CIBSE

Energy Performance Group

Our mission

- To improve the energy performance of buildings
- Provide an expert Q&A forum covering key aspects of energy performance
- To enable networking opportunities, promoting collaboration amongst our members
- To respond to and support the implementation of emerging legislation

www.cibse.org/epg

← Back To Special Interest Groups

Energy Performance Group

CIBSE Energy Performance

Energy Performance Group

About

Energy Performance Group Committee

Carbon Bites

Power Hours

Building professionals everywhere have been presented with a real and serious challenge to drastically reduce CO2 emissions and improve building energy performance. In rising to this challenge, CIBSE has created the Energy Performance Group (EPG), a special interest group with a mission to:

Improve the energy performance of buildings by increasing awareness amongst all building professionals and supporting the implementation of relevant legislation aimed at reducing carbon emissions in buildings.

The Energy Performance Group (EPG) is CIBSE's largest Special Interest Group and has over 23,000 members from around the world.

Young Energy Performance Group (YEPG)

The YEPG has emerged into the light and is gathering members at pace!
Find out more

Related content

News

CIBSE revises Energy Performance Guidance

→

Knowledge

TM52: The Limits of Thermal Comfort: Avoiding Overheating in European Buildings

→

News

Spending Review must support innovation to improve resilience and cut carbon emissions

→

Knowledge

www.cibse.org/epg

Join a Group **today for free**

To join a CIBSE Special Interest Group simply log in or register for MyCIBSE. Once logged in select the Groups & Networks tab and tick the Group you want to join.

Join for free today →

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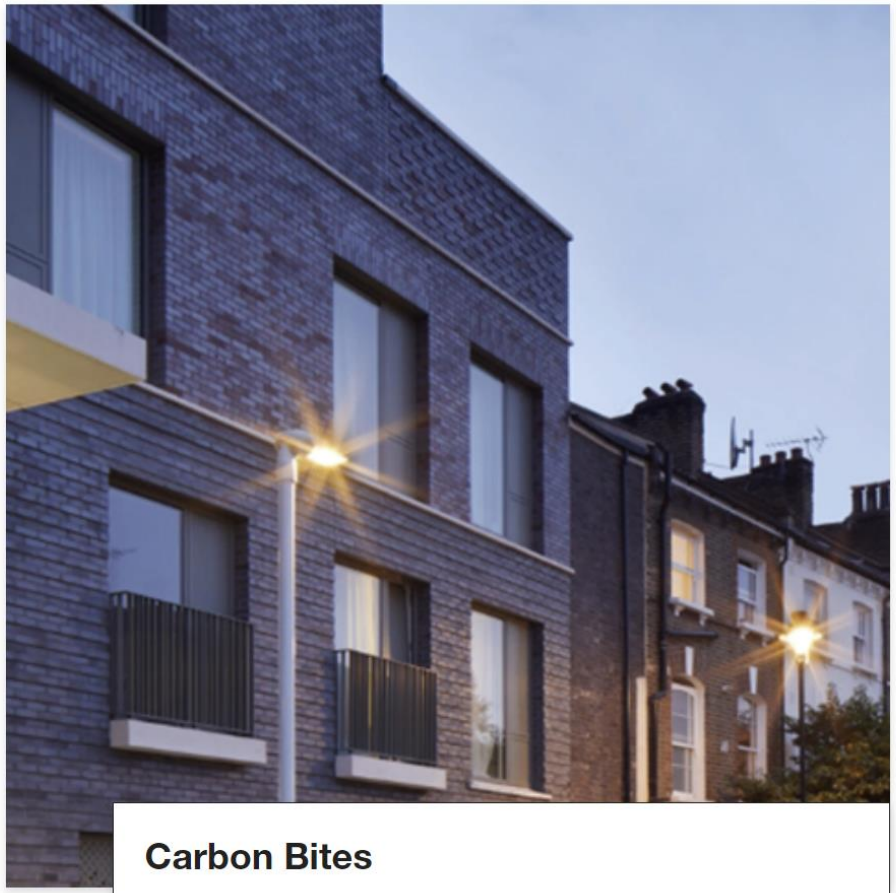
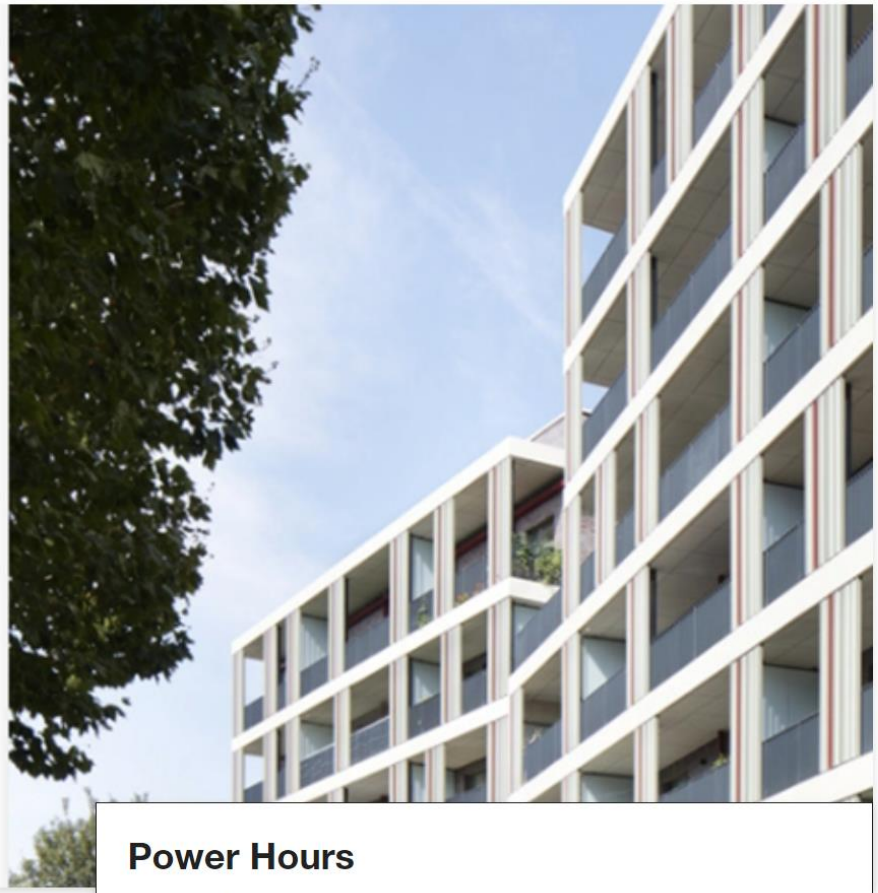


Carbon Bites

Carbon Bites →



Power Hours

Power Hours →

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Coming up next

- A joint event with the Young Energy Performance Group - Date TBC
- Member profiles on social media

TM67: The Electrification of Buildings for Net Zero

Tony Day

tony@tonyday.co.uk

About Tony Day

- Independent energy research consultant with over 35 years experience in academia and industry focusing on energy in buildings
- Chair of the TM 67 working group

Technical Memorandum 67

The purpose is to highlight:

- The role of electrification of buildings for Net Zero (energy and carbon)
- The key challenges at the generation, network and building levels
- The latest thinking on system design and operation and point to existing guidance
- The need for new guidance and further research needs
- Design *and* operational considerations
- The transfer of new loads to the electricity network

