SMES
Superconducting Magnetic Energy Storage

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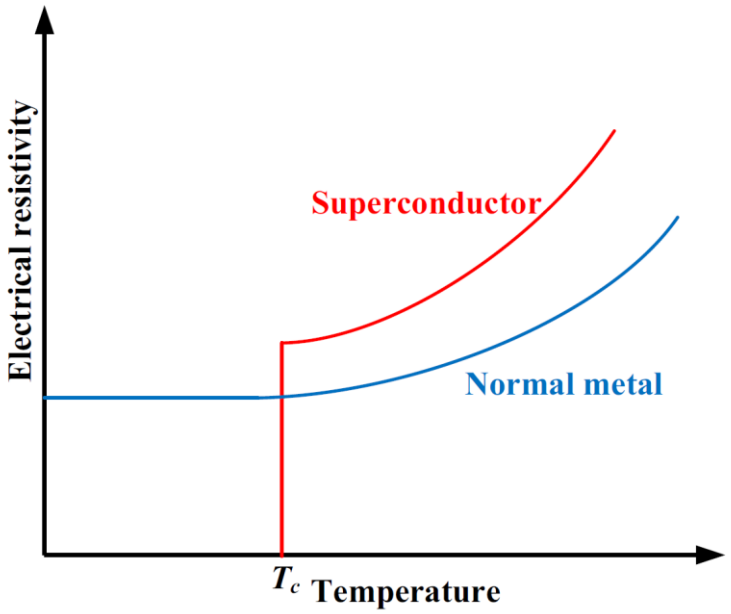
Background

