European policy and Swiss Hydropower

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SCCER SoE Annual Conference
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AWP News | Energie | Kotierte Aktien | News-Ticker

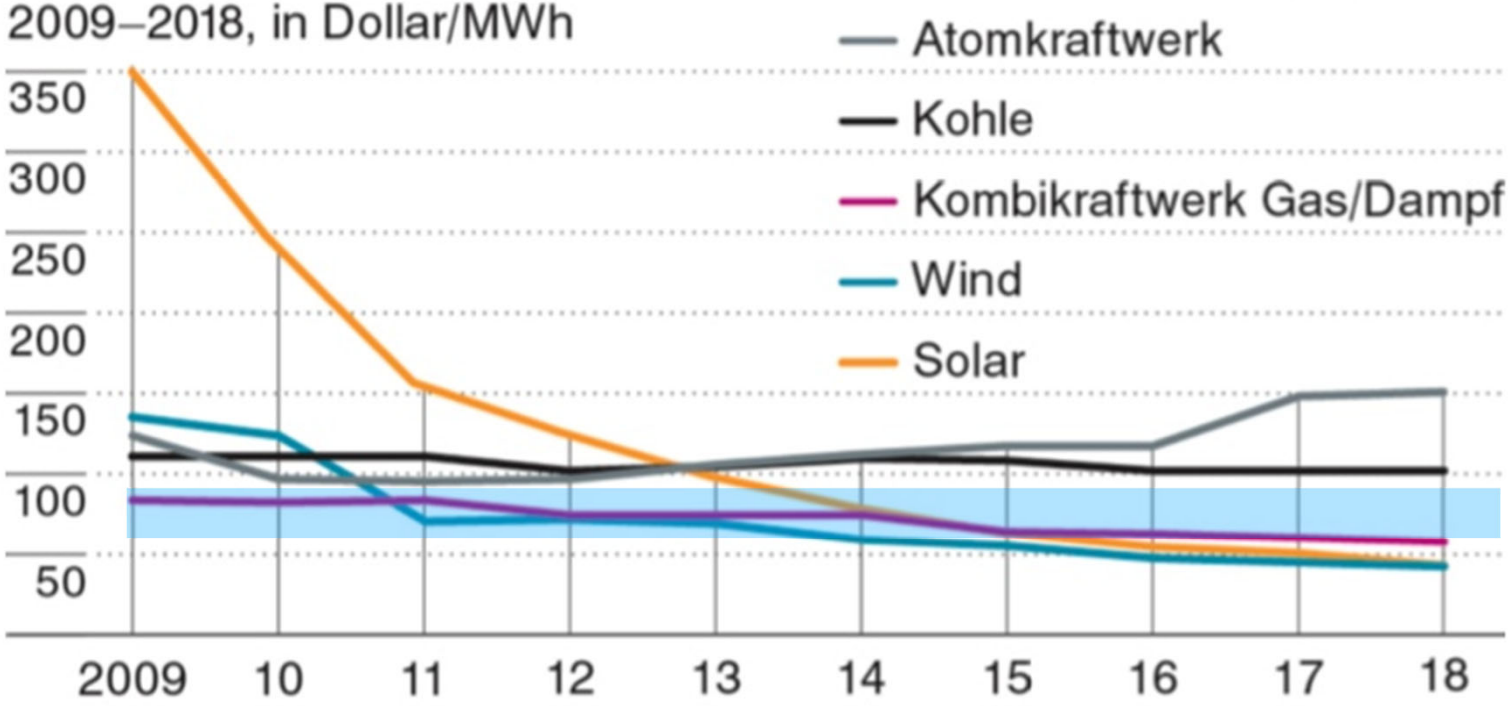
Alpiq: 2018 erneut mit Verlust – Keine Dividende

Von **AWP** - 4. März 2019 417 0

Alpiq hat im Geschäftsjahr 2018 erneut einen Verlust erlitten. Nach dem Verkauf des Industriebereichs und der Rückkehr zum traditionellen Geschäft, der Stromproduktion, erachtet der Energiekonzern den Turnaround allerdings als geschafft.

