



Science and
Technology
Facilities Council

ISIS Neutron and
Muon Source



WAO 2021
Workshop on Accelerator Operations
5th - 8th October 2021, Online

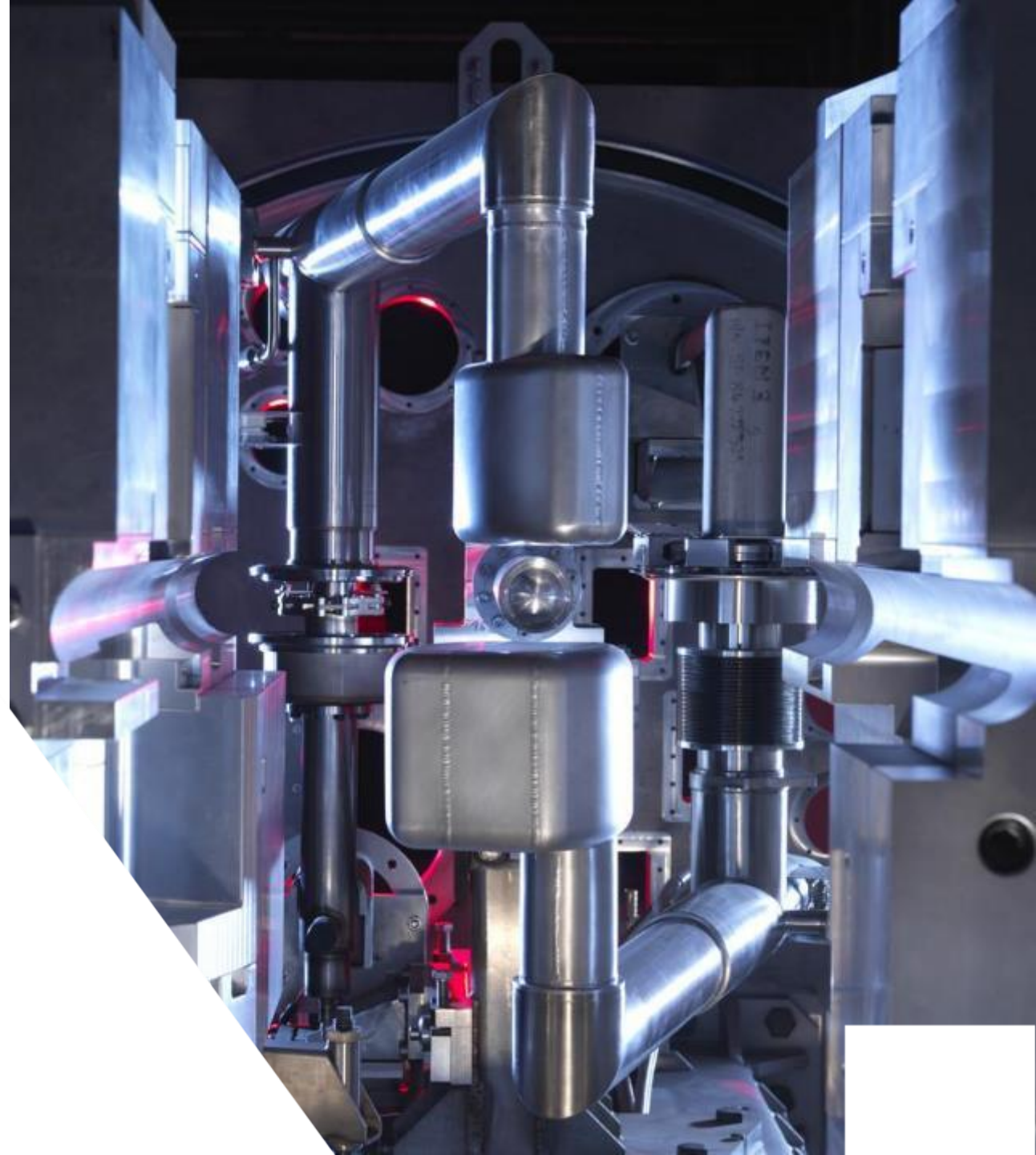
How the ISIS accelerator weathered the Covid-19 storm

Julian Brower CEng FIET

Performance Improvement, ISIS Accelerator

Contents

- 1** Introduction to ISIS
- 2** UKRI STFC Covid response
- 3** ISIS response to Covid
- 4** Questions