Superconductivity

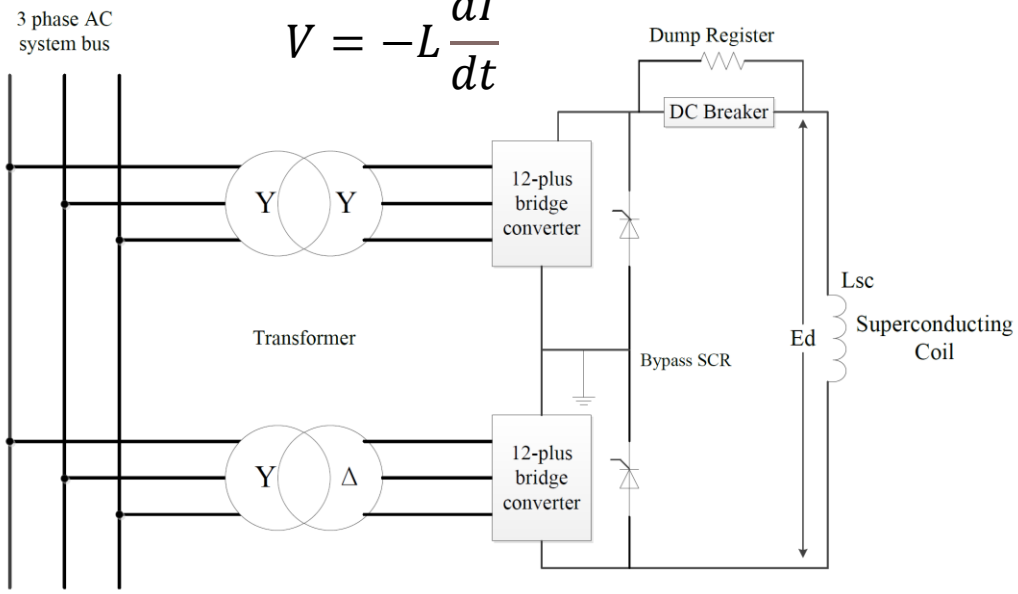


SMES

$$E = \frac{1}{2} L I^2$$

$$Energy\ Density = 1 - 5\ \frac{kJ}{kg}$$

$$V = -L \frac{dI}{dt}$$

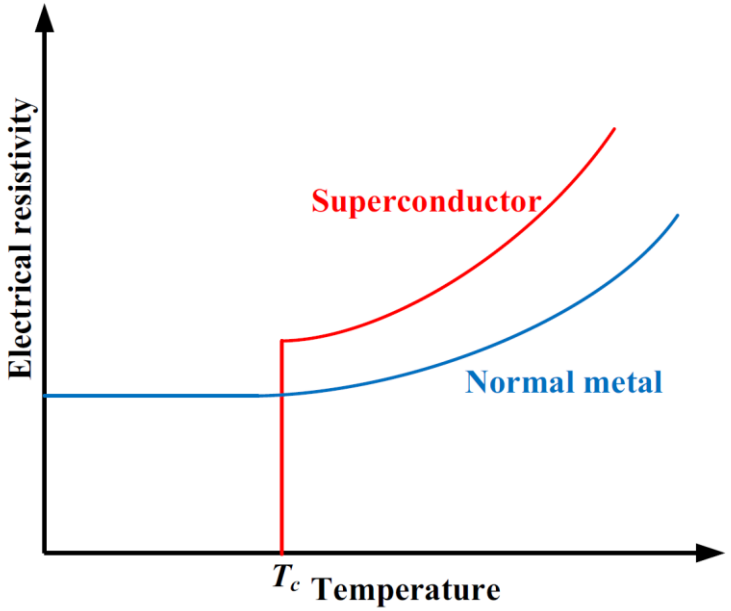


Adetokum et al. Journal of Energy Storage 55 (2022) 105663

