Logistics Vehicle System Replacement (LVSR)

The Logistics Vehicle System Replacement (LVSR) is a new Marine Corps heavy in the Marine Logistics Group (MLG), Marine Divisions (MAR DIVs) and Marine Aircraft Wings (MAWs). The LVSR also offers reduced life-cycle costs. Both vehicles can carry 22.5 tons on the highway, but the more powerful LVSR can transport 16.5 tons off road, compared with 12.5 tons for the LVS.

The LVSR can travel up to 65 miles per hour on paved surfaces and has a cruising range of 300 miles. It can ford 5 feet of water. Built by Oshkosh Corporation, the new tactical-distribution heavy hauler carries fuel, water, ammunition, standardized containers, palletized cargo, and heavy equipment. The earlier-vintage LVS, also built by Oshkosh, is a two-piece truck-trailer, with a four-wheel-drive front power unit and five categories of trailer rear-body units. In contrast, the all-wheel-drive LVSR has a straight body design in three different variants – cargo, wrecker, and tractor. The wrecker performs heavy wrecker/recovery missions. The tractor variant will tow heavy engineer equipment and combat vehicles with the 40-ton Medium-Heavy Equipment Trailer.

The LVSR, with a standard two-person cab (and a third position for an optional machine gunner position), uses Oshkosh's TAK-4 independent suspension system for improved mobility and off-road maneuverability. The suspension system allows each wheel to move up and down separately in response to uneven surfaces, reducing the stress on the axle and keeping the vehicle more level on rough terrain. The LVSR appears to move like a giant caterpillar.
Oshkosh's mechanical rear-steer technology, in which the rear wheels actually steer separately, the LVSR makes a complete 360-degree turn in only about 84 feet. This tight turning radius facilitates vehicle storage aboard ship. The LVSR has a 600-horsepower Caterpillar diesel engine and an Allison 7-speed automatic transmission. The vehicle is 35.5 feet long, 8 feet wide and 12 feet high. It has a "cab-over" design, in which the cab hangs out over the front wheels fairly low to the ground.

The vehicle features factory-installed, integral underbody armor for cab floor mine-blast protection. To counter improvised explosive devices (IEDs), the Marine Corps has fitted the LVSR's cab with a removable, add-on armor package developed by the OEM, Oshkosh Corporation, and Israel's Plasan Sasa. Unlike previous tactical trucks with armor added after the fact due to the threats in Iraq and Afghanistan, the LVSR vehicle was designed and built to accommodate the weight of its armor package without degrading vehicle performance.

Fielding of the LVSR cargo variant began in early summer 2009; the vehicle achieved an initial operational capability in September of that year. The program received approval for full-rate production for the cargo variant in December 2009 and for the Wrecker and Tractor variants in April 2011.

As of August 2011, 1,1134 (1,106 Cargo, 17 Wrecker Low-Rate Initial Production (LRIP) vehicles and 11 LRIP Tractors) LVSRs had been delivered to the Marine Corps and 199 were in Afghanistan. After delivery, the vehicles are fitted with additional warfighting equipment (i.e. IED "jammers", tactical radios, and other electronics) before being shipped overseas.

The wrecker variant is able to recover heavy Mine-Resistant Ambush-Protected (MRAP) vehicles, which have given the 7-ton Medium Tactical Vehicle Replacement (MTVR) wrecker some difficulty. The initial deliveries of LVSR Wreckers to Afghanistan were expedited based on requests from theater commanders, with the first two vehicles arriving in-theater April 2011.

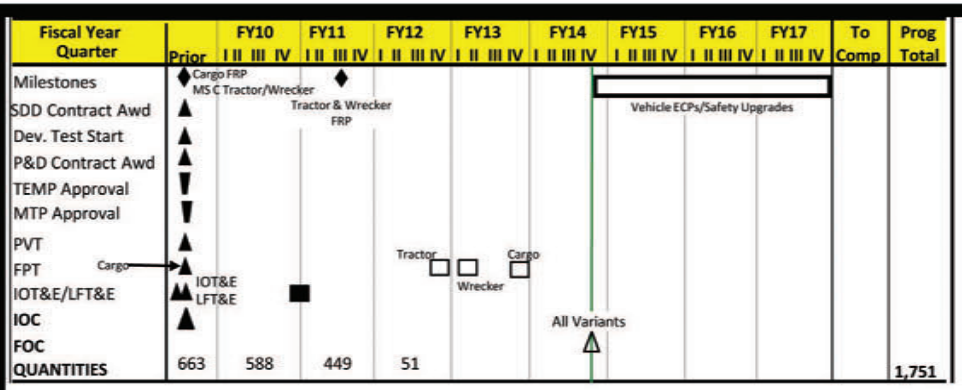
The Marine Corps' LVSR Approved Acquisition Objective (AAO) is 2,000. To date, 1,713 vehicles are on contract made up of 1,318 cargo variants, 123 wreckers, and 272 tractors, Miller said.