STFC Rutherford Appleton Laboratory

ISIS
Synchrotron

Diamond Light
Source

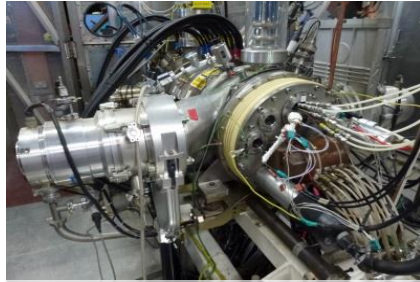
ISIS
LINAC

ISIS Target
Station 1 (TS1)

ISIS Target
Station 2 (TS2)



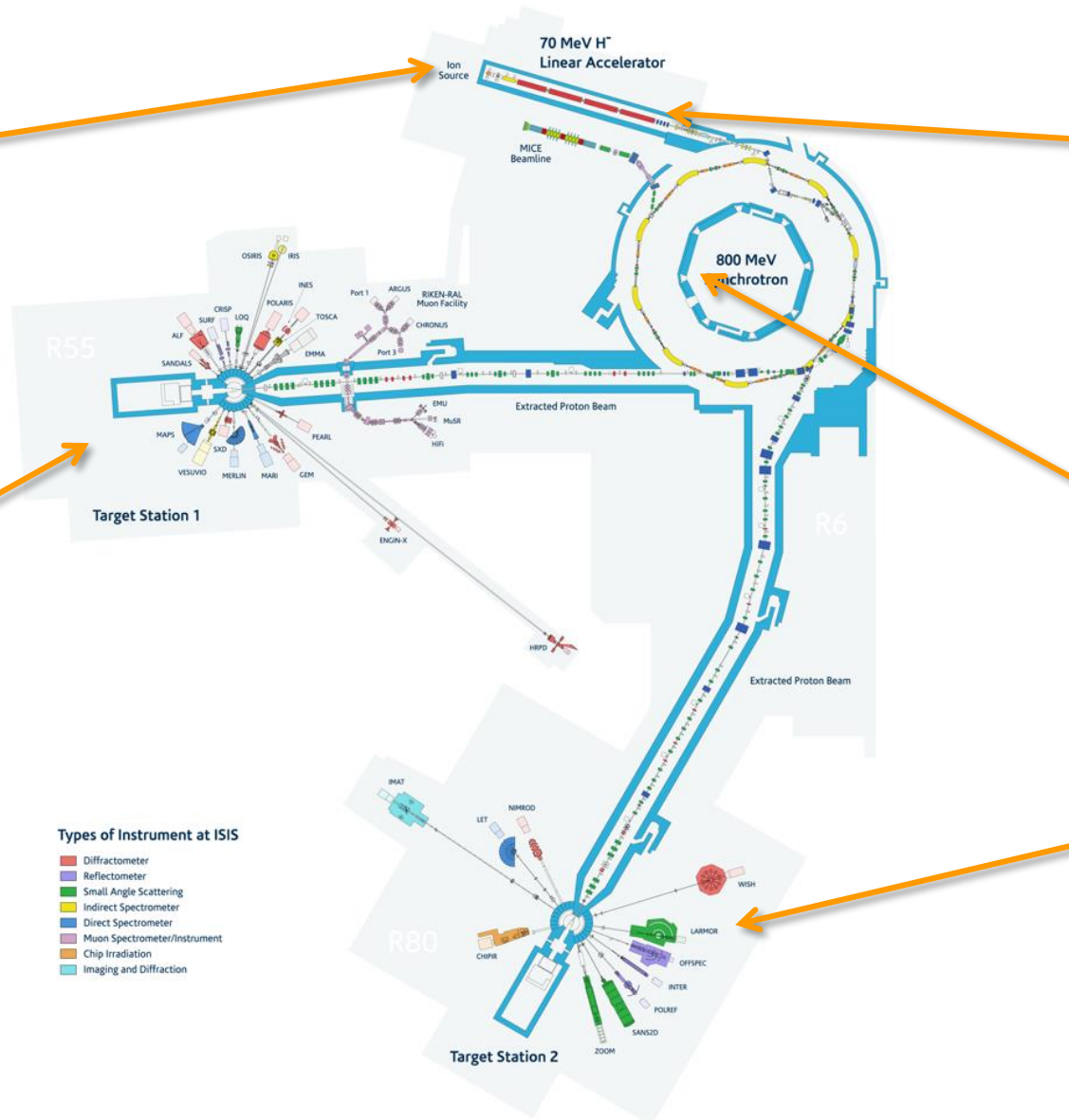
ISIS Neutron and Muon Source



Ion Source: **35 keV H⁻**



TS1: **200uA, 160kW**



- Types of Instrument at ISIS**
- Diffractometer
 - Reflectometer
 - Small Angle Scattering
 - Indirect Spectrometer
 - Direct Spectrometer
 - Muon Spectrometer/Instrument
 - Chip Irradiation
 - Imaging and Diffraction



LINAC: **70 MeV H⁻**,



Synchrotron: **800 MeV**



TS2: **40uA, 32kW**

ISIS Neutron and Muon Source

World class Spallation Neutron and Muon Source since 1985

- Flagship STFC facility, over 400 staff
- Up to 2,000 visiting scientists, 1,000 experiments and 600 papers per year



Clean energy / Environment



Materials / Engineering



Nanotechnology / IT



Pharmaceuticals / Healthcare

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UK response to Covid

23 March 2020

UK Prime Minister, Boris Johnson, addressed the UK on Coronavirus



People in the UK advised to:

- Stay at home
- Only shop for basic necessities, as infrequently as possible
- Do one form of exercise a day
