COVID 19: The impact on the power system and lessons for the energy transition

EDSO webinar

Ronnie Belmans, Jef Beerten, Hakan Ergun

Impact on electricity in

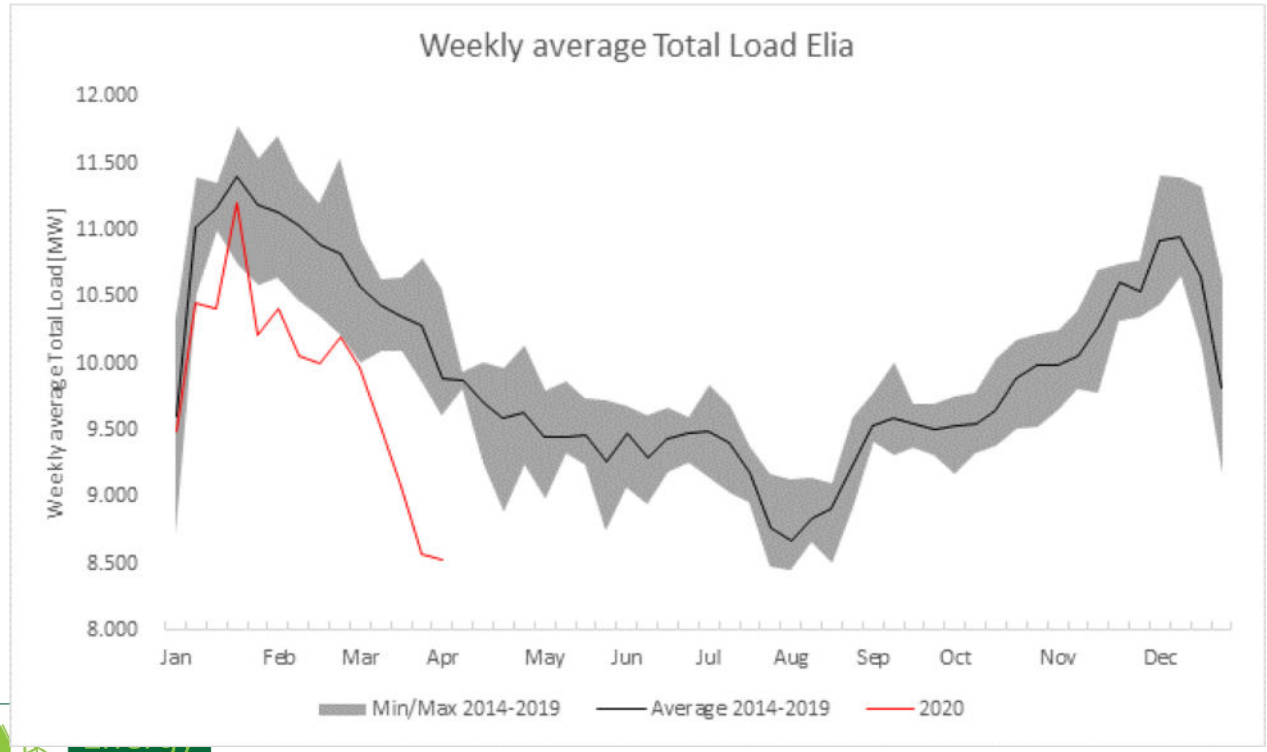
Impact on the electricity infrastructure around the world

- Power system loading
- Critical personnel
- Maintenance & construction projects
- Technical challenges in grid operation

Power system loading

Industry slowing, less public transport, offices closed, …

- General trend: significant reduction in peak demands and power system loading



Example: loading in Belgian power system

- Drop in demand as a result of impact of governmental measures (5-10% on 12/3, 10-15% on 17/3 and 15-25% on 23/3);

Source: https://www.elia.be/en/company/covid-19_elia-s-initiatives

Power system loading

- General trend: significant reduction in peak demand and power system loading

- Noticeable reported regional differences
  - Impacted by severity of restrictions
  - Beginning of April:
    - Italy (28%), France (26%), Spain (25%)
    - Elia (Belgium, 16%) vs 50 Hertz (Germany, 8%)

Reported load reductions in Italy, France and Spain from https://www.eurelectric.org/covid-19/
And Elia & 50 Herz control zone from https://www.elia.be/en/company/covid-19_elia-s-initiatives

Critical personnel

- Working from home is largely the norm worldwide for personnel working at administrative sites

- Except for
  - Control center personnel
  - Intervention teams
  - Other supporting personnel for business continuity (security, IT, …).

Critical personnel

Control centers & control center personnel

- General trend: most stringent measures worldwide
- Strictly limited access to control center
- Varying reported measures for control centers & personnel
  - Additional hygiene and contact measures for personnel
  - Additional cleaning and disinfection of workstations and other shared facilities
  - No longer using public transport, companies organizing transport when required
  - Rotating shifts between different control centers
  - Sequestration reported in some parts of the world, but in general not applicable to Europe

Critical personnel

Intervention teams for field operations

- Adjusted work plans to accommodate physical distancing
  - Separated shift schedules to keep crews separated from one another
  - Different protocols for jobs requiring more than one crew member

- Rules in place for quarantining employees exposed to or with symptoms

Maintenance and construction projects

- General trend: reduction of work plans for field work
  - Entso-e reports than new connection and development projects might be affected with some delays, depending on duration and severity of COVID-19 crisis.

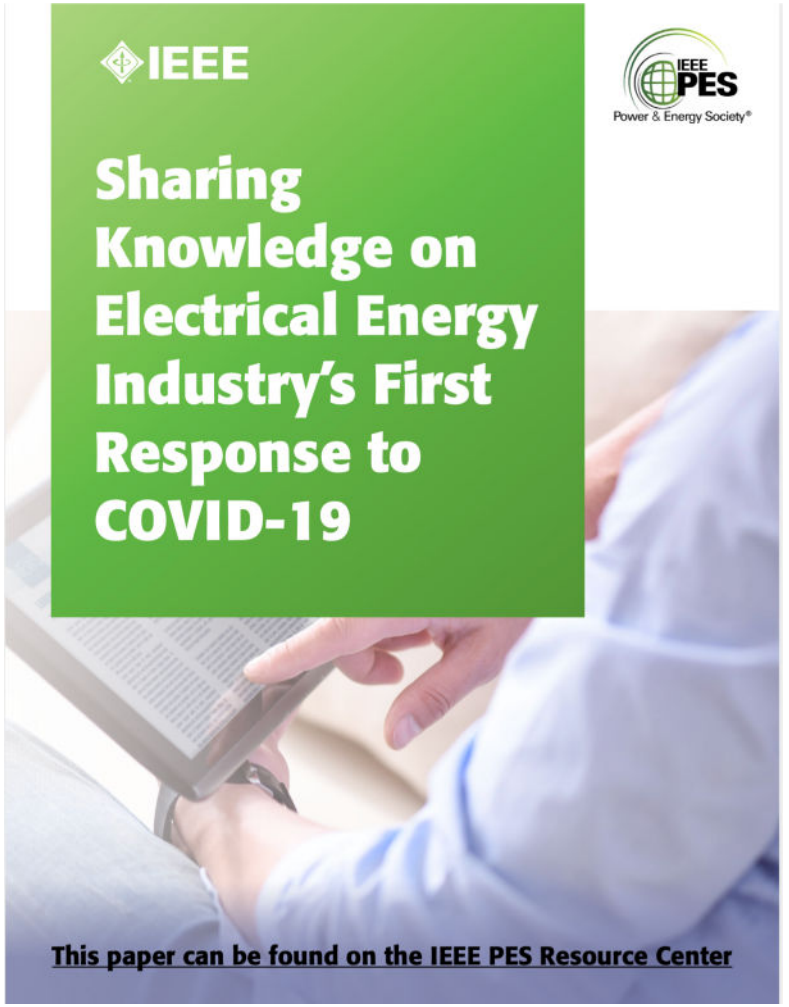
- Differences noticeable in adjusting work plans
  - For example:
    - Elia stopped work on construction sites after governmental measures
    - At 50 Hertz, work on construction sites is much less impacted

