AN AGGREKO WHITE PAPER

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AGGREKO DATA CENTRES CONTENT SERIES – #1

Loadbank testing and commissioning for new data centres

Testing times for data centres

The commercial data centre market is expanding at an unprecedented rate. This is true in new growth regions, such as Scandinavia and Ireland, as well as more established markets like the UK, Germany and the Netherlands.

But as the need to collect, store, process, distribute and allow access to data increases, so too does our reliance on the critical infrastructure delivering this service. And as the power and cooling demands within the data centre industry become increasingly complex due to these growing pressures, the need for resilient power and temperature control equipment grows too.

For new data centres ensuring that comprehensive testing has been undertaken on all critical infrastructure is one area that cannot be compromised on.

Commissioning is a critical phase and testing will include:

- Incoming MV electrical distribution down to rack-level power, from 20kV switchgear to AC or DC power distribution units
- Transformers, uninterrupted power supplies (UPS), and stand-by generation
- Mechanical cooling including water cooled towers, chillers, free cooling solutions down to the DX & CRAC units within the halls
- Heat loads to perform the integrated systems test (IST), as free standing loadbanks sized to test halls with containment or without, or rack mountable loads for precise testing at the point the server will be situated.

