Data Centre Sector Position Statement
September 2021

IED/EPR and Data Centres

Summary
Air quality is an important issue, and pollutants like oxides of nitrogen (NOx) are injurious to health. In the UK our air quality is not as good as it should be and NOx is a particular problem in urban areas. Data centres make a negligible contribution to overall levels of pollutants like NOx, but have the potential, because of embedded diesel generating capacity, to have short term local air quality impacts. IED is a legislative instrument that controls pollution from generators but is poorly designed for emergency standby plant in data centres. As a result it is disproportionately burdensome for operators to comply.

The Environment agency is now insisting that operators meet requirements relating to NOx emissions that may be costly but ineffective. These requirements have not been the subject of due diligence or cost benefit analysis, have not been formally discussed or consulted on with either the supply chain or the data centre industry, so we don't know whether they are appropriate for the sector. Moreover the details have not been finalised or proactively communicated and have not been formally published. Most importantly, no forward timetable has been set for compliance. As a result, they are causing significant confusion within the sector and making it difficult for UK operators to meet their contractual obligations. Operators are not arguing against the need to mitigate air quality impacts, nor against the additional costs that procuring compliant plant will impose in future, but against the lack of formal notice.

Data centre operators take their responsibilities to minimise air quality impacts seriously. They fully understand the need to minimise NOx emissions and are committed to, and will invest in, appropriate solutions. With healthy growth in the sector more sites will need to comply with IED requirements in future. Development schedules have to meet challenging deadlines and long order items like generators are procured years in advance. So these requirements need to be communicated clearly to operators, developers, construction teams, designers and supply chains and with enough lead time to enable the market to prepare and comply. This is currently not the case.

The sector therefore seeks a more open dialogue with relevant stakeholders on how best this should be achieved, with a timetable established for implementation. The following notes provide context for this dialogue and further detail on the more contentious areas of permitting.

What are data centres?
Data centres[i] are highly resilient facilities that underpin our modern economy by processing, storing and transacting digital data and, with communications networks, form our core digital infrastructure[ii]. Besides underpinning all online activity, data centres enable retailers and banks to process financial payments, supermarkets to resupply, delivery companies to manage logistics and public authorities to deliver services and messaging. Some sites are officially deemed CNI (critical national infrastructure) to reflect the nature of the activity being managed therein.

Where do generators come in?
Data centres run on electricity but most facilities maintain standby capacity in the form of diesel generators to provide continuous power in the event of an emergency like grid supply failure or a drop in frequency[1]. Computer servers are vulnerable to even the shortest perturbations in supply. Larger sites typically have

[1] See: https://www.techuk.org/images/techUK_TechCttee_Briefing_Emergency_Generation_1701.pdf

dual feeds to the grid to minimise risk from local supply disruption. Diesel generators are the default solution because they can provide the highest concentration of power in the shortest time, and reserve fuel supplies can be stored safely on site.

Which regulations are causing the problem?

The Industrial Emissions Directive (IED) applies to installations with thermal input of 50MWth and above and includes standby plant. Some data centres in the UK have sufficient on-site emergency generating capacity to require IED permits and in view of the current trend towards fewer, larger facilities, more operators are likely to find themselves obliged under this regulation in future. However, awareness is patchy, not least because IED is implemented differently according to nation state, and also because the legislation has been poorly communicated and the government guidance available is extremely difficult to interpret.

What is IED all about?

IED is one of a suite of regulatory requirements targeted at pollution control. As an EU Directive it is implemented through domestic legislation in the UK: EPR – Environmental Permitting Regulations. While it controls all forms of emissions to air, water and ground, air quality is the key factor in a data centre context. Generators emit oxides of nitrogen and sulphur, CO_2 and particulate matter. Oxides of Nitrogen (NOx) are of particular concern because UK levels are higher than they should be and NOx is injurious to health. Data centres with installed diesel generating capacity are point sources of NOx. Although these generators rarely run, they have to be tested periodically and in the event of a grid outage may have to run continuously until the problem is fixed. While emergency running is exceptionally rare, the generators will inevitably emit some NOx during testing and have the *potential* to emit greater levels of NOx into their local environment if there is an emergency. While the overall contribution of data centres to UK NOx levels is miniscule, data centre generators could have short term impacts at local level. Some data centres are located in areas where local NOx emissions are approaching, or regularly breaching, legal thresholds and/or where there are sensitive receptors, by which we mean hospitals, schools, care homes and people in the vicinity with existing respiratory problems. Data centres are also clustered and one concern is that a major power outage could result in multiple facilities resorting to emergency generators and collectively creating an air quality exceedance. The likelihood of this scenario is subject to ongoing discussion.

