Energy Materials – SRA

Energy Transmission, Distribution & Storage

Distribution

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Context

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

Materials UK Energy Review 2007

Report 5: Energy Transmission, Distribution and Storage

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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 CO_2

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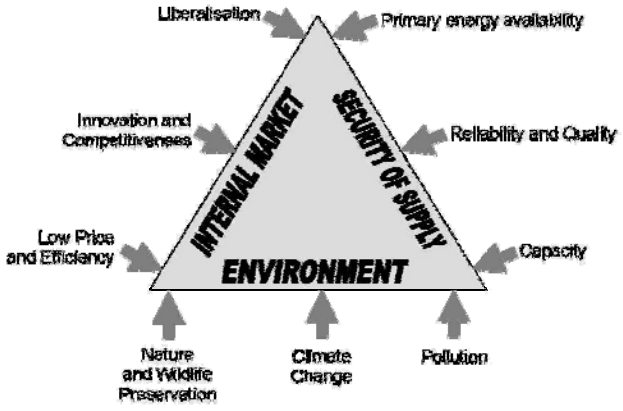
Today's Landscape

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

Opportunities and Challenges for Tomorrow

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

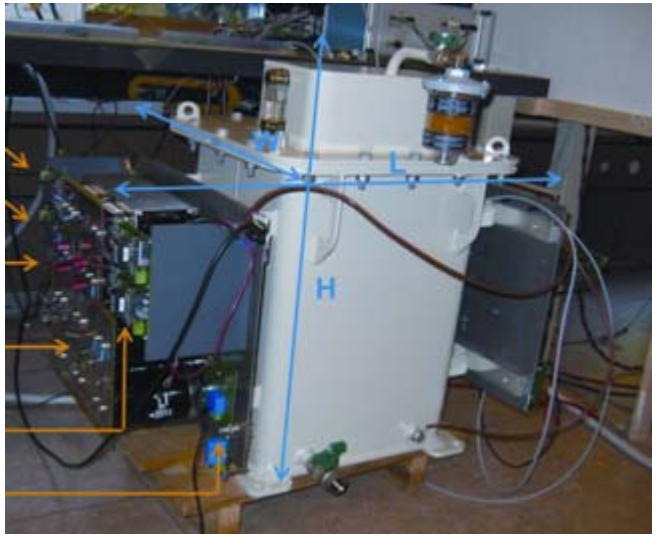


Opportunities and Challenges for Tomorrow

- **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

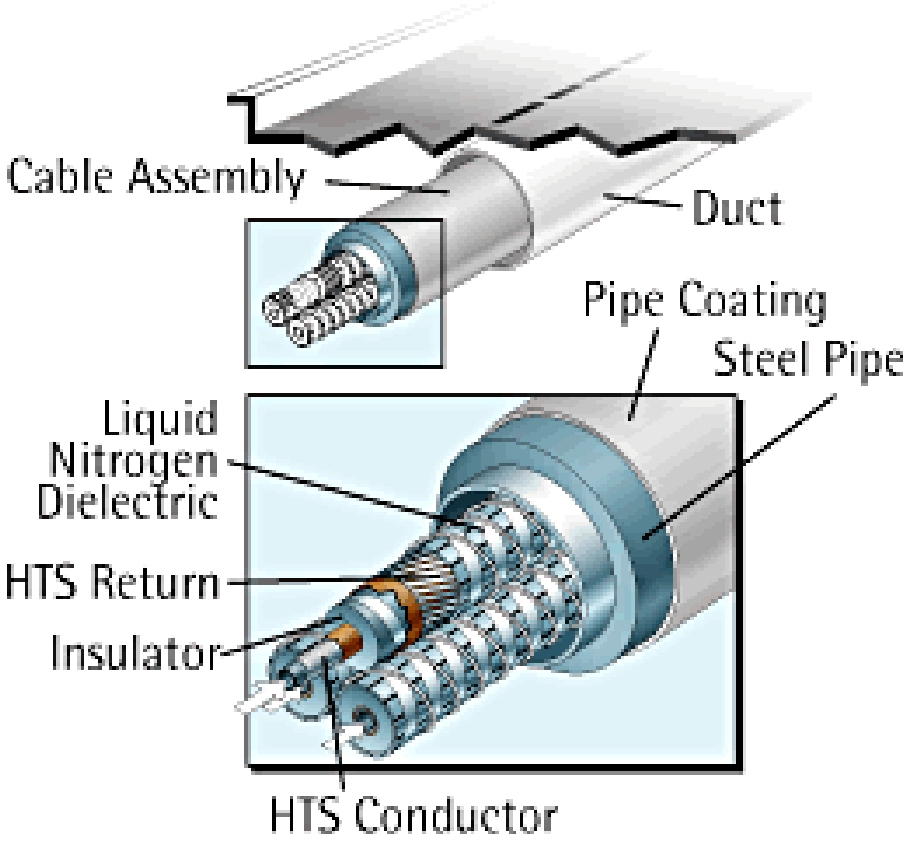
- Energy Transformation
  - Development and application of amorphous core steels
  - Advanced power converters



