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Environmental impact mitigation for new 110 kV overhead line in natural protected area

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SUMMARY

This paper presents one major 110 kV project where an original approach has been deployed by Elia, the Belgian TSO, with their partner Geolys, for developing access roads in a highly protected natural area: The **East loop** project (step 2). This paper describes all the steps followed in the development of this approach and how a solution acceptable for all the parties has been found.

It was quite a challenge due to the constraints given by the local environmental authorities. But taking into account some basic hypothesis, a study included the field measurements and different soil modelisations leading to an optimisation of themetaling thickness. During the execution of the access road and the different steps of the project, different in-situ settlement measurements took place under the road metalling so that it was possible to compare these data with the original model predictions for the settlements.

The results obtained are quite promising (good recovery of the settlements due to traffic loads) and will be confirmed by the removal of all road metallingôs in Q2/2022.

This paper describes also the different improvements that have been made in comparison with the step 1 (cfr.[1]) of this project to optimize the solution on different aspects: better visual impact, lower maintenance, better use factor of the concrete poles, and durability of the materials.

The paper will also give the lessons learnt of this project with possible improvements for next projects using **concrete poles** equipped of 110 kV pivoting Vees or insulated cross-arms.

Some lessons learnt during the construction phases will be also given as well as some maintenance issues to be taken into account during the development phases. The objectives of the design were to minimize the intervention times on site during construction and maintenance phases to increase the acceptability of this project. Concrete poles are durable (no pollution and fully recyclable) and require no maintenance/painting compared to lattice towers.

KEYWORDS

Concrete poles ï special access roads - Environment ï Insulated cross-arms ï Public acceptance.

1 Introduction

This paper will present the technical and environmental challenges when building a new 110 kV line (uprating an existing corridor from 70 to 110 kV; step 2 of the East loop project) in a highly sensitive and swampy environmental area (Natura 2000) with restrictive access constraints, in order to protect wild life on one side and the protection of groundwater area around the Spa Monopole on the other.

The 1st part of the paper will focus on the original approach used during the construction of the access roads (~3 km) for the machines, cranes and transport truck in order to meet the requirements of the environmental authorities (maximum pressure on ground in order to avoid soil compaction and deformation). The overall objective is the protection of soils as far as possible during the construction phases. The objective was also to reset the ground as much as possible in its original state after the works. The investigation and calculation methodologies are given as well as the implementation on the field, and will be supplemented by the results and observations once works have been completed Observations and results after removal of the access road will be also supplied, at a later stage, probably during the poster session.

The 2nd part will describe the optimisation and simplification of the design of the concrete poles. In fact, many improvements have been made to the existing standards for example using insulated cross-arms on tangent towers, other configuration on angle bi-poles in order to reduce at minimum maintenance and managing costs throughout the operational life of the pole.

2 Original solution for access roads

2.1. Standards from Elia

Elia has two standard access ways - which can be used during the construction of a new line.
The use for each one is conditioned by the location of the future power lines and the administrative constraint of each region.

Type of access road :	**Steel plates or (wooden pieces)**	**Stones track**
Impact on permit :	No permit required	Archaeological survey sometimes Requested. Permits needed if permanent
Easiness of solution :	Easy and flexible Inappropriate in hilly reliefs and humid fields	Heavy installation and difficult to remove completely
Cost :	Advantageous for short duration (< 6 months)	Advantageous for long duration (> 6 months)
Safety :	Slippy when humid Reduced speed	Less risk of accident
Maintenance & risk of stealing :	Necessary washing risk of stealing	Less maintenance and no risk of stealing

Figure 1 : Usual access ways used by Elia

For Elia projects, steel road plates is the most common solution.

2.2. Challenges of this project

The challenge was to have an access at the feet of the towers located in a highly sensitive and swampy area for all the machines and trucks essential for the building phase and to convey concrete poles of 30 m / 20 tons without damaging the ground irreversibly or altering the circulation of surface water.

In this area of high environmental value, the construction of access tracks focused on two points:

- The execution of geotechnical surveys for the design,
- The technical implementation to minimize their impact on the ground and to allow their dismantling and the restoration of the land to its initial state.

The first target was achieved by carrying out a ñportableò soil testing: lightweight variable energy dynamic cone penetration tests and manual drillings. The temporary access tracks thickness and stability were calculated on the basis of the theory of Prandtl-Buisman.

Based on the initial results, the so-called **ñpaddedò tracks were designed to be raised above the initial ground level protected by a very high resistant geotextile**[1]. This solution would have the advantage to avoid the excavation of the upper sensitive ground layer for the temporary access foundation and will notably the recovery of all materials used for the temporary access.

As the local aquifer is exploited by a private mineral water company, local raw material was supplied for the roadbed in order to get stones compatible with the hydrogeological characteristics of the aquifer.

The optimization of the access tracks and local supply enable the project to minimize the cost, the transport, and the global environmental impact.

On this last point, we would like to thank the local authorities for forest protection (called D.N.F.Département de la Nature et des Forêts) witch during the period of the environmental assessment studies and execution phase had worked closely with us.

2.3. Basic hypothesis

The initial idea of the local environment authority (DNF[2]), was to impose to Elia a maximum contact load pressure on the ground, for the access track to limit its impact on the ground. This value was usually applied for forest exploitation but was not reasonable for the construction of an overhead line and it has been demonstrated subsequently by our calculation.

[1] The general principle of those padded tracks has been suggested by Dessolin, B.T.P, a company located in France specialized in groundworks and various public works.

[2] Département de la Nature et des Forêts - DNF (wallonie.be)

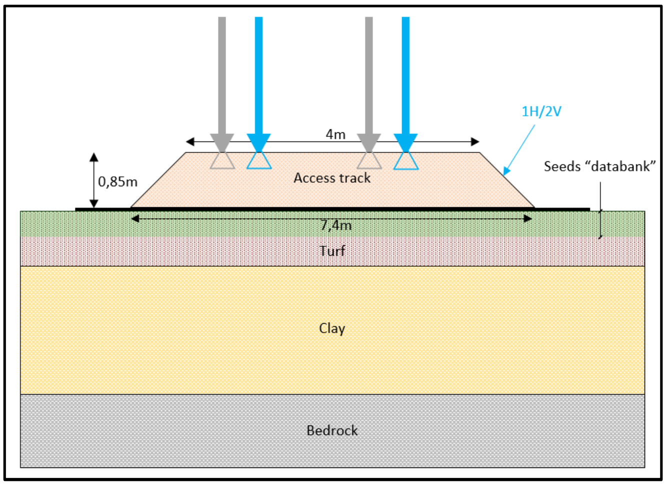

Figure 2 : Section of the access road and different layers of the ground

Our studies showed that imposing this value was not realistic and Elia could not guarantee by this way that there would not be any invertible damage to the environment due to a track collapsing.

Moreover, even with a low pressure value, a long duration application would destroy inevitably the vegetation present under the access road.

Then another constraint came from the DNF asking us to maintain the ñseeds databankò. It meant not to destroy irreversibly the upper layer of the ground (~30 first centimeters) enabling a new growth of the vegetation after the removal of the track. Destroying this layer would cause irreversible damage to the biodiversity.

Thatôs why the initial hypothesis had to be redefined in a more realistic objective: **how to optimize the access road with enough load-bearing capacity while impacting as low as possible the first layer of the ground and thus biodiversity underneath**.

