

Alpine Hydrology - Winter Outlooks



MONTEL Analysis

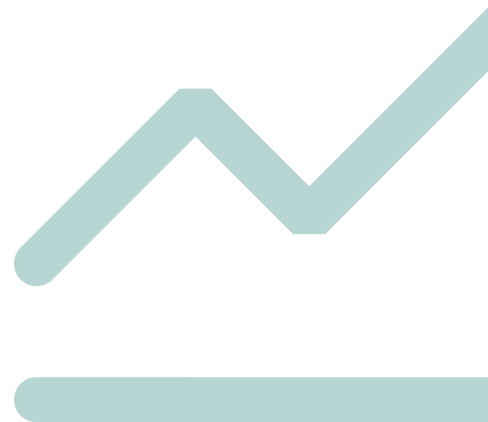
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Agenda for the presentation

- Overview hydropower – countries around the Alps
 - - characteristics , production system, levels and profiles
- Hydrological balance – definition and examples
- Winter outlooks – scenarios hydr. Balance and production curves



Alp Region - hydropower modelling (CH/AT/FR/IT)



- Italy-North 80% IT hydropower
- Rhone/Provence Alps = 65% French hydropower
- 30% of AT hydropower from Danube, 45% Ober+Nieder Österreich

Hydropower characteristics AlpRegion

		AT	CH	FR	IT	"Alp Region"	
Net Hydropower	(TWh)	34,3	35,4	59,1	40,2	168,9	(TWh)
% of consumption		58%	58%	14%	15%	20%	
Run-river production	(TWh)	26,1	16,4	39,5	33,2	115,2	(TWh)
% of total hydo		76%	46%	67%	83%	68%	
Hydro reservoir capacity	(TWh)	3,3	8,9	10	6,7	28,9	(TWh)
% of total hydo		9%	24%	17%	15%	17%	

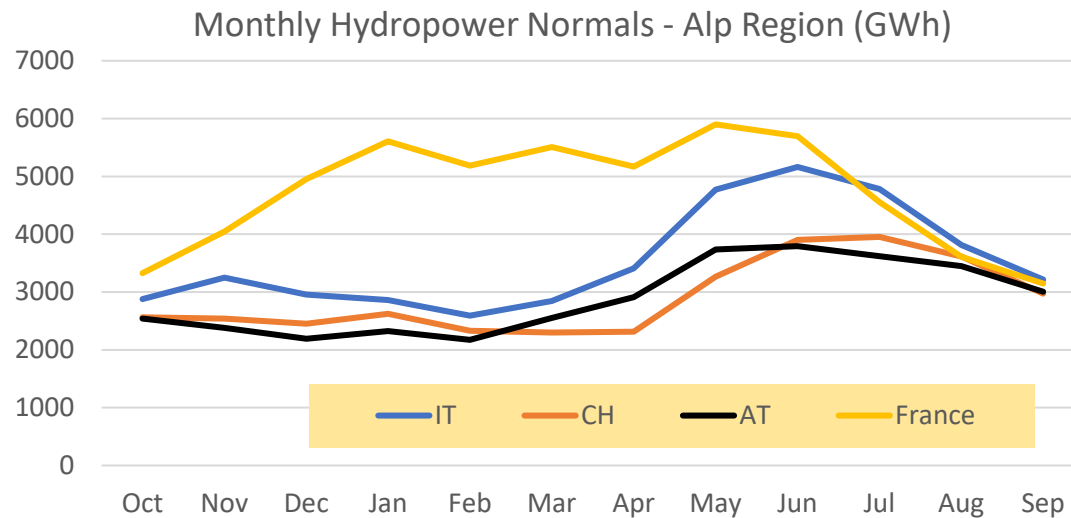
Production variation band :

