



# Why Is the Navy Going Electric?

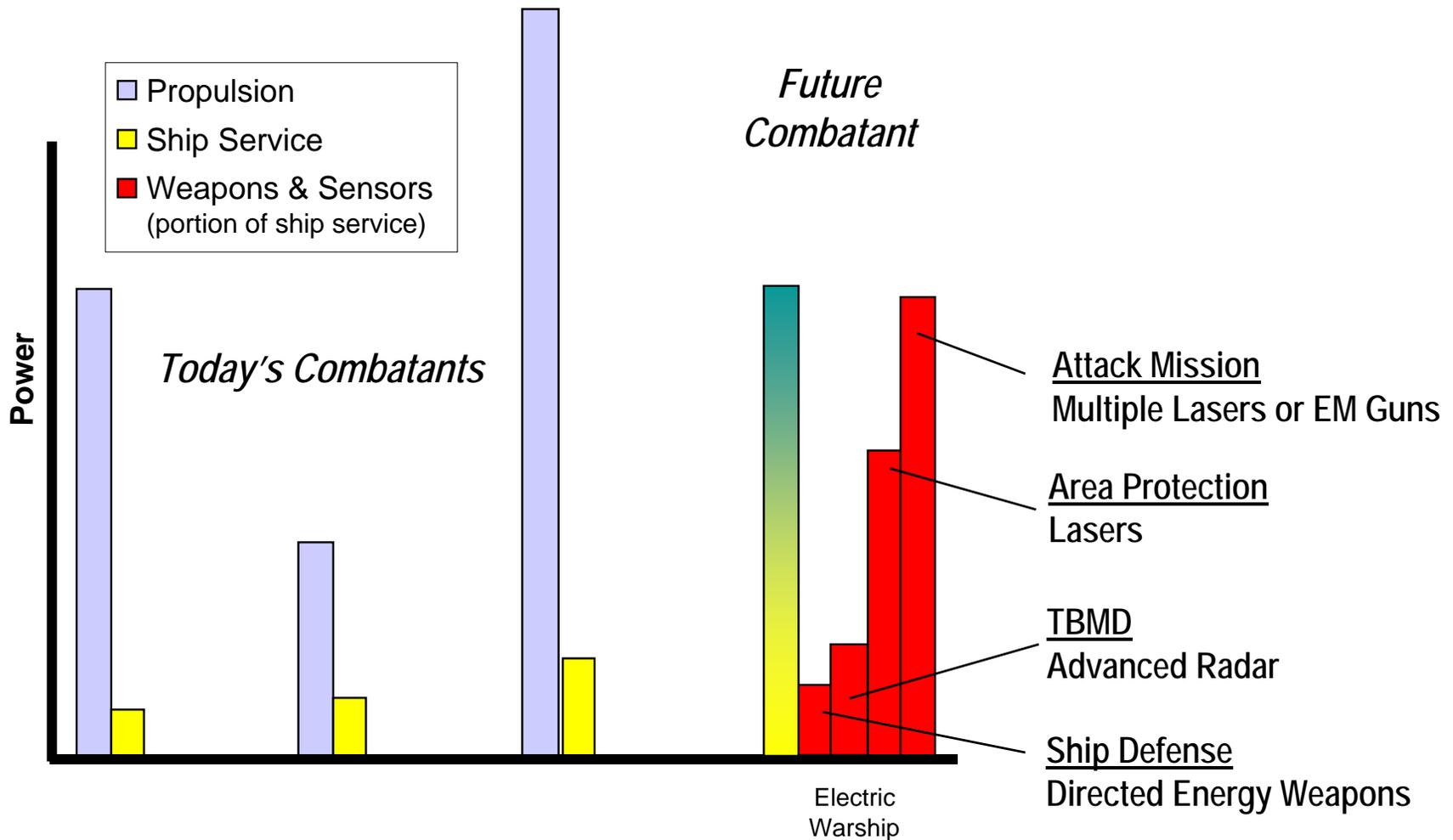


- **Enable Transformational Weapon Systems**
  - Electromagnetic Guns
  - Directed Energy
  - Advanced Sensors
- **Improve Survivability**
  - Rapid and anticipatory reconfiguration of power and systems
- **Reduce Signatures**
  - Eliminate propulsion gear noise
  - Enable silent watch capabilities
- **Reduce Life Cycle Costs**
  - Reduce number of Prime Movers
  - Improve fuel efficiency
  - Eliminate high maintenance hydraulic systems