Solarstrom ist viel billiger als vor 10 Jahren

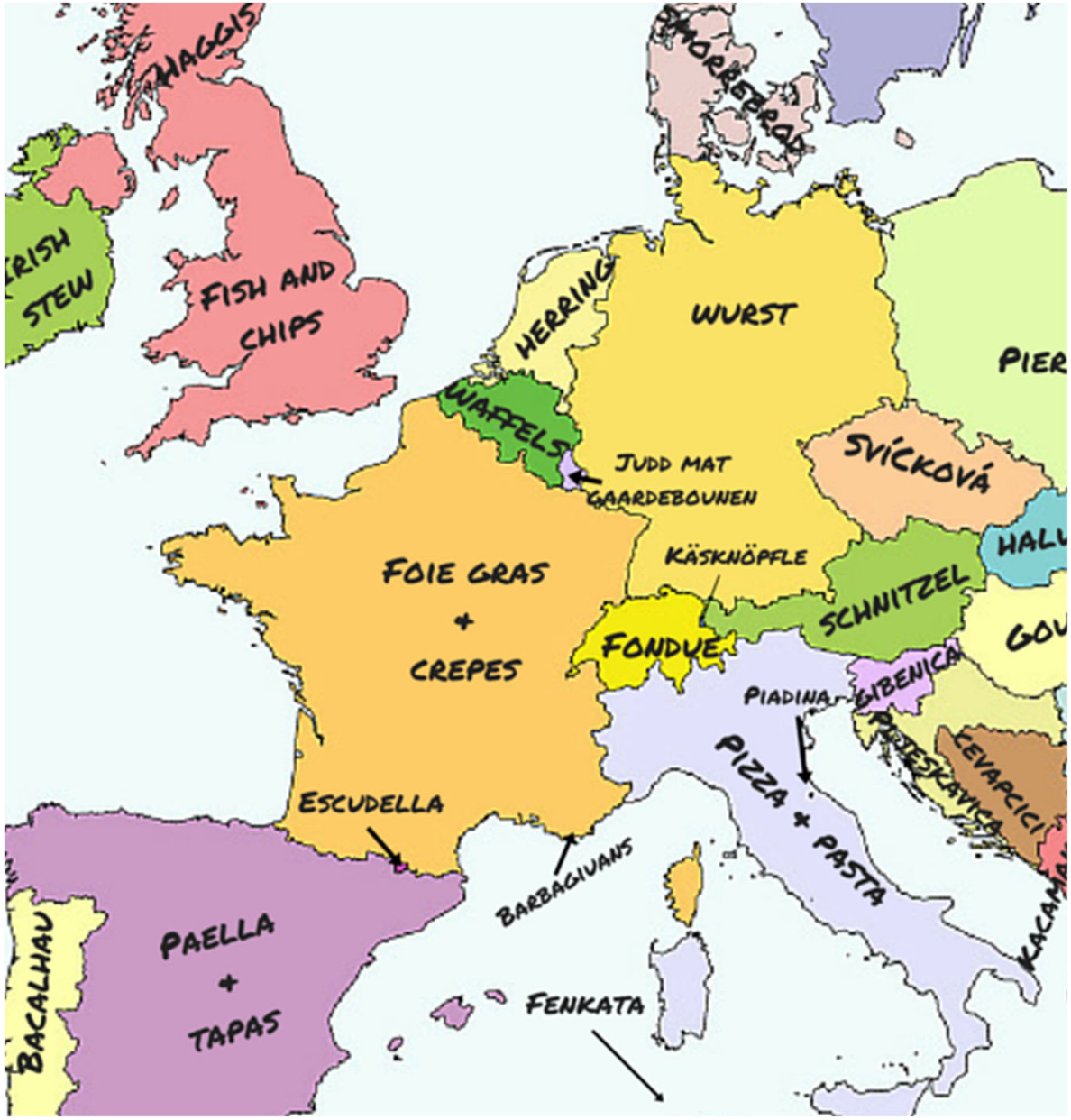
Produktionskosten: Vergleich Solarstrom mit anderen Energiequellen 2009–2018, in Dollar/MWh



Grafik: ake / Quelle: Lazard (2018)

← Swiss hydro

Tagesanzeiger, 03.09.19



How will the supply and demand for renewable electricity in Europe affect the financial viability of Swiss hydropower plants?

Part 1: European electricity roadmaps

Part 2: Swiss hydro in the context of these roadmaps

Policy pathways for the energy transition in Europe and selected European countries

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Pablo del Río, Christoph Kiefer (CSIC)

Natalia Caldés, Yolanda Lechón (CIEMAT)

Gonzalo Escribano, Lara Lázaro Touza (Royal Institute Elcano) (all funded by MUSTEC)

Leonhard Späth (ETH Zürich, Climate Policy Group) (funded by SCCER JA IDEA)