The Marine Corps began deploying the first four LVSR Cargo vehicles to Afghanistan in September 2009 in support of urgent fielding of the Mobile Trauma Bay. The latter is a fully enclosed and armored surgical unit with three operating stations in modular pieces that are mounted on the back of an LVSR. The Mobile Trauma Bay allows a five-person shock trauma platoon to treat severely wounded Marines earlier at forward casualty- collection points instead of making them wait for a medevac helicopter or ground vehicle.

The LVSR's in-cab vehicle electronic diagnostics system lets the driver monitor the engine, transmission, brakes, central tire inflation system, and other critical components. The vehicle's simplified maintenance features a single-source lubrication system, which houses the engine oil, transfer case, hydraulics, and transmission in the same reservoir.

The LVSR and the MTVR, both built by Oshkosh, share common parts and similar maintenance.

Logistics Vehicle System Replacement (LVSR)



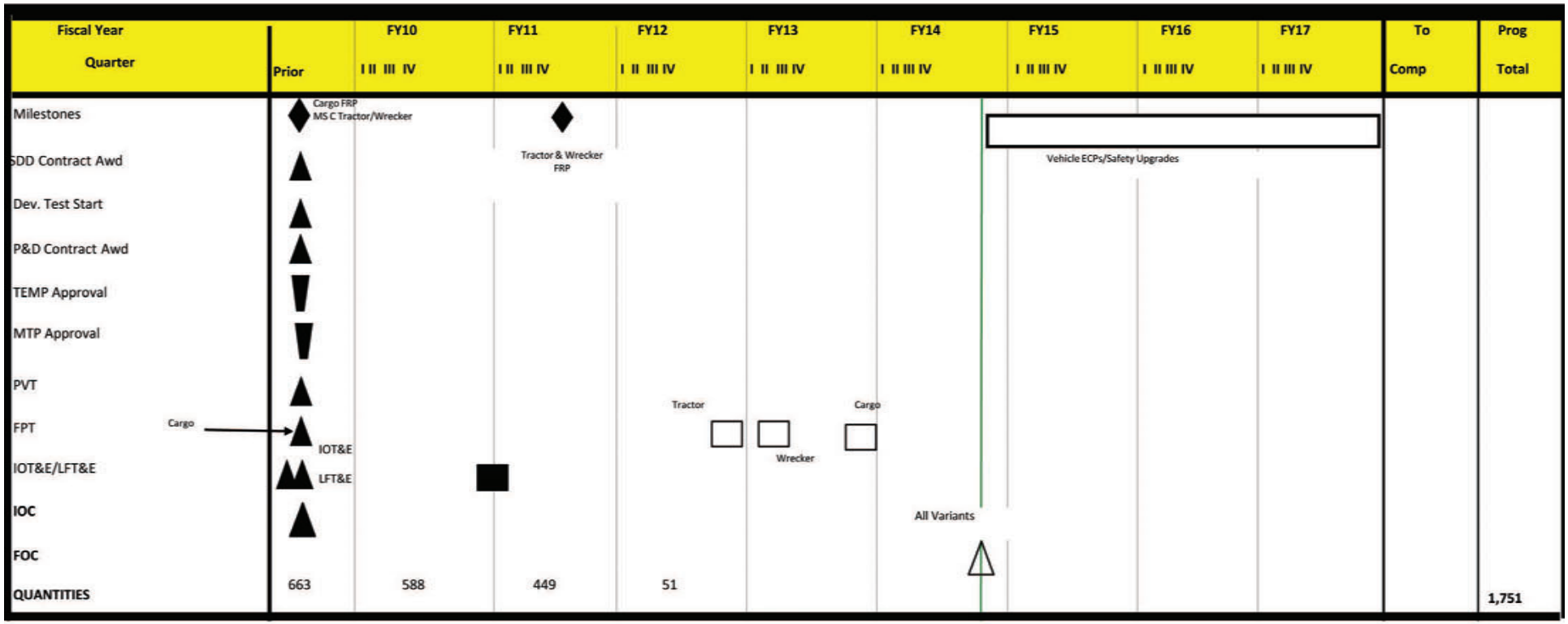
Program Description

The Logistics Vehicle System Replacement (LVSR) will replace the current Marine Corps heavy-tactical wheeled vehicle, the Logistics Vehicle System (LVS). As the Marine Corps' heavy-tactical distribution system, the LVSR Cargo variant will transport bulk liquids (fuel and water); ammunition; standardized containers; bulk, break-bulk, palletized cargo, and bridging equipment. The LVSR Wrecker variant will perform heavy wrecker/recovery missions, while the LVSR Tractor variant will tow heavy engineer equipment and combat vehicles with the M870A2 40 ton Medium Heavy Equipment Trailer (MHET).

Program Status

- AAO 2000 Includes (1489 Cargo, 349 Tractors, & 162 Wreckers)
- Prime Contractor: Oshkosh Corporation
- Significant events
  - All variants in process of fielding
  - MARCENT – 182 Cargo variants delivered 2Q FY11
  - LRIP Wrecker fielding to OEF started 2QFY11 (Total qty 51; MEF fwd request to reduce qty to 36 pending approval)
  - Tractor & Wrecker FRP completed 4/21/11
  - Tractor fielding to OEF started Jul 11 (Total qty to be 60)
  - Current Production Contract extended 16 months to Sep 12

Logistics Vehicle System Replacement (LVSR)



Logistics Vehicle System Replacement (LVSR)

LVSR's Top Three Program Technology Issues:

1. Fuel Economy - At 2.0 miles per gallon, coupled with the Fully Burden Cost of Fuel (FBCF), a moderate increase in fuel efficiency of the LVSR has the potential of saving millions of dollars. Current fuel efficiency efforts that have LVSR potential are: engine mounted fuel efficiency technologies and regenerative breaking.

2. Current & Future C4I Integration Demands - The addition of multiple communications and electronics equipment to the LVSR will soon exceed the vehicle's power generating capability. In addition, interoperability, heat rejection, and space claim issues present human systems integration challenges to the crew. Although there are no active S&T initiatives specifically addressing these demands, there are numerous ONR and TARDEC programs addressing vehicle power demands.

3. Increased Survivability - Although the addition of armor has directly increased survivability of the LVSR, continuing effort is required to maintain or increase survivability of the vehicle and occupants from emerging threats. This includes increasing armor protection while maintaining or reducing current weight, improvements in blast resistant seats, crew egress systems, and advanced fire suppression systems.

1. Fuel Economy:

1a. No Active S&T Initiatives for LVSR

1b. Potential S&T Initiatives for LVSR

Discovery & Invention (D&I)
- Future Fuel Alternatives
- Extended Traction Tire (ETT)

Exploration & Development (E&D)
- Integrated Power and Propulsion
- Fuel Efficient Enabling Technologies w/ TARDEC

Future Naval Capability (FNC)
- Fuel Efficient MTVR

Small Business Innovation Research (SBIR)
- Engine Efficiency Enhancements (MTVR Phase II SBIR)

TARDEC
- Alternative Fuels & Petroleum, Oil & Lubricants
- Efficient Powertrain Technology Integration

2. <u>Current & Future Power Demands:</u>

2a. No Active S&T Initiatives for LVSR

2b. Potential S&T Initiatives for LVSR

Exploration & Development (E&D)
- Modular Vehicle Platform (MVP)
- Integrated Power & Propulsion

TARDEC
- Electrical Power Systems
- Vehicle Electronics Integration Technologies
- Distributed Soldier Load Through SMART Vehicle Control
- Vehicle Electronics Architecture and Standards

Other
- NUCLEUS Effort

3. <u>Increased Survivability:</u>

3a. No Active S&T Initiatives for LVSR

3b. Potential S&T Initiatives for LVSR

Discovery & Invention (D&I)
- Lightweight Armor Materials
- CSTV Shock Mitigating Seats
- Energy Absorbing Structures for Blast Mitigation

