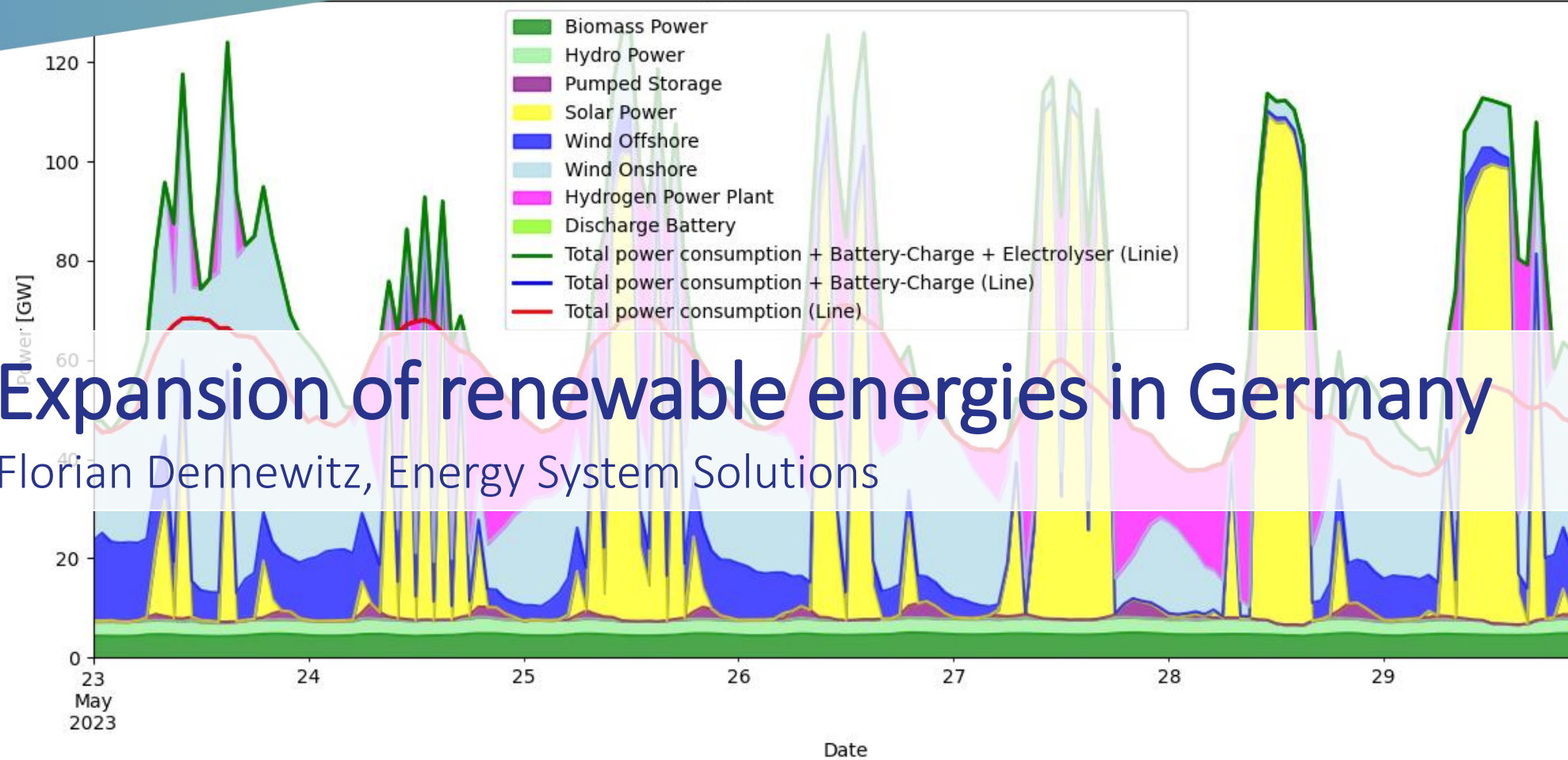


Energy production (summer week)