- Travel for medical need allowed, to provide care or help vulnerable
- Travel to and from work, but only where absolutely necessary and work cannot be done from home

Coronavirus alert levels in UK

Stage of outbreak		Measures in place
Risk of healthcare services being overwhelmed	5	Extremely strict social distancing
Transmission is high or rising exponentially	4	Social distancing continues
Virus is in general circulation	3	Gradual relaxation of restrictions
Number of cases and transmission is low	2	Minimal social distancing, enhanced tracing
Covid-19 no longer present in UK	1	Routine international monitoring

Source : UK government

BBC

UKRI STFC response to Covid

STFC/UKRI executive are dealing with the pandemic

Gold team

UKRI board members

Silver team

Executive teams from each council
within UKRI

Bronze team

Senior leadership teams within STFC

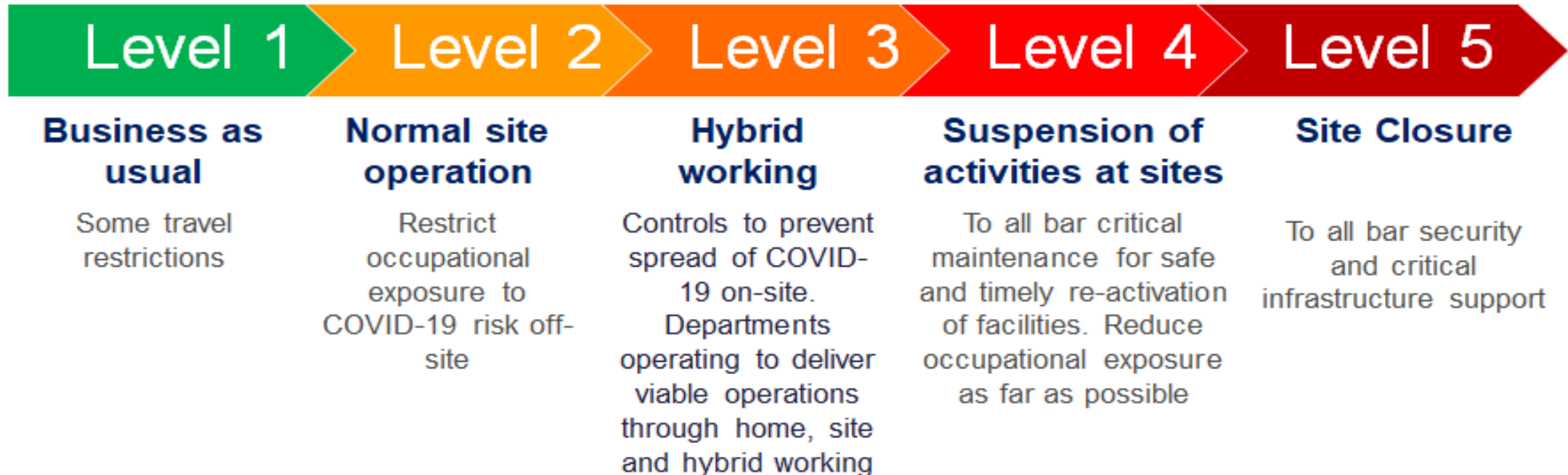
Bronze team activities

- Planning prior to Covid-19 arriving in the UK and the response as the pandemic progresses
- Initially meeting daily
- Implementing safety measures
- Monitoring staff, site usage, safety issues, etc.
- ISIS departmental level business continuity team meetings
- Weekly all staff webinars from March 2020

