Mit Unterstützung vom
Bundesministerium
Klimaschutz, Umwelt,
Energie, Mobilität,
Innovation und Technologie

forum wissenschaft & umwelt

Atomenergie oder Alternativen?

Fachdialog

EU long-term strategy 2050 – ohne Atom und gefährliche Lagerung (CCS)?

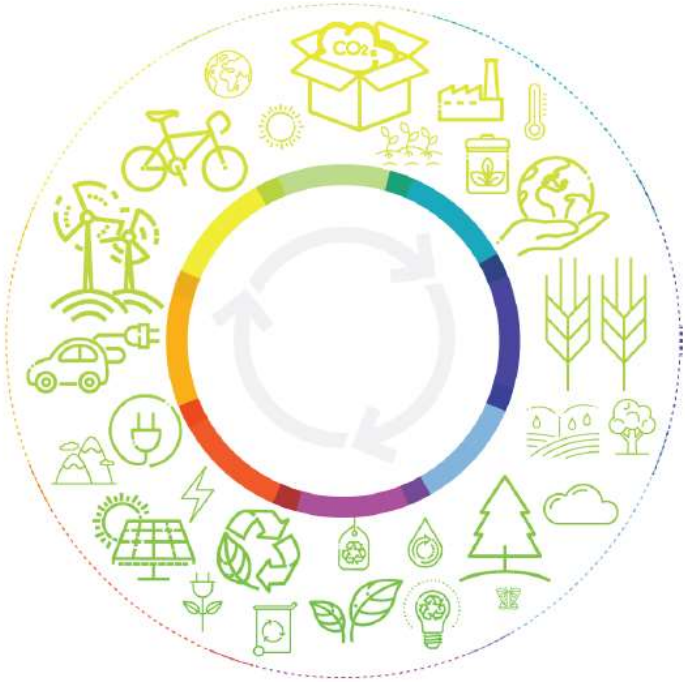
Rupert Christian, Umwelt Management Austria

Novum Wien Hauptbahnhof,
Wien, 02.09.2020

long-term strategy 2050

A Clean Planet for all

A European long-term strategic vision for a prosperous, modern, competitive and climate neutral economy



long-term strategy 2050

Long Term Strategy Options

	Electrification (ELEC)	Hydrogen (H2)	Power-to-X (P2X)	Energy Efficiency (EE)	Circular Economy (CIRC)	Combination (COMBO)	1.5°C Technical (1.5TECH)	1.5°C Sustainable Lifestyles (1.5LIFE)
Main Drivers	Electrification in all sectors	Hydrogen in industry, transport and buildings	E-fuels in industry, transport and buildings	Pursuing deep energy efficiency in all sectors	Increased resource and material efficiency	Cost-efficient combination of options from 2°C scenarios	Based on COMBO with more BECCS, CCS	Based on COMBO and CIRC with lifestyle changes
GHG target in 2050	-80% GHG (excluding sinks) ["well below 2°C" ambition]					-90% GHG (incl. sinks)	-100% GHG (incl. sinks) ["1.5°C" ambition]	
Major Common Assumptions	• Higher energy efficiency post 2030 • Deployment of sustainable, advanced biofuels • Moderate circular economy measures • Digitilisation					• Market coordination for infrastructure deployment • BECCS present only post-2050 in 2°C scenarios • Significant learning by doing for low carbon technologies • Significant improvements in the efficiency of the transport system.		
Power sector	Power is nearly decarbonised by 2050. Strong penetration of RES facilitated by system optimization (demand-side response, storage, interconnections, role of prosumers). Nuclear still plays a role in the power sector and CCS deployment faces limitations.							
Industry	Electrification of processes	Use of H2 in targeted applications	Use of e-gas in targeted applications	Reducing energy demand via Energy Efficiency	Higher recycling rates, material substitution, circular measures	Combination of most Cost-efficient options from "well below 2°C" scenarios with targeted application (excluding CIRC)	COMBO but stronger	CIRC+COMBO but stronger
Buildings	Increased deployment of heat pumps	Deployment of H2 for heating	Deployment of e-gas for heating	Increased renovation rates and depth	Sustainable buildings			CIRC+COMBO but stronger
Transport sector	Faster electrification for all transport modes	H2 deployment for HDVs and some for LDVs	E-fuels deployment for all modes	Increased modal shift	Mobility as a service			• CIRC+COMBO but stronger • Alternatives to air travel
Other Drivers		H2 in gas distribution grid	E-gas in gas distribution grid				Limited enhancement natural sink	• Dietary changes • Enhancement natural sink

