

APEX Webinar

“Perspectives on the COVID-19 Pandemic”

and Annual General Meeting



9 September 2020
12:00 p.m. EDT



Perspectives on the COVID-19 Pandemic

Session 1: Review of COVID-19 Impacts and Business Continuity Plans (45 minutes)

Moderator: Lanny Nickell, SPP & APEX Board Director

- *Panelists should share observations and analyses of the COVID-19-related impacts on system operations and markets experienced to date as well as describe specific approaches taken to assure business continuity during the pandemic.*

Panelists

- Juan Carlos Olmedo (Coordinador Electrico Nacional)
- Kevin Dawson (AESO)
- Ahmed Al-Ebrahim (GCCIA)
- Ekaterina Moiseeva (Nord Pool)



COORDINADOR
ELÉCTRICO NACIONAL

Review of COVID-19 Impact and Business Continuity Plans

September 9th, 2020

Mr. Juan Carlos Olmedo, Board's President
Coordinador Eléctrico Nacional

Action plan for Control Centers (CC)



1 Control Centers distributed in 3 locations

Contingency plan

1. Shift schedule (curfew management)
2. 12 hours shift as contingency plan. During pandemic, reduced number of operators physically in CC.

3 Supply of safety and personal care elements.

4 Private transport for CC crew to avoid use of public transportation.

5 Preference for hotel lodging during shifts rounds.

6 Implementation of remote work tools for CC operators

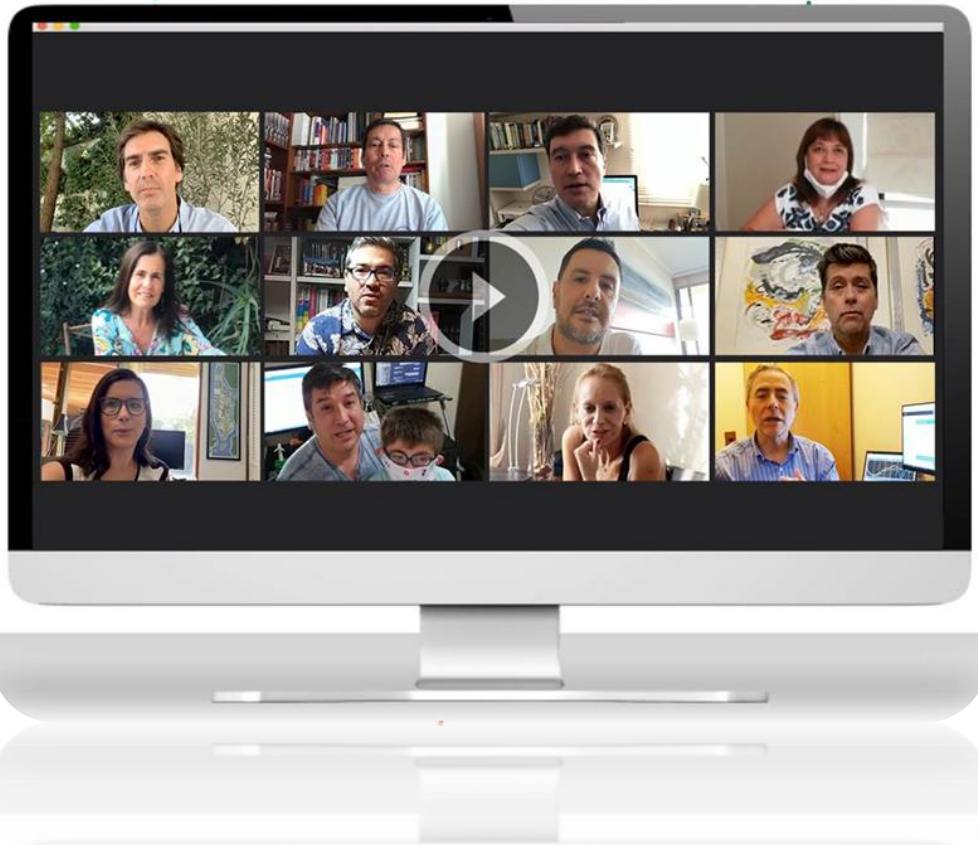
7 Influenza flu vaccination for operators at CC

Training for engineers to replace CC Operator (Back-up)

1. Former experienced Control Center operators.
2. Personnel training for CC staff replacement.

9 Plan for early detection of COVID-19 contagion in CC

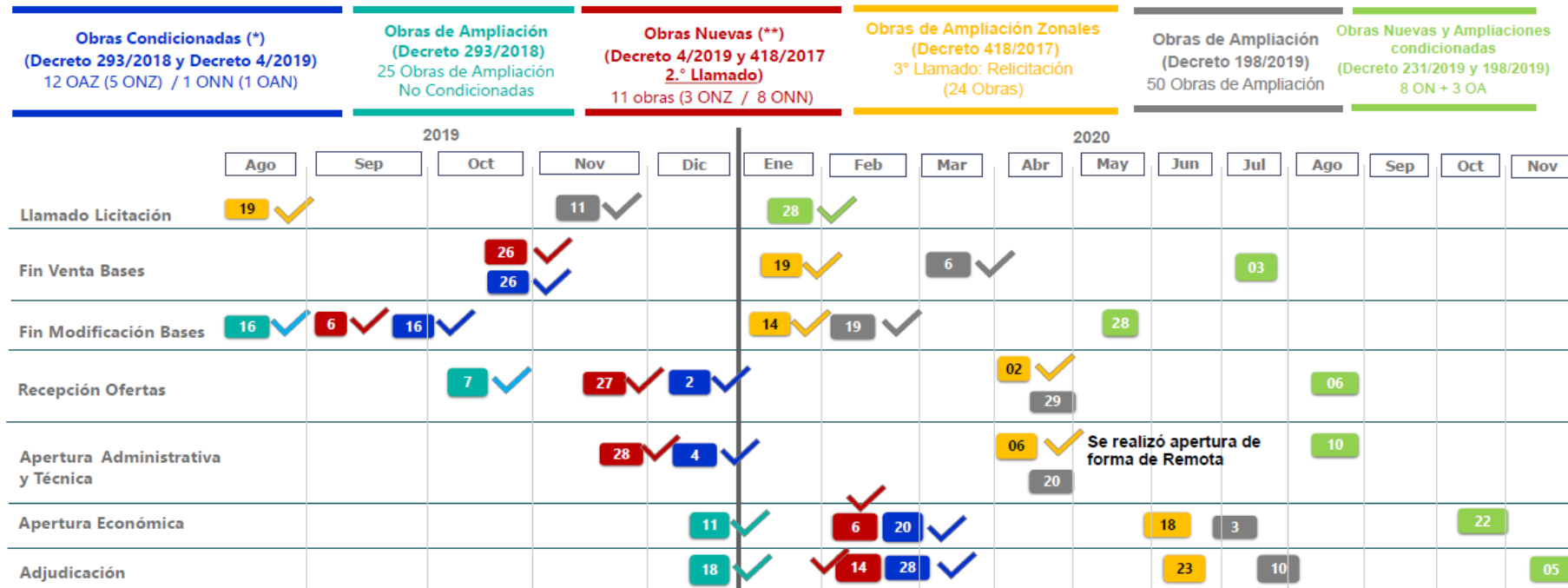
Ensure a safe and healthy environment for our workers and their families



1. Since March 16th we started home office work.
2. All in-person events and meetings were canceled.
3. Domestic and international travels were canceled.
4. Personal care and safety supplies delivered to all the personnel.
5. We enabled permanent communication channels with all personnel.
6. Virtualization of physical correspondence and mail reception.
7. Bidding awarding process for Transmission Project Tenders done virtually via Streaming.
8. We requested all market agents for their contingency mitigation plans during pandemic.

All tender processes for transmission projects have been performed normally

CRONOGRAMAS PROCESOS DE LICITACION EN CURSO Y FUTUROS



During 2019 and 2020, we developed 6 tender processes for 165 transmission projects.

Interconnection of new renewable projects continues with high intensity

TOTAL MW
4.708

Geotérmica: 33 MW

Solar: 1.800 MW

Eólica: 1.462 MW

Térmica: 620 MW

Hídrica: 790 MW

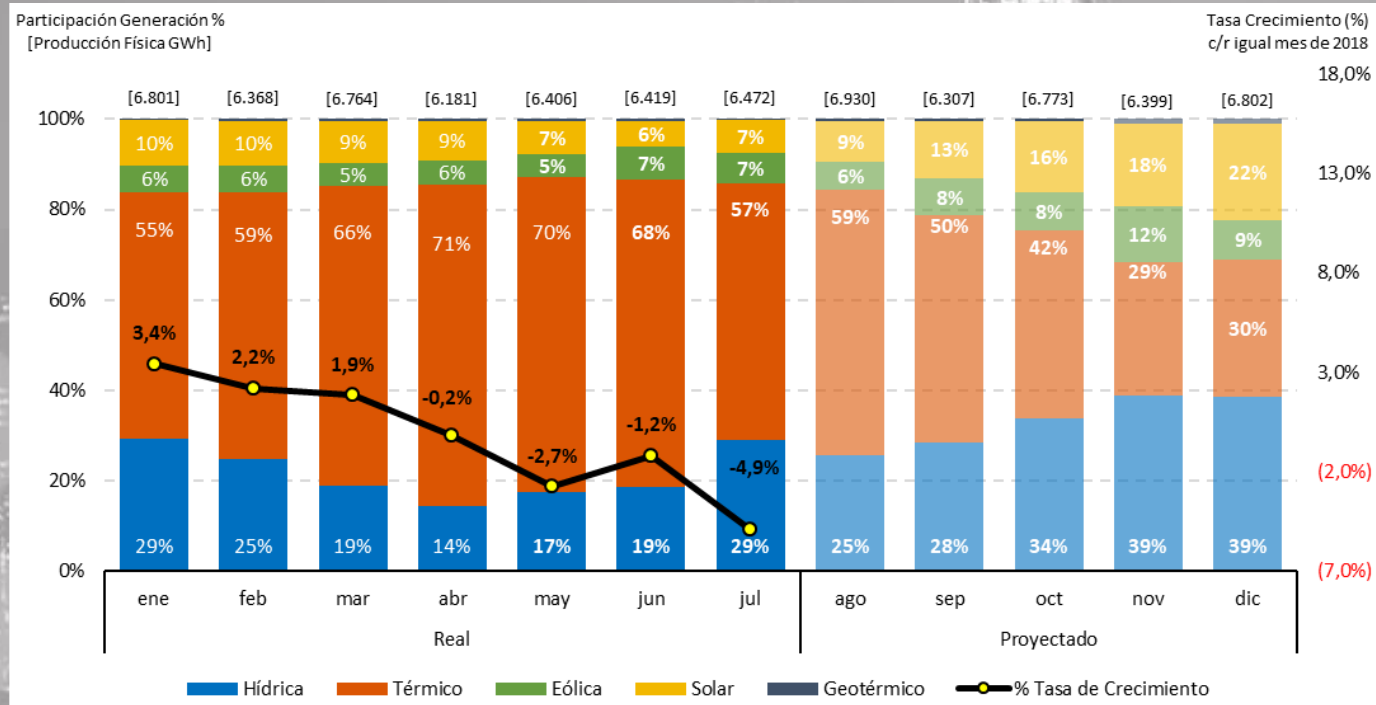
Proyectos Relevantes

Plan de Centrales a Interconectar en 2020

Potencia MW	ene	feb	mar	abr	may	jun	jul	ago	sept	oct	nov	dic
Geotérmica: 33 MW										33		
Solar: 1.800 MW	30 (18)	135 (26)	323 (129)	224	122	47	5	108	270	302	60	175
Eólica: 1.462 MW	40	9	87	9	204	84		56	159	559	254	
Térmica: 620 MW	5		431	25	135		25					
Hídrica: 790 MW	3		19	1	18		22,4	20		7		701
Proyectos Relevantes		Granja Solar 105 MW	Andes Solar IIA 80 MW Cóndores 100 MW Llanos Blancos 150 MW	Atacama Solar II 150 MW	Cabo Leones 204 MW	Tolpán Sur 84 MW	San Javier I 25 MW	Capricornio 88 MW Digua 20 MW	Finis Terrae 126 MW PE Calama 150 MW	Río Escondido 145 MW PE Tchamma 155 MW	Cerro Tigre 185 MW	Sol del Desierto I 530 MW Alto Maipo 530 MW

For 2020, there are 122 new interconnections processes underway for power plants accounting for 4,708 MW.

