



Energy Materials

*Energy Materials – SRA
Energy Transmission, Distribution & Storage*

Distribution

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Presentation draws upon a study performed during
2007 and reported in:

Materials UK Energy Review 2007

Report 5: Energy Transmission, Distribution and
Storage

Summary

1. Today's landscape
2. Opportunities and challenges for tomorrow
3. Specific issues

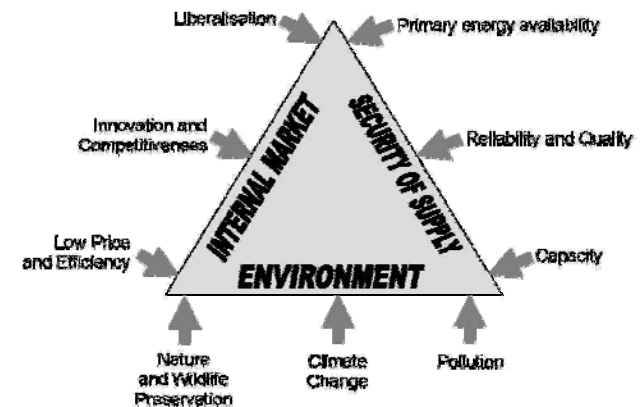
Today's Landscape

- UK's energy distribution networks are considered mature and essentially take energy from the transmission system and provide it to customers, i.e. one-way flow
 - UK generates 40 GW of power, with peak of ~ 60 GW
 - Transmission network: 25,000 km of overhead cables
 - Distribution network: ~ 800,000 km of lower voltage cabling
 - Transmission & Distribution losses ~ 2% and ~6%, respectively
 - Main losses are in energy transformation and in cable/line heating
 - Losses equate to 3.2 GW of base load - i.e. equivalent to about 8 million tonnes of CO₂

Today's Landscape

- Globalisation of the energy supply equipment market
- Effect of globalisation on UK knowledge profile
- Effect of age profile on sustainability of UK knowledge

1. Power Quality
2. Reliability
3. Affordability
4. Impact on the Environment (e.g. carbon footprint and Eco design)
5. Sustainability



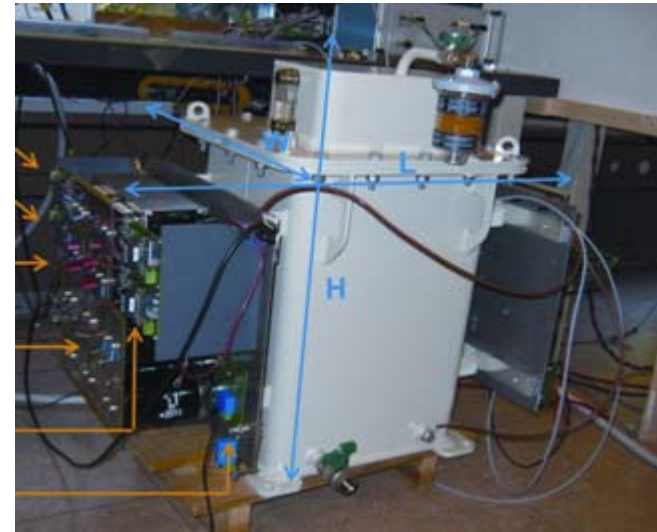
- **Smart Grid Technologies**

- Information Technology led
- User centric approach
- Provides opportunity for higher levels of control
- Provides opportunity for real-time pricing, leading to reduction in peak and smoothing of demand.
- Potential delay need for investment in networks to cope with increasing demand
- Supports growth of distributed and micro generation
- Manages two-way flow in distribution system and islanding
- Possible route for affordable and valued introduction of energy storage in the electricity network



