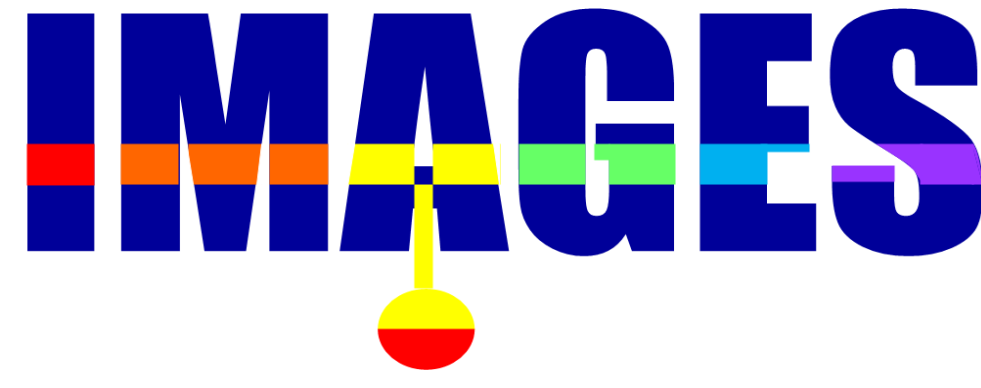
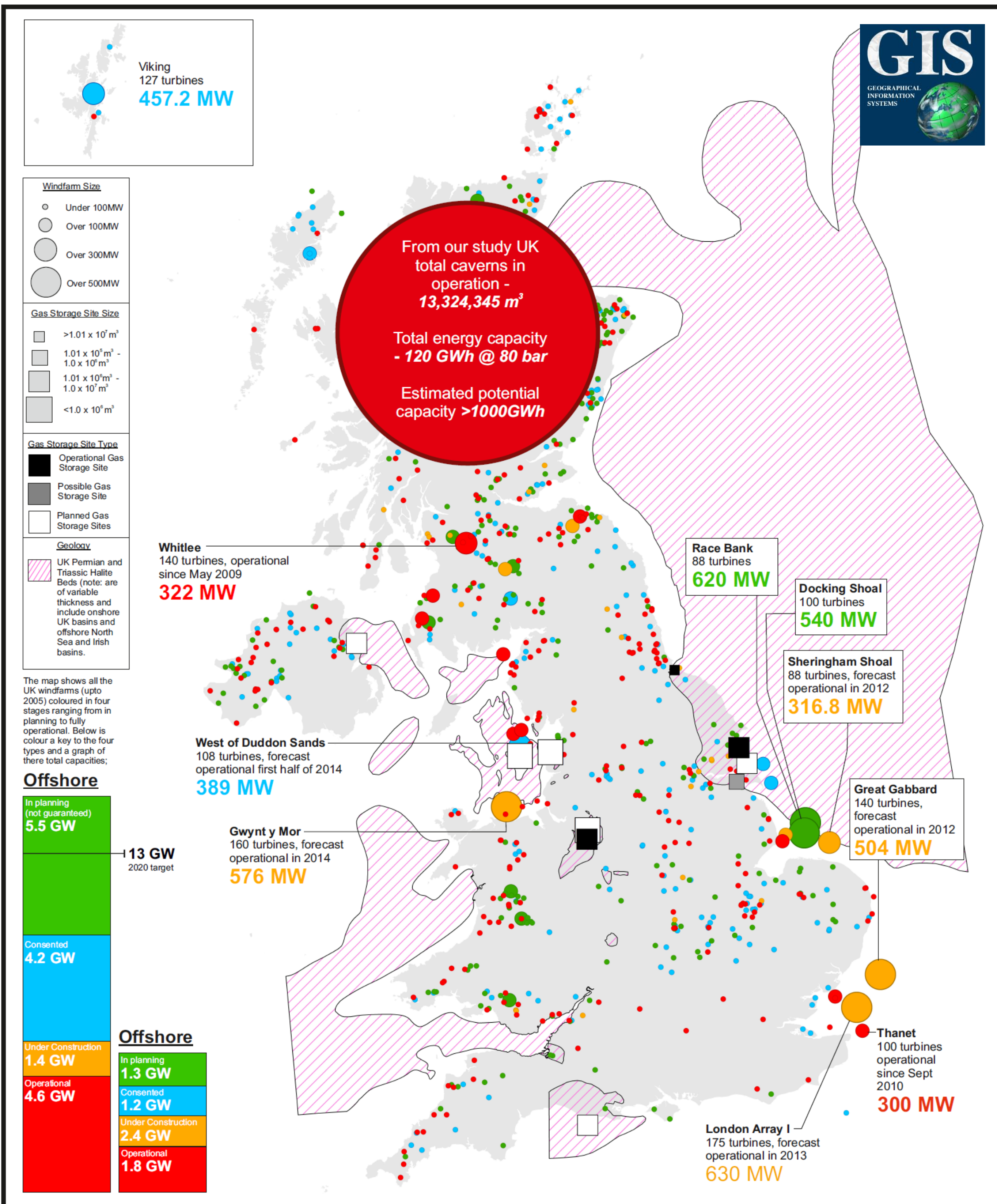