- Updated procedures are being shaped for phase after lockdown
  - Not only limited to own personnel, but also involving external contractors

Technical grid operation challenges

- Low loading conditions combined with relatively high levels or RES penetration
  - Voltages control challenges reported in some world regions
  - Concerns w.r.t. system strength at some points in the networks
- Note: In Europe, Entso-e reports regular operation without significant challenges due to voltage, system strength or concerns over inertia.
  - Some TSO's report higher system voltages, but they are still within normal system state values
- Accompanying changes in loading patterns
  - Additional challenges for load forecasting

Further reference



- A comprehensive overview of worldwide impact and best practices can be found at:

https://resourcecenter.ieee-pes.org/technical-publications/white-paper/PES_TP_COVID19_050120.html

What can learn from the Covid-19 pandemic for the renewable energy transition?

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What can we learn from the Covid-19 pandemic for the renewable energy transition?

- Currently, we are facing a low demand and high renewable generation period caused by the deceleration of economic activity
- We will compare generation, demand and price profiles in Belgium and neighboring countries to a number of years [1]
- Looking at these profiles we will draw some general conclusions towards the renewable energy transition

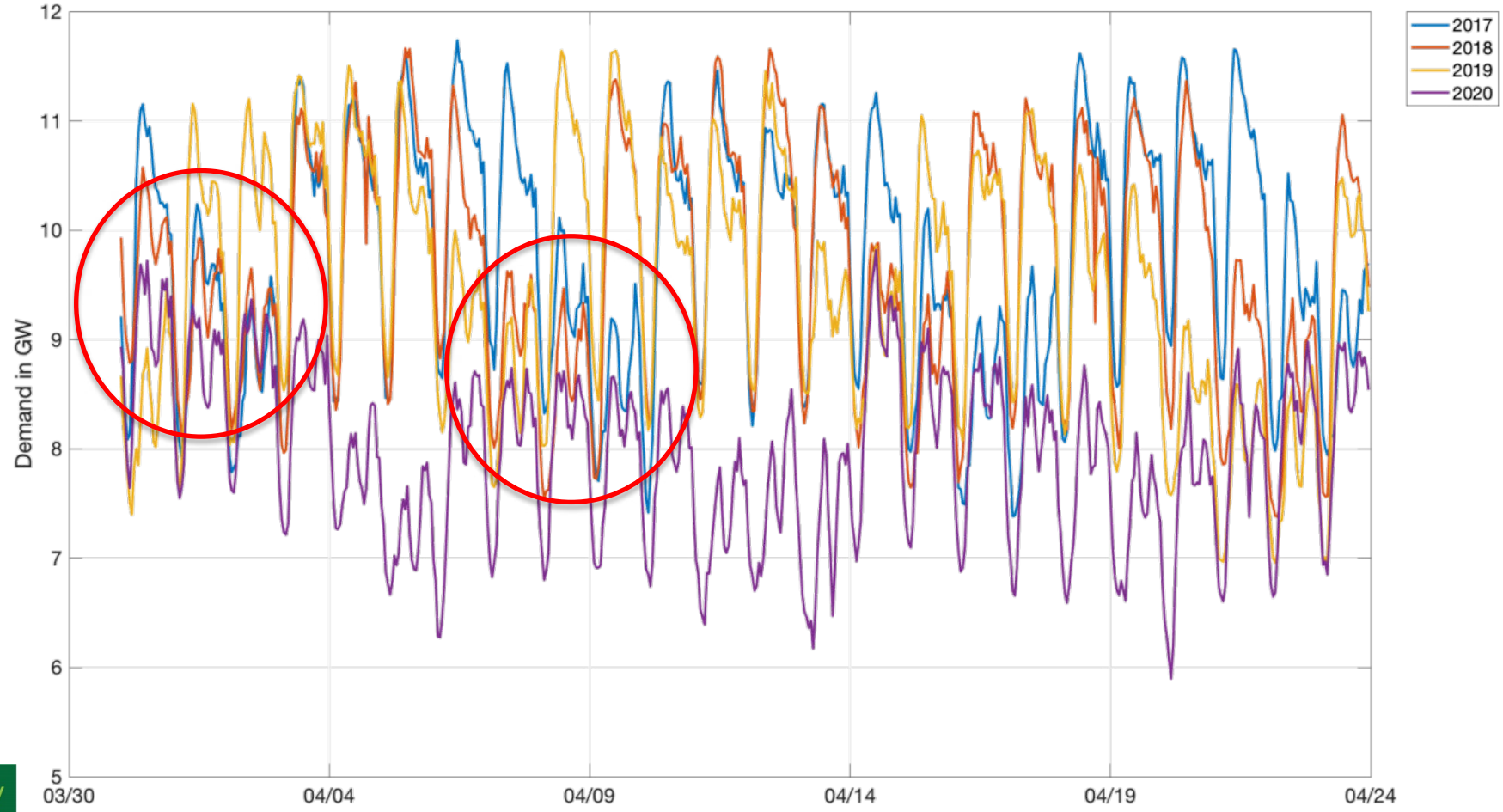
[1] All data is obtained from the Entso-e transparency platform: http://transparency.entsoe.eu/