2.4. Access road study

2.4.1. Introduction

The first step is to know the nature of the ground in order to model it correctly. Indeed, the soil settlement is hardly dependent on the ground nature and water content. Therefore Elia has launched a campaign of tests (Pandas tests): manual drillings on the future location of the access road - agreed between Elia and DNF - to map and characterize the different types of ground. These Pandas are also used in the road industry to check the compactness of the road structure. The measured cone resistance gives an indication on the nature and loading capacity of the soil. Electrical cone drillings were here not allowed because it requires heavy equipment on the moorland.

Based on the measurements, we could make a calculation model of the different types of ground and estimate the impact of the access road and loadings on it. Later on, during the construction phase, we have measured the real settlements at different steps to validate the predictions of the model.

2.4.2. Attempted settlements of the natural ground under loaded access track

The theoretical calculation for soil settlements evaluation along the track under the metaling considers the embankment dead weight and the traffic loads. The calculation was principally based on the different types of soil recognition. This is determined by analysis of the resistance strength evolution measured during geotechnical tests and correlated by the manual drillings and the field observations.

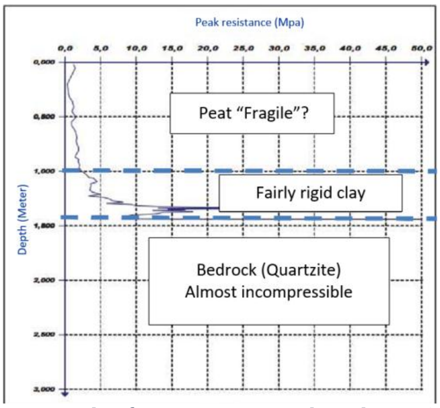

Figure 3 : Example of resistance strength evolution (P66 test)

After comparison of all the results, three different section profiles were defined, principally distinguished by the measured thickness of the upper layer with low resistance. Based on the soil investigation the nature of this upper layer was assumed to be organic rich (turf) or weak sandy clay/silt.

Profile	Description
P1	no turf / low resistance layer 3.0 m thick layer of clay (q_c = 5 N/mm²) > 3 m : bedrock incompressible
P2	0.5 m thick turf / low resistance layer (q_c = 0.5 N/mm ²) 2.5 m thick layer of clay (q_c = 5 N/mm²) > 3 m : bedrock incompressible
P3	1.1 m thick turf / low resistance layer (qc = 0.5 N/mm ²) 1.9 m thick layer of clay (q_c = 5 N/mm²) > 3 m : bedrock incompressible

Table 1 :Section profiles

The calculations are based on the classical Terzaghi and NEN-Bjerrum theory with use of the Geodelft software ñD-settlementò [2])

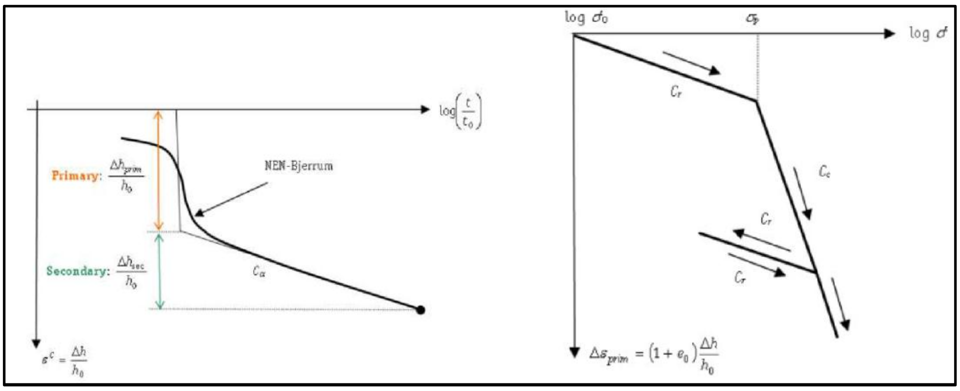

Figure 4 : Calculation model used

Based on the different hypotheses for the upper low resistance (variability in vertical consolidation coefficient C_v and primary, secondary and unloading/reloading compression coefficients resp. C_c, Cŭ& C_r), the settlements for the 3 profiles after 365 days can be estimated. The relatively high resistance of the second clay layer leads to neglect the secondary settlement (creep) for these.

- 4 mm for **P1**
- 42 to 116 mm for **P2** (respectively for upper layer = sandy clay/silt or turf)
- 83 to 243 mm for **P3** (respectively for upper layer = sandy clay/silt or turf)

The vertical consolidation coefficient C_v was estimated to be $C_v = 1E^{-7}$m²/s and doesnôt seem to influence the final result after 365 day because primary consolidation takes places in all scenarios well before 365 days, this is due to the limited thickness of the weak layer (consolidation time is related to 1/d² with
d = dewatering length of the weak layer which is in this case half the thickness of the weak layer).
By applying the load of the yard road to a weak layer with limited permeability, the load is first transferred to the water in the soil pores, inducing a hydraulic gradient. Due to this gradient the pore water excess pressures can mitigate, and the load is then gradually transferred to the soil grains inducing evolving settlements in time and thus starting the primary consolidation phase. One can calculate ca 1 month of consolidation time for a 1m thick weak layer and ca 1 week for a 0,5m thick weak layer with $C_v = 1E^{-7}$m²/s. Simultaneous with the start of the primary consolidation (based on compression coefficient C_c) the NEN-Bjerrum method induces settlements due to creep which are independent of the load itself but solely depend on the creep coefficient C_α and the time difference between the start of creep and the desired evaluation time.
Given the short ñtimeframeò of traffic load (minutes) in relation to a minimal consolidation time of ca 1 week for a 0,5m thick weak layer it was estimated that the loads of the traffic itself would not be of great influence on the primary settlement.
Otherwise said: the traffic load was assumed to take place in a short time frame in relation to the consolidation time needed. The primary compression coefficient ñC_cò was based on a coefficient of Sanglerat α = 0,7 for the turf layers and α = 2,0 for the sandy clay/silt layer. It has to be mentioned that due to the low values of the measured cone resistances in the Panda tests, the values q_c can be subject to appreciable errors which means the same for the derived compression coefficients.

Underneath the results of the calculated settlements with time for P2 profile (0,5m thick weak layer) are shown due solely to the dead weight of the yard road15,9kN/m².

