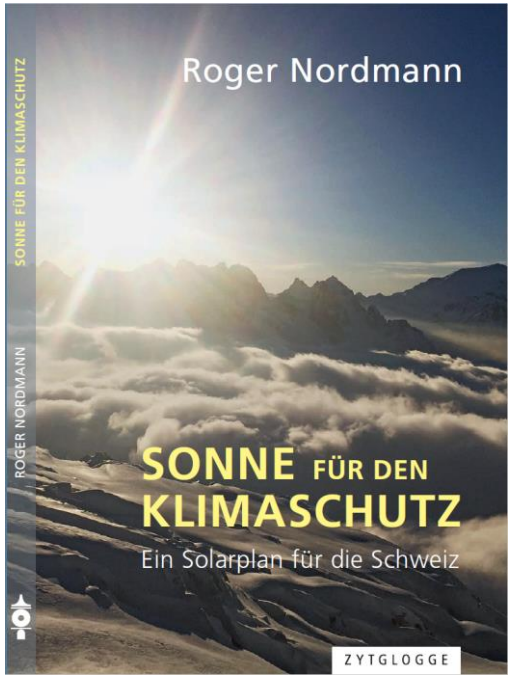
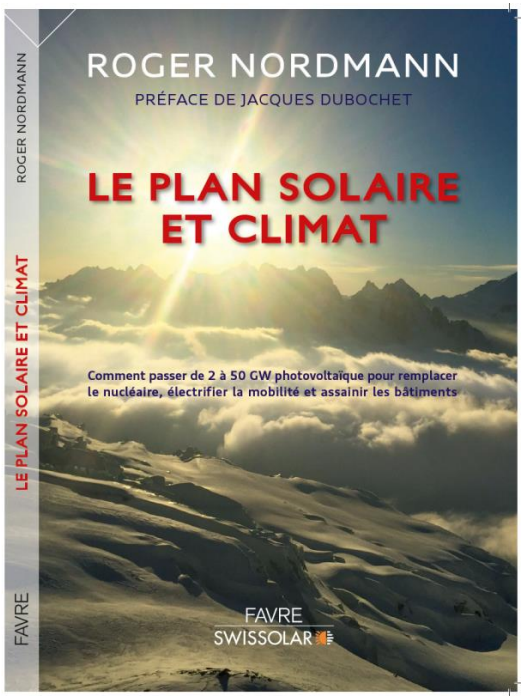




1st World CleanTech Week eConvention

22. April 2020

The Solar Plan for Climate»

toward 6 KW photovoltaics per capita in Switzerland

Roger Nordmann, MP Swiss Parliament

President of the social-democrat Group

Environment, Spatial Planning And Energy Committees (former President)