STFC Operational Alert Levels

STFC has now moved to Operational Alert level 2

We are here



Control measures

Controls mitigating the **transmission** of infection on STFC sites

- Low occupancy in most operational areas/offices
- Risk assessment and additional controls where social distancing can't be met

CO2 monitoring to assess ventilation and occupancy



Perspex screens and ventilation considerations in shared locations

2 metre social distancing

Face coverings in public areas
No public communal areas

Hygiene controls

Controls mitigating the **arrival** of COVID-19 infection onto STFC sites

MINIMISING ON SITE NUMBERS

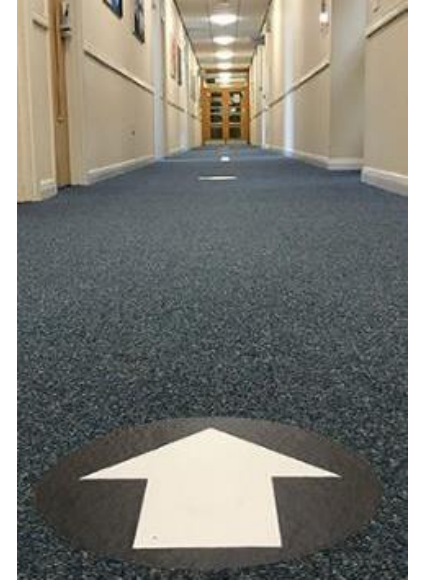
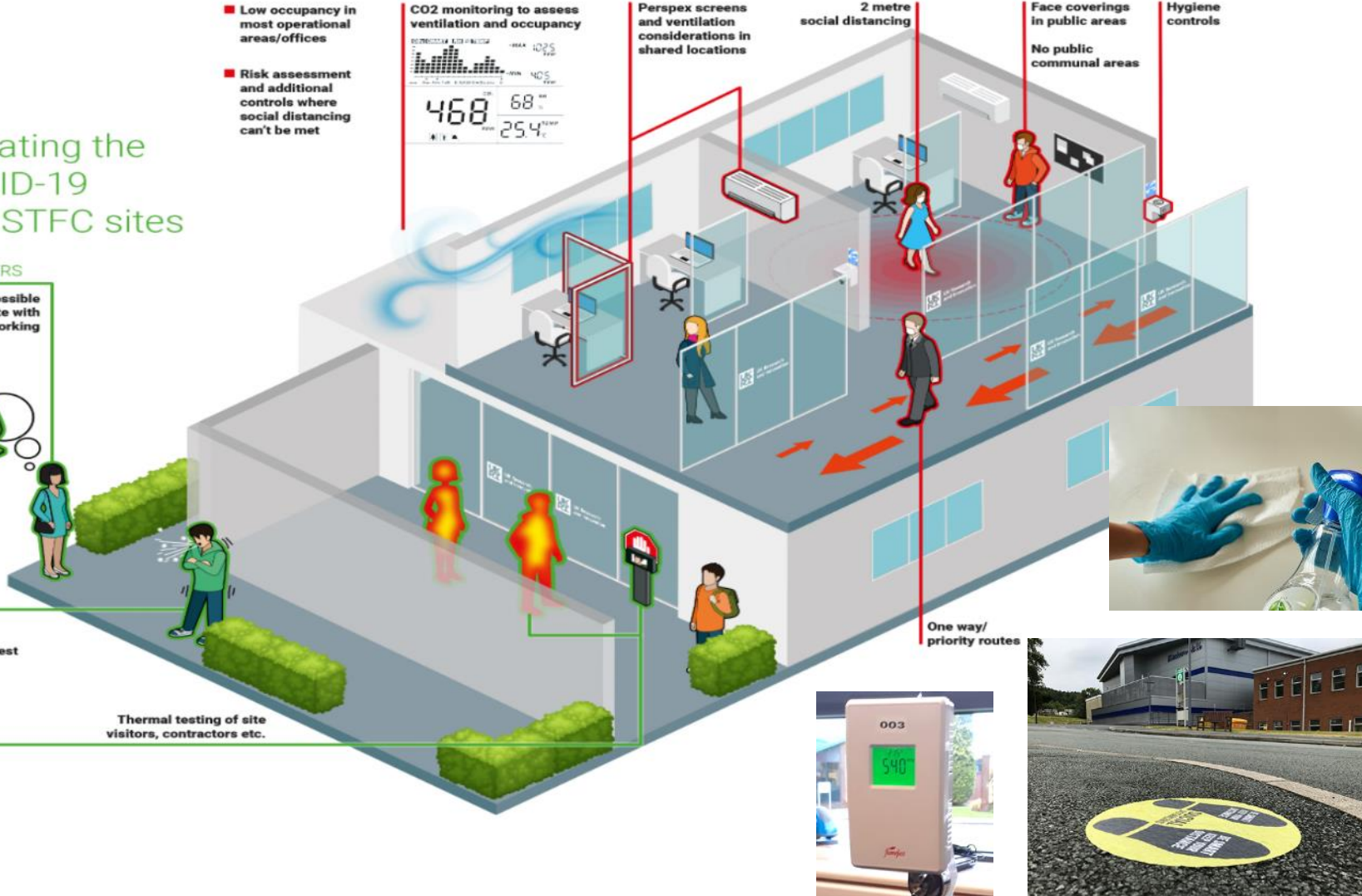
Move to home working where possible and minimising time on site with hybrid home and site working