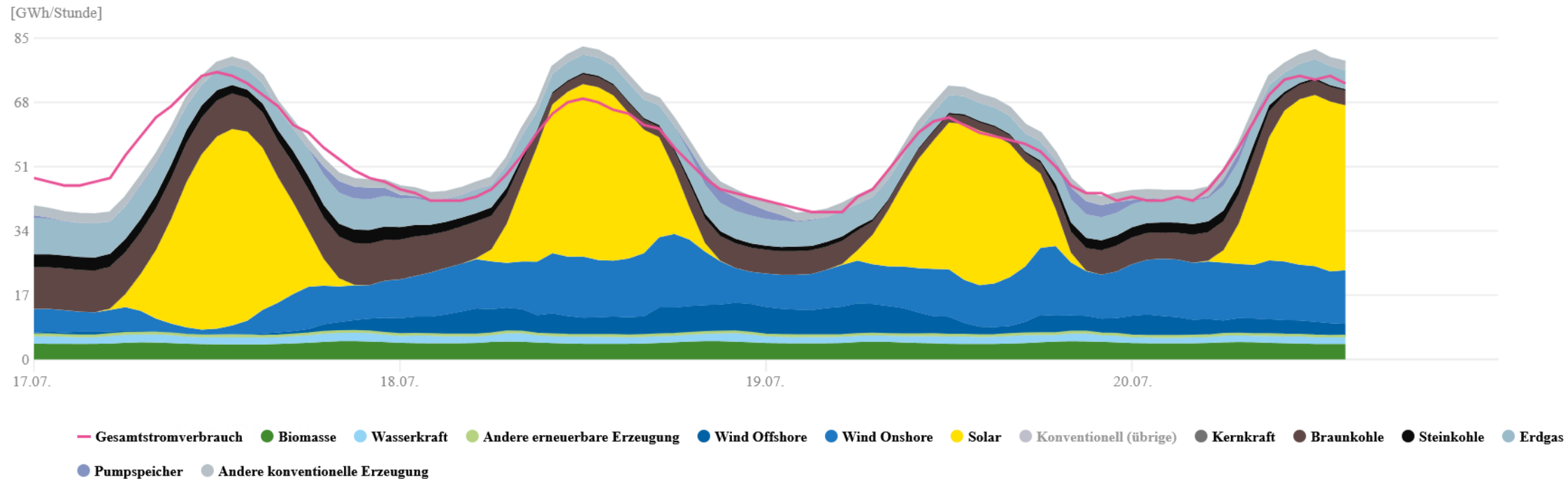


Expansion of renewable energies in Germany

Florian Dennewitz, Energy System Solutions

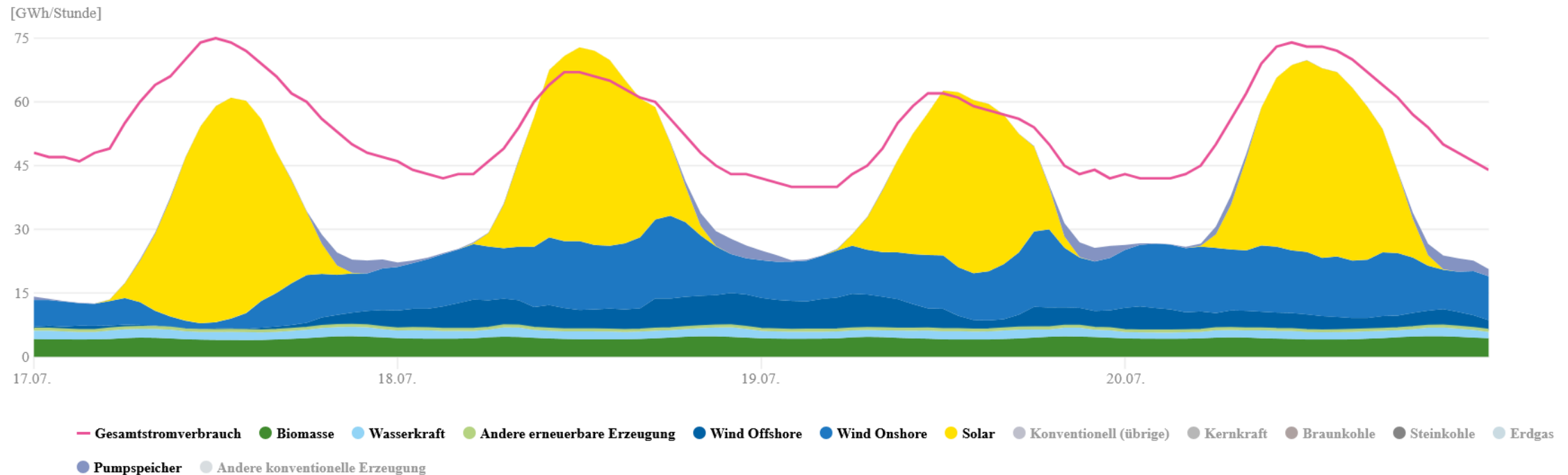
Analyzing Current Situation (Agora-Energiewende)