Integrated Market-fit and Affordable Grid-scale Energy Storage

Energy Storage Grand Challenge, EPSRC(EP/K002228/1)

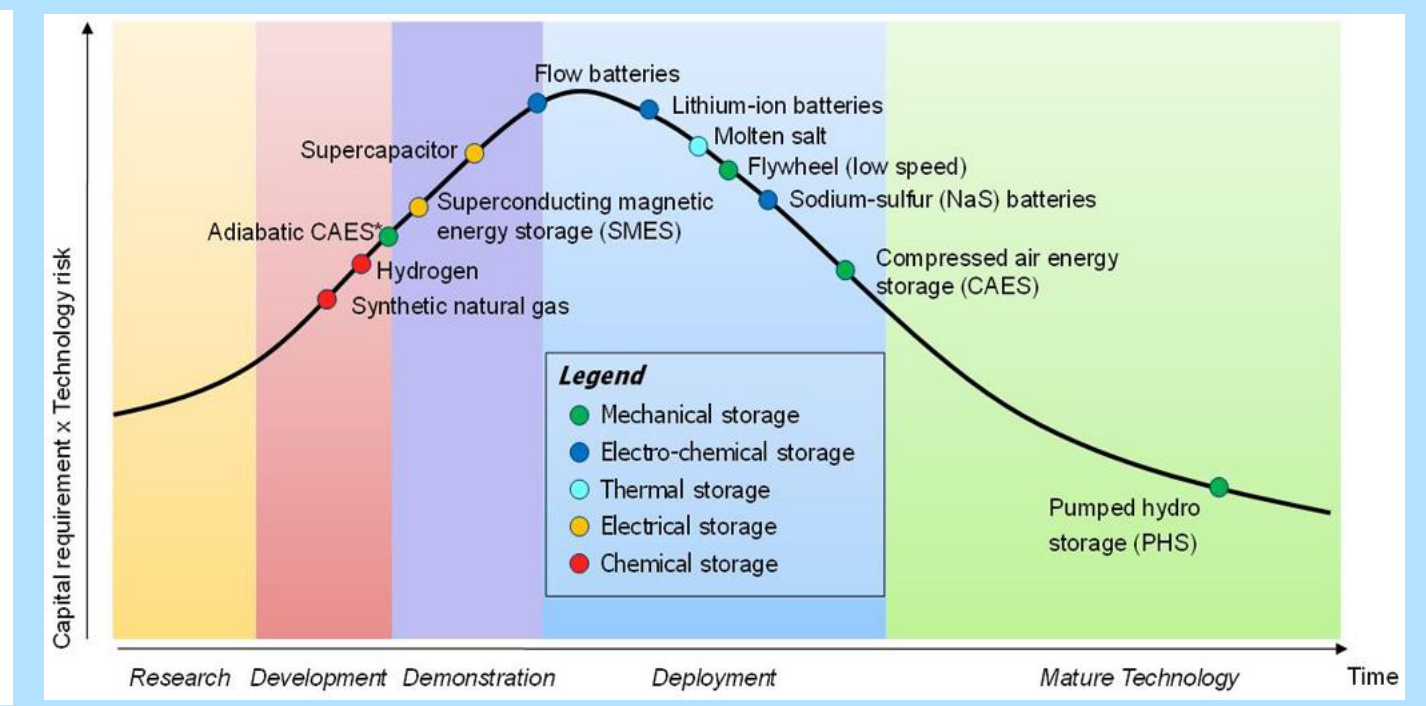
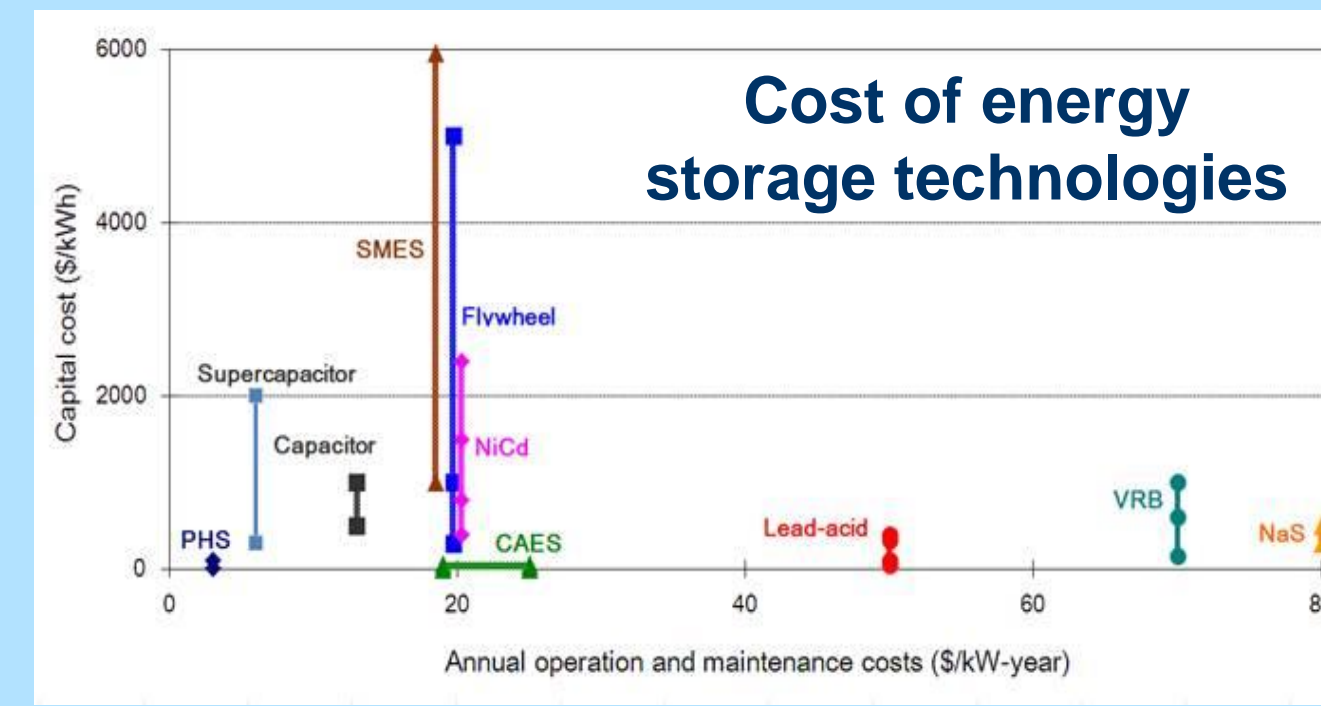