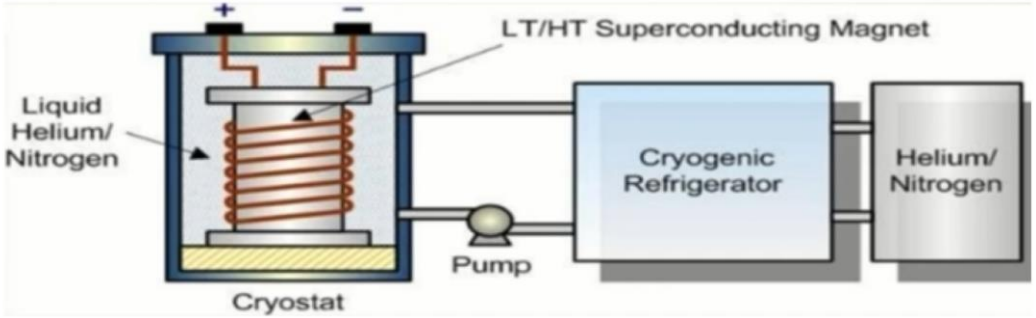
Wang et al. Energies 10 (2017) 185

Background

Superconductivity



SMES



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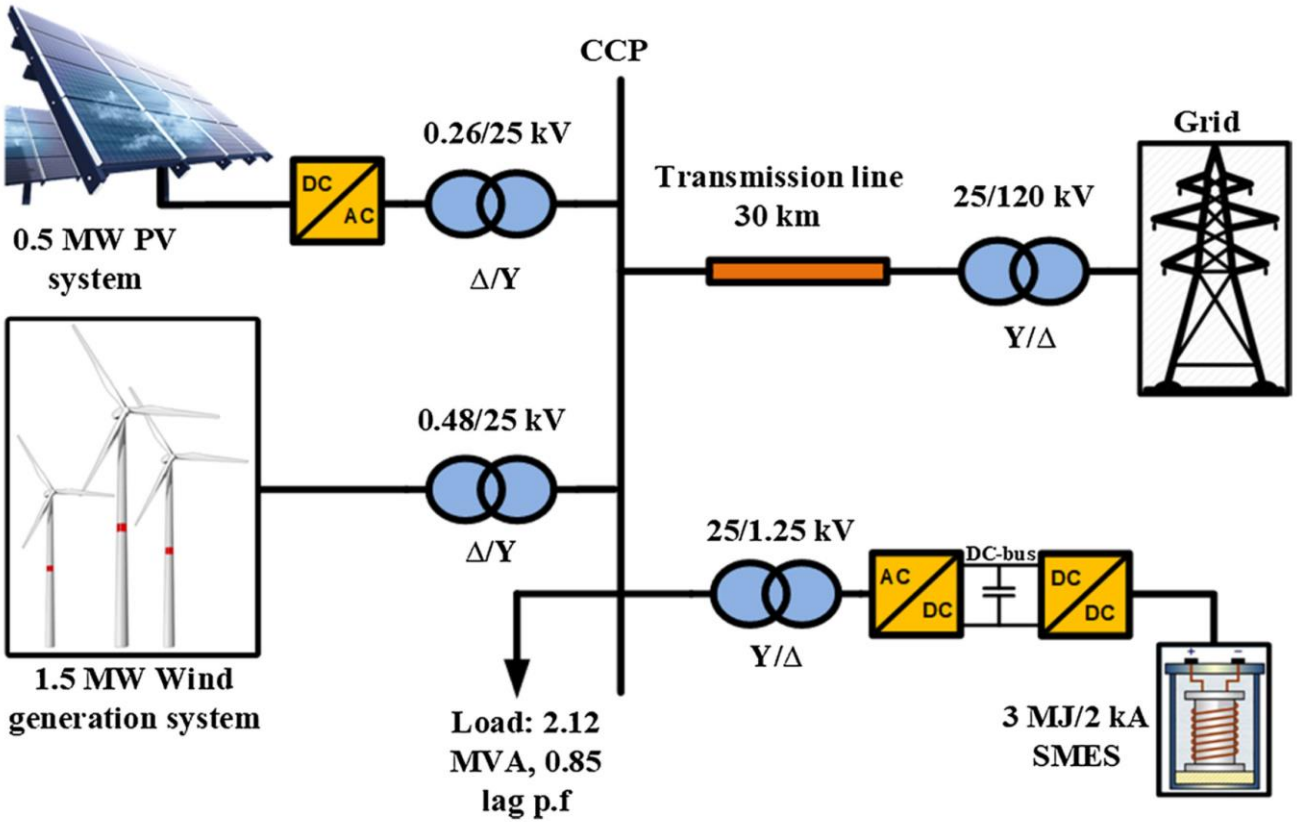
SMES integration