TWh yearly +/- 30 TWh

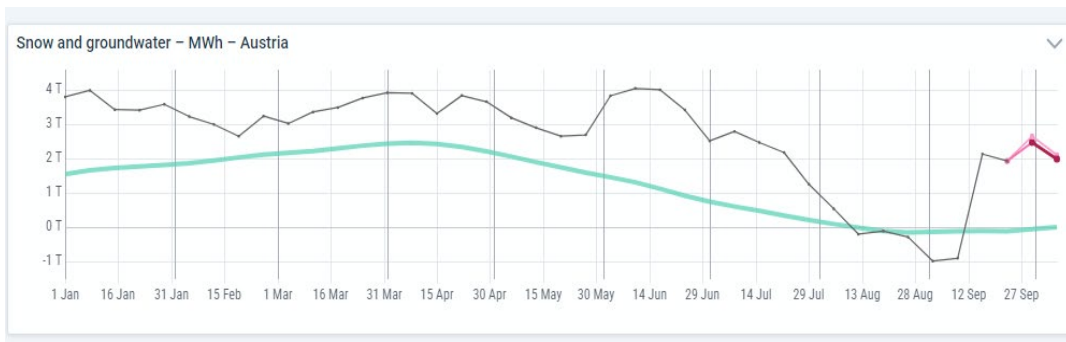
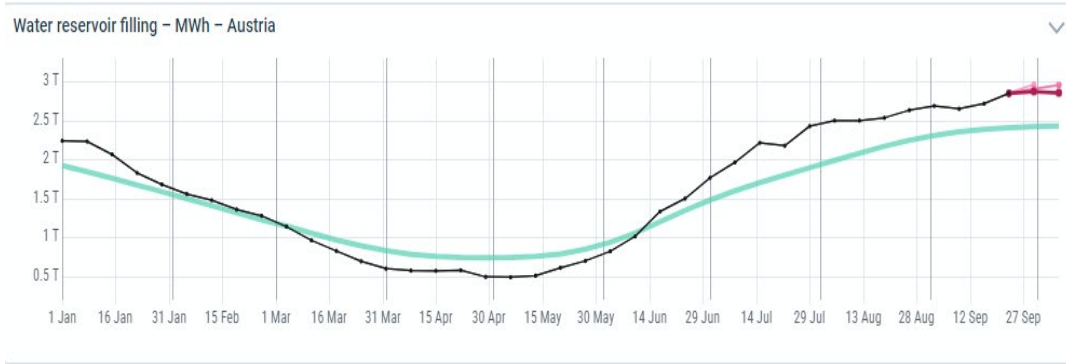
GW monthly +/- 5 GW

GW average winter = 17 GW

Winter 23/24 = 22 GW (max level)



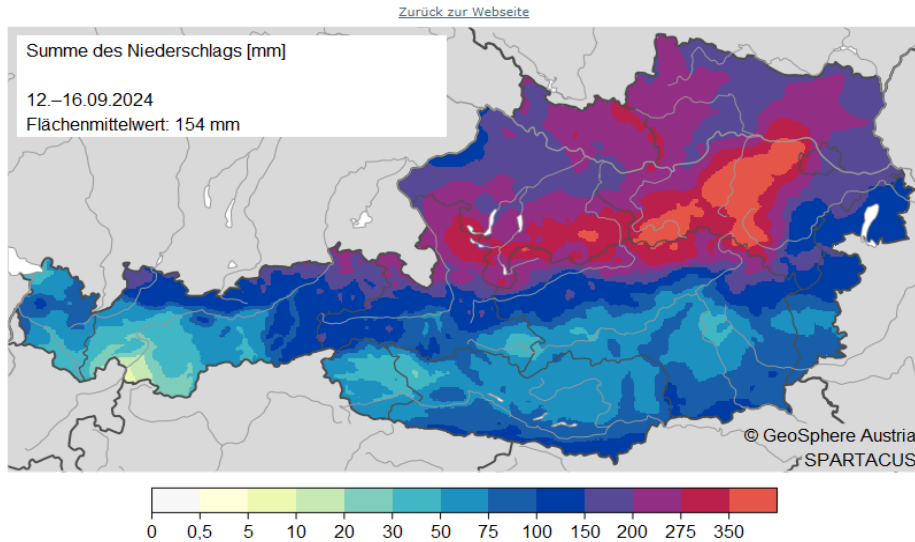
Hydrological balance – example Austria



Austria		hydrological situation week 39		
		Actual	Deviation	
Snow/groundwater		1,3	1,3	(TWh)
Water reservoir		3,2	0,8	(TWh)
Hydrological resource		4,5	2,1	(TWh)
Hydrological balance			2,1	(TWh)

- Hydr. Balance Austria increased by about 3 TWh during the extreme flooding incident recently .. -> let's have a look ...

