Study Committee B1

Insulated Cables

gnosys

www.gnosysglobal.com

# Integrated Development and Assessment of New Thermoplastic High Voltage Power Cable Systems

Mike FAIRHURST (1), Ankit GORWADIA (1), Gary STEVENS*(2), Ben PHILPOT (2), Janet THOMAS (2), James PILGRIM (3), Paul LEWIN (3)

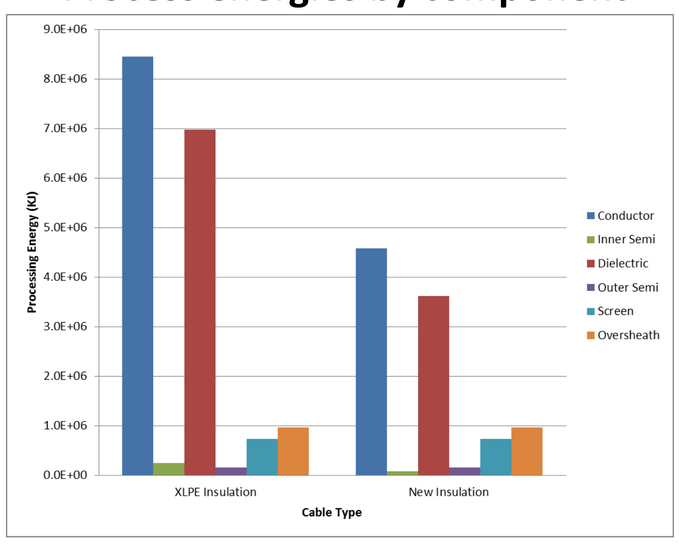
1-National Grid PLC, 3-ECS, University of Southampton, 2-Gnosys Global Ltd, 17-18 Frederick Sanger Rd, Surrey Research Park, Guildford, GU2 7YD, UK

## Introduction

European policy drivers exist to improve the design and deployment of power cable systems in transmission networks, particularly the whole life performance of future low carbon networks.

A new high temperature and recyclable thermoplastic blend HV power cable has been proposed and a new approach has been developed to carry out integrated assessment of multiple performance factors.