Generation demand has been reduced by pandemic



Comparison vs. a year w/o pandemic
(2019 + 2.6% growth):

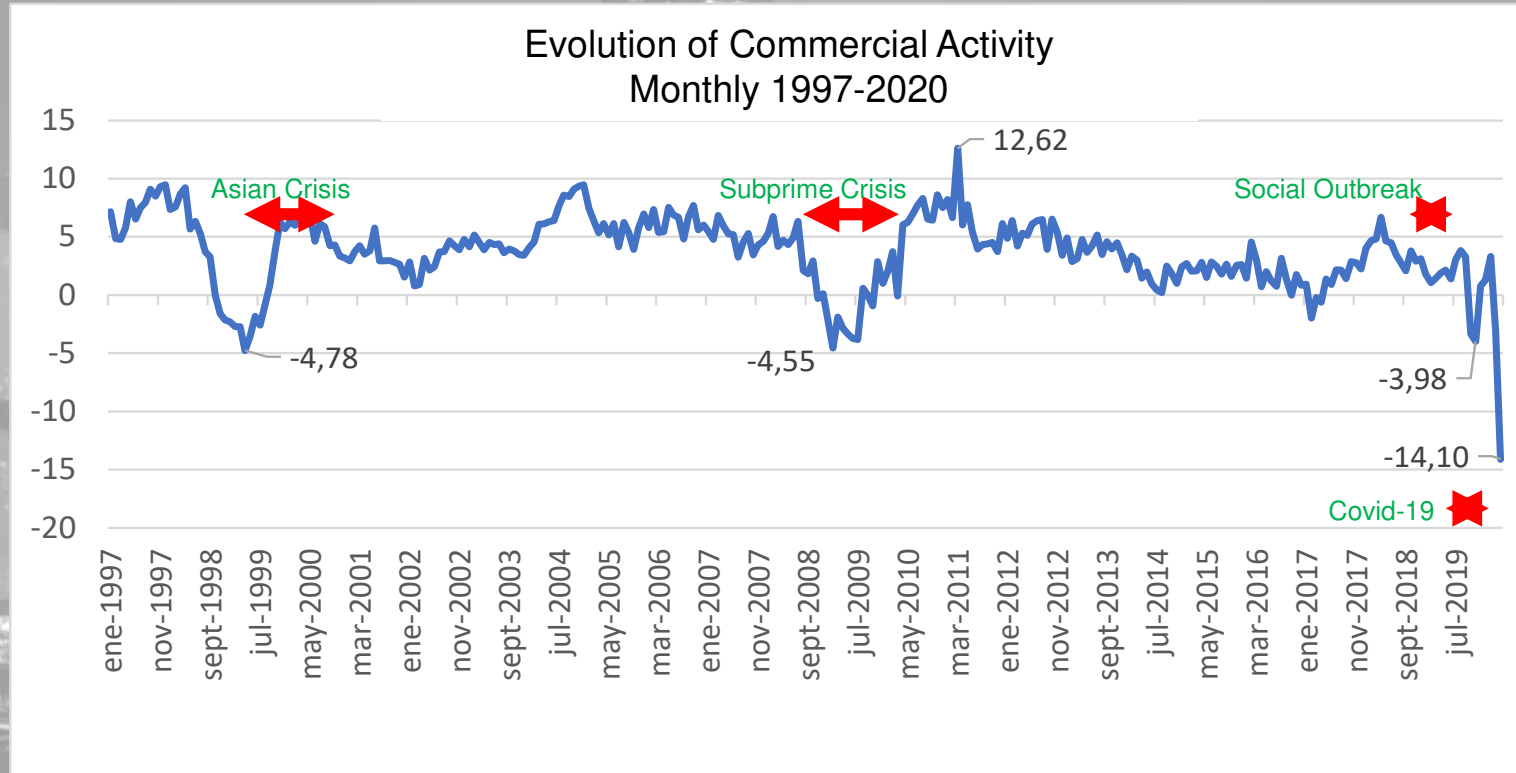
- March → -4,5% (16 - 31)
- April → -2,7%
- May → -6,8%
- June → -4,1%
- July → -7,2%
- Cumulative effect from March 16th to August 15th → -5,1%

YTD Growth 2020/2019 (January-July) → +0,3%

Demand composition:

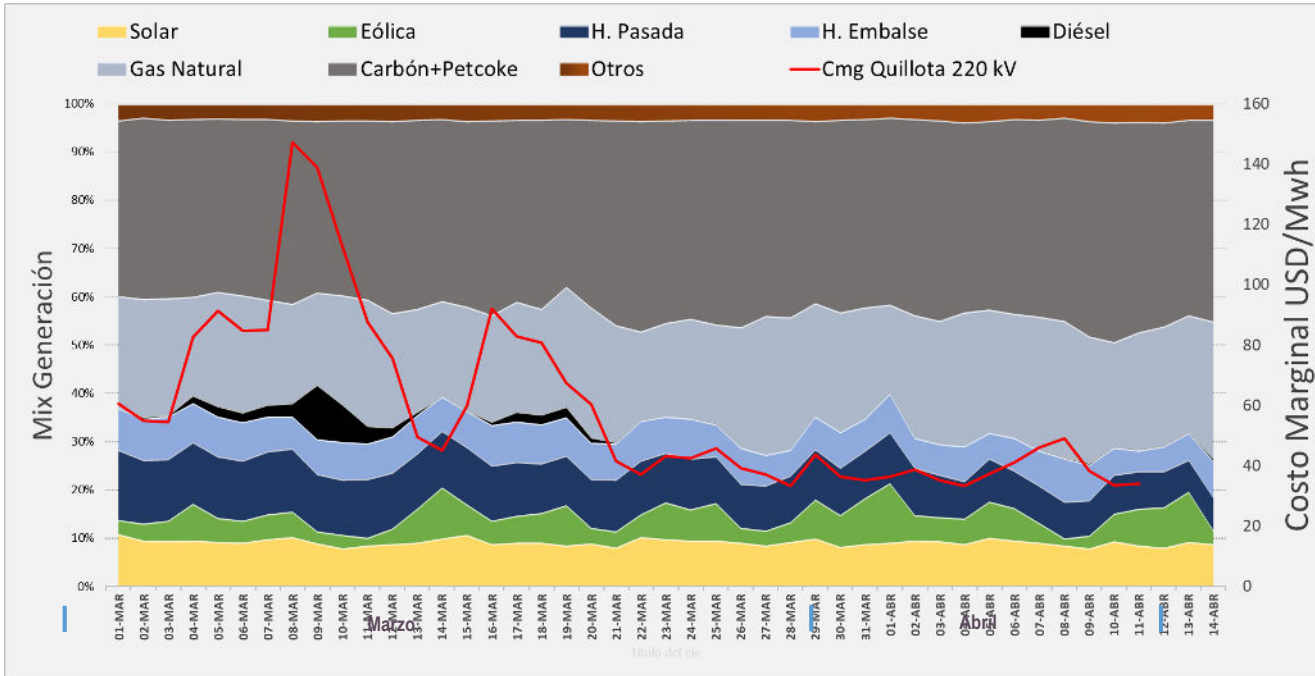
- Disco demand is 40,9% and commercial-industry is 59,1%.
- Mining is 35% of total demand and industry is 20% (Chemical, forestry and pulp mill, food and others).
- Remaining 9.1% is retail, restaurants and offices

.... Demand reduction has been driven by slowdown of commercial sector (malls, retail, restaurant and offices)



Source: Central Bank of Chile

Market Monitoring Actions

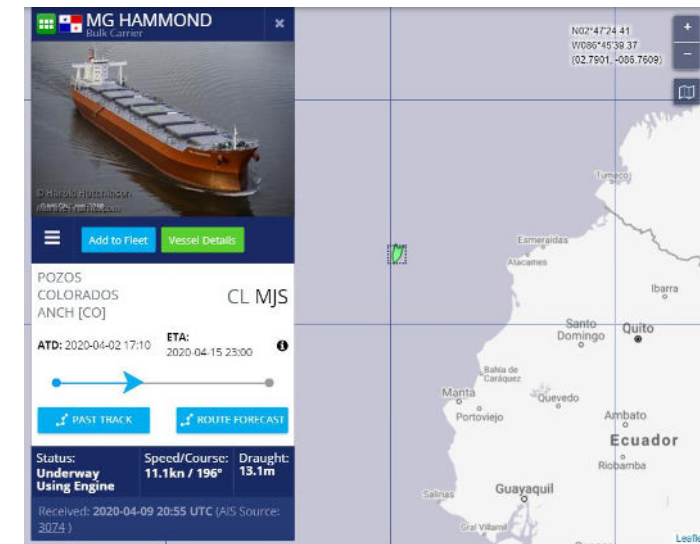


Generation from the start of pandemic (March/April 2020):

Participation in Energy Mix:

- Solar PV + Wind : 14,7%
- Hydro : 17,6% (dry year)
- LNG+NG : 23,6%
- Coal : 39,6%
- Oil : 1,1%
- Others : 5,4% (Geothermal, Biomass and others)

- Review of maintenance schedules
- Fuel supply prices and stocks monitoring
 - Daily monitoring for fuel stocks and their forecast (coal and LNG)
 - There were risk factors such as Colombian port strikes and congestion in Australia.
 - Instruction to all thermal power plants to report yearly fuel shipment schedule and supply risk factors for short and mid-term.
 - Fuel shipment monitoring for coal and LNG.

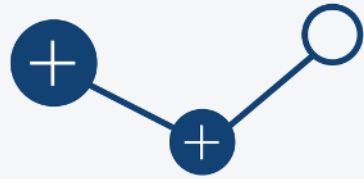


Review of COVID-19 Impacts and Business Continuity Plans

Association of Power Exchanges 2020 Webinar

September 9, 2020

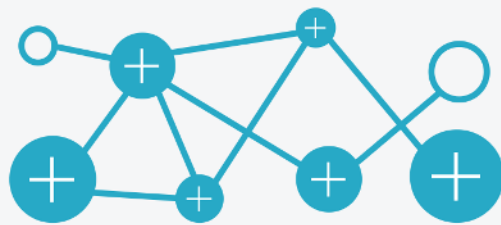
Kevin Dawson, Alberta Electric System Operator (AESO)



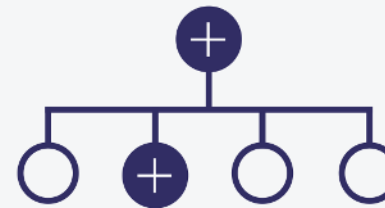
Connect
CUSTOMERS



PLAN
transmission



Operate the
GRID



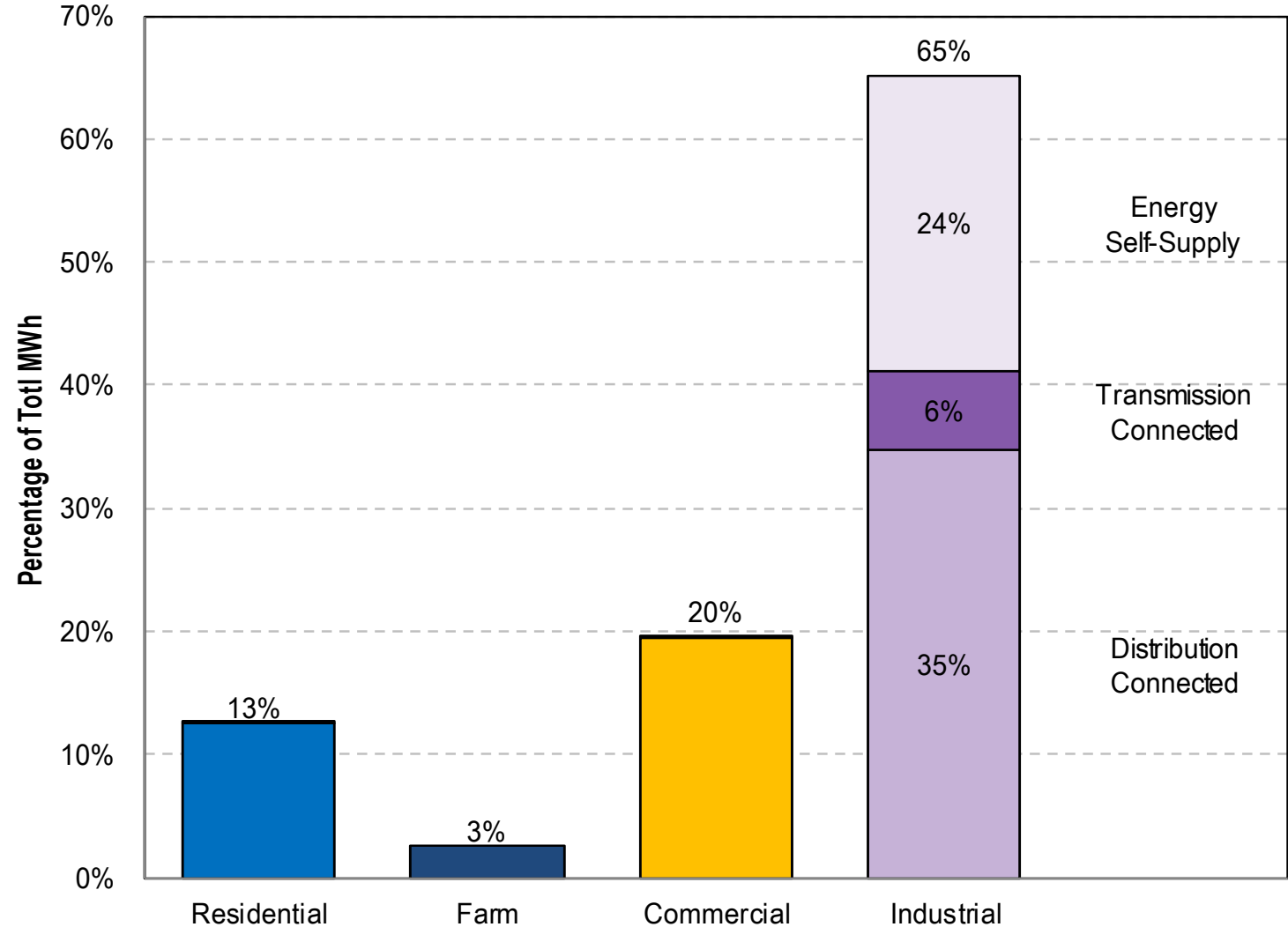
Plan and Operate the
MARKET

- Responsible for safe, reliable, economic planning and operation of Alberta Interconnected Electric System (AIES)
- AESO is a not-for-profit, statutory corporation; independent of government and industry:
 - Governed by independent board appointed by Minister of Energy
 - Must operate in the public interest
 - No financial interest in any generation unit, transmission or distribution infrastructure
 - No government funding; costs recovered from Alberta ratepayers
- Highest visibility of Alberta electricity sector