Compressed Air Energy Storage (CAES) - Grid Scale, Fit for the UK



UK Opportunities:

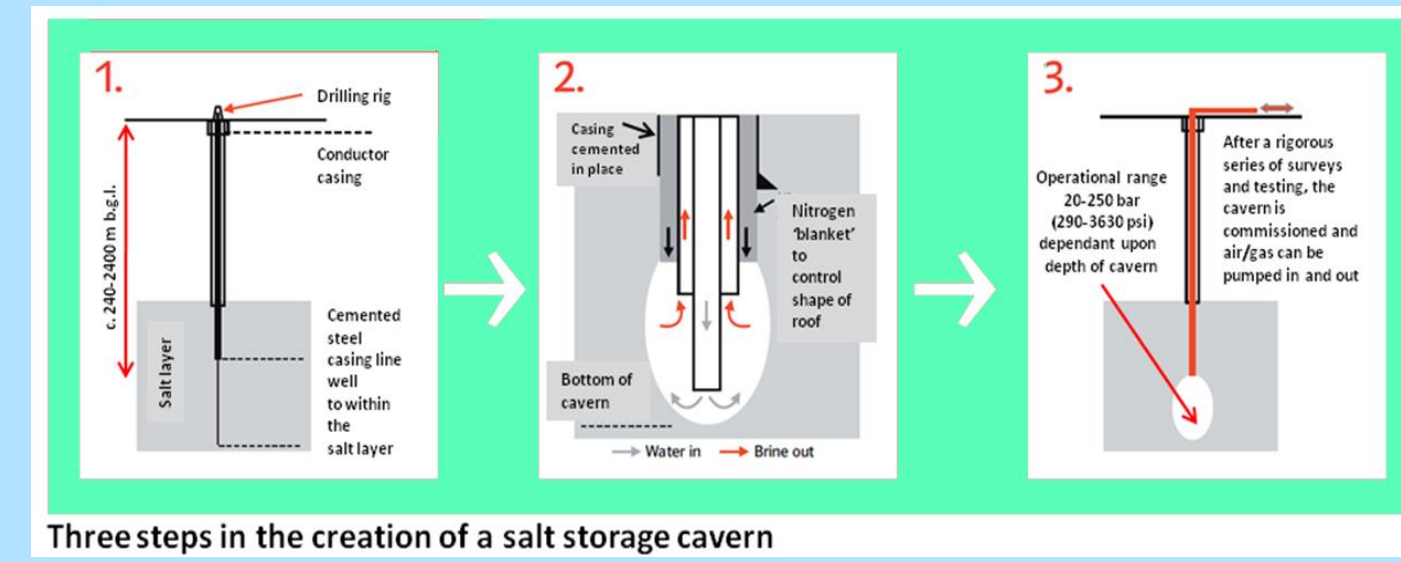
- Rich in underground storage resources
- Lower cost
- Large scale



Research Challenges and Our Work:

Cavern formation

- Cavern structure
- Optimal formation
- Underground resources

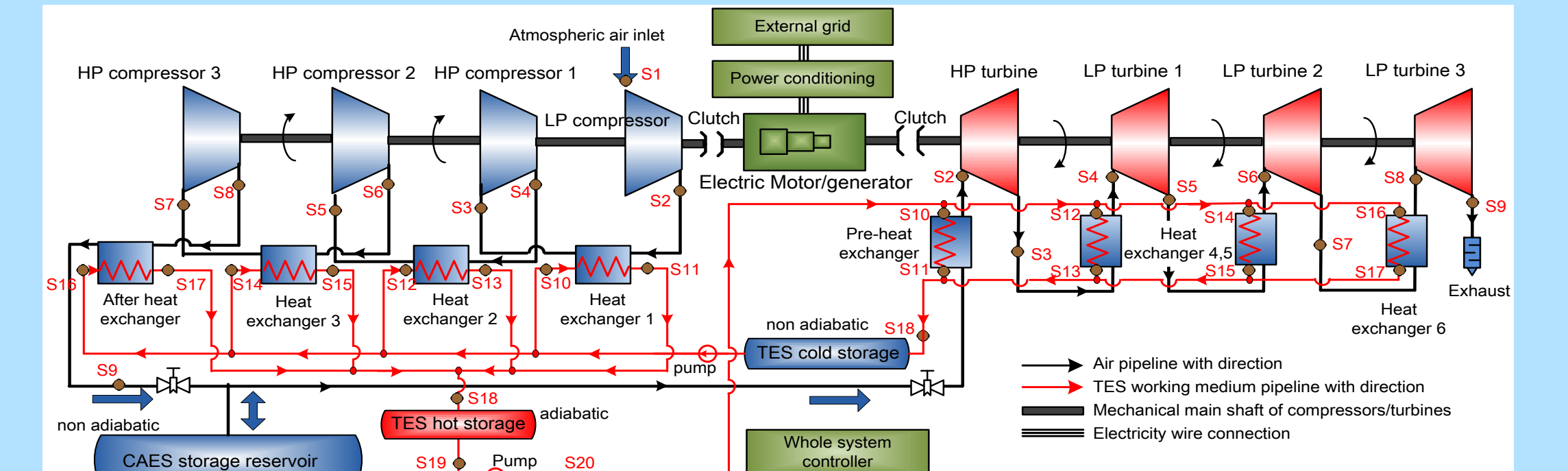


3D Images inside the cavern



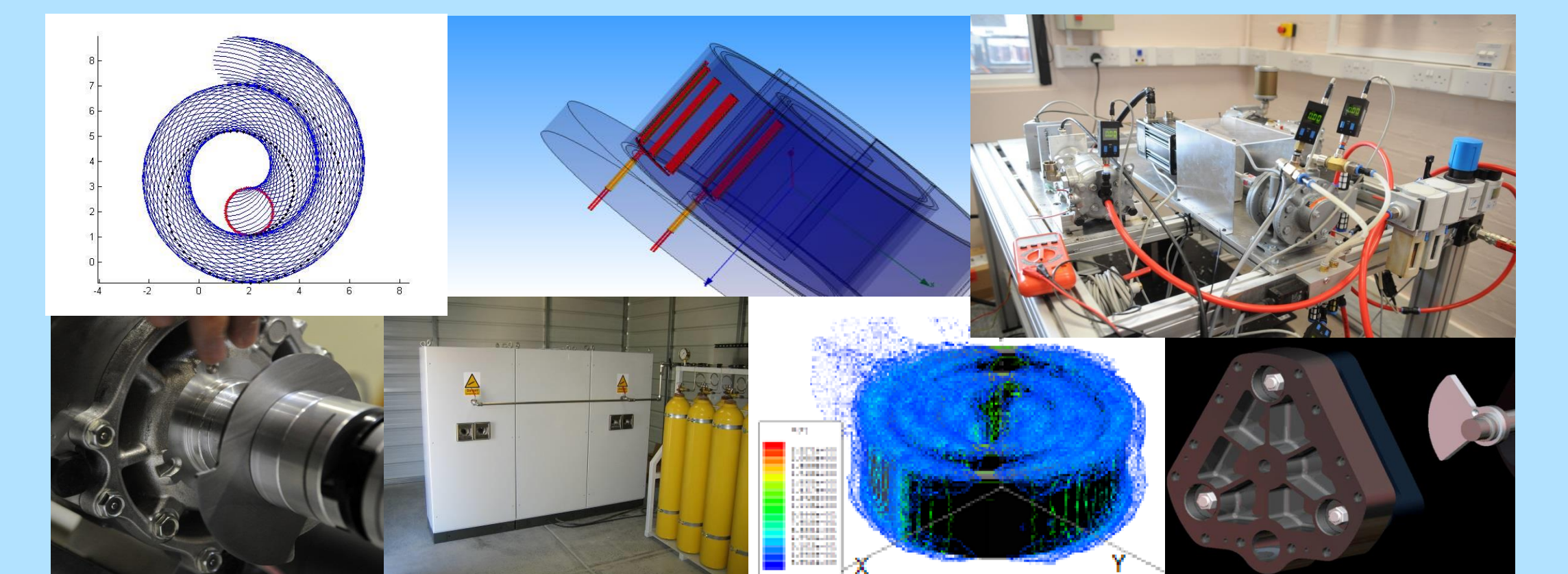
Improving cycle efficiency

- Whole system analysis via modelling and simulation
- Dynamic system modelling and simulation tool for optimal design



Innovation in machinery technologies

- Efficient compressors, turbines - designed and made in the UK
- The first compressed air battery - UK innovation
- Innovative design of air-electricity conversion