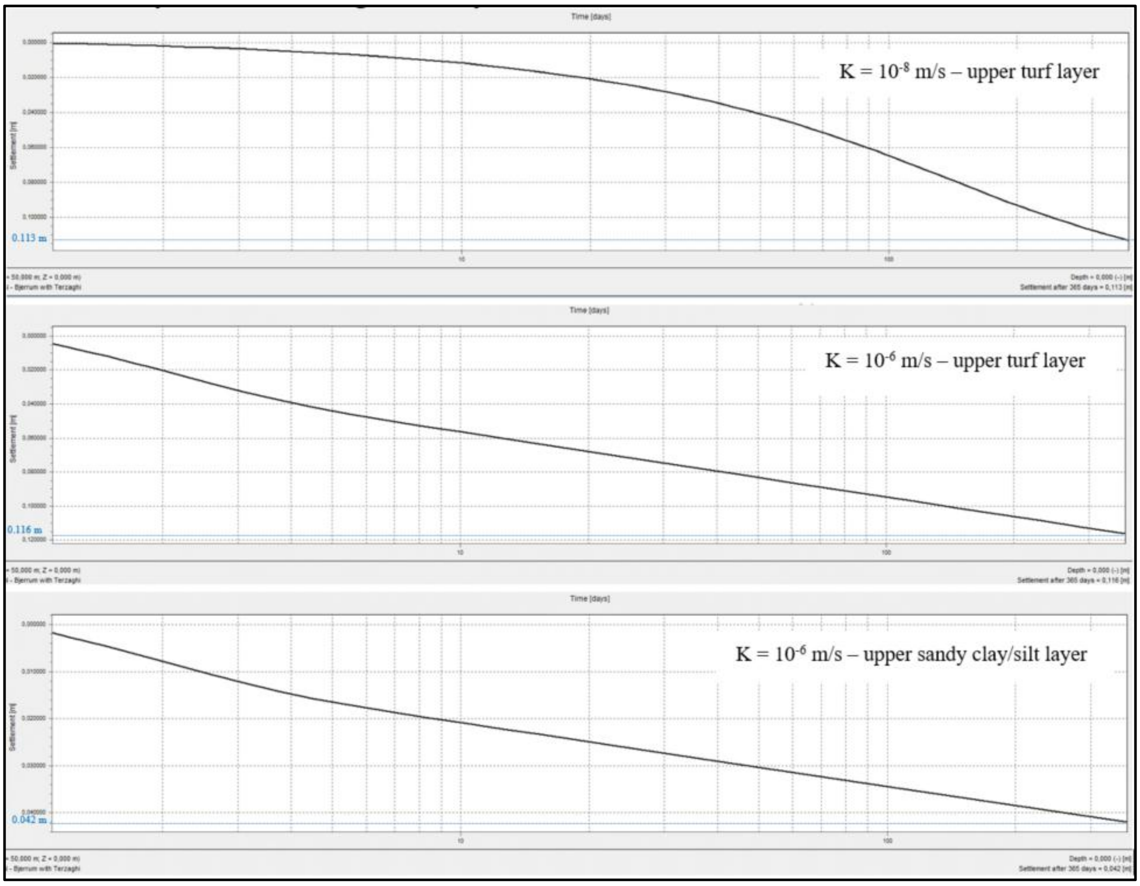

Figure 5 : Calculated total settlements for P2 profile for 365 days

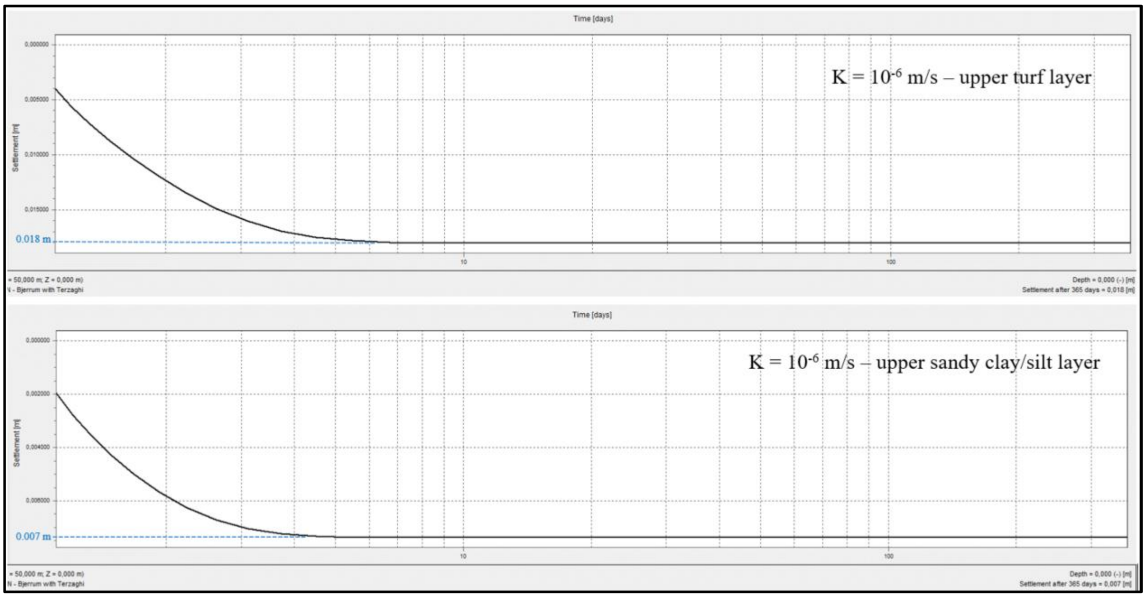

Figure 6 : Calculated primary settlements for P2 profile for 365 days

By comparison of the theoretical results with (Figure 5) and without creep (Figure 6) it becomes apparent that the secondary creep settlements in the models are dominant after 365 days.
The common ratio between primary and total settlements habitually observed for turf is 80% to 50% depending on the consolidation state of the ground. By comparison of this ratio between calculations considering turf and sandy silt upper layer, the results assuming an upper sandy silt/clay layer seems to be preferred (for P3: ratio is 11% with turf and becomes 30% with sandy silt/clay). However, the conservative result with upper turf layer must be considered like a possible extreme value. These results indicate that the range of values for attempted settlements can be very large with the actual ground in place.

The calculation of the minimum thickness of the metaling is based on ULS (Ultimate Limit State) calculation by using Plaxis (finite elements method) [4]) as well as an analytical calculation was provided. This calculation leads to recommend two different thicknesses: 50 cm for P1 profile and 85 cm for P2 and P3 profiles, undifferentiated because of the large range of ground behaviour.

2.4.3. **Metaling thickness optimisation**

Due to variability in Pandaôs result, a more complete survey has been carried out in order to optimize the access tracks design as shown on figure 7 here below.

According to this survey, it appears that profile 3 previously defined (with a 1 meter thick soft layer) was never encountered. Then, 2 new profiles were defined as show on Figure 7 and Figure 8 here below :

- « type 1 » which upper soft layer thickness is between 0.15 m $< C_1 <$ 0.50 m
- « type 2 » which upper soft layer thickness is between 0.50 m $< C_1 <$ 0.75 m

As the results were more favorable than expected, the thickness of the yard track was recalculated for the 2 new types:

	Road thickness
Type 1	0.55 m
Type 2	0.65 m

Table 2 :Road thickness

With these optimized thickness somewhat lower settlements can be expected in the models.