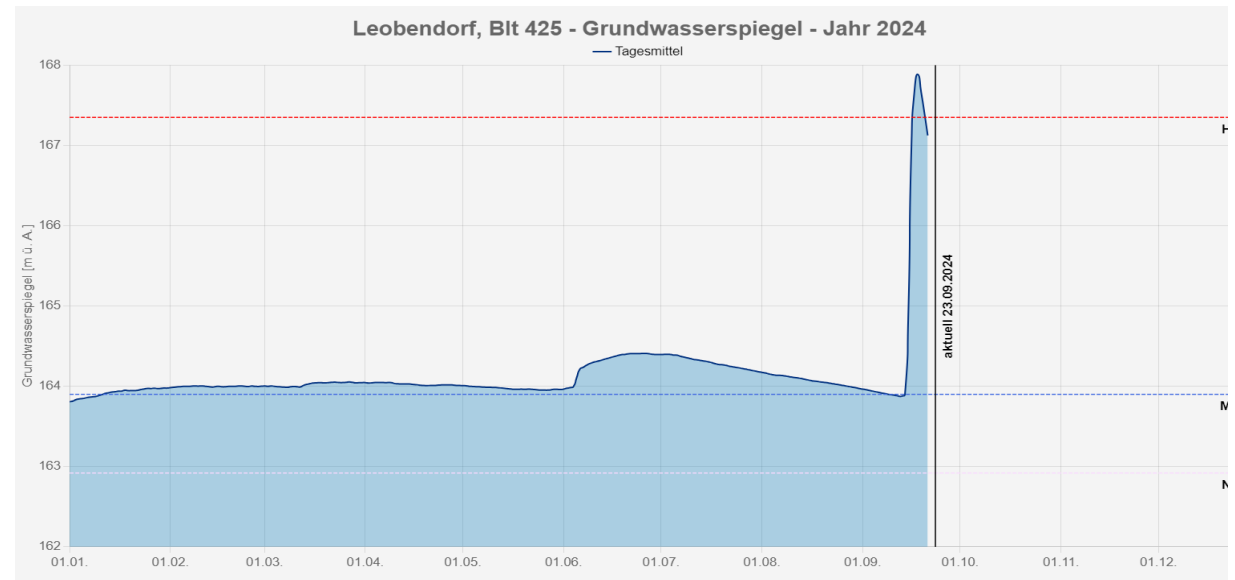
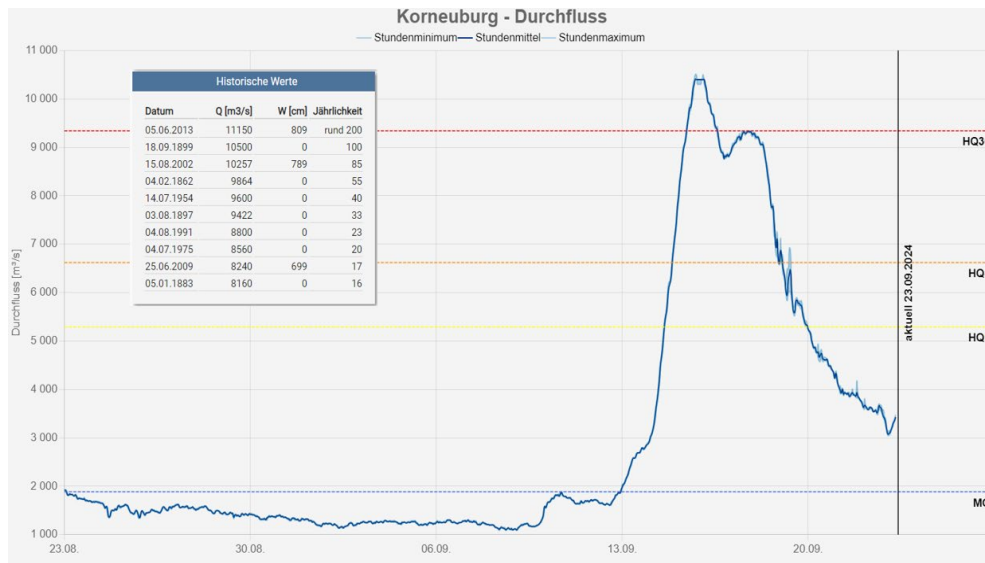
“Fünf b” weather incident 12. – 16. sept - Austria



