vivapolis
Powered by French creativity

HESOP, INVERTER SOLUTION FOR LONDON UNDERGROUND

IMPROVING THE ENERGY EFFICIENCY OF THE VICTORIA LINE

In 2013, Alstom was chosen by UKPNS to supply Hesop, its advanced reversible power substation, to London Underground (United Kingdom). Configured to operate in inverting mode, Hesop is installed at the Cloudesley Road substation, on the Victoria Line, and has been in commercial service since March 2015.

INNOVATIONS

▶ Hesop is a power-supply solution designed to deliver the best energy efficiency for rail DC systems (tramway, metro and suburban networks). Hesop's novelty lies in its specific single converter which optimizes the power required for traction and captures more than 99% of the recoverable energy during a train's braking phase. The energy can then be redistributed back into the HV network for re-use locally or remotely. Hesop also reduces the amount of heat generated by trains, a notable problem in London's deep small-profile tunnels. Cooling and ventilation equipment along the network can therefore be further optimized and on-board train brake resistors can be removed.

STAKEHOLDERS

▶ **Alstom**
(French rail transport equipment manufacturer)
In charge of the design, supply, installation supervision, commissioning and 3-month observation and performance measurement of the inverter solution (Hesop).

▶ **UK Power Networks**
(UKPNS – distribution network operator for London and South-East England)
In charge of modifications of existing substation and installation of the inverter solution.

▶ **London Underground Limited**
(LUL – London metro network operator)
In charge of operating the inverter solution.

KEY DATA

- **Hesop 630V/780kW** (peak power: 3,5 MW)
- **IGBT technology**
- **Natural Air cooling**
- **Start of service: March 2015**
- **Line length: 21 km in tunnel**
- **Number of passenger stations: 16**

Liberté • Égalité • Fraternité
RÉPUBLIQUE FRANÇAISE
MINISTÈRE DE L'ENVIRONNEMENT, DE L'ÉNERGIE ET DE LA MER
MINISTÈRE DU LOGEMENT ET DE L'HABITAT DURABLE

IMPLEMENTATION

▶ The contract was signed in April 2013 and the installation of Hesop took place the following year, in June 2014. The main worry of the operator was that a new technology might have caused compatibility issues with existing line equipment and disrupted the operation. This hurdle was cleared by a solid safety case listing all behaviours expected from the unit vis-à-vis its environment.

▶ **Milestones:**

- Contract signature: April 2013
- Installation: June 2014
- Night tests: End 2014
- Start of commercial service: March 2015

Christine Darragon, Infrastructure Innovation & Competititiveness Director, Alstom

"Hesop has been recognized by several networks worldwide including London as a solution offering numerous benefits in terms of energy efficiency and traction optimization."

RESULTS

/// Energy recovered **in line with modelling predictions**.

/// **Recovers more than 800kWh/day** (on average): equivalent energy amount to **power 2 medium-sized passenger stations**.

/// **50% more recovery** on weekends vs. weekdays.

/// London Underground **awarded prize** from both **Railway Industry Awards** and **Transport Times** in the UK for Hesop inverter installation.

FINANCIAL DIMENSION OF THE OPERATION

/// For London Underground, energy has become a key consideration during power system design. The inverter solution is now part of their future line upgrade plans.

- → Over 99% recovery of braking energy
- → Energy recovery: 800 kWh daily
- → Energy re-used by station equipment or returned to the grid

ALSTOM

Contact:
Christine DARRAGON, Infrastructure Innovation & Competititiveness Director, christine.darragon@alstom.com