Electricity demand in Belgium

(1)Total average demand decreased with 18%

(2) In 2020 week days do not reach weekend demand of previous years

Period: March 31st – April 24th

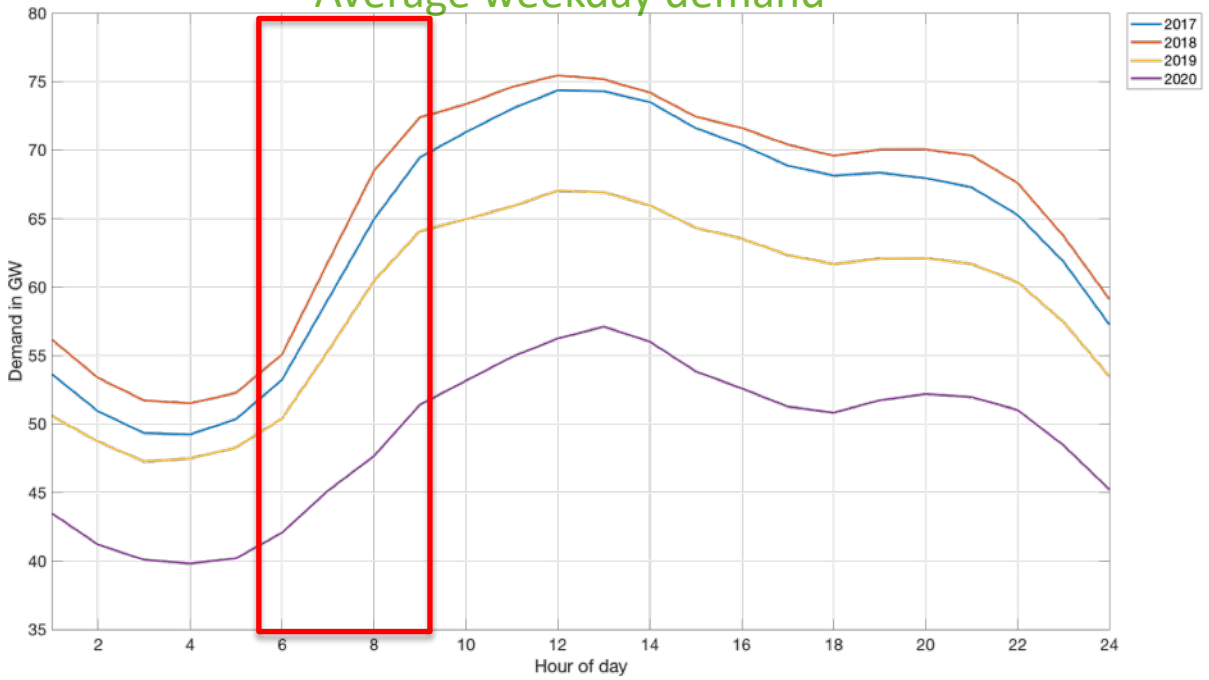


Electricity demand in Belgium

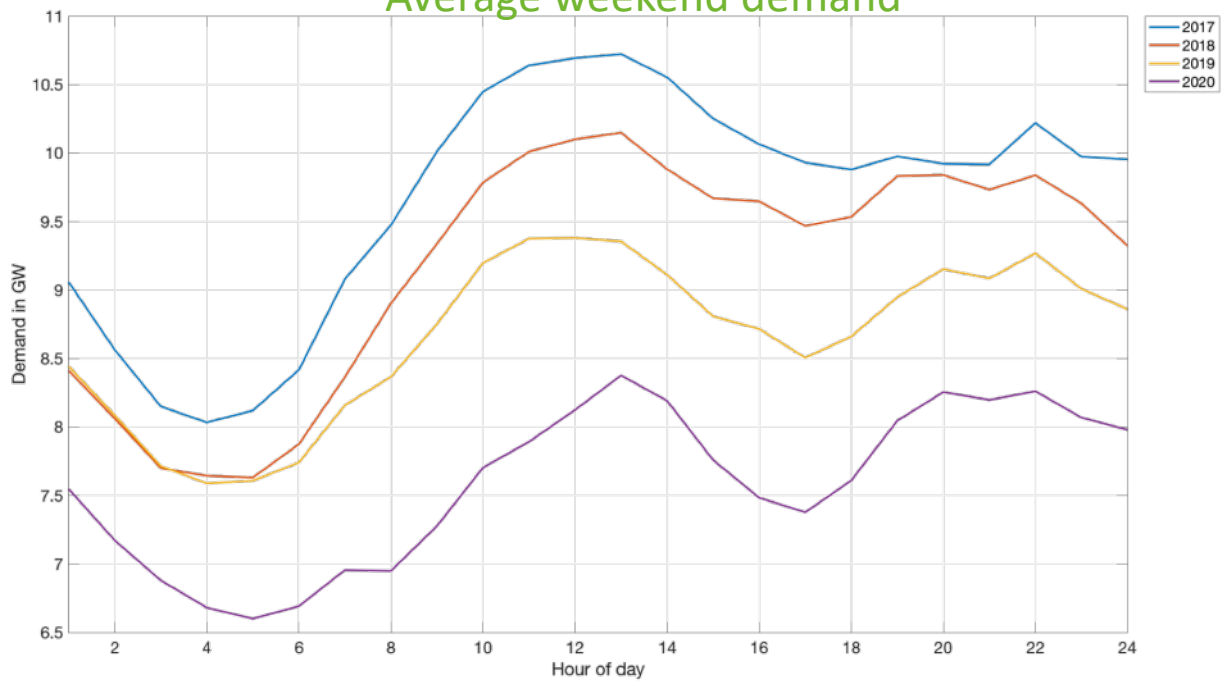
(1) Demand dynamics have not changed

Period: March 31st – April 24th

Average weekday demand



Average weekend demand

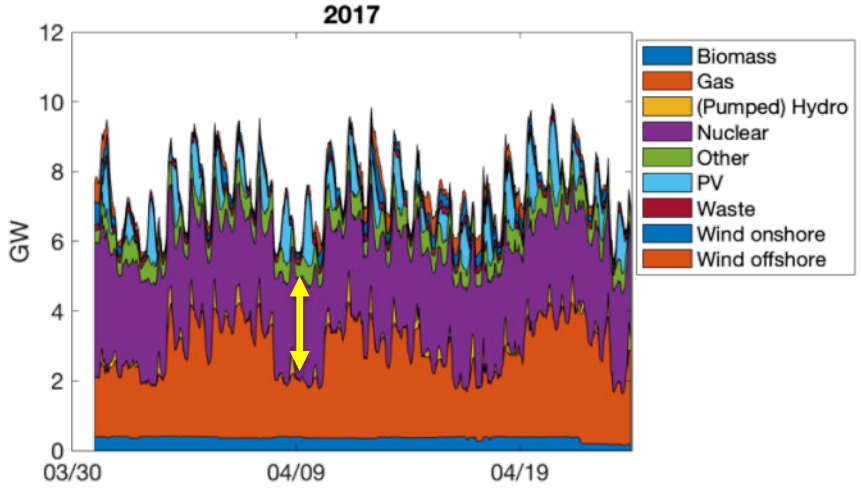


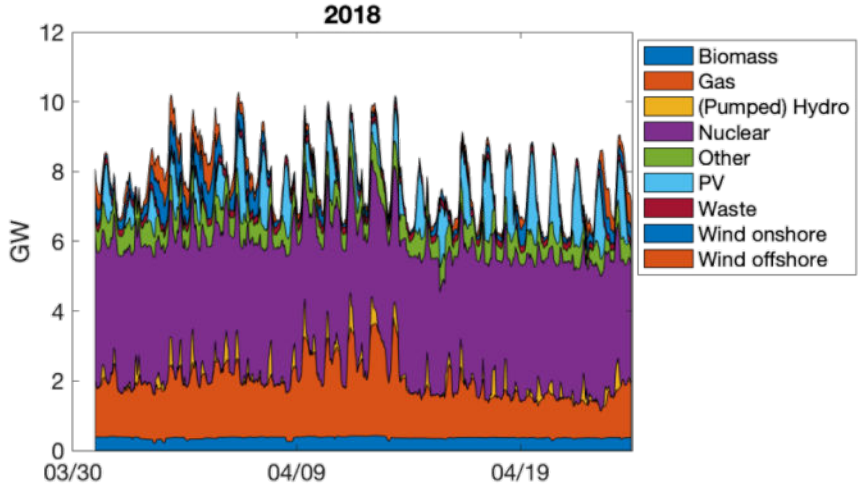
	2017	2018	2019	2020
Average power demand	9730 MW	9767 MW	9492 MW	7973 MW
max(Demand)/min(Demand)	1,59	1,58	1,68	1,66

