U.S. ARMY COMBAT CAPABILITIES DEVELOPMENT COMMAND – GROUND VEHICLE SYSTEMS CENTER

Combat Vehicle Power Generation

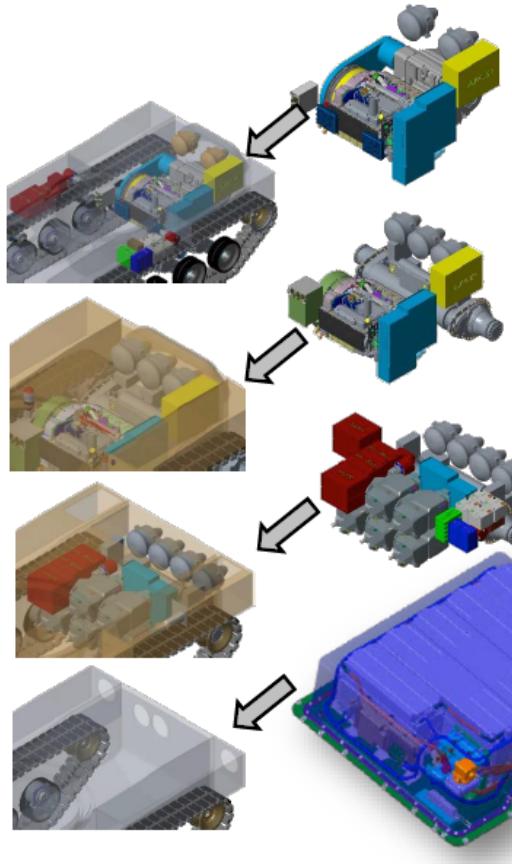
Dean McGrew, Branch Chief

Ground Vehicle Power and Mobility

CCDC GVSC

DISTRIBUTION A. Approved for public release; distribution unlimited.
OPSEC #: *3649*

ELECTRIFIED POWERTRAIN CONCEPTS



Future Tank 2A	Parallel Diesel Hybrid	262 ft³ +210 lbs
Future Tank 2B	Series Diesel Hybrid	267 ft³ +530 lbs
Future Tank 2C	Series Fuel Cell Hybrid	350 ft³ +125 lbs
Future Tank 2D	All Electric	850 ft³ +28,000 lbs

