SOLAR POWER: STATE OF PLAY

IEA'S RENEWABLES 2024 AND MAF CZ 2023

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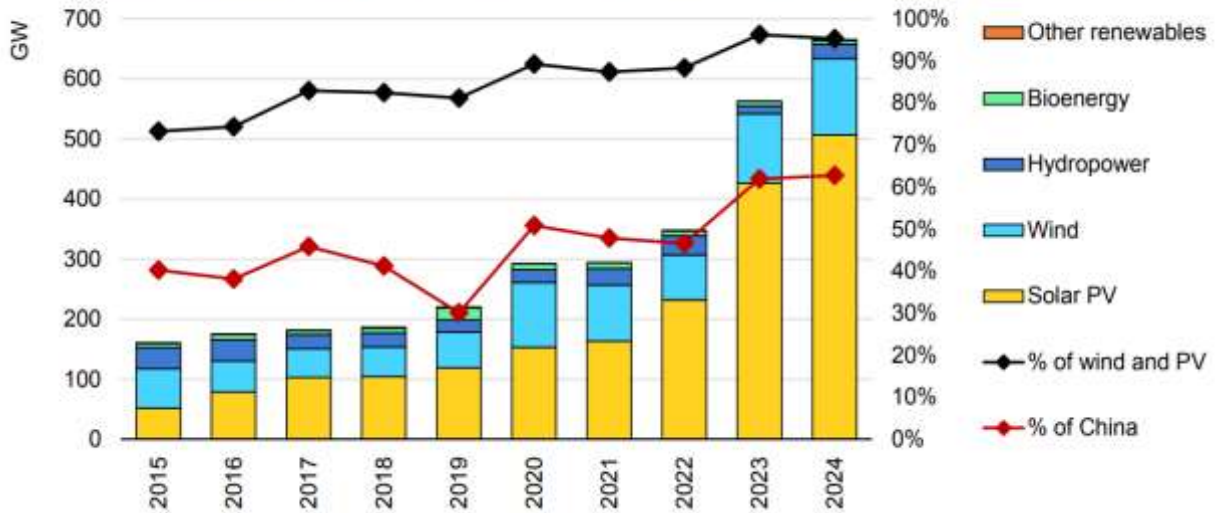
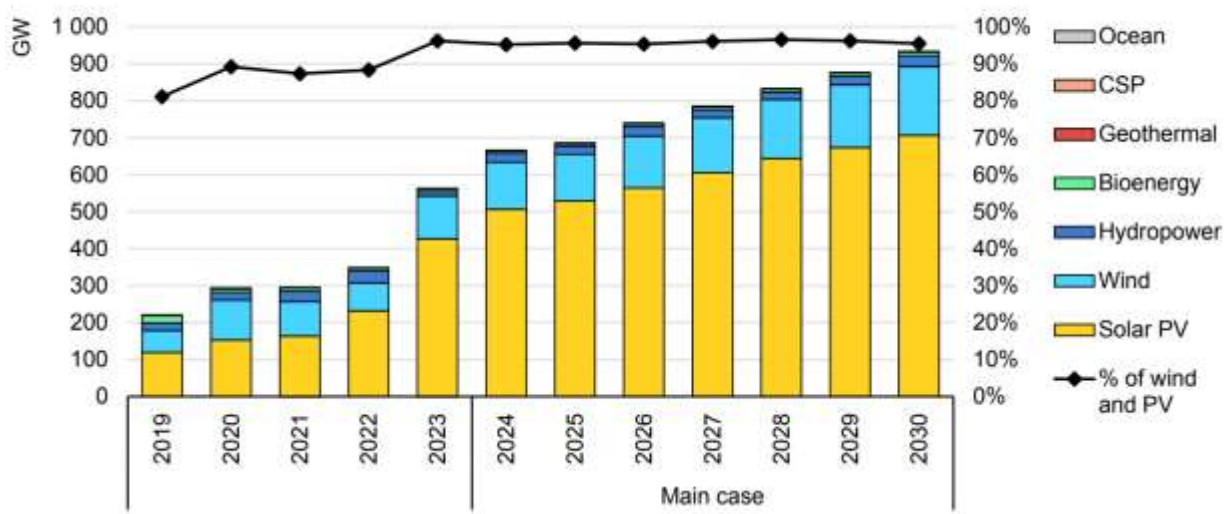
IEA's Renewables 2024

