DOWNSTREAM FISH MIGRATION ALONG THE LOW MEUSE RIVER

Action C1

Operation report of the electrical barrier during 2019 migration periods

Deliverable – Operation report during 2019 migration periods

Révision				
Ind.	**Date**	**Published by**	**Checked by**	**Remarks**
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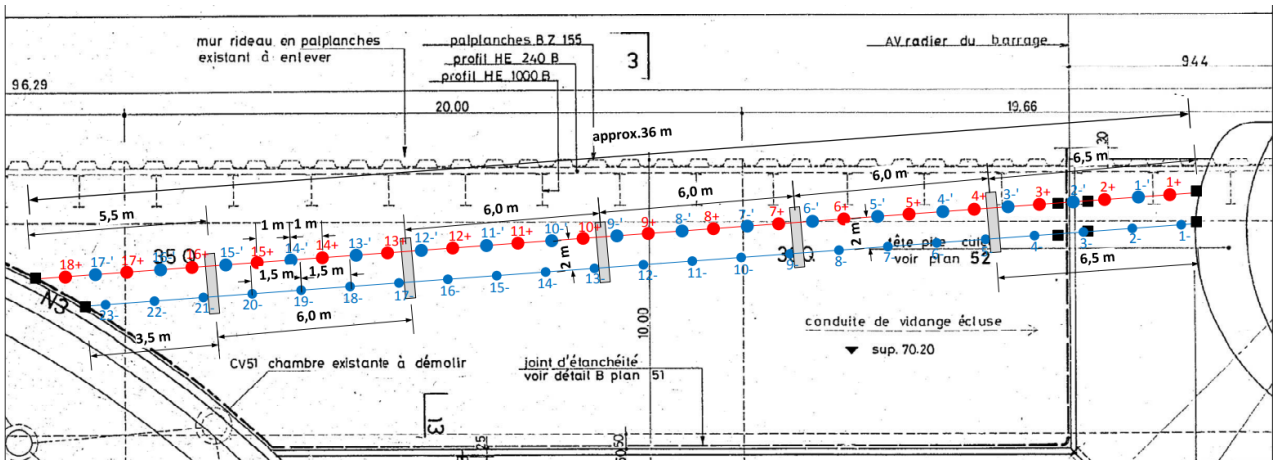
I. Introduction

Following the selection of the electrical barrier solution at the Grands-Malades pilot site, the commissioning of the solution took place in July 2019.

Two submerged chains formed a parallel linear line and on this line electrical to which an electric cable and electrodes are attached. It's used to control the movements of fish and direct them away from hydropower plant. The barrier comprises two verticals rows of positives and negatives electrodes in order to create an electrical field. The objective of the barrier was to redirect the fish to the dam. This first electrical barrier was designed to influence eels behavior and is placed at the entry of the channel.



Positioning of the eels barrier

II. Eels migration

During the autumn 2019, the eels begin their migration to the north see through the Meuse river. The main biologic parameter is the increase of water flow in the river. Therefore, the eels has to pass the obstacles in their way such like dam, lock and hydropower plant.

As the eels follow the water flow and as we take an important flow in order to produce energy with our turbines, the eels can be attracted by our activities. The objective of the barrier was to create an electrical field at the entry of the channel to direct them to the dam.

Eels are redirected by the barrier to the dam

The system is powered by an electrical cabinet on the river bank.

The two rows of electrodes

The electrical cabinet

During the migration period we switched on the barrier and it fulfilled its purpose. It is the subject of another report.