- Analyzing the consumption and production of electricity in Germany
 - Use of Agora Energie for 2024/2023



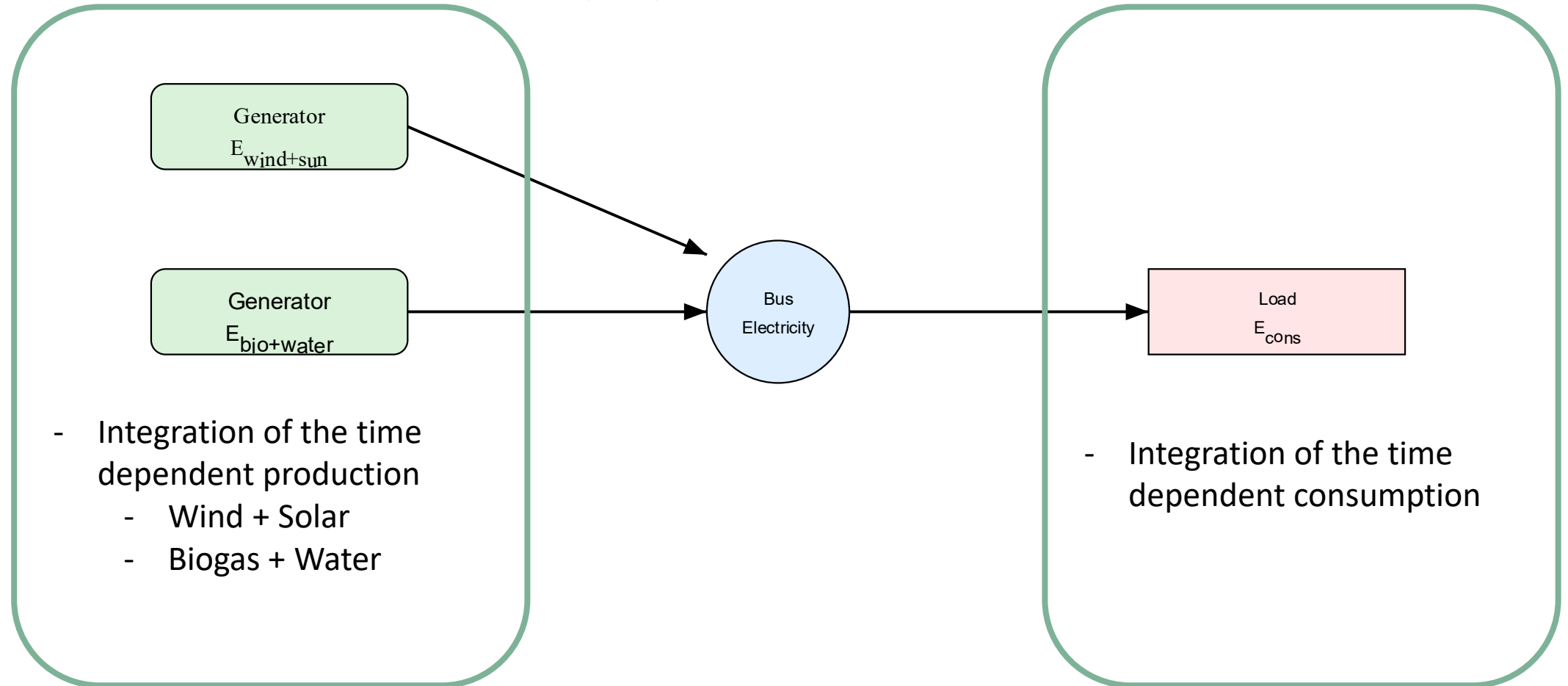
Dienstag, 22. September 2026

The German Electricity System Model

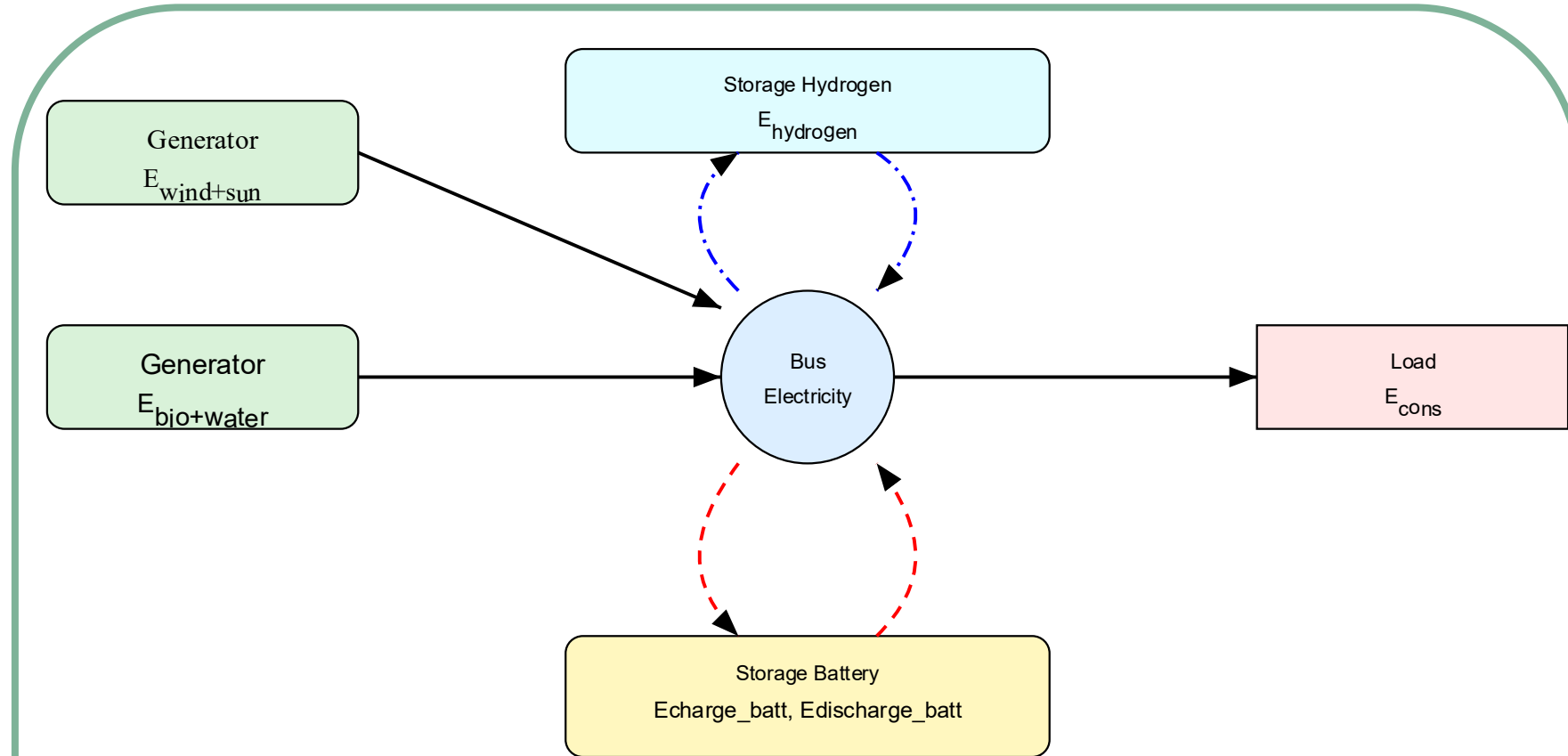


- Data of renewable energy production and the consumption are the baseline of this work
- Research Gap:
 - Scale up and Storage capacities based on current renewable production and consumption