Feasible for a mid 20's demonstration

Feasible for a mid 20's demonstration

Feasible for a late 20's demonstration

Not Feasible for 2020's demonstration

Current R&D Focus

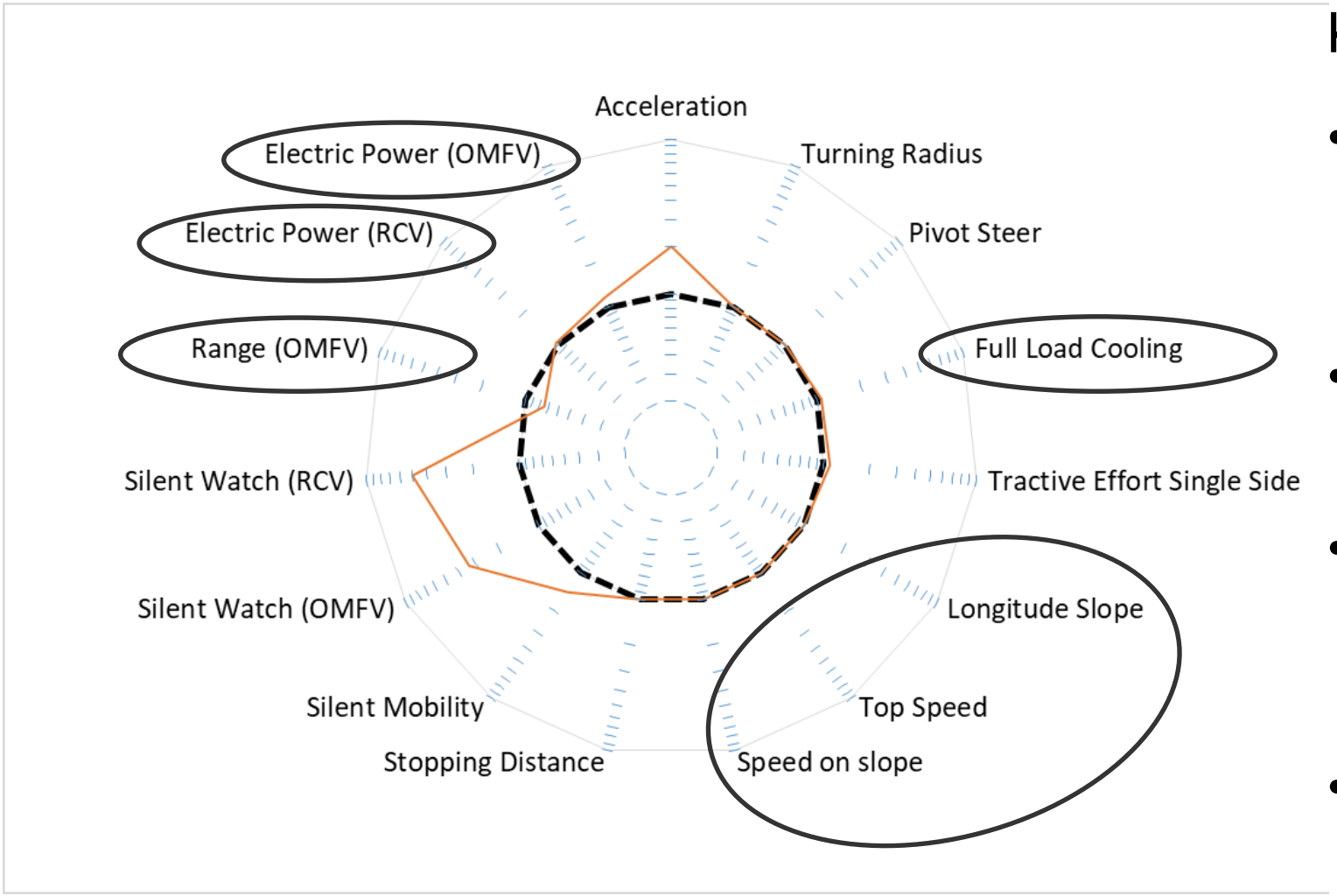
Propulsion volume estimates for ~48T combat system with fuel for 300 mile range.

- Baseline volume is 225ft³.
- Baseline weight is 15,000 lbs.
- Does not include armor for external hydrogen fuel tanks

Study Identified two key gaps
- Energy Storage Density, 4x
- Charging Needs, 8-16x

DISTRIBUTION A. See first page.

EFFICIENT ELECTRICAL POWER GENERATION



Key Goals/Impacts:

- Maximize electrical power available for mobility/other
- Minimize heat rejected to the cooling system
- Optimal use of fuel for operational range/ duration
- Maximum Power impacts Top Speed

DISTRIBUTION A. See first page.

POWER GENERATION – 1X RCV AND 2X OMFV

- Key System Elements: Engine, Generator, & Inverter
- Electronics capable of electrical power generation

  ~ 400 kW RCV

  ~ 800 kW OMFV
- Engine Limited – Enables improved capability as engines improve
- Utilize same inverter and generators in both platforms
- 600 VDC compliant to MIL PRF GCS600A