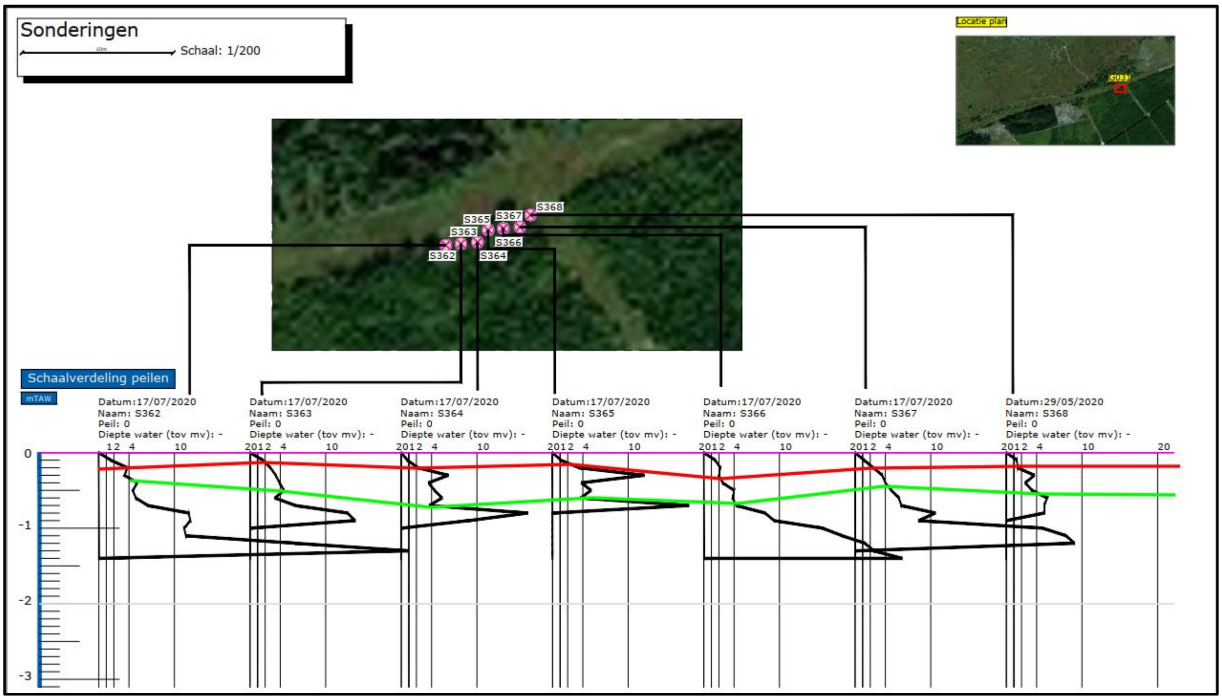

Figure 7 : Geotechnical cross section based on Pandaôs results -> « type 1 »

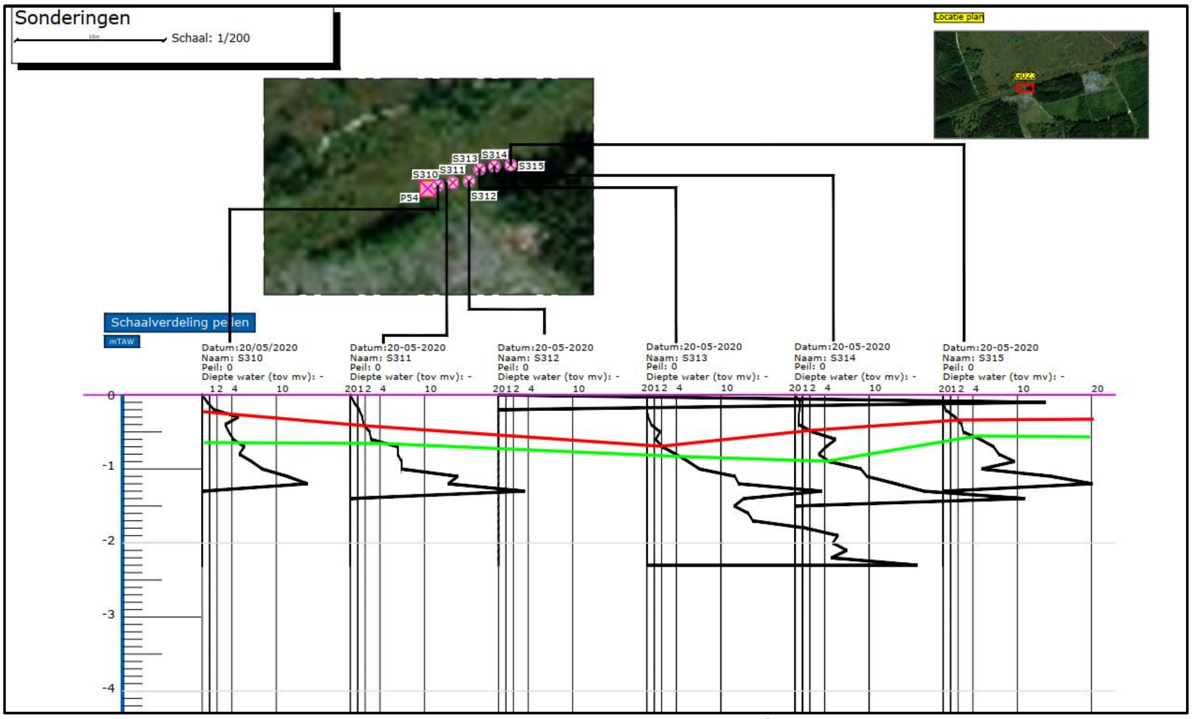

Figure 8 : Geotechnical cross section based on Pandaôs results -> « type 2 »

2.4.4. **In situ settlements measurement: method and results**

To compare estimations and actual settlements values, a test campaign was set up on a transversal portion of the track. Fort this purpose, a low deep measurement equipment was installed on February 17, 2021 under the road metalling before being placed. The settlement measurements were made by the test laboratory of CSTC [5].

Three types of measurement methods were used:

- A classical measurement by water pressure measurement in a 50 mm diameter tube placed under the track,

- Two unusual methods based on optical fibres: FBG (Fiber Bragg Grating) and BOFDA (Brillouin Optical Frequency-Domain Analysis) technologies. The optical fibres were glued above and below the water-filled tube. With them, the settlements can be deduced from tube deformations.

For the FBG method, the measurements are provided by sensors locally placed on the optical fibre.
For the BOFDA method, the entire cable is used to obtain measurements each 5 cm.
In the case of water pressure measurements, the tube is filled with a constant water level and a sensor TML (Transducer Markup Language) measure the pressure each 50 cm.

Figure 9 : Measurement equipment before and after road metalling placement on March 2, 2021

Five measurements were planned over a long term period taking into account the different construction phases:

- **February 17th, 2021**: after installation: zero measure
- **March 2nd , 2021**: after road metalling placement
- **May** 4th , 2021: after first traffic loads (road metalling refill)
- **August 11th, 2021**: after second traffic loads (concrete truck)
- **October 12th, 2021**: after third traffic loads (crane supply) ï end of work

Finally, because of not anticipated and expected plastic deformations in the tube at the flangeways and reference point movement, the two optical fibre methods results were esteemed not to be workable once the traffic loads had taken place. Only the water pressure measurement can be used for settlement estimations.
Before the first traffic loads, the BOFDA and FBG measures fit well with water pressure measures.