MUSTEC

Market Uptake of Solar Thermal Electricity

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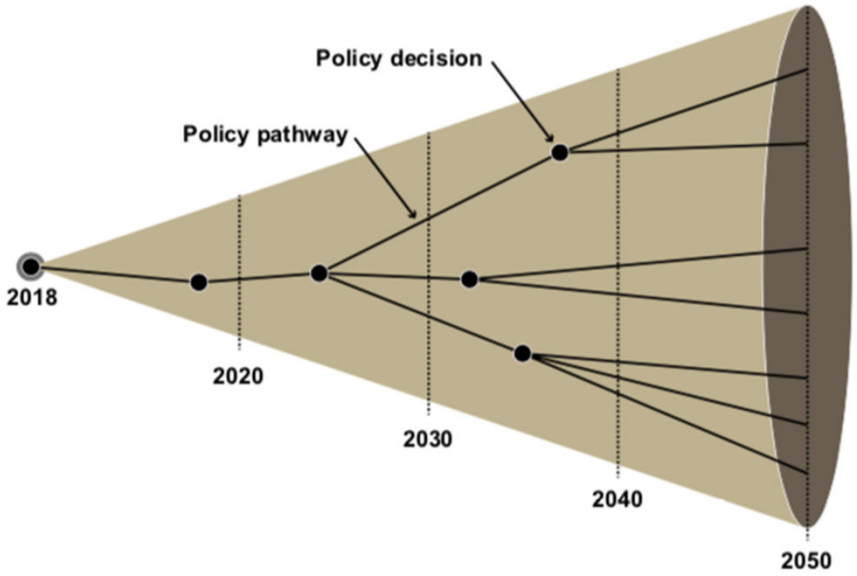
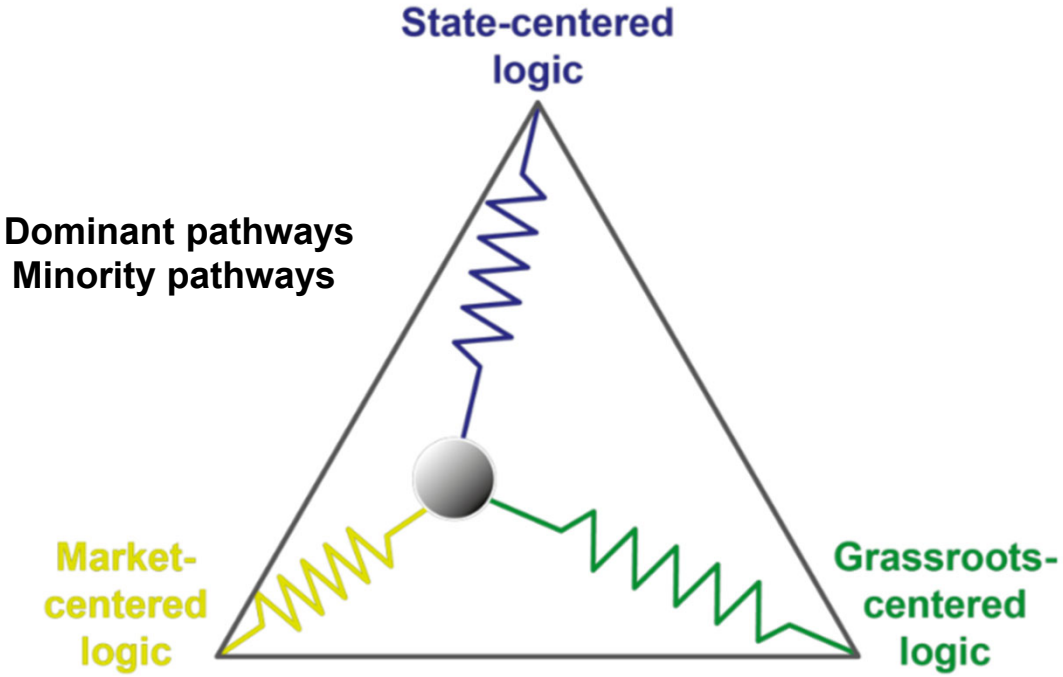
SUPPLY of ELECTRICITY

Dominant plan (CDU / SPD) is mainly state-centred

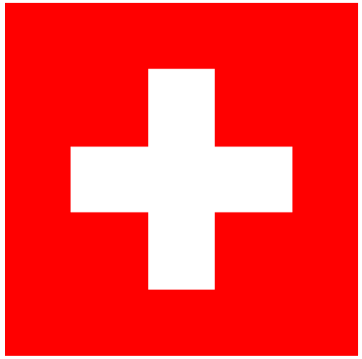
DE: Dominant	2016	2020	2030	2040	2050
GHG reduction targets (economy-wide)	894 Mt CO_{2eq}	40% (GHG-1990)	55-56% (GHG-1990)	> 70% (GHG-1990)	80-95% (GHG-1990)
ETS sector reduction targets	474 Mt CO_{2eq} (European annual emission allocation)	431 Mt CO_{2eq} (European annual emission allocation)			
Non-ETS sectors emission reduction targets		14% (GHG-2005)	38% (GHG-2005)		
GHG reduction targets (electricity sector)			61-62% (GHG-1990)		100% (GHG-1990)
Renewables targets (energy; % of final energy consumption)		18%	30%	45%	60%
Renewables targets (electricity; % of final energy consumption)	30%; 194 TWh; 108 GW	By 2025: 40-45%	By 2035: 55-60% gross generation	>65%	>80%
Intermittent renewables	117 TWh; 90 GW				
Wind onshore	79 TWh; 50 GW	+2.8GW per year (2017-19); +2.9GW per year	+2.9GW per year	+2.9GW per year	+2.9GW per year
Wind offshore	included above	6.5 GW	15 GW		
Solar PV	38 TWh; 41 GW	+2.8 GW per year	+2.8 GW per year	+2.8 GW per year	+2.8 GW per year

Similar tables for plans put forth by the Greens and FDP


Policy decision
Policy pathway
2018
2020
2030
2040
2050


State-centered logic
Dominant pathways
Minority pathways
Market-centered logic
Grassroots-centered logic

- **Every dominant pathway seeks to decarbonise electric power, primarily through wind and solar.**
- **No dominant pathway seeks to expand nuclear power or carbon capture and storage (CCS) for base-load or peak load power.**
- **Not a single pathway, dominant or minority, has a plan to address the intermittency of wind and solar.**
  - *No plan speaks to diversifying renewable power supply through international cooperation.*
  - *No plan is specific with respect to storage requirements, or the gains from sectoral coupling.*