Exploration & Development (E&D)
- CSTV Shock Mitigating Seats
- Silencing USMC Vehicles

Small Business Innovation Research (SBIR)
- Mitigation of Blast Injuries through M&S (MTVR SBIR Phase II)

Small Business Technology Transfer and Research (STTR)
- Mitigation of Fuel Tank Explosions and Fires (MTVR STTR Phase I)

TARDEC

- RPG Active Protection (RAP)
- Enhanced RPG Active Protection (ERAP)

Other

- AMAS JCTD
- Fuel Tank Protection System Swampworks
- MTVR Blast Seat Evals

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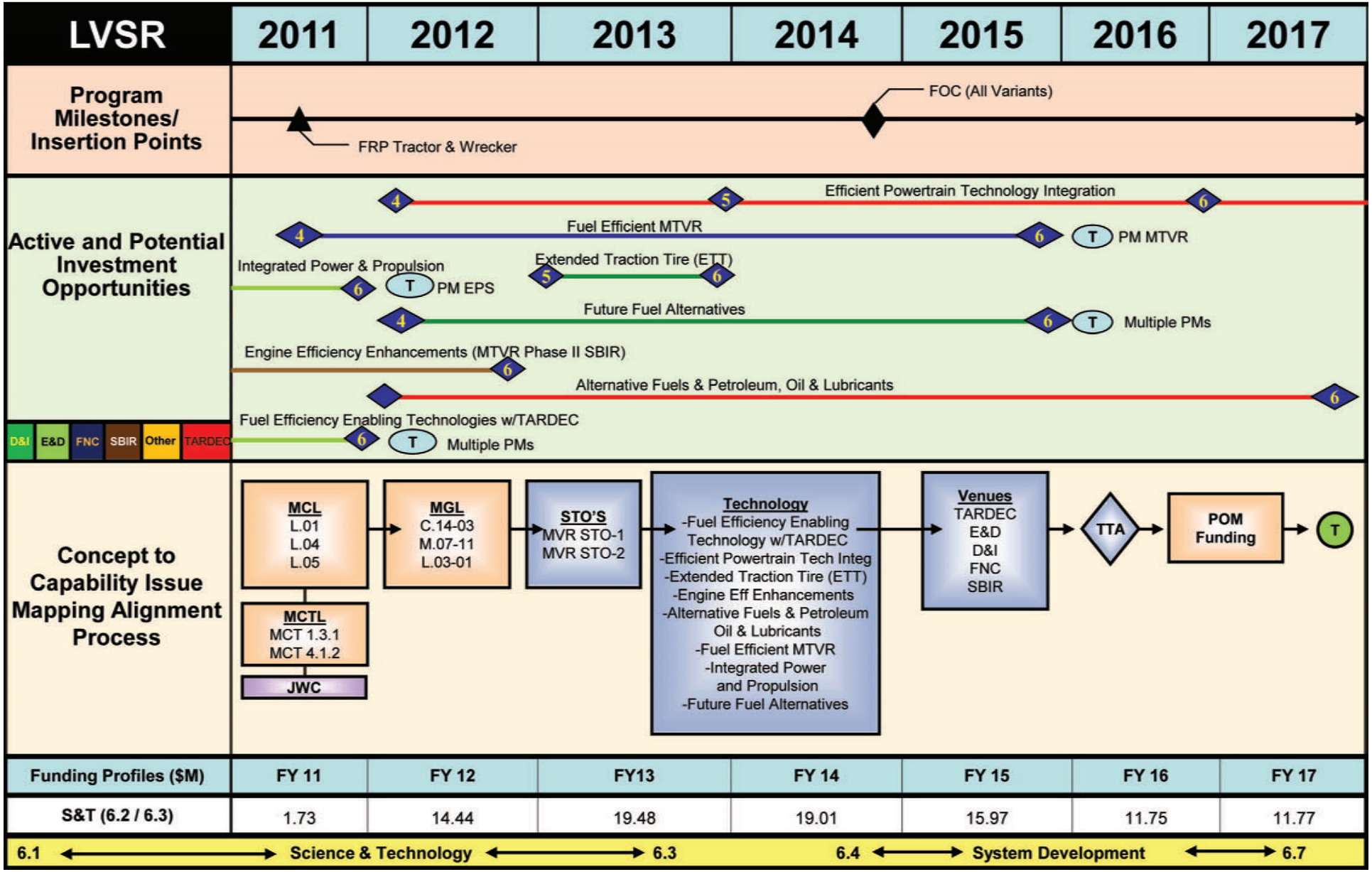
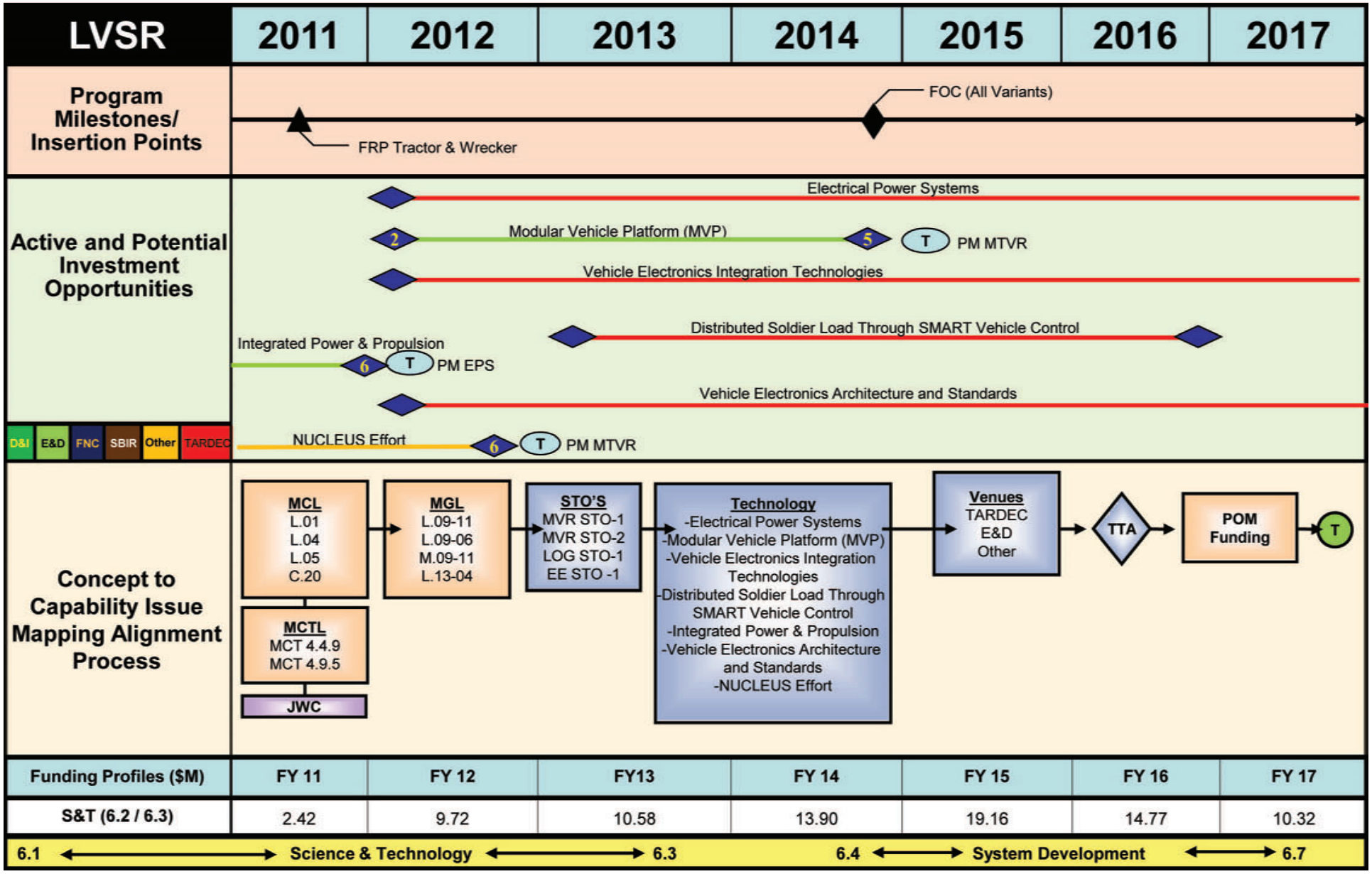
LVSR Technical Issue #1 Fuel Economy



