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Energy density Extended Reference Table

This is an extended version of the energy density table from the main Energy density page:

Energy densities table

Storage type	Specific energy (MJ/kg)	Energy density (MJ/L)	Peak recovery efficiency %	Practical recovery efficiency %
Arbitrary Antimatter	89,875,517,874	depends on density		
Deuterium–tritium fusion	576,000,000[1]			
Uranium-235 fissile isotope	144,000,000[1]	1,500,000,000		
Natural uranium (99.3% U-238, 0.7% U-235) in fast breeder reactor	86,000,000			
Reactor-grade uranium (3.5% U-235) in light-water reactor	3,456,000			30%
Pu-238 α-decay	2,200,000			
Hf-178m2 isomer	1,326,000	17,649,060		
Natural uranium (0.7% U235) in light-water reactor	443,000			30%
Ta-180m isomer	41,340	689,964		
Metallic hydrogen (recombination energy)	216[2]			
Specific orbital energy of Low Earth orbit (approximate)	33.0			
Beryllium + Oxygen	23.9[3]			
Lithium + Fluorine	23.75			
Octaazacubane potential explosive	22.9[4]			
Ammonia (NH_3)	16.9	11.5[5]		
Hydrogen + Oxygen	13.4[6]			
Gasoline + Oxygen –> Derived from Gasoline	13.3			
Dinitroacetylene explosive - computed	9.8			
Octanitrocubane explosive	8.5[7]	16.9[8]		
Tetranitrotetrahedrane explosive - computed	8.3			
Heptanitrocubane explosive - computed	8.2			
Sodium (reacted with chlorine)	7.0349			
Hexanitrobenzene explosive	7[9]			
Tetranitrocubane explosive - computed	6.95			
Ammonal (Al+NH_4NO_3 oxidizer)	6.9	12.7		
Storage type	**Energy density by mass (MJ/kg)**	**Energy density by volume (MJ/L)**	**Peak recovery efficiency %**	**Practical recovery efficiency %**

Storage type	Specific energy (MJ/kg)	Energy density (MJ/L)	Peak recovery efficiency %	Practical recovery efficiency %
Tetranitromethane + hydrazine bipropellant - computed	6.6			
Nitroglycerin	6.38[10]	10.2[11]		
ANFO-ANNM	6.26			
battery, Lithium–air	6.12			
Octogen (HMX)	5.7[10]	10.8[12]		
TNT [Kinney, G.F.; K.J. Graham (1985). *Explosive shocks in air*. Springer-Verlag. ISBN 978-3-540-15147-0.]	4.610	6.92		
Copper Thermite (Al + CuO as oxidizer)	4.13	20.9		
Thermite (powder Al + Fe_2O_3 as oxidizer)	4.00	18.4		
Hydrogen peroxide decomposition (as monopropellant)	2.7	3.8		
battery, Lithium-ion nanowire	2.54			95%[13]
battery, Lithium Thionyl Chloride ($LiSOCl_2$)[14]	2.5			
Water 220.64 bar, 373.8 °C	1.968	0.708		
Kinetic energy penetrator	1.9	30		
battery, Fluoride-ion	1.7	2.8		
battery, Hydrogen closed cycle H fuel cell[15]	1.62			
Hydrazine decomposition (as monopropellant)	1.6	1.6		
Ammonium nitrate decomposition (as monopropellant)	1.4	2.5		
Thermal Energy Capacity of Molten Salt	1			98%[16]
Molecular spring approximate	1			
battery, Sodium–Sulfur	0.72[17]	1.23		85%[18]
battery, Lithium–Manganese[19][20]	0.83-1.01	1.98-2.09		
battery, Lithium-ion[21][22]	0.46-0.72	0.83-3.6[23]		95%[24]
battery, Lithium–Sulfur[25]	1.80[26]	1.26		
battery, Sodium–Nickel Chloride, High Temperature	0.56			
battery, Silver-oxide[19]	0.47	1.8		
Storage type	**Energy density by mass (MJ/kg)**	**Energy density by volume (MJ/L)**	**Peak recovery efficiency %**	**Practical recovery efficiency %**

Storage type	Specific energy (MJ/kg)	Energy density (MJ/L)	Peak recovery efficiency %	Practical recovery efficiency %
Flywheel	0.36-0.5[27][28]			
5.56 × 45 mm NATO bullet	0.4	3.2		
battery, Nickel–metal hydride (NiMH), low power design as used in consumer batteries[29]	0.4	1.55		
battery, Zinc-manganese (alkaline), long life design[19][21]	0.4-0.59	1.15-1.43		
Liquid Nitrogen	0.349			
Water - Enthalpy of Fusion	0.334	0.334		
battery, Zinc Bromine flow (ZnBr)[30]	0.27			
battery, Nickel metal hydride (NiMH), High Power design as used in cars[31]	0.250	0.493		
battery, Nickel–Cadmium (NiCd)[21]	0.14	1.08		80%[24]
battery, Zinc–Carbon[21]	0.13	0.331		
battery, Lead–acid[21]	0.14	0.36		
battery, Vanadium redox	0.09	0.1188		70-75%
battery, Vanadium–Bromide redox	0.18	0.252		80%–90%[32]
Capacitor Ultracapacitor	0.0199[33]	0.050		
Capacitor Supercapacitor	0.01		80%–98.5%[34]	39%–70%[34]
Superconducting magnetic energy storage		0.008[35]		>95%
Capacitor	0.002[36]			
Neodymium magnet		0.003[37]		
Ferrite magnet		0.0003[37]		
Spring power (clock spring), torsion spring	0.0003[38]	0.0006		
Storage type	**Energy density by mass (MJ/kg)**	**Energy density by volume (MJ/L)**	**Peak recovery efficiency %**	**Practical recovery efficiency %**

Notes

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