Why do operators struggle with IED?

The characteristics of generator operation in data centres, where we have high standby capacity but very low activity, pose a number of challenges for operators undergoing IED permitting. Typically, generators are run regularly for testing and maintenance, usually on low load for short periods of time. This means that mitigation like secondary abatement (where catalytic converters are bolted onto plant) is ineffective because during test runs the temperature threshold at which the catalytic converters become effective is not reached. A few types of secondary abatement invalidate manufacturers' warranties but this is rare.

IED also poses a challenge for operators because it represents a change in policy direction: for decades the sector has been focused on purchasing generators on the basis of fuel efficiency in order to reduce carbon impacts associated with scope 1 emissions from plant. Policy now requires operators to purchase generators on the basis of their air quality performance and the regulator is seeking to impose a 2g limit (see below) for NOx, a major pollutant. The problem is that there is a trade-off between fuel efficiency and air quality. Simplistically, you cannot have your cake and eat it. While operators accept that the policy priorities have changed, and will accept lower fuel efficiency, generators are a one-off purchase which

means older plant will not be replaced although it may not meet the new specifications. This has been recognised by the EA when permitting established sites, which has been welcomed by the industry.

What is this 2g thing?

The Environment Agency considers that new generating plant should not exceed emissions of 2000mg NOx per M^3 at environmental conditions standardised to 5% O_2. In practice this defines the maximum allowable concentration of NOx in the exhaust for a given oxygen level. This can be calibrated for other oxygen concentrations by a series of calculations. The EA has stated that the applicable standards for data centres are 2gTA-Luft or Tier II USEPA. The former sets requirements at 2000mg/m^3 NOx; 650 mg/m^3 for CO; particulates and dust 130 mg/m^3 and 150 mg/m^3 for hydrocarbons (all at reference conditions and 5% O_2).

Why are operators objecting to the 2g TA Luft Standard in particular?

The industry is not objecting in principle to a 2000mg threshold being applied in future. However, there are concerns with the choice of 2G TA Luft as a standard because it has a number of shortcomings; it is not a standard but more a contractual specification and it is interpreted variably depending on customer requirements; it was introduced in Germany to address a specific pollution problem from legacy plant. It was not designed for standby plant and is inappropriate for this application. Moreover it has been discontinued and therefore the supply chain is not minded to invest in further research and development of compliant plant.

Operators are also concerned that the performance of 2gTA Luft compliant plant may not be materially different from non-compliant plant in the operational scenarios typical of data centres, where generators are usually only run for testing and maintenance purposes. Meeting the 2g emissions level can also have a significant impact on power output – anecdotally we understand that plant can only be run at 75% load if it is to comply. The obvious result is that operators must purchase larger units to achieve the same output and guarantee operational resilience, or more units. The problem is that they may not be able to fit these on the site, so they cannot provide resilience for the activity therein and cannot meet their contractual obligations. Using more machines to achieve the same load will also erode the net benefit of 2G TA Luft compliant plant.

The other standard referenced by the EA is US EPA Tier II, of US origin and unlike TA Luft, a genuine standard and relevant for standby plant. This may be a better solution but due diligence is needed to ensure it is appropriate for data centre generator runtime characteristics.

Supply chain and operational resilience

Operators are reporting very limited availability of 2g compliant plant in the unit size that they need. In some cases the only plant available is physically too big to fit within the site. It is also essential that the imposition of an emissions standard does not restrict the supply chain for plant in a way that limits choice, imposes geographical or supplier bottlenecks or creates market distortion. Diversity of supply is critical for sector resilience.

What else can operators do to minimise air quality impacts?

Other options already being adopted by operators are to schedule test runs at times where ambient air quality is likely to be better, to stagger running so that the impact is spread, to increase stack heights and improve dispersion. Operators are also considering switching to biofuels although as yet there is no peer reviewed scientific evidence that these reduce emissions levels at the point of combustion.

Why are operators so upset about the permitting process?
There are two fundamental problems:

1) Legislative shortcomings: The IED legislation as currently enacted is inappropriate for this application, imposing a regulatory burden wholly disproportionate to the outcome. It is unlikely that data centres were considered when it was formulated and a more bespoke approach to minimise and mitigate data centre air quality impacts is urgently required. This does not mean compromising on ambition or requirements, but we must ensure that they are proportionate and deliver meaningful outcomes.

