COVID-19 Impacts and Preparations

Preliminary Analysis of Italian Load and Summary of Actions Taken by Members

EPRI Transmission Operations and Planning
March 20, 2020

WORKING DRAFT v1.3 – SUBJECT TO CHANGE
Webcast Introduction

We are NOT recording

Poll

Webex Chat

You are muted on entry. Please use chat for questions
STOP THE SPREAD OF GERMS

Help prevent the spread of respiratory diseases like COVID-19.

- Avoid close contact with people who are sick.
- Cover your cough or sneeze with a tissue, then throw the tissue in the trash.
- Avoid touching your eyes, nose, and mouth.
- Clean and disinfect frequently touched objects and surfaces.
- Stay home when you are sick, except to get medical care.
- Wash your hands often with soap and water for at least 20 seconds.

For more information: www.cdc.gov/COVID19
EPRI Response to COVID19

Using global reach to gain insights and share with wider audience

COVID19-GRID-IMPACT@EPRI.COM

Information Gathering

Key Insights

Technical data analysis

Information Sharing

Webcast updates, technical brief reports
What’s New from Previous Update (3/19 to 3/20)

Email any insights related to COVID-19 on electricity systems to our confidential inbox: covid19-grid-impact@epri.com
Ongoing work on demand impacts

- Dashboard setup to be able to monitor impacts on load in regions across the world – will update regularly

- Further analysis beginning on demand impacts
  - Normalizing year on year demand impacts with respect to temperature and underlying load growth/changes
  - Extrapolating what this may mean for other regions with different load mix and public COVID-19 management strategies
  - Extrapolating what it might mean into the future – summer loads, etc

EPRI continue to work on this and will update
Operational impacts

- Questions/comments raised during March 19 call
  - Voltage management with reduced load
  - Power flow changes
  - Excess energy in high PV regions
  - TSO-DSO coordination
  - Rectifying faults with personnel is taking longer

- Other impacts might start to appear – need to share

As we move from preparation to operations, need to consider impacts to ops
Control Center Practices Updates Since 3/19 Webcast

- Control Center strategies:
  - Day to night swap between facilities. Empty CC is deep cleaned when other CC is in operation.
  - Definite need to engage cleaning companies / contractors to assess protocols. Some companies have started self cleaning the facilities.
  - Some operating out of remote backup facilities, isolated from all other facilities and company offices.

- Some locations: operations staff asked to stay at home when not on shift, limit contacts to only family and not to use public transportation.
  - A few utilities reported checking individuals entering the facility or office.
  - One utility asking operators to self test themselves prior to coming to work. (100 F as the threshold)

- Splitting of engineering and technical staff into separate groups with no mixing.

- Europe – focus shifted to core activities:
  - Grid monitoring, congestion management, operations planning, voltage control, load frequency control, asset management etc.
  - In some cases maintenance work is being cancelled or postponed due to travel restrictions.
Control Center Practices Questions from 3/19 Webcast

- Questions on sequestering operators and the ability to test?
  - We have not heard reports of covid test kits being made available to electricity companies. Some mentioned working with local authorities.
  - Lack of test kits should not impair temperature monitoring as a first step for key staff in the organization and operators.
  - We have not heard reports of power plants being shut because of outbreaks. If you have heard reports, please let us know.
  - Companies should speak with power stations, asset owners, distribution owners, telecomms etc. to ensure precautions for working and contingency plans are being put in place.
  - Postponing vacation: We have heard that leave has been cancelled in Europe, but this is expected. Companies have refunded cost of vacations for operators.
Other questions from 3/19 webcast we are investigating

- Impact of drop in demand on system voltage / constraints.
  - To date load drop has not being below yearly valley load, continental European systems are summer peaking. Will be system dependent.
- Training and certifying staff
  - Need to engage wider on this, especially NERC.
- What happens for infected staff
  - At the moment following expert advise (isolate, contact trace etc)
  - Need to engage wider on how to mitigate and stop spread within office.
- Italy specific questions on control centers
  - We are engaging to see if there are lessons to be learned from Italy, but at this point most companies are taking major precautions.
Agenda

Impact of COVID-19 shutdown on load in Italy

Summary of COVID-19 Related Operations Actions Taken by Various EPRI Members (Transmission and Distribution)

Aim to keep the webcast and discussion focused on operations
Impact of COVID-19 shutdown on load in Italy

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Information and disclaimers about analysis

- We used publicly available data from ENTSO-E for analysis:
  - [https://transparency.entsoe.eu/](https://transparency.entsoe.eu/) (account needed to download)

- Compared the period since shutdown begun (March 11-18)
  - One week prior (March 4-10)
  - One year prior (weeks 11 and 12 in 2019)
  - As time goes on, comparison with prior weeks become less relevant

- Other factors are not considered but likely to impact load levels
  - Temperature
  - Underlying non-COVID economic factors
  - Behind the meter resources, etc

