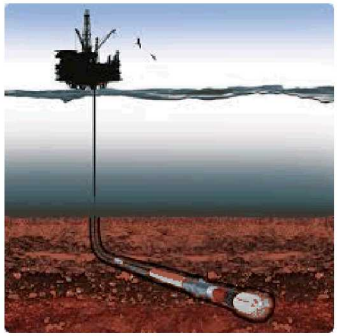
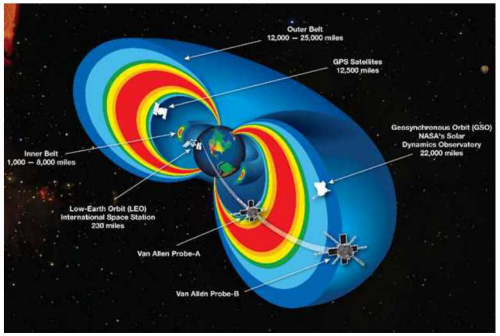
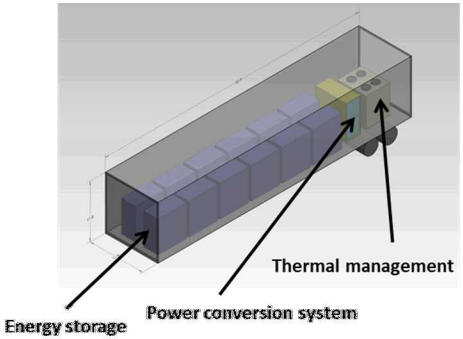
This paper describes objective technical results and analysis. Any subjective views or opinions that might be expressed in the paper do not necessarily represent the views of the U.S. Department of Energy or the United States Government.

SAND2019-13217C







GaN Power Device Market Adoption: National Laboratory Perspective

WiPDA 2019 GaN Panel Discussion

Robert Kaplar, Sandia National Labs

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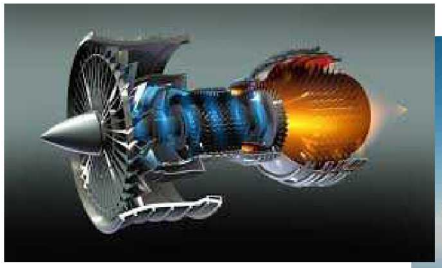
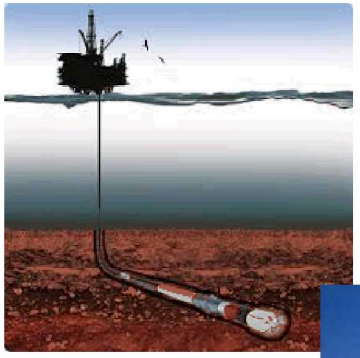
High-Reliability GaN Power Electronics for Demanding Environments

Relevant demanding environments:

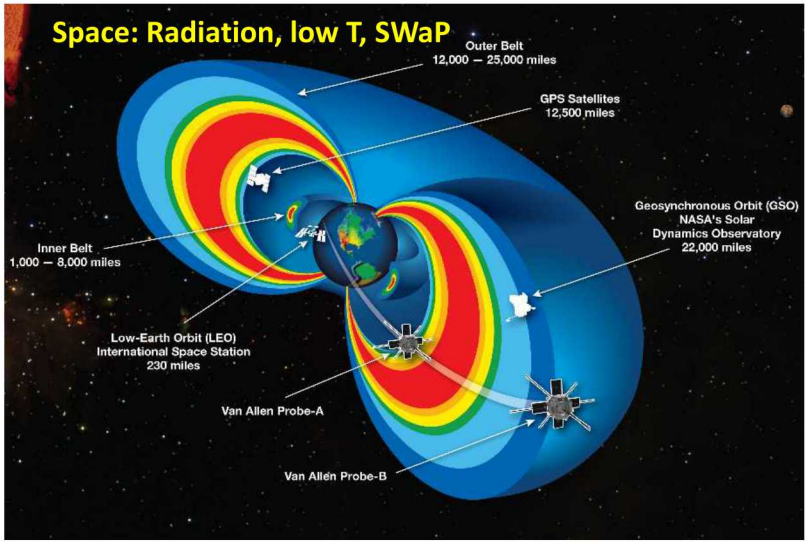
- Temperature
- Vibration
- Radiation
- SWaP-constrained
- Demanding loads



Aviation: High T, vibration, SWaP



Down-hole: High T, vibration, SWaP



Naval: SWaP, pulsed power loads

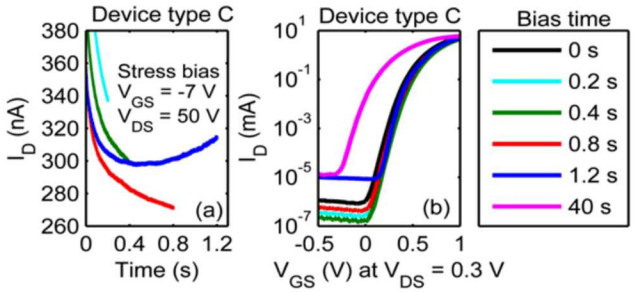
Representative Examples: Vehicle Electrification, Grid Energy Storage

DOE vehicle drivetrain electrification goals are a 100 kW electric traction drive system with[1]:

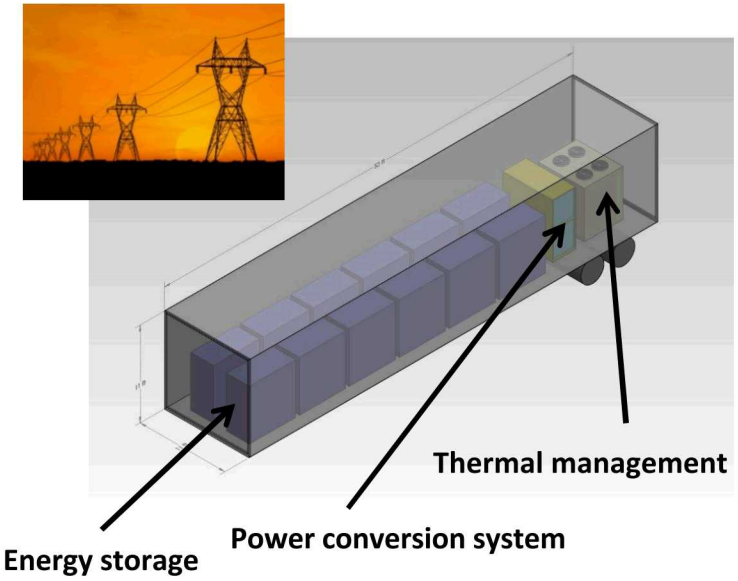
- **Power density of 33 kW/L (~10X improvement)**
- **Cost of $6/kW (~50% cost reduction)**
- **Operational life of 300,000 miles (~2X improvement)**

Power electronics for grid-tied energy storage:

- **High consequence of failure**
- **High reliability required!**



Performance shifts in power GaN HEMTs[2]



[1] USDRIVE Electrical and Electronics Technical Team Roadmap (October 2017)
[2] R. Kaplar et al., ISPSD (2014), IRPS (2014)