Battery type (Rechargeable)	Positive	Negative
Lead acid 30-50 Wh/kg 85-90 Wh/L	• Extremely high current output - low internal resistance - very high conversion efficiency (80-85%). • No voltage depression ("memory" effect). • Can be tailored for particular use (eg, deep cycle). • Low cost. • Low to medium self discharge (8-40% per month).	• Dangerous chemicals used (lead, sulfuric acid). • Heavy. • Low storage density - "The energy a lead-acid battery stores per [kilogram] of battery is lower than just about any technology short of a potato wired with zinc plates." • Reduced capacity with increased temperature (50% with each 8°C). • Reduced capacity under heavy loads (Peukert Effect) - worse than sealed lead acid. • Cannot be stored flat.
Sealed lead acid (gel cell or absorbed glass mat) 30-50 Wh/kg 85-90 Wh/L	• Sealed, and so much safer than standard lead acid. • Extremely high current output - low internal resistance - extremely high conversion efficiency (gel 85-90%, AGM 95%). • No voltage depression ("memory" effect). • Low cost. • Low self discharge (2-10% per month).	• Does not like deep discharging. • Can (permanently) die suddenly. • Cannot be fully charged. • Heavy. • Low storage density. • Reduced capacity with increased temperature (50% with each 8°C). • Reduced capacity under heavy loads (Peukert Effect), although not as bad as lead acid. • Cannot be stored flat.
Rechargeable alkaline 80 Wh/kg (initial)	• Batteries and chargers are less expensive than other types. • No cadmium (more environmentally friendly than NiCd). • Very low self discharge	• Require a special sort of charger. • Cannot be recharged as many times as other types (25 to 100 times). • Cannot be fast-charged. • Reduced capacity under heavy loads (Peukert Effect). • Can have a reduced capacity after several

		charge/discharge cycles.
NiCd rechargeable (nickel cadmium) 40-80 Wh/kg 100-150 Wh/L	• Extremely high current output - low internal resistance - high conversion efficiency (65%). • Not much capacity loss under heavy loads (little to no Peukert Effect). • Very level output voltage curve, holding very steady at 1.2V until almost flat. • Can be recharged many times (500-1000) if maintained properly. • Copes very well with abuse such as heavy loads, deep discharge, etc, if maintained properly. • Can be stored in any state of charge.	• Cadmium is bad for the environment. • Cells exhibit voltage depression ("memory" effect) if recharged from a less than completely flat state (ie, they go flat before they should). • Must not be over discharged. • Reduced capacity with increased temperature (20% with each 8°C). • Careful handling required because of high current output - don't carry in your pocket, especially with a set of car keys.
NiZn rechargeable (nickel zinc) 60 Wh/kg 100-170 Wh/L	• Similar to NiCd but no toxic cadmium. • Zinc is less expensive than cadmium. • The nickel and zinc can be fully recycled. • Even lower internal resistance than NiCd. • Higher than normal voltage, nominal 1.6V per cell. • Can be recharged many times (500-600) if treated gently. • Fast recharge.	• Reduced life (100-200 cycles) if heavily discharged - one manufacturer recommends using 80% discharge for longest life. • Moderate self discharge rate. • Careful handling required because of high current output - don't carry in your pocket, especially with a set of car keys. • Charging can be tricky - for 100% charge one manufacturer suggests using 2.5C for one hour, pause 5 minutes, then use constant voltage at 2.05V. • Actually first patented in 1901 but the tendency for the cathodes to break down due to dendrite formation have kept them off the shelves.
NiMH rechargeable	• Can give very high current output.	• Must not be over discharged (and prefers shallow

(nickel metal hydride) 60-120 Wh/kg 220-300 Wh/L	• Not much capacity loss under heavy loads (little to no Peukert Effect). • Very level output voltage. • Can be recharged many times (500+) if good quality and treated well. • Little voltage depression ("memory" effect). • No cadmium (more environmentally friendly than NiCd). • Roughly 150% the gravimetric storage density (by weight) or up to 220% the volumetric storage density of NiCd. • Can be stored in any state of charge.	discharges). • Moderately high self discharge (30% per month), although Sanyo Eneloop claims to hold a 90% charge over 6 months and 85% over 12 months. • Need special chargers because overcharging can damage the battery - this means an ordinary NiCd charger may damage your NiMH battery.
Lithium ion 100-140 Wh/kg 270 Wh/L	• No voltage depression ("memory" effect). • Very high storage density (~200% of NiCd).	• Must not be over discharged. • Reduced capacity under heavy loads (Peukert Effect). • Can be recharged "only" a few hundred times (less than NiCd or NiMH).
Lithium ion polymer (lithium polymer) 130-200 Wh/kg 300 Wh/L	• No voltage depression ("memory" effect). • Even higher storage density than lithium ion (up to 300% of NiCd storage density). • Doesn't have to be in a cylindrical shape. • Environmentally friendly.	• Must not be over discharged. • Reduced capacity under heavy loads (Peukert Effect). • Can be recharged "only" a few hundred times (less than NiCd or NiMH).
Lithium iron phosphate ($LiFePO_4$) 130-170 mAh/g 90-120 Wh/kg	• Higher discharge current than other lithium batteries. • Do not explode under extreme conditions like other lithium rechargeables. • Weigh less than other Li-ion batteries. • Low cost. • Non toxic.	• Have lower voltage (3.2V) than normal Li-ion cells so can't be charged on other Li-ion chargers. • Also have lower energy density. • Not widely in production, so little performance information is available.