- We are continuing to monitor and update this information
Key insights from Italy on demand impacts

<table>
<thead>
<tr>
<th>PHASE</th>
<th>Day 1-2 (Thurs,Fri)</th>
<th>Day 3-4 (Weekend)</th>
<th>Day 5-8 (Mon-Wed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Partial shutdown</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PEAK REDUCTION</td>
<td>3%-4%</td>
<td>10%-14%</td>
<td>6%-8%</td>
</tr>
<tr>
<td>NOTES</td>
<td>Only North Italy shut down and people adjusting</td>
<td>Reduction in weekday peak, and energy usage, year-on-year and compared to previous week</td>
<td>Min. demand, energy use reduction. Weekend demand still lower than weekdays</td>
</tr>
</tbody>
</table>

Analysis does not account for weather differences or non-COVID-19 economic factors.

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Key insights from Italy on demand impacts

- **Load shapes stay much the same** with reduction in magnitude, but some indications of lower morning peaks in last few days

- Day ahead **forecast mean absolute error 1%** worse Thursday, seems to be getting better in last few days

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Italian load in last 2 weeks – 2019 vs 2020

Weather and economic growth impacts not considered but clear trend observable

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Impact of shutdown (5-7 days in – March 16-18)

Reduction in demand got larger in last few days

- Mon: 15%-16%
- Tues: 18%
- Wed: 18%-21%

Peak Demand

- Mon: 16%-18.5%
- Tues: 19%
- Wed: 20%-21%

Daily Energy Demand

- Mon: 8-10%
- Tues: 14-16%
- Wed: 17-20%

Min Demand

Reduction varies depending on whether comparing with 2 weeks previous or last year

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Impact of nationwide shutdown (first 3 days)

Reduction in demand increased across first few days

Weather, change in underlying load mix, etc. not considered

Peak Demand
- W: 5%-7% lower
- Th: 10%-11% lower
- Fr: 11%-11.5% lower

Daily Energy Demand
- W: 4%-6% lower
- Th: 10%-12% lower
- Fr: 13%-14% lower

Reduction varies depending on whether comparing with previous week or year
Impact of shutdown (first weekend)

Reduction in demand over weekend as well as weekdays

- Peak Demand
  - Sat: 6%-9%
  - Sun: 5%-8.5%

- Daily Energy Demand
  - Sat: 12%-14%
  - Sun: 8%-11%

- Min Demand
  - Sat: 11%
  - Sun: 12%

Weather, change in underlying load mix, etc. not considered

Reduction varies depending on whether comparing with previous week or year

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Day ahead forecast performance
March 2-18, 2020

Day ahead forecasts got worse initially, but may have improved since weekend

Weather, change in underlying load mix, etc. not considered

Mean Absolute Error

- 3.1% in the last week
- 2.2% in previous week
- 1.9% same week 2019

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Italian System Context (based on available public info)

- Italian elec. consumption about 2.5 times lower per capita than the US
- Residential load is about 20% of total load in Italy (30%+ in US)
- Large amounts of industry in the north of the country, but didn’t see notable reflection in load profile until entire country was shut down

- More information at [ENTSO-E statistical factsheet](https://www.entsoe.eu)

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Ongoing Monitoring of Demand Impacts in US, Europe

US & EU Public Demand Data Monitoring

**Example Trending - Italy**

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Summary of COVID-19 Related Operations Actions Taken by Various EPRI Members (Transmission and Distribution)

**Disclaimer:** The information presented here is based on information gathered from EPRI members. We do not present these as recommended or best practices, but we do present these as potentially useful information for utilities and system operators as they implement their own practices.
Sanitary and Hygiene Basics

- **Alcohol sanitizing gels, sprays, wipes** available throughout control center and office
- Regular handwashing and hand sanitation emphasized for all staff, especially operators. **20 seconds per handwash**
- **Limit or restrict use of common equipment** such as phone receiver or mouse, keyboards which are particularly susceptible to germs
- Consider **standard issue equipment** for operators. Each operator responsible for their own equipment:
  - Wireless computer mouse and keyboards
  - Phone headsets
- **Wipe all equipment** pre and post shift. Reports of desks being disinfected 3 or more times per day
- Consider “**clean turnovers**” – turnover is given with operators on adjacent desks. When person leaving shift finishes, they wipe down desk and equipment and unplug headset / mouse USB point.
  - Person starting shift begins by wipe down of desk and plug in own headset and mouse
- **Keep at least 1 meter distance** during interactions with essential staff members in TCC and during turnover
- Consider operators wearing surgical masks during shifts (one member report)
Cleaning / Disinfecting / Sterilizing

Note the subtle difference in terminology:

- **Cleaning** - Removes debris
- **Disinfecting** - Removes most organisms from surfaces
- **Sterilizing** - removes all life including viruses, bacteria, fungi from workspace