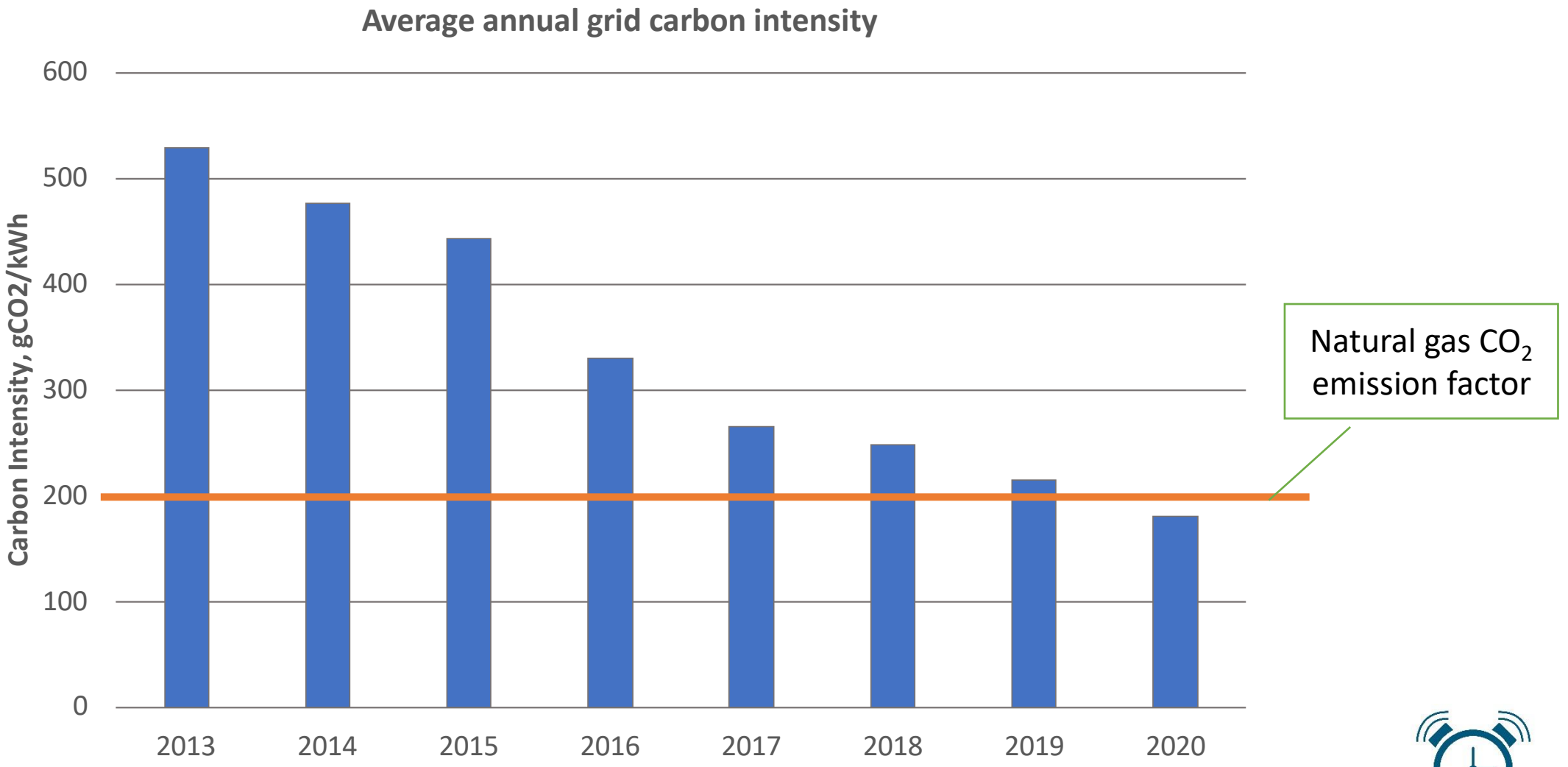
You can find TM 67 at:

https://www.cibse.org/knowledge-research/knowledge-portal/tm67-electrification-of-buildings-for-net-zero-pdf-only

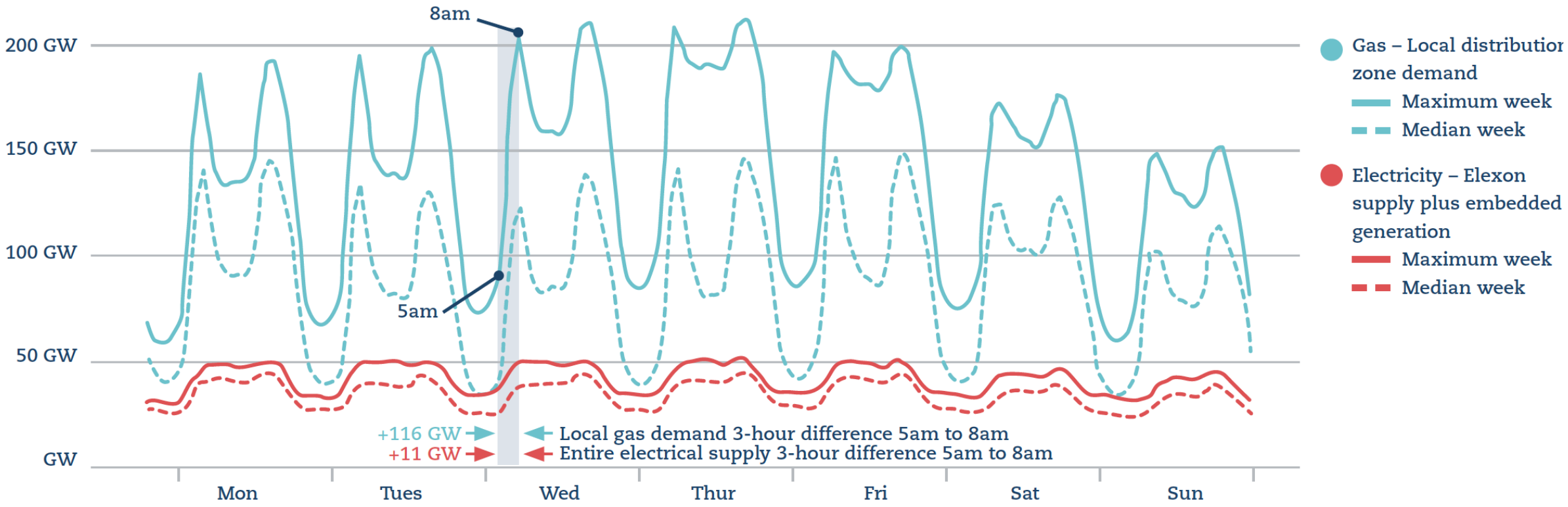
Areas of focus in TM 67

- Electrification of heat
  - Heat pumps
  - Thermal storage
  - The role of resistance heating (e.g. DHW)
- Self-generation and electrical storage
  - PV (or other micro-generation)
  - Batteries
  - Smart and interactive controls (e.g. with ToU/dynamic tariffs)
- Electrification of transport