Reducing Energy Losses

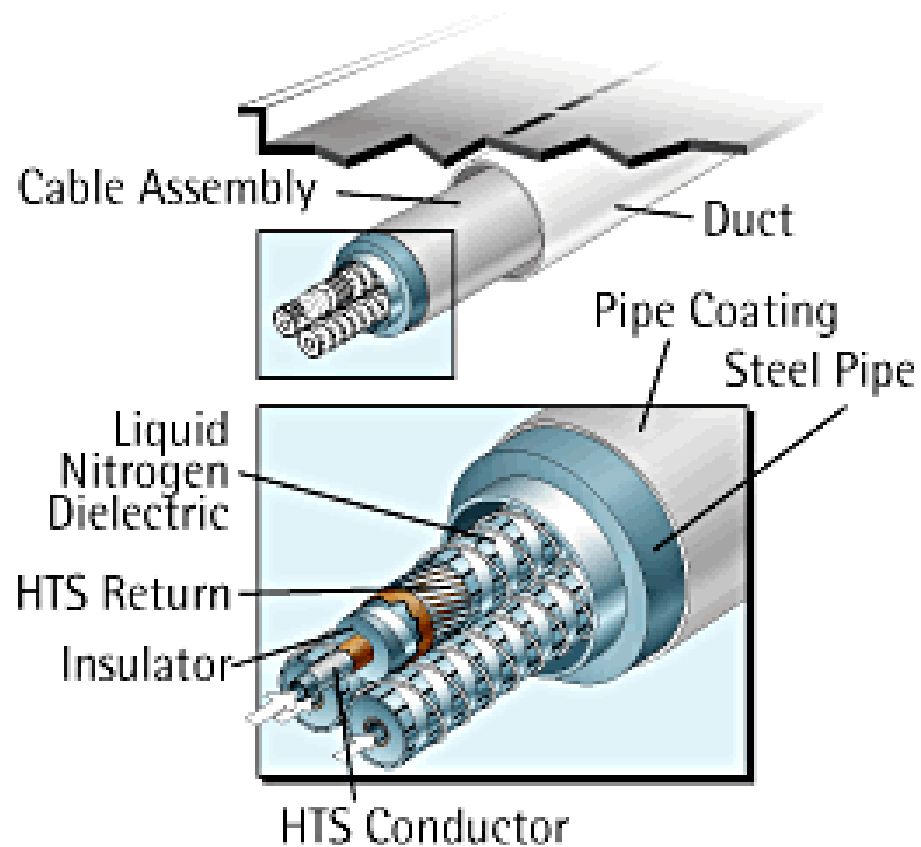
- Energy Transformation
 - Development and application of amorphous core steels
 - Advanced power converters



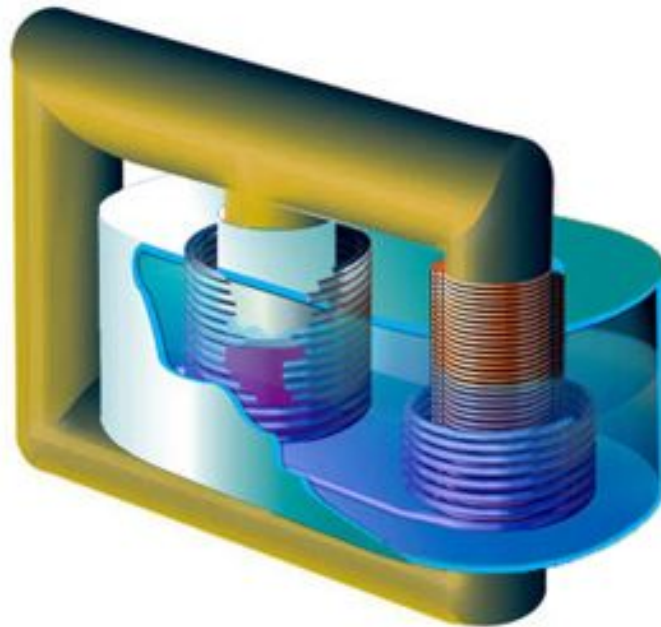
UNIFLEX-PM: Power converter, with high frequency transformer component

Reducing Energy Losses

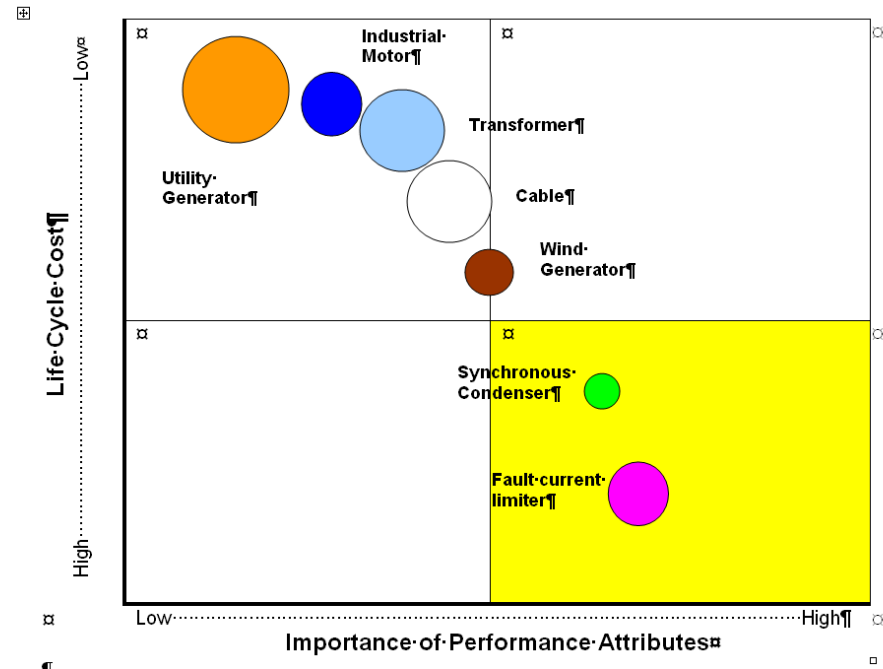
- Power supply
 - Lower / zero loss cables