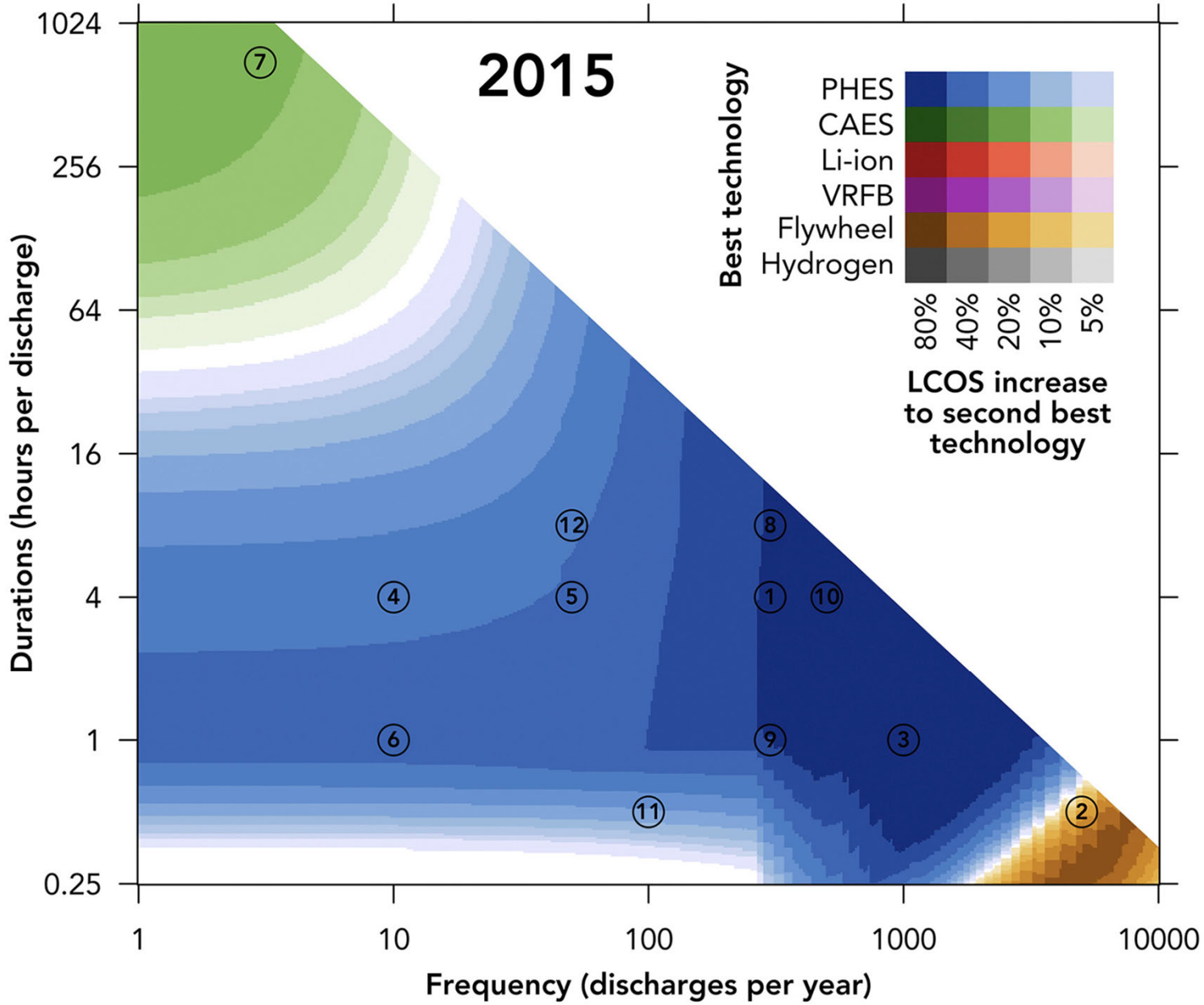


This is probably good news for the operators of hydro-electricity.

