What is emergency generation in a data centre context?
Data centres rely on mains electricity to function. A single data centre may support the core IT function of dozens, or even hundreds, of organisations, many of whom in turn rely on the facility to support services to their own customers and so on. Functions range from batch processing to financial transactions and air traffic control, so the purpose of the data centre is to provide a secure, resilient environment with guaranteed power and connectivity. Electronic equipment cannot work without a continuous supply of electricity (IT systems can handle a maximum outage of as little as 6 milliseconds) and is also very sensitive to variations in the quality of that supply. Data centres therefore have emergency power supplies in case of interruptions to, or fluctuations in, mains electricity.

What do we mean by emergency generation?
Emergency generation within the data centre sector means generating electricity on site to enable a facility to continue functioning. There are two main criteria.
1. The generated power flows into the facility and not into the grid.
2. Emergency generation is reactive, not elective. This means that it is triggered by an inadequacy, malfunction, failure, or other fluctuation in the incoming power supply, not by operator choice. In very rare circumstances, operators may manually switch to back-up power if there is high risk of an imminent interruption to incoming power supply, for instance in the case of flood or fire.

How is emergency power delivered in data centres?
Data centres need both instantaneous and longer term emergency power. Instantaneous emergency power is usually provided from on-site storage, either from batteries or from the momentum within a flywheel. This is usually short term and simply bridges the time delay whilst longer term capacity, usually in the form of diesel generators, comes online and accepts load. Common industry practice is to use a combination of stored and generated power, which can take several forms. Simplistically the main approaches to emergency power provision in data centres are: UPS plus generator plus batteries or flywheel, combined UPS and generator with no batteries or UPS and batteries only.

**Generator backed static or rotary UPS:** The majority of data centres use UPS (Uninterruptible Power Supply) backed up by both generator and battery or rotating energy storage. The UPS does what it says on the tin, ensuring a continuous power feed into the data centre irrespective of the quality or availability of external supply. Static UPS uses electronics and rotary UPS uses an internal flywheel but they both detect and address perturbations in power, bringing standby power online and removing “noise” such as frequency variations. Batteries provide instantaneous emergency power while the generators get going. It takes 7-30 seconds for the generators to start and accept load but the start command is usually delayed by 4-5 seconds because the majority of utility disturbances are less than 3 seconds in duration. This time delay reduces the number of incidents when generators start in anger.

**Diesel Rotary UPS (DRUPS):** Emergency power in some larger scale data centres is supplied via DRUPS, where the UPS and generator are integrated into a single operating unit, accepting load within 5-10 seconds. A large flywheel provides instantaneous power so there is no need for batteries. This rotating flywheel slows as it provides power while the generators start but can only maintain that power for a short period (autonomy time) before the energy stored becomes expended. The short autonomy time makes DRUPS, by necessity, more sensitive to utility disturbances than UPS backed by emergency diesel.
generators and battery. In the UK DRUPS probably accounts for 12.5-15% of the large data centre market. While not suitable for low loads, they take up less space and can be more efficient for larger scale datacentres.

**UPS and battery-only back-up:** some data centres have UPS plus battery back up that works instantaneously but for short duration (as the batteries will soon be exhausted). This kind of back up is designed to allow the system to be shut down safely and may be used in server rooms, small scale operators or where site activity is mirrored with another site. Battery only back up applies to a very small proportion of the UK data centre market by energy consumption. Obviously, this power is not generated on site from fuel, it is stored.

**Testing and maintenance:** Generators have to be test-fired regularly for maintenance and drills, usually for up to an hour once a month. Some operators are obliged to schedule all maintenance well in advance to meet customer SLAs, others have more flexibility regarding testing and maintenance regimes.

**Further information**
These notes are only intended to provide a brief rule-of-thumb. The Technical Committee is on hand to provide further detail on the contents of this communication (see below).

**About techUK’s Data Centres Technical Committee**
techUK’s Data Centres Technical Committee was originally established to advise techUK’s Data Centres Council and provide expert technical input to policy responses, publications and other communications. However, the Committee’s expertise is increasingly being sought during dialogue between industry and external stakeholders (predominantly government) and as a result the Committee is providing objective advice about the technical and market characteristics of the sector on a regular basis to a range of stakeholders, both in the UK and further afield. From time to time the Committee produces briefing notes and communications in conjunction with techUK’s Data Centres Council.

Members collectively possess a wide spectrum of technical expertise relevant to the sector. While the core focus is on engineering and technology, some members specialise in business processes, others cover operational aspects and some are experts on market trends, policy or legislation. The Committee includes external observers to ensure objectivity. Members are appointed on the basis of the specific areas of knowledge that they can contribute. Formal Terms of Reference provide governance for the group. The Chairman is Professor Ian Bitterlin and the Vice Chair is Mark Acton.

**Further information:**

**Terms of reference:** [https://www.techuk.org/images/DCTC_ToR_1509.pdf](https://www.techuk.org/images/DCTC_ToR_1509.pdf)

**List of members:** [https://www.techuk.org/images/technical_cttee_bios_1510.pdf](https://www.techuk.org/images/technical_cttee_bios_1510.pdf)

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