



A critically ill patient clings to life in a hospital intensive care ward with the help of a respirator. Suddenly, the main power source to the building is cut by construction workers digging in a nearby neighborhood. Panic grips the nurses attending the patient because a short moment without power could disable respirators before the hospital's backup generator turns on. Here is a product that could run sensitive equipment for a short duration until backup power kicks in.

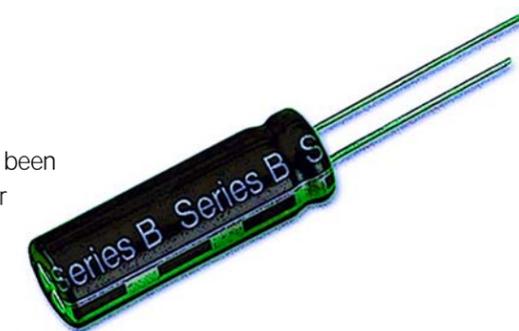
PowerStor®

How It Helps: The PowerStor aerogel capacitor offers big electrical storage capabilities in a small package. The capacitor has extremely fast discharge capabilities and low equivalent series resistance, which make it ideal for pulsed power applications. The device has high energy density (100 times greater than electrolytic capacitors) and high power (10 to 100 times greater than conventional lithium batteries). Because there are no chemical reactions, it can be recharged hundreds of thousands of times without degradation. Other advantages include small size, low cost, and reliable operation over a wide temperature range.



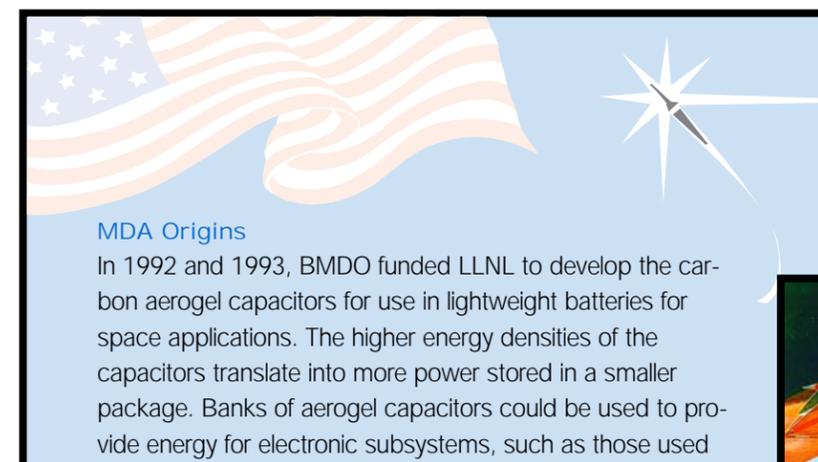
How It Works: The PowerStor aerogel capacitor is based on a novel material called carbon aerogel. Carbon aerogels consist of interconnected nanometer-sized particles with small pores. This monolithic structure leads to very high surface area (the equivalent surface area of 10 football fields) and high electrical conductivity. Capacitors can be made using thin-film carbon aerogel paper as both the positive and negative electrodes. A microporous separator is placed between the two electrodes, creating a sandwich that is wound in "jellyroll" fashion and housed in an aluminum or steel can. The can is then filled with electrolyte and sealed, with protruding leads. When the capacitor is charged, positive and negative ions are oriented along the surfaces of the oppositely charged electrodes. As energy is released, this orientation relaxes back to a disorganized state.

How Much It Will Cost: A full line of aerogel capacitors has been designed for memory backup, pulsed power, and main-power applications. Prices range from \$0.25 to \$30, depending on the type and quantity desired.



When It Will Be Ready: More than 10 million of these devices have been sold in Asia, Europe, and the United States, with new applications emerging monthly. One notable customer, Microsoft, uses the capacitor to power the clock in its new X-Box™ gaming console system. Several aviation equipment manufacturers install the device in their aircraft displays to maintain continuous voltage when switching from one electrical bus to another. Other applications include low-tech toys, valve actuators, and insulin pumps.

Who Is Working On It: Cooper Electronic Technologies is selling these devices. The company acquired this technology by purchasing PowerStor, a subsidiary of the now-defunct PolyStor Corporation. PolyStor licensed the aerogel capacitor technology from Lawrence Livermore National Laboratory (LLNL), which originally developed the technology. PowerStor employs 25 people in its 18,000-square-foot office facility in Dublin, California where the capacitors and their electrodes are made. The business unit also owns manufacturing facilities in Malaysia and China; these plants produce the capacitor's packaging. For more information, contact Marc Juzkow of Cooper Electronic Technologies at (925) 828-6700 or mjuzkow@cooperet.com. The company Web site is www.cooperindustries.com.



MDA Origins
 In 1992 and 1993, BMDO funded LLNL to develop the carbon aerogel capacitors for use in lightweight batteries for space applications. The higher energy densities of the capacitors translate into more power stored in a smaller package. Banks of aerogel capacitors could be used to provide energy for electronic subsystems, such as those used for computers and communications.