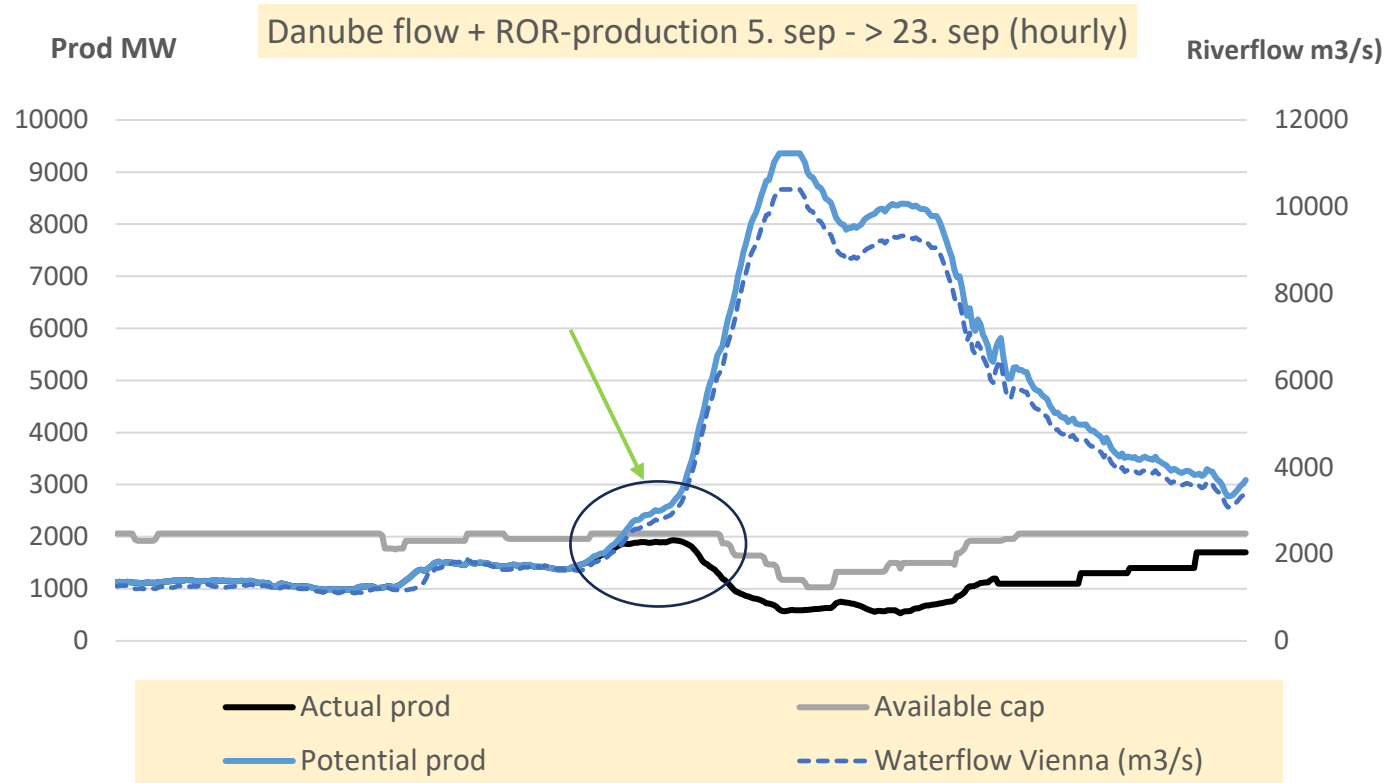
In den fünf Tagen von 12. bis 16. September 2024 ist in Niederösterreich, Wien und Oberösterreich fast flächendeckend 25 Prozent mehr Niederschlag gefallen als bei den stärksten fünftägigen Ereignissen seit dem Jahr 1961. Im Gebiet vom Tullnerfeld über St. Pölten bis Lilienfeld waren es im Schnitt um 120 Prozent mehr, im Gebiet um Langenlebarn sogar bis zu 160 Prozent mehr. (siehe Bild 2)

Flows exceeded plant capacities ...