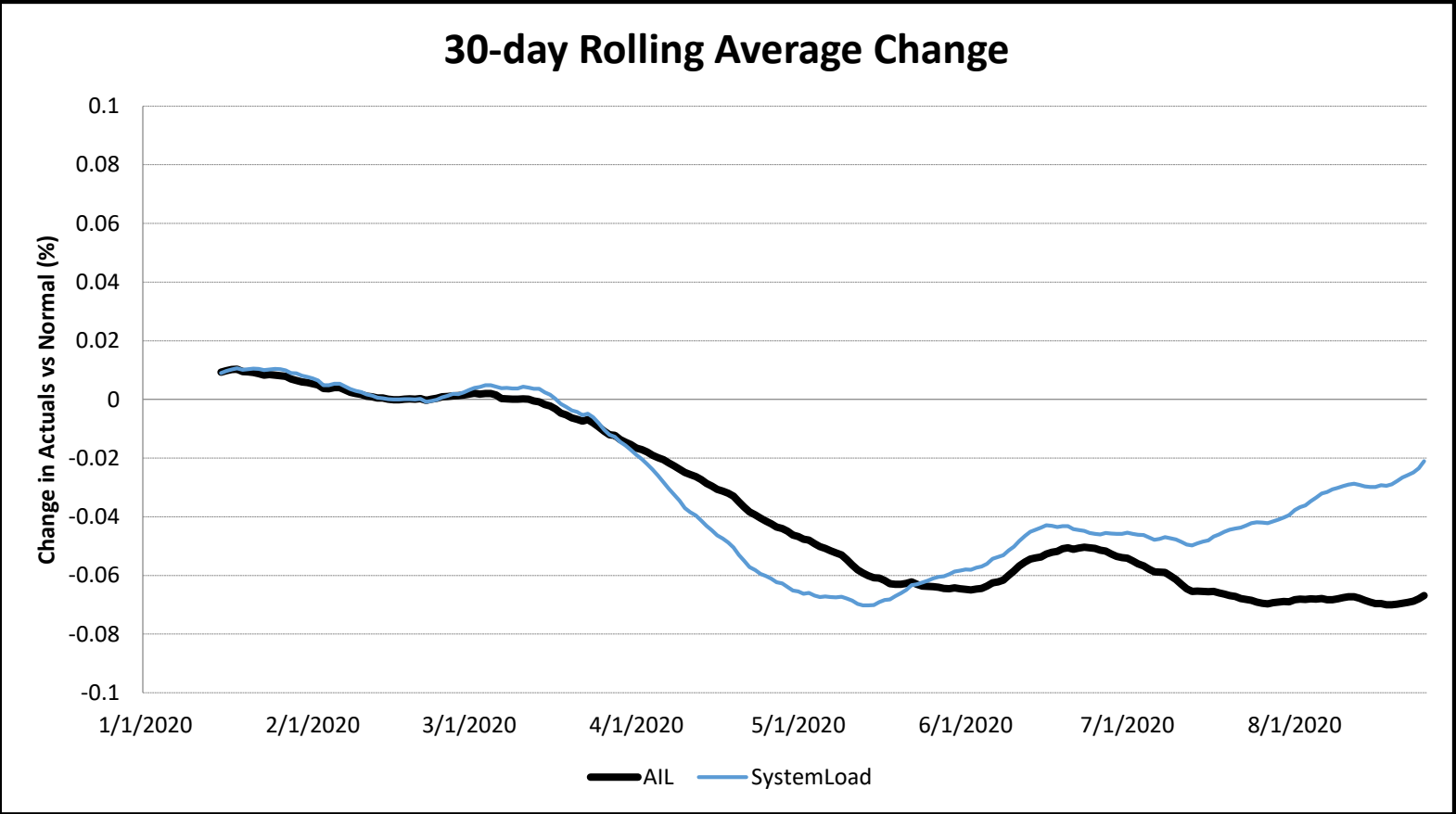
Alberta Internal Load



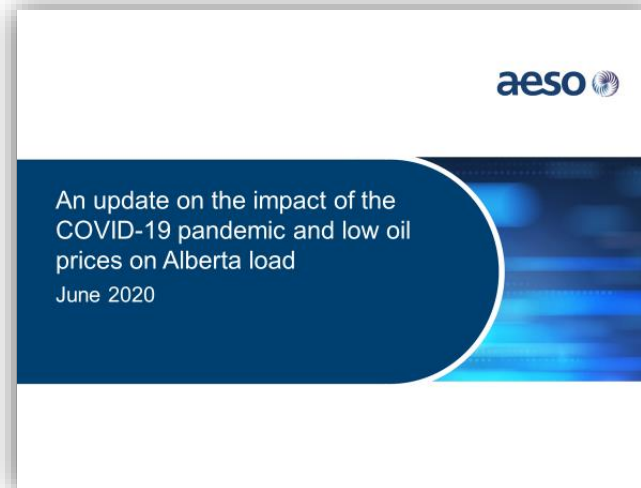
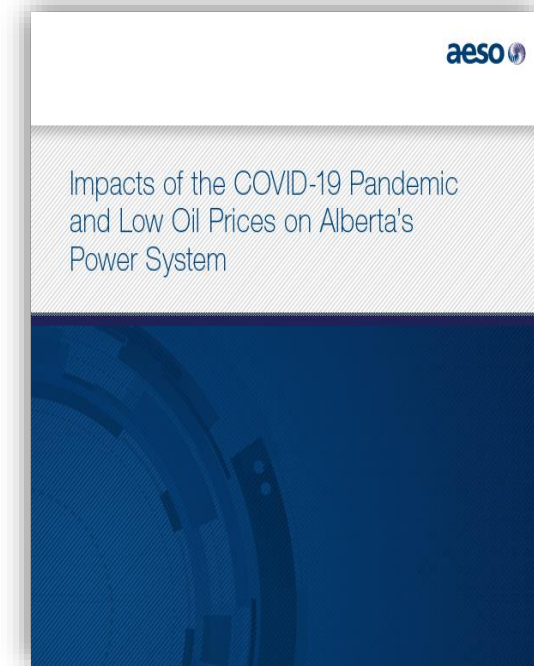
What's the impact been?



- Alberta Internal Load (AIL) has been negatively impacted by a confluence of factors:
 - Lock-down measures to control COVID-19
 - Reductions in industrial output in response to a low oil price environment



- In April 2020, the AESO provided two reports with initial observations and scenarios on load and reliability
 - Scenarios tested a range of weakened economic conditions and oil production shut-ins
 - These scenarios were designed as stress cases and no supply adequacy concerns were revealed during these simulations
- June 2020 – update on load impacts with greater regional detail and forecast scenarios



1) Protect staff and stakeholders – conservative approach

- Business Continuity Plan activated.
- Non-critical staff work from home – mid-March
 - Will continue to work from home until the end of the year. Return to site is only voluntary at this time. Approximately 5% of AESO staff have returned to site, and most only 1-2 days per week.
 - Prior investments in technology and flexible work policies have paid off
- Only essential 3rd party vendors allowed on premises
- Travel halted
- Critical operations staff:
 - Operator shifts split between two control centres. Deep clean at each location after each shift.
 - Separate crews never come in contact. Shift change performed by phone call.
 - We require operators to do temperature testing before each shift.
 - Operators are asked to wipe down their work stations before each shift, even though the stations have been cleaned.
- All external meetings and stakeholder sessions moved to virtual
- No plans to change current operating situation until sometime next year.

2) Create contingency plans

- We have detailed plans in the event operators begin to get sick and test positive, with a couple trigger points where we would consider sequestration.
- Sequestration would only be considered as a last resort, and at a point where we were down to about 50% of our system controllers still healthy. It also depends how quickly the situation is deteriorating as to whether or not we do this sooner.
- Multiple sequestration options considered

3) Utilize and create redundancy

- Converted training centre into a fully functioning 3rd control room. Our nightshift is currently working at this site because it is behind the same fence as our primary control centre, and easier to control access in and out. Backup control room is kept as a “clean” control room in case we need to move the incoming shift due to a COVID positive case.

The pandemic has not resulted in any negative impacts to the delivery of electricity to Albertans!

- **Twitter:** *@theAESO*
- **Email:** *info@aeso.ca*
- **Website:** *www.aeso.ca*
- Subscribe to our stakeholder newsletter



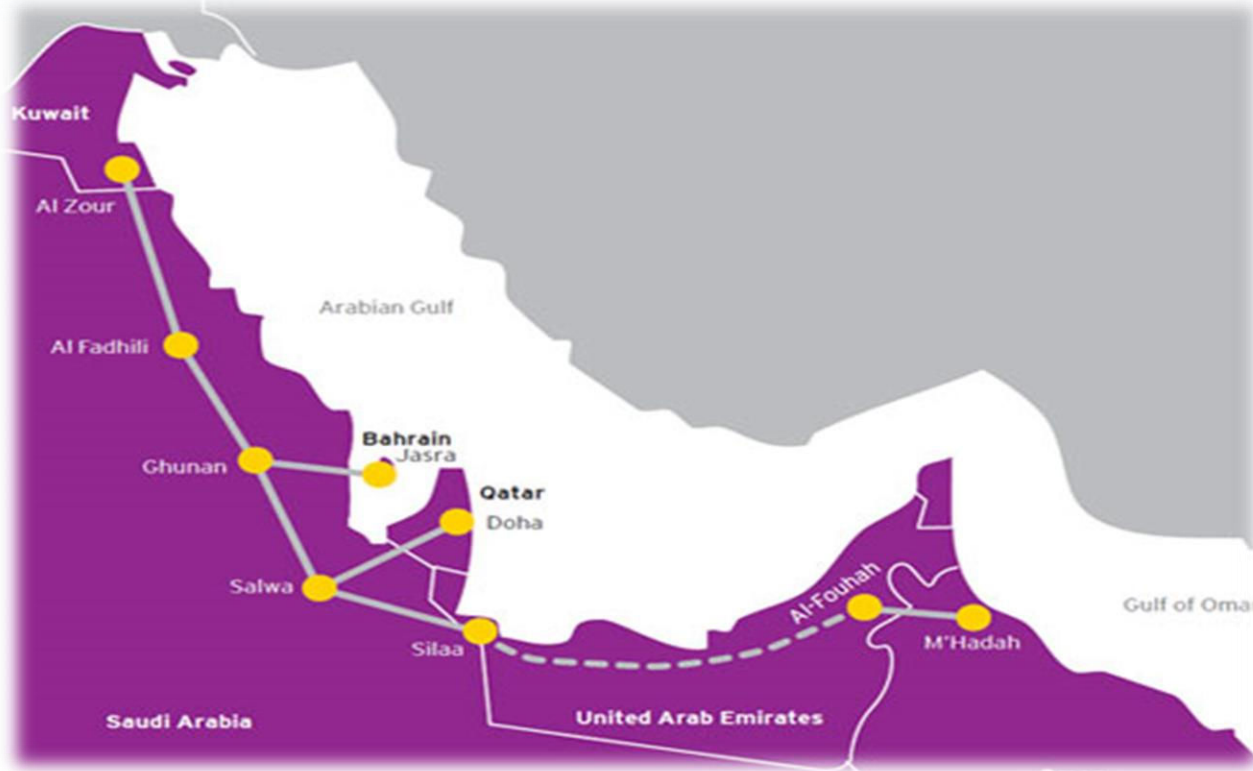
هيئة الربط الكهربائي
لدول مجلس التعاون لدول الخليج العربية
GCC Interconnection Authority



