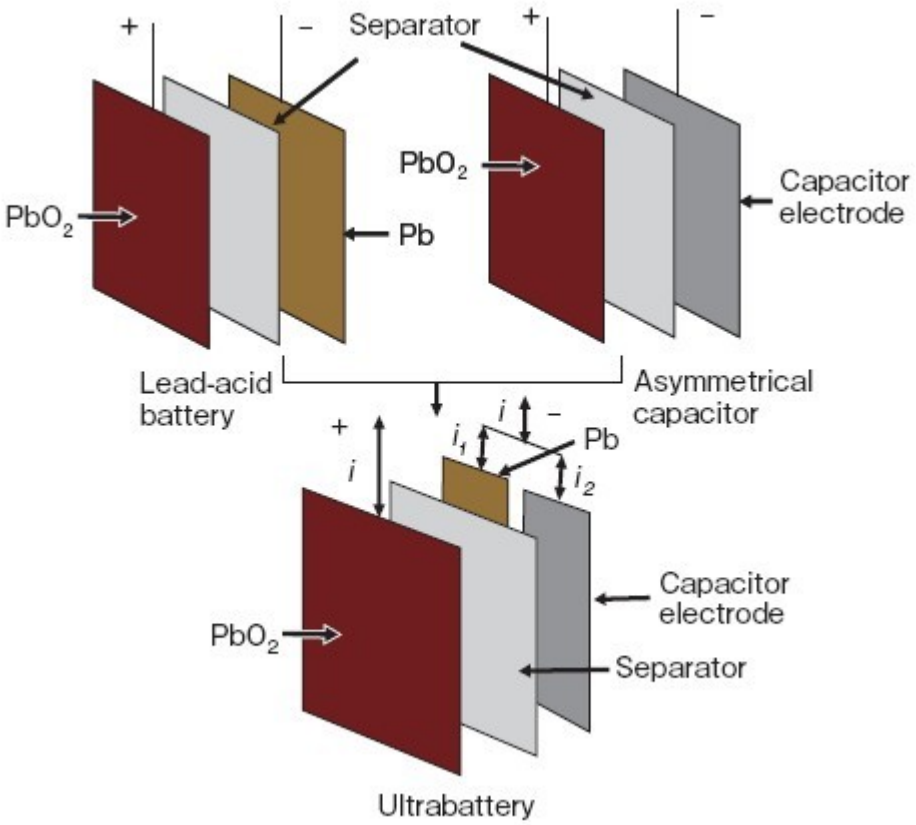
UltraBattery 1

- UltraBattery technology sold to Furukawa Battery Company: http://www.furukawa.co.jp/english/index.htm
  Scientific papers at http://www.furukawa.co.jp/review/fr032/fr32_07.pdf and http://www.furukawadenchi.co.jp/research/tech/pdf/fbtn63/fbtn63_201.pdf



UltraBattery 2

- UltraBattery has 4+ times life of equivalent lead acid battery; basically equivalent to NiMH with 6% weight penalty (2.8% less range in HEV), 70% lower cost (about $2000 savings in HEV)
  - GM's EV1 (Generation 2) had 260km range on NiMH – with UltraBattery would be 250km with equivalent construction (2 seat subcompact) at much reduced cost. Improved technology (motor in each wheel, regenerative braking, etc) would push range to >300km
- UltraBattery has much better charge/discharge profile
- Been used in HEV in Japan/England (Honda Insight et.al.) – over 160000km without incident
- Being tested for RAPS use

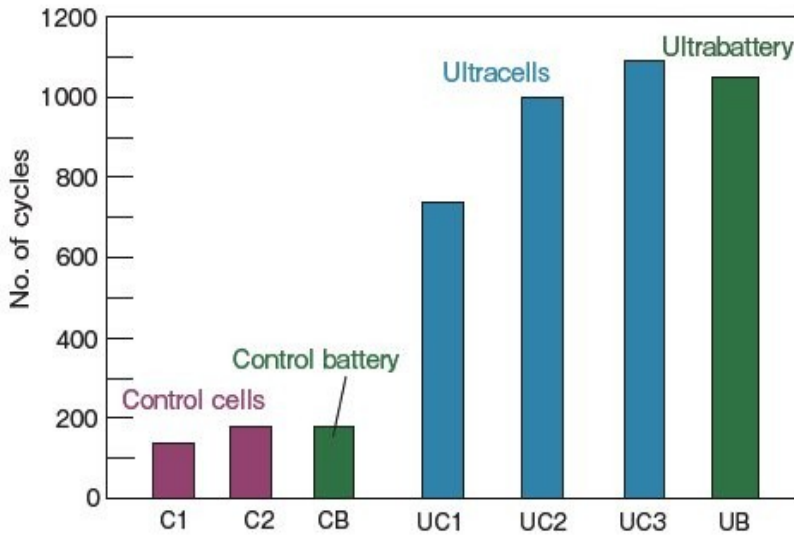


Figure 15 Comparison of life spans under RHOLAB profile.

