

# Experience of EN-EL on the integration of conventional electrical lines

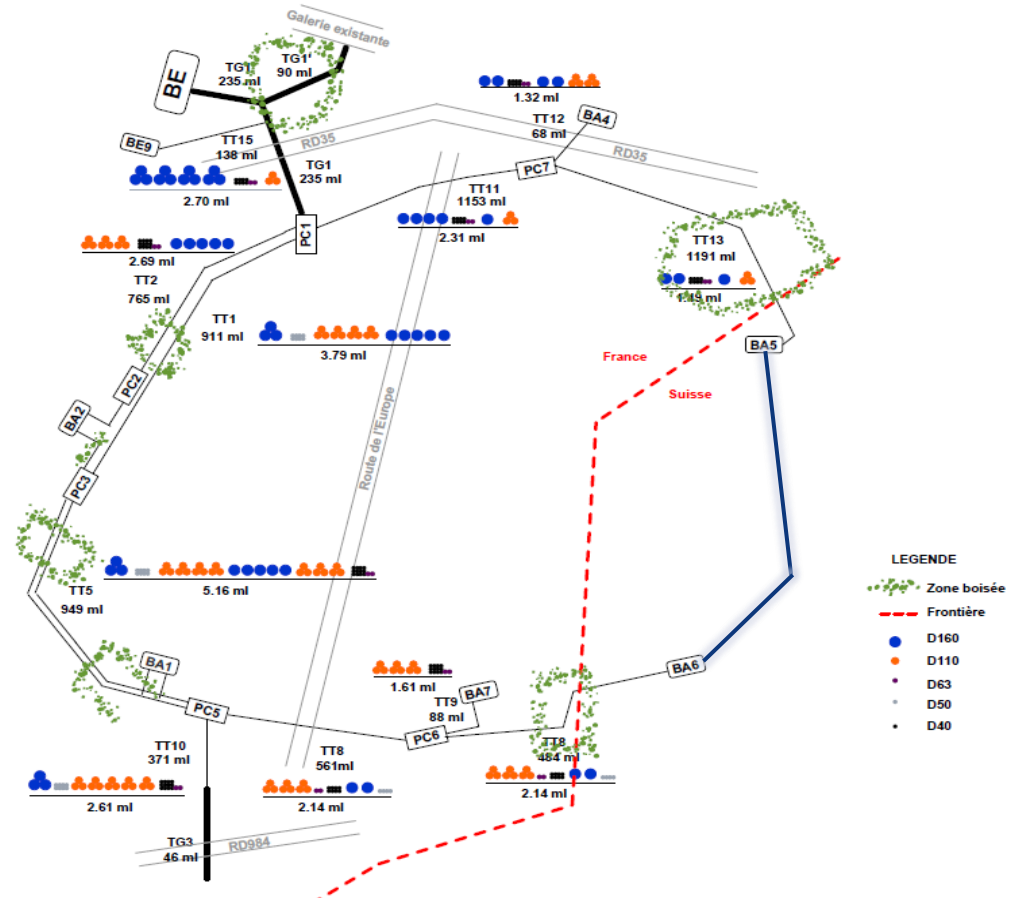
C.RICHARD EN-EL-HT



- Description of installation
- Types of cables
- Types of installation
- Transport, pulling
- Some challenges
- Requirement for pulling