MINIMISING SYMPTOMATIC SITE USERS

Self-awareness of COVID-19 symptoms, distribution of thermometers to site users to self test

Thermal testing of site visitors, contractors etc.



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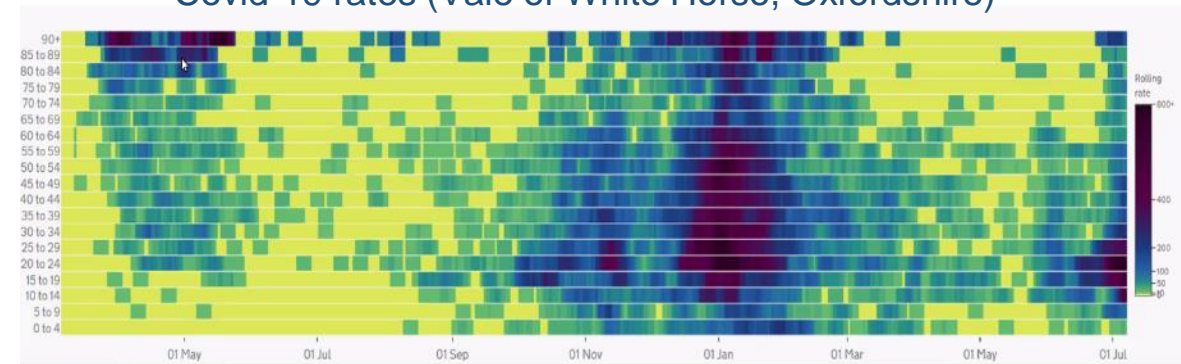


Covid-19 rates and site occupancy

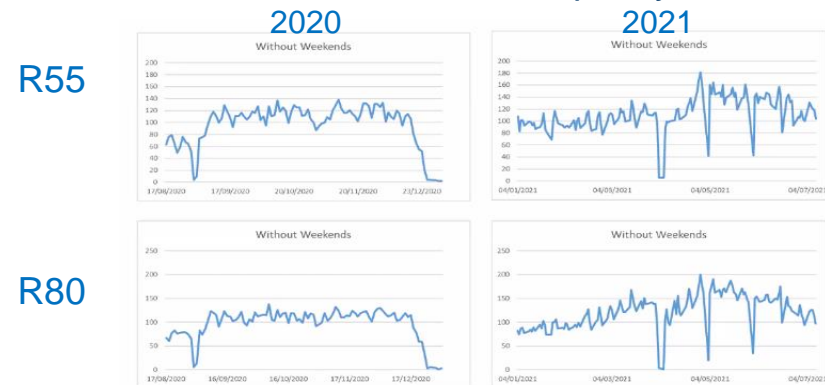
Initial occupancy critical staff only

- Focus on:
 - Making safe
 - Covid response strategy
 - Essential maintenance
- Covid rates increased in the local area after Christmas 2020 in build up to beam
- ISIS Target Station 1 and 2 occupancy rates remained similar throughout

Covid-19 rates (Vale of White Horse, Oxfordshire)



ISIS on-site occupancy



Survey questions asked

1. What activities and measures occurred at the first lockdown?
2. What happened during lockdown leading to machine operations?
3. What significant things contributed to success or failure of processes and system performance & reliability?
4. What lessons were learned and kept for the 'new normal'?