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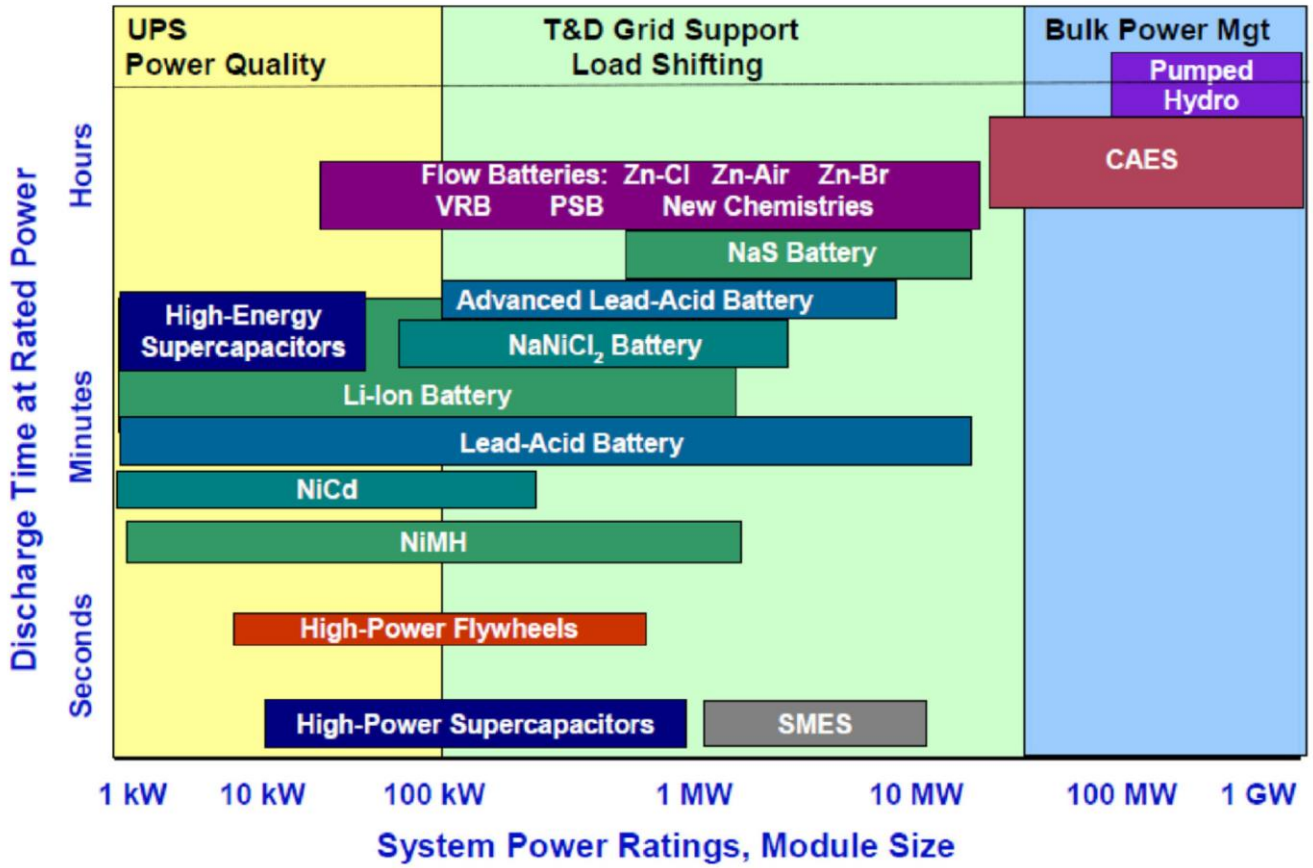
Energy Storage