Board swisscleantech Association

President of Swissolar

The goal is to produce enough electricity for

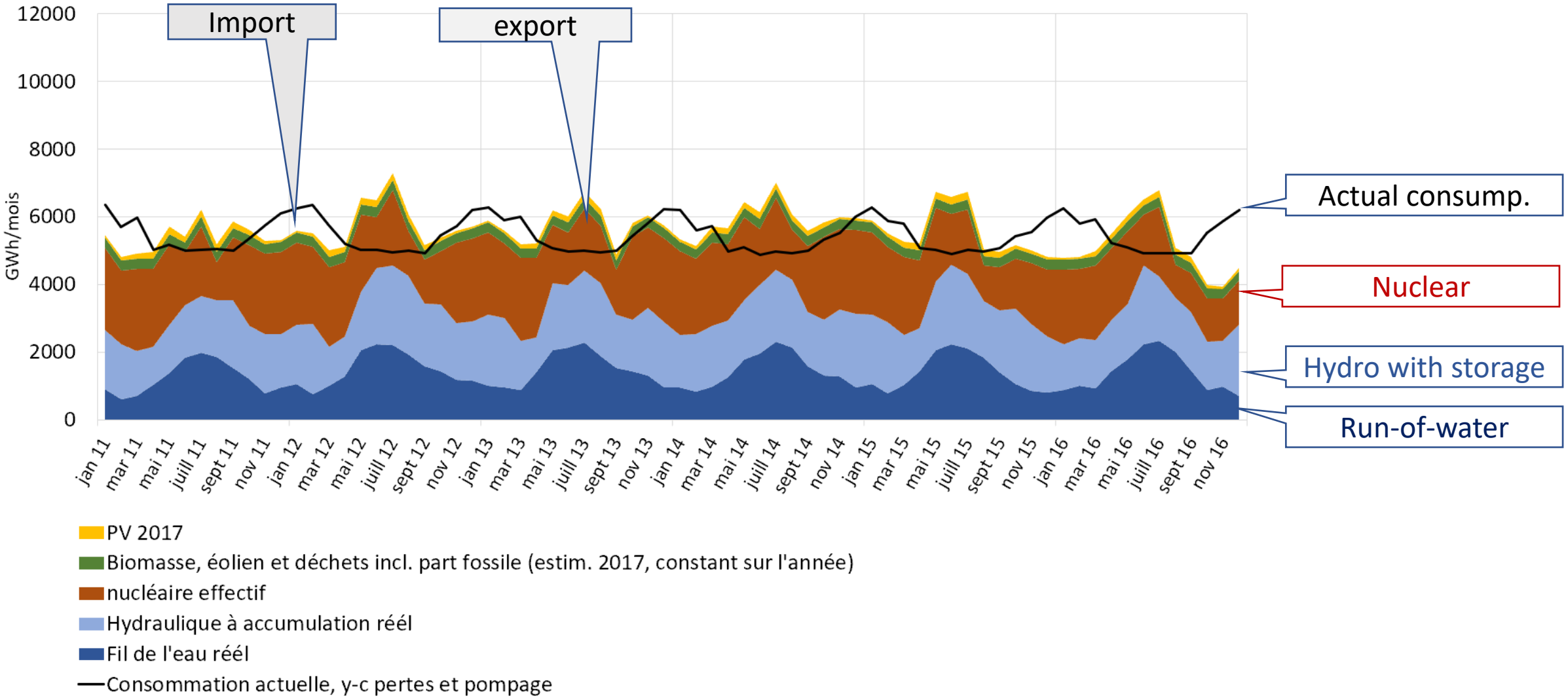
- substitution of nuclear power and
- full decarbonisation of road/off-road transportation
- Heat pump to full decarbonise buildings (together with retrofit)

Under special swiss conditions:

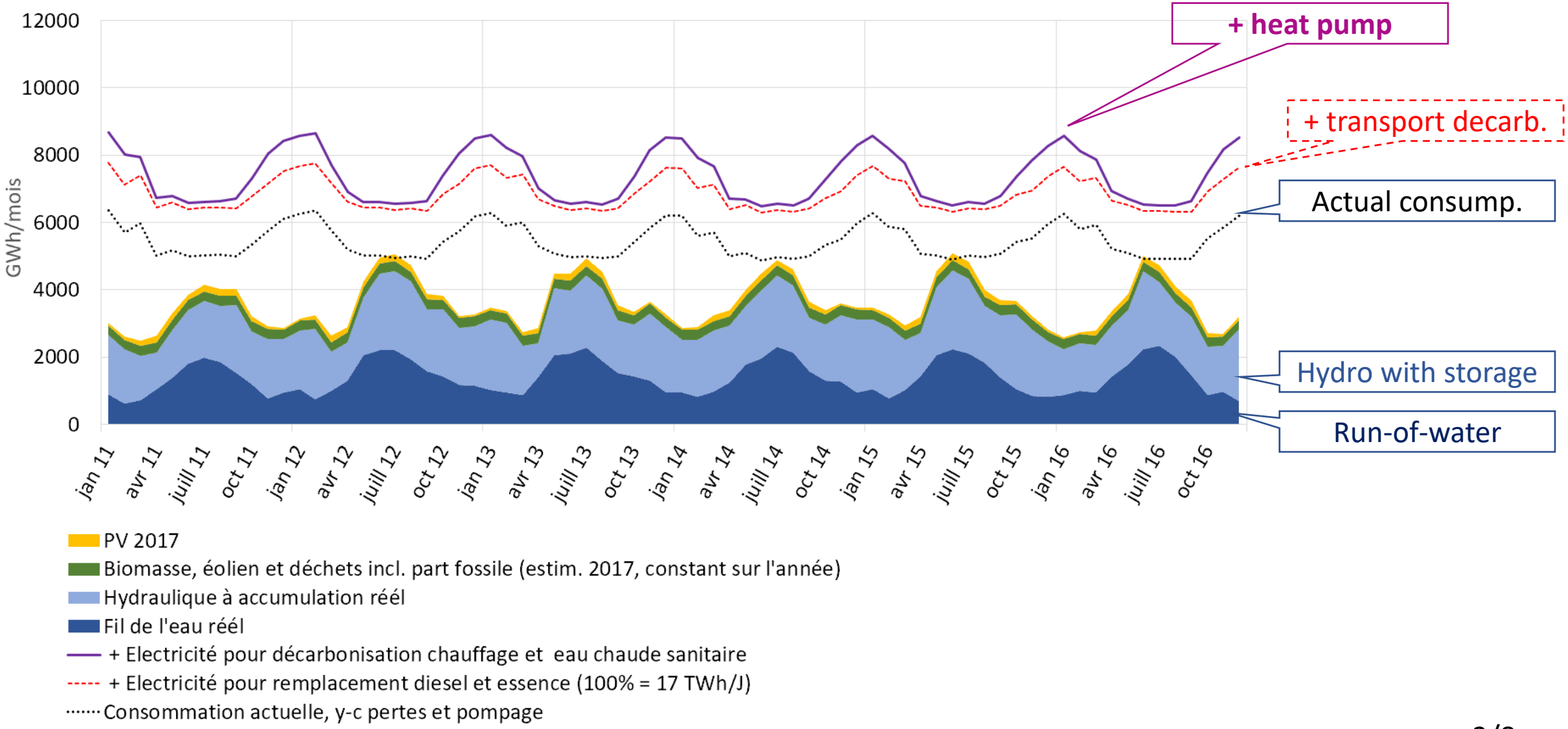
- Strong hydropower with huge storage, but few additional potential.
- High opposition against wind power
- High solar potential (especially rooftop)
- Higher electricity consumption in Winter.

→ No problem for short-run grid balancing, but **huge seasonal deficit during winter**