ISIS Operations

- Legal requirement to staff operations
- 8hr to 12hr shift, 3 to 2 crew, 2+1 handovers, Police authority
- Stringent double cleaning, own food & drink, no sharing
- Directional corridor route plans, toilets, masks, sanitisers
- Emergency alarm investigation team restructured 1+2
- EO's and crew; critical maintenance and repair risk assessments
- RAMS trailed to bring minimum staff on site for machine turn on

Take away

- Positive response for new 12 hour shift patterns
- Crew had greater responsibility improving morale
- Main Control Room swipe access now limited





ISIS Diagnostics

- End button to stop statistics; treated as shutdown
- Machine physics cancelled, non operational work, PhD's delayed
- Maintaining group cohesion: virtual meetings, daily catch ups
- Setup alternative control desk in Main Control Room annex
- Reschedule working rotas; day by day,
- New learning of remotely operated machine, concerns by management
- Machine tuning from home had big challenges but were overcome
- Biggest challenge, which support staff available
- Overcome building access challenges
- Training new staff with limited operational time and coordination

Take away

- Promote positivity and creativity to overcome problems

Health Physics

- Initial input to ISIS business continuity team
- Initial flurry for IT systems reusing laptops (waste inventory, surveys) as many staff not worked from home previously
- Radioactive materials, targets and samples made safe, no leakage
- Staff retained for stack monitoring, sealed source security, (complete with official working documents for Police)
- Measuring Gamma, Beta and Tritium data maintained
- Risk assessments prepared, personal protection equipment (PPE) sourced and instructed
- National ventilation programme, learnt how to manage workspaces

Take away

- Successes: group cohesion, flexibility, and supporting logistics
- Working with plant section has greatly increased ventilation systems: work areas, experimental cabins and ISIS main control room
- New building controls; occupancy, limited access greatly improved



ISIS Controls

- Treated as shutdown, no specific changes
- Meeting to manage projects in lockdown
- Maintaining group cohesion, virtual meetings, daily catch ups
- Reschedule working rotas, call out mechanism, building access
- Manage staff reaction to Covid-19
- Control system already available on line though Vista and Exceed
- Some specific adjustments for Cryogenics and cooling systems
- Start-up was like normal start-up

Take away

- Working from home is now affirmed as viable and may be extended: hybrid working
- Concerns over losing team work/social interaction





Low Energy Beams

- Switched everything off, treated Covid as shutdown
- Line managers returned to learn Covid working practises
- Generic 'Pick and Mix' RA's developed, simple and quick
- Home production line activities short lived (insurance)
- Most activities were single person operations, rapid return
- Returned to operations without issue

Take away

- Everybody is different and has different work needs:
 - **Practical vs administration roles, single people vs families**
- Flexible working from home for training, analytical software, programming, health and safety

Mechanical Engineering

- Treated as shutdown, safe switch off, Legal requirements covered,
- water quality, legionella, conductivity
- Senior leadership teams planning and governance meetings
- Risk assessments for operations and maintenance, new control measures
- Personal protection equipment hard to find, national shortage
- Staff redeployed: ventilators, masks, sanitary, police force
- Pilot tasks, learned, refined and implemented
- Focus on restarting projects Tank 4 and Target Station 1
- All governance in place for August start up
- High staff conformity, speedy and successful staged return

Take away

- Working from home more transparent through IT: security, Teams/ Zoom
- Teams site now fully engaged
- Much more equipment/plant monitoring taking place
- Working from home courses, training, health and safety, projects