LVSR Technical Issue #1 Fuel Economy

MCL	L.01 Provide supply support L.04 Provide logistics services L.05 Provide deployment and distribution support.	
MCTL	MCT 1.3.1 Conduct Maneuver MCT 4.1.2 Conduct Ground Supply Operations	
MGL	C.14-03 Limited Transport Capability M.07-11 Mobility in all terrain & climates L.03-01 Sustainment Distribution	
STO'S	MVR STO-1 Fuel efficient power generating systems MVR STO-2 Ground vehicle mobility	
Technology	Active: N/A	Potential: -Efficient Powertrain Technology Integration -Extended Traction Tire (ETT) -Integrated Power & Propulsion -Future Fuel Alternatives -Alternative Fuels & Petroleum, Oil & Lubricants -Fuel efficiency Enabling Technology with TARDEC -Fuel Efficient MTVR -Engine Efficiency Enhancements (MTVR Phase II SBIR)
Venues	TARDEC, E&D, D&I, FNC, SBIR,	
TTA	w/ MTVR	T Transition target for: PM MTVR, EPS, Multiple PMs
POM Funding	MCCDC integration division	
T	Transition to a program of record	Comments/Issues:

LVSR Technical Issue #2 Current & Future C4I Integration Demands



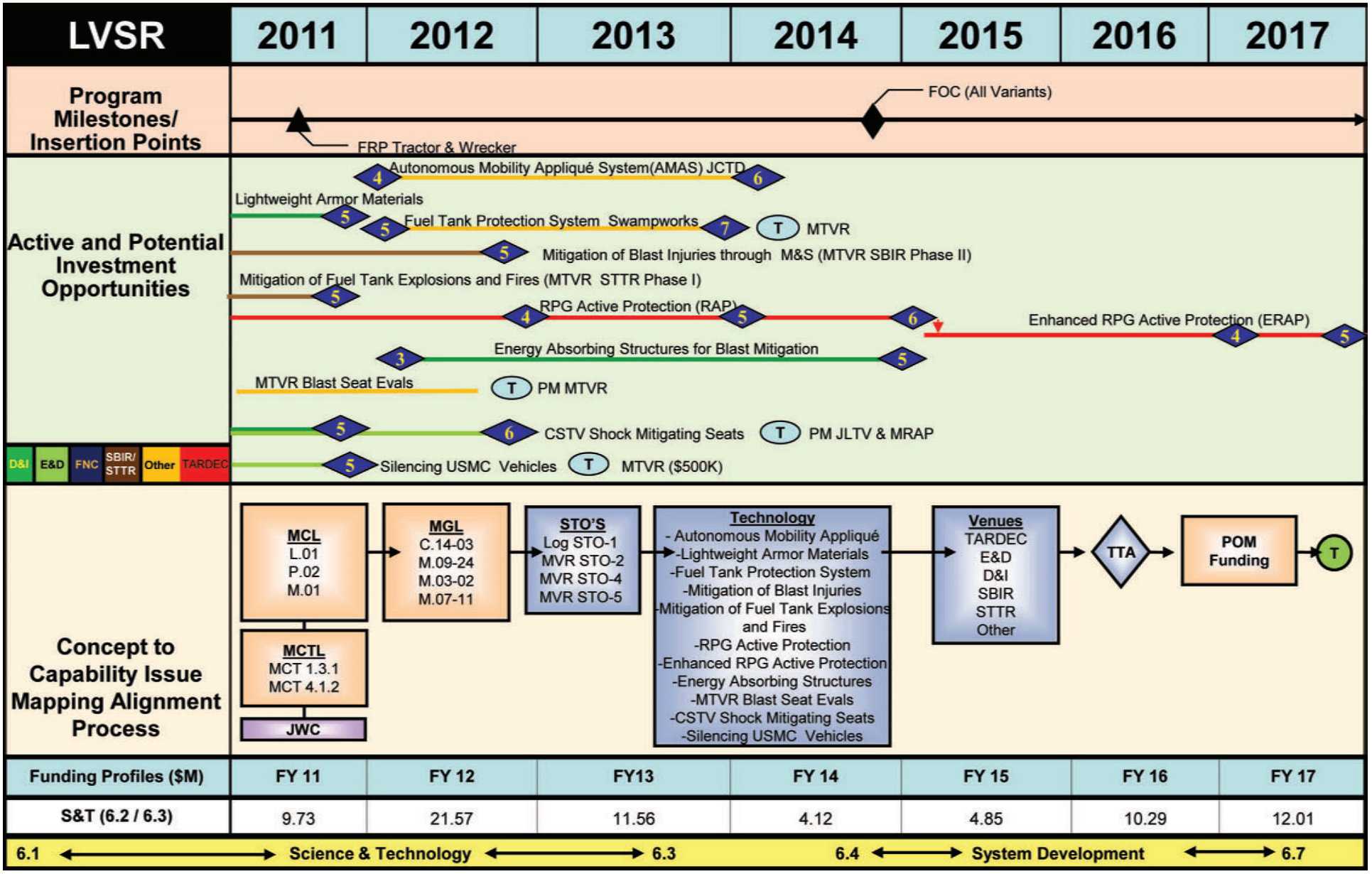
Funding Profiles ($M)	FY 11	FY 12	FY13	FY 14	FY 15	FY 16	FY 17
S&T (6.2 / 6.3)	2.42	9.72	10.58	13.90	19.16	14.77	10.32