COVID-19 Impacts and Business Continuity Plans



Presented by:
Engr. Ahmed Al-Ebrahim
Chief Executive Officer
GCC Interconnection Authority



Established in 2001, GCCIA has successfully built and operates the GCC interconnection 400kV super grid since 2009, connecting the 6 GCC countries, providing a new level of Energy security for the GCC through:

- I. Coordinated Operations (ICC)
- II. Sharing of reserves and Capacities (\$\$ Savings)
- III. Energy exchange during emergencies (in-kind)
- IV. Regional exchange and trade of energy (Market)

Mission

A resilient interconnection grid ensuring power security and economic benefits

Vision 2025

To become a global hub in grid interconnections emphasizing on innovation, resiliency, and sustainability; and creating dynamic electricity market for the region and beyond

Effect of COVID19 on business in GCC

Suspension of flights

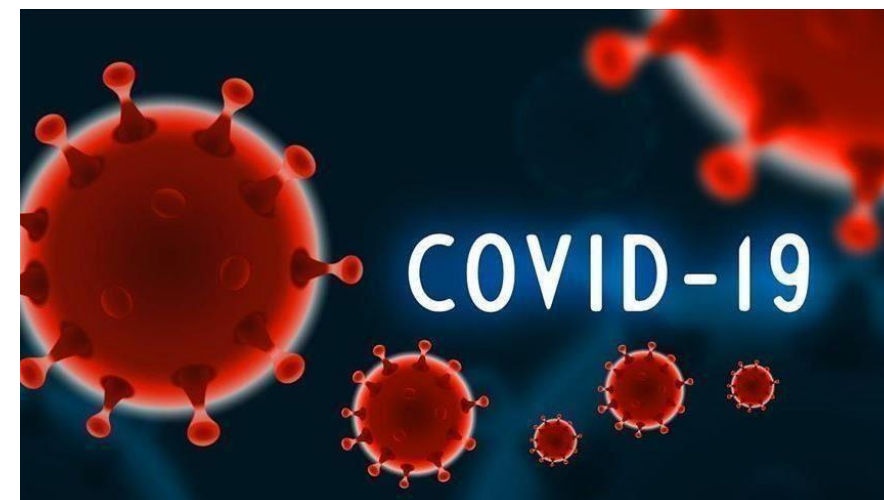
Partial and Full Curfews

Lock downs

Quarantine

Business Activities were suspended

GCC Country	Date of first Corona case Detected
KSA	02 March 2020
Bahrain	21 February 2020
Kuwait	24 February 2020
UAE	23 January 2020
Qatar	27 February 2020
Oman	24 February 2020



Impact on GCC Load Demands

Before Lockdown

(1 Jan to 15 Mar 2020)

Energy Growth at all MS's were **positive** except **Oman**.

During Lockdown

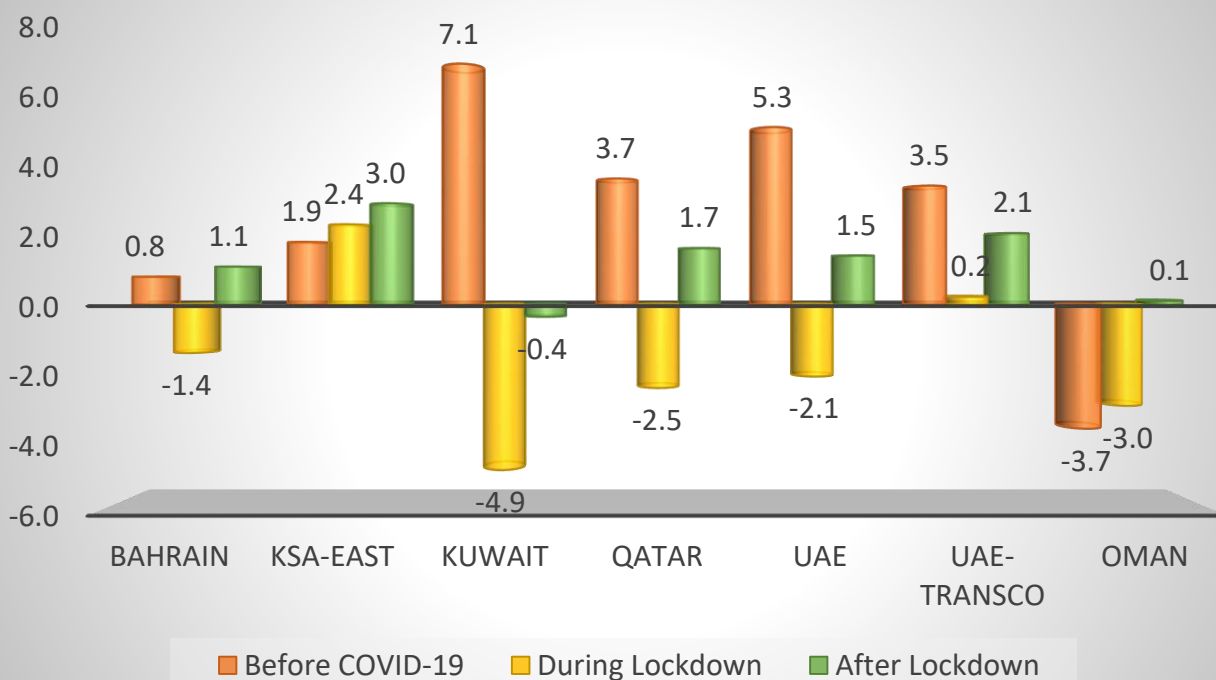
(16 Mar to 31 May 2020)

Energy Growth at all MS's were **negative** except at **KSA-East & Abu Dhabi**

After Lockdown

(01 Jun to 15 Aug 2020)

Energy Growth at all MS's were **positive** except at **Kuwait**



2020 Energy Growth % (GWh)

State	Before Lockdown	During Lockdown	Post Lockdown
Bahrain	0.8	-1.4	1.1
KSA-East	1.9	2.4	3.0
Kuwait	7.1	-4.9	-0.4
Qatar	3.7	-2.5	1.7
UAE	5.3	-2.1	1.5
Oman	-3.7	-3.0	0.1

Control Centre Operational regimes

Ensure availability of Field Operations staff

Emergency communication channels within & Beyond

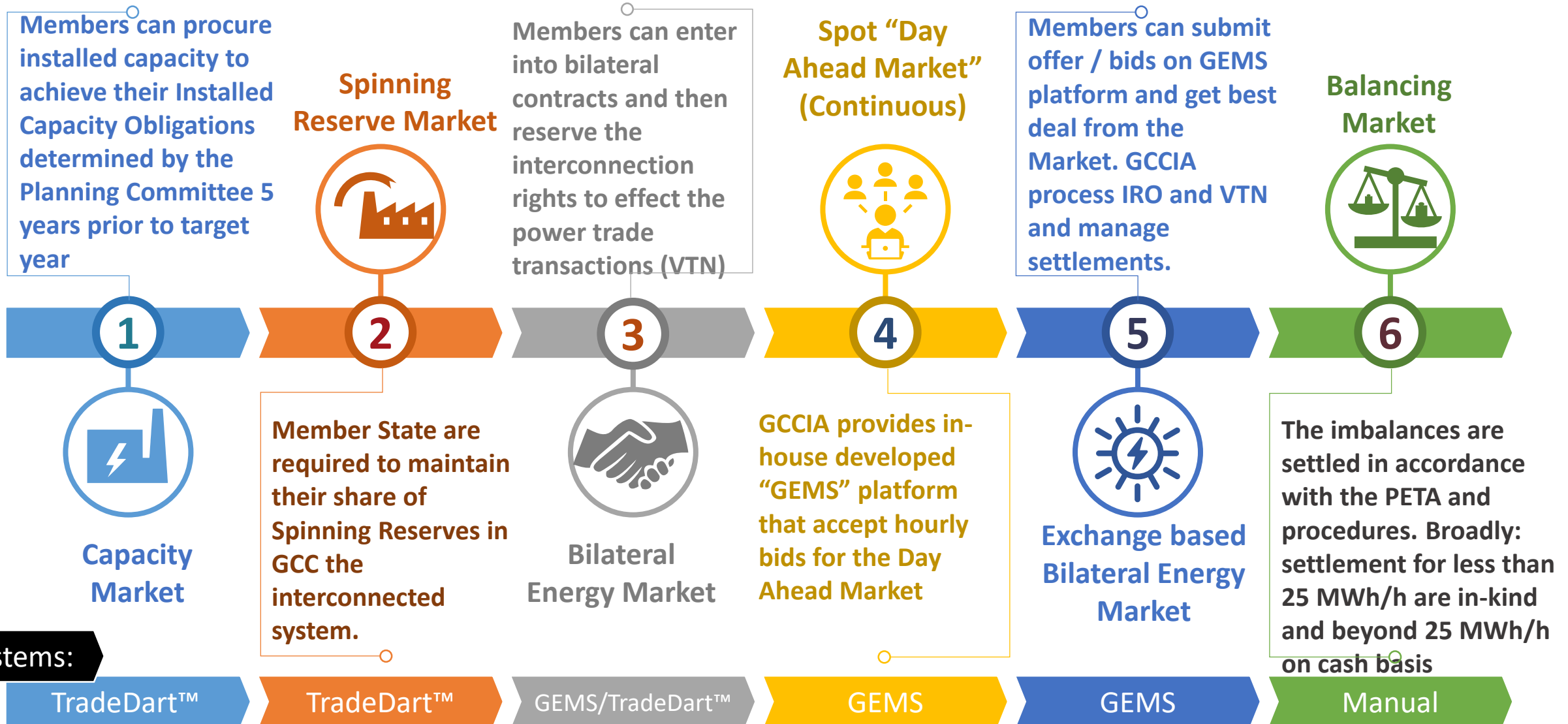
Ensure reliability of Back up Systems and Facilities

Activate Emergency Protocols

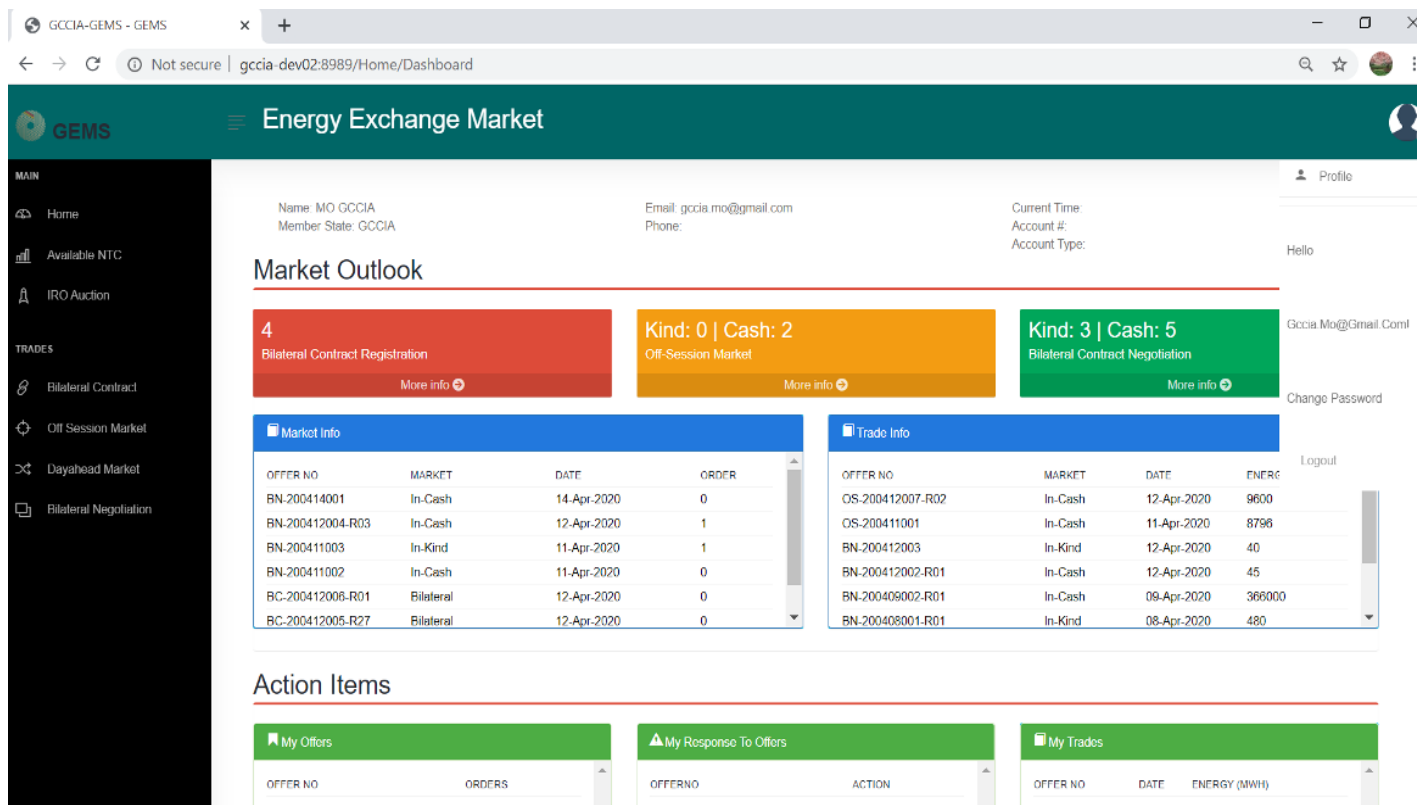
Re-scheduling of Maintenance Activities



GCC Electricity Market



- ✓ The Market Operations of GCCIA carried out its functions online without any interruption during the pandemic.
- ✓ Regular online meetings with Electricity Exchange Market Committee.
- ✓ GCCIA launched its online bilateral trading platform, which was developed Recently.
- ✓ The availability of the trading systems was 100% and the maintenance was done online.



