Proposed R/V Paragon Electrical HPU Upgrades.

The upgrades to an electrical Hydraulic Pump Unit for the R/V Paragon start with the motor suggested by Jared, the ECPC 1004. This is meant to be a direct replacement for the Honda GX-390 currently being used. This is a 48Vdc, 200A (11HP) brushed DC motor which will spin at 3200 RPM under a full load. Based on our desired speed of ~2500 RPM, we will be operating the 1004 motor at 36V nominally.

The capacity of the batteries is driven by the mechanical power required to control the hydrophone pole in a vertical position while operating in a variety of sea states. Andy did some calculations and presented the required power needed in a separate document. The ultimate power required by the hydraulic system is 1500 Watts, with a mean current of 34 amps, and a peak current of 168 amps. These current draws could be higher, however, based on rougher sea states. The proposed battery is the 36V GATR Max. It is a 36V battery, but actually has an output range of 36V-45V, with 42V being the nominal output. A single 36V GATR Max battery can supply 150 amps of continuous current, so two in parallel can source up to 300 amps continuous. The energy available with two parallel batteries is 42V x 120Ah x 2 = 10kWh. With an average draw of 1500 Watts, this gives us 6.7 hours of use. This should be sufficient power for us, but up to eight batteries can be strapped in parallel. They each contain their own Battery Management System (BMS), but there is no external communication with them. They provide thermal, over/under voltage and current protection. The dimensions of each battery are: L=29.75”, W=10.25”, and H=11”. They each weight 110 pounds.

The manufacturer of the batteries, BigBattery, sells their own battery charger. There are minimal technical specs online for this charger, however, once I contact them for more information and a quote, I will request the user’s manual (if available). In any case, this should be sufficient for initial testing. I can design our own battery charger in the future, if needed.

Figure one shows a simple block diagram of the proposed system. All of the equipment will reside in the aft hatch on the R/V Paragon, with the possible exception of the charger.

We will not need a motor controller for speed control for this application, however, we will need to have a unit with appropriate on/off and metering functionality. This will probably be a 3U container (box) which will reside near the batteries. I am currently designing this unit using as many of the suggested parts from the motor distributor as possible. Figure two shows a work-in-progress of this unit. The unit will have two switches: the first supplies battery power to the unit, the second activates the motor, and hence, the HPU. The batteries are charged through this unit; this charging current is sent through the shunt, allowing the charging current to be displayed on the front panel meter. The front panel meter displays battery voltage, discharge current, charge current, and amp-hours used.

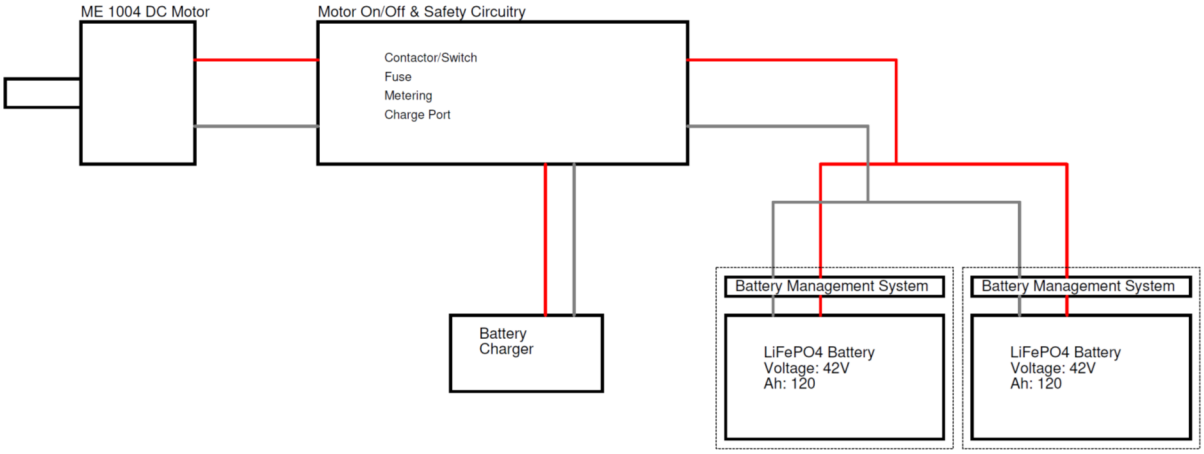

Figure One: Block Diagram of the proposed electrical HPU system.