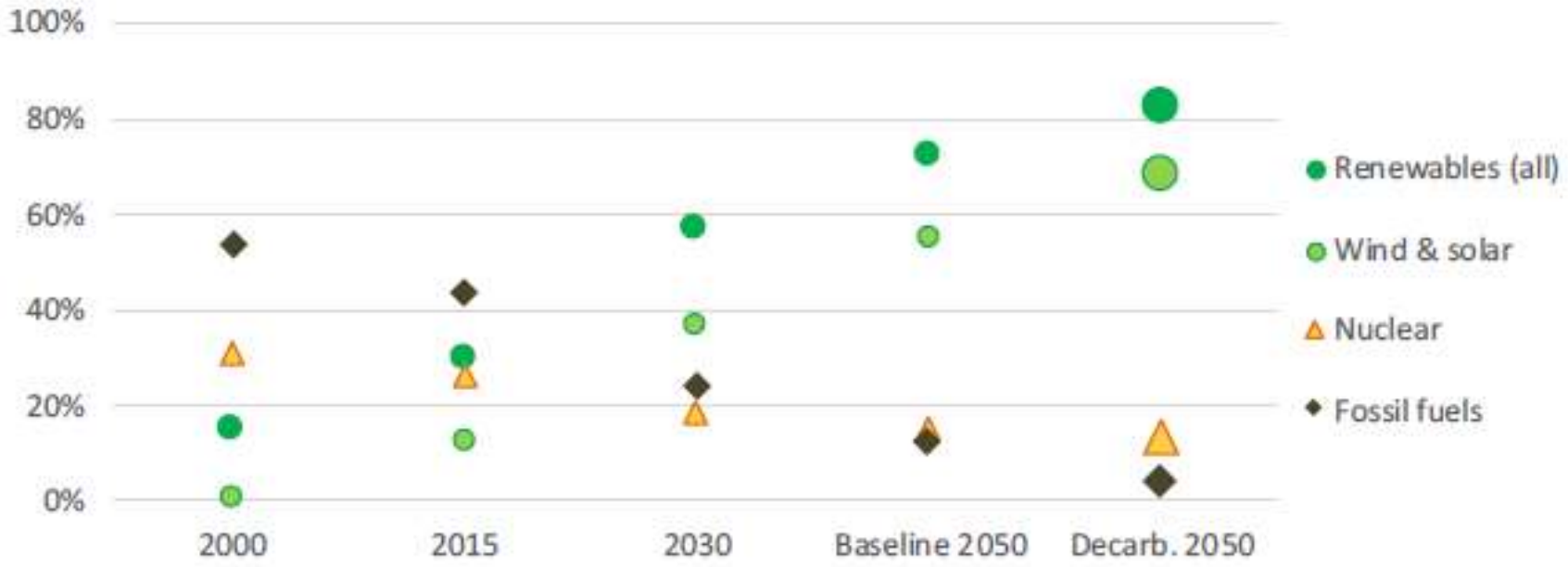
long-term strategy 2050

8 Szenarien

- Electrification (ELEC)
- Hydrogen (H2)
- E-fuels (P2X)
- Energy Efficiency (EE)
- Circular Economy (CIRC)
- COMBO
- Negative Emissions Technologies (1.5TECH)
- Sustainable Lifestyles (1.5LIFE)