The screenshot shows the GEMS Energy Exchange Market dashboard. The page title is "Energy Exchange Market". The user is logged in as "MO GCCIA" with member state "GCCIA". The dashboard displays the following information:

- Market Outlook:**
 - 4 Bilateral Contract Registration (More info)
 - Kind: 0 | Cash: 2 Off-Session Market (More info)
 - Kind: 3 | Cash: 5 Bilateral Contract Negotiation (More info)
- Market Info Table:**

OFFER NO	MARKET	DATE	ORDER
BN-200414001	In-Cash	14-Apr-2020	0
BN-200412004-R03	In-Cash	12-Apr-2020	1
BN-200411003	In-Kind	11-Apr-2020	1
BN-200411002	In-Cash	11-Apr-2020	0
BC-200412006-R01	Bilateral	12-Apr-2020	0
BC-200412005-R27	Bilateral	12-Apr-2020	0
- Trade Info Table:**

OFFER NO	MARKET	DATE	ENERG
OS-200412007-R02	In-Cash	12-Apr-2020	9600
BN-200411001	In-Cash	11-Apr-2020	8796
BN-200412003	In-Kind	12-Apr-2020	40
BN-200412002-R01	In-Cash	12-Apr-2020	45
BN-200409002-R01	In-Cash	09-Apr-2020	366000
BN-200408001-R01	In-Kind	08-Apr-2020	480
- Action Items:**
 - My Offers (Table with columns: OFFER NO, ORDERS)
 - My Response To Offers (Table with columns: OFFERNO, ACTION)
 - My Trades (Table with columns: OFFER NO, DATE, ENERGY (MWH))

Pre-
Pandemic



During
Pandemic



Post
Pandemic

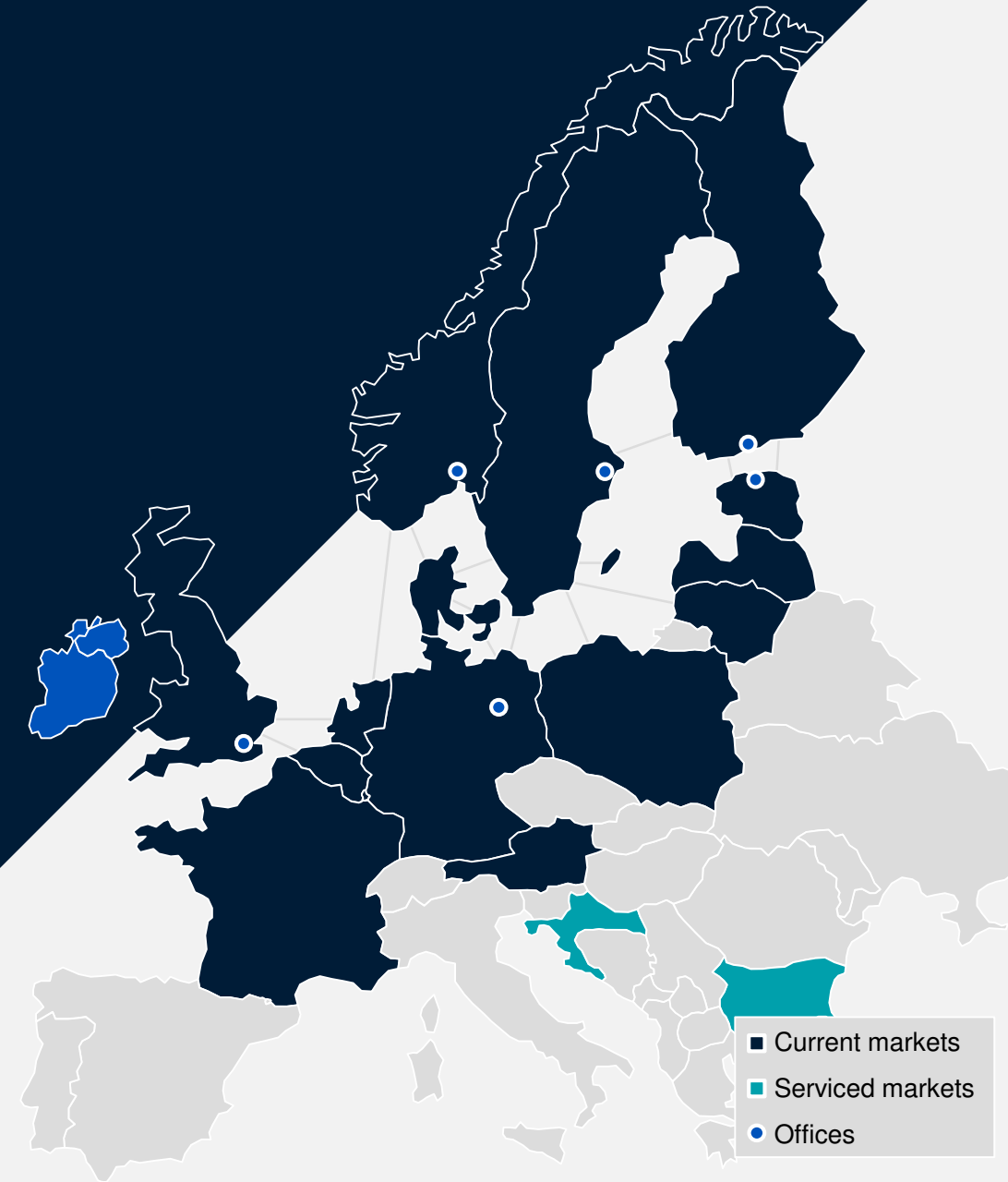
Focus	Implementation
<ul style="list-style-type: none"> ▪ Risk Management ▪ Business Continuity ▪ Cyber Security 	<ul style="list-style-type: none"> ✓ Carry out Risk Assessment for all GCCIA processes and assign mitigation plans ✓ Certification sought with several ISO standards in Quality, Business Continuity and Cyber security. ✓ Drills and training on Emergency procedures
<ul style="list-style-type: none"> ▪ Operations continuity ▪ Health & Safety ▪ Utilize Technology 	<ul style="list-style-type: none"> ✓ Control Centre operational regimes to ensure safety while continuing operations (2 locations , separate crews, shift rotation) ✓ More communications between teams and Management ✓ Corona Crisis Team follow latest and recommend actions ✓ Activate “Virtual Office” where all employees were enabled to carry out all their tasks working from home (Mar-Jun 2020). ✓ Field operations support through contractors to mitigate curfew restrictions and closed borders
<ul style="list-style-type: none"> ▪ Improving Business Resilience ▪ Digital Transformation 	<ul style="list-style-type: none"> ✓ Use Lessons learned to improve Business Resilience and continuity. ✓ Create O&M depots to mitigate curfews and cross-border issues ✓ Move to a full digitalization and virtualization of processes. ✓ Ensure resilient supply chain and availability of alternative services providers.

COVID-19: Impacts and business continuity plans

Ekaterina Moiseeva, PhD
Market Surveillance Analyst

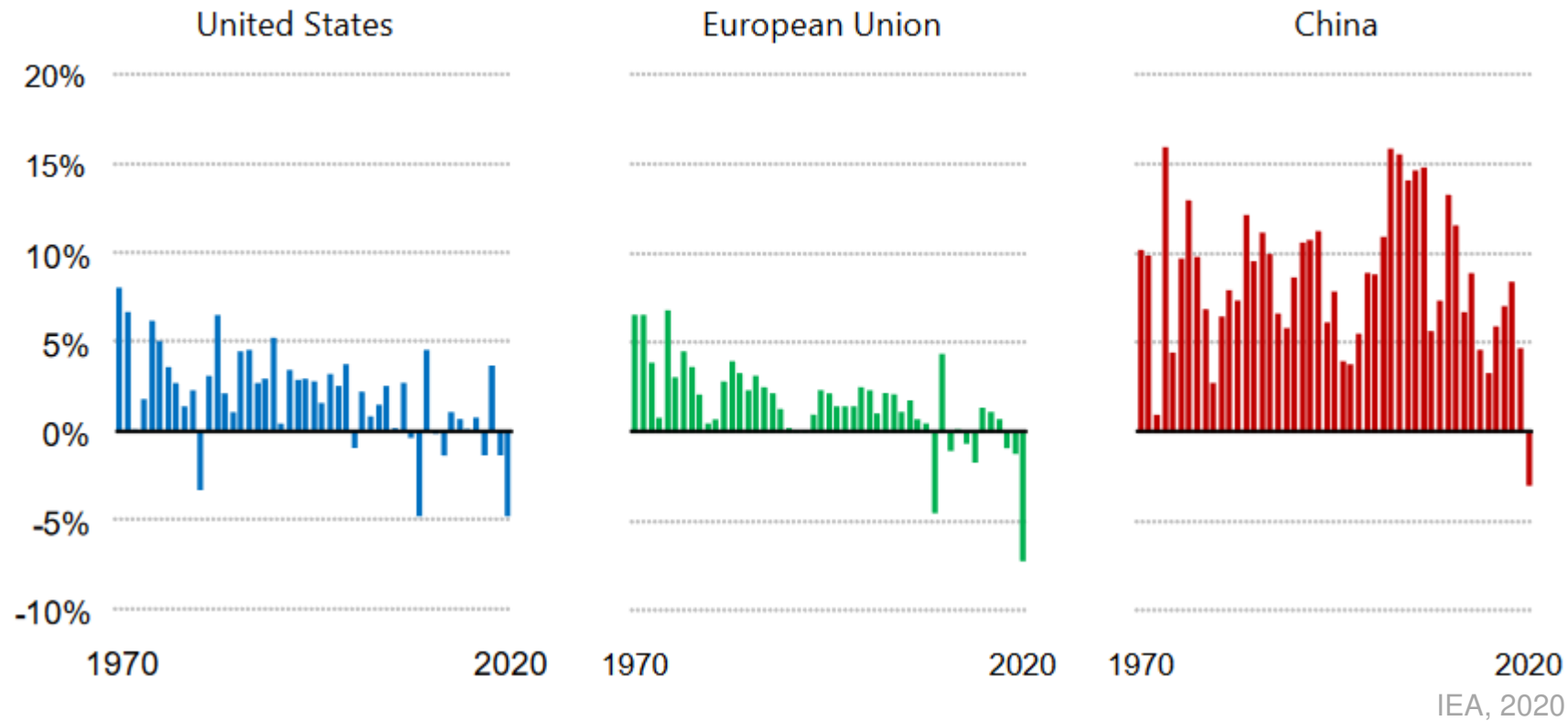
APEX webinar – Perspectives on the COVID-19 Pandemic
9th September 2020