Pumped storage

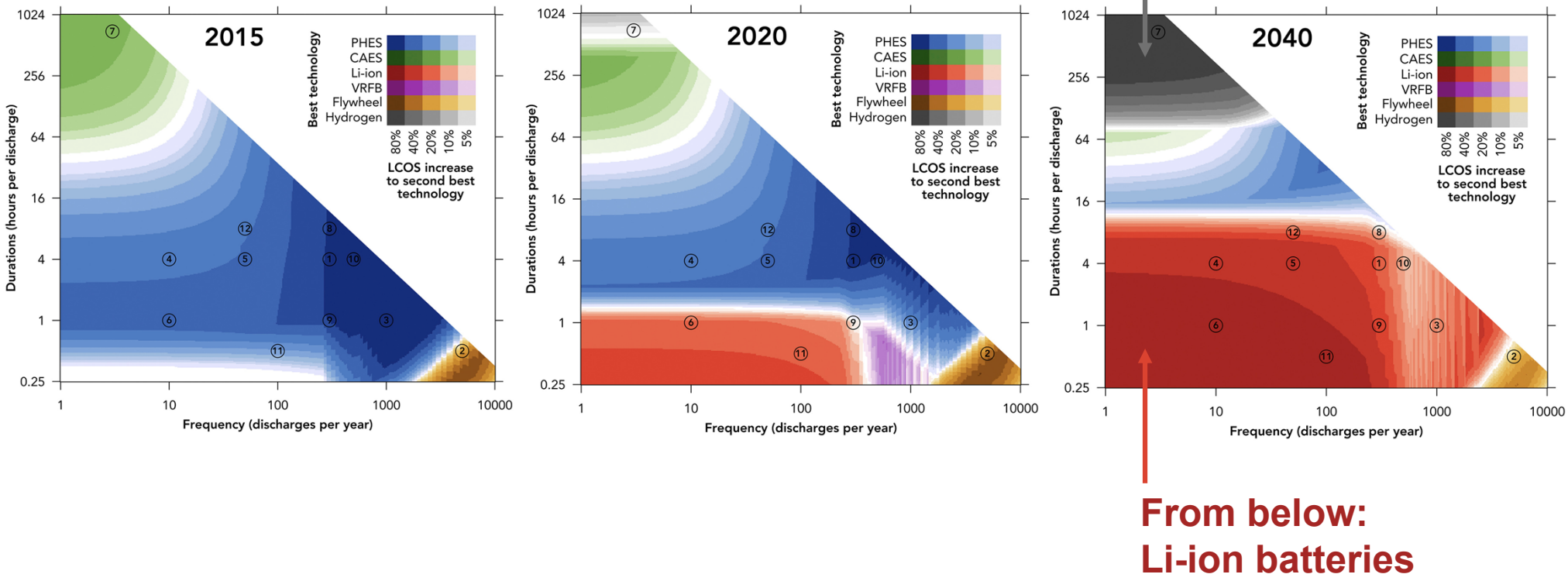
Storage dams

Part 2: Variability and the need for balancing / storage



Schmidt et al. (2019). https://doi.org/10.1016/j.joule.2018.12.008

Pumped hydro is being squeezed from above and below



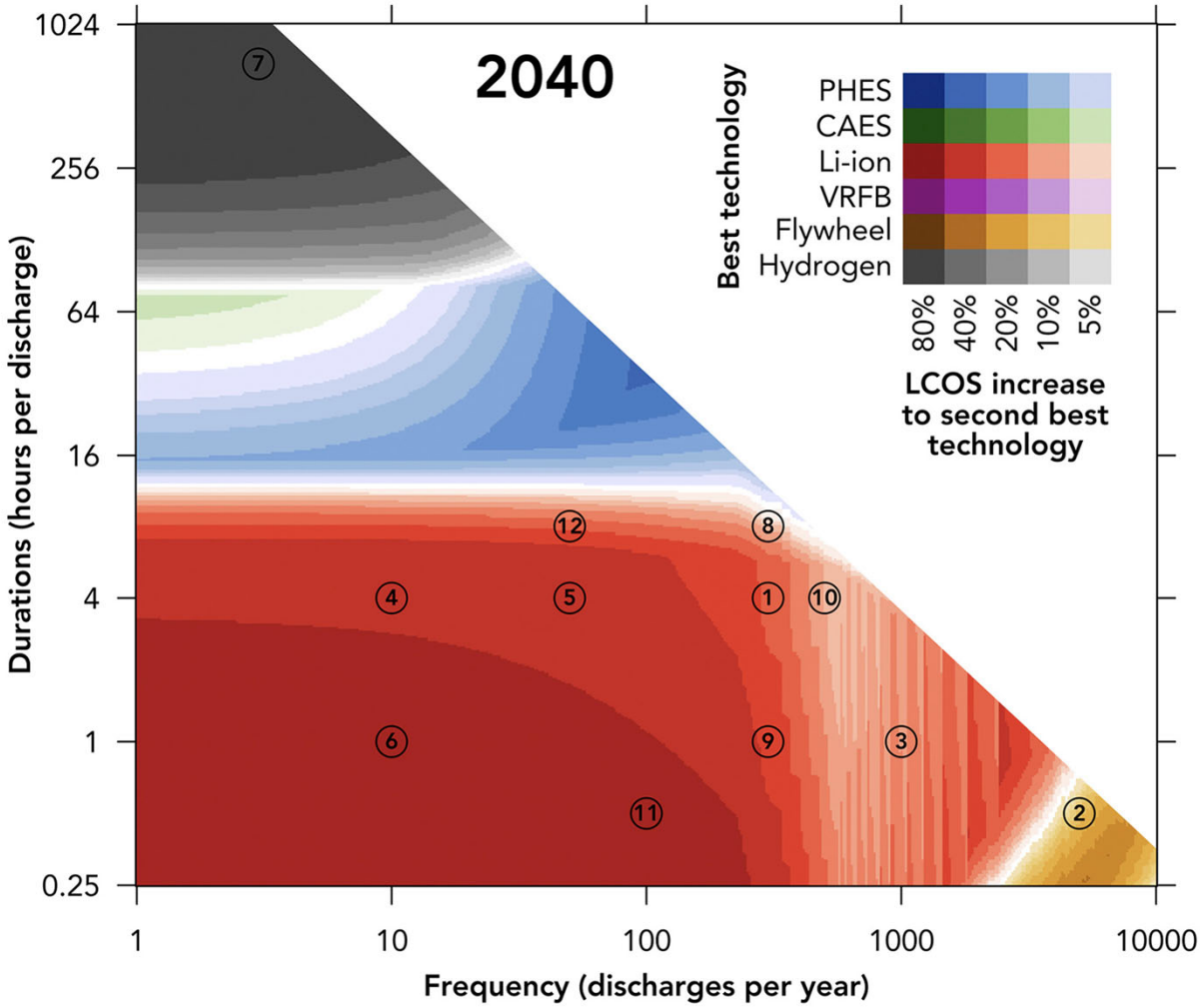
Schmidt et al. (2019). https://doi.org/10.1016/j.joule.2018.12.008

Supply of three storage types

Seasonal storage (hydrogen?)

Multi-day to weekly storage (pumped hydro?)

Diurnal storage (Li-Ion batteries?)