Main Achievements:

- Clear picture of UK underground storage resources – affordable grid scale storage
- The world first whole CAES system dynamic analysis tool for optimal design
- Innovative air expander/turbine design – the first compressed air battery in the world
- Feasibility study of thermal power plant integration with HTTS
- Test platform for HTTS material development

Exploitation:

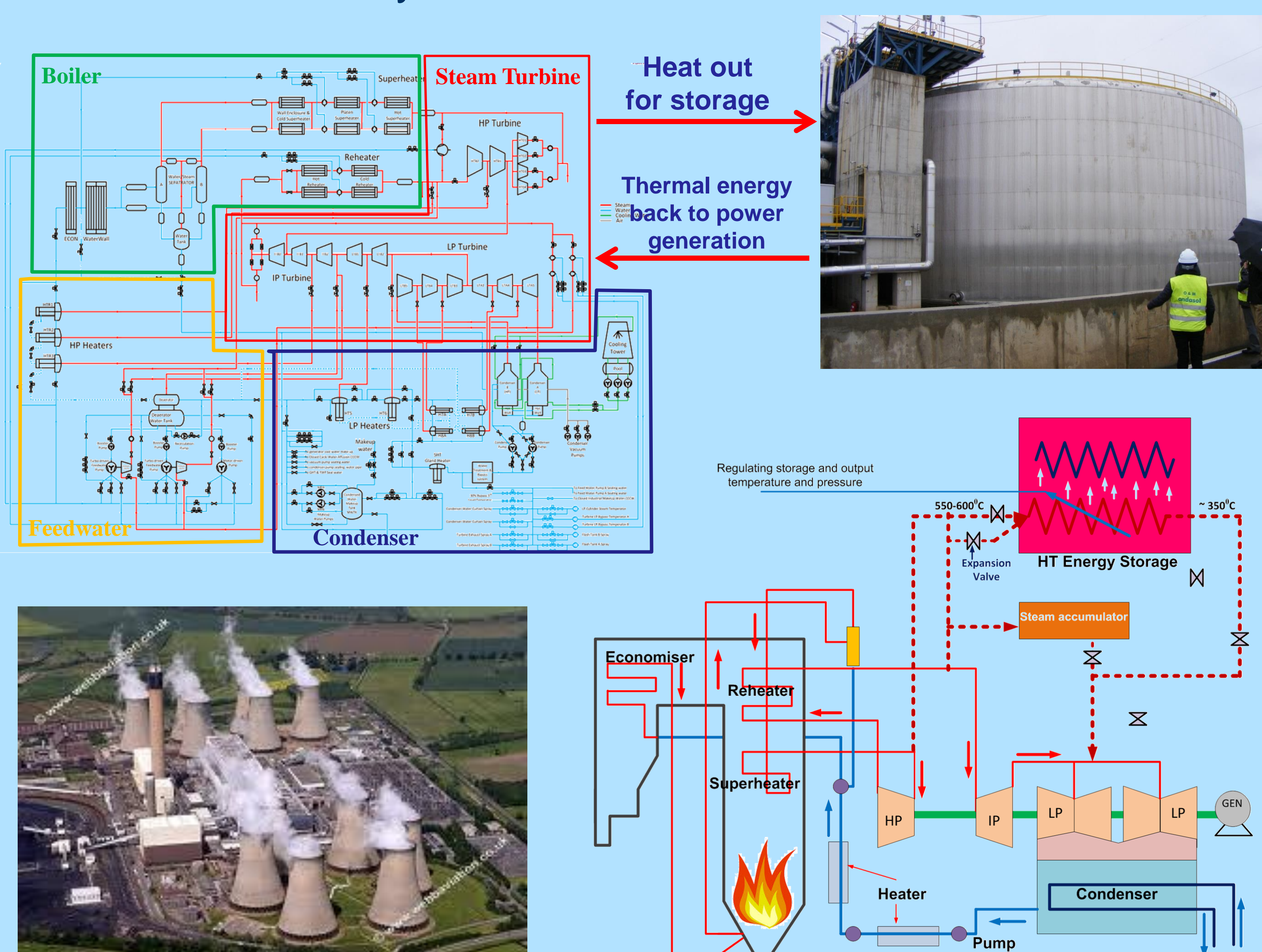
Suggestion - to have major investment for a CAES demonstration plant over 10MWh.

Why the area of CAES and HTT should remain a priority to receive Research Council funding?