**NORD
POOL**



Electricity demand to face biggest ever decline

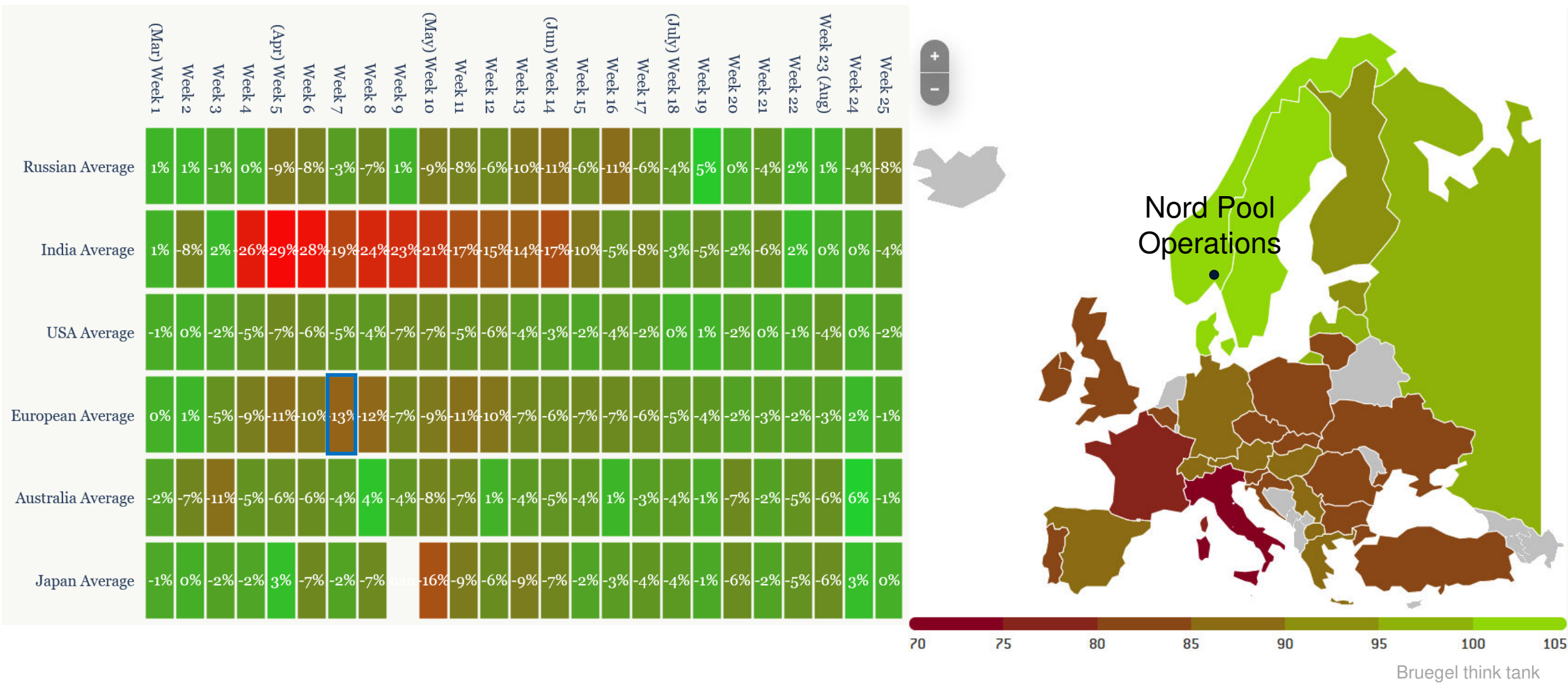
Percentage change in electricity demand in selected regions, 1970-2020



Global electricity demand is set to **fall by 5% in 2020**, the largest decline since the Great Depression. Impacts are largest in the **European Union and United States**, but extend to all corners of the world.

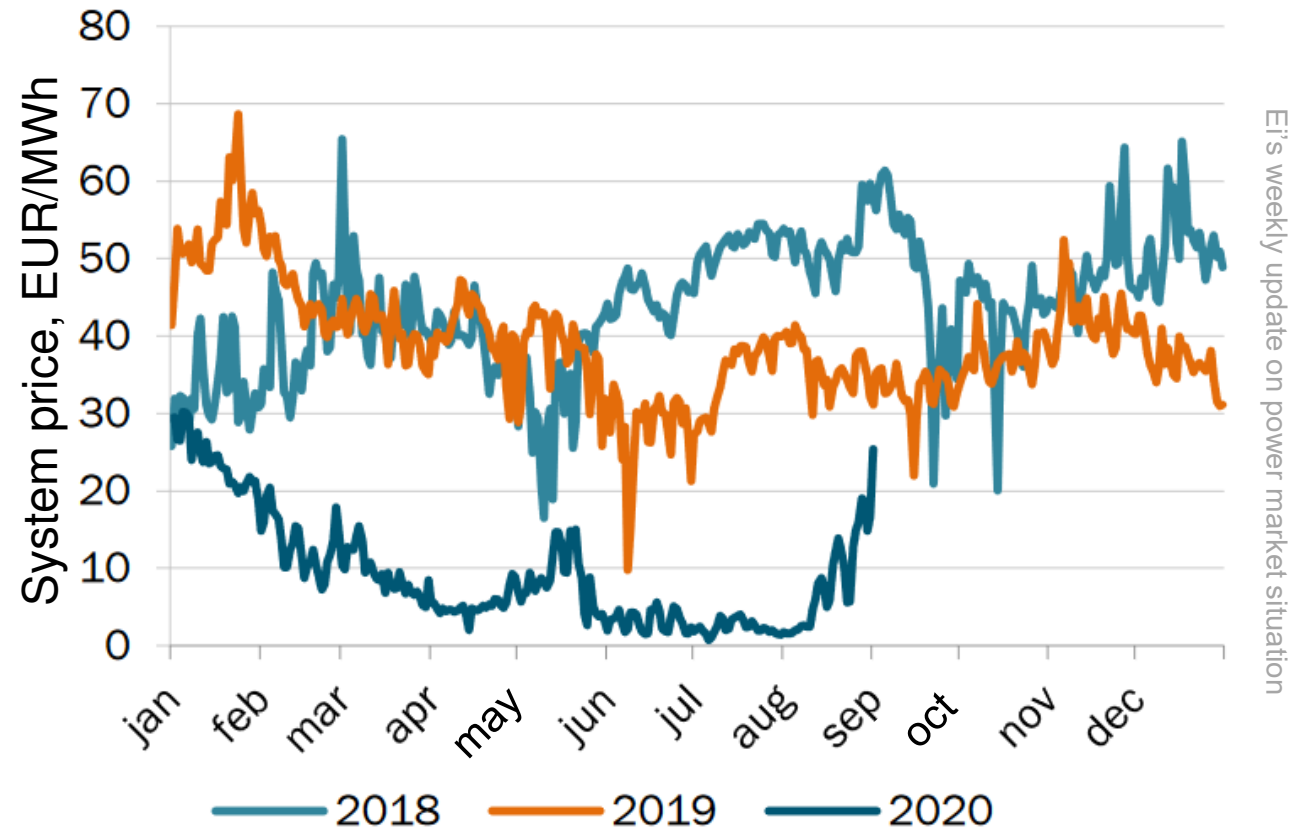
Consumption in Europe

Average peak hour consumption in 2020 as a percentage of the corresponding week in 2019



Low prices in Scandinavia

Minor effect on consumption, but other factors play a role

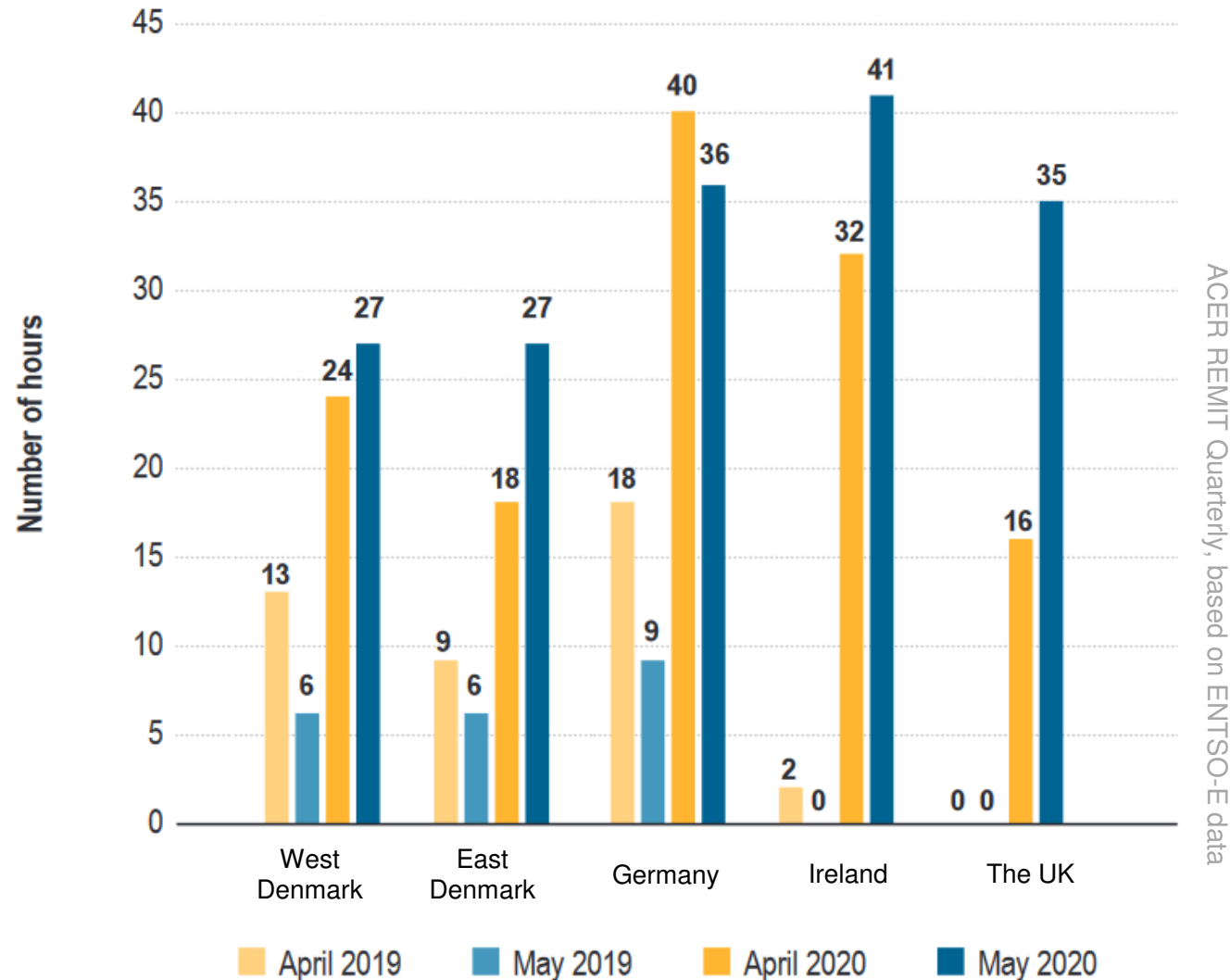


Factors:

- Very high reservoir levels and snow deposits,
- High availability of nuclear power expected in Sweden,
- Very mild temperatures, significant precipitation.

Low prices in Europe

Number of hours on the day-ahead market with negative electricity prices in April and May 2019/2020 for the most impacted bidding zones





Thank you!

Ekaterina Moiseeva

ekaterina.moiseeva@nordpoolgroup.com

**NORD
POOL**



Perspectives on the COVID-19 Pandemic

Session 2: Future Implications of the COVID-19 Pandemic on Markets (40 minutes)

Moderator: Stu Bresler, PJM and APEX Board Chairman

- *Panelists should discuss expected near-term and long-term implications of the COVID-19 pandemic on markets/system operations and any special market provisions or rules that should be considered to lessen the impacts of future pandemics.*