Parts:
Motor: ECPC 1004
Battery: 36V GATR Max (x2)
Battery Charger: Manufacturer
Control Circuitry: Custom (MBARI) made

I will plan on running through extensive lab testing prior to using on the R/V Paragon. A separate discussion will need to take place with Jared and DMO management regarding permanent installation onto the Paragon.

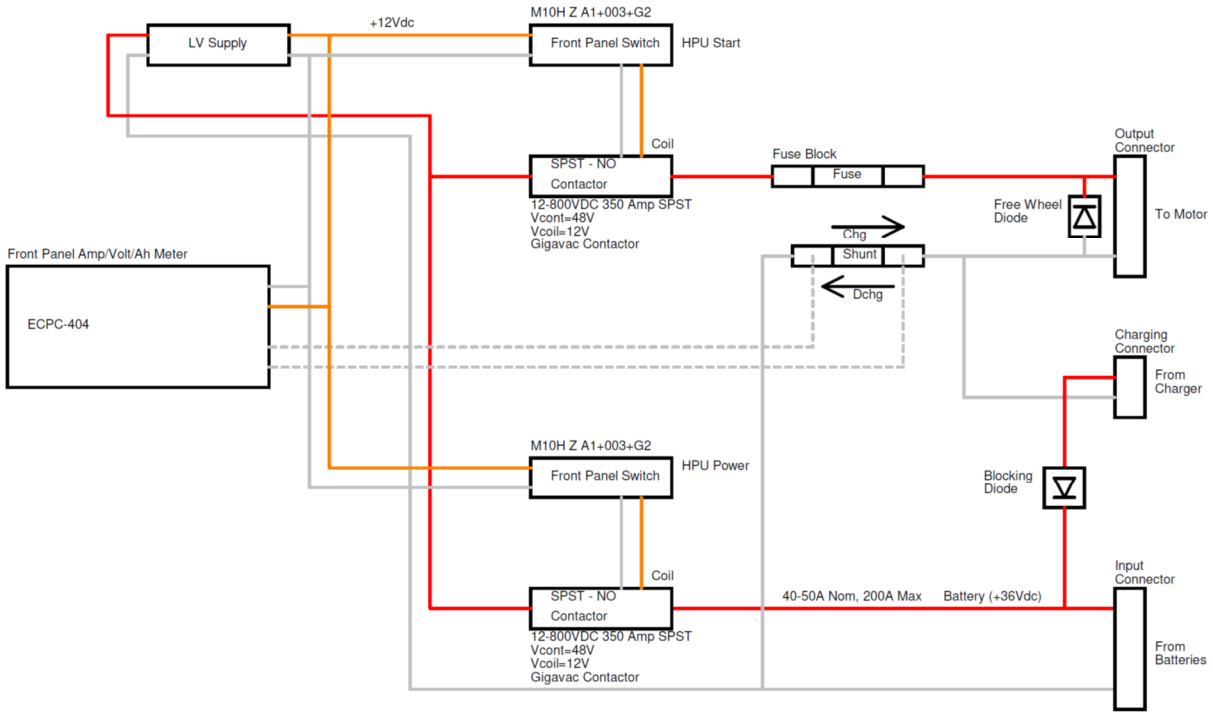

Figure Two: Safety and Monitoring unit for electrical HPU system

Item	Manuf PN#	Unit Cost	Quan	Cost	Tax	Shipping	Total
Motor	ECPC 1004	$565.00	1	$565.00	$50.85	$50.00	$665.85
Battery	36V GATR Max	$1,500.00	2	$3,000.00	$270.00	$400.00	$3,670.00
Meter	ECPC 404	$85.00	1	$85.00	$7.65	$25.00	$117.65
Contactor	12-800Vdc	$175.00	2	$350.00	$31.50	$50.00	$431.50
Charger		$191.00	1	$191.00	$17.19	$25.00	$233.19
FP Switch		$100.00	2	$200.00	$18.00	$25.00	$243.00
Shunt/Fuses		$250.00	1	$250.00	$22.50	$25.00	$297.50
12V PS		$250.00	1	$250.00	$22.50	$25.00	$297.50
IP68 3U Box		$300.00	1	$300.00	$27.00	$25.00	$352.00
				$0.00	$0.00		$0.00
				$0.00	$0.00		$0.00
				$0.00	$0.00		$0.00
				$0.00	$0.00		$0.00
				$0.00	$0.00		$0.00
							$6,308.19

Table One: Costs of the major components