long-term strategy 2050

Anteile (%) an der Stromproduktion



long-term strategy 2050

	$E_{el}^{ges.}$	$E_{el,nuk}$	$E_{el,nuk}^{rel.}$
EE	4.335	645	14,88%
CIRC	4.853	726	14,97%
ELEC	5.758	799	13,87%
H2	6.567	868	13,22%
P2X	7.667	908	11,85%
COMBO	6.696	886	13,22%
1.5TECH	7.958	959	12,05%
1.5LIFE	6.535	845	12,93%

long-term strategy 2050

	P_{2050}^{LTS}
EE	99,3
CIRC	106,7
ELEC	112,9
H2	114,1
P2X	116,9
COMBO	116,9
1.5TECH	121,3
1.5LIFE	114,8

Situation der Atomkraft

derzeit in Bau:

- **5 Reaktoren**
- **5,74 GW Leistung**

derzeit in Planung:

- **8 Reaktoren**
- **9,57 GW Leistung**

Bauzeit:

- **68 Monate (Median, global)**

Situation der Atomkraft

Atomkraft 2050:

- **10 GW noch am Netz**
- **derzeitiger Bau ⇨ 45 GW**
- **derzeitige Planung ⇨ 69 GW**
- **Summe Bau & Planung ⇨ 105 GW**

IAEA-Szenarien

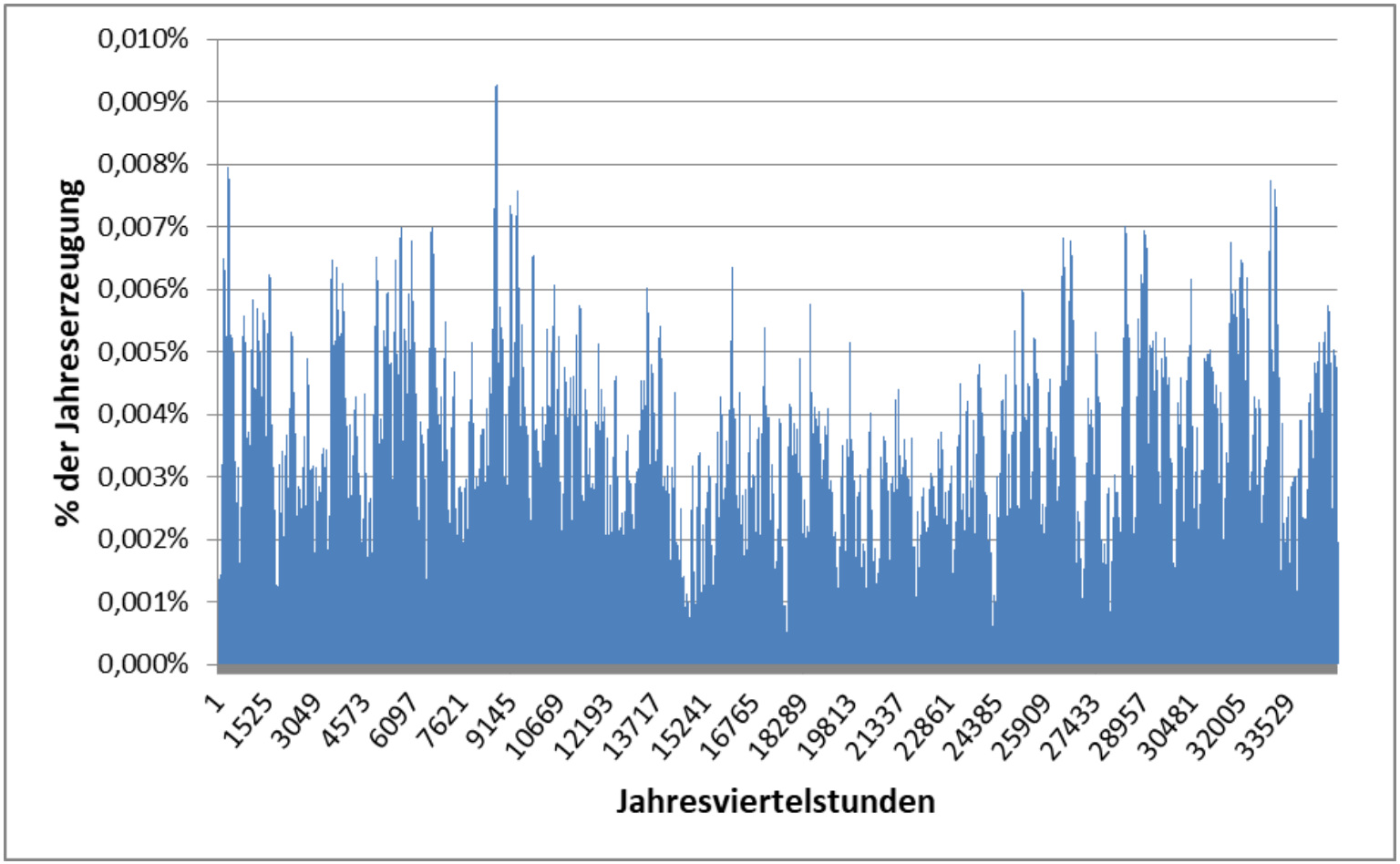
- **low case: 42 GW**
- **high case: 67 GW**