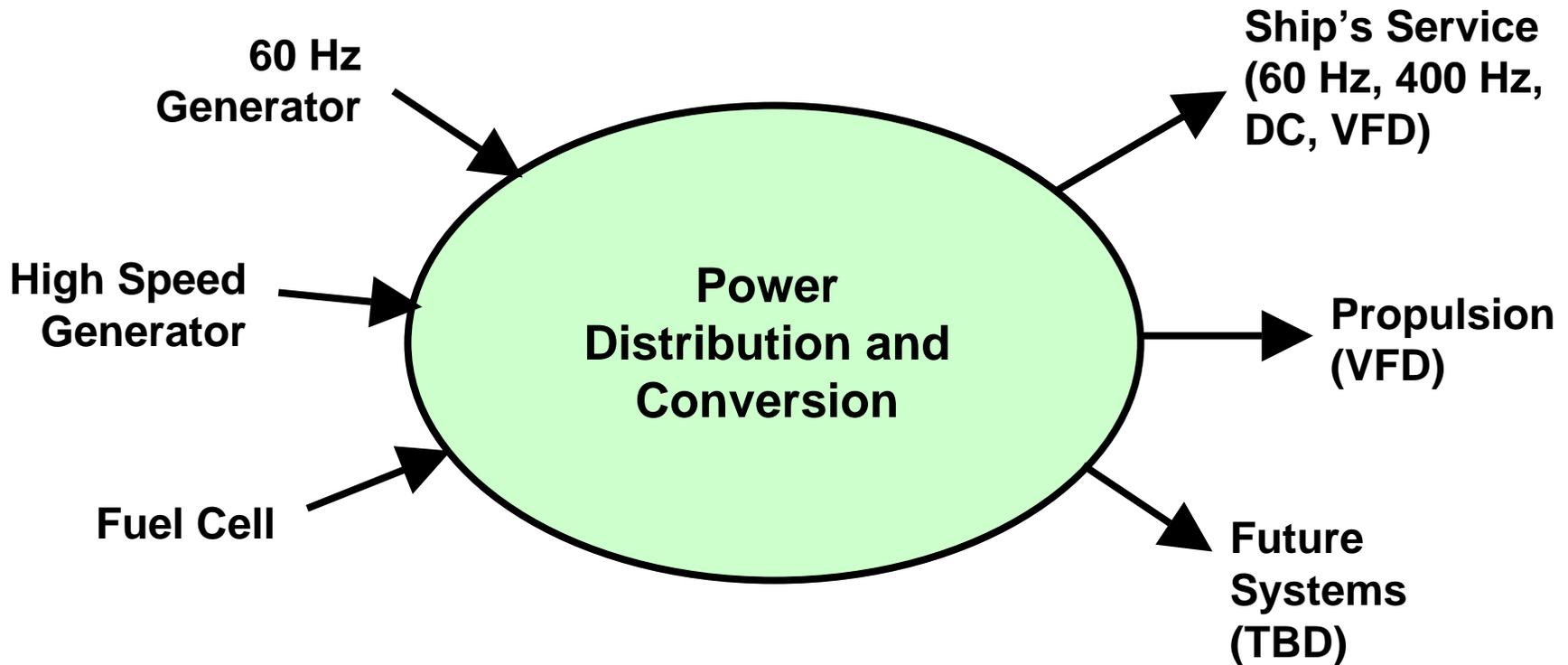


# Expected Growth in Power Requirements





# Increasing need for power conversion



**Increasing percentage of sources and loads are not 60 Hz!**



# Key Navy Issues

- Power Density
- Pulsed Power Loads
- Signatures



# Motor Example

<i>Generation</i>	<i>Technology</i>	<i>Torque density (ft-lbs/lb)</i>
1 <sup>st</sup>	Air-cooled induction, Field-excited synchronous	3.5
2 <sup>nd</sup>	Liquid-cooled permanent magnet	8
3 <sup>rd</sup>	advanced PM, HTS	16
4 <sup>th</sup>	Advanced materials	>20