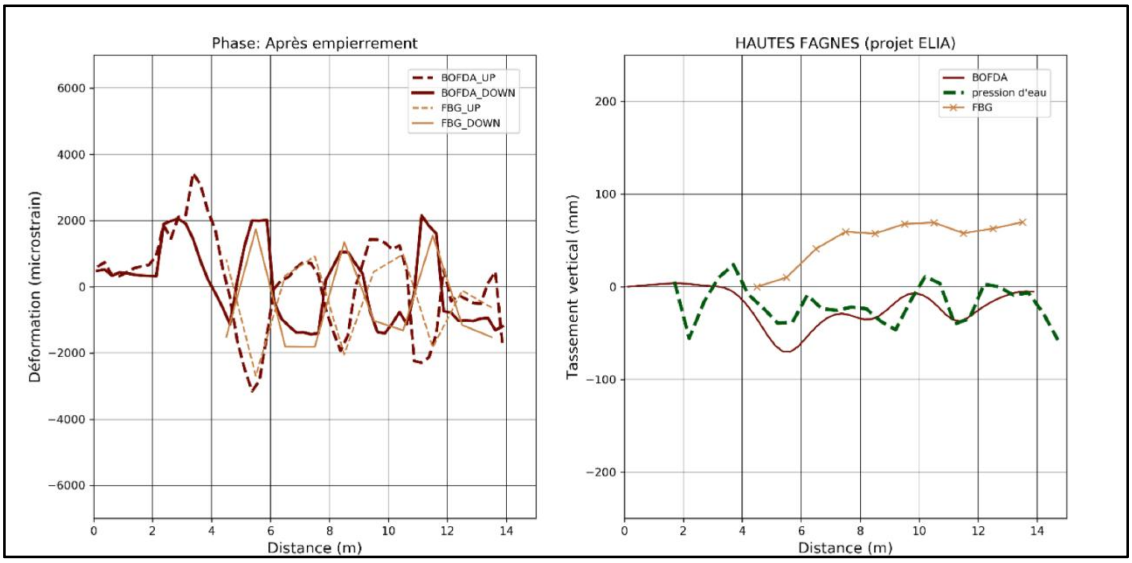

Figure 10 : Comparison of measurement methods on March 2, 2021 before traffic loads

Finally, the settlement values for each date came out and are figured here below.

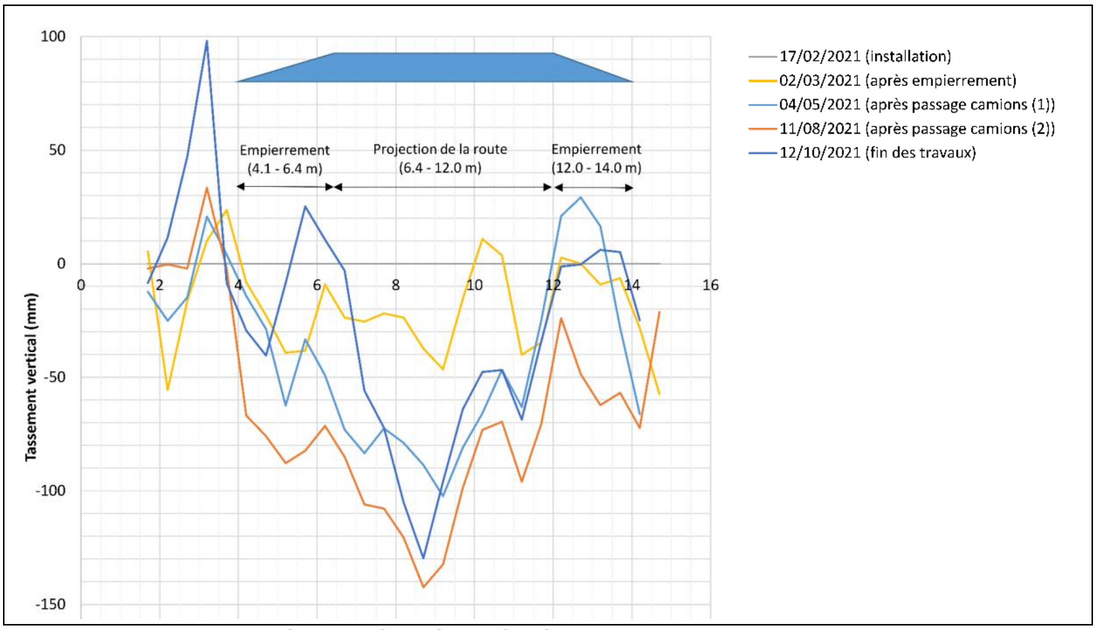

Figure 11 : Settlement values obtained with water pressure measurements

2.4.5. **Interpretation and comparison with calculations**

The aim of the in-situ measurements was to have some reflection on the calculated values and to challenge the adopted soil parameters. Because the geotechnical profile at the test side was not included / observed in the first calculations a new calculation profile was provided.

The test profile is based on 4 geotechnical Panda tests made in the measurement area. The analysis of the resistance strength evolution shows again an upper low resistance layer which is fixed to 20 cm in the calculations.

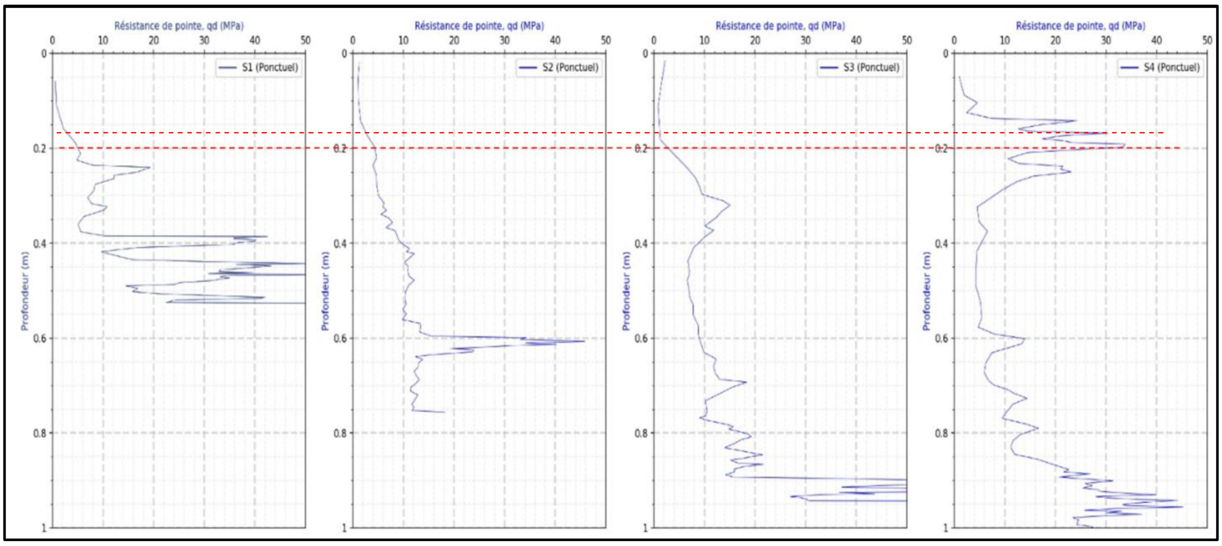

Figure 12 : Panda tests in measurement area

For this new calculation, the road metalling thickness is 60cm as performed at the test site. The coefficient for primary settlement is adapted to the layer thickness (0.20 m) and to have good agreement between the calculations and the measurements the cone resistance was adapted from q_c = 0,5 MPa in the first models to $q_c \sim 0.13$ Mpa. Like stated already with low cone resistance values the relative error on the absolute value of CPTôs in general and Panda can be significant. A traffic load of 10kN/m² is applied between 30 and 150 days. The yard track is assumed to be removed after 230 days. Furthermore, the coefficient C_r and C_c shown on Figure 4 are assumed equal (=> $C_r/C_c = 1.0$) which means that all the primary settlements are recovered after unloading (assumption due to in-situ observations, see Figure 15 and also further in nota).

