Proposal for DUGL Battery Deployment and Charging

At the moment, DUGL plans to operate four stations at locations that do not have AC power: 4850ft near 17 ledge, and three stations at the 1700ft level.

We expect that each station will consume 10 W of power at 12V, so to be conservative we will budget for 15 W power consumption. A bank of 20 batteries, each at 12V and 100 Amp-hours, is expected to operate for over 2 months, hence requiring recharging every 2 months.

We propose to use the 12V 100 Amp-hr Deep Cycle Sealed AGM batteries, such as UB121000. These batteries are about 65 lbs each, so human-movable. The battery footprint is about 12”x7” (about 8” height), so 20 of them would fit on a 48” x 36” (4’x3’) footprint.

The AGM batteries appear to be ideally suited for our application. They are gelled so that it is impossible to spill acid even if they are broken. They are sealed and they recombine the hydrogen and oxygen inside the battery (99%+ efficient), so we do not have to worry about outgassing during recharging or operation.

Operation at Seismic Stations

At each of the battery-powered stations we will have a 4’x3’ area for the batteries, placed as close as possible to the rails to minimize the heavy lifting by people. Given the robustness of these batteries, we propose to simply place the batteries on the ground (but if required it would be simple to place them in plastic tubs – this would increase the footprint, though). The batteries will be connected to a diode-board to minimize the drainage, and with a long cable to our experiment.

Charging

For charging we envision two options: 1) set up the charging station at the same level at which the seismic station resides, or 2) set up the charging station at the surface. Option 1 would significantly reduce the handling of the batteries.

Option 1: On day 1 morning, bring 1 extra (charged) battery to the station and hook it up to the experiment. Manually disconnect the existing 20 batteries and move them to the train. Transport the batteries to the Yates shaft, and connect them to the chargers. Return on day 2 in the morning, unplug the batteries from the chargers, return the

batteries to the station and (manually) hook them up to the diode board. Remove the extra battery and bring it back to the surface.

Option 2: Similar to option 1, but would require taking the batteries off of the train and onto the shaft elevator, bringing the batteries to the surface, moving them to a dedicated location for charging (and repeating this the following day in reverse). This requires significantly more work and coordination, as well as a cart to be used at the surface for moving the batteries around.

We plan to use 5 bank chargers, 12V 10Amp, which should be able to simultaneously charge 5 of our batteries in 10 hours:

http://www.batterystuff.com/battery-chargers/12-volt/multi-bank/PS1210x5.html

This model takes 120V 11Amp as input, and we will need 4 of them, totaling the power consumption of a bit less than 5.5 kW. This is not a negligible amount of power (~20 computers).