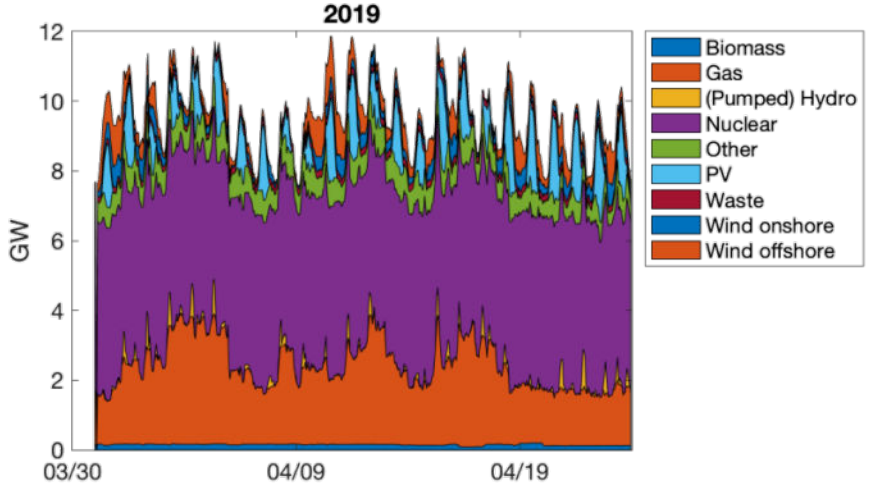
Power generation in Belgium

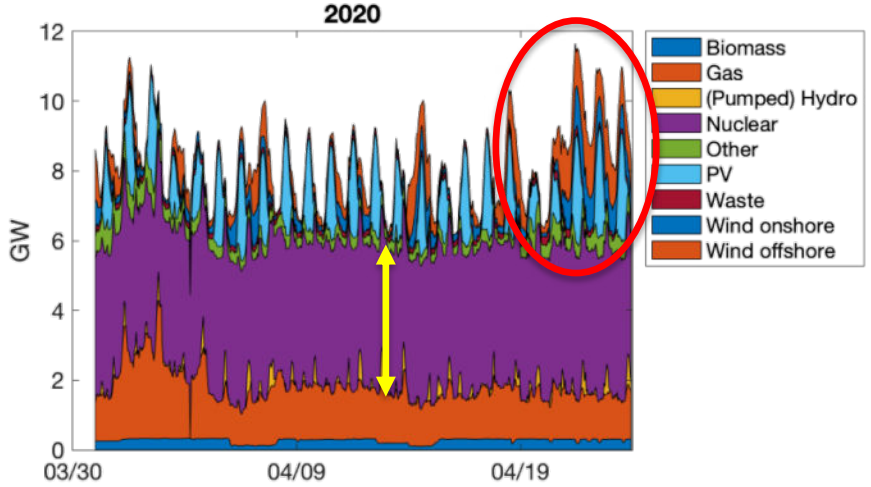
Period: March 31st – April 24th

(1) On average higher nuclear generation than in 2017 & 2018
(2) Higher generation from PV and wind in the second half of April 2020









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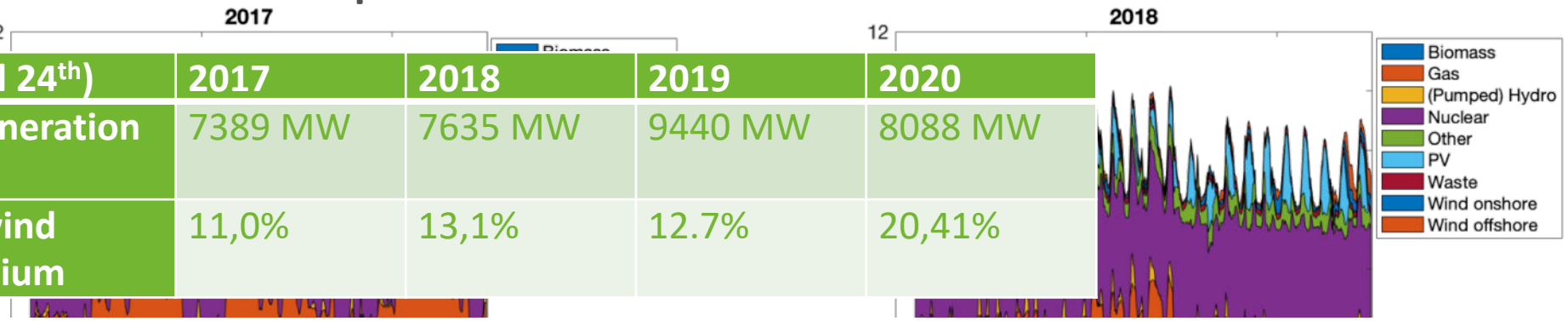
Power generation in Belgium