The German Electricity System Model



The German Electricity System Model



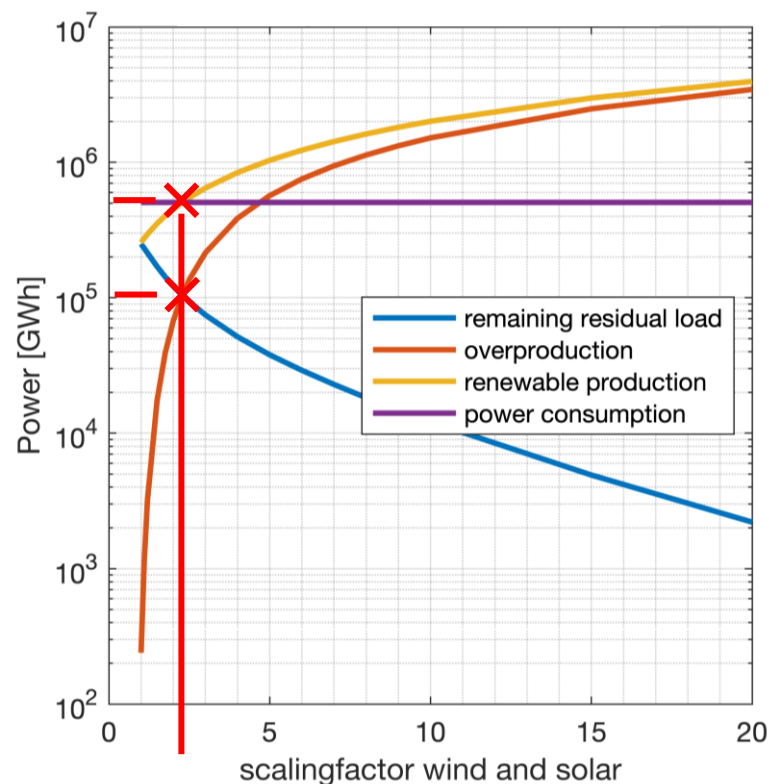
Optimized Energy Model Variants

- Battery storage + AC/DC Dis-/charge (VAR 1/2/3)
- Hydrogen storage + ELY + Hydrogen PP (VAR 2/3)
- Over production scenario (VAR 3)

