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Requirements:

Output Current: Operating Maximum of 450 Amps including hysteresis, DC

Load Resistance: 0.34 Ohms (magnet)

Load Inductance: Not specified

Load Voltage: 150 Volts + 20 Volts in cable + overhead =180 Volts

Regulation: 0.1% drift

Max. Current Ripple: Not Specified

Available power supplies:

There are no available spare power supplies on the JLab campus that will meet this requirement. All power supplies that will meet this requirement are in use for the main machine.

Solutions:

Option 1: Buy new power supply

A new 50 ppm class Danfysik power supply at the ~ 90kilo-watt power range will cost around \$80k (procurement fees will add more to the cost).

A second possibility is to buy a bulk supply and build up the controls in house as has been done for the Dogleg power supplies. The cost for that is broken down below:

- a. Bulk Supply -- ~ \$35k (waiting for quote from vendor, will also need procurement approval since this is a purchase above \$5k)
 - b. Rack -- \$2k
 - c. Controls Chassis -- \$2k
 - d. DCCT -- \$1k
 - e. AC contactor and VVU -- \$2k
 - f. Labour – 6 man-weeks for assembly and testing
- Total: \$42k procurements + \$18k Labour = \$60k

Option 2: Modify Magnet coil design

There are 4 spare supplies readily available at JLab with output capable of 300 Amps operating current. These are also capable of upto 800Volts, so adding another 50% extra turns will not be a problem. If this option is chosen, the spare supply from storage should be configured and tested into a dummy load before being installed in the Gun Test stand. It will be about 4 man-weeks of effort to complete this (2 persons, 2 weeks) testing and configuration.

Option 3: Modify spare from 300 Amps, 800 Volts to 500 Amps, 300 Volts

It is possible that the spare power supply in house can be modified to obtain the required current and voltage for this application. An engineering assessment of water cooling and space within cabinet still needs to be conducted.

A preliminary cost estimate is shown below.

- a. Replace 350 Amp inductor with 500 Amp DC inductor: ~ 4.5k
 - b. Add transistors to transistor bank: ~ 3k
 - c. Modify cooling water circuit: ~ 2k
 - d. Replace 400 Amp DCCT with 600 Amp DCCT: ~ 1.2k
 - e. Procurement charges: Unknown
 - f. Danfysik Service Charges for software, parts: estimate ~5k-10k (waiting for response from Danfysik service department)
 - g. Engineering Labour: ~ 4 person-weeks
 - h. Labour for modifications: 8 person-weeks
 - i. Labour for testing: 5 person-weeks
- Total: ~22k procurements + ~30k labour

This estimate is assuming that a < 100 ppm level current ripple is required. If there is no stringent requirement in current ripple, then the transistor bank modifications may not be needed, there will be a reduction in labour as well.

Risk assessment:

- a. Options 1 and 2 are low risk but may have longer lead times.
- b. Option 3 carries the risk of having to fit new components into existing cabinets and being able to receive parts from the manufacturer. Some of the parts may be obsolete. It also assumes that the Danfysik service department will be able to provide the services required, which they've yet to respond.