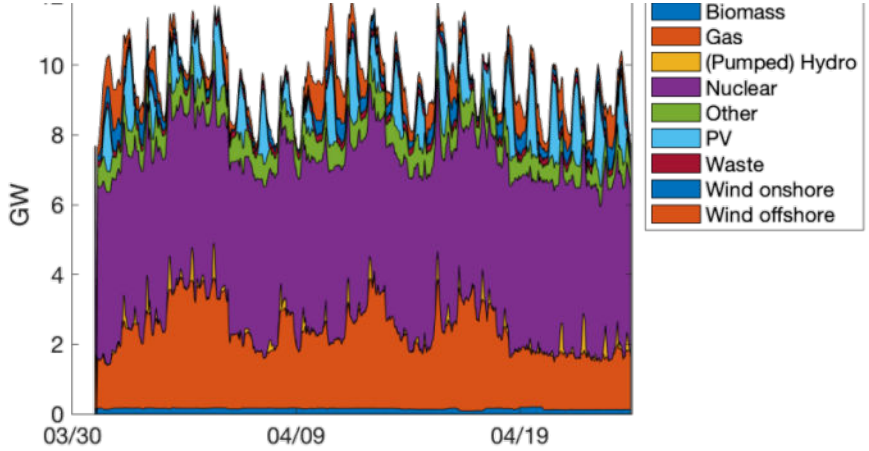
Period: March 31st – April 24th

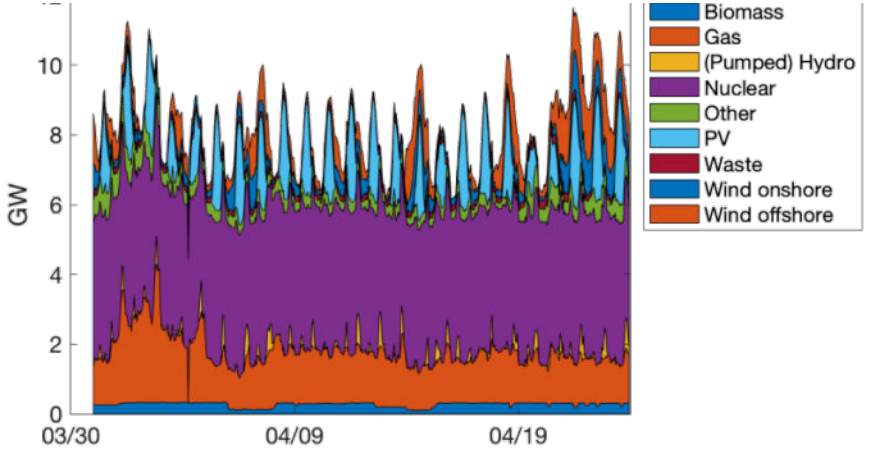
(March 31st – April 24th)	2017	2018	2019	2020
Average power generation in Belgium	7389 MW	7635 MW	9440 MW	8088 MW
Share of PV and wind generation in Belgium	11,0%	13,1%	12.7%	20,41%



(1) Although the demand is much lower, the generation in 2020 is higher than 2017 & 2018 with limited nuclear generation availability

(2) Share of generation from wind and PV higher than 20% of total in average





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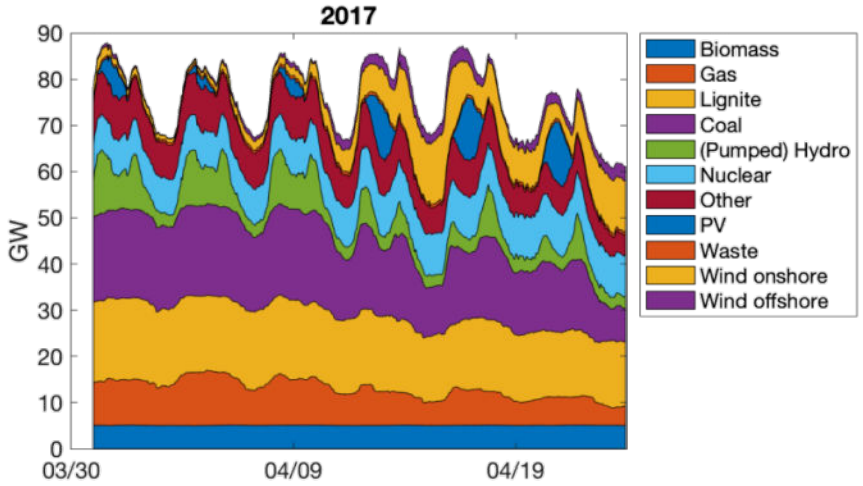
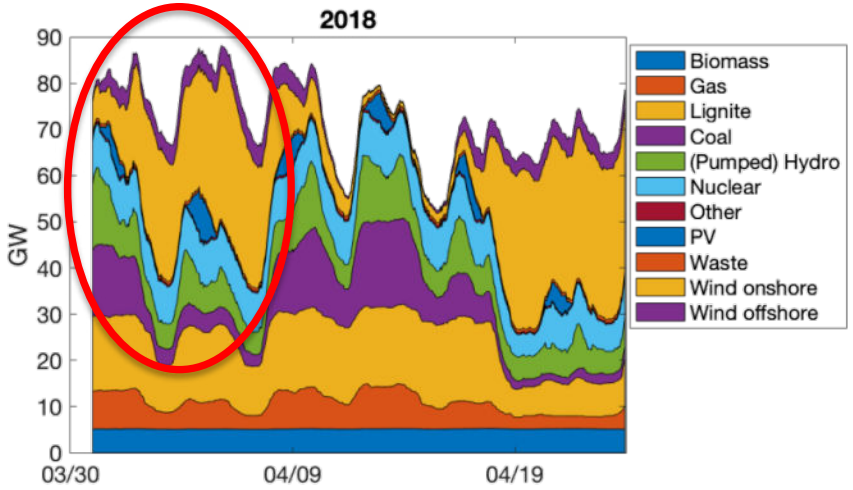
Power generation in Germany

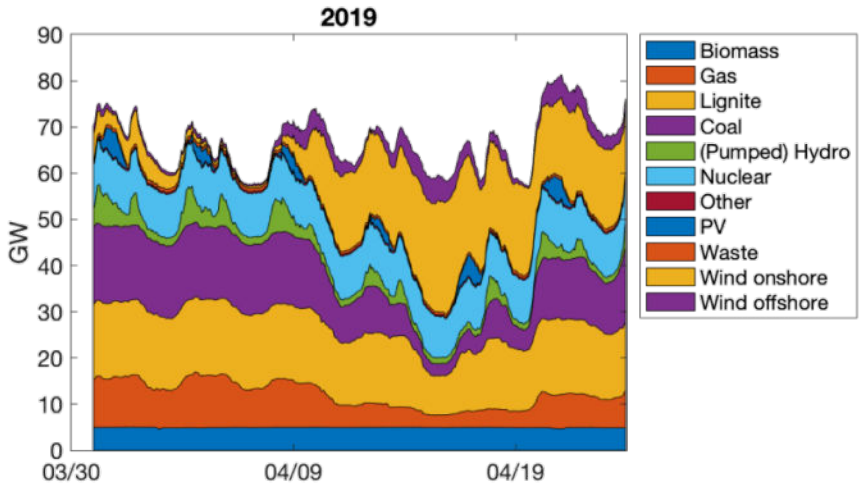
Usually high impact on prices

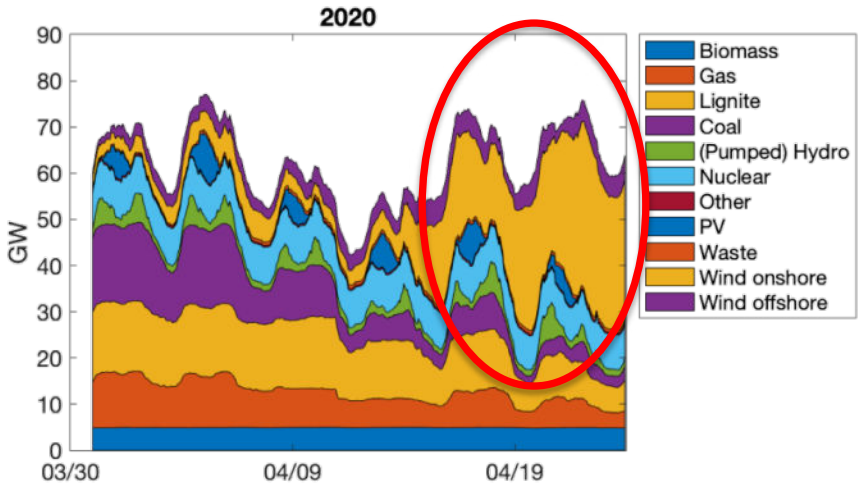
(1) High renewable generation in second half of April 2020