- **China** is set to cement its position as the global renewables leader accounting for 60% of the expansion in global capacity to 2030 and is forecast to be home to every other megawatt of all renewable energy capacity installed worldwide in 2030
- The **main-case** renewable electricity forecast is **not on track** to reach the IEA Net Zero Emissions by 2050 Scenario goals, which indicate that the share of renewables in global electricity generation should double to almost 60% by 2030

Renewable electricity capacity additions by technology, and China's share



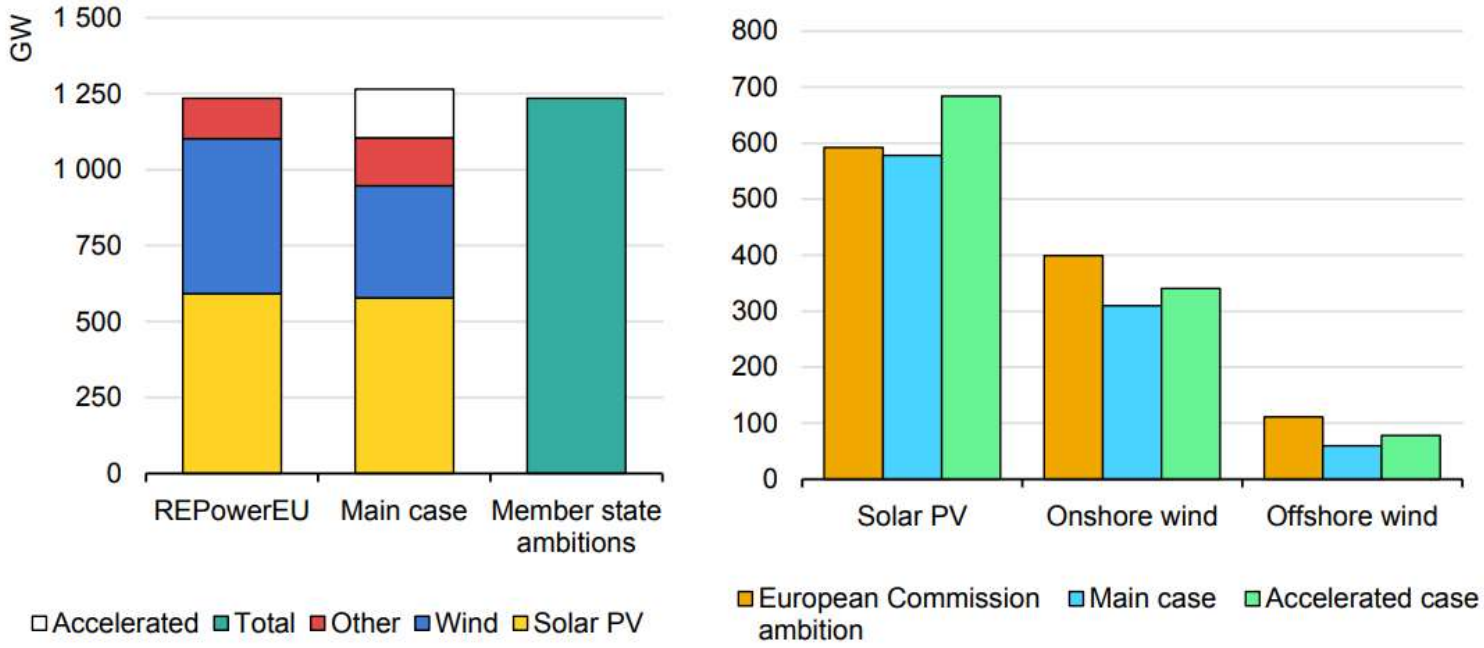
Renewable electricity capacity additions by technology, main case, 2019-2030