III. Incidents during operation

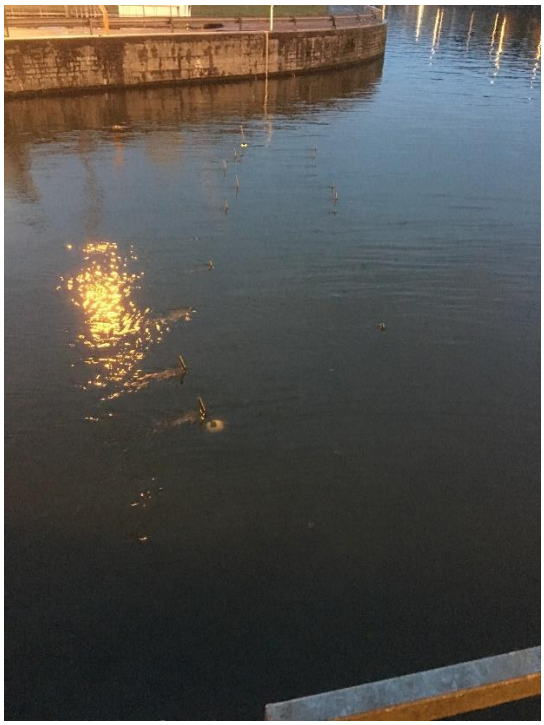
After the commissioning of the barrier, various incidents occurred during the operation (see below). However, the quick resolution due to the resilience of the system allowed us to handle them quickly without compromising the rest of the program.

III.1 Water flow in the Meuse

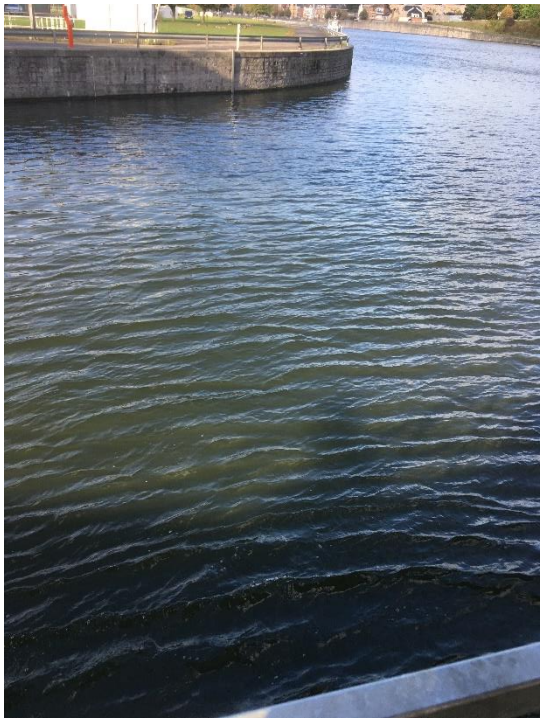
A lot of trashes are carried by the river throughout the year and even more during and after the winter flood period.

The system which consists of metal pipes attached to the bottom of the water and not on the surface allows to oscillate according to the water flows present in the Meuse. On the pictures below we can see that the barrier is progressively immersed by lying down slightly to absorb the power of the current without breaking. The electric field generated is sufficiently large to fulfill its role, especially since the targeted species, the European eel, swims mostly at the bottom of the river.

In addition, this system does not oblige us at all to reduce the production of the powerplant and therefore perfectly meets the production targets linked to the project.



Water flow of 80m³ : normal production



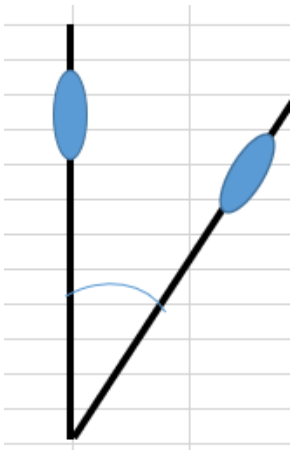
Water flow of 126m³ : high production

III.2 The problem of waste in the Meuse

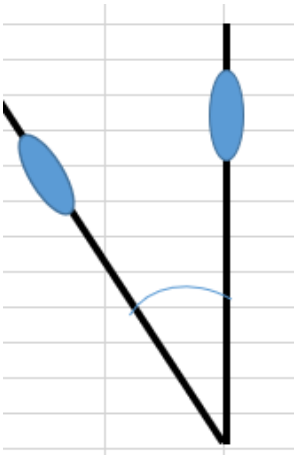
Usually the trashes coming from the river follow the water flow. In consequences, more we have water flow more we might have trashes arriving at the powerplant. Most of the floating trashes as

well as larger waste such as trunks are very well managed by the trash rack cleaner and don't have any impacts on the barrier.

Moreover, the electrodes act like reeds and lie down when the waste passes through and then stand up again.