Schmidt et al. (2019). https://doi.org/10.1016/j.joule.2018.12.008

Seasonal storage

Multi-day to weekly storage

Diurnal storage

Pumped storage

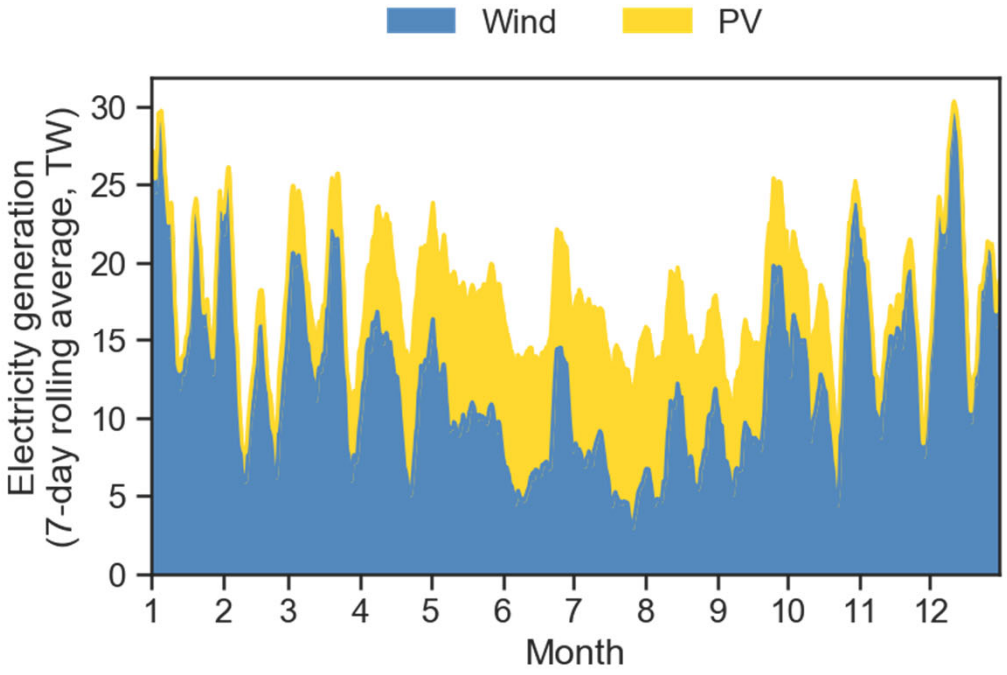
Storage dams

Seasonal storage

Multi-day to weekly storage

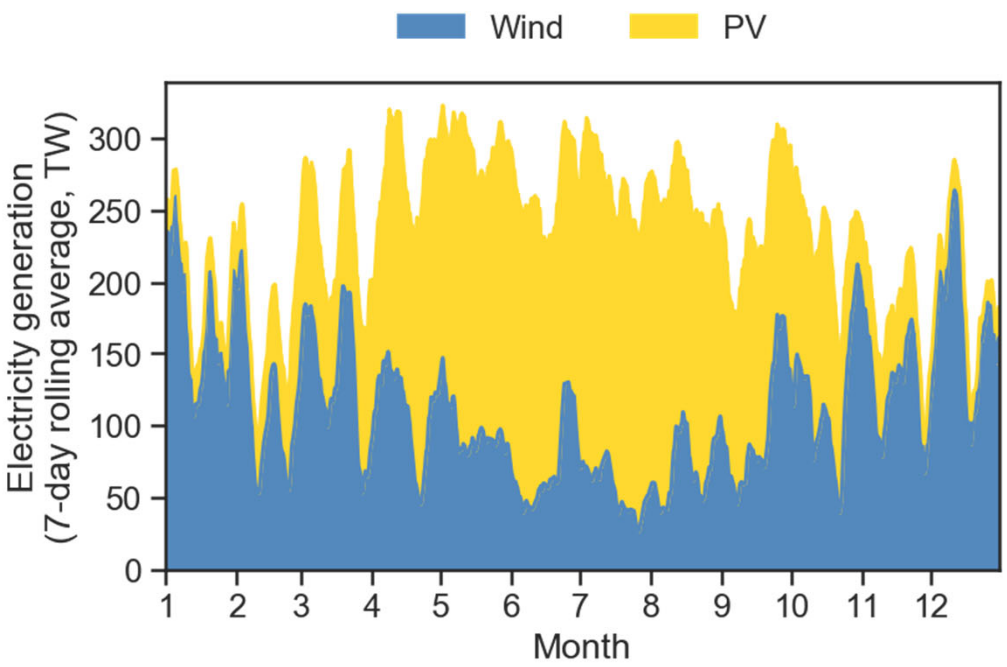
Diurnal storage

Germany 2018

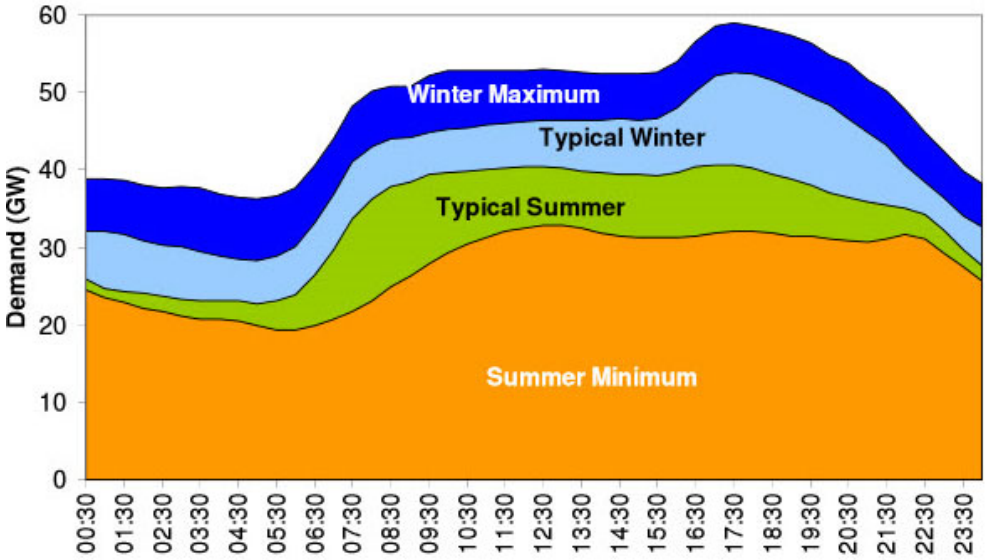


German wind and PV generation (2018)

Europe 2050?