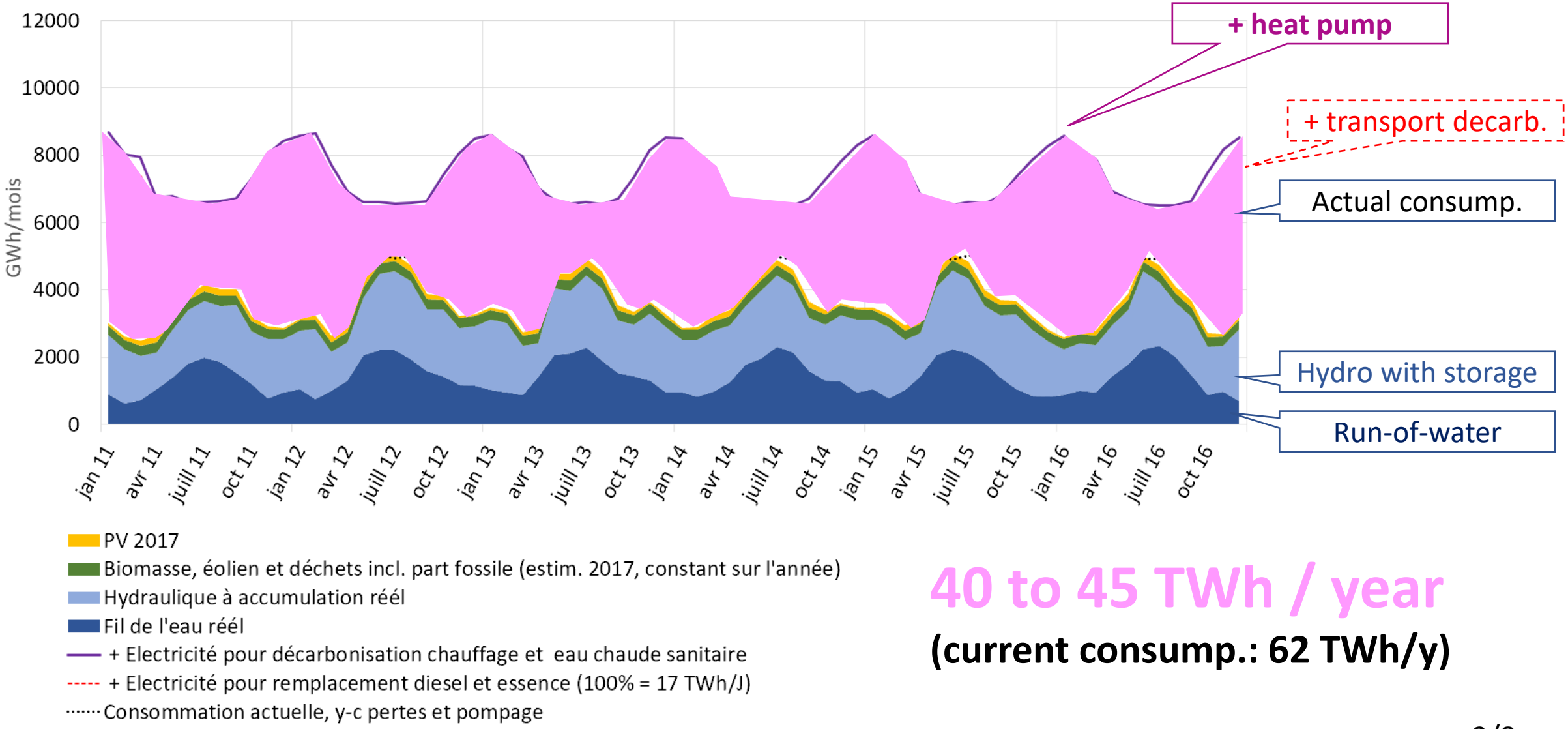
The monthly electricity production and consumption in Switzerland: actual situation



The monthly electricity production and consumption in Switzerland: nuclear removed + new consumption



The monthly electricity production and consumption in Switzerland



40 to 45 TWh / year

(current consump.: 62 TWh/y)

My initial intuition (somewhat confuse):