zukunftsfähige Alternative

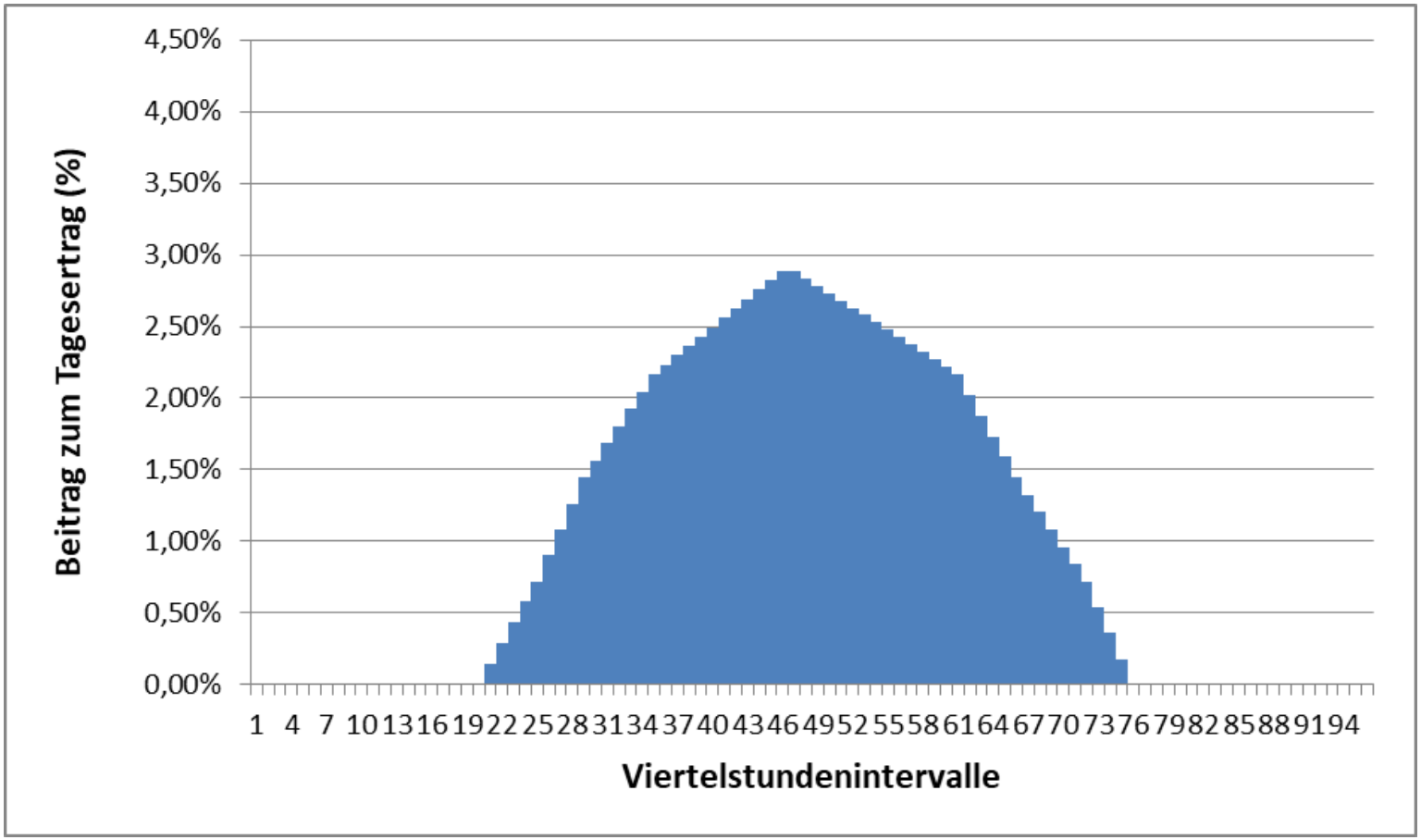
Ersatz durch Wind & PV

- Ersatz von 959 TWh Grundlast
- Gewinnung von 1.055 TWh nötig
- 80% Wind, 20% PV
- Speicherung
  mittelfristig: Pumpspeicher, Akkumulatoren (80%)
  langfristig: P2X (41%)