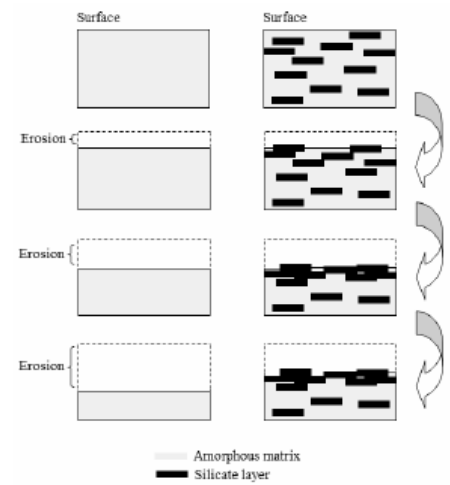
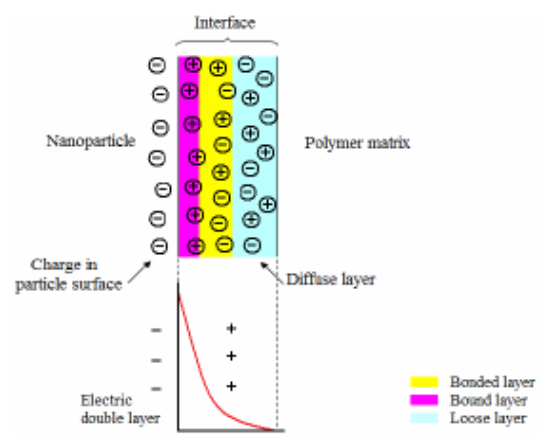
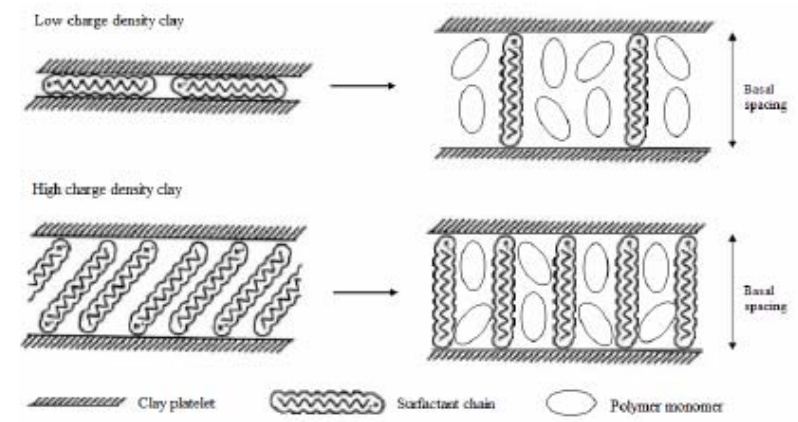
- Superconductivity