Spilled water estimated to be 900 GWh spillage for weeks 37->39, included in the models

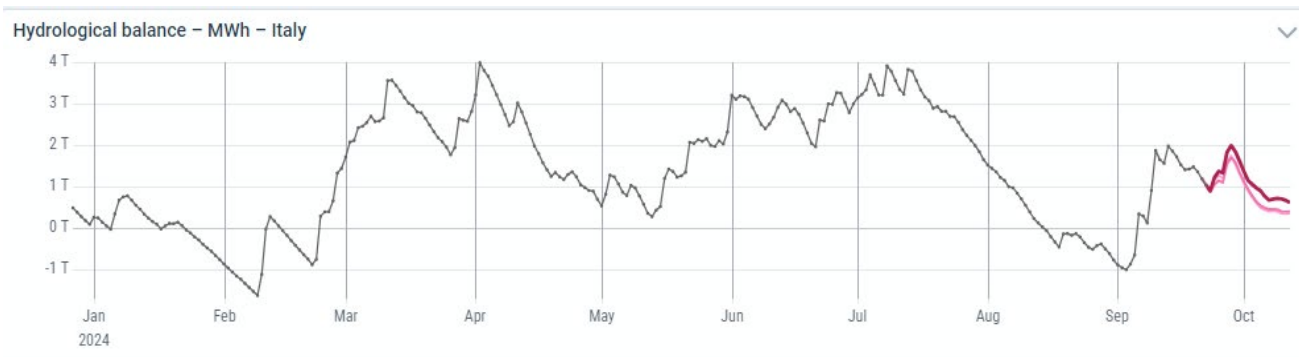
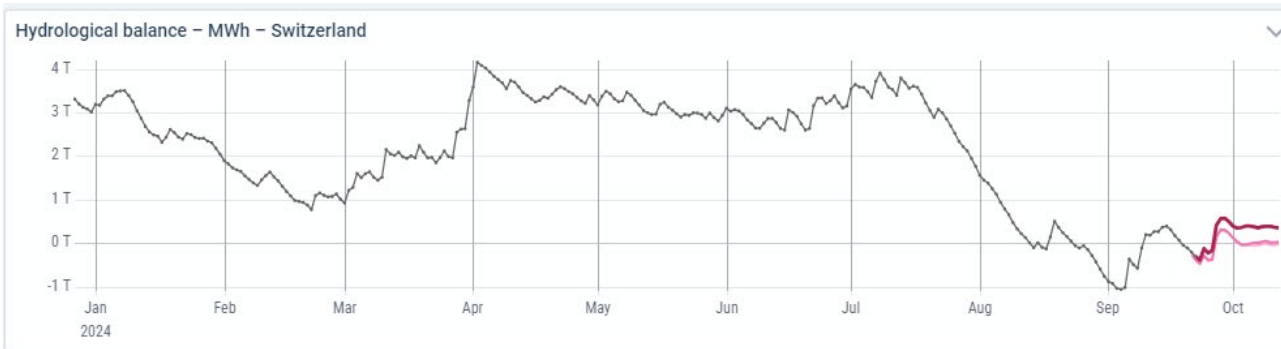
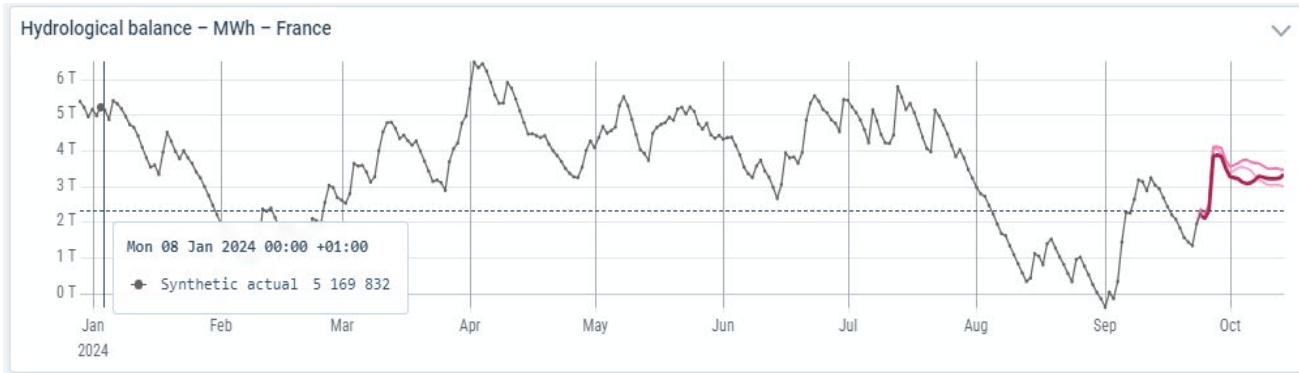


