Supporting Information for

The Impact of Intelligent Cyber-Physical Systems on the Decarbonization of Energy

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Supplementary Tables

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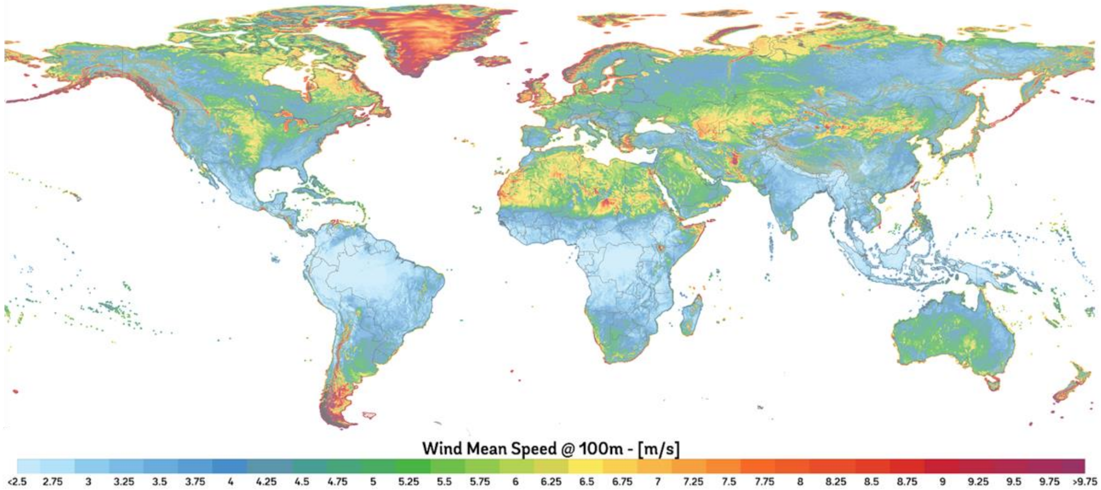
Reference

Table S1. Technical, economic and energetic performance of selected bulk energy storage[1,2].

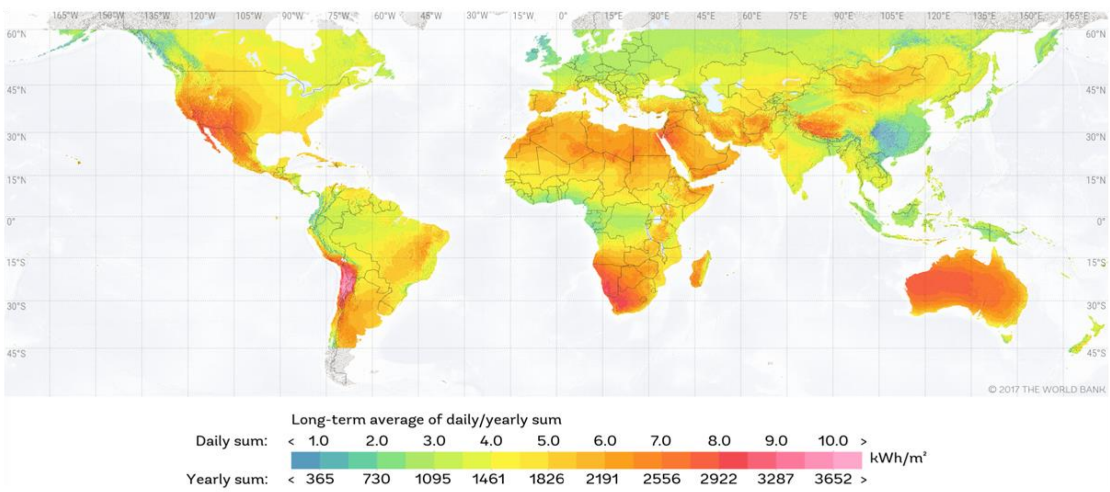
	Round-trip efficiency (%)	Power specific capital cost ($ per kW)	Energy specific capital cost ($ per kWh)	Energy return on investment (kWh per kWh)
Pumped hydro	75-80	1500-2000	10-100	704
Compressed air	55-70	850-1200	200-250	797
Pb-A battery	75-90	450-650	300-450	5
NaS battery	75-85	350-800	250-400	20
ZnBr battery	60-75	500-1500	200-400	9
VRB battery	65-80	1000-1500	200-600	10

Table S2. Impact of CPS technologies on the marginal abatement cost of selected decarbonization technologies in energy transition[1–23].

Sector	Potential without CPS[1-3] (Mton)	Price without CPS[4-16] (EUR)	Potential with CPS[4-16] (Mton)	Price with CPS[4-16] (EUR)	Potential with CPS and AI[17-23] (Mton)	Price with CPS and AI1[17-23] (EUR)	Price Uncertainty[8]
Building	1500	-65	1650	-68	1920	-72	-190 to +310
Petrochemical Industry	273	-60	284	-61	325	-63	--
Solar	1882	18	1976	17	2315	16	0 to 190
Iron and steel	303	21	321	23	367	19	--
Wind	941	23	969	21	1139	21	2 to 220
Coal CCS	2000	44	2060	45	2160	42	30 to 2000
Biomass CCS	235	46	242	47	254	44	10 to 250
Hybrid/Electric Vehicle	640	88	768	97	928	88	30 to 640



(a) Global wind power resources in terms of wind mean speed at 100m height



(b) Global solar power resources in terms of direct normal irradiation

Figure S1. Global wind and solar power resources in terms of wind mean speed at 100m height and direct normal irradiation. Data obtained from the Global Wind/Solar Atlas, a free, web-based application developed, owned and operated by the Technical University of Denmark (DTU) in partnership with the World Bank Group, utilizing data provided by Vortex, with funding provided by the Energy Sector Management Assistance Program (ESMAP)[24,25].

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