IEA's Renewables 2024: State of Play in Europe

- The **EU** is forecast to double the pace of RES capacity growth between 2024 and 2030 and is on track to fulfil its 2030 ambitions for solar, but more effort is needed for wind
- Total renewable capacity in the main case reaches 1105 GW by 2030, falling **11% short** of the REPowerEU ambition of 1 236 GW due to persistent challenges to faster wind deployment
  - In May 2022, the European Commission set goals to reach 1 236 GW of total renewable capacity by 2030, with 592 GW of solar and 510 GW of wind
  - Total installed capacity for wind reaches almost **370 GW** in the main case, falling 28% short of the **510-GW** target largely because permitting challenges and grid congestion have been impeding deployment

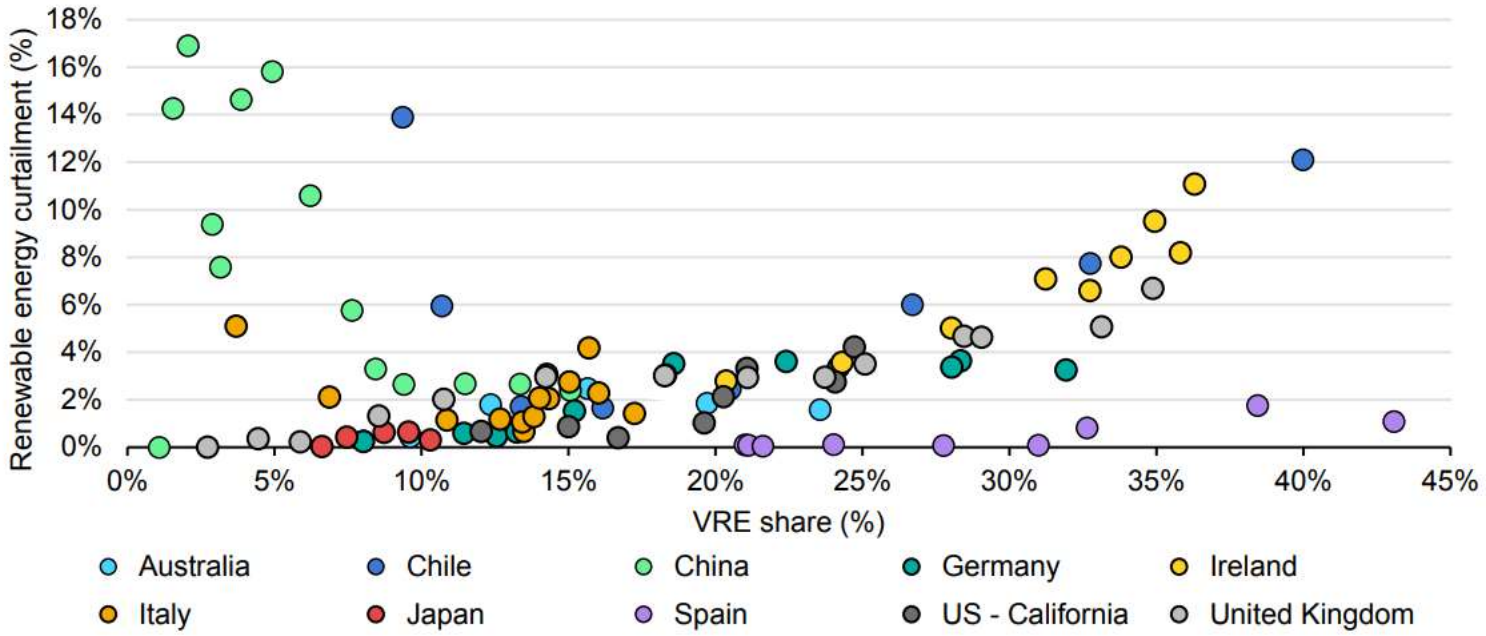
REPowerEU, EU member state, and main- and accelerated-case ambitions for 2030 (left) vs European Commission technology ambitions (right)



IEA's Renewables 2024: Integrating Variable Renewable Electricity

- **Europe** has the highest share of VRE in power generation, wind and PV penetration is anticipated to reach almost 45% by 2030 – nearly double its current level
- **Germany** is currently responsible for around 1/5th of VRE generation in the region and would remain as such by 2030
- By the end of the decade, **wind power** is expected to be the leading electricity source in the continent, with around 1/4 of the generation, surpassing the share of nuclear from 2027
- Solar **PV** generation would provide **20% of European electricity mix**, surpassing hydropower over the forecast period