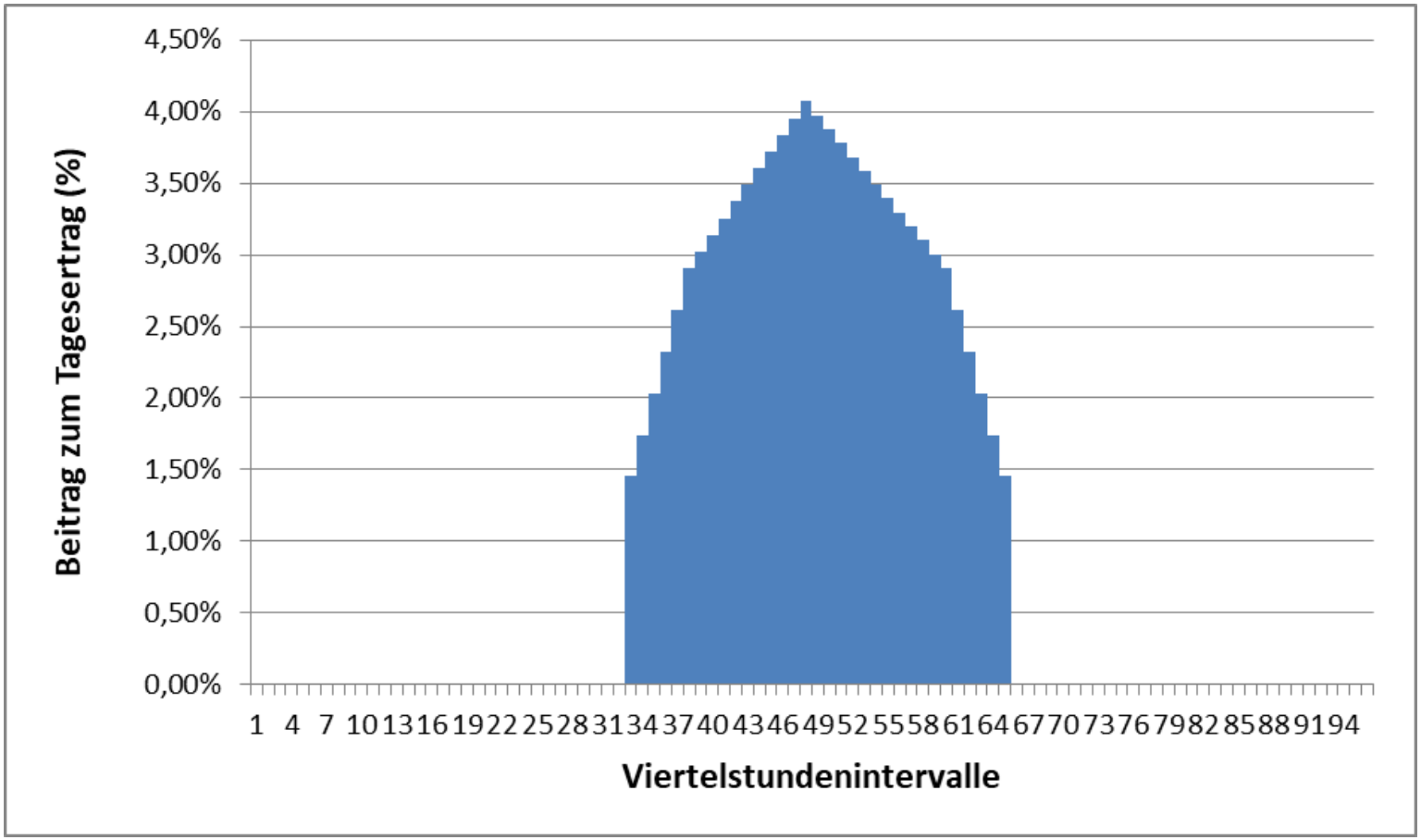
zukunftsfähige Alternative



zukunftsfähige Alternative



zukunftsfähige Alternative



zukunftsfähige Alternative

	WE	PV	AE	Δ	U	Ü
Jänner	78,742	6,623	81,440	-3,924	12,683	16,607
Februar	73,130	12,510	73,559	-12,082	9,210	21,292
März	82,168	17,171	81,331	-18,008	9,177	27,184
April	87,735	19,869	78,813	-28,791	5,530	34,321
Mai	64,602	30,172	81,440	-13,333	9,644	22,977
Juni	51,103	30,662	78,813	-2,952	14,327	17,279
Juli	52,505	28,209	81,440	0,726	15,205	14,479
August	48,853	25,266	81,440	7,321	15,816	8,495
September	63,434	18,643	78,813	-3,263	10,747	14,010
Oktober	79,412	13,001	81,550	-10,863	13,322	24,185
November	80,133	4,170	78,813	-5,490	11,012	16,502
Dezember	82,011	4,661	81,440	-5,232	12,724	17,956
	843,826	210,957	958,894	-95,889	139,398	235,288

zukunftsfähige Alternative

Potenziale

gesamte Erzeugung:

- Szenario 1.5TECH und Ersatz
- 4.793 TWh Windkraft & 1.706 TWh PV

Windkraft (onshore):

- „EU-wide high restrictions“-Szenario
- 1.902 GW bzw. 4.668 TWh

Photovoltaik:

- geeignete Dachfläche von 7.935 km^2
- 1.587 GW bzw. 2.063 TWh

Quellen: ENSPRESO – an open, EU-28 wide, transparent and coherent database of wind, solar and biomass energy potentials
A high-resolution geospatial assessment of the rooftop solar photovoltaic potential in the European Union

zukunftsfähige Alternative

Speicherbedarf

- **Dezember:**
  - **10 Tage Unterdeckung**
  - **→ 8,3 TWh Speicherbedarf (mittelfristig)**
- **Juni – August:**
  - **Unterdeckung überwiegt**
  - **→ 22 TWh Speicherbedarf (langfristig)**
- **Gesamter Speicherbedarf: 180 TWh**

zukunftsfähige Alternative

Fazit

- **Einsatz der Atomkraft geht zurück**
- **LTS-Szenarien liegen über IAEA**
- **Ausbauraten nicht absehbar**
- **Reichweiten ~ 20 Jahre**
- **erneuerbare Alternative möglich**

⇨ LTS besser ohne Atomkraft!

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Danke

für Ihre

Aufmerksamkeit!