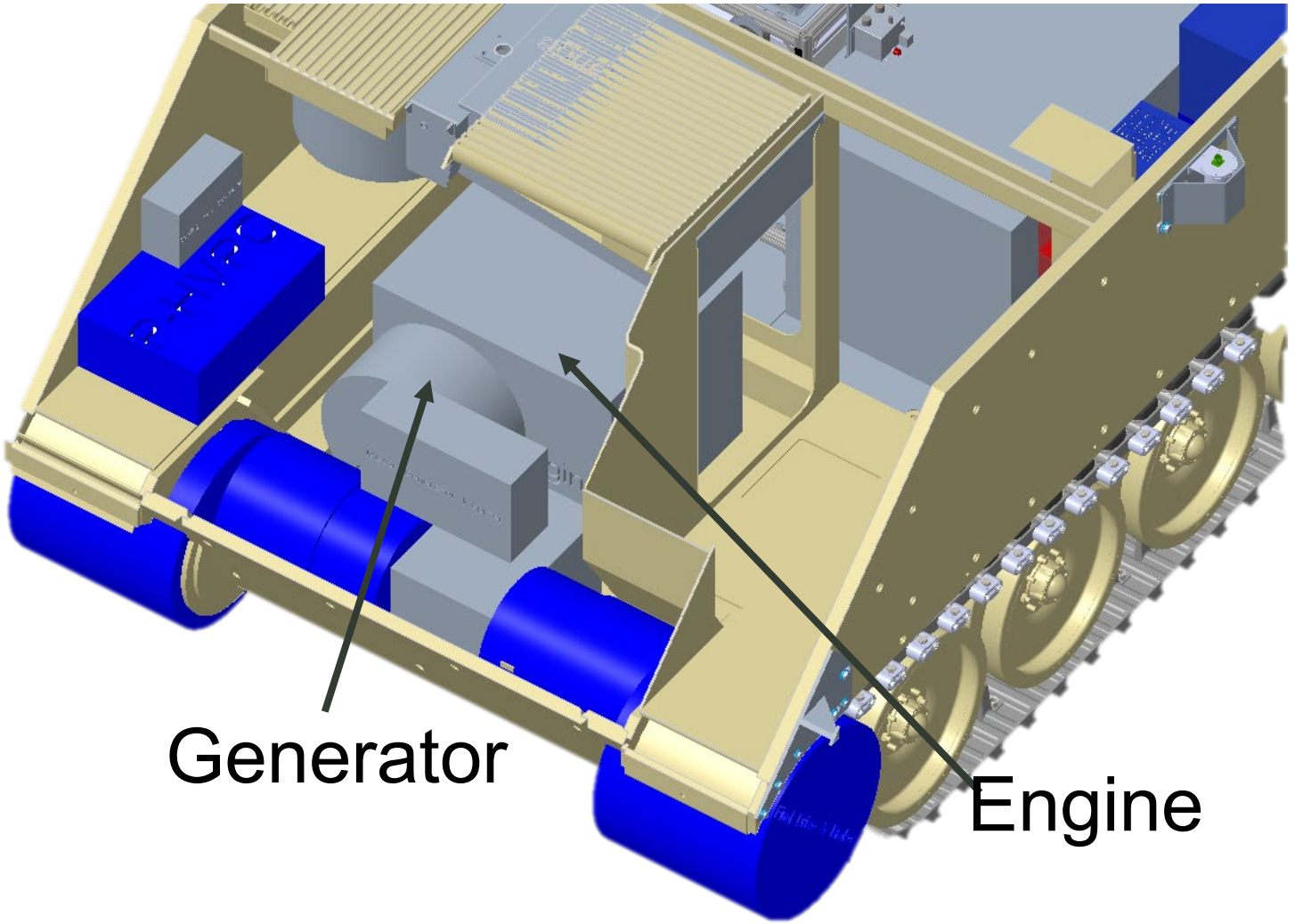
  - Transient load voltage recovery - 20ms
- Highly Efficient & Highly Power Dense
- Powerpack capable of swap-out with Fuel Cell or EV when ready

  – future has greater silent mobility/lower heat signature

DISTRIBUTION A. See first page.