Annual VRE shares in generation and technical curtailment for selected countries and regions



- However, Increasing VRE penetration leads to rising **curtailment**
- Italy, Australia and Chile: the net load has begun to resemble the **Duck curve**, requiring additional flexibility
- According to ČEPS's simulations, the Duck curve awaits the **Czech Republic** as well in the future…

Mid-Term Adequacy Forecast (MAF CZ 2023)

- **Resource Adequacy** represents the ability of a country to cover its electricity demand by its domestic production of by available resources within the interconnected European market (i.e. imports) for every hour of a specified period (typically a year)
- MAF CZ 2023 considers the two following **Scenarios** of the Czech energy mix evolution:

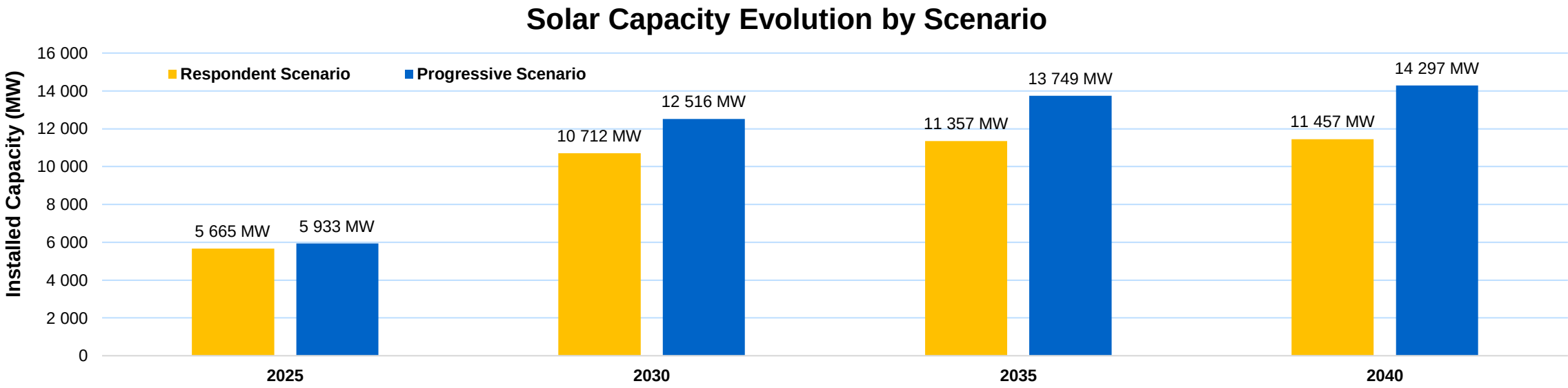
	Scenario Storyline	Power Consumption	Fossil Fuels	Nuclear Plants	Renewables
2025 - 2040 Respondent Scenario	The scenario reflects the capacity evolution as assumed by producers, the Czech economy and consumption grow moderately, new RES are gradually integrated	**Total Consumption** 81,5 TWh in 2040 **EV** 6,6 TWh **HP** 5,5 TWh	Coal phase-out and heating industry switch to gas according to producers' plans	**Both Scenarios assume** An SMR in 2035 Two new EDU blocks in line with current tender results Operation of existing ETE and EDU units until the end of their lifetime	**Solar in 2040** 11,5 GW **Wind in 2040** 2,5 GW
2025 - 2040 Progressive Scenario	The scenario assumes a faster renewables development, electrification and coal phase-out until 2030 (inclusive)	**Total Consumption** 92,1 TWh in 2040 **EV** 7,8 TWh **HP** 6,4 TWh	Coal phase-out and heating industry switch to gas until 2030 (inclusive)		**Solar in 2040** 14,3 GW **Wind in 2040** 2,9 GW