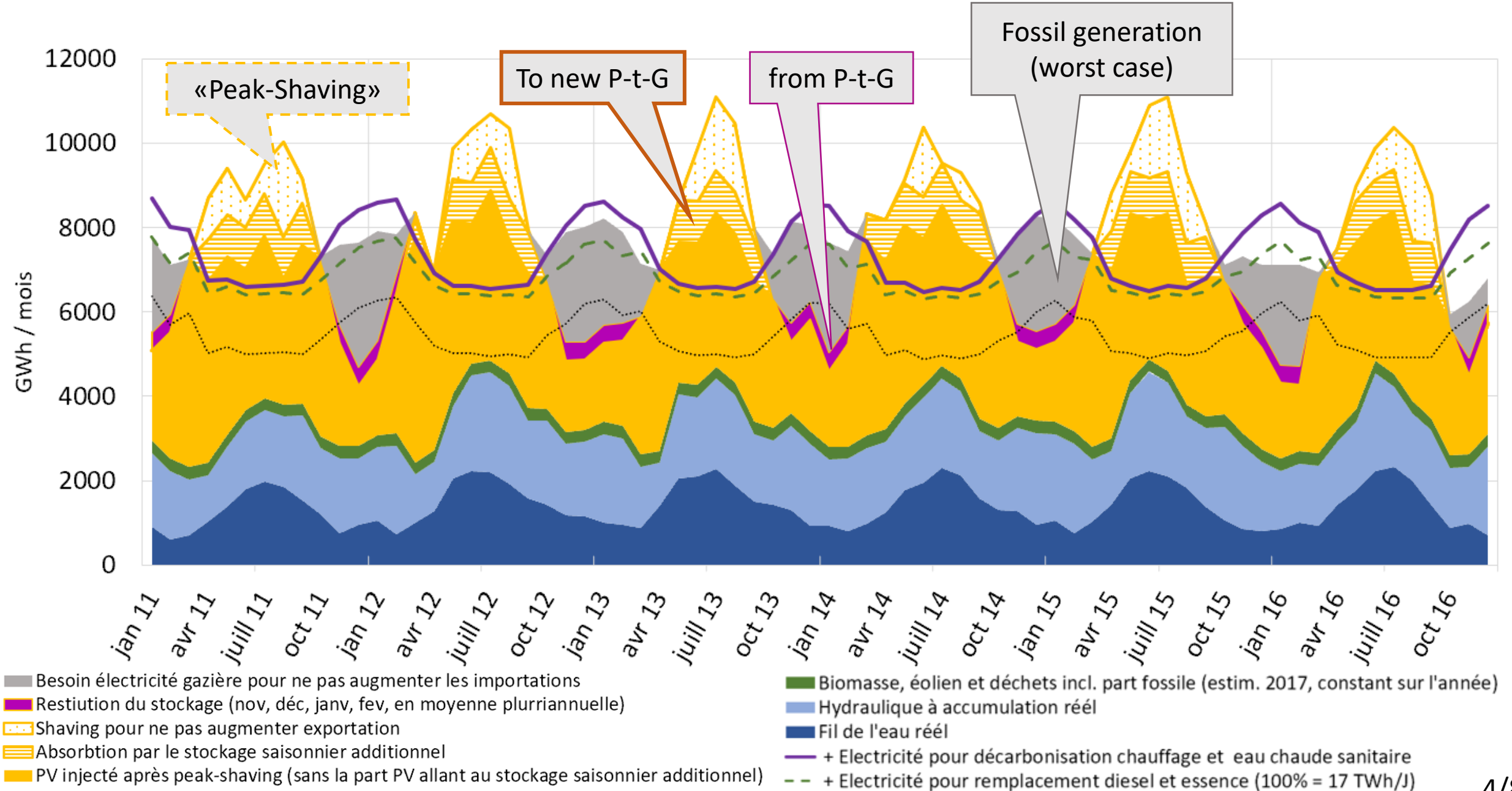
Around 40 GW PV with strong development of seasonal storage (New Hydro dam or Power-to-gas) and investments in the grid.

But after computing the monthly modelling, I came to this "base scenario" of the "Solar plan"

- 50 GW PV (2018: 2 GW)
- Very few P-t-G, no additional hydro dam
- Mainly no additional Grid investment, but instead of it:
- "Peak-shaving" (curtailment) of excessive PV-Production in summer (=reduced harvesting of electricity)
- Decent winter PV generation in winter
- Worst case: fossil gas for the missing part in winter

(assumption: No increase of import in winter and of export in summer)

Result with 50 GW PV, zero nuclear, full decarbonisation of Building and (off-)road



PV Situation

49 TWh PV

-5 TWh lost by peak-shaving (11% of average year production)

=38 TWh PV directly used and 6 for additional seasonal storage (power-to-gas)

And 9 TWh fossil generation (natural gas).