Flooding Danube from Sept 12th - reduced hydropower – production spillage - data from run-river plants Danube



- Water spill by about 3000 m³/s flowrate (13. sept)
- Production reduced from 2300 -> 600 MW
- Production losses (spill) estimated to about 1 TWh

Alpine Hydrological situation end week 39 (Sept 29th)

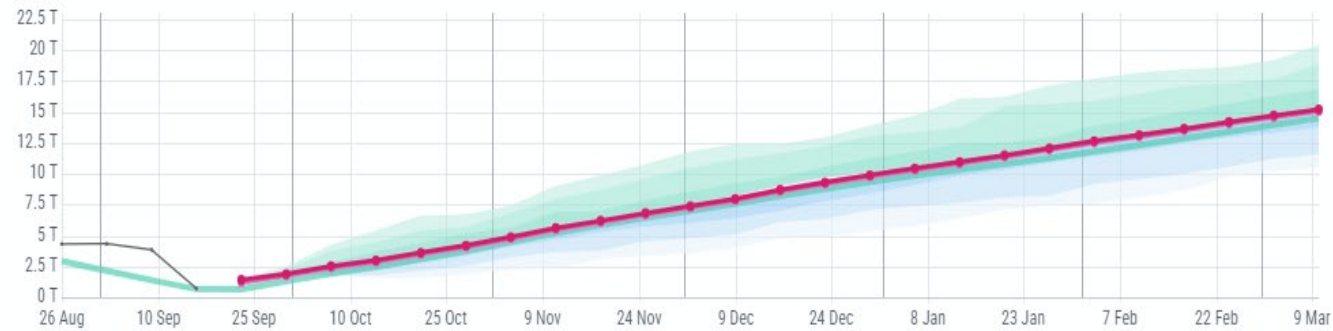


- Hydr.balance Alp Region + 7.5 TWh, - quite strong - > healthy outlooks for the winter ?

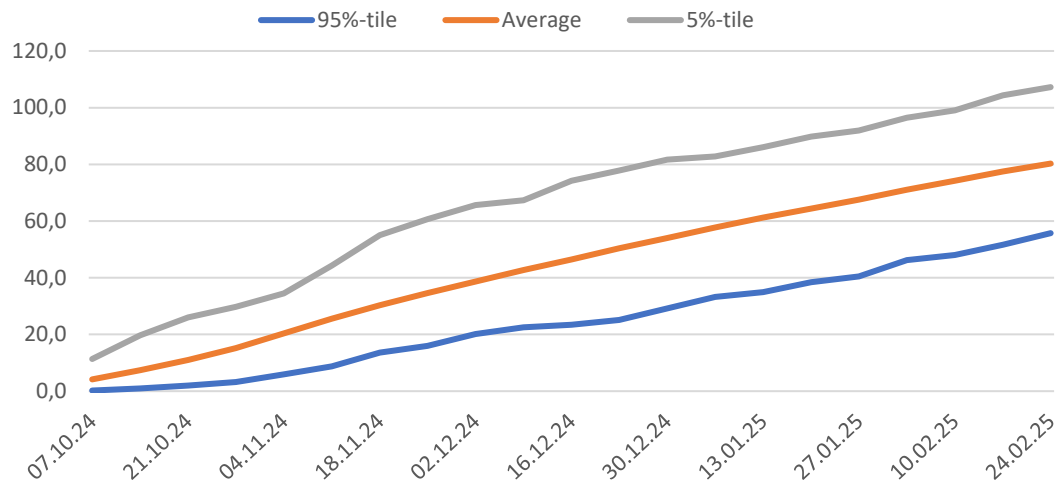
	Snow/ Ground TWh	Hydro Reservoir TWh	Hydr. Balance TWh
CH	0,4	0	0,4
AT	1,5	0,8	2,3
FR	1,2	1,6	2,8
IT	1,0	0,6	1,6
Alp Region	4,10	3,00	7,1

