Supergen ORE Hub Flexible Fund

WARWICK
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Enhancing Control Capability of ORE Systems for Stress Management and Grid Support

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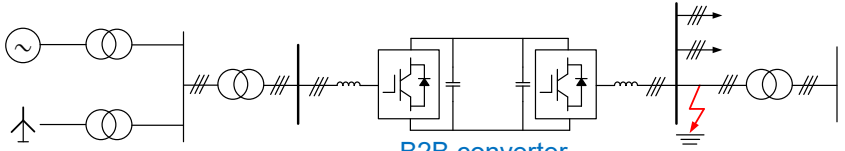
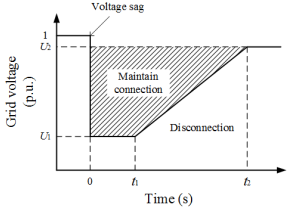
Motivation

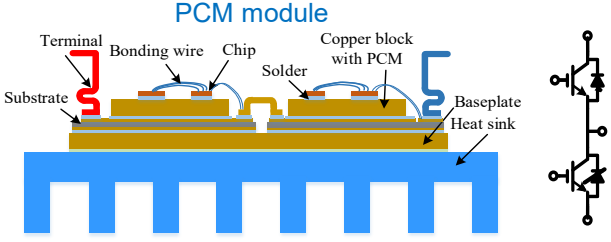
- **Grid Support:** grid inverters are unable to source large current during grid fault.
- **Stress Management:** there is no coordinated stress management strategy.

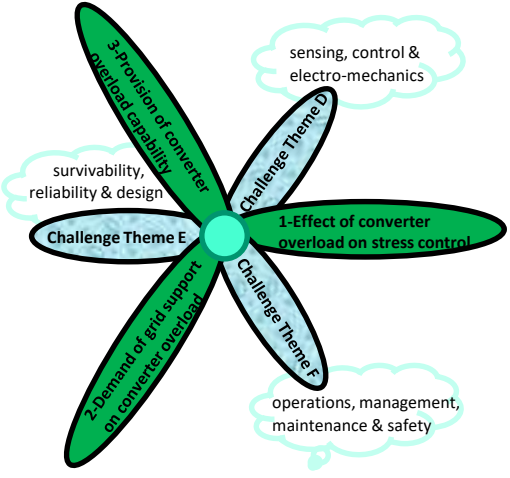




Methodology

- WP1. Model building and identification of critical scenarios.
- WP2. Optimized short term overloading in power electronic control.
- WP3. Power module design for short term overload capability.



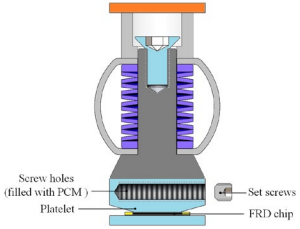


Conclusion

Research outcome

- The proposed PCM integrated module can be overloaded to 240% of its rated current for 3 seconds without exceeding the maximum allowable junction temperature.
- In digital twin system, a simple on-off control strategy shows about 10% stress reduction on pitching system. Improvement of control strategy would produce more effectiveness.

PCM integrated module



Follow-on work

- Develop PCM power modules for EVs, CRRC and Dynex at Birmingham, £300K.
- Rapid response and 're-solidification' by using liquid-gas PCM, ORE Catapult, £140K EngDoc.

Appendices

[1] Ren H., Shao W., Ran L., Hao G., Zhou L., Mawby P. and Jiang H., "*A Phase Change Material Integrated Press Pack Power Module with Enhanced Overcurrent Capability for Grid Support – a Study on FRD*", **IEEE Trans. on Industry Applications**, Vol. 57, No. 4, 2021, pp3956-3968

[2] Iosifidis N., Zhong Y., Hu B., Chen B., Ran L., Lakshminarayana S., Jia C., McKeever P. and Ng C., "*Reliability of Wind Turbine Power Modules Using High-Resolution Wind Data Reconstruction: a Digital Twin Concept*", **IEEE ECCE Conference**, October 2021, Vancouver