**Process energies by component**

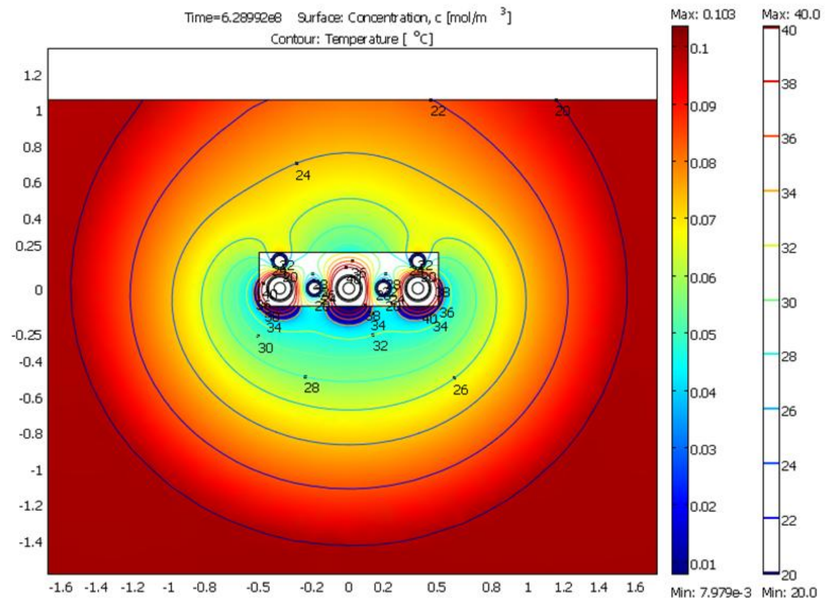


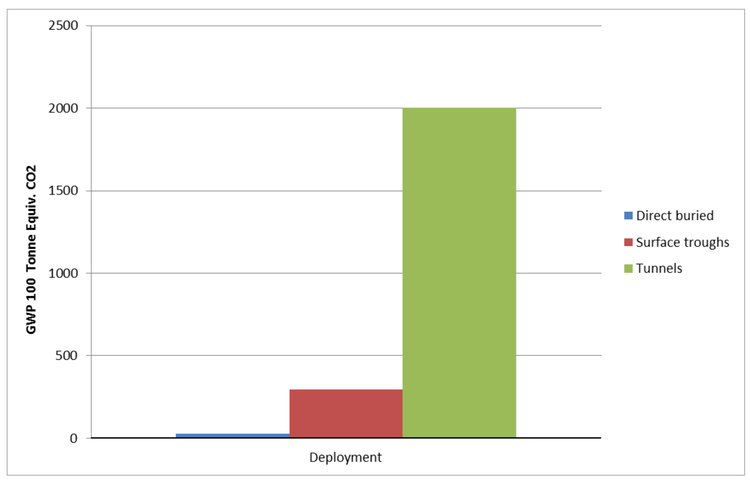

## Lower Manufacturing Costs

- Manufacturing process energy and time is substantially lower for the new cable design.
- The lower process energy of the new thermoplastic cable is due to a lower net energy required for processing and the absence of the crosslinking and degassing process.

## Post Fault Operation Constraints

- Constraints can be relaxed during post-fault operation from 20 minutes with a conventional cable to 6 or 24 hours with the thermoplastic cable.
- System emergency and constraint studies carried out by National Grid concluded that if a conventional double circuit was replaced with a single thermoplastic based circuit and operated to 90°C prior to the fault, the 6hr emergency rating would help to reduce the system costs in the event of a fault.



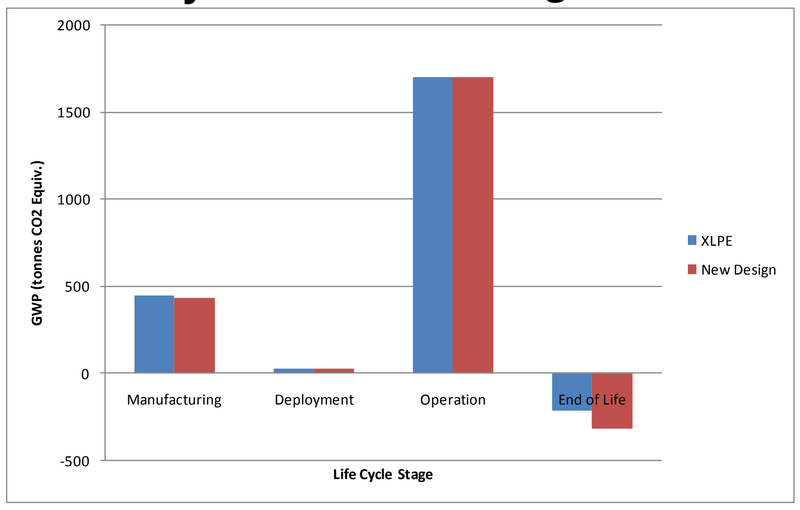

## Deployment Options

- The difference in GWP of tunnel deployment and the other deployment scenarios is a factor of 8 relative to surface troughs and 78 relative to direct buried.
- The re-use of tunnels after a circuit is decommissioned dramatically reduces its whole life cost and environmental burden.

## Fully Recyclable – Lower Life Cycle Impact

- The new cable design allows more efficient manufacture with a reduction in Global Warming Potential and cost in cable manufacturing.
- Resource and carbon credits are gained for the recovery of copper, polymer and other recoverable cable components.
- Overall carbon saving of the new cable was 125 $tCO_2$ per km across the life (60 years) compared to XLPE.

**Life Cycle Global Warming Potential**




* Manufacturing includes embedded burdens from raw materials