- Need for Grid Scale Energy Storage
- Fit for the UK-Storage sites
- Affordability
- Job creation in UK machinery manufacture sectors

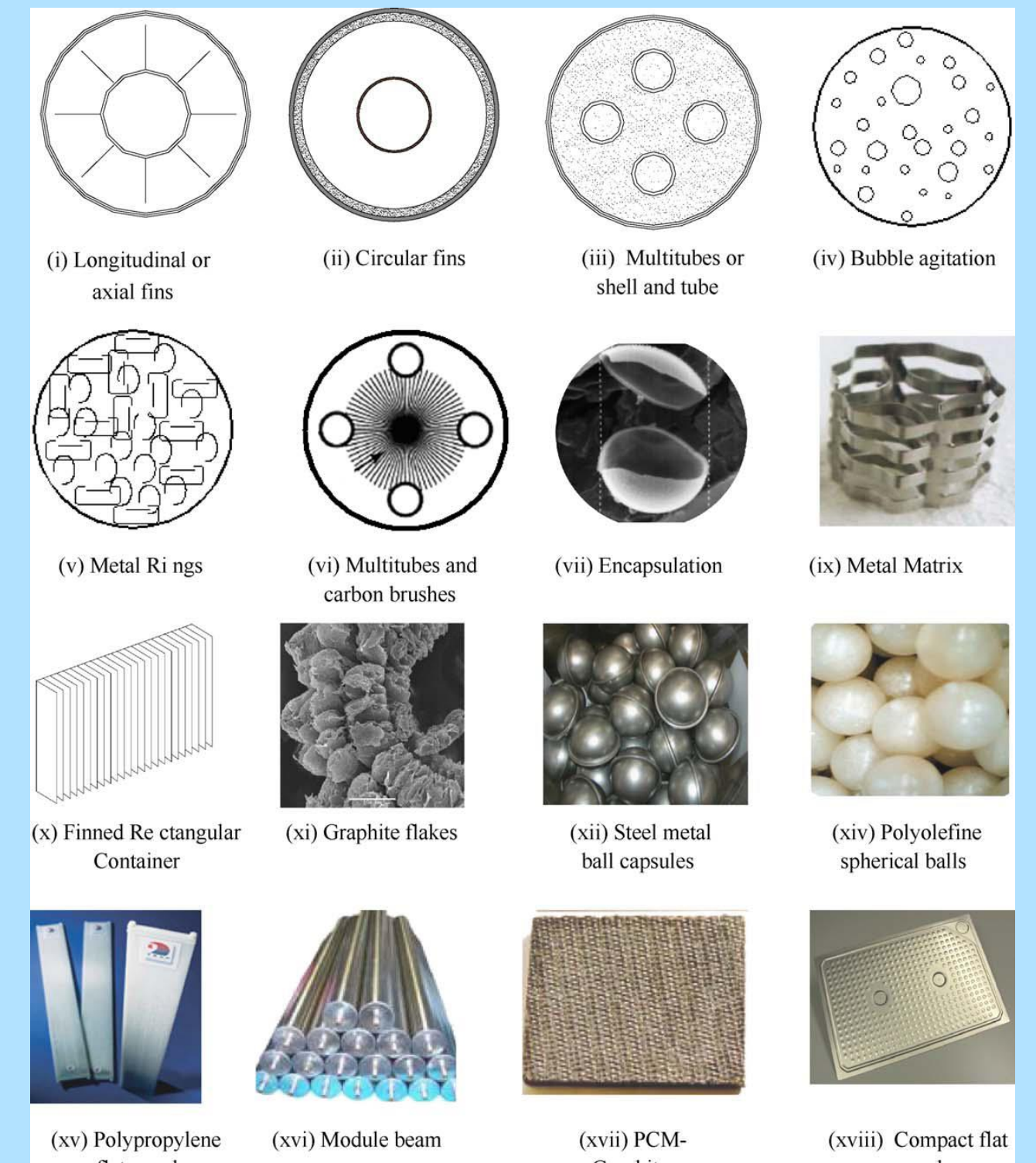
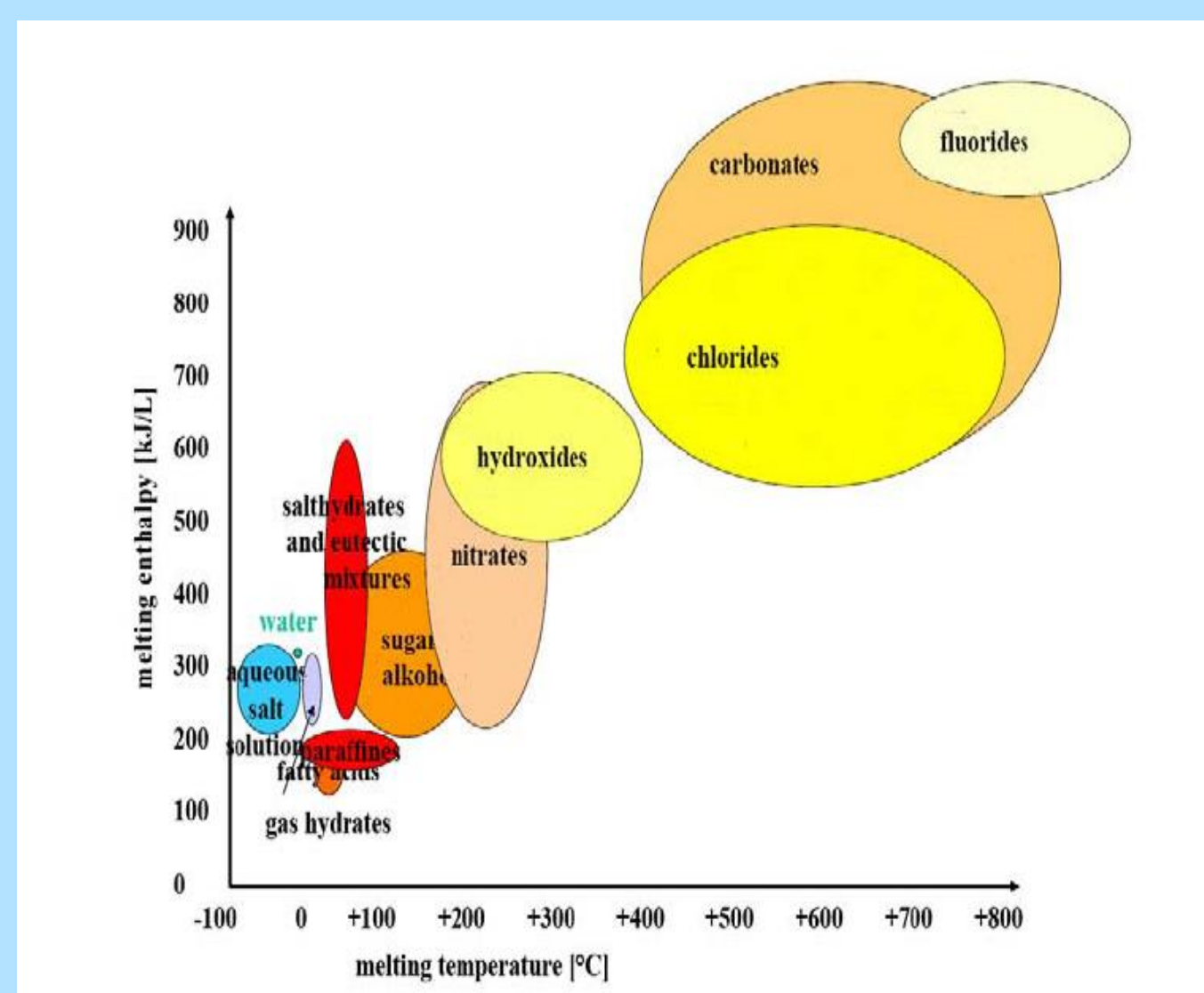
Large Scale High Temperature Thermal Storage (HTTS)