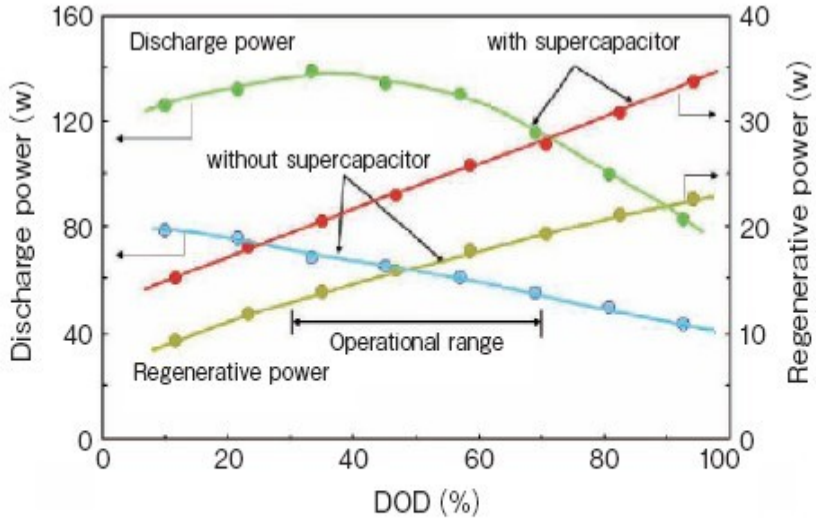
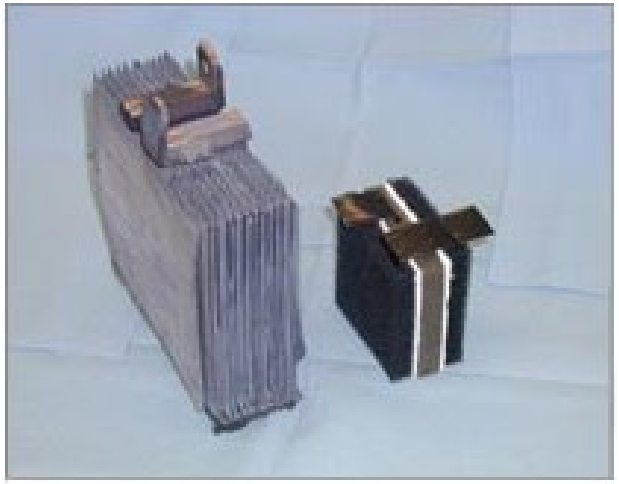


Figure 14 Relationship between depth of discharge and charge/discharge power.

UltraBattery 3

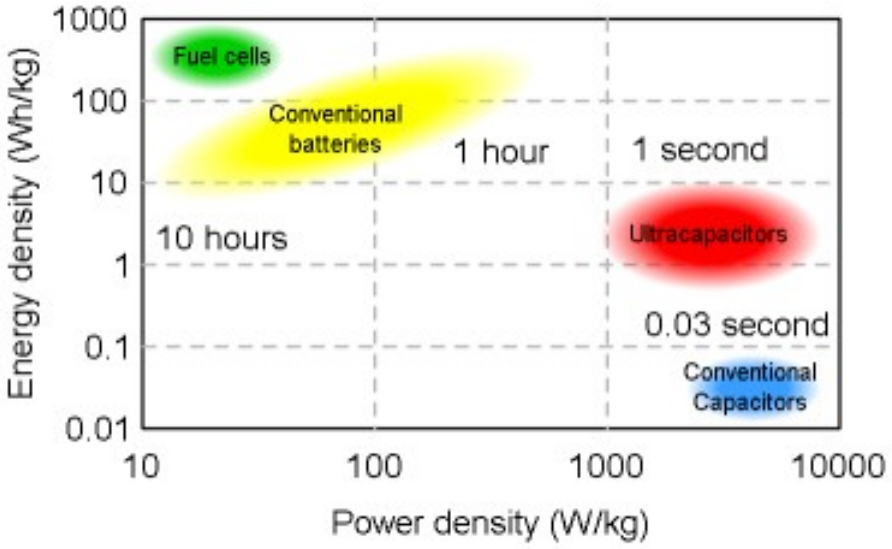
- Competitors – Firefly Oasis Group 31 battery with carbon/lead “foam”: http://www.fireflyenergy.com/index.php?option=com_content&task=view&id=273&Itemid=100 and http://rfdesign.com/mag/706RFDEF3.pdf
- Near identical design from Power Technology (PowerTech) – see http://www.pwtcbattery.com/technology/



Conventional lead metal grid-based 2v battery cell (left). Firefly carbon-graphite foam 2v 3D2 cell (right).

Super Capacitors

- MIT have shown that supercapacitors (ultracapacitors) with energy densities of 60+ Wh/kg are possible
- EEStor claim their system (using ceramics) is 225+ Wh/kg & will have cars running for 400km on a 5 minute charge by 2009; higher claims for 2010-2020. Much interest/support from Lockheed Martin for military use



Hydrogen at Home

- CSIRO had device in 2005 suitable for producing hydrogen at home for fuel cell car – took until 2008 to find business partner; unsure about future (commercial 2009?)
- Produces enough hydrogen overnight to power car 150km; mass production cost $500, handles variable loads (solar, wind generation)

Series Hybrid Technology

- CSIRO aXcessaustralia hybrid concept car (2000) – 50% fuel consumption, 10% toxic emissions of normal car
- GM also made series hybrid variant of the EV1 (1999) – 40km range electric before gas turbine (petrol, etc) motor kicked in to recharge to 50% and power car (60km if drain batteries); total range in combined mode 620km+ (25L tank; 60+ mpg), under 2 hours for recharge – see http://www.autoworld.com/news/GMC/Series_Hybrid.htm