SUPPLEMENTARY MATERIAL

For "Seasonal and multi-seasonal energy storage by Power-to-Methane technology" by Kristóf Kummer and Attila R. Imre.

method	η_b	η_s/day	Shelf-life (year)
Lead-acid battery	0.85	0.003-0.004 [1]	3-15
Nickel-metal hydride battery	0.80	0.005-0,009 [2]	5-10
Lithium-ion (LiNMC/LiFePO4) battery	0.95	0.001-0.002 [1]	2-3
"Second-life" Lithium-ion battery	0.5-0.8	0.005-0.01	3-6
VRFB (offline)	0.75	0.2	20-30
VRFB (standby)	0.75	0	20-30
Sodium-Sulphur battery	0.85	0.068	15-25
Power-to-Hydrogen (with high-pressure gas storage)	0.75	0.01	>50
Power-to-Hydrogen (with cryogenic liquid storage)	0.75	0.002-0.006 [3][4]	>50
Power-to-Methane	0.33-0.5	0.000023 [5][6]	>50
Gravity storage	0.9	0.000064	>1000

Table S1: Shelf-lifes and range of constants of the simplified (linear) ADSF(t) function (Equation 3), used in Figure 5a and 5b taken from various sources and from own estimates.

Sources

(1) Thilo Bocklish, "Hybrid energy storage systems for renewable energy applications", Energy Procedia 73 (2015) 103-111, 9th International Renewable Energy Storage Conference, IRES 2015

(2) Christine Jeyaseelan, Antil Jain, Parul Khurana, Dinesh Kumar and Sheenam Thatai, "Ni-Cd Batteries" in Rechargeable Batteries: History, Progress, and Applications (eds.: Rajender Boddula Inamuddin Ramyakrishna Pothu Abdullah M. Asiri) 2020 https://doi.org/10.1002/9781119714774.ch9

(3) W. A. Amos, "Costs of Storing and Transporting Hydrogen.", NREL/TP-570-25106, 1998, https://www.nrel.gov/docs/fy99osti/25106.pdf

(4) G. Petitpa: Boil-off losses along LH2 pathway, OSTI report,

https://www.osti.gov/biblio/1466121-boil-off-losses-along-lh2-pathway 2018.
(5) D.A. Kirchgessner, R.A. Lott, R.M. Cowgill, M.R. Harrison, T.M. Shires: Estimate of methane emissions from the U.S. natural gas industry, 1997, U.S. Environmental Protection Agency
(6) Hungarian methane emission: http://www.ksh.hu/docs/hun/xstadat/xstadat_eves/i_ua028d.html