

## EXPERIENCE WITH DEVELOPING AND INSTALLING OF A THREE CORE 150 KV POWER CABLE

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### Introduction

In a heavily urbanized city as Amsterdam, the Netherlands, it is very difficult to obtain a new cable route. Not only because of the fact that the buried infrastructure is very dense but also the impact of the civil works on the normal life can be substantial.

The 150kV grid of Amsterdam consists for a main part out of gas pressure pipe cables. In recent past the discussion started concerning the current rating of those cables. Some cables were de-rated by more than 20% due to technical/thermal reasons. Further it has to be taken in account that a considerable load growth is expected in this area and as a consequence the cables will be overloaded in the coming years.

Above was the basis of developing and installing a three core 150kV XLPE power cable with re-usage of the existing steel pipe of the gas pressure cable. This cable is known as a 150kV CityCable. After successfully type testing the cable was produced for installing in a pilot project in Amsterdam. After installation, the cable passed the after laying test in Q4 of 2010 and will be in service in the beginning of 2011.

### Development

The CityCable itself is a triple phase cable with each phase having its own isolation coordination. The CityCable is ideal for installing in existing conduits such as steel pipes, water pipes, tunnels and PE ducts. It has to be mentioned that this will be the first 150kV CityCable to be installed worldwide and was the basis for further development of a 220kV three core XLPE cable.

Maximising the cross-section of the conductor with respect to the existing steel pipe leads to field strengths of the 220kV voltage class. For the voltage class 150kV with operating field strengths at 220kV no standard was completely matching. With use of both IEC and NEN standards a type test was developed for cable and accessories.

### Installation

During this project experience was gained with respect to pulling out of the old gas pressure cable, cleaning and re-calibrating the steel pipe. On installing the CityCable a lot was learned by first experience of gyroscopically locating the precise position of the steel tube, the pulling forces on the cable and pulling wire, joint bay construction. The learning process from the practical side of the project will pay off in future CityCable projects.

### Operations

Within the triple phase arrangement of the cable a OF is installed for performing distributed temperature measurements. Since this type of cable is new to the grid it is from utmost importance to study and verify the thermal behaviour of the CityCable installed in a steel pipe. After energising the cable in the beginning of 2011 the load and temperature profiles will be monitored and evaluated in order to obtain the highest reliability of the cable.

In the final paper the development, practical installation aspects and operations performance of the CityCable will be presented.