# Description of installations

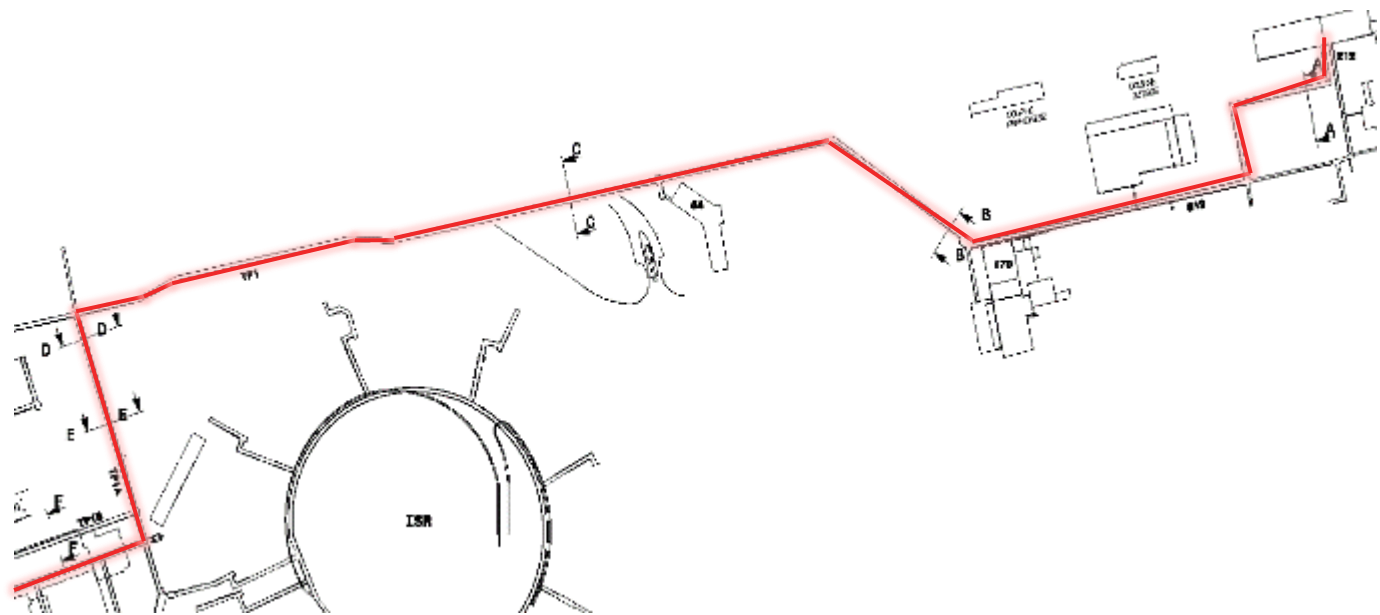
- Consolidation of SPS network
  - Trenches  $\approx 7000$  m
  - Cables installed in **HDPE tubes**
  - Construction of **3** technical galleries  $\approx 300$  m
  - Pulling of power cables 3.3/18/66 kV , control cables and optical fibers  $\approx 120$  km



# Description of installations

- New Meyrin's links between ME59 (B.112) and ME9 (B.212)
  - 4 new power lines
  - 1 power line replaced
  - 700 m each: 13 segments
  - All in technical gallery

ME59  
(B112)

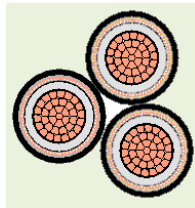
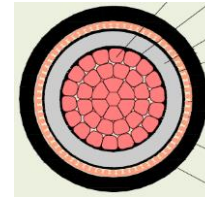


ME9  
(B212)

# Type of cables

- 1x400 mm<sup>2</sup> Cu 12 kV

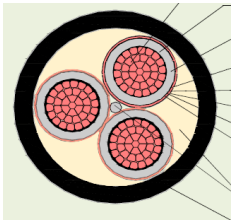
- 5 kg/m
- 46 mm in diameter
- Minimum bending radius 690 mm
- Maximum drum dimension: up to 11 t and 2,5 m x 1.4 m



- 3x95 mm<sup>2</sup> Cu 12 kV;

- 4,9 kg/m
- 68 mm in diameter
- Minimum bending radius 800 mm
- Maximum drum dimension: up to 14 t and 3,8 m x 2.3 m

- 3x240 mm<sup>2</sup> Cu 12 kV;



- 14 kg/m
- 90 mm in diameter
- Minimum bending radius 1070 mm
- Maximum drum dimension: up to 19 t and 3,8 m x 2.3 m