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

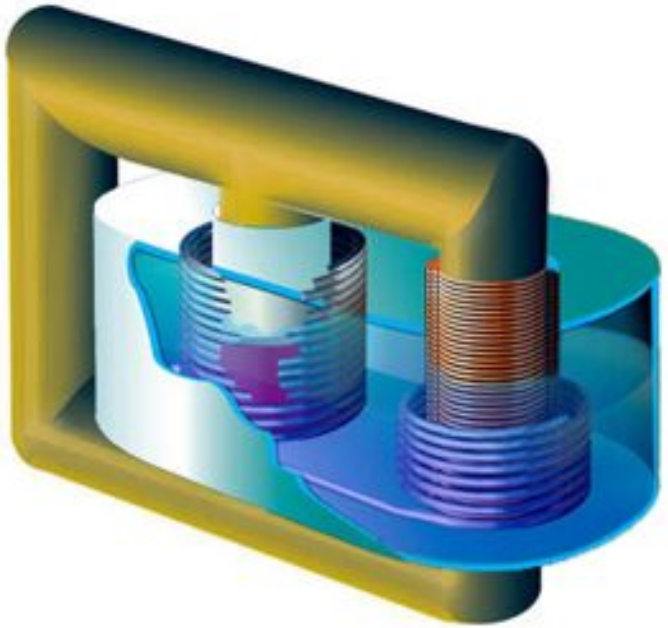
Reducing Energy Losses

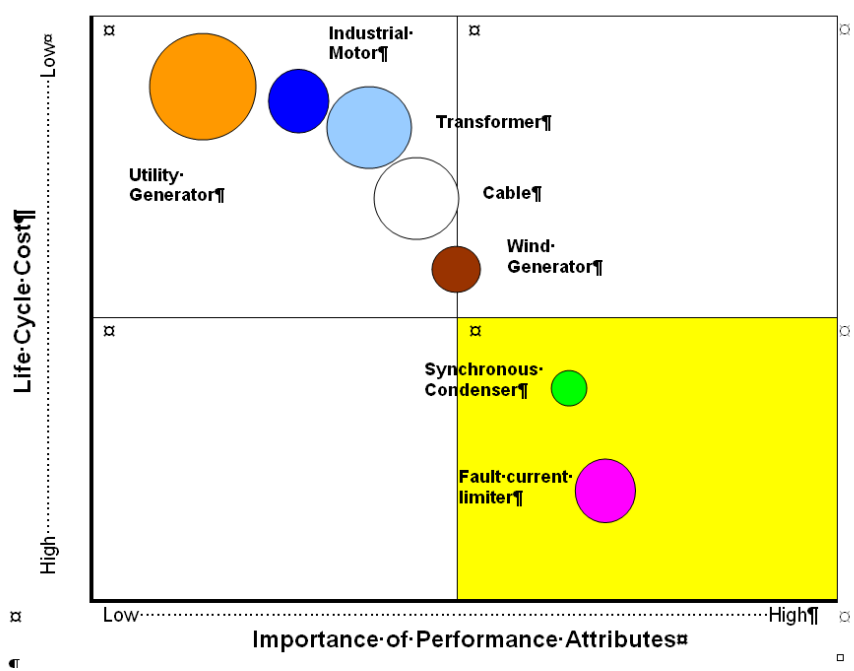
- Power supply
  - Lower / zero loss cables