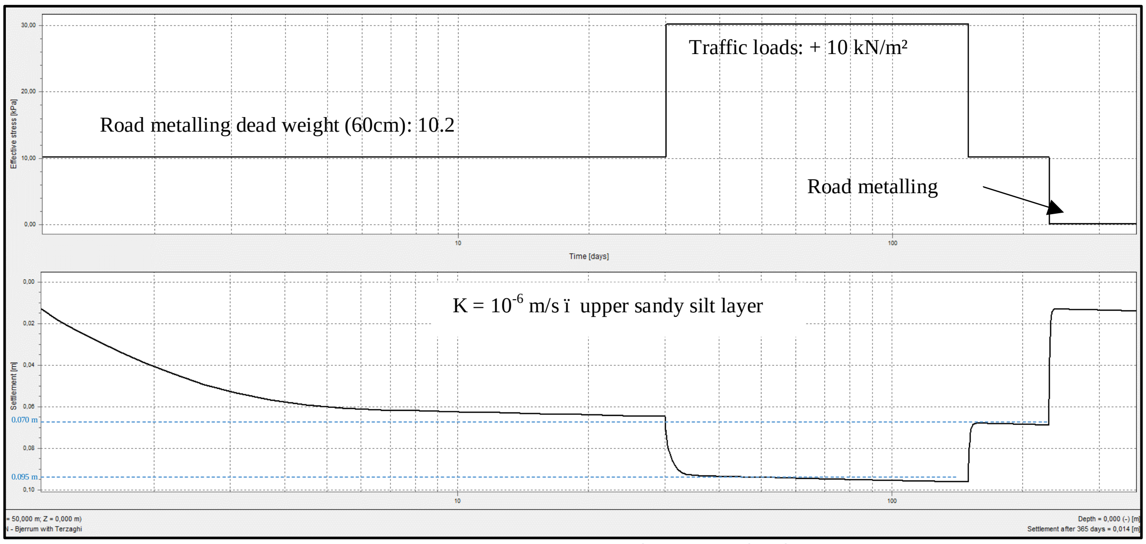

Figure 13 : Calculated total settlements for test profile for 365 days

To be able to use the in-situ measurements, the results had to be corrected somewhat.
When inspecting the measured settlements just after installation of the yard track, it can be seen (see Figure 11) that some values are far from realistic. These ñerrorsò seem to be repeated at each measurement and are probably related to initial installation effects. For example, at x = 10m, an unrealistic uplifting of 10mm is measured next to two points with a settlement of 40mm. The influence of this ñupliftò is then observed at each measurement. Considering this observation, all the points of the first measurement on March 02 2021 (just after installing the yard road) are calibrated and equalised to a mean calculated settlement profile like shown in dashed lines in the Figure 14.

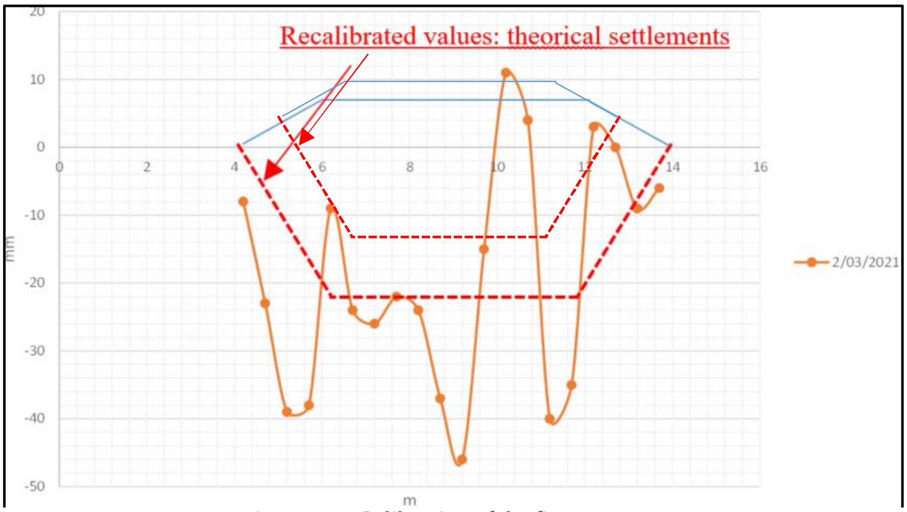

Figure 14 : Calibration of the first measure

The recalibrated results for the later measures are shown on Figure 15.

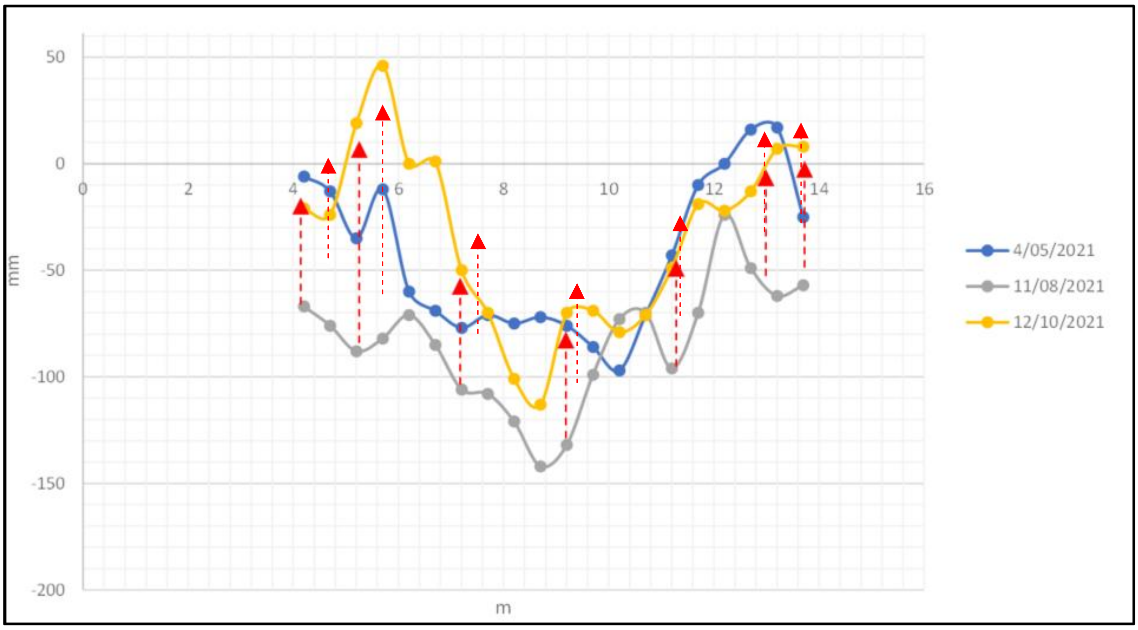

Figure 15 : Recalibrated measurements

From this the following can be observed:

- The mean measured settlement increases from 20 to 70 mm after 2 months ï given the absence of significant traffic during this period this is mostly due to consolidation of the dead weight of the road. Given the limited thickness of the weak soil (0,2m) the consolidation time for the dead weight load of $\Delta P = 0{,}6*17$ kN/m³ = 10 kN/m² with $C_v = 1E^{-7}$m²/s is about 1 day.
- The traffic loads between May and October generate extra settlements of about 40 mm mostly localised on the middle part of the profile. Because of the limited thickness of the weak layer and the quick derived consolidation of ca 1 day for ΔP = 10kN/m² (see above) the influence of the traffic loads can be observed.
- A relatively great recovering/uplift of about 50 mm average is observed after all traffic loads are gone (red arrows)

These observations indicate a good recovering of the primary settlements. Indeed, the recovering after traffic load seems to be almost complete indicating on a relation of $C_r / C_c \approx 1$. This seems somewhat surprising. For clays a relation of $C_r/C_c = 3$ is classic. It is known that for wet organic/clay rich layers $C_r / C_c \approx 1$ can occur in a limited time frame suggesting a good swelling potential related to active clay minerals.

