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Performance of some environmental power systems in Antarctica.

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In the austral summer season of 2007/8 we deployed four systems to measure the geo-electric field at three remote locations in Antarctica at 78°S 23°W 1525m, 81°S 22°W 1180m, 75°S 71°W 1560m. The scientific measurements are the Air to Earth current (about 2-6pAm-2), the electric field potential (100-200Vm-1) and the supporting meteorology. Here, however, we concern ourselves with the design and performance of the environmental power supply. Each site is powered by a combination of 80W of photovoltaic panels, three different manufacturer's wind generators (each capable of outputs greater than 100W in high wind speeds), and thermally insulated AGM lead acid cells. The power system was sized to provide 30W continuous average power over the whole year but is modular and variants can be used to provide up to 100W. The use of multiple wind generators from different manufacturers not only allows scalability but also provides some redundancy and protection from systematic failure modes. The control of the generators is by bespoke electronics which we developed to maximize high wind speed survivability and to provide performance data that can be logged for both design verification and to provide maintenance information.