Management of Fault Currents

- Superconductivity

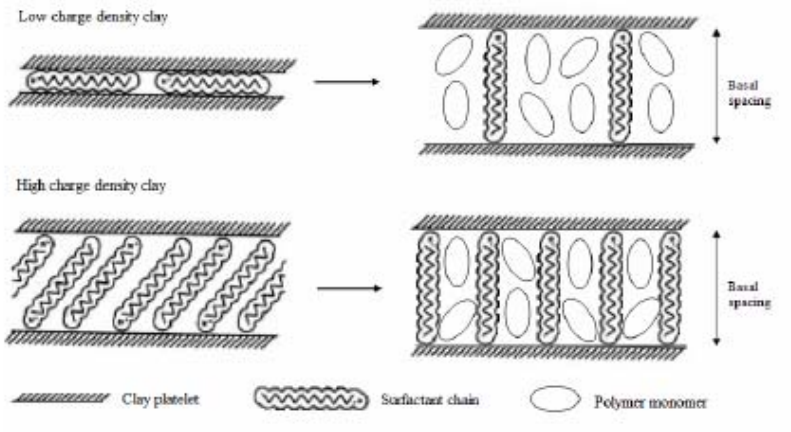


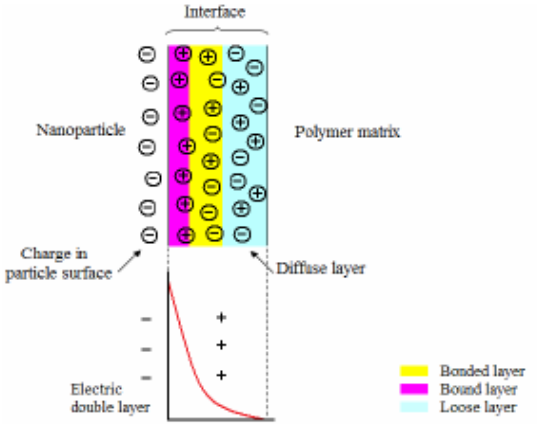


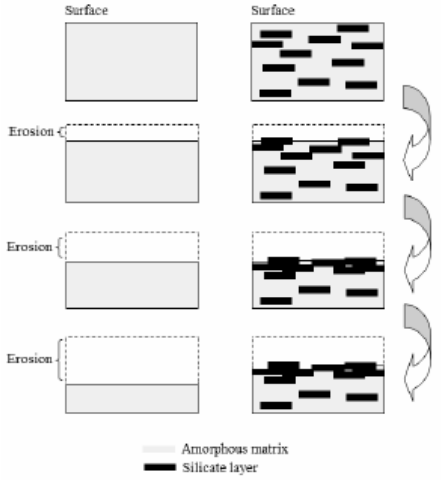
SLIM FORMER: Innovative, hybrid device with fault current limitation function