Precipitation accumulation- weather yrs 1990-2023

Net precipitation energy – MWh – Austria Accumulated



Accumulated precipitation scenarios 1990-2023
Alp Region – until end Feb 25



- Precipitation variations (accumulated) :
- FR +/- 11 TWh
- AT +/- 4 TWh
- CH +/- 5 TWh
- IT +/- 11 TWh
- Alps +/- 25 TWh

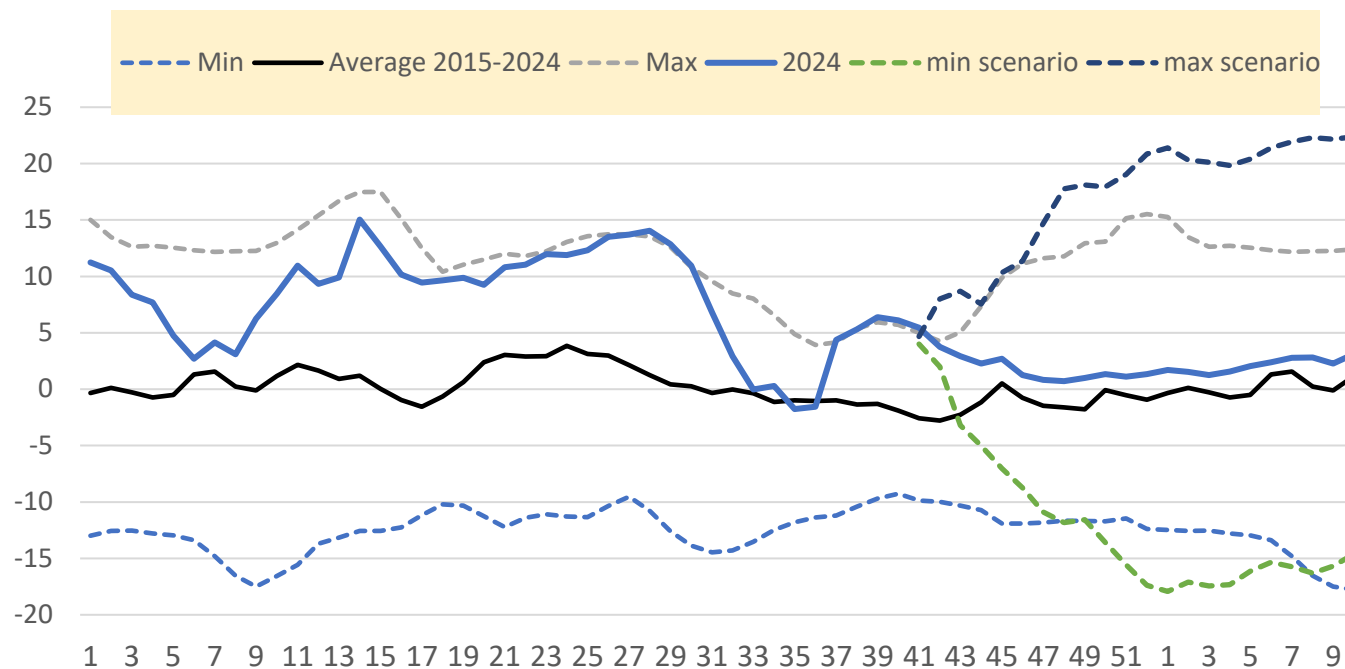
Hydr. Balance outlooks winter 24/25 - variation band



Variation bands :

- Accumulated precipitation :
+/- 25 TWh

Hydrological balance Alp Region 2024 + scenarios winter 25 (TWh/week)