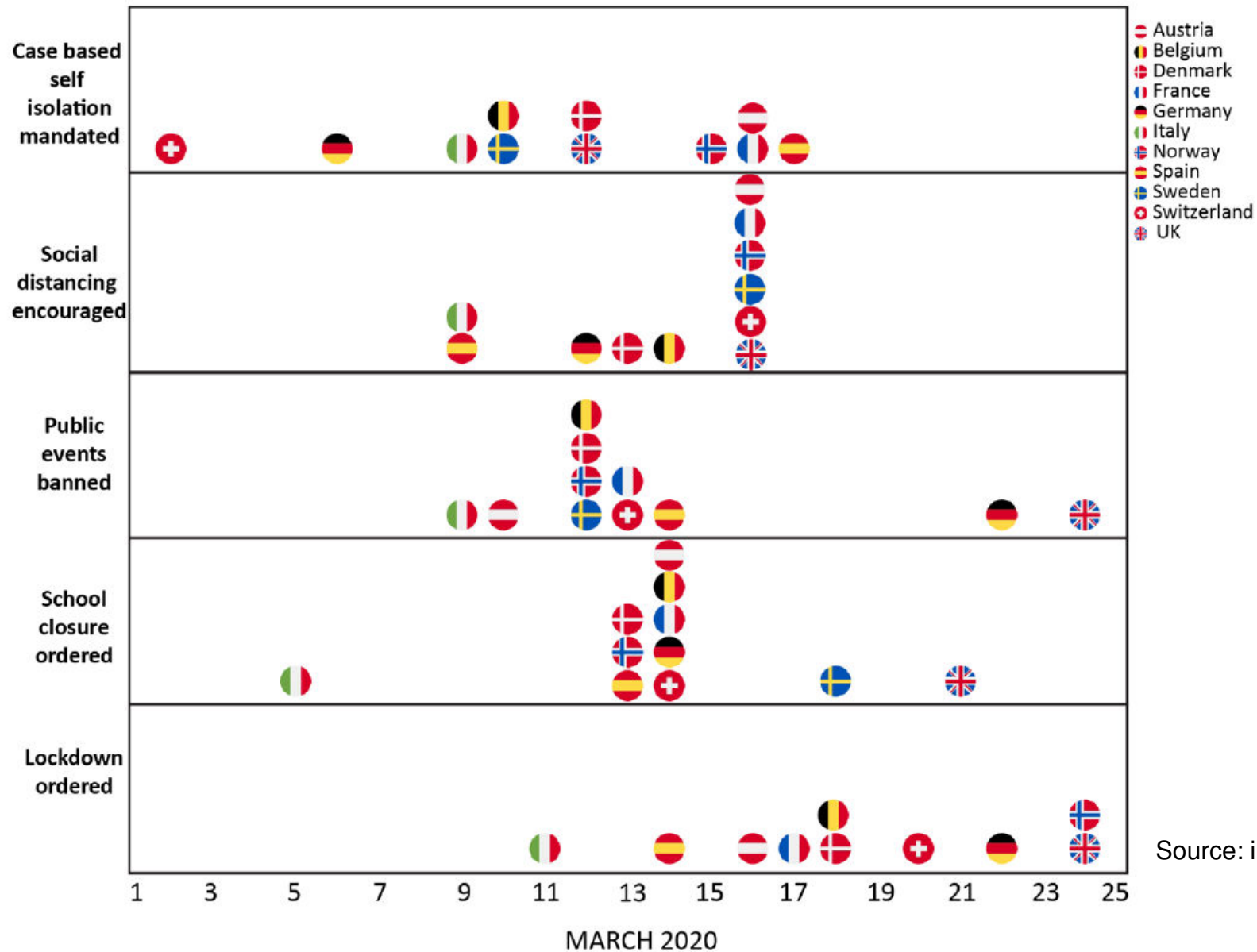
Panelists

- Philippe Vassilopoulos (EPEX)
- Cecilia Maya (XM)
- Richard Doying (Mid-Continent ISO)

APEX Webinar: “Perspectives on the COVID-19 Pandemic”

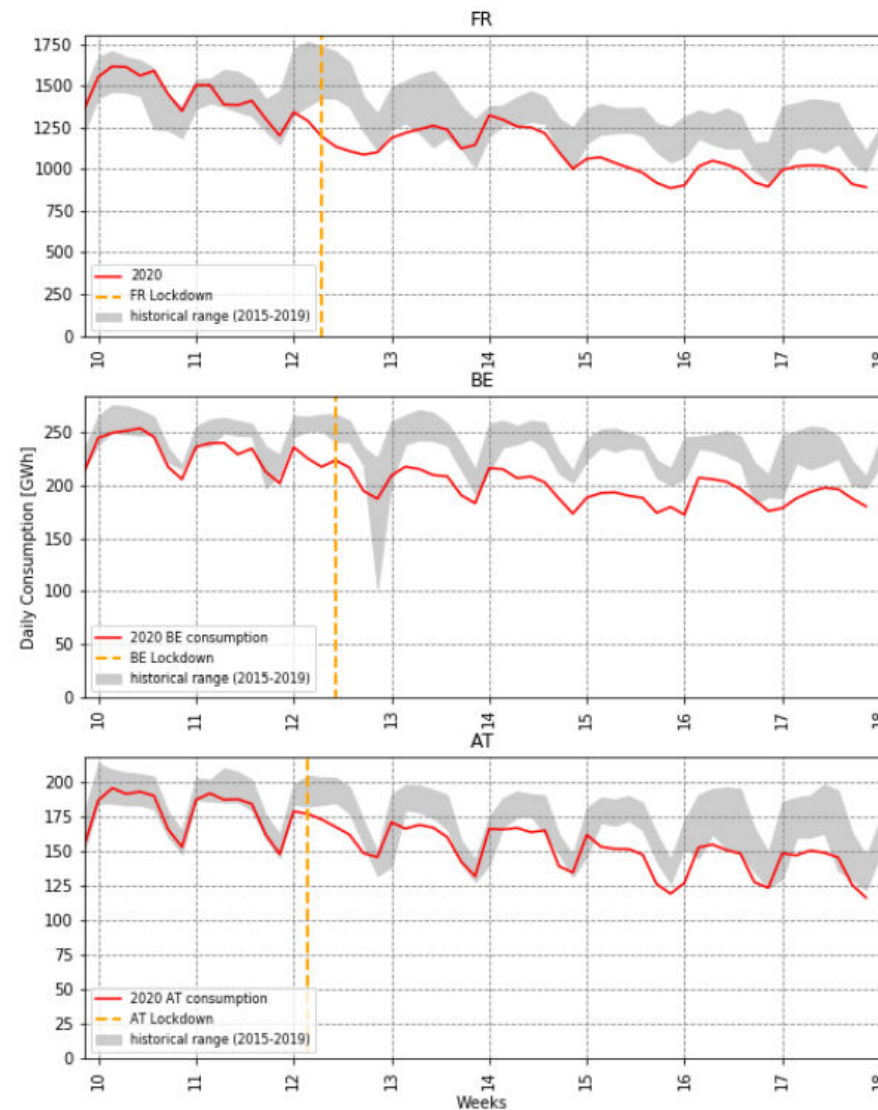
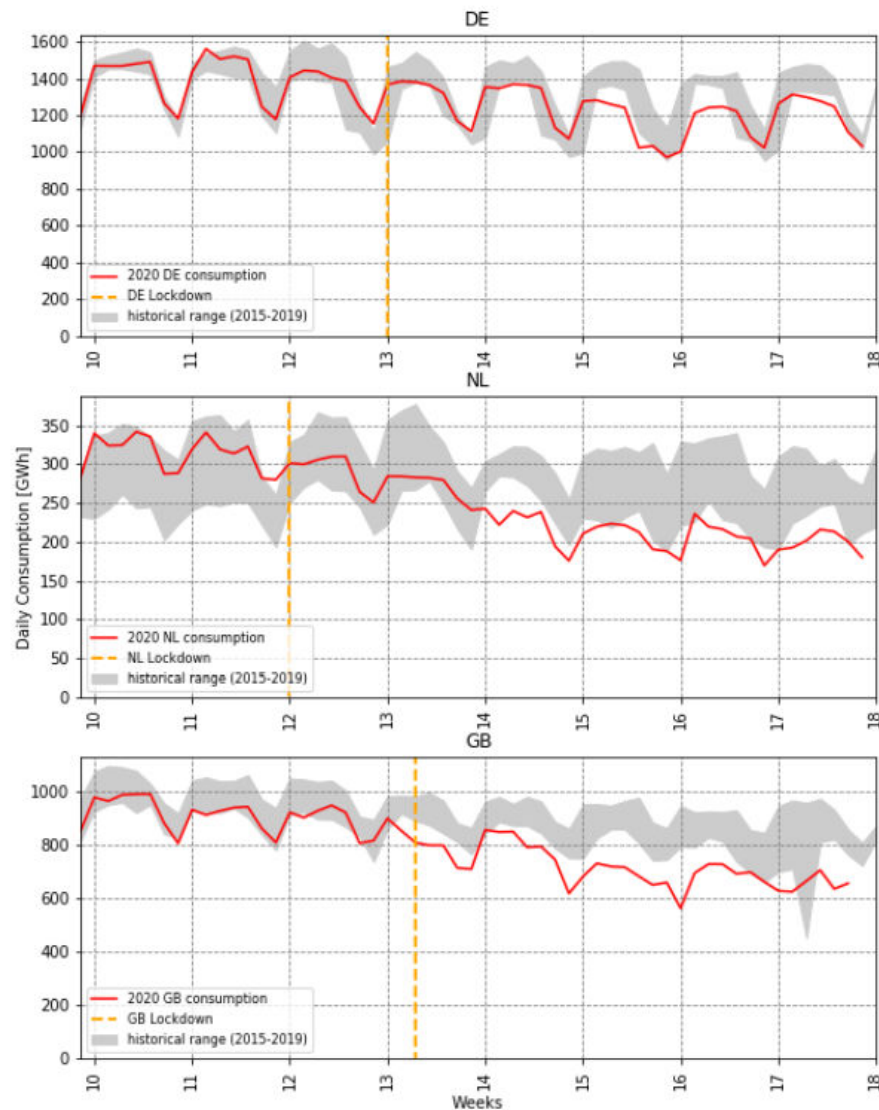
EPEX Spot,
09 September 2020