Electric Grid Expansion + Battery Capacity

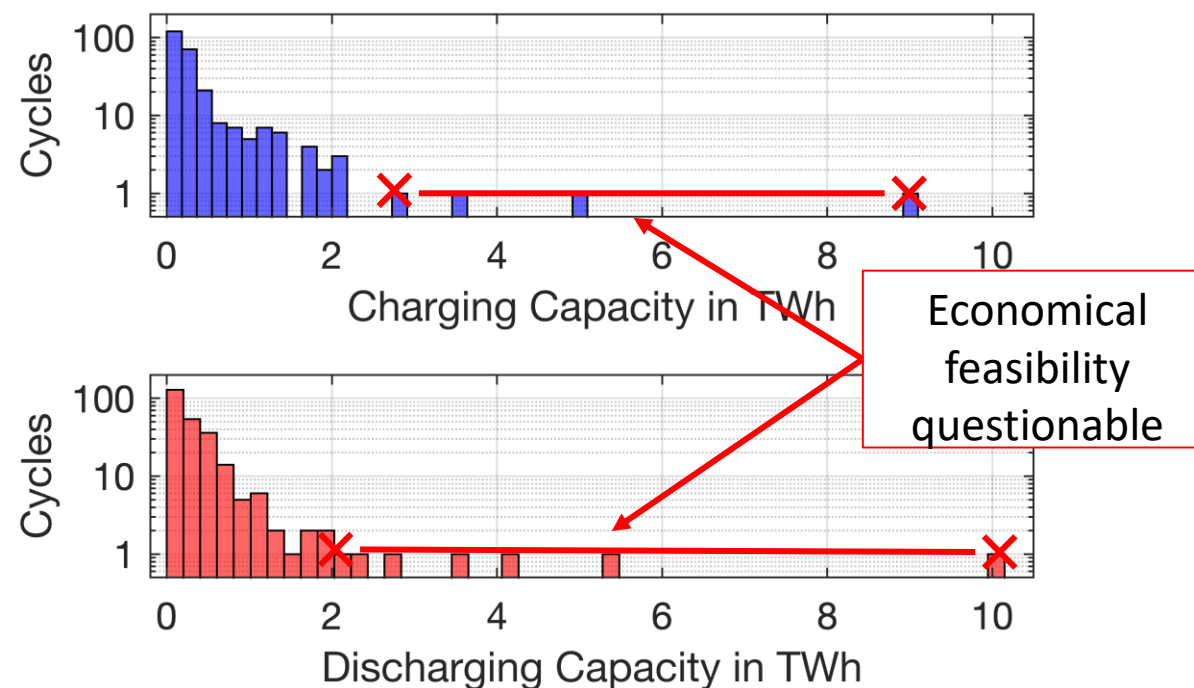
VAR 1

Scaling of Renewable Energy



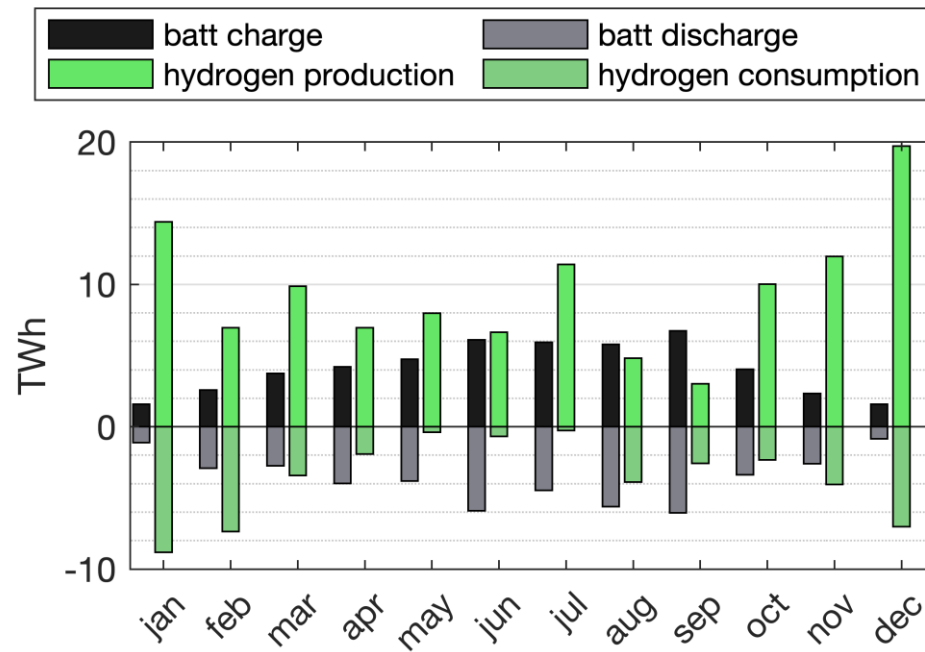
Scalingfactor 2.34 of renewable energy

Battery Expansion

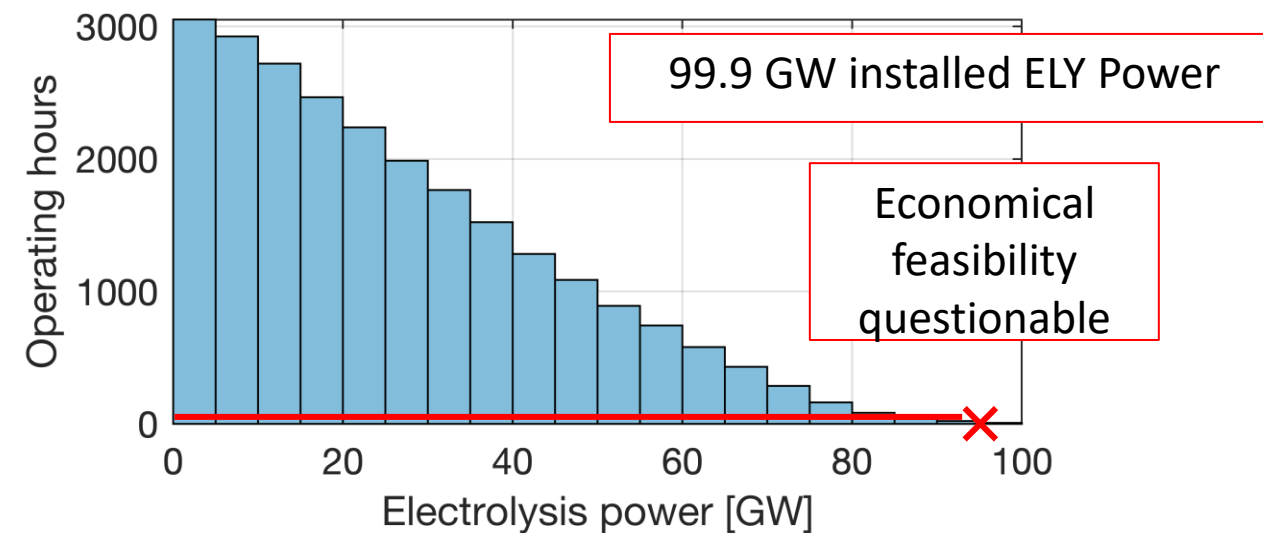


Combined Variation (Electric + H2) VAR 2

Seasonal Use of Storage SF RE 2.68



Operating Hours ELY SF RE 2.68



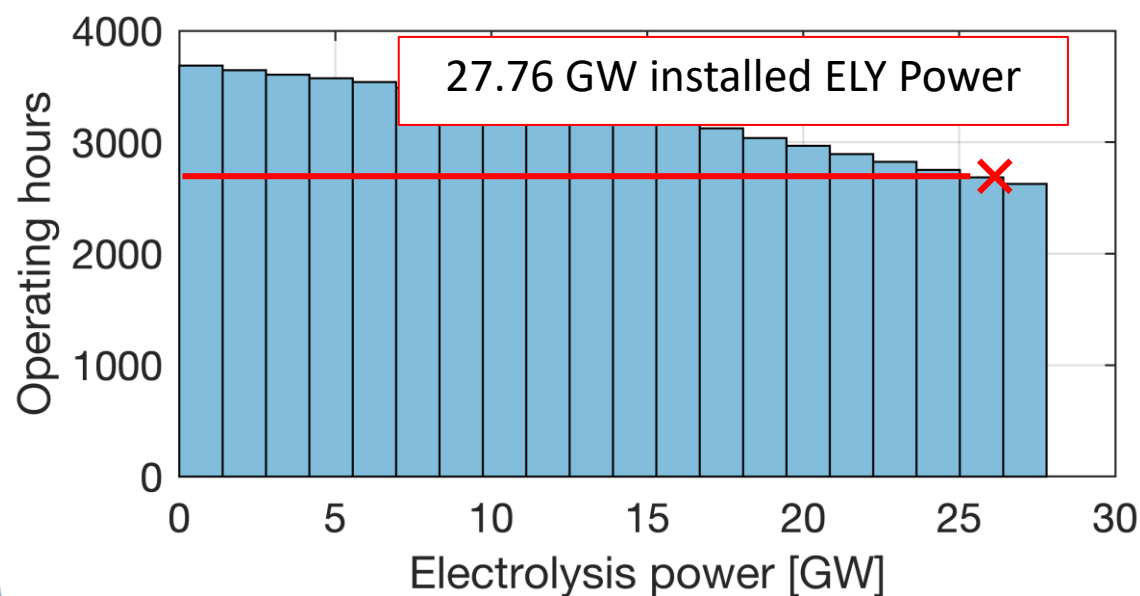
Scenario Comparison

VAR 1-3