Motor outweighs motor drive

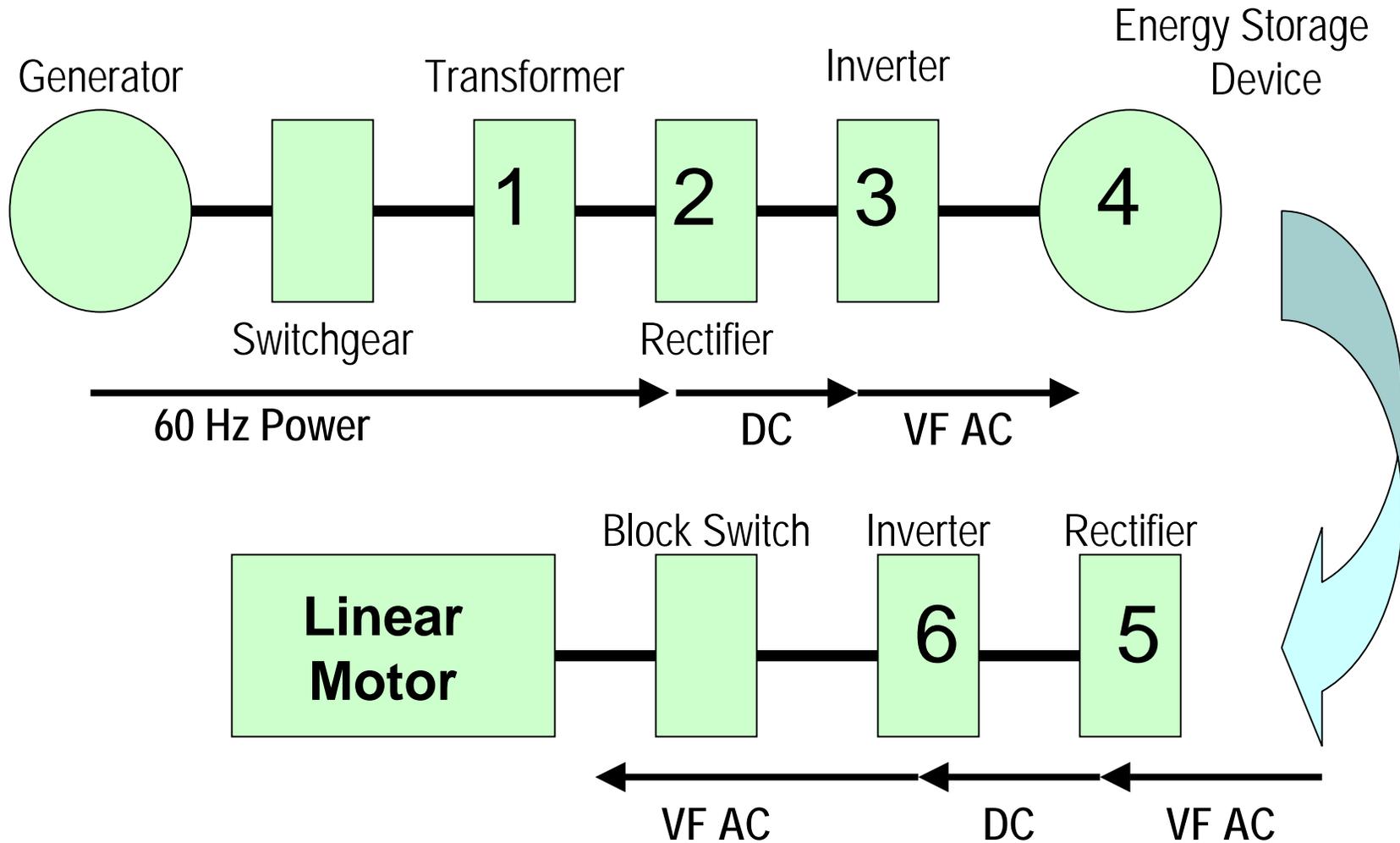
Motor drive outweighs motor

**Table 2: Motor Torque Density Trends**

**Source – Peter Mongeau,  
ASNE Electric Machines  
Symposium, Dec 2003**



# Launcher Example



Six Conversion Steps from Source to Load. Significant weight and cost driver.



Questions?