2) Process: There are multiple shortcomings in the enforcement and permitting process. The most material are that the EA has not adequately evidenced their due diligence process on the selection of 2g TA Luft in particular and suppliers and operators have yet to be consulted. Most critically, no announcement has been made and not timetable for compliance has been proposed or agreed. The requirements being imposed exist only in a draft, preliminary FAQ document prepared by the EA that has not been adequately shared with the industry or formally published.

Other process shortcomings that have been repeatedly raised by operators but have yet to be resolved include inconsistencies in approach, variable technical knowledge among permitting staff, spurious demands irrelevant to the activity, slow response times, failure to acknowledge cost benefit considerations and reluctance to share or adopt available evidence to inform decision making.

Where does that leave us?
The data centre sector is undergoing a buoyant period of growth and new activity is taking the form of fewer but larger individual developments that can provide economies of scale in terms of operational efficiency, but are more likely to be obliged under IED. In the long term the data centre sector will need to transition away from diesel plant, but at the moment alternative approaches are still at trial stage, so diesel generators are currently the default solution for ensuring resilience and business continuity. Mitigating air quality impacts will continue to be a priority for the sector. Generators are long lead time assets and are ordered years in advance. Sites cannot usually be re-sized to accommodate new or large generator configurations.

What needs to change
The lack of clarity and readily available information is causing severe confusion among suppliers, operators and developers within the data centre sector. We need to be in a position to alert new developers as well as existing providers and the supply chain to these requirements so they can plan, budget and order. It is therefore critical that this confusion is resolved as quickly as possible.

- Firstly we need to agree appropriate requirements for data centre operation.
- Secondly these need to be announced formally to operators and the supply chain through government websites and industry associations.
- Thirdly a timetable for compliance needs to be set so that operators and the supply chain can prepare.
- In parallel, all stakeholders need to work together to develop a bespoke Industry Code of Practice for Generating Plant.

We anticipate that this will improve clarity and certainty and provide a consistent reference point for the permitting process moving forward.

Further information and relevant sources

See the Compliance section of our data centre programme Directory:
https://www.techuk.org/data-centres-programme/data-centres-resource-index.html

NOX: Implications for Data Centres
https://www.techuk.org/asset/587EFBAD-B224-4121-80E70AD8FD045E3C/

MCPD and SGC: Briefing notes for Data Centres
https://www.techuk.org/asset/8E10811D-BA7A-49B8-A90206653E971384/

Data Centres and Environmental Permitting: Position Statement 2018
https://www.techuk.org/asset/5F315FF6-ACD2-4DB9-A1D212993DD0435E/

Cones of Pain: Generator Emissions Compliance Roadmap
https://www.techuk.org/asset/BD57956C-073E-4991-9359529ACDF1D206/

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Endnotes

[i] **What is a data centre?**
A data centre is a building (or self-contained unit) used to house computing equipment such as servers along with associated components such as telecommunications, network and storage systems. A data centre is equipped with a guaranteed power supply and high bandwidth connectivity. Resilience is critical so redundancy (duplication) of networks, power and other infrastructure is common to ensure continuity. Building management controls such as air conditioning maintain the environmental conditions for the equipment within a specified envelope of temperature and humidity, and security systems ensure that the facility and its data remain secure.[i]

We estimate that there are around 500 data centres in the UK, depending on definitions. 200 or so of these are colocation (commercial) facilities, operated by specialist data centre service providers. These include our very largest facilities. The rest are known as enterprise, which loosely means "in house" although they may be remote from other business operations. These underpin corporate IT functions for all sorts of organisations like universities, banks and supermarkets. Sizes vary but on average these facilities are smaller. Many organisations use a mixture of outsourced and in-house provision to minimise costs and risk.

Data centres underpin an internet economy that contributes over 16% of domestic output, 10% of employment and 24% of total UK exports and is growing faster than any other in the G-20. Our sector provides the technical infrastructure for financial services, aerospace, transport, healthcare, retail and utilities. Each new data centre contributes between £397 M and £436 M GVA per year to the UK economy while that of each existing data centre is estimated to lie between £291 M and £320 M per annum.

[ii] **What is digital infrastructure?**
Our core digital infrastructure is not a single system but multiple systems and networks that interoperate. The three main constituents are fixed line telecommunications (made up of the high capacity and highly resilient core network plus the access network that runs from the exchanges to tens of millions of individual customer premises), mobile telecommunications (that interact with the core network but provide customer coverage through a cellular network) and data centres (that manage, transmit, process and store data for government, businesses, individuals and academia).