= 4,4 million tons CO_2

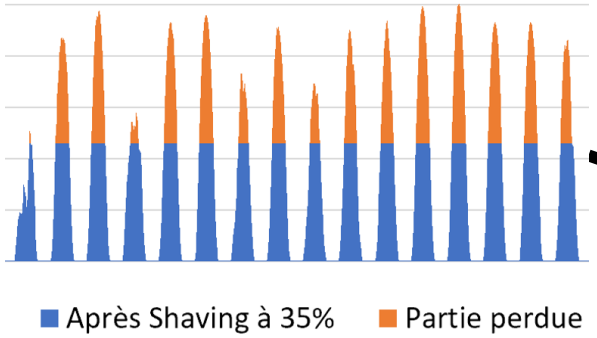
= 3/5 of overall Swiss GHG Emissions

CO_2Balance

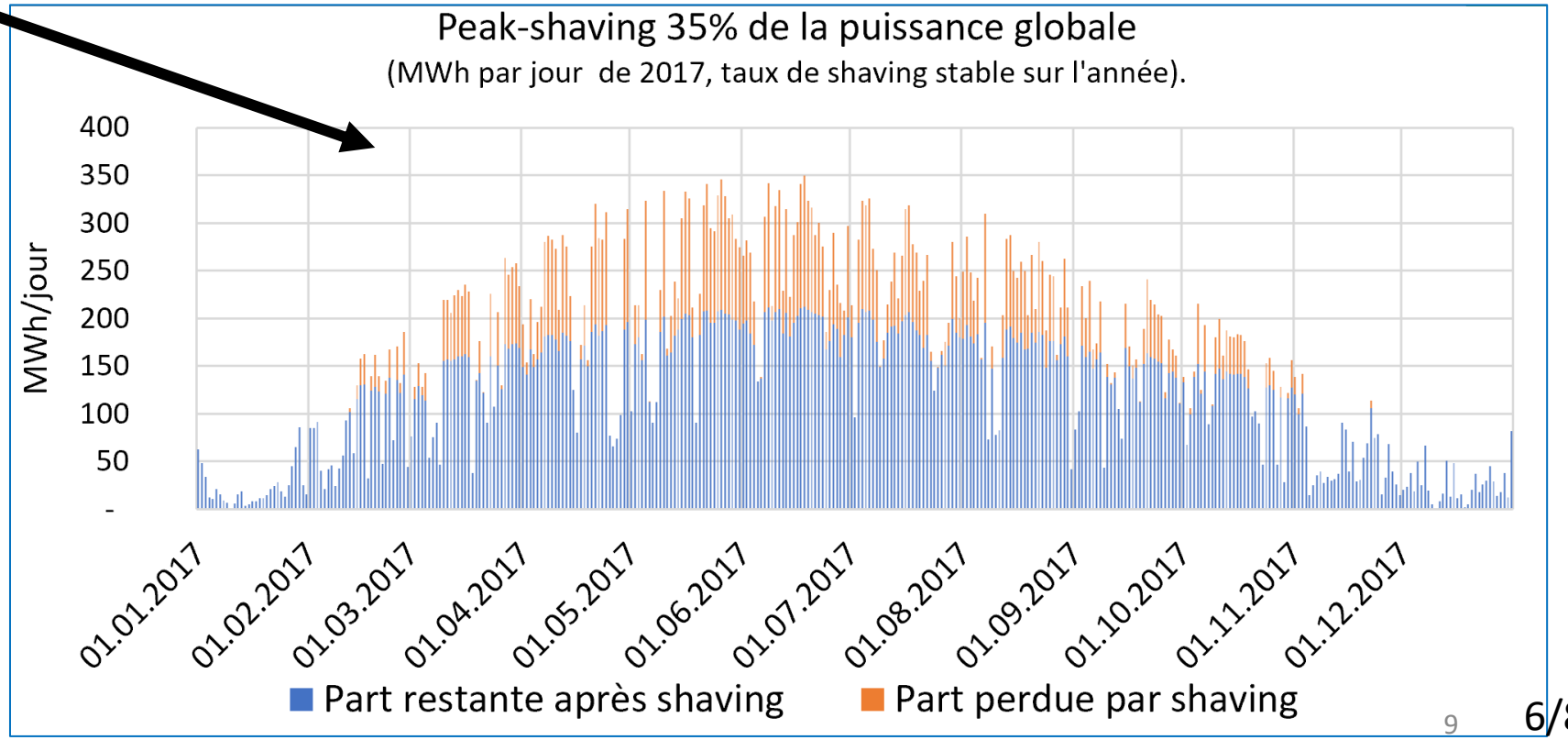
Million tons CO_2	2017	Full decarb (off-) road and Bulding
(off-) Road	16	0
Buildings	14.8	0
Fossil power Generation	0	4.4
Total	**30.8**	**4.4**
Decrease CO2		-86%

«Peak-shaving» is the key for political and technical acceptance of mass PV deployment