MAF CZ 2023: Simulation Results

- Simulation results are presented as an average over three typical climate years (1995, 2008, 2009) and separately for climate values from 1985 (Sensitivity analysis)
- For the Resource Adequacy Assessment, the indicator **LOLE** (**Loss of Load Expectation**) is used**:** number of hours per year where the domestic production and import do not cover the demand in Czechia (upper threshold LOLE in Czechia: **6.7 h/y**)
- The other indicator of non-delivery is **EENS** (**Expected Energy not Served**): volume of electricity (GWh) inside the time window of the year where the domestic production and import are insufficient to cover the electricity demand in Czechia

Scenario	2025			2030			2035			2040		
	LOLE	EENS	Import	LOLE	EENS	Import	LOLE	EENS	Import	LOLE	EENS	Import
Respondent	0 h	0 GWh	- 2 073 GWh	0 h	0 GWh	11 217 GWh	**10.3 h**	27.2 GWh	14 018 GWh	**7.0 h**	10.6 GWh	7 009 GWh
Progressive	0 h	0 GWh	- 440 GWh	2 h	1.0 GWh	14 992 GWh	**8.7 h**	16.3 GWh	18 721 GWh	**13.7 h**	25.0 GWh	15 177 GWh
Respondent Sensitivity analysis	0 h	0 GWh	- 5 396 GWh	**14 h**	7.7 GWh	8 983 GWh	**65 h**	142.3 h	12 926 GWh	**32 h**	50.8 h	6 920 GWh
Progressive Sensitivity analysis	0 h	0 GWh	- 4 065 GWh	**41 h**	82.3 GWh	14 030 GWh	**63 h**	192.4 GWh	17 777 GWh	**74 h**	170.7 GWh	15 571 GWh