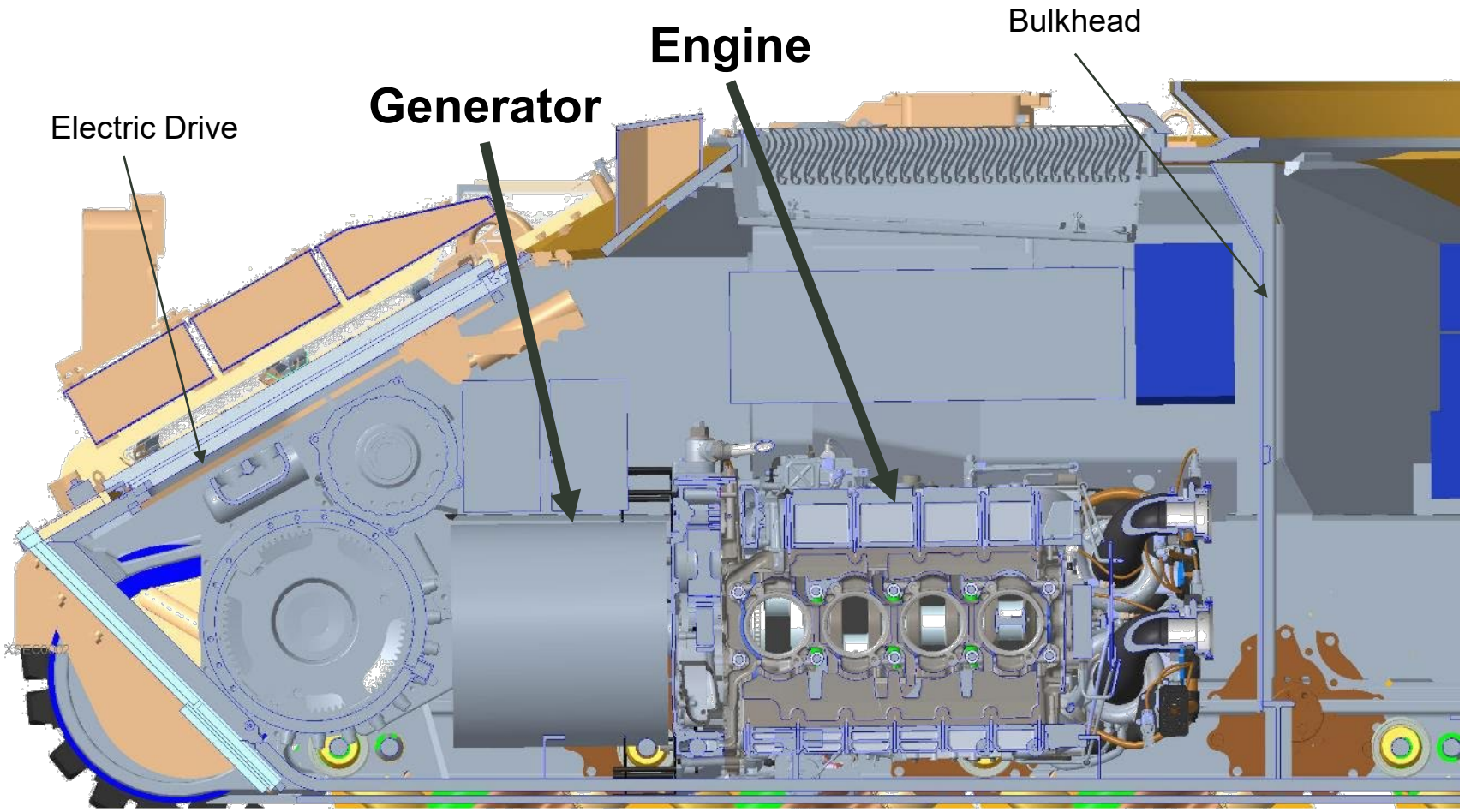
POWER GENERATION – ENGINE/GENERATOR – RCV – 1X

- Engine depends on OEM ~400kW
- (1) 400 kW Generator
- (1) 500 kW Inverter
  (same as inverter as e-drive)
- Engine aligned side-to-side for surrogate
- Power bus-barred to traction inverters and distribution
- Engine speed/power is primary driver of system efficiency



DISTRIBUTION A. See first page.

POWER GENERATION – ENGINE/GENERATOR – OMFV – 2X



- 1000 Hp Engine
- ~700 kW electrical power
- (2) 400 kW generators
- (2) 500 kW Inverters
- Engine longitudinally aligned in surrogate platform
- Engine power limited primary driver of system efficiency

DISTRIBUTION A. See first page.

ANTI-IDLE WILL BE STANDARD – INTEGRATED START CAPABILITY

- Army Combat Vehicles Idle ~80% of time
- LiIon Energy Storage (HV & LV) capable of supporting Loads/Cycles

  Loads = Turret, Radios, Sensors, Air Conditioning, Lighting, other

  Cycles ~ mission duration/ 4 hours silent watch/cycle
- ~25% reduction in fuel use
- Improves operational duration from 3 days to 4 days

DISTRIBUTION A. See first page.

Thank You for Your Time

DISTRIBUTION A. See first page.