- 1x630 mm<sup>2</sup> Al 66 kV;

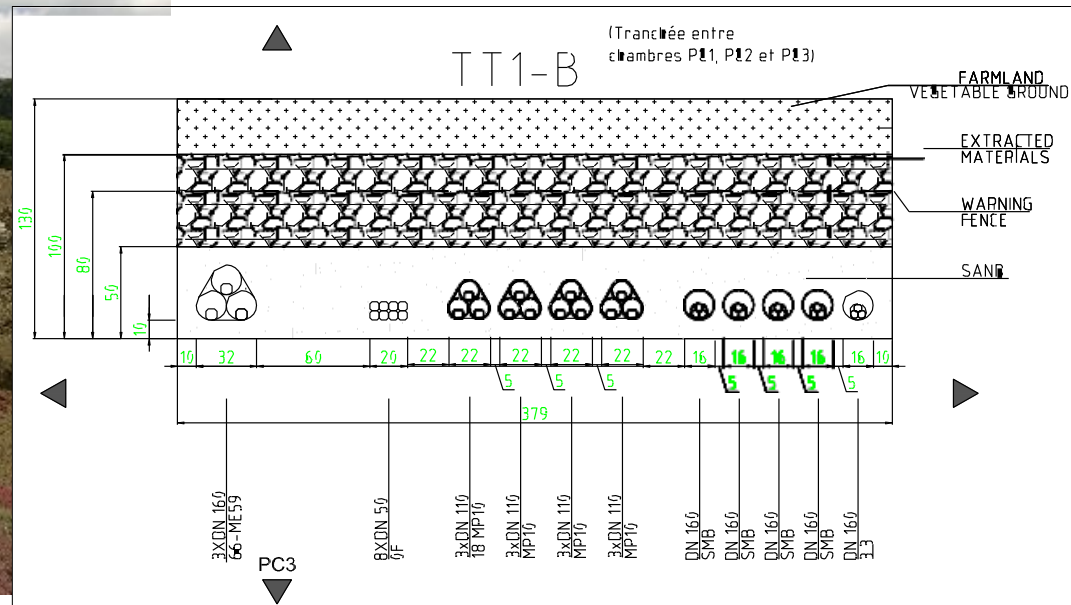
- 5 kg/m
- 61 mm in diameter
- Minimum bending radius 915 mm
- Maximum drum dimension: up to 6 t and 2,8 m x 1.6 m



# Type of Installation

- Installation in HDPE tubes (buried)

- Pulling strength could reach very high value ( 4000 daN) in case of large number of turns and long distance
- HDPE tubes to avoid damages on cables during pulling and to limit friction



# Type of installation

- Installation in technical gallery
  - Pulling strength limited to the weight of the cable (no friction)
  - Large number of equipment required to guide cables





# Transport, pulling

- Transport has been arranged by our supplier of cables
- Specific transport for large and heavy drums
- Crane needed to unload drums and to manipulate
- Equipment to put in place the drum for pulling





# Transport, pulling

- Pulling possible in any free area
- Electric winch to pull inside a building or a technical gallery
- Installation to guide cables



# Transport, pulling

- Material available

- Rolling equipment
- Pneumatic pusher



- Experience with 6 different companies

# Some challenges

- Length of segment up to 2500 m (induced by the limitation of joint required);
- Weight of drums up to 19 t;
- Mixed of pulling between HDPE and technical gallery;
- Installation in crowded environment with limited access.

# Requirement for pulling

- Clear definition of the cables path (length, number and type of turns, buried or not);
- Maximum admissible pulling strength on the cables (defined by the manufacturer);
- Connection on extremity to pull the cable;
- Minimum bending radius of cables.
- Size and weight of cables to determine dedicated equipment and number.
- Previous visit before installation of equipment and after installation before pulling

# Questions?



Thanks for your attention