SLIM FORMER: Innovative, hybrid device with fault current limitation function



- Multi/nano scale technology



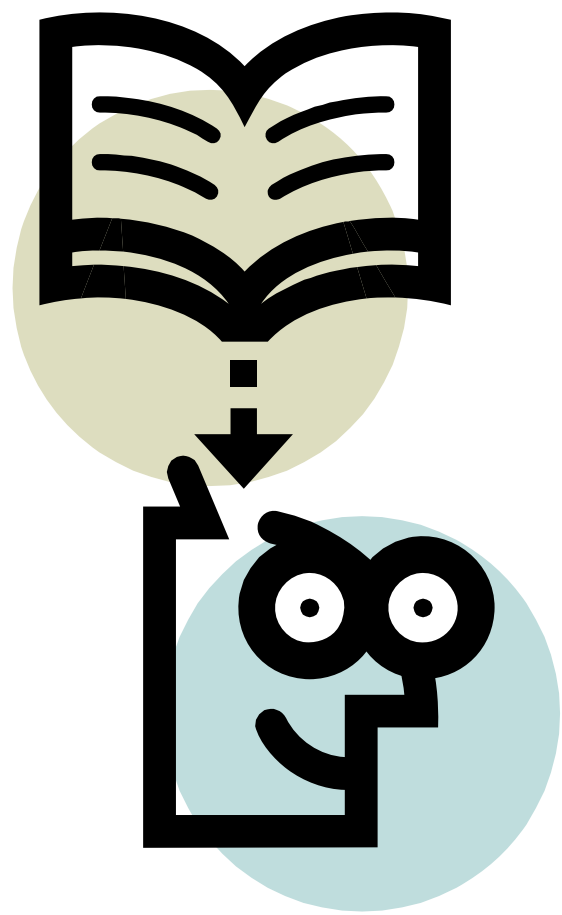
Eco design



Affordable sensors



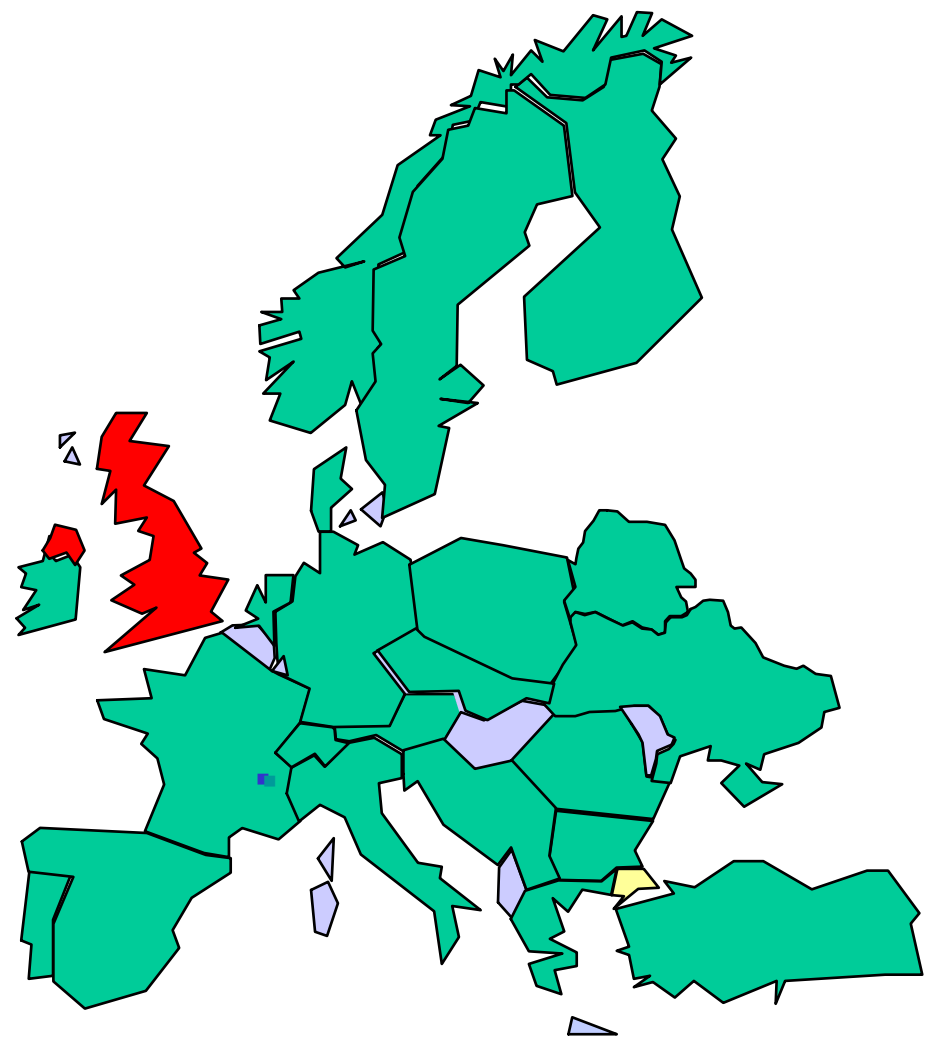
Knowledge & training





International partnership & sustainability of action

Energy Materials



Core Group

Oxford Instruments NanoScience

AREVA T&D

QinetiQ

National Grid

CORUS

MAST Carbon Technology

University of Strathclyde

University College London