Targets and Experiments

- Instruments left in safe operational state
- Existing users sent home, new users cancelled and staff minimised to health and safety/essential only
- Computers/ broadband/ chairs/ as staff worked from home on project, data analysis, planning tasks, and personal development
- Covid-19 protocols, cabin issues, passing places, airflows
- All tasks risk assessed, building supervised, reviewed line management approval
- Experiment challenges, user samples posted, assembled components
- A new cloud computing software platform called IDAaaS (*ISIS Data Analysis as a Service*) allowed data sharing worldwide

Take away

- Group cohesion via virtual coffee catch ups and open and honest, collective decisions, staff empowerment
- Delivered 1660 User days

RAL Estates

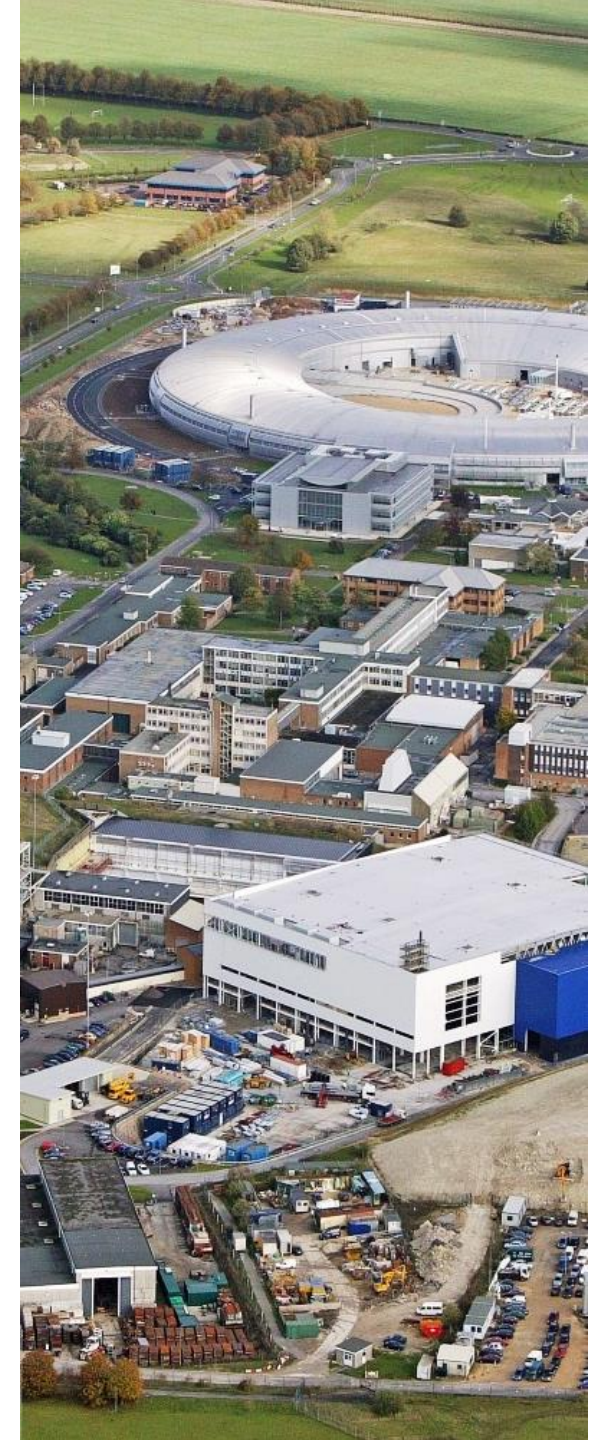
- Responsibility to maintain site security, access, maintenance and safety, Joining each departments' needs into common language and controls
- Learning continuously as knowledge changed: surfaces to airborne
- Supply chain and service providers challenged for PPE availability
- Coordinate local teams to manufacture personal protective equipment: Screens in technology, sanitiser stations in ISIS
- Internal challenges burst water and supply failures
- Important to record all reasons for decisions

Positives:

Estates projects gained budgets, unhindered work, carbon reduction grant to install photo voltaic site wide, site development work