Hypothetical EU-wide wind and PV generation with 500 GW wind, 1000 GW PV (using German 2018 data)

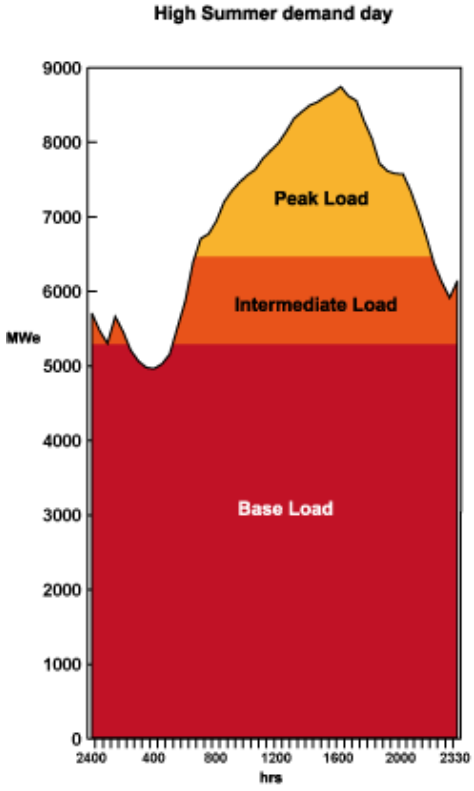


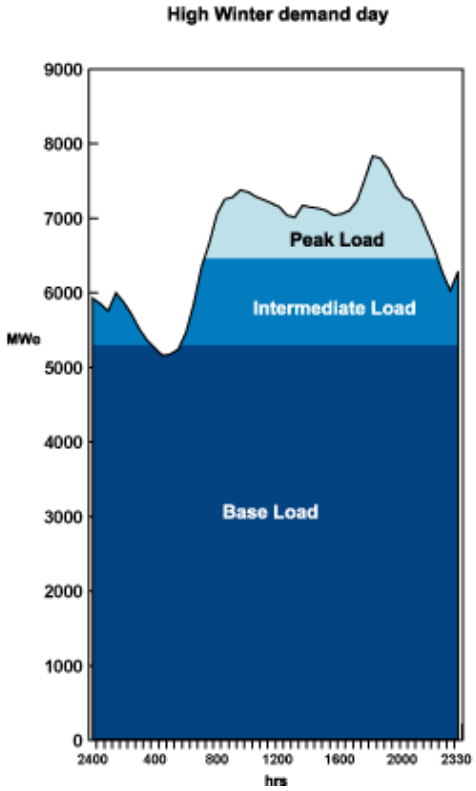
United Kingdom

https://energymag.net/daily-energy-demand-curve/

United States

https://www.world-nuclear.org/information-library/current-and-future-generation/world-energy-needs-and-nuclear-power.aspx