UK Electricity System Carbon Intensity



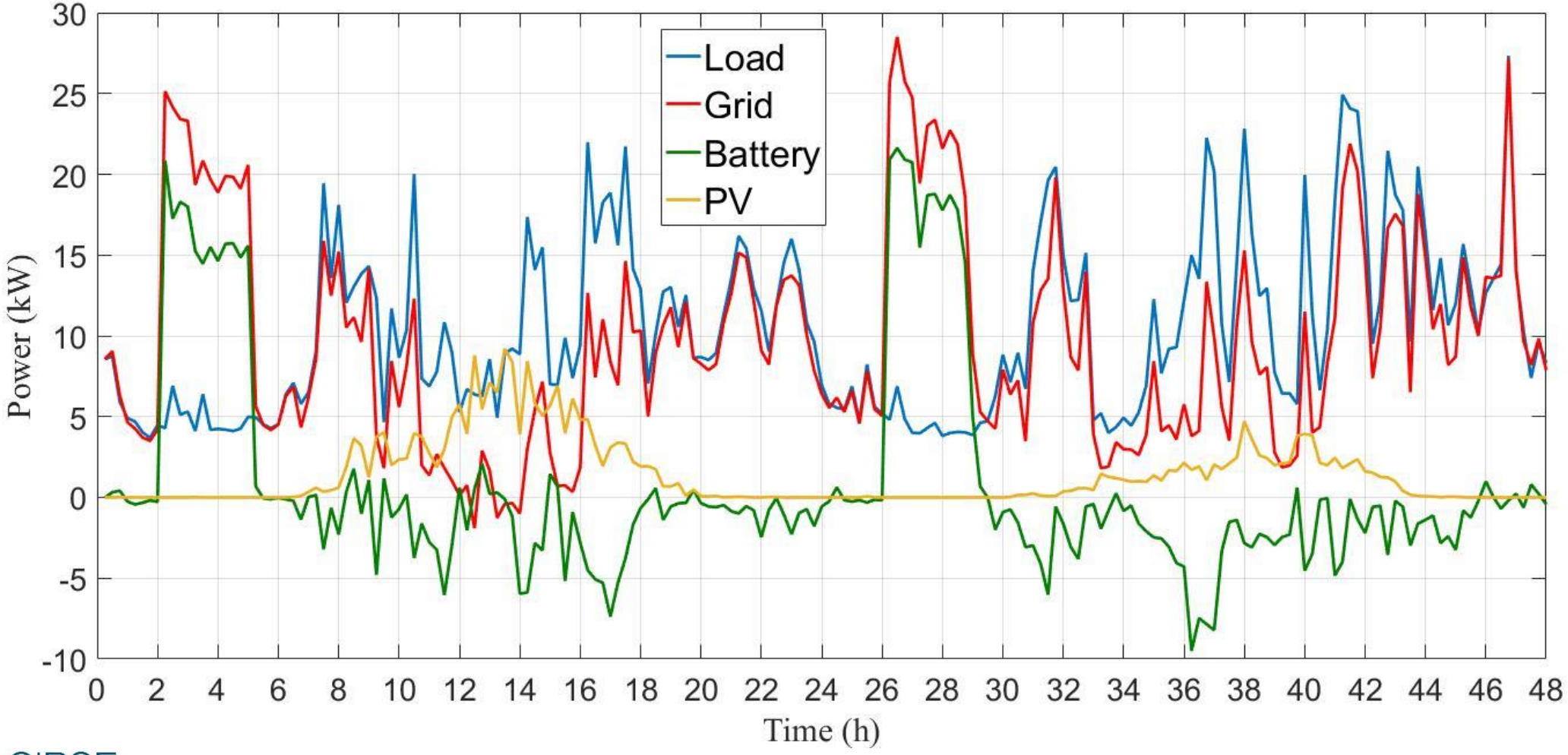
Gas and Electricity system demand



Key issues

- Reduce overall energy use (kWh)
- Reduce instantaneous demand (kW)
- Identify responsibilities and ownership of issues
- Provision of energy storage
- The transfer of transport energy to buildings' supplies
- Digitalisation of energy
  - Data analytics and data value
  - Data ownership, storage and security
  - Communications protocols

Complexity


Load
Grid
Battery
PV
Power (kW)
Time (h)
30
25
20
15
10
5
0
-5
-10
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48

Digitalisation and data management

- Increased volume of data, in energy, carbon and money:
  - Who owns it?
  - Where will it be stored?
  - How secure does it need to be?
  - What standards need to be in place?
- UK Open energy Project https://openenergy.org.uk/
  - Developed from the findings of the Open Energy Task Force https://es.catapult.org.uk/reports/energy-data-taskforce-report/
  - Governance, visibility of data and assets, data value and asset registration

Responsibilities

- Designer
  - delivery of requirements, energy and carbon performance, costs
- Network operator
  - security of supply, connection costs
- Owner/operator/end user
  - effective and efficient operation, costs, carbon, contractual relationships
- Aggregators
  - system operation, operating costs, balancing
- Energy suppliers
  - data, pricing, carbon intensity, security of supply

Challenges for rapid electrification of buildings

- Transferring energy from gas and oil to electricity network, and adding entirely new loads such as transport.
- Constraints on the national and local electricity networks:
  - Electricity network investment and operation
  - Resistance to change (e.g. stranded gas assets)
- Ownership of the risks:
  - Who is responsible for the safe and reliable operation of the overall system?
- New guidance for designers to keep pace with technology and design thinking
- Supply of skills for required rates of installation
- Evidence of operational performance to reduce perception of risks
- Data: ownership, analytics, security

Thank you!

Tony Day

tony@tonyday.co.uk

Distribution System Operation (DSO) Flexibility Markets as an Enabler for Net Zero and Electrification