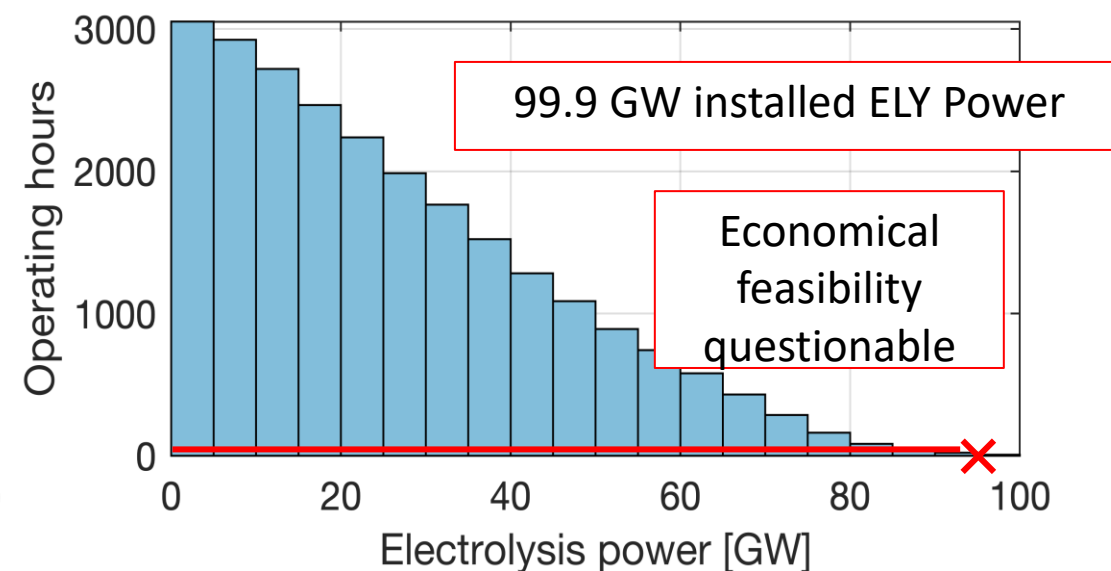
Metric	2023	2024	Metric	2023	2024
Starting situation			Variant 1 – All-battery scenario		
Power consumption [TWh]	506.20	505.88	Scaling factor	2.34	2.26
Peak solar production [GW]	44.09	52.65	Wind & solar [TWh]	456.10	451.55
Peak wind production [GW]	50.09	50.14	Battery capacity [TWh]	22.35	20.39
Bio- & hydropower [TWh]	61.14	64.59			
Wind & solar production [TWh]	195.10	199.90			
Variant 2 – Hydrogen, full coverage			Variant 3 – Hydrogen, overproduction		
Scaling factor	2.68	2.53	Scaling factor	3.00	3.00
Wind & solar [TWh]	522.06	505.76	Wind & solar [TWh]	585.30	599.69
Battery capacity [TWh]	0.60	0.60	Battery capacity [TWh]	0.60	0.60
Hydrogen power plants [GW]	62.69	60.34	Hydrogen power plants [GW]	62.10	59.97
Electrolysis power [GW]	99.90	113.42	Electrolysis power [GW]	27.76	16.58
Hydrogen storage capacity [TWh]	26.86	28.57	Hydrogen storage capacity [TWh]	24.12	22.69