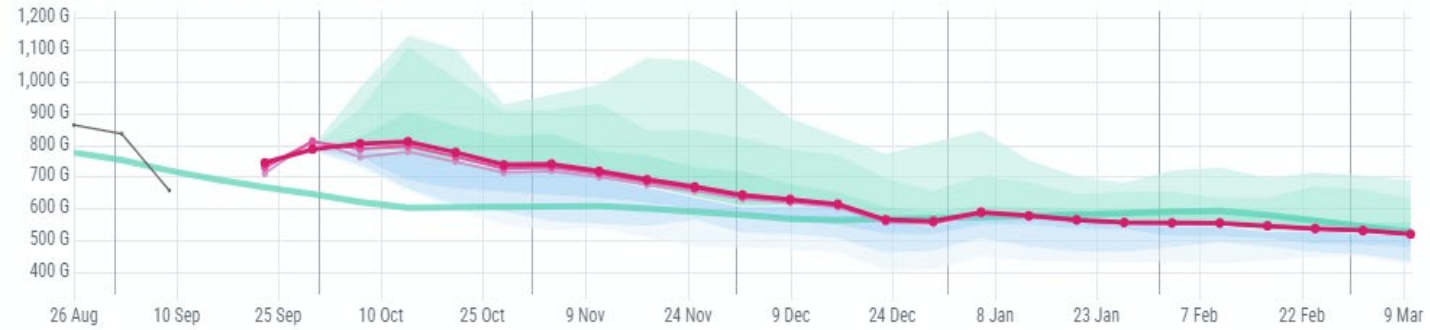


- Hydrological balance end February :
+ 22/-17 TWh



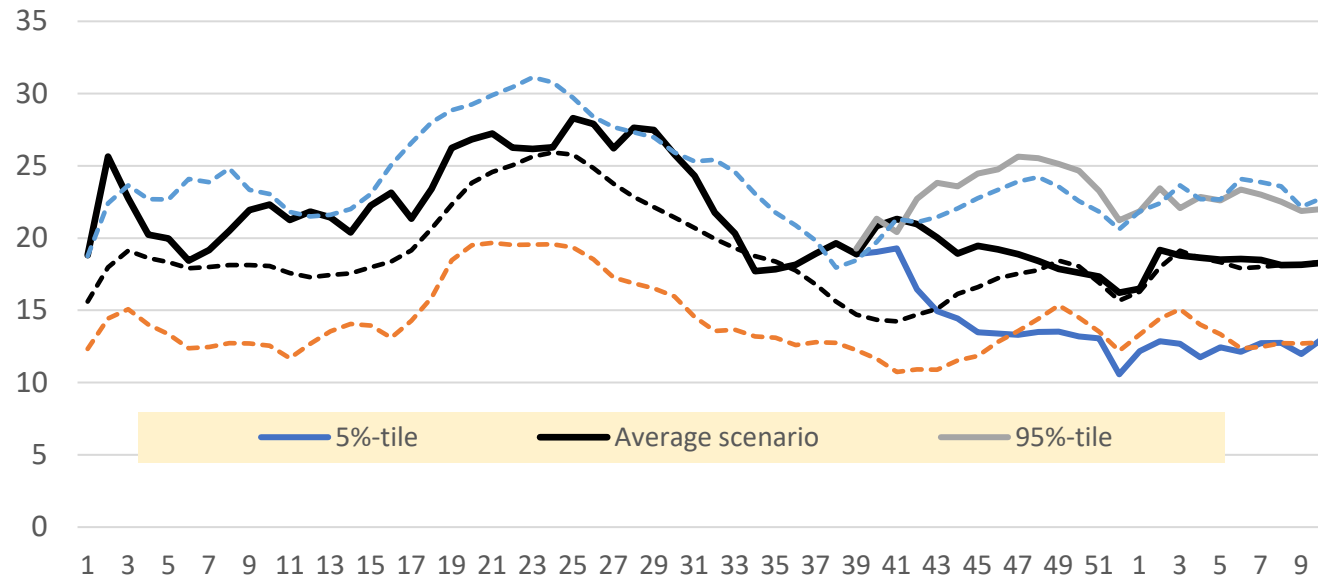
Weekly production scenarios winter 20 24/25

Net hydro production – MWh – Switzerland



The current hydr. surplus (7 TWh) brings increased hydropower production during Q4, normalized production Q1 by normal weather.

Alp hydropower 2024 + winter 24/25 (GW/week)



During Dec. statistical variation band is reached (+/- 5 GW)

Conclusions - hydropower outlooks winter 24/25

- Flooding incident Austria has limited impact for the winter outlooks
- Today's hydrological surplus expected nearly to cease out before New Year
- Variation band hydr. Balance winter 2025 about 40 TWh (+22/-17 TWh)
- Production stronger than normal Q4-24, will normalize during Q1 – variation band expected to be +/- 5 GW for the entire Alp Region countries.