First: if too much power

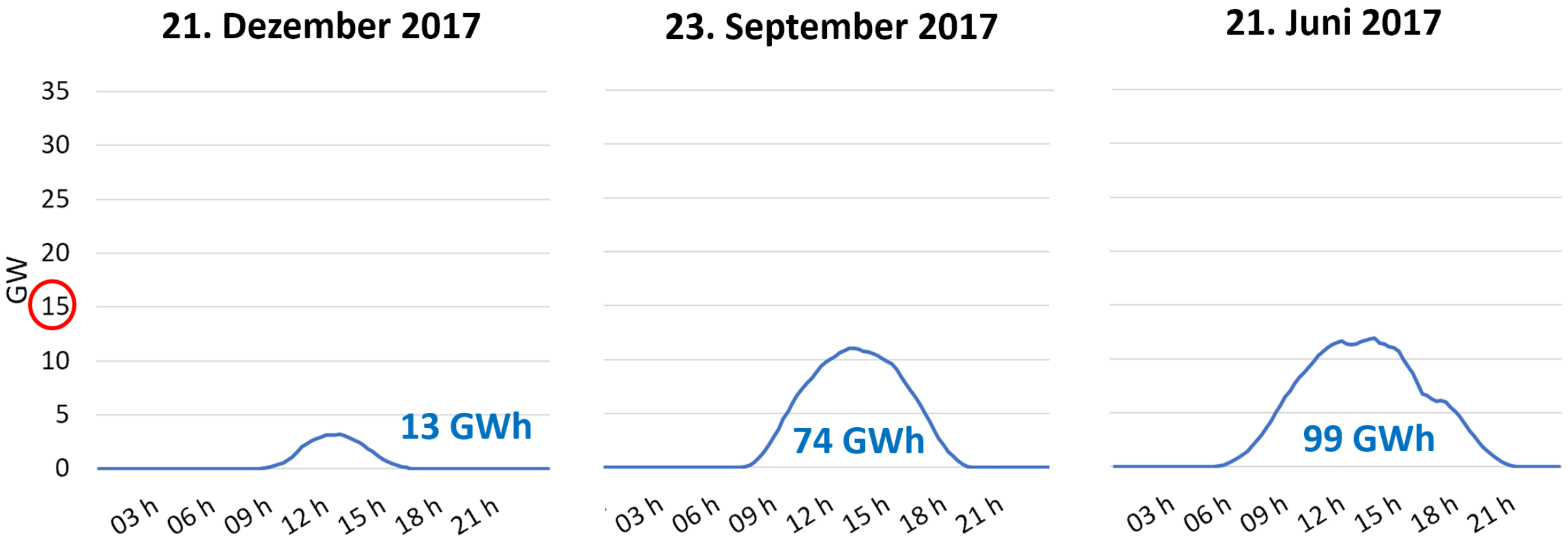


Extrem Peak-shaving at 35% of nominal power=
20% less production
(when excessive production and low prices)



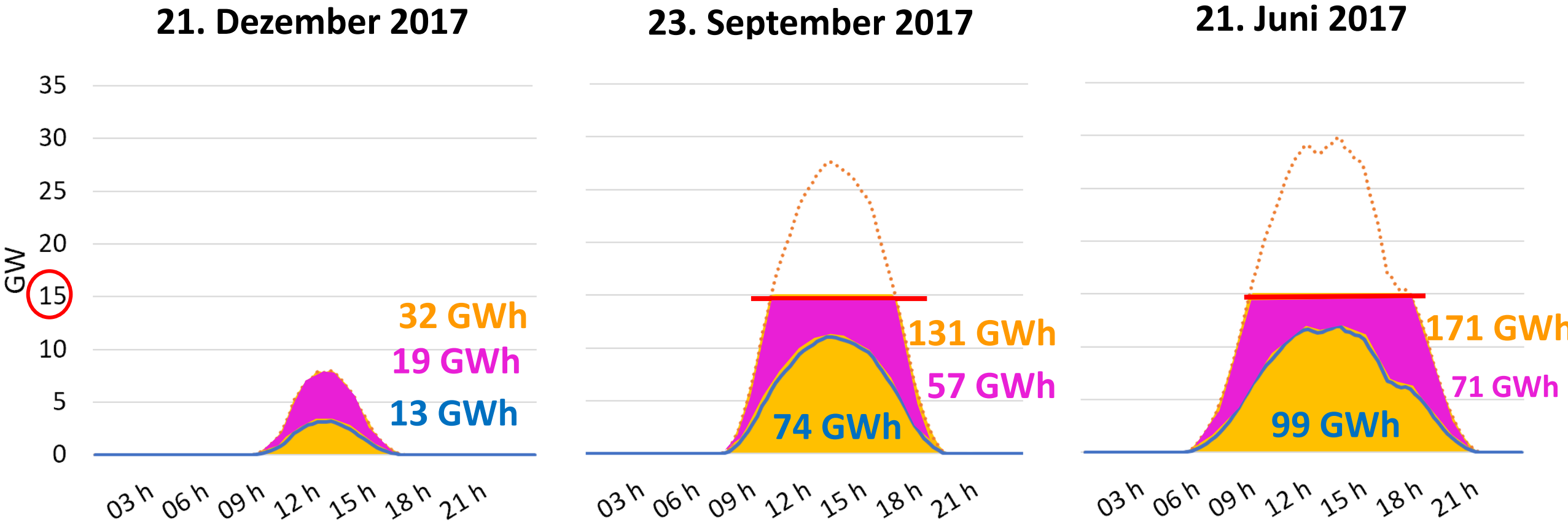
Peak-shaving allows to install more PV, very helpfull in Winter