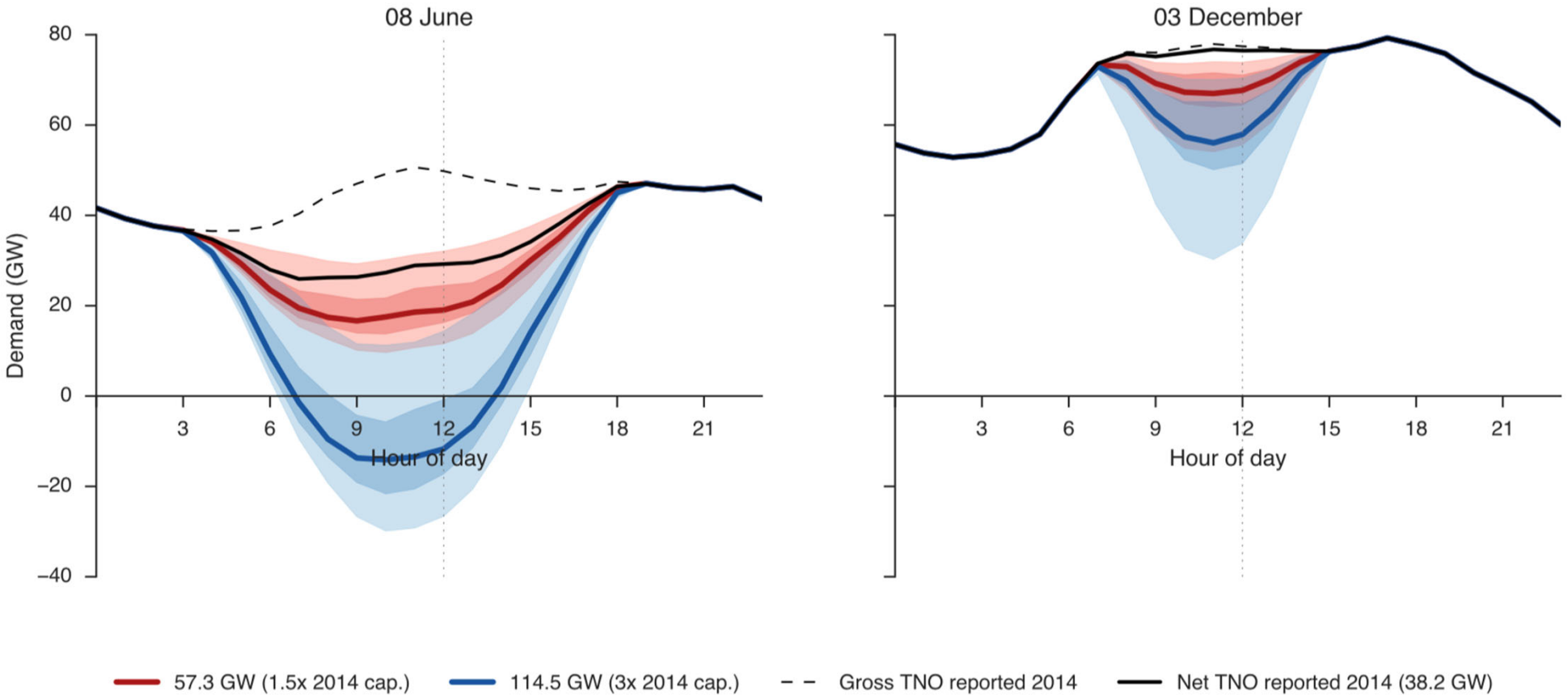




Seasonal storage

Multi-day to weekly storage

Diurnal storage



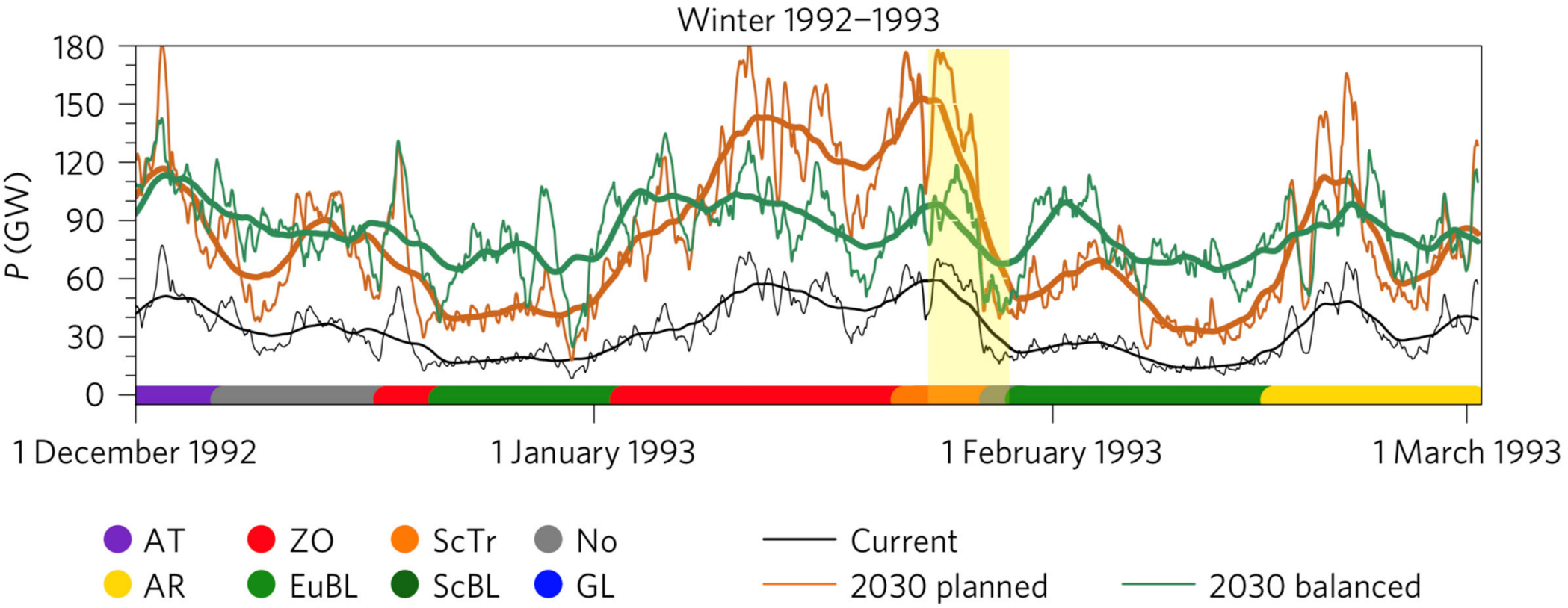
Germany example: at >100 GW of installed PV (blue), huge diurnal variability needs balancing!

Pfenninger and Staffell (2016). https://doi.org/10.1016/j.energy.2016.08.060

Seasonal storage

Multi-day to weekly storage

Diurnal storage



Our work on European wind power showed large fluctuations over periods of weeks driven by continent-wide weather regimes.

Grams et al. (2017). https://doi.org/10.1038/nclimate3338

Demand for three storage types

Seasonal storage

- Growing
- Demand sensitive to: solar/ wind development, cooling
- Storage dams could potentially compete against hydrogen storage

Multi-day to weekly storage

- Potentially growing
- Demand sensitive to: European cooperation on wind development
- Mid-term opportunity for pumped storage, potential longer-term opportunity for storage dams

Diurnal storage

- Growing
- Demand sensitive to: growth in distributed storage
- Storage dams could potentially compete against grid-scale batteries