High temperature thermal energy storage for increasing nuclear plant flexibility, improving CCS plant utilisation, efficiency >95% heat-heat to electricity is possible depending on store size and cycle time.

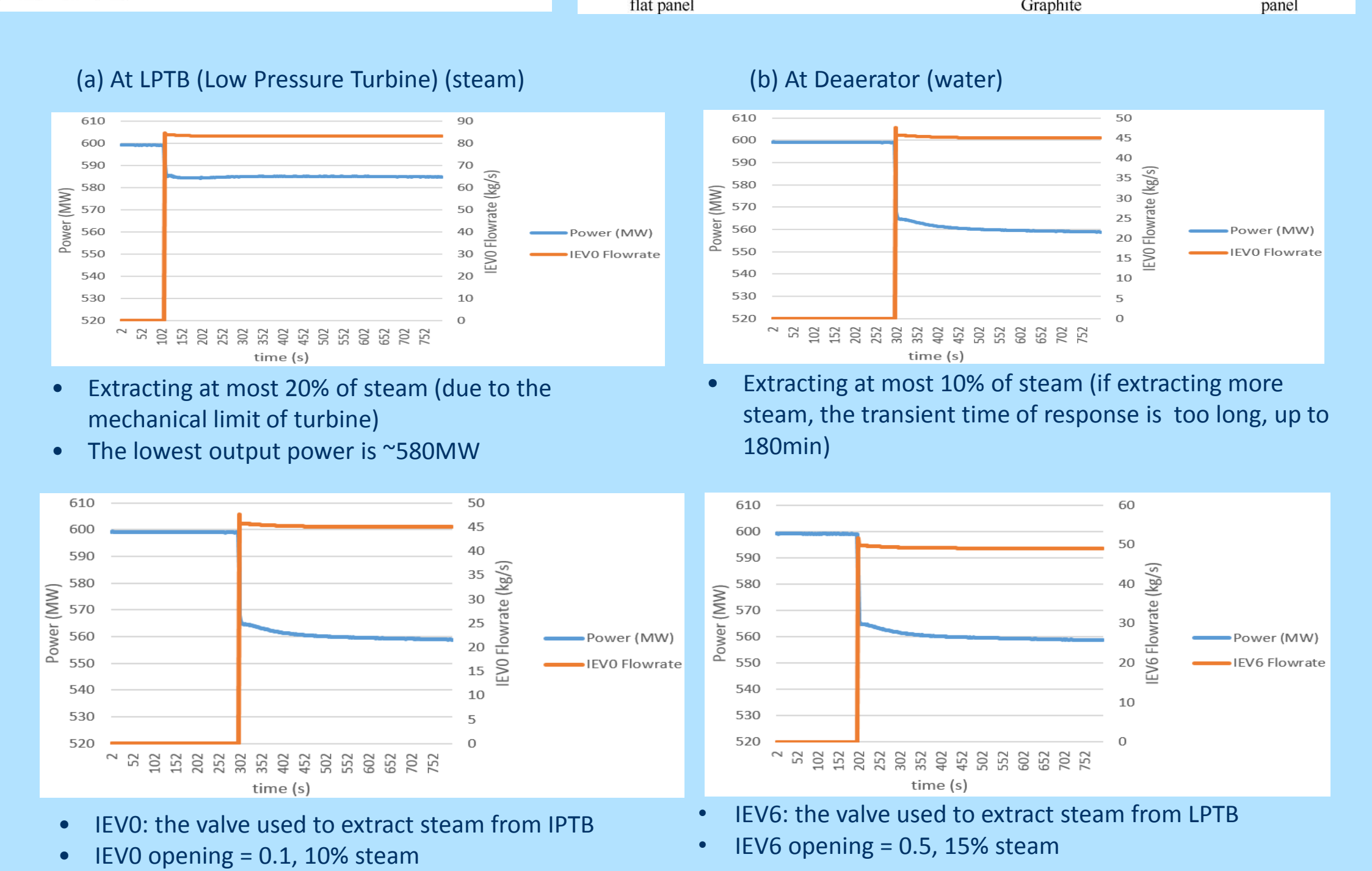
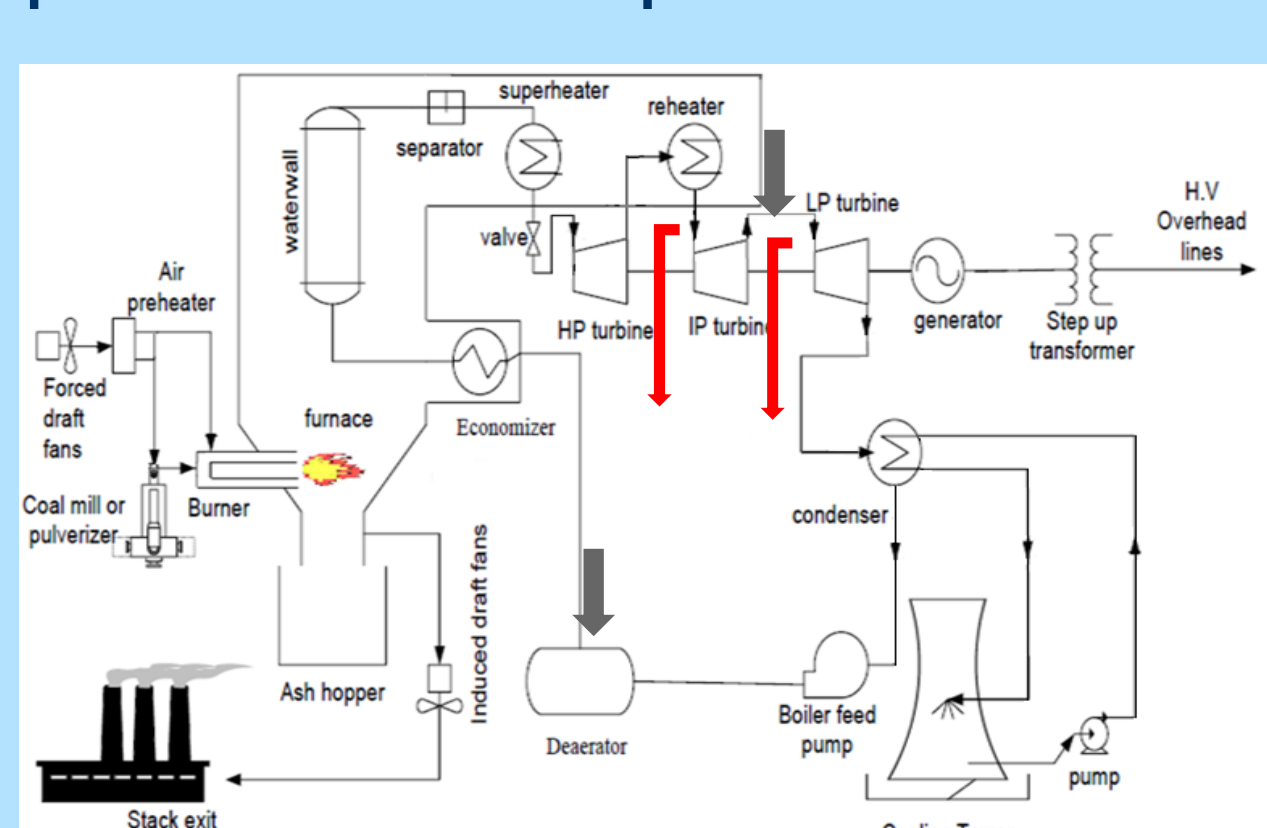


Research Challenges and Our Work:

Materials – high energy density, high temperature, low cost, large scale



Integration with power plants: taking heat out from the plant water-steam cycle and integrating the heat with plant flexible operation.



Project information can be found at:
www.warwick.ac.uk/energystorage
 and
www.integratedenergystorage.org