Scenario Comparison VAR 3 vs VAR 2

Operating Hours ELY SF RE 3



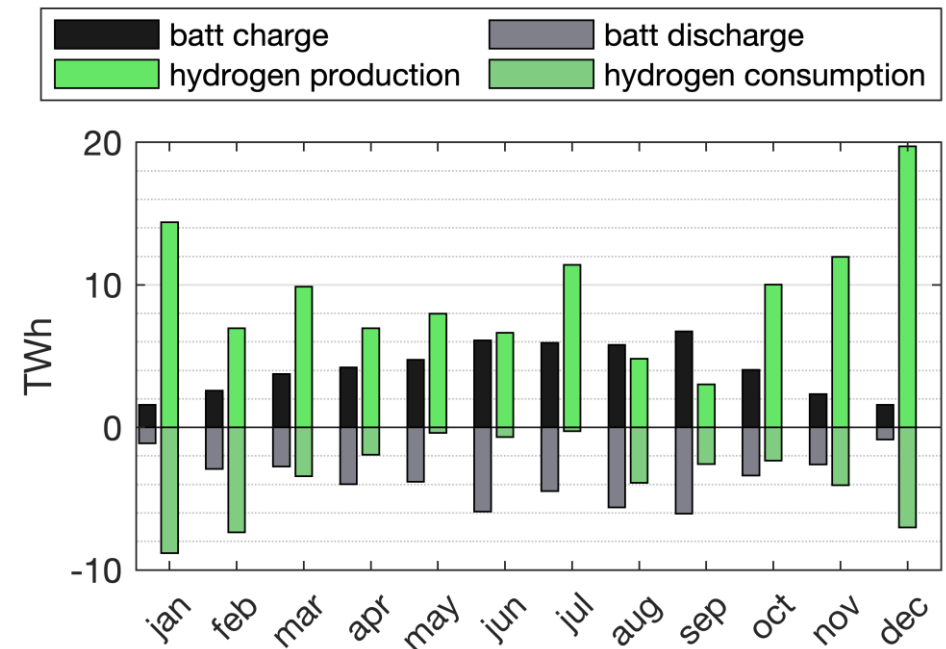
Operating Hours ELY SF RE 2.34



Conclusion

- Based on the scale up of renewable energies between **SF 2.34** and **3** of the current installation
 - **Up to 28 GW** of **electrolysis power (ELY)**
 - **Up to 63 GW** of **hydrogen power plants (HPPS)**
 - **Up to 600 GWh** of **Battery** capacity
- planned **BMWE 20 GW**, **EU 12-12.5 GW** gas power plants (H2ready)

Seasonal Use of Storage SF RE 2.34



Aus Bausteinen wird System.

Wir verbinden Erzeugung, Verbrauch, Flexibilität und Klimaziele.

Unser Fokus: die beste Kombination für den konkreten Standort und die industriellen Prozesse.

vom Baustein zum System

1. Lastgang und Prozesse **verstehen**
2. Technologie **kombinieren**
3. Varianten wirtschaftlich **bewerten**
4. Roadmap zur Umsetzung **ableiten**



Das Ergebnis

Ein Energiesystem, das zu Ihrem Unternehmen passt.

Investitionen werden priorisiert,
Emissionen angepasst
und Effizienz entsteht im Gesamtsystem
bis hinein in Ihr Werk.

mehr Resilienz

geringere Energiekosten

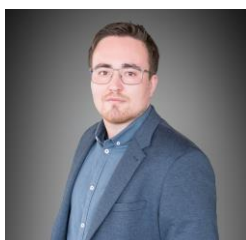
weniger Emissionen

Flexible Strategie

Energy System Solutions
Strategie. Simulation. Ihre Umsetzung.



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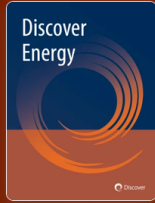
On the expansion of renewable energies in Germany and the problems related to fluctuation in the German electricity grid

Research | [Open access](#) | Published: 03 June 2026
Volume 6, article number 37 (2026) | [Cite this article](#)

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