

All-Electric Conversion of the USPS Long Life Vehicle (LLV)

Vehicle: USPS eLLV Conversion by *Autoport/AC Propulsion/University of Delaware*

Vehicle ID: 2204700

Seatbelt Positions: One (right hand drive)

Standard Features:

- Cabin Heat (gasoline fired heater)
- Power Steering (electro-hydraulic)
- Power Brakes (vacuum assist)
- Regenerative Braking
- Steel wheels

Additional Features:

- Vehicle-2-Grid Capable up to 80A



Vehicle Specifications

Battery

Type: Li-Ion

Pack Locations: Underbody (inboard of frame rails)

Nominal System Voltage: 375 V

Rated Capacity (C/3): 60 Ah

Cooling Method: Forced air, conditioned with A/C (air to air exchanger)

Powertrain

Motor Type: AC Induction

Number of Motors: One

Motor Cooling Type: Forced air

Drive Wheels: Rear Wheel Drive

Transmission: Fixed Gear Reduction

Charger

Location: Underhood

Charger Port: Driver's side, front quarter panel

Type: Conductive (J1772 connector)

Input Voltage(s): 120 or 240 VAC

Chassis

Aluminum Body on Steel Frame

Rear Suspension: Solid Axle with Leaf Springs

Front Suspension: Dual A-arm with Coil Springs

Weights

Design Curb Weight: 3250 lbs

Delivered Curb Weight: **3408 lbs**

Distribution F/R: 50.4/49.6%

GVWR: 4450 lbs

Max Payload: **842 lbs** + 200 lbs driver¹

Performance Goal Payload: 1000 lbs + 200 lbs driver

Dimensions

Wheelbase: 100.5 inches

Length: 175.5 inches

Width: 76 inches

Height: 85 inches

Tires

Tire Mfg: Kumho

Tire Model: Solus KR2

Tire Size: P195/75R14

Tire Pressure F/R: 35/35 psi²

Performance Statistics

Acceleration 0-50 mph (332 lbs payload)

At 90% SOC: 11.5 sec

At 50% SOC: 12.1 sec

Max. Battery Power: 71.4 kW

Acceleration 0-50 mph (1000 lbs payload)

At 90% SOC: 11.7 sec

At 50% SOC: 13.1 sec

Max. Battery Power: 80.3 kW

Braking From 60 mph (332 lbs payload)

Controlled Dry: 189 feet

Course Deviation: 0.0 feet

Braking From 60 mph (1000 lbs payload)

Controlled Dry: 192 feet

Course Deviation: 0.0 feet

Performance Goal: 216 feet

Gradeability (Calculated) (332 lbs payload)

Maximum Speed @ 3%: 67.6 mph

Maximum Speed @ 6%: 57.4 mph

Maximum Grade: 33.5%

Maximum Speed @ 50% SOC (332 lbs payload)

At 1/4 Mile: 64.4 mph

At 1 Mile: 72.5 mph

Constant Speed Range @ 45 mph,⁶ (332 lbs payload)

Range: 47.2 miles

Energy Used: 16.0 DC kWh

Average Battery Power: 14.4 kW

Recharge Energy: 20.4 AC kWh @ 240 VAC

Efficiency: 338 DC Wh/mile

Efficiency: 432 AC Wh/mile

Constant Speed Range @ 60 mph^{3,6} (332 lbs payload)

Range: 35.9 miles

Energy Used: 17.5 DC kWh

Average Battery Power: 23.0 kW

Recharge Energy: 23.8 AC kWh @ 240 VAC

Efficiency: 487 DC Wh/mile

Efficiency: 663 AC Wh/mile

USPS Delivery 25 Mile Cycle^{4,5} (1000 lbs payload + 200 lbs driver)

Driving Distance: 25.0 miles

Energy Used: 18.2 DC kWh

Recharge Energy: 29.1 AC kWh @ 120 VAC

Efficiency: 727 DC Wh/mile

Efficiency: 1160 AC Wh/mile

Driving Cycle Range (J1634)⁶ (332 lbs payload)

Range per J1634: 54.4 miles

Energy Used: 18.7 DC kWh

Recharge Energy: 24.3 AC kWh @ 208 VAC

Efficiency (J1634): 446 AC Wh/mile

Efficiency UDDS: 318 DC Wh/mile

Efficiency HWFET: 385 DC Wh/mile

Charger Level 1 (@120 VAC / 13A)

Time to Fully Recharge: 22 hours

Charger Level 2 (@208 VAC / 18A)

Time to Fully Recharge: 6.5 hours

Test Notes:

1. Design Payload Value is 1000 lbs plus one 200 lbs driver (no passengers) given the original LLV GVWR of 4450 lbs.
2. Manufacturer recommended Tire Air Pressure
3. Test was terminated due to overheating.
4. At test termination, vehicle was still able to maintain the required drive schedule.
5. USPS Delivery Cycle: 8 miles city, 6 miles freeway, and 11 miles stop/go with 700 stops.
6. At test termination, vehicle was not able to maintain the required drive schedule.

Values in **Red** indicate the Performance Goal was not met.

USPS Requirement Specifications

1. Vehicle has a payload of at least 1000 pounds.
2. Seating capacity is one (1) driver occupant.
3. The cargo space has not been intruded upon by the electrical conversion components or materials.
4. The vehicle consumes no liquid fuel for propulsion.
5. The vehicle has a parking mechanism per SAE J2344 section 4.10 Mechanical Safety to prevent unintended motion of the vehicle when placed in "P" (PARK) or when the key is removed.
6. The vehicle contains a vehicle crash sensor automatically disconnect high voltage in case of a crash.
7. The vehicle has a minimum range between charges of at least 25 miles when loaded with 1000 lbs payload and one 200 lbs driver over the specified USPS drive cycle including 8 miles of city driving, 6 miles of freeway driving, and 11 miles of delivery driving with 700 stops.
8. The vehicle is capable of accelerating from 0 to 15 mph in 5 seconds, 0 to 50 mph in 22 seconds, and 0 to 55 mph in 35 seconds.
9. The vehicle is capable of coming to a complete stop from 60 mph in 216 feet, 30 mph in 57 feet, and 20 mph in 25 feet.
10. The vehicle manufacturer has certified the charger is capable of accepting input voltages of 110V single phase 60 Hertz alternating current service. Charger input current is compatible with a 15A branch circuit.
11. The vehicle does not contain exposed conductors, terminals, contact blocks or devices of any type that create the potential for personnel to be exposed to 50 volts or greater.
12. The vehicle will be accompanied by manuals for service, operation, maintenance, and towing
13. Propulsion power is isolated from the vehicle chassis.
14. Charging circuits are isolated from the vehicle chassis.

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