Daniel Burke

SSE Networks - Distribution Network Operator

Local Energy Oxfordshire

transition
Moving to a smart future

Scottish & Southern Electricity Networks

University of Oxford

Oxford Brookes University

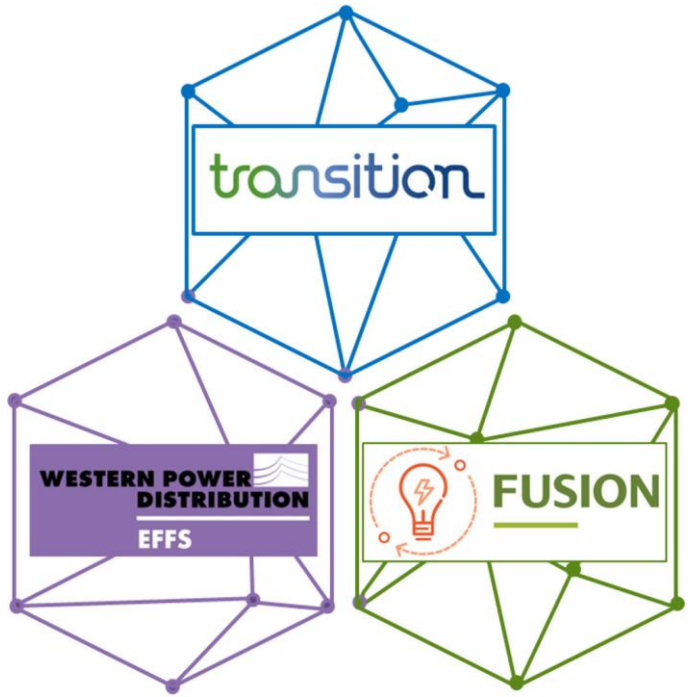
low carbon hub

Oxfordshire County Council

NUVVE

Oxford City Council

piclo



EDF ENERGY

Origami
POWER OVER ENERGY

With funding from

Industrial Strategy

UK Research and Innovation

RIIO

NIC
Network Innovation Competition

ofgem

Whole System Thinking in Projects LEO/TRANSITION

Smart

Technologies and Platforms

Smart

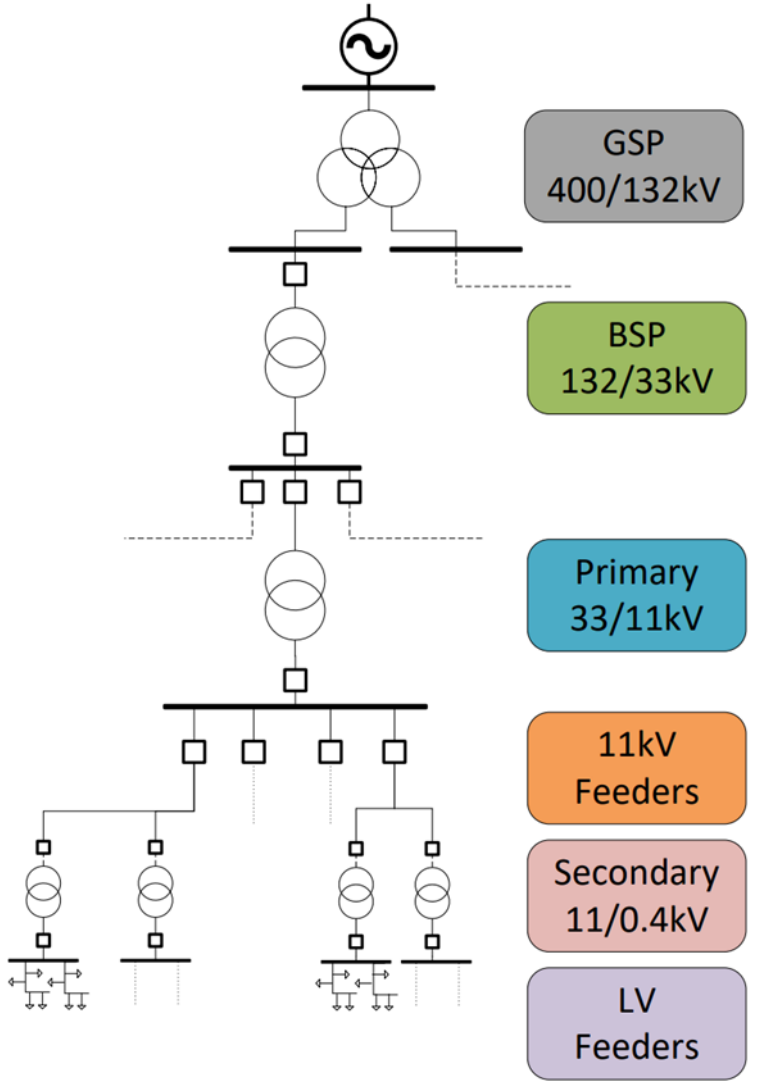
Markets and Commercial

Smart

Informed and Engaged People

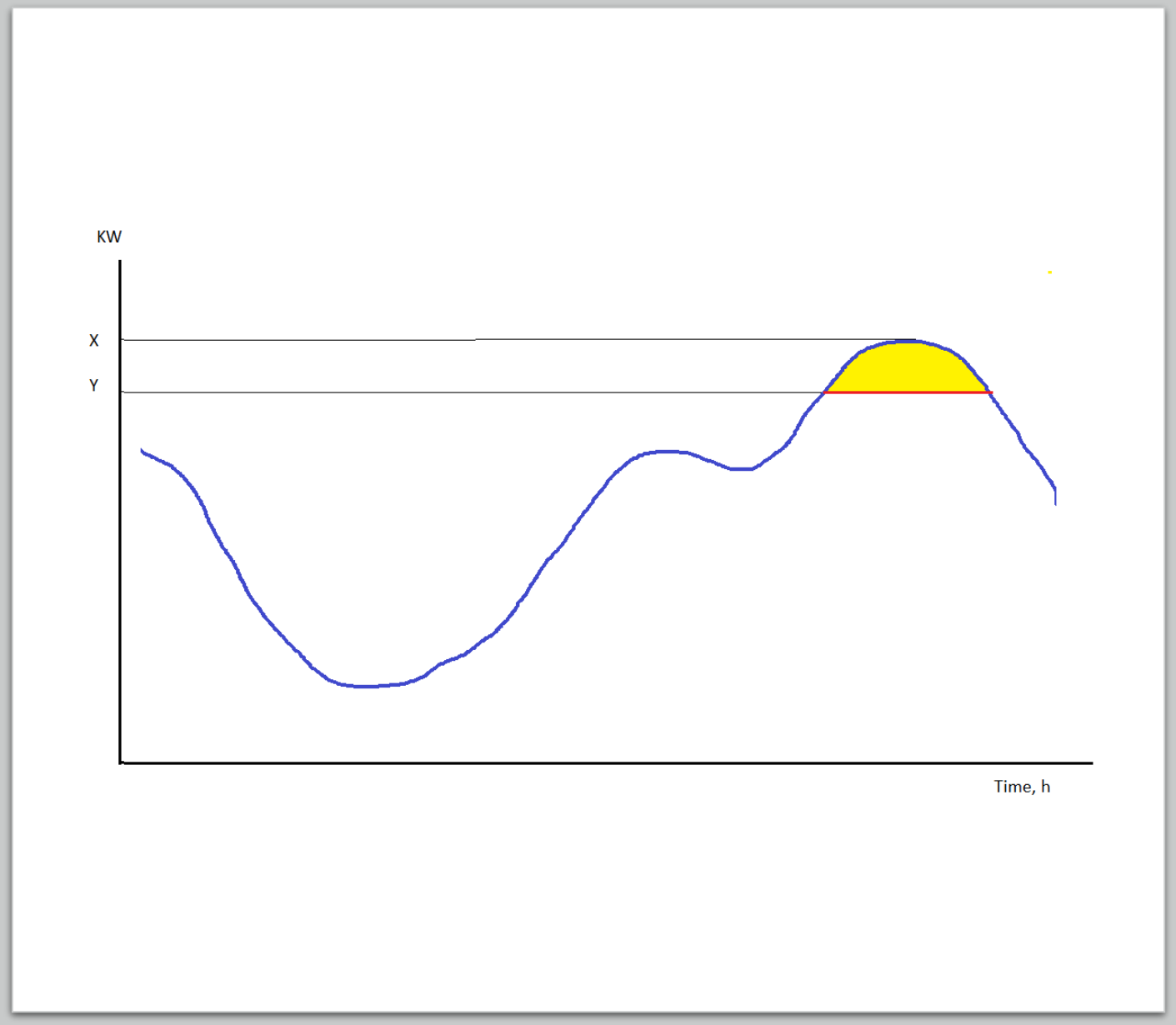
Understanding the Electrification Impact on Networks

- Electrification will create new constraints on the distribution network
- Traditional reinforcement is not a realistic solution
- We need to get smarter how we design and use the network
- "**Flexibility First"** is the key

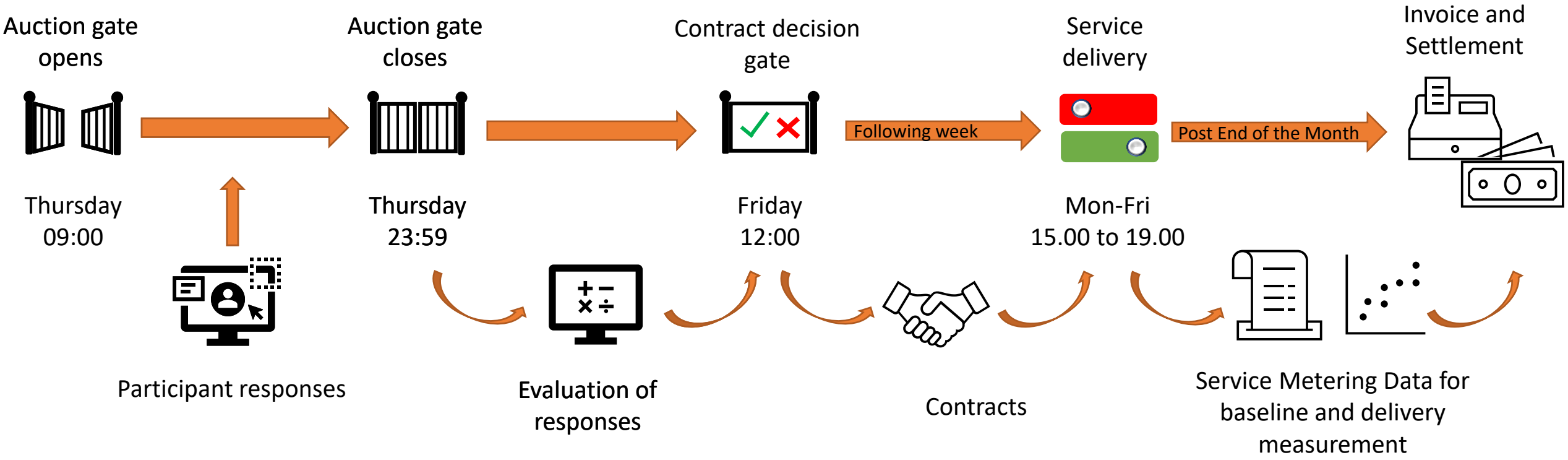


What is Flexibility?

- Flexibility is a change in the consumption of generation patter as a result of a signal from the network operator
- There would be a direct financial incentive for customers to deliver this flexibility to the network operator
- Projects LEO and TRANSITION are trialling a number of new innovative approaches to explore how this can work at scale