Engage external experts on the best solutions for workspaces and control center disinfecting and sterilizing

The Greek TSO IPTO released this image of their control center

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Steps that Control Centers Have Implemented

Staffing Within the Company

• If staff have been in an affected area in the past two weeks leave work and self isolate for 2 weeks.
• Identify key operational staff in the company. All illnesses immediately reported to management for further advise, no matter how small. Report of a company implementing a dashboard to track staff sickness.
• Monitor body temperature for fever of every person entering building.
• Managerial briefings given electronically by company preferred means (email, IM, text, video conference)
• Most companies have:
  • Instructed all non essential staff to work remotely
  • Restricted access by external people to offices
  • Restricted access to floors that Control Centers, IT, market systems are on.
  • No meetings, no walk throughs on these floors, unless person’s desk is on the floor. Controlled by security personnel. Reduce meetings & interactions generally.

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Staffing in the Control Center – One Approach

- Body temperature screening prior to access control center site
- Crews are not mixed. Multiple shifts in each site and/or handover to alternate site at end of shift crew cycle.
- Utilizing additional operator workstations in Storm Operations Centers, Backup Control Centers, Mobile Command Centers or regional control centers.
- Some CCs have adjusted the shift pattern to 2 x 12 hour from 3 x 8 to reduce turnovers and lengthen the cycles in each control center 8-15 days depending on staff
- Pre planning for critical staff (such as operators) for extended stays within the CC for up to 2 weeks.
  - Backup stock of food or clear supply line to food in each control center.
  - Plan for familial / child care impacts and mental health aspects of this approach.
  - Some utilities are restricting CC common area access. So this should be carefully managed.

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Staffing in the Control Center – Another Approach

- Body temperature screening prior to access control center site

- Sterile, locked down backup control center and offices if the main center gets infected or a staff member gets sick.

- Maintains continuity in main control center

- Hybrid approach is worth considering, two operational centers and a sterile, locked down site.

Control Center A (main)
- Normal operations
- Shift crew
- EMS/IT support
- Shift Supervisors
- Key system ops staff

Control Center B (backup)
- Sterile site
- Locked down
- If outbreak in center A -> move operations to center B

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Steps that Control Centers Have Implemented (US/EU)

Emergency Response Planning

- Most companies have enacted business continuity plans and/or pandemic response plans, if available.
- Communicate to power stations and advise on emergency response operations. Ensure proper business continuity procedures are in place in critical power stations.
- Test critical station staffing protocols (from blackstart and storm restoration plan)
- Test external communications protocols (from blackstart and storm restoration plan).
- Distribution Operations is adapting storm restoration plans for the potential that Mutual Assistance will be unavailable.

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Preparing for an Infectious Outbreak

Pre Planning
• Grid operator new staff pipeline
• Accelerated training programs or certification if this is possible

Infection
• Quarantine and treat staff member
• Immediate switch to backup Control Center
• Sterilization of infected control center
• Contact tracing with operations staff who interacted

Post Event
• Continued monitoring of operations staff health
• Communicate to appropriate crisis response agencies if required

Any other plans in place for grid operations in the event of infection? (Enter in Chat)
Other Publicly Available European News and Insights

Many companies proactively engaging the wider public to assure continued electricity operation and contingency planning

- **Statnett Norway**: only TSO we have monitored to publicly report a case of Covid-19 among one member of staff
- **Swissgrid**: Publicly state they are monitoring (temperature) of staff for fever.
- **RTE France**: Launched their official business continuity plan as of Monday 16\(^{th}\) March
- **National Grid UK ESO** have posted a blog post by the Director explaining the response
- **Red Eléctrica Spain**: very active on LinkedIn with news updates to public; operating across three autonomous control centers, each capable of independently controlling full system; have deployed hygiene teams to work with staff
- **AEMO Australia**: Implemented full Pandemic Response Plan

We will continue to monitor and update with new information

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Distribution Operations Workshop – March 26

- EPRI P200C (dist. ops) staff will facilitate the discussion.
- Participating utilities will share the strategies they have implemented. This should take about five minutes per utility.
- The group will discuss strategies as necessary, similar to what happens during the DOIG conference.
Coronavirus COVID-19 in RT Operations

- Email setup for providing information or if you have questions on operations related issues: COVID19-GRID-IMPACT@epri.com

- Looking to setup information sharing microsite

- Open discussion on Coronavirus impacts – please share comments, thoughts or questions for EPRI SMEs or EPRI members on mitigating impacts of virus

Medium term: EPRI planning to develop a set of guidelines for TCC business continuity for a serious health issues or pandemics
Together...Shaping the Future of Electricity

Prepared by Aidan Tuohy, Adrian Kelly, Brian Deaver, Eamonn Lannoye, Daniel Brooks

EPRI COVID Operations Helpline: COVID19-GRID-IMPACT@epri.com