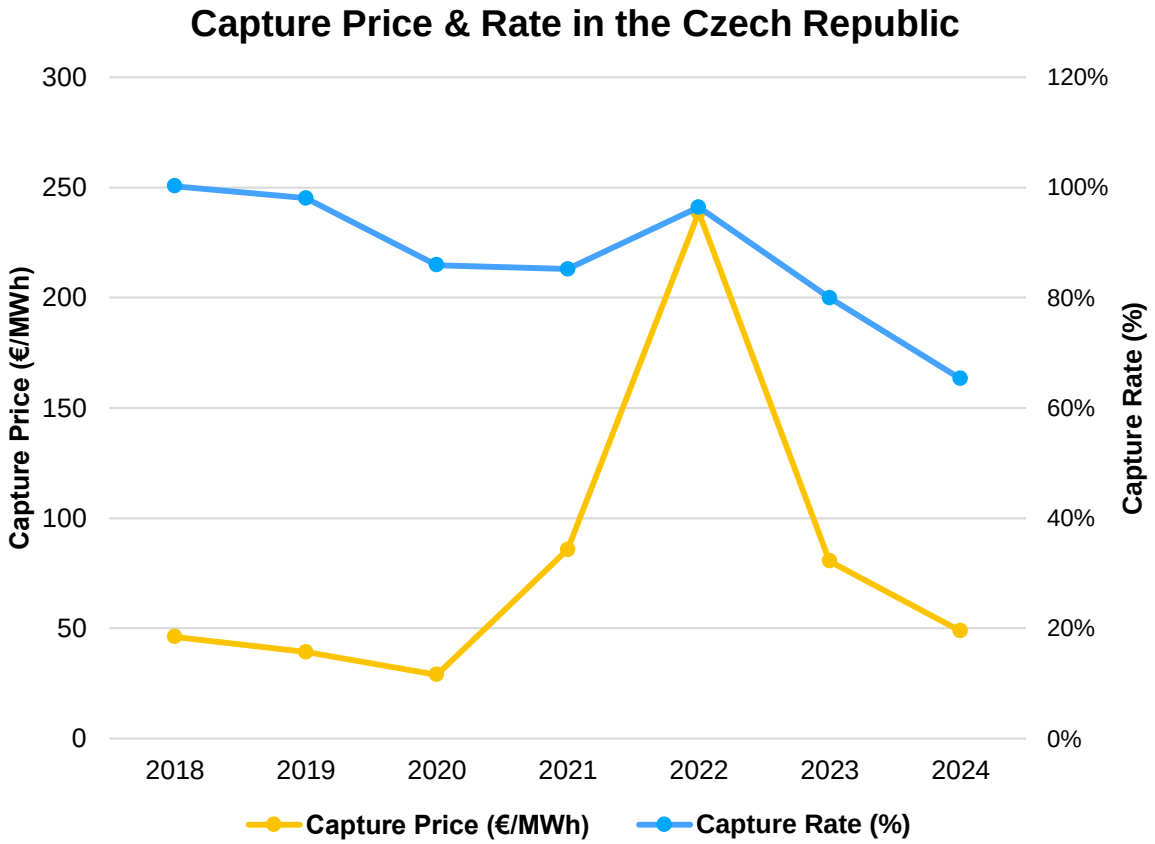
MAF CZ 2023: The Case of Solar Energy



- Both Scenarios are based on the estimates of investors' interest in the development of renewables and the current volume of connection requests to distribution networks
- Both Scenarios differ in the expected volume of available investment support, limitations on financing by banks (after reaching a certain installed capacity), construction capacities, the degree of CAPEX indexation and the decommissioning of some solar plants
- Respondent Scenario considers a reduced volume of financial support within the Modernization Fund and prefers the development of smaller photovoltaic installations (up to 99 kW) at the expense of larger installations
- Progressive Scenario assumes a greater utilization of subsidy programs and better technological possibilities