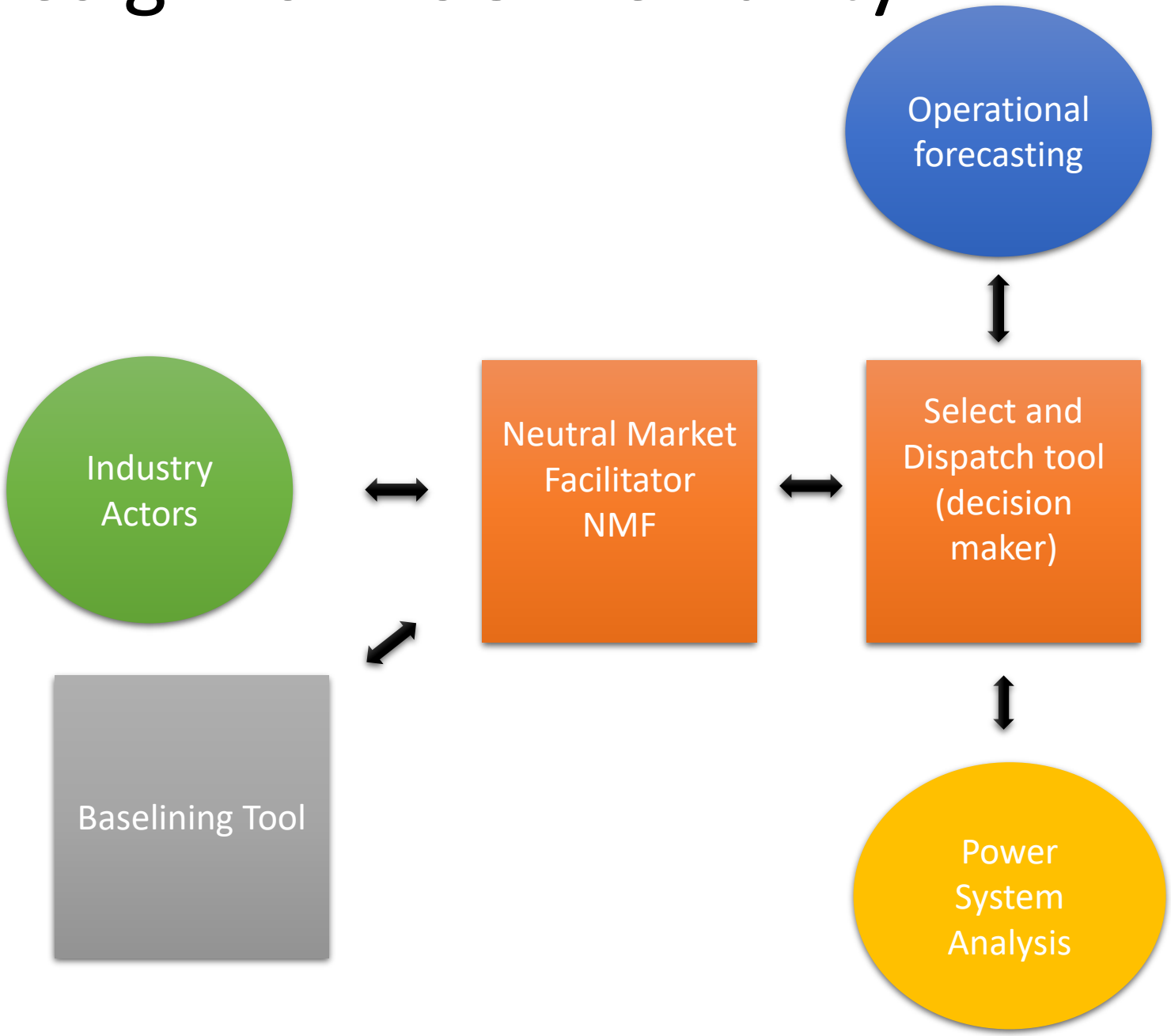


A Day in the Life of a Flex Service



- We have now trialled this process with tangible flexibility delivered by local energy resources in Oxfordshire including:
    - Battery storage
    - Vehicle to Grid
    - Library air conditioning unit

System Design for DSO Flexibility Market



How Can We Scale This?

- DSO Flexibility Markets are still in their relative infancy of development but will need to scale quickly and soon

- Some important enablers of this from all actors across the industry:

  - Clear sign-posting of opportunities, requirements and responsibilities to take part in these markets

  - Simplicity of customer journey through the process : in particular for the “small and many”

  - Making flexible assets ready to take part, and creating a significant base of assets to take part
    - Building management systems, EV chargers, controls etc to be flex ready as possible
    - Automation is likely to be a key enabler, rather than human in the loop processes

  - The importance of a fertile electricity supplier/“aggregator” actor space to be an intermediary in the industry between network operators and the management of the end consumer interaction

Thank you

- find out more -

www.project-leo.co.uk/

www.ssen-transition.com

Open Networks: developing the smart grid - Energy Networks Association

Decarbonisation of Existing Assets

Jen Elias, Principal Building Performance Engineer, AECOM
jennifer.elias@aecom.com

AECOM

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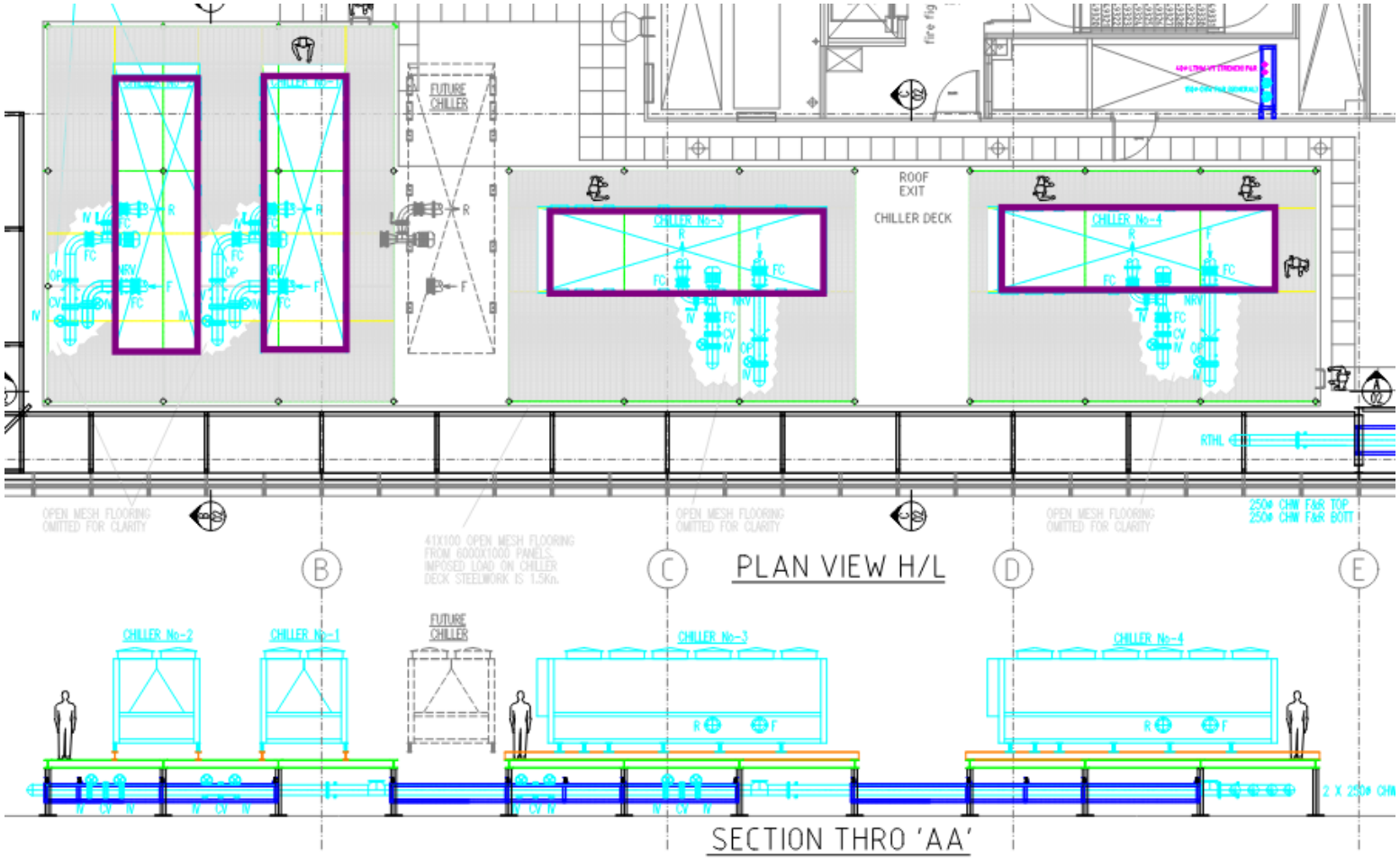
Leading Considerations

- Available Space
- What capacity is actually necessary?!
- Considering Building Performance
- Considering tenants & occupiers

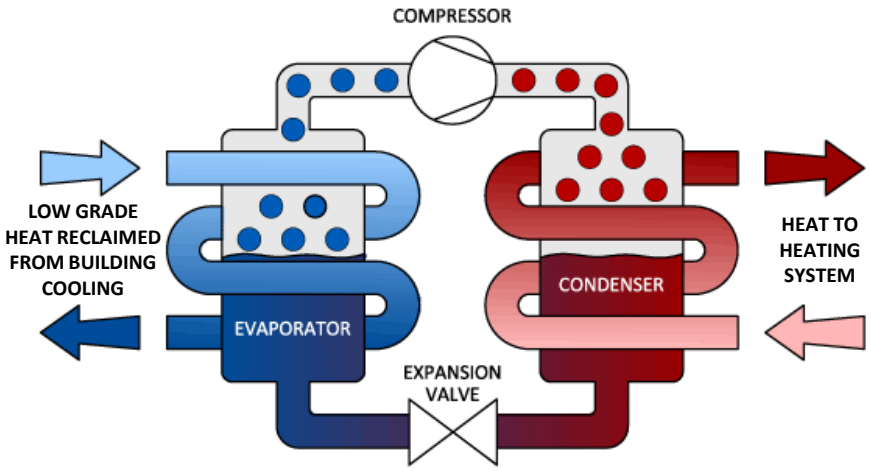
Plant space (Low Temperature Hot Water)