Performance enhancement and life extension

- Multi/nano scale technology





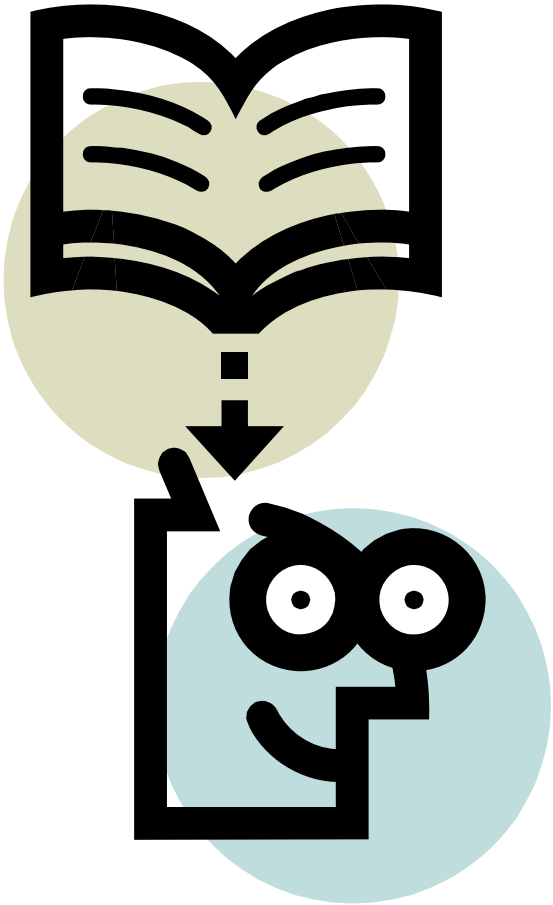


Eco design


ENVIRONMENTAL FRIENDLINESS
ECONOMIC DEVELOPMENT
SOCIAL UNDERSTANDING

Affordable sensors

Knowledge & training



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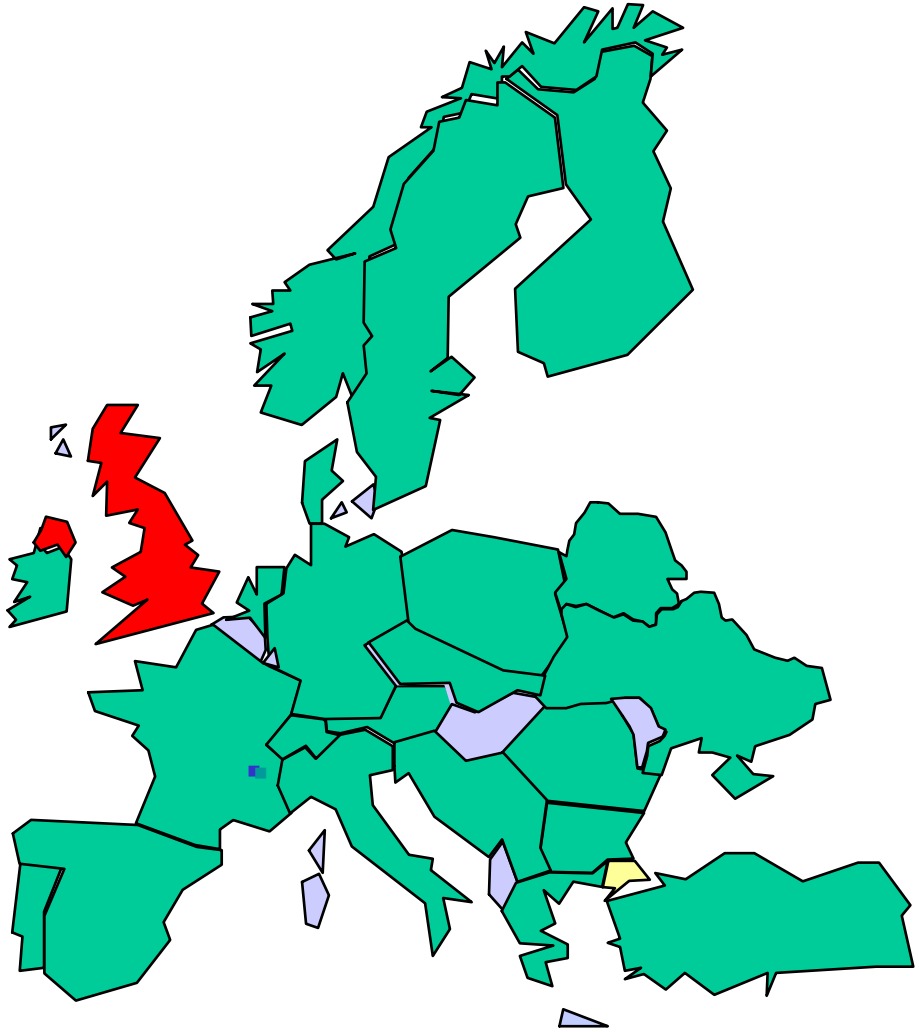
International partnership & sustainability of action



Acknowledgements

Core Group

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