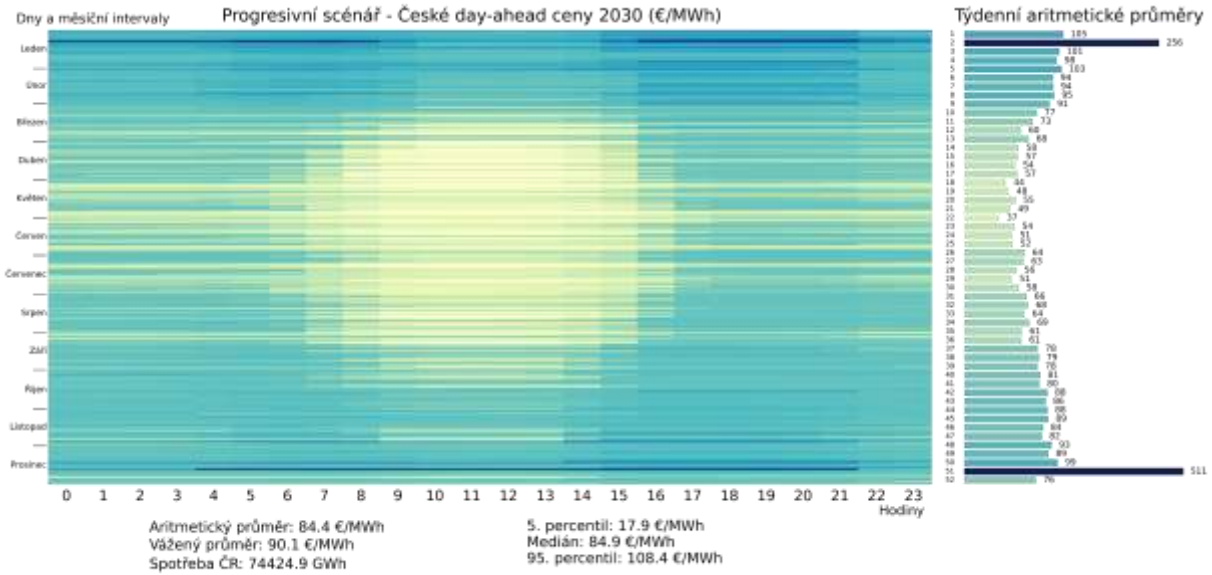
Capture Price and Capture Rate

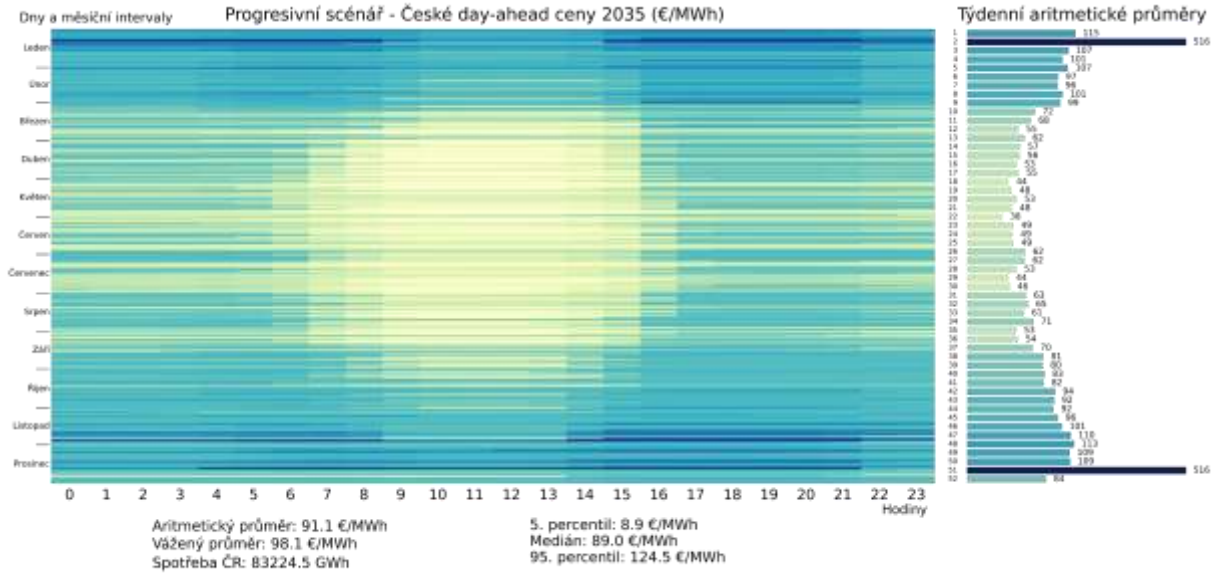
- **Capture Price**: weighted average electricity price (in €/MWh) that an electricity source achieves throughout a given timeframe, i.e., the sum of hourly revenues (hourly production * respective DA price) divided by the total sum of electricity produced within the considered period
- **Capture Rate**: ratio between the Capture Price and the Baseload Price (in %) that an electricity source achieves throughout a given period
- Capture Rates have been steadily decreasing as more generation capacity of a Renewables sources of electricity is introduced into an electricity system (i.e., the **price cannibalization**), introducing more risks to the revenue streams and the profitability of new projects



Here comes the sun

- The **heatmaps** below depict the simulated Day-Ahead prices for the target years 2030 and 2035 of the Progressive Scenario
- All **8760 hours** of the year are displayed, with the bright colours representing lower electricity prices and vice-versa
- Rapid expansion of Solar in the Czech Republic will ensure low price levels during summer, however, it will not be able to cover the demand throughout the periods of **Dunkelflaute**, resulting in the activation of the most expensive sources in the merit order (or the non-delivery of electricity altogether)
- The **Capture Rate** will be falling as well, and the winter peaks will not be able to fully ensure the profitability of solar
- **Disclaimer**: The values presented hereunder are not power price predictions but mere indications of cost trajectories