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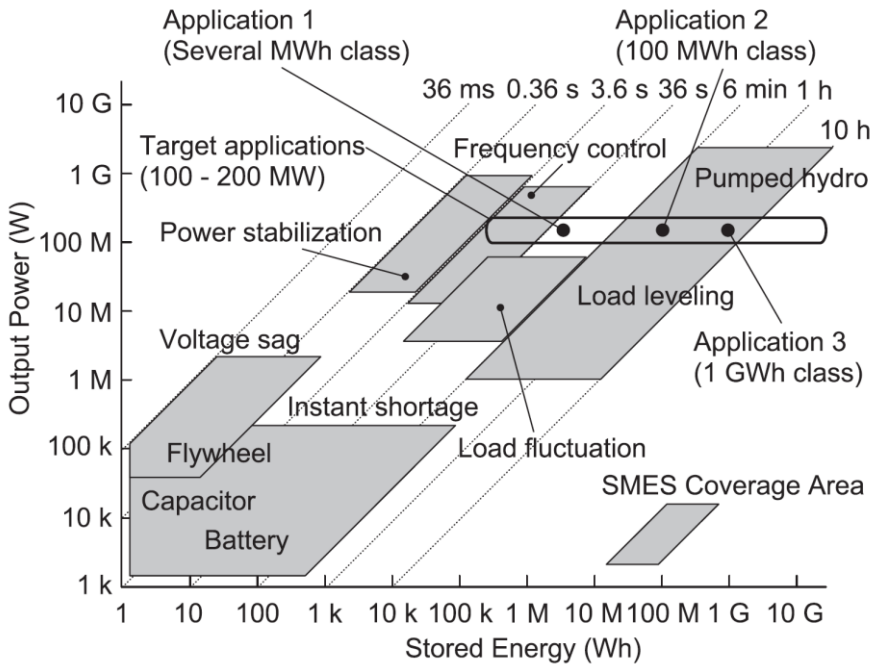
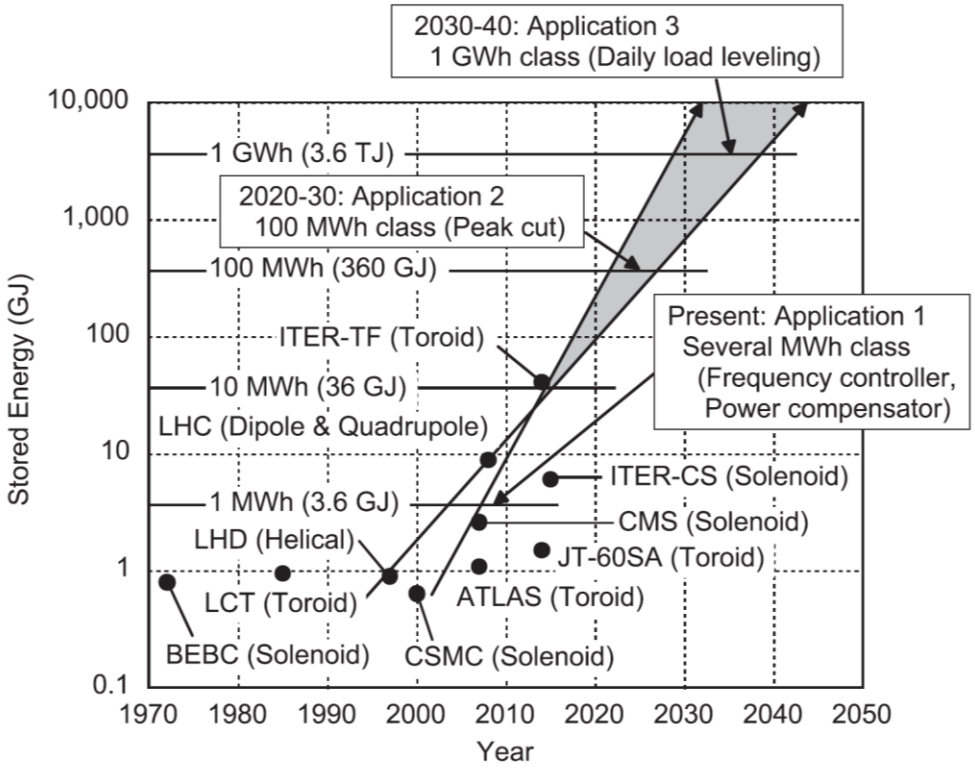
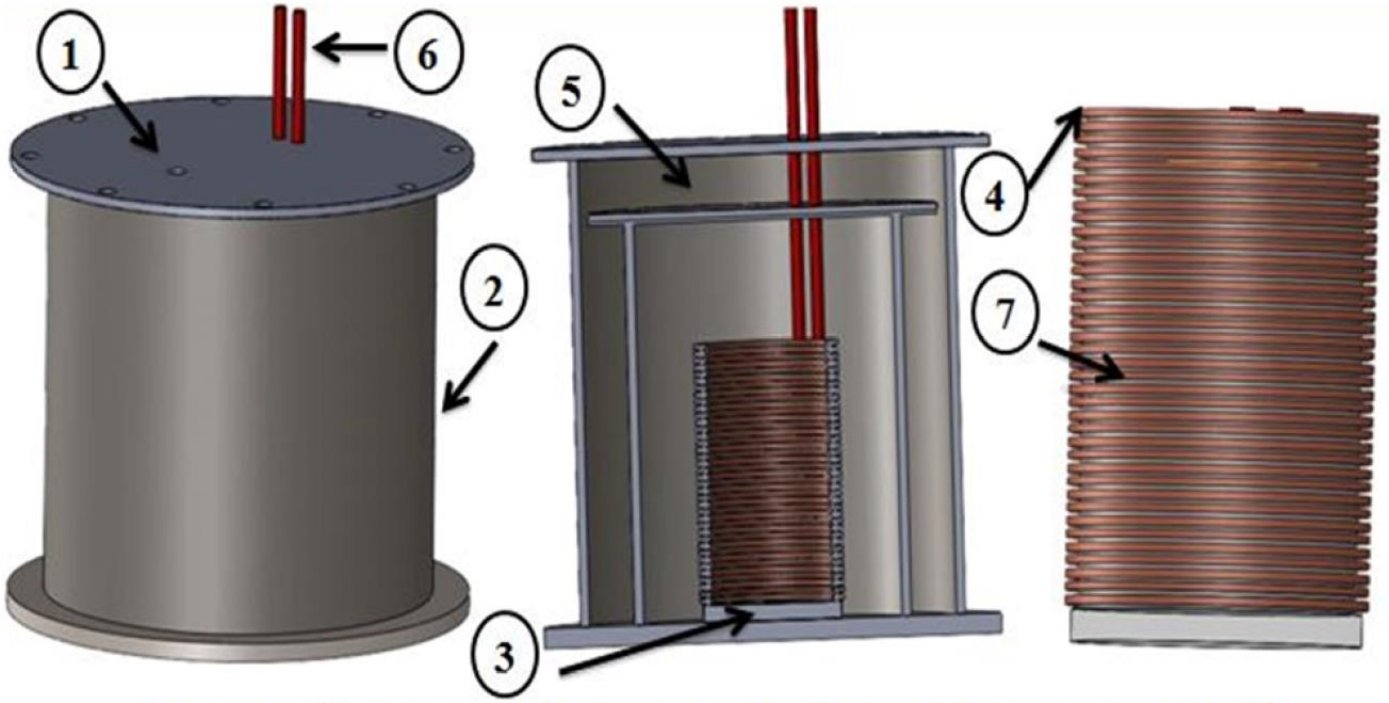
Energy Storage





Nomura et al., Applied Superconductivity 20 (2010) 1373-1378

Example



1. Cryocooler Port; 2. Shell; 3. Supporting Structure; 4. HTS Coil;
5. Vacuum; 6. Current Leads; 7. Non-Metallic Spacers

Kumar et al., Materials Today: Proceedings 21 (2020) 1755–1762

Summary

- ✓ SMES is a developing technology, where operational systems are already available
- ✓ The growing capabilities of superconducting materials shall allow further improvements in SMES systems
- ✓ SMES is the most effective technology for maintaining electricity stability, however, daily energy storage with SMES systems is already considered

Thank you for your attention
Nir Tzabar