6.1 ⟷ Science & Technology ⟷ 6.3 6.4 ⟷ System Development ⟷ 6.7

LVSR Technical Issue #2 Current & Future C4I Integration Demands

MCL	L.01 Provide supply support L.04 Provide logistics services L.05 Provide deployment and distribution support C.20 Optimize Networks	
MCTL	MCT 4.4.9 Conduct Tactical Electrical Supply MCT 4.9.5 Supply Electrical Power	
MGL	L.09-11 Alternate Power Sources L.09-06 On Move Power Generation M.09-11 Exportable Power For On-Board Systems L.13-04 Power Generation/ Distribution	
STO'S	MVR STO-1 Fuel efficient & power generating vehicle systems MVR STO-2 Ground vehicle mobility LOG STO-1 Asset versatility EE STO-1 Expeditionary energy harvesting	
Technology	Active: N/A	Potential: -Electrical Power Systems -Vehicle Electronics Integration Technologies -Distributed Soldier Load Through SMART Vehicle Control -Integrated Power & Propulsion -Vehicle Electronics Architecture and Standards -NUCLEUS Effort -Modular Vehicle Platform (MVP)
Venues	TARDEC, E&D, Other	
TTA	No TTAs is needed	T Transition target for: PM MTVR, EPS
POM Funding	MCCDC integration division	
T	Transition to a program of record	Comments/Issues:

LVSR Technical Issue #3 Increased Survivability



LVSR Technical Issue #3 Increased Survivability

MCL	L.01 Provide supply support P.02 Protect Personnel physical assets & LOCs M.01 Maneuver to secure		
MCTL	MCT 1.3.1 Conduct Maneuver MCT 4.1.2 Conduct Ground Supply Operations		
MGL	C.14-03 Limited Transport Capability M.09-24 Force Protection M.03-02 Protected Mobility M.07-11 Mobility in all terrain & climates		
STO'S	Log STO-1 Asset versatility MVR STO-2 Ground vehicle mobility MVR STO-4 Advanced materials and survivability technology to enhance the performance and survivability of combat vehicles &surface craft MVR STO-5 Vehicle and surface craft design for Marine usability, habitability, and survivability		
Technology	Active: N/A	Potential: Fuel Tank Protection System Swampworks -Mitigation of Blast Injuries through M&S (MTVR SBIR Phase II) -Mitigation of Fuel Tank Explosions and Fires (MTVR STTR Phase I) -MTVR Blast Seat Evals -Silencing USMC Vehicles	Potential continued: -Autonomous Mobility Appliqué System(AMAS) JCTD -Lightweight Armor Materials -RPG Active Protection (RAP) -Enhanced RPG Active Protection (ERAP) -Energy Absorbing Structures for Blast Mitigation -CSTV Shock Mitigating Seats
Venues	TARDEC, D&I, E&D, SBIR, STTR, Other		
TTA		T Transition target for: PM MTVR, MRAP, JLTV	
POM Funding	MCCDC integration division		
T	Transition to a program of record	Comments/Issues:	