2.4.6. **Conclusion**

In comparison whit the calculations it becomes clear that given the small measured cone resistances in the Pandaôs appreciable ñerrorsò can be made in the derivation of the compression coefficients, especially when the weak layer is situated on top and is of low thickness (< 0,5m). More detailed laboratories test (oedometer , vane tests, etc..) could help to better estimate the compression coefficients and in that regard the vertical compression coefficient C_v. Despite this observation it is esteemed that the model calculations for profiles P2, P3 with thicker weak layers are good guidelines for the estimation of the settlements.

The nature of the weak layer at the test site shows good recovery of primary settlements due to traffic load, it can be expected that the same is fully or partially valid for the load of the dead weight of the yard track. This means that the resulting settlements after removal of the yard track would be mainly driven by the secondary creep of the organic rich layers and are somewhat independent on the limited loads which arise from the dead weight of the yard track and the traffic itself. This all depends on the exact nature of the weak layers in relation to its mineralogical content.

This theoretical method allowed us to optimize the quantity of stones required for the ñpaddedò access tracks by reducing it, in the first instance, by 55% for Type 1 and by 40% for Type 2. Nevertheless, after the installation of the track, due to a very bad weather in Europe in summer 2021 (unusual heavy rains), additional quantity of stones had to be loaded because of the sudden rise of the upper water level (to keep the road metalling above the water level), which induced more weight, thus more pressure on the ground. Despite this, the final results is a substantial gain of 30% for Type 1 and 20% for Type 2 reducing the cost about 20% on these particular access roads. This result would have been even more effective without the exceptional rains

2.4.7. **Withdrawal of the road metaling and restoration of the ground**

After the construction of the new overhead line, one essential step is the withdrawal of the road metaling and the ground restoration.

The challenge was that no vehicles were tolerated outside de road while dismantling the metaling. To this end the excavator and the truck had to work backward to remove the large majority of the stones and use the geotextile to ñwrapò all the remaining stones.

Figure 16 : "coating" of the remaining stones of the road metaling

Simultaneously, the excavator had to restore the ground following specific methods that was approved by the environmental authorities. One of those method (which is mainly used in this case) is to scrape off the firsts 5 centimeters of the compacted layer of the ground and windrow the scraped soil perpendicularly to the track, keeping the height of each pile lower than 80cm.

Figure 17 : Restoration of the compacted ground by scraping and windrowing the upper layer (5cm)

The vegetation recovery is still unknown, as those works are currently in progress. We hope to see the first results by this year, around August 2022, depending on the weather conditions. When conditions allow, those recovery results would be presented on the next Cigré poster session.

3 The work schedule: another challenge

Besides the constraints linked to the creation of the tracks and the protection of the soil and vegetation, the work schedule of this project was also rather complex as there were many other environmental constraints related to the wildlife to cope with (see example below of activities and forbidden period for some specific works on specific locations with protected environment)

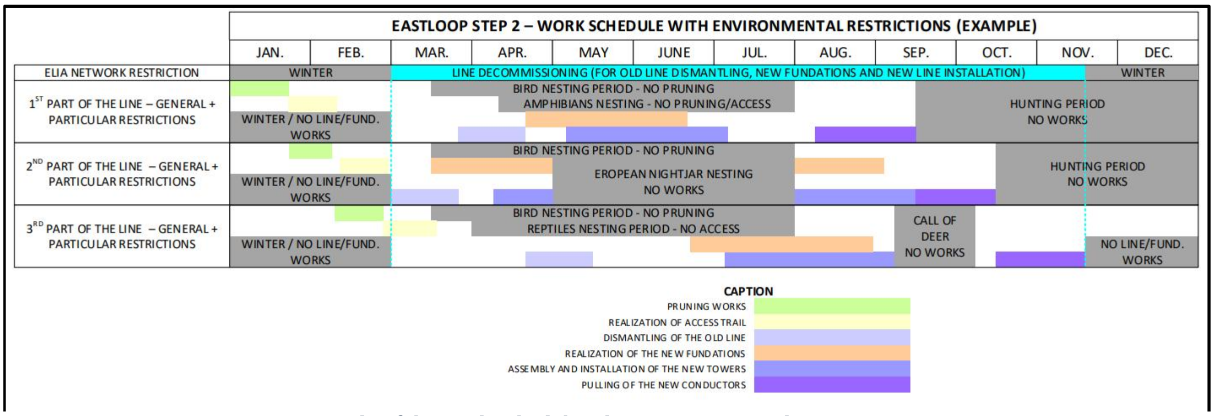

Figure 18 : Example of the work schedule taking environmental constraints into account

4 Concrete pole optimization and simplification

Another environmental aspect playing a role in the acceptance of a project of a new line is its visual impact and landscape integration which is a rather subjective topic. The local authorities and people living near the line were quite sensitive on this aspect as this region is attractive for nature tourism. Therefore, coming with more aesthetical poles, could have a positive impact on the public acceptance.

Elia has realised this project taking into account the lessons learnt of the step 1 project (*cfr. [1]*) by simplifying and optimizing as much as possible the pole designto reduce de visual impact, the costs and limit the maintenance frequency due to the access difficulty across the lands located under the line.

4.1. Silhouette optimization

By the experience gained with the use of insulated cross-arms on different voltage levels, it was decided to limit the foot bending loads due to the fact that the conductor had an increased diameter compared to the 1st step. As the conductors were here bigger 504 AAAC-2Z + OPGW, the challenge was to optimise the **high-performance concrete poles** by using only one earth wire on the bipods and using **insulated cross-arms** (IC) on tangent towers to decrease the foot bending solicitations. Note that the use of 110 kV IC was not new as there had been already a pilot project in 2018 on composite poles (see [1]).

4.1.1. Tangent concrete poles

By using insulated cross-arms on tangent poles, the corridor could be a bit narrower but also the level of the points of application of forces, the moment resulting from the conductors in the base of pole was reduced (around 10% on average). This was necessary to use the same types of poles as on the step 1 as the conductor diameter had increased from 22.4 mm to 27.5 mm for step 2. The insulated cross-arms ask also normally less maintenance while metallic cross-arms use to be painted regularly in Belgium.

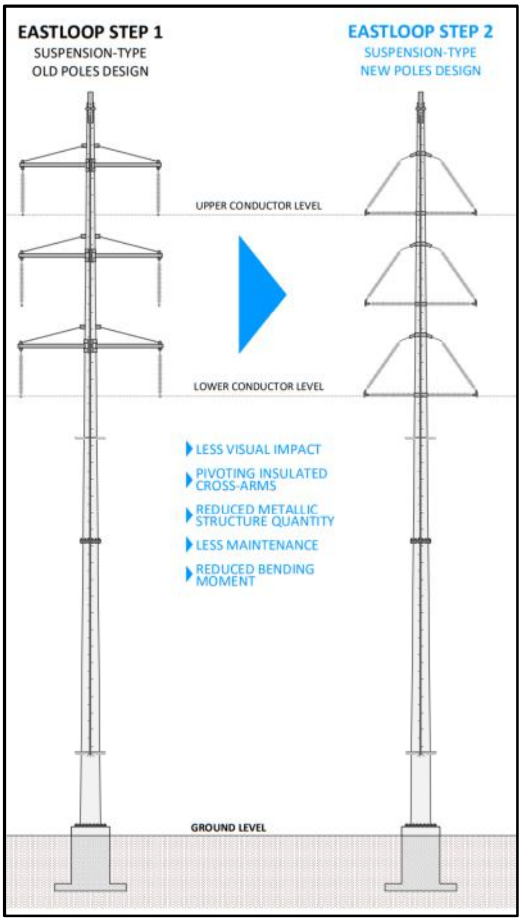

Figure 19 : Design evolution of tangent pole

4.1.2. **Characteristics of insulated cross-arms**

Compared to 2018 application on single poles, it was here necessary to increase the length and diameter of the compression insulators in order to enable climbing the pole with one circuit in service. Also the mechanical loads were here much higher because of longer spans and bigger conductors.
The min leakage distance was in this new design equal to 3750 mm.