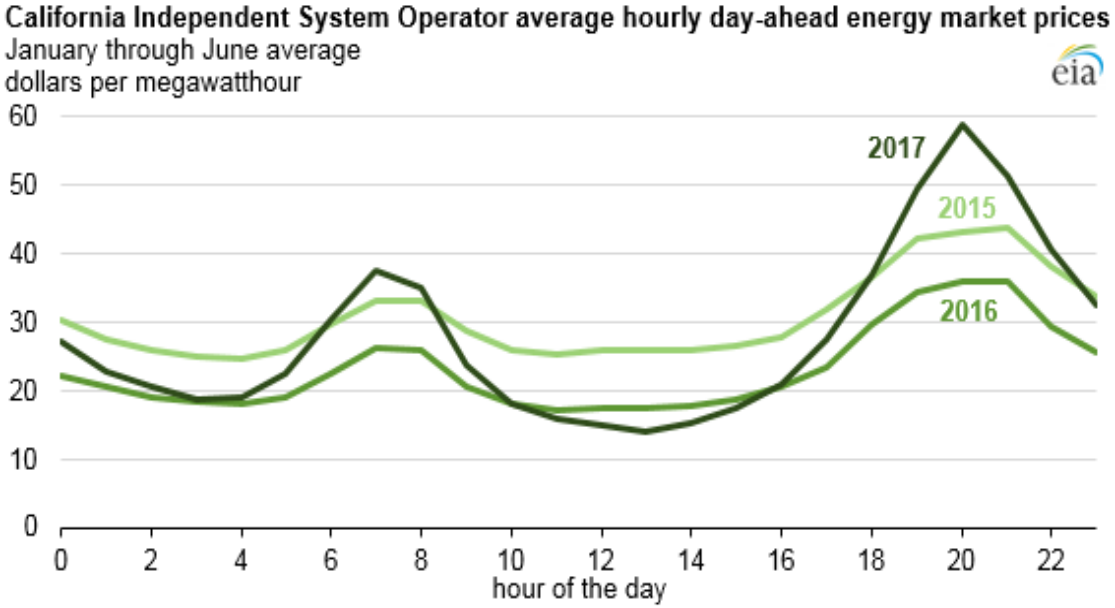




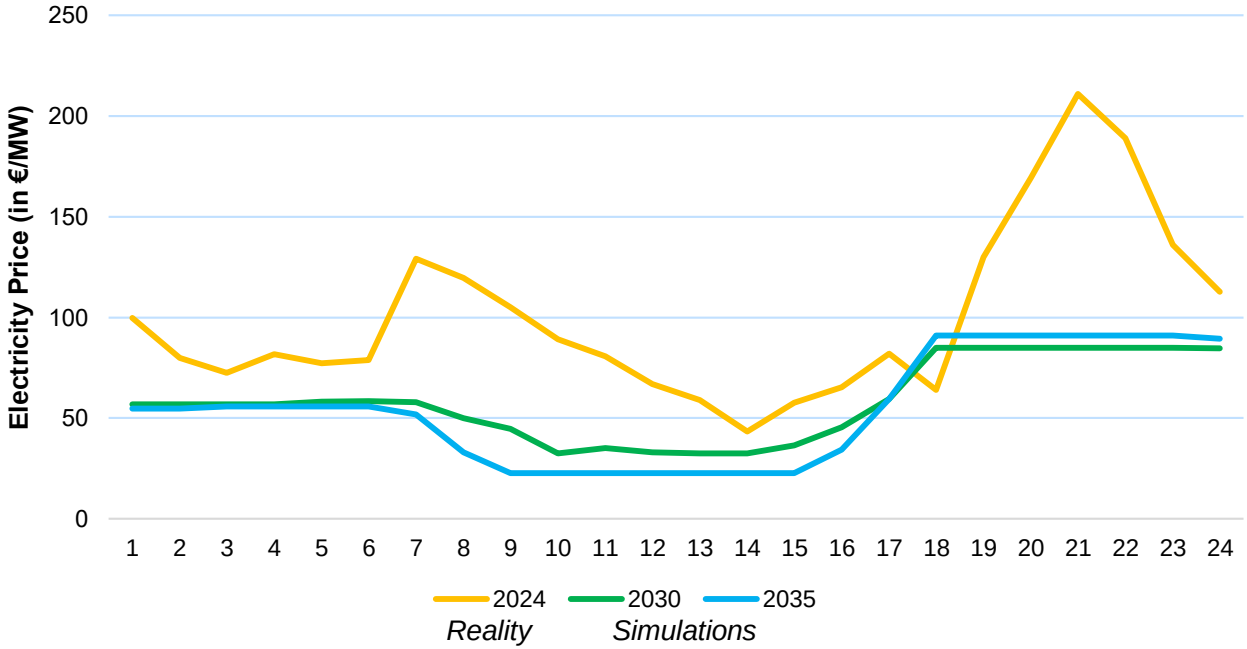
0 €/MWh — 200 €/MWh

Ducks will get more aggressive

Californian Duck



Czech Duck (Power prices for July 11)



- The Duck is ‘fed’ either by a higher proportion of solar to wind or by a smaller consumption during solar generation

VEDEME ELEKTŘINU NEJVYŠŠÍHO NAPĚTÍ

THANK YOU FOR YOUR ATTENTION

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