(2) On average not as high as in 2018









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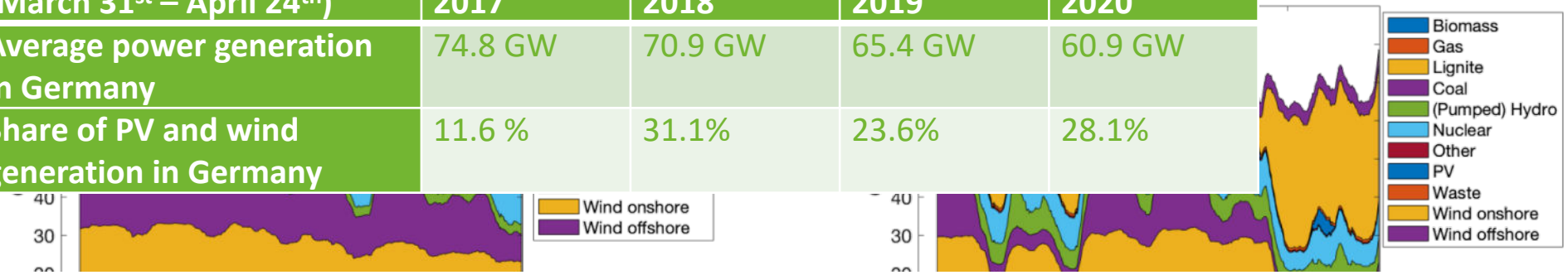
Power generation in Germany

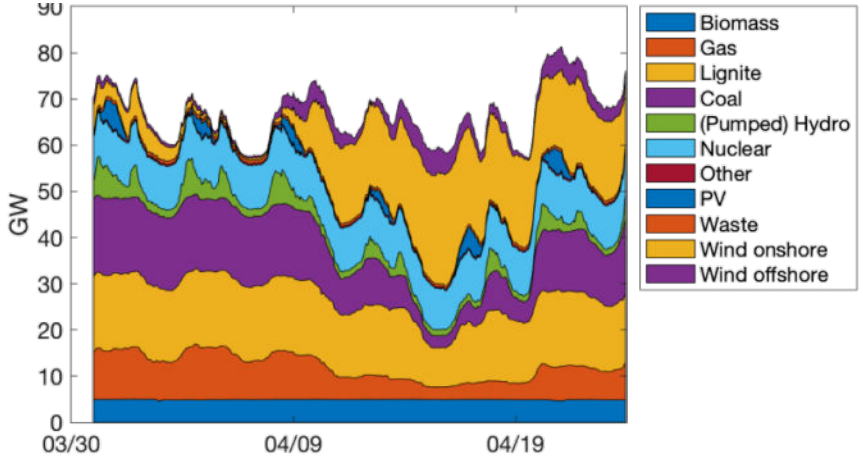
High impact on prices due to high renewable infeed

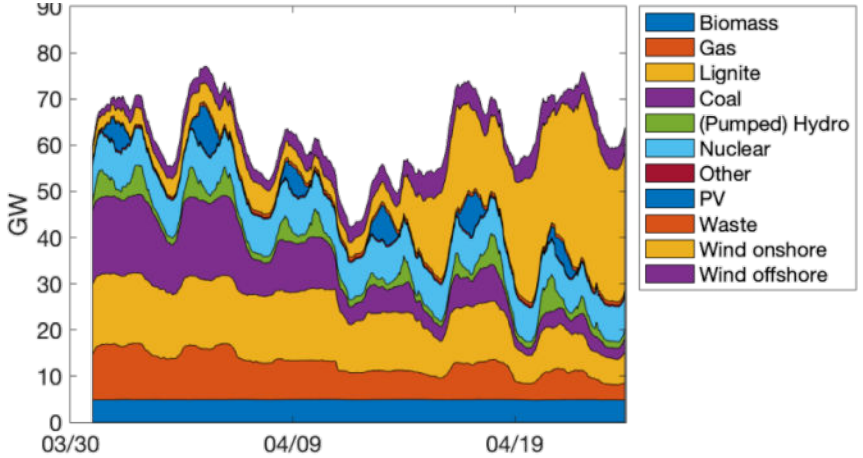
(March 31st – April 24th)	2017	2018	2019	2020
Average power generation in Germany	74.8 GW	70.9 GW	65.4 GW	60.9 GW
Share of PV and wind generation in Germany	11.6 %	31.1%	23.6%	28.1%



(1) High renewable generation form wind and PV, but not exceptionally high

(2) RES generation in 2020 is lower than in 2018 both absolutely and relatively. 2018 levels could have resulted in even more pronounced peaks.