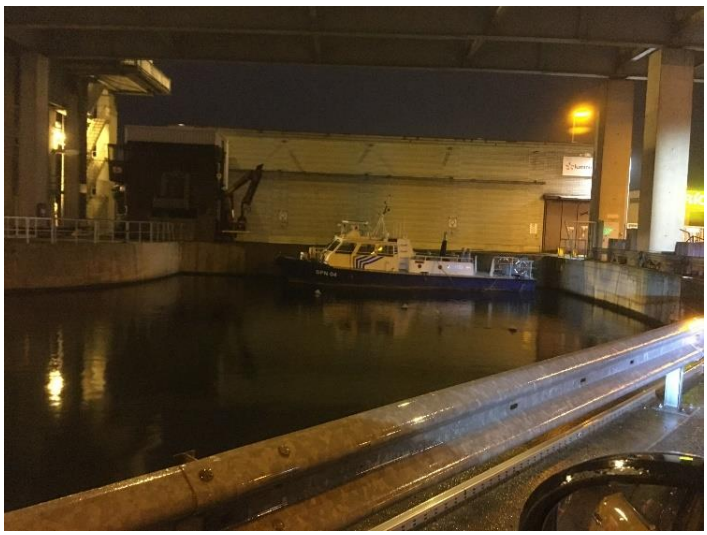
Electrodes lying down for trashes passage



Electrodes standing up again after trashes passage

For example, a large police boat which had probably not been tied properly had drifted with the current to the entrance of the turbines. It passed without damaging the eel barrier.

Floating trunks in the river



Police boat at the turbines after the barrier

However sometimes heavy trashes follow the flow in the bottom of the water and can touch the electrodes. When it's happened the pipes might be laid down or damaged by the force of the flow

and the weight of the waste. We therefore follow the barriers and organize dives when damage are observed.

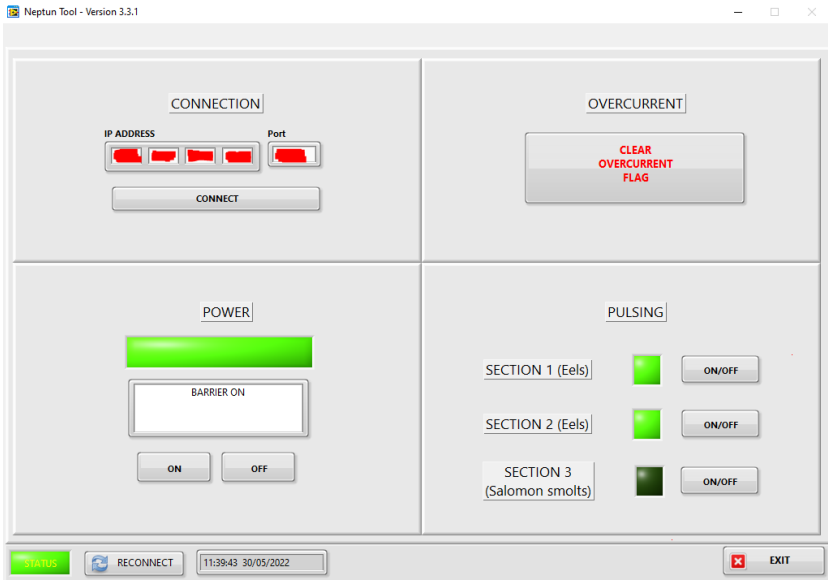
III.3 Communication with the Neptun System

To pilot the barrier remotely, PROCOM created an application that we can use on our computer, the NeptunTool system.

The eel barrier is divided into two separately controllable sections. However, we have to activate both sections to switch on the barrier.

Luminus' security requirements force us to use an external network. That's why a router has been installed in the cabin to allow us to have a signal linking the barrier, Procom and Luminus.

During the commissioning we had some communication problems between the barrier and the application or faults which were promptly corrected by PROCOM.



NeptunTool System

Error on the electrical cabinet

IV. Conclusion

Despite the various problems linked to the novelty of this system at Luminus and the conditions in the Meuse, the operation of the system was done in the best possible conditions. The biggest fear was the waste carried by the river, which was verified by the resilience of the system. Moreover, we did not have to regulate our energy production according to the deliverable down for the migration monitoring.

These different elements confirm the partners in the choice of this technology to reach the objectives of the project and to deploy electric barriers on the sites requiring an action.