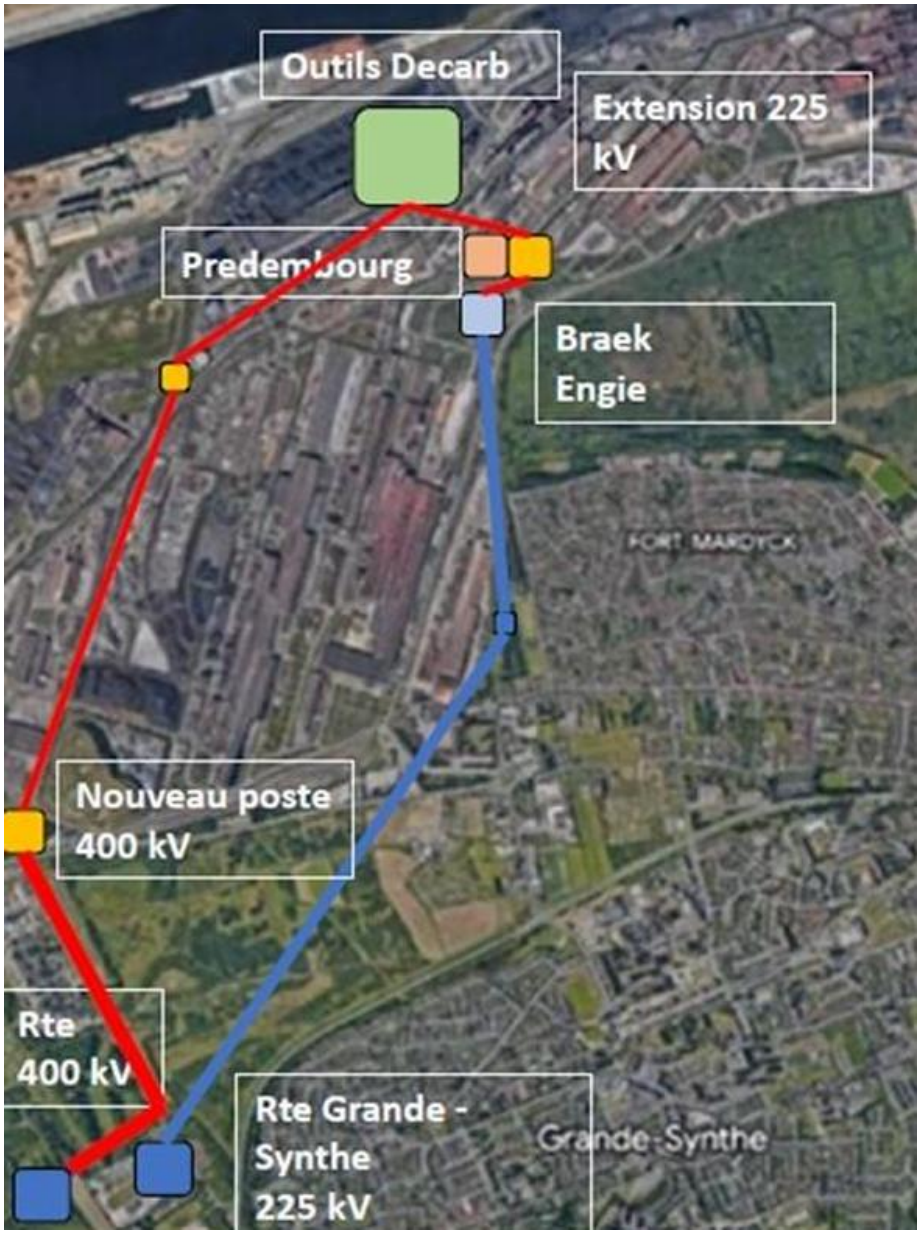
The design of the electrical substation takes into account the site's current consumption and plans to install steel industry equipment to ensure the production of a volume of steel identical to the current capacity, namely 5.5 million tonnes per year. These facilities will mainly consist of electric arc furnaces and secondary metallurgy furnaces, which also

operate on electricity.

In light of these considerations, the electrical power to be supplied by the grid will exceed 400 MW. This power level requires a connection to the highest voltage level currently available on the electricity transmission network, namely 400 kV.

A connection request was submitted to RTE in the first quarter of 2022. This was reviewed and led to the following approach:

- RTE has proposed the construction of a new distribution substation on its 400 kV network. It will be located in the municipality of Grande Synthe, near an existing high-voltage substation operated by RTE. From this substation, two underground cable links will be laid and connected directly to a delivery substation, which ArcelorMittal will be responsible for constructing.



In view of land constraints, this future substation will be located on the boundary of the site, at its western entrance. To this end, and given the available floor space, the technology selected will be a Metal-Enclosed Substation (MESS) with the live parts insulated by a gas possessing high dielectric properties.

For reasons of compatibility with the site's existing network, a step-down of the operating voltage to 225 kV will be necessary. To achieve this, a bank of several step-down transformers from 400 kV to 225 kV will be integrated into the future substation connected to the 400 kV network.

Two on-site overhead lines will provide the connection between the delivery substation and the electrical substation that will supply power to the industrial facilities.

The timeframes for planning, design and construction of the new infrastructure by RTE and on the ArcelorMittal side are estimated at five years. Commissioning of the facilities is targeted for 2030.

RÉSUMÉ

As part of its decarbonisation strategy, ArcelorMittal Dunkerque plans to replace fossil fuels with low-carbon electricity. This transition requires a significant increase in available electrical power, estimated at over 400 MW, to power new industrial equipment such as electric arc furnaces.

Proposed solutions
• Construction of a 400 kV high-voltage substation in the municipality of Grande-Synthe, connected to the RTE grid
• Construction of a delivery substation by ArcelorMittal, on the western boundary of the site Timeline
• Use of metal-enclosed substation (MESS) technology with 400kV → 225kV step-down transformers
• Two internal overhead lines will connect the delivery substation to the industrial substation

Timetable

• Studies and works estimated to take 5 years
• Commissioning scheduled for 2030

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