Lockdown imposed in several European countries



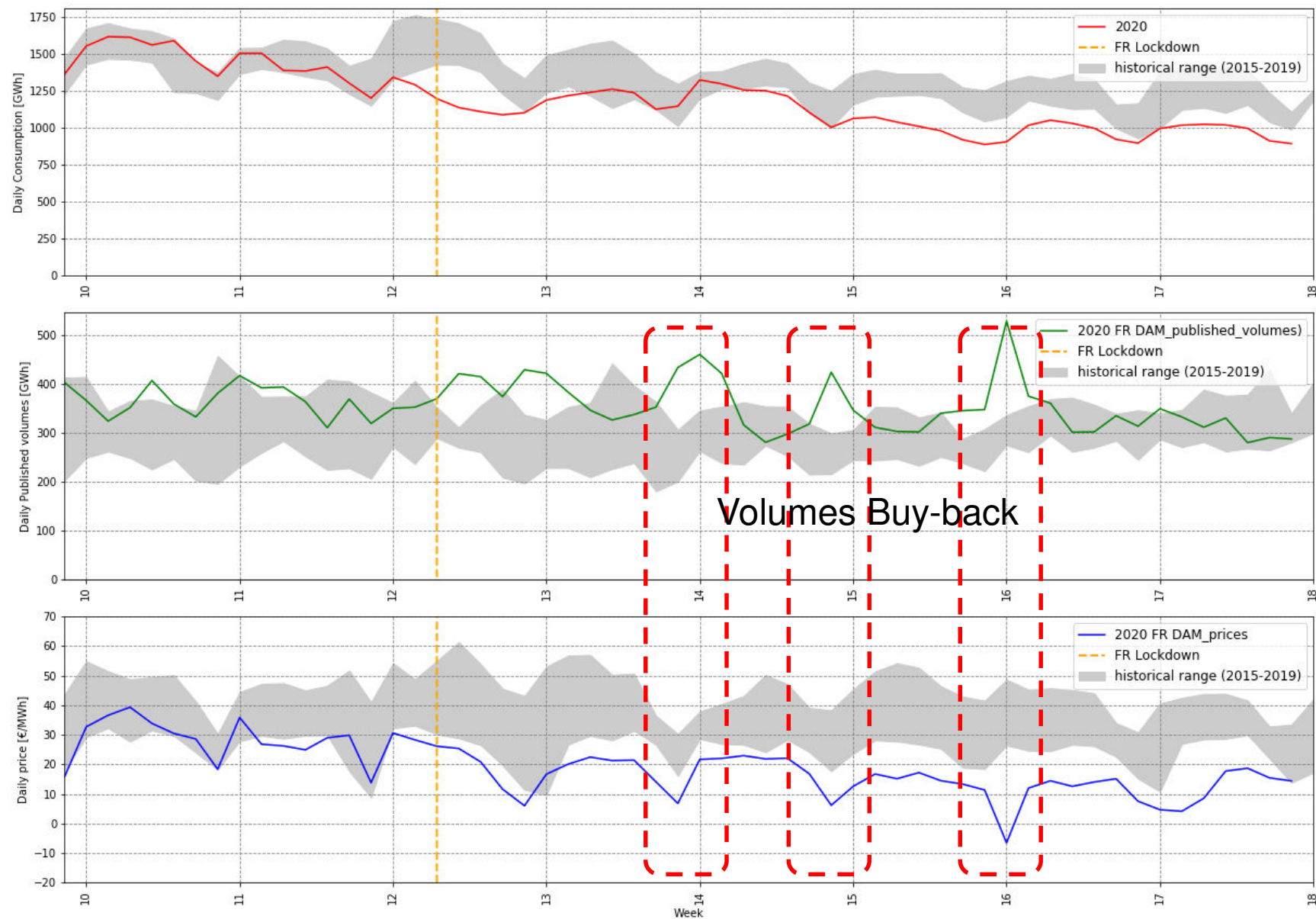
Source: imperial college

Electricity consumption impacted by lockdowns

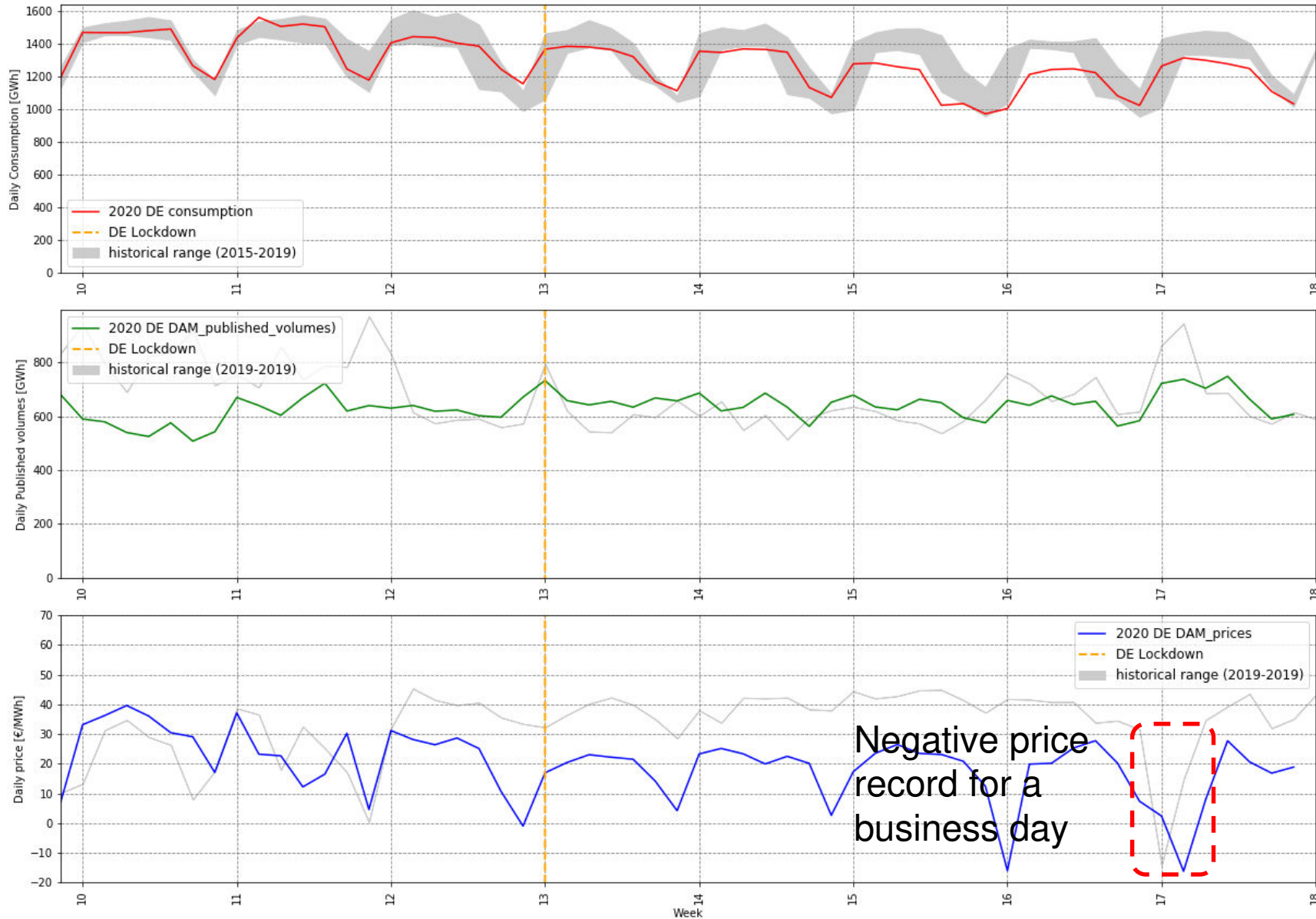


Source:Enstoe transparency

Epexspot DAM markets – DAM FR

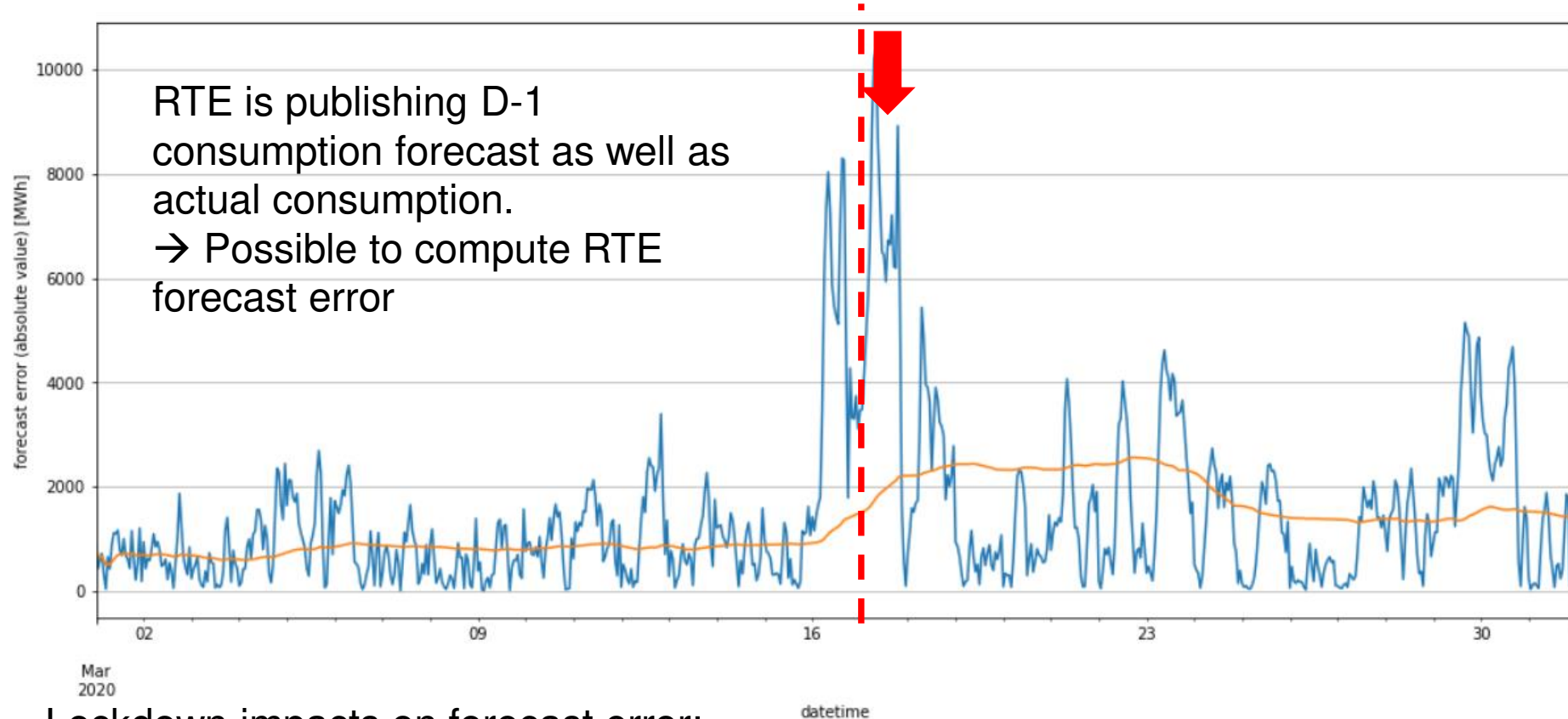


Epexspot DAM markets – DAM DE



Impact on consumption forecast errors

First day in lockdown in FR: March 17 (Tuesday)



Lockdown impacts on forecast error:

- Important increase of forecast error starting one days before lockdown effective date
- error has stabilized after 3 days but at a higher level than prior Lockdown
- is there some impact on IDM FR volumes?...

Impact of COVID on Capacity Market in France

- On the capacity market in France, worries have been voiced by the authorities/TSO on the risk on security of supply (and of seeing high prices due to COVID 19 in the capacity auctions).
- EDF had to reduce personnel at minimum, 20 maintenance schedules for 2020/2021 were delayed in several reactors. Risks are anticipated by EDF for next winter's security of supply (especially Q4 2020).
- This uncertainty added to the Futures price volatility (power/fuel/CO2) could make it more difficult for market participants to compute their missing money and bid into the capacity market auction.
- The Capacity Market auctions were maintained (and two additional auctions were planned). As expected, positive outcome in terms of traded volumes for 2021 and 2022 but prices much higher than in previous delivery years.

EPEX Spot Capacity Auction: Prices and numbers of Guarantees

Auction Gate Closure	23 April 2020		25 June 2020	
Underlying year	Price	Number	Price	Number
2022	€ 1,664.17	50,323.0	€ 3,896.64	43,335.0
2021	€ 1,922.03	42,399.0	€ 4,740.10	38,596.0
2020	-	-	€ 4,500.08	4,982.0
2019	-	-	€ 39.45	19,708.0

Thank you for your attention!

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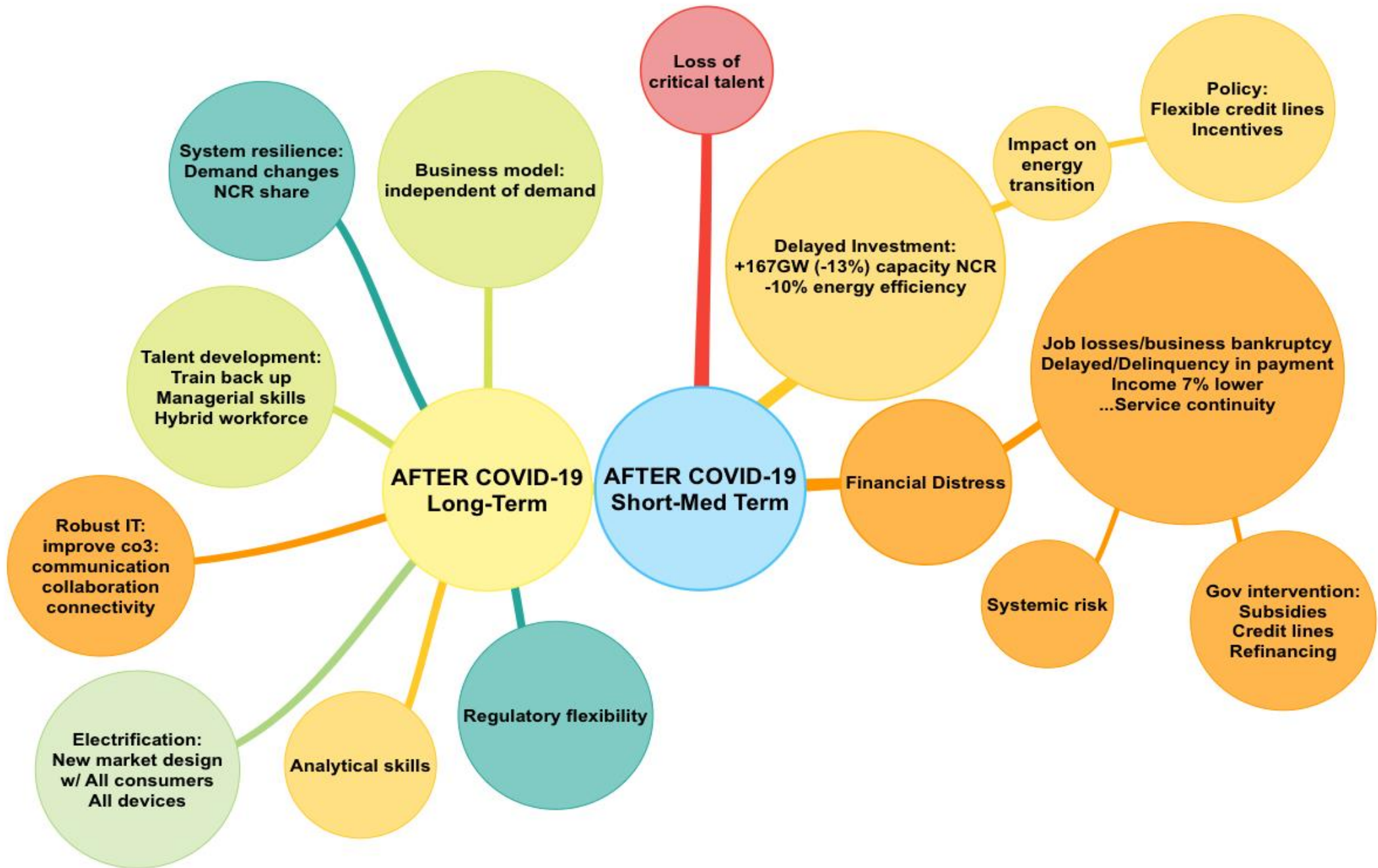
EPEX SPOT Wien

Mayerhofgasse 1/19
1040 Wien
Austria

Future Implications of COVID-19 on Markets



Cecilia Maya Ph.D.
COO Markets
September, 2020





Stu Bresler, Chairman of APEX

- **Announcements and Closing Comments**
- **Annual General Meeting (AGM)**