4.1.3. **Limits of insulated cross-arms**

In hilly terrain we gained some lessons from this project. Elia knew the compact lines are mainly used in flat terrain but wanted to enlarge as much as possible the use of pivoting insulated cross-arms on this project for integration purposes and reducing the visual impact of the line in the landscape.

Figure 20 : Picture of a tangent pole with insulated cross-arms

During the pulling operations, a temporary blocking system was used to avoid any swinging of the insulated cross-arm (see picture below of mounting test at ground level).

Figure 21 : Hinge of the cross-arm and **ñ***anti-swinging***ò** *system*

Some lessons learnt from this installation will lead to a small redesign of the blocking piece and also painting it in red in order to make it more visible so not forgetting to remove it before energizing the line.

At some locations where a tangent pole was in a valley, it can happen that uplifting loads occur in winter conditions. Therefore, we had to add some counterweights on some poles to prevent this phenomenon.

We recommend to limit the use of pivoting insulated cross-arms with towers height differences of max. +/- 5 % of the span length, while the clamping was also not easy.

Figure 22 : Upper part of a tangent pole with insulated cross-arms

4.1.4. Strategic poles: gantry-type concrete poles

The gantry-type concrete poles - used as ñstrategicò poles for particular line configuration inducing high mechanical constrains - were also optimised by removing the steel cross-arms and connecting the conductors directly on the pole, adding a post insulator to maintain the jumper at a safe distance.

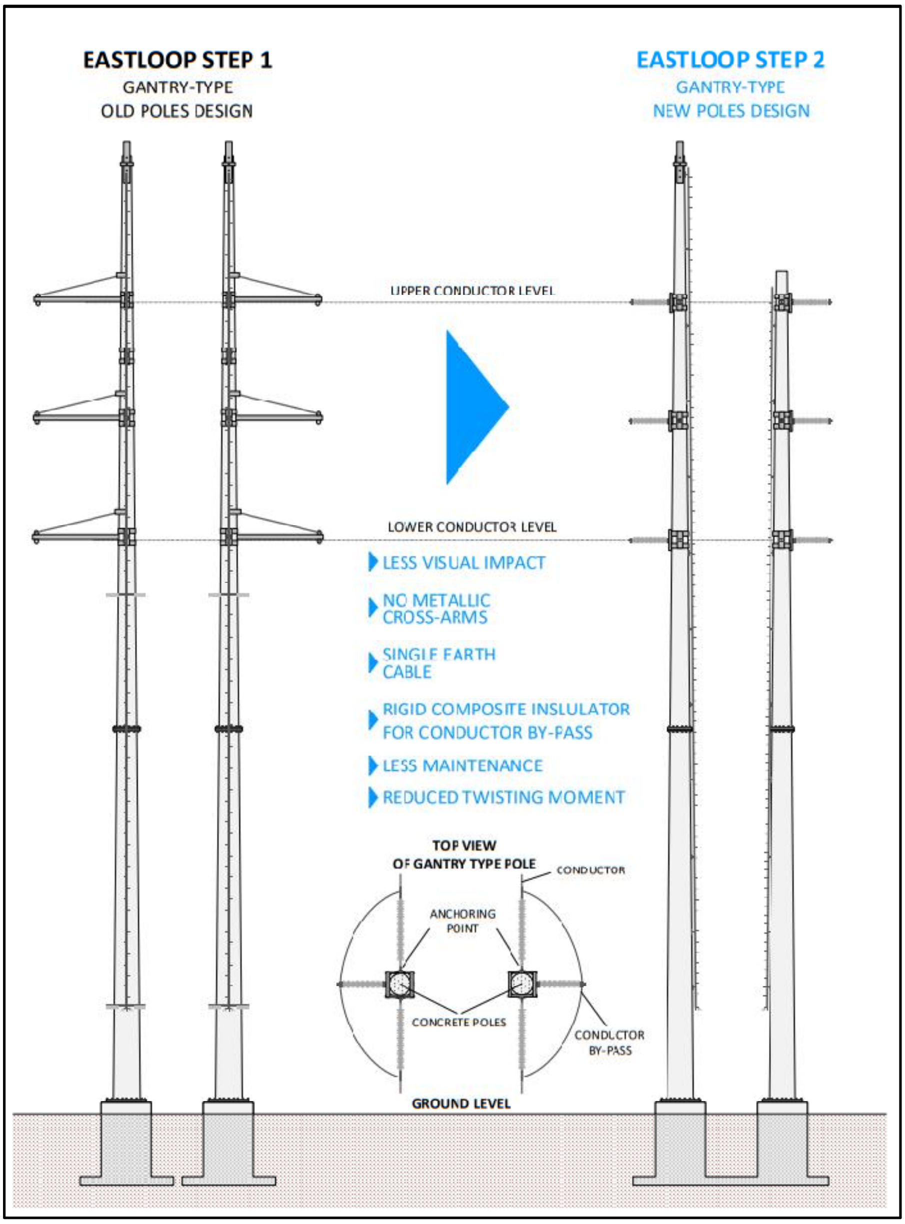

Figure 23 : Design evolution of gantry-type pole

4.2. Enhanced durability of the solution

Compared to the step 1 project, some improvement have taken place in order to achieve an enhanced durability. It was reached by different ways:

- Reducing maintenance costs and impact by using insulated cross-arms, inducing less painting area of metallic pieces ;
- Using galvanised anchor bolts to fix the poles on the foundation ;
- Adding a metallic cap in the area of the concrete poleȍs feet to cover and avoid any damage to the earth cable.

5 Conclusions

Due to a good collaboration between Elia and the local authorities, it was possible to build a new line in a highly protected natural environment. This paper shows that an original approach combining well known and new techniques can help us solving a big challenge.

Weôve been quite far in the different steps of the scientific approach but keeping pragmatic in its application on the field with the focus on a solution acceptable for all the parties at a reasonable cost.

The East Loop project step 2 is the second project to use high performance concrete poles (concrete poles with height up to 46 m and higher loads: 2 circuits 504 AAAC-2Z + OPGW) in Belgium.

The main advantage offered by these high-performance concrete poles is that they have a limited ground coverage and a reduced working area on their feet and maintenance compared to lattice towers. They can be seen as more aesthetical certainly in compact configuration, considering the challenges they can provide on a logistic matter.

By constructing these **new compact supports** in concrete in a very challenging and sensitive environment, Elia is carving out a position in the field of technological excellence where research and development with solid partners is essential.

It reflects also the need for a good cooperation between Elia and local authorities to use new solutions as **special access roads** for facilitating public and environmental acceptance.

https://www.youtube.com/watch?v=HGZ2I1DeSRY

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