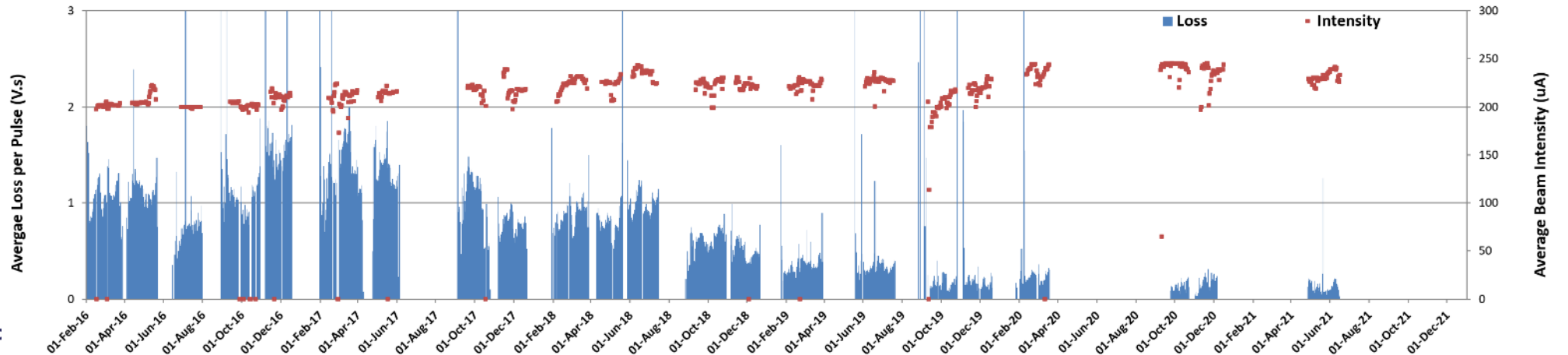
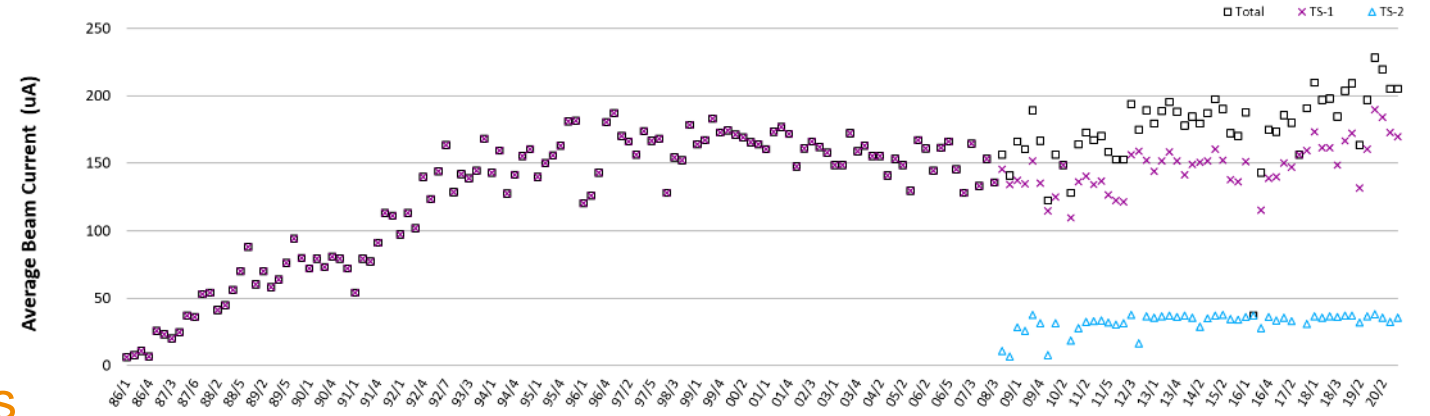
2020/21 Installations

Site	Panels	MWH	Annual CO2 offset Tonnes	Annual Saving
DL	4668	1225	362	£185,000
RAL	8995	3516	932	£410,000
Total	13663	4741	1294	£595,000



Record performance

- Cycle 2019/02 record day **5.64 mAh**
- Cycle 2019/04 record day **5.84 mAh**
 - **Availability 95%**
- Cycle 2020/02 record day **5.87 mAh**
 - **Maximum beam 245 μA for 24 hrs (2 minutes off)**
- **78/107 scheduled days >5mAh in 2020**



Headlines

- Throughout pandemic, there was no evidence of Covid transmission on-site
- ISIS/STFC succeeded in keeping staff safe and avoided long isolation times
- ISIS/STFC complied with all Government advice and guidance
- ISIS gained a lot of experience in how to maintain operations with fewer staff on site and a remote user community
- ISIS has learned some unique lessons that will be factored into the departmental business continuity plan to help us manage future pandemics





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Questions?

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