First step: PV at 20 GW = 10x more than 2018

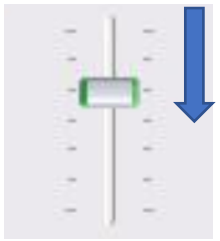


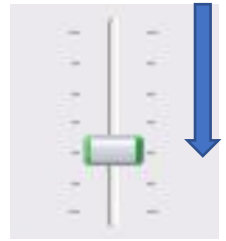
Peak-shaving allows to install more PV, very helpfull in Winter

second step: PV at 50 GW = 20x more than 2018



Peak-shaving





Outlook

The overall story is about decarbonisation

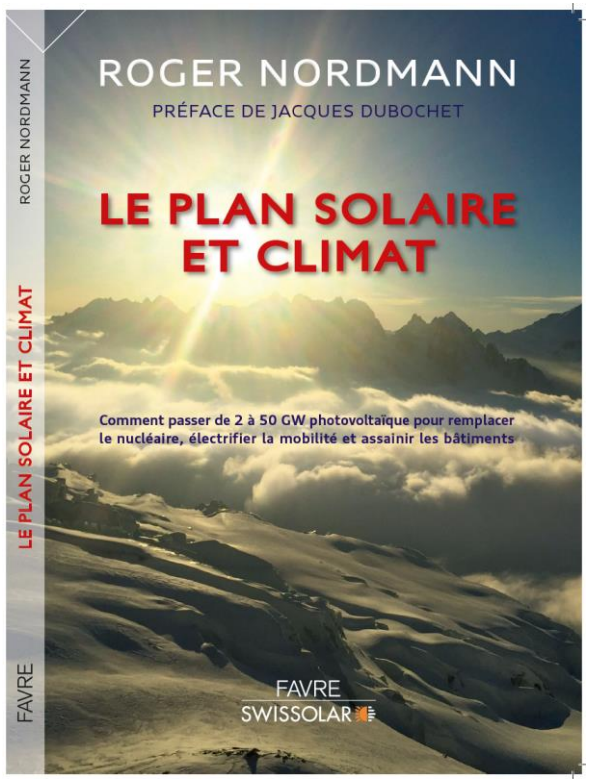
- If storage technology improves, «peak shaving» could never take place in real life
- But the mere possibility «peak shaving» helps to lift opposition against PV (utilities, business lobbies, administration)
- Everybody can accept mass PV deployment from now on, even if its remains a lot of uncertainty about the details of the last steps 2040 or 2050.
- Everyone can invest without fearing grid congestion.
- Slightly oversizing PV enhances security of supply and resilience

PV is the key technology on the path to decarbonisation, in combination with hydro, wind and storage.

Exact mix and use depend on national conditions and neighbour countries.

Des p'tits pas, des p'tits pas, des p'tits pas ça suffit pas!

(small steps are not enough)
Manifestants pour le climat, Lausanne, 2 février 2019



French edition may 2019

Thanks for the attention

www.roger-nordmann.ch
www.swissolar.ch
www.swisscleantech.ch

German translation august 2019