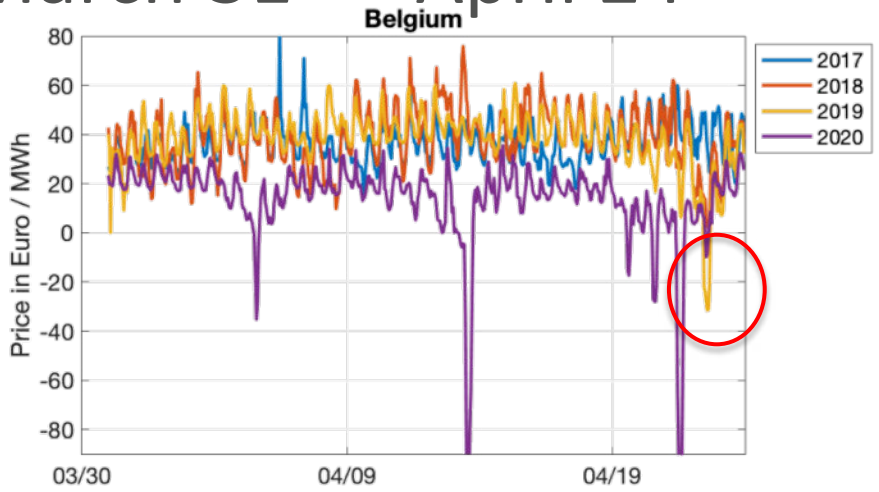


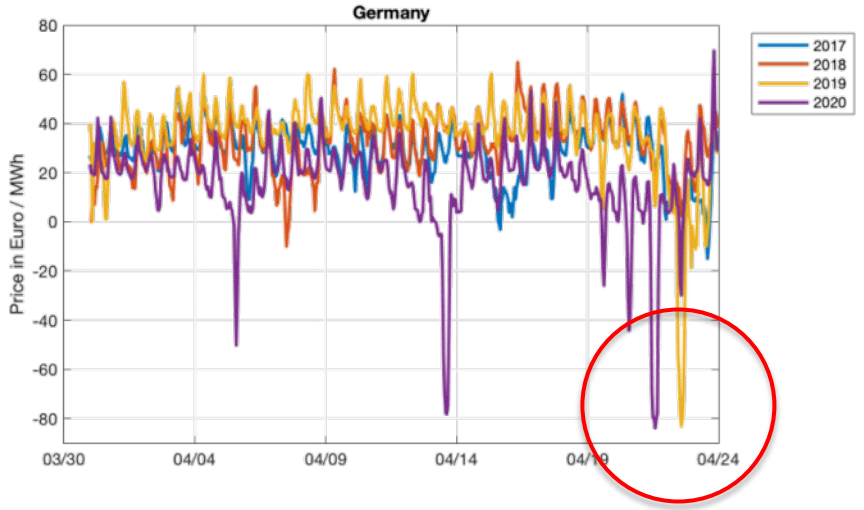


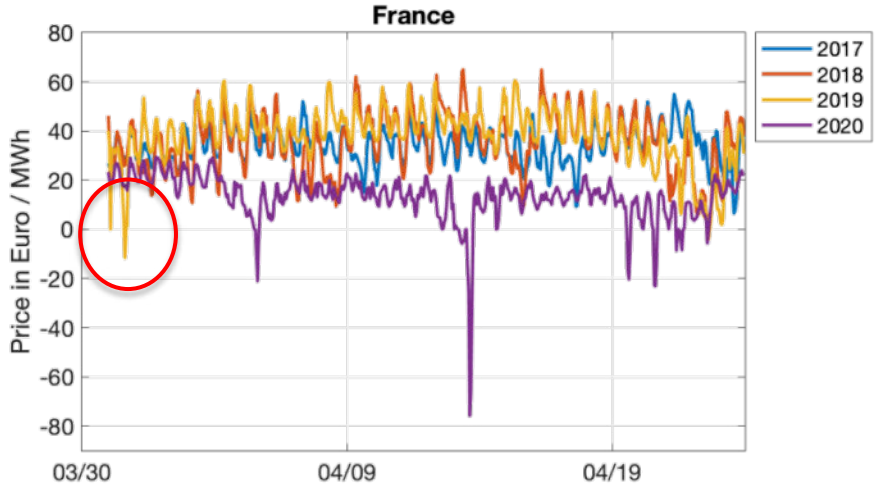
Day ahead electricity prices

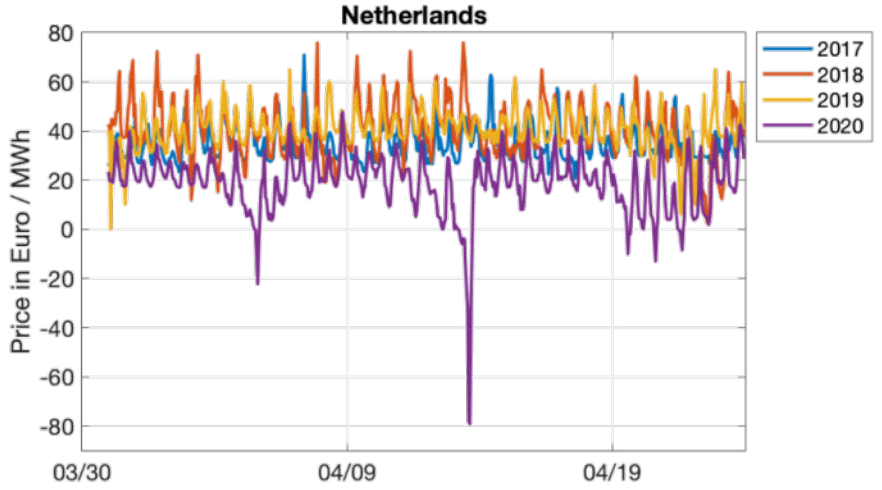
Period: March 31st – April 24th

(1) Higher number of negative price events and more pronounced negative peaks





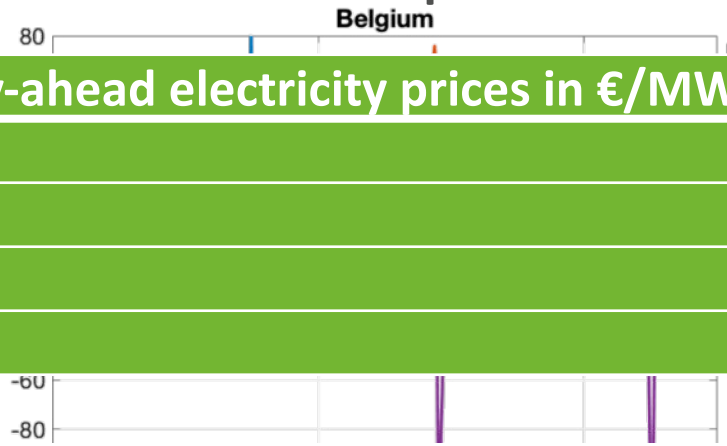


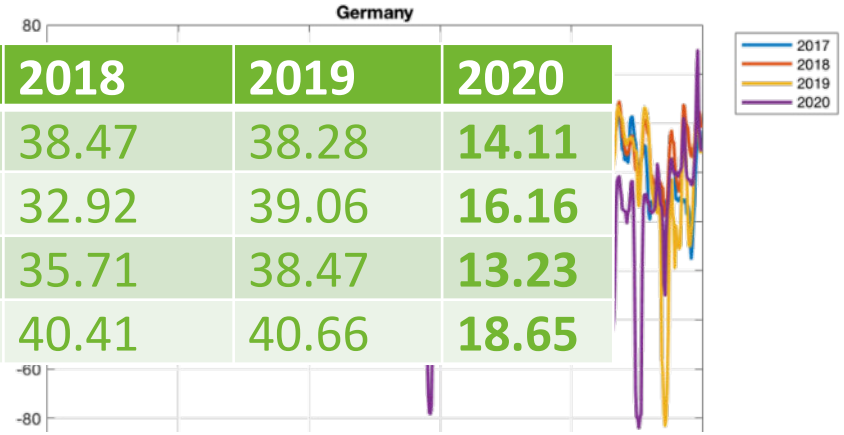


Day ahead electricity prices

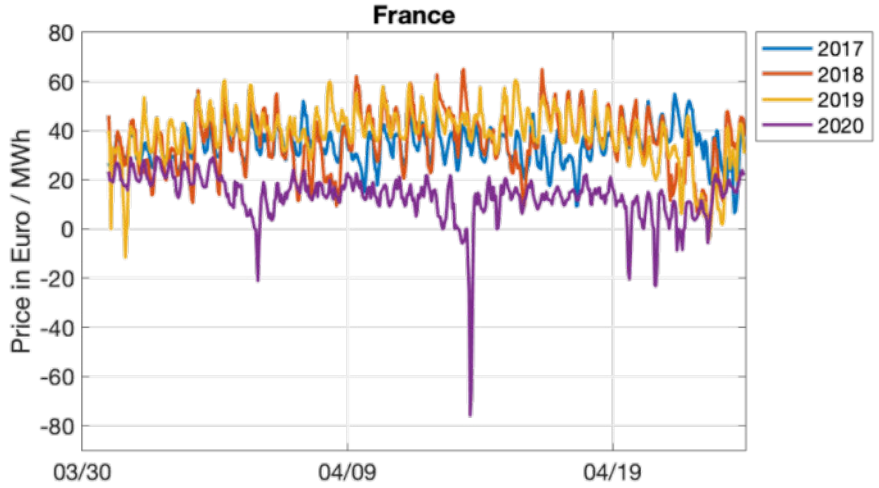
Period: March 31st – April 24th

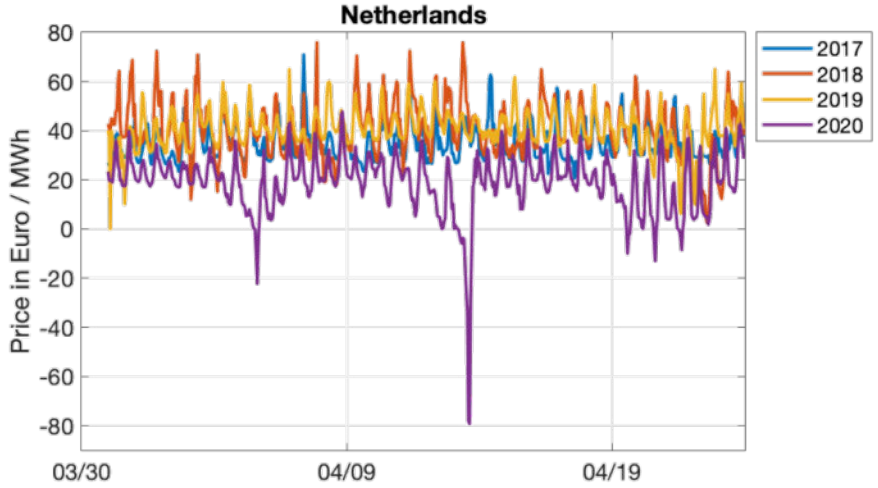
Average day-ahead electricity prices in €/MWh	2017	2018	2019	2020
BE	36.79	38.47	38.28	14.11
DE	28.89	32.92	39.06	16.16
FR	34.36	35.71	38.47	13.23
NL	35.18	40.41	40.66	18.65





(1) Average day-ahead prices ***less than half***

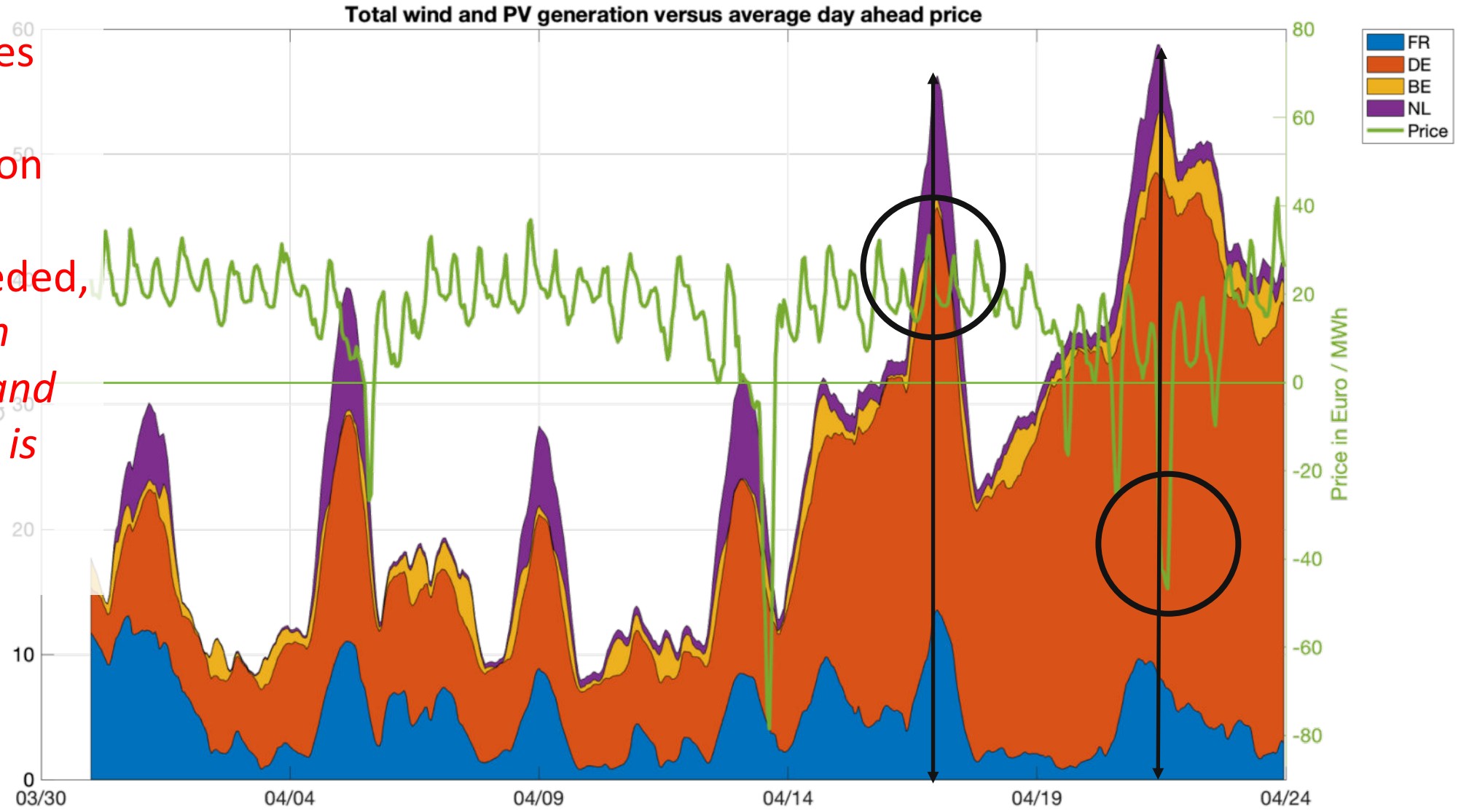




Renewable generation vs prices

(1) Day ahead prices do not capture actual generation

(2) More demand flexibility is needed, *especially when industrial demand in the weekend is low*



Conclusions

For the short term

- Keeping enough security margins in operation is of paramount importance to avoid outages
  - The thunderstorm season in Europe is between May and August, increasing the risk of outages on major lines due to lightning strikes
- Day-ahead prices and actual renewable generation not always coherent due to ***lack of flexibility***
- Demand flexibility, storage and liquid intraday markets would avoid price peaks

Conclusions

Some lessons for the future

- We can see the current simulation as a scale-down demonstration of a renewable dominated future
- Currently high share of renewables, ***but not even remotely comparable to 2050***
  - The ***MWh based*** market organization must be rethought to avoid frequent price peaks in the future (both positive and negative)
  - Clear need for up and downwards reserves; large scale deployment of storage and ***demand flexibility*** is essential, also to avoid high price peaks
  - Higher transmission capacity and ***flexible transmission*** elements are required to cope with the expected flow increase and volatility and enhance system stability

Thank you very much for the attention

For further questions please send an email to

communication@energyville.be