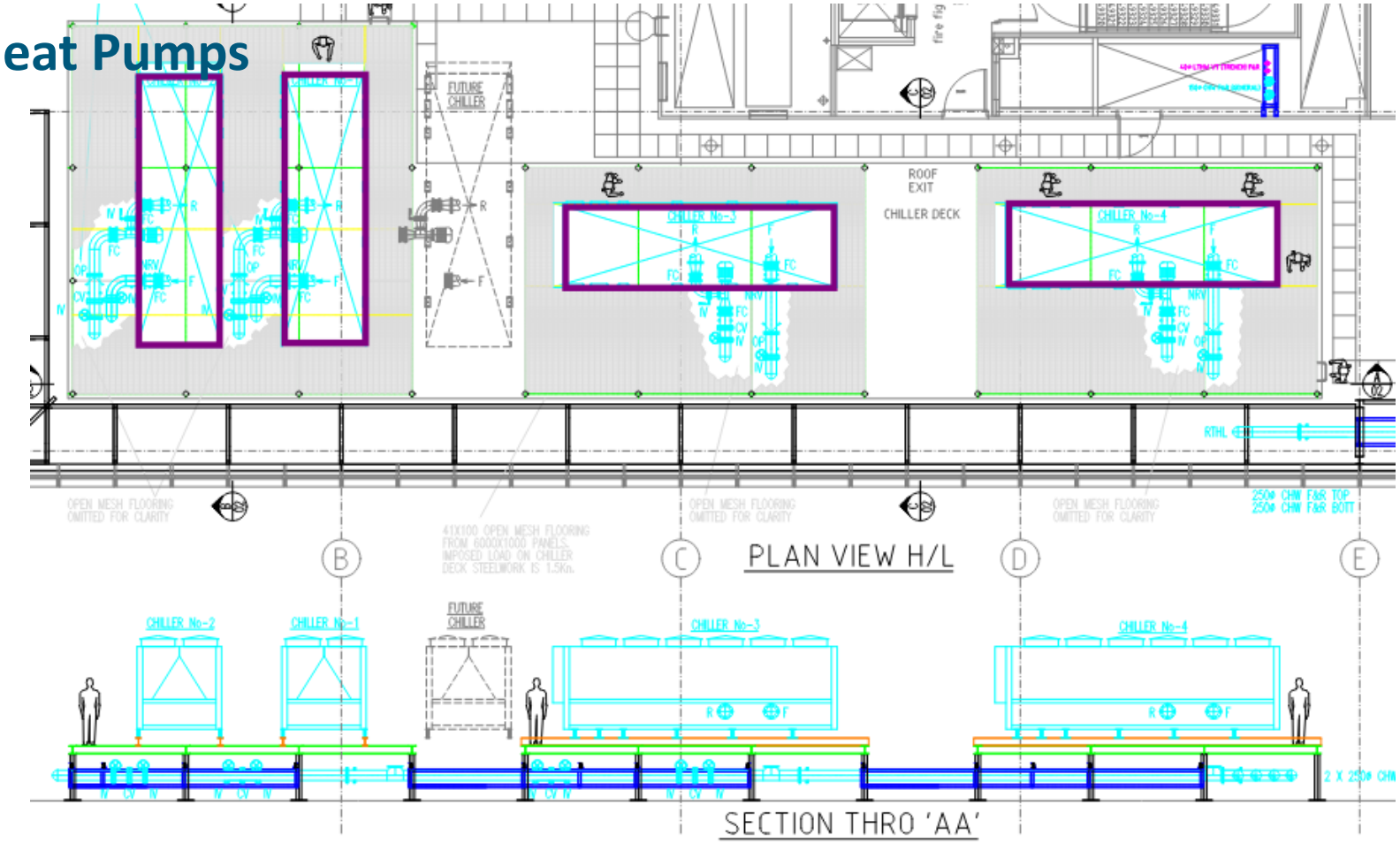


Plant space (Low Temperature Hot Water)

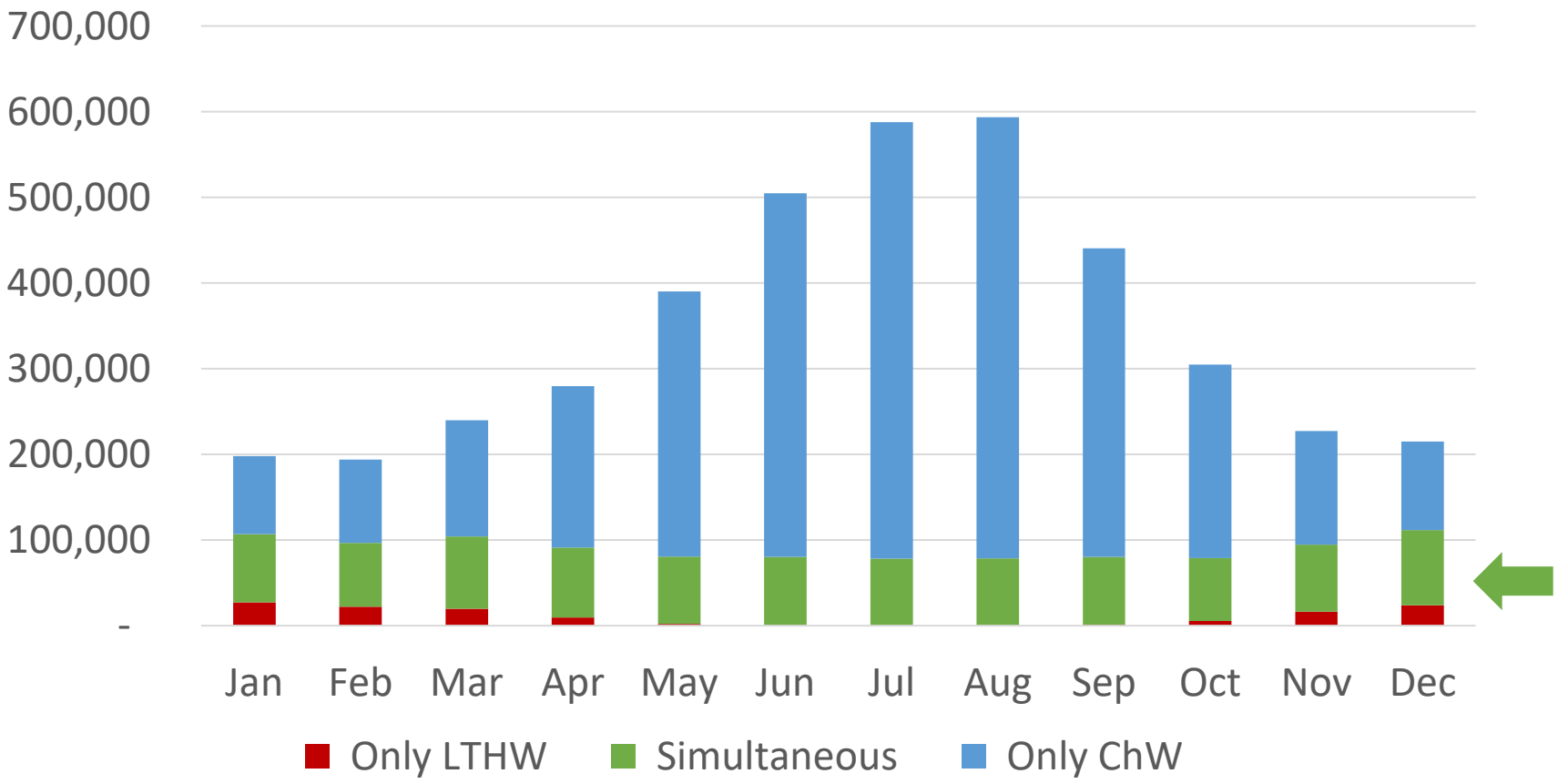
Simultaneous (Heat Recovery) Heat Pumps

- Typically only slightly larger footprint than existing chillers





Plus energy savings!



Simultaneous operation:
Heat recovery, TER >6!

Necessary Capacity (Cooling)

In the absence of a specific occupier requirement….

Key criterion	2019 *Guide*	2022 Update
Cooling loads – *continued*		
On-floor equipment cooling loads		
Typical office:		
On floor peak	20 W/m²	5 W/m²
Terminal unit	17 W/m²	10 W/m²
Central plant	14 W/m²	Designer's discretion on diversity reflecting the size and use of the building

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BCO

British Council for Offices
Position Paper
June 2022

BCO GUIDE TO SPECIFICATION KEY DESIGN CRITERIA UPDATE 2022: A POSITION PAPER

The Key Criteria in the 2019 British Council for Offices (BCO) *Guide to Specification*[1] were informed by research and market trends before the wave of concern about climate change and prior to the COVID-19 pandemic. With some degree of normality returning to the workplace, now is the time to revisit the Key Criteria to better reflect the net zero carbon (NZC) agenda and the changing patterns of use.

The single most important criterion is occupancy – it drives all the others – and we need your help to set a new benchmark. The last definitive occupancy research was carried for the BCO in 2018, and it showed that, on average, most offices allocated around 10 m² to each worker, with 40–60% utilisation of the space.

Post-pandemic, working patterns have changed but have yet to settle down. However, the emerging trend is for hybrid working, with many staff working at home for some of the week. Mondays and Fridays are quiet; Tuesdays, Wednesdays and Thursday are the busy days; Wednesday has the peak occupancy. Early observations show that the peak occupancy is lower in most offices than recorded during the most recent occupier density research carried out in 2018. Further research has been commissioned by the BCO and will report later in the summer.

The current view is that occupancy peaks will be no greater, and utilisation no higher, when the return to work has stabilised. The 2019 criteria were pitched to cater for high-intensity use. While that may have been appropriate at the time, the aim now is to specify for the needs of the majority rather than those of extreme cases. Offices should avoid overspecification, minimise waste and move progressively towards NZC, in both construction and operation.

This position paper sets out the BCO's proposal for a single workplace density occupancy criterion of 10 m² per work setting and a utilisation of 60%, for typical office use. This

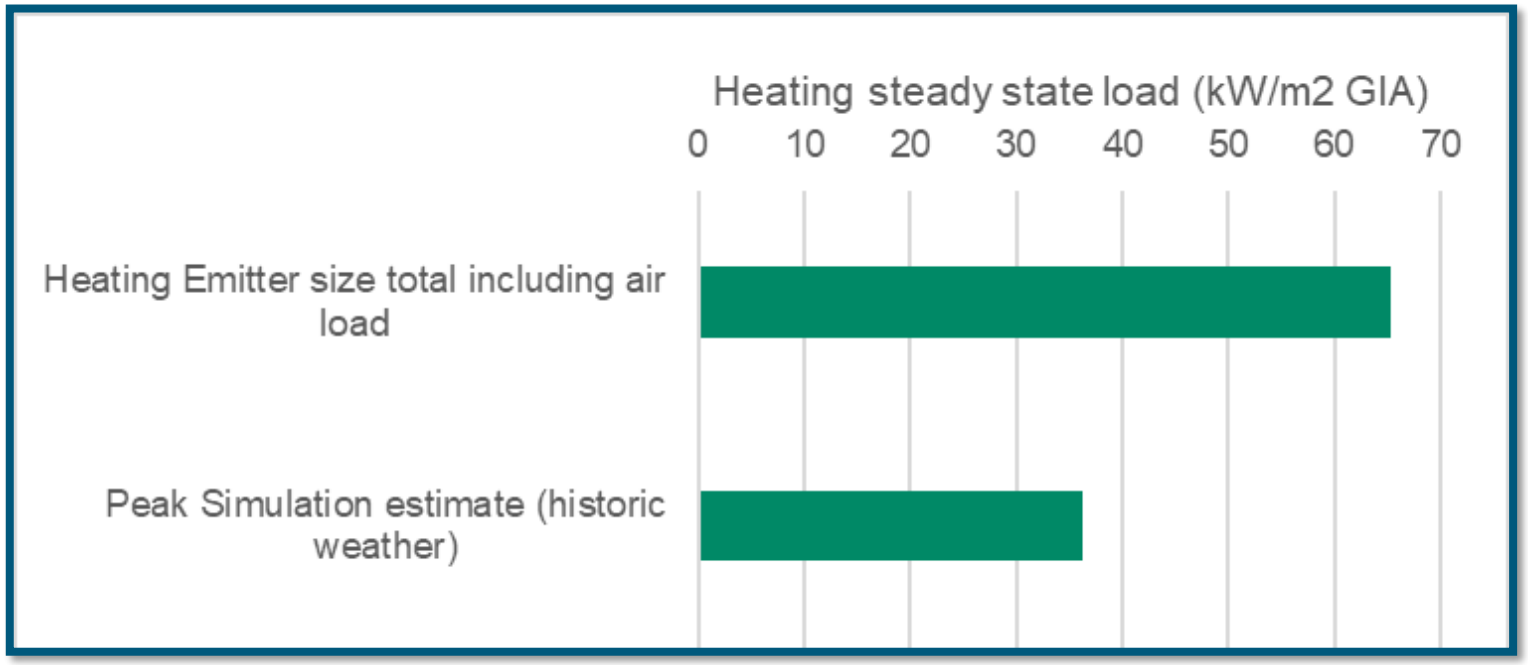
compares to the often de facto application of the 2019 *Guide* recommendations for high density and high intensity use of 8 m² and 80%. This is expected to be controversial. It is a big change, and will be viewed differently by the different stakeholders.

The proposal will be influenced by the outcome of the occupancy research but will also consider likely changes in occupier strategy. Occupiers may choose to exploit the agile working prompted by hybrid attendance, perhaps reducing their floorspace, increasing workspace sharing and forcing up utilisation. The BCO team working on the revision of the BCO *Guide to Fit-Out*[2] will inform this debate.

In the meantime, 800 delegates will gather in Manchester for the 2022 BCO conference – the first full event since before the pandemic. It will be an ideal opportunity to gauge the views of the broad membership, and debate the proposals. Please read this position paper, join in the discussion, and help shape the next generation of offices.

Join the conversation and discussion by sending your comments to research@bco.org.uk or mail@bco.org.uk.

Necessary Capacity (Heating)



-4 degrees outside
No internal gains

0.5 degrees outside
Overnight standby power gains


How much of the office do we really need to heat in the middle of winter..?

Heat Pump efficiency

Heat Pump Efficiency drops as Flow Temperature increases:

- **Boilers: ΔT = 20 (80F – 60R)**
- **Heat pumps: ΔT ~ 5-6 degrees**
  55F-50R (poor efficiency) vs
  48F-43R (better efficiency)

Heat Pump efficiency

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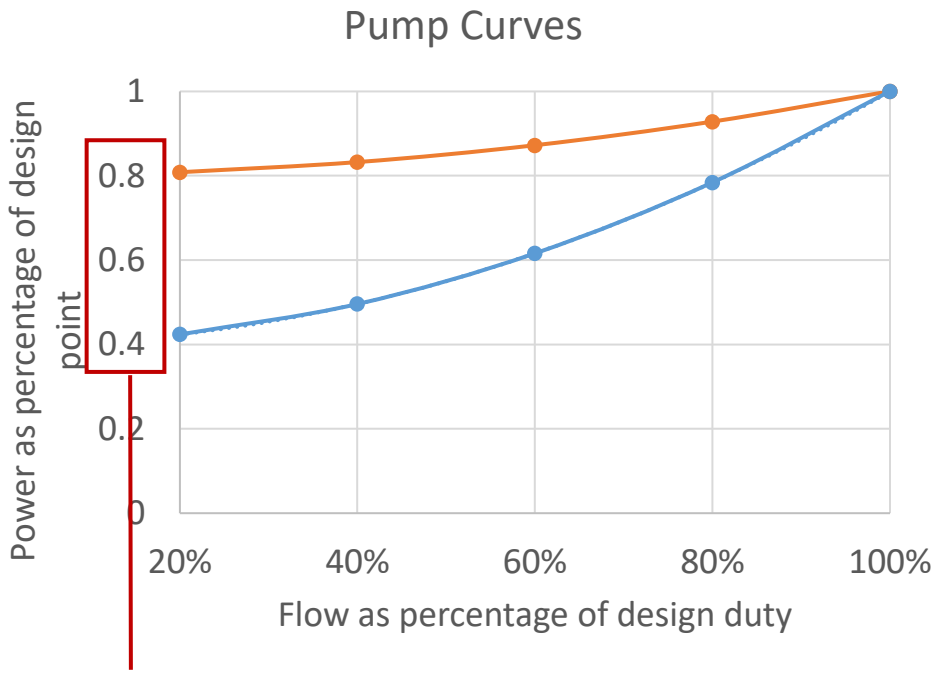
As ΔT drops, pump energy increases

… be careful as many heat loads are 24/7



Large pumps operated long hours (even at very low flow) use a lot of energy!

Heat Pump efficiency

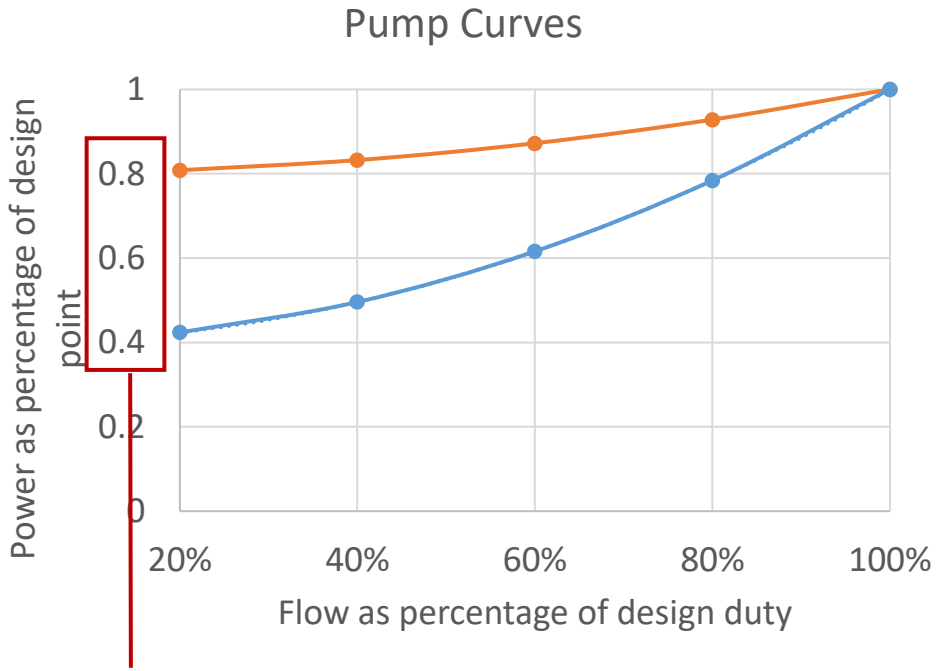
Heat Pump Efficiency drops as Flow Temperature increases:

- **Boilers: ΔT = 20 (80F – 60R)**
- **Heat pumps: ΔT ~ 5-6 degrees 55F-50R (poor efficiency) vs 48F-43R (better efficiency)**

… but onfloor works may be required to deliver output

As ΔT drops, pump energy increases

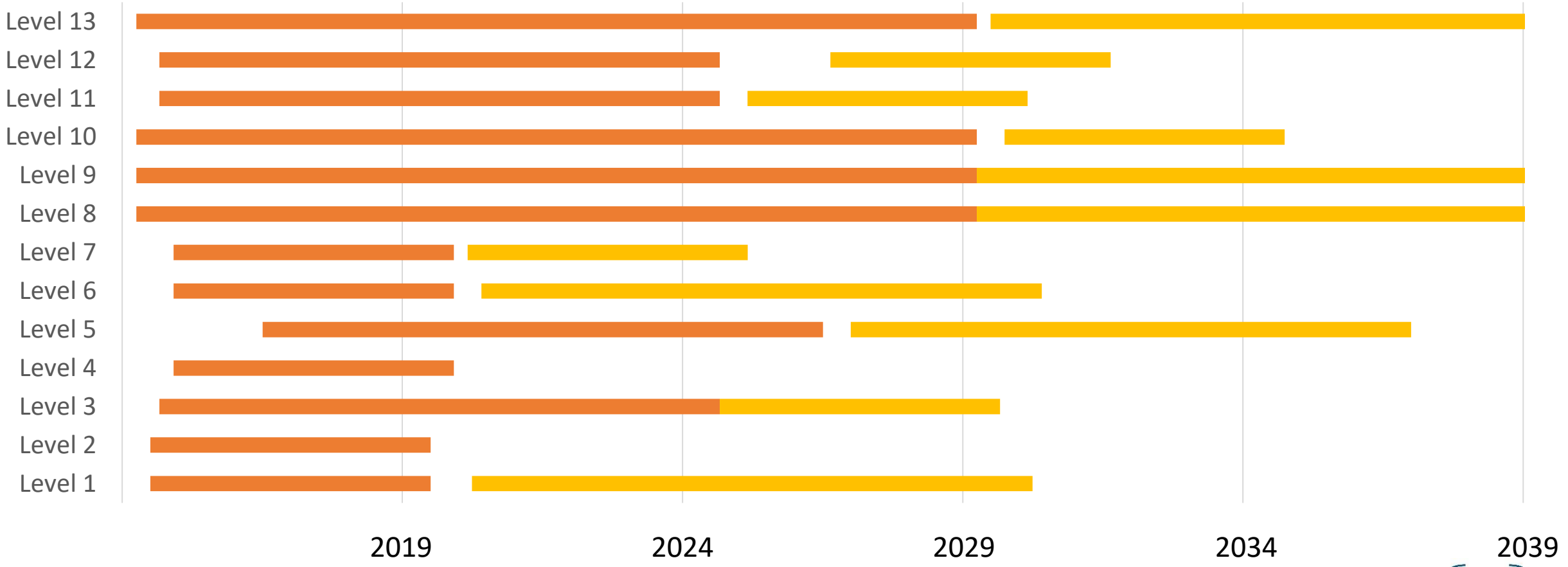
… be careful as many heat loads are 24/7



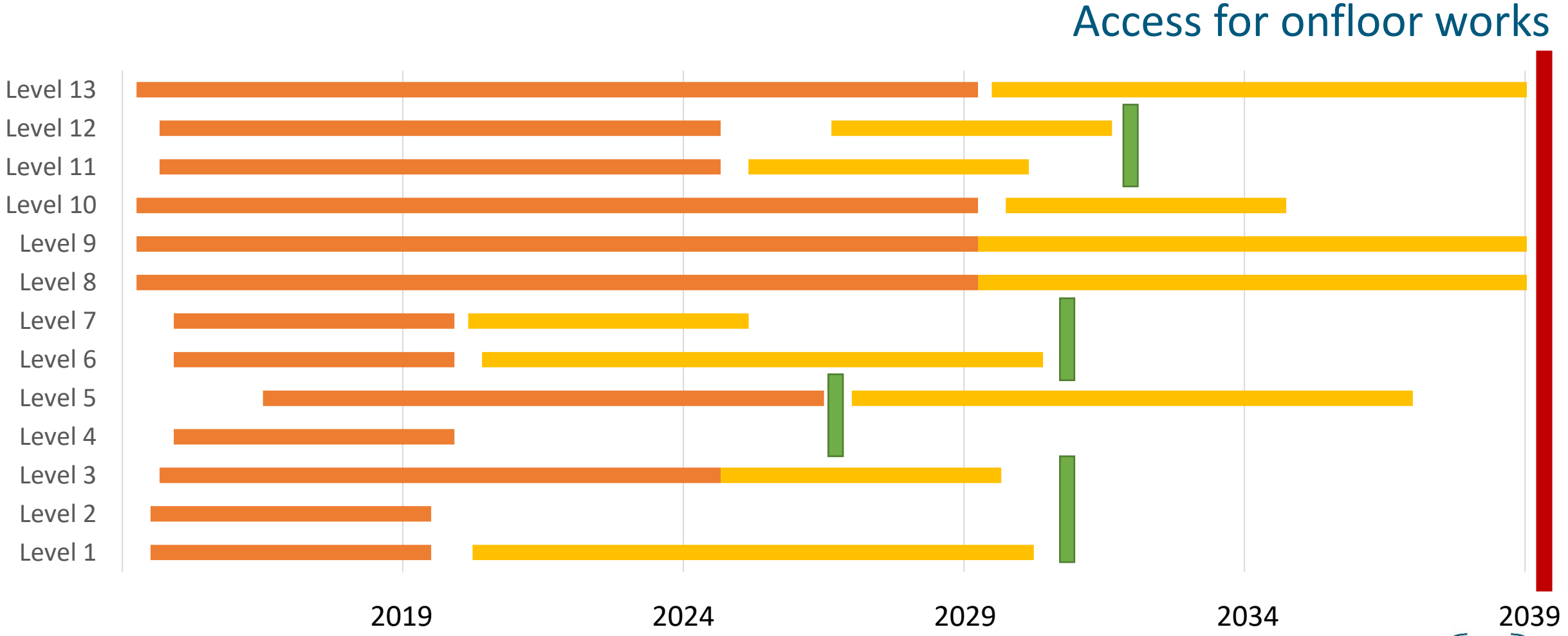
Large pumps operated long hours (even at very low flow) use a lot of energy!

Planning Works Onfloor

Lease dates



Planning Works Onfloor



Overcoming barriers to heat pump upgrades…

Capital Cost & Space

- Assess whether like for like replacement is necessary:
  - Given measured loads
  - Factoring in the future of work

Operational Cost

- Look holistically for energy savings:
  - LED lighting and controls
  - 4-pipe heat pump/chillers
  - Flow/return temperatures & pump sizing
  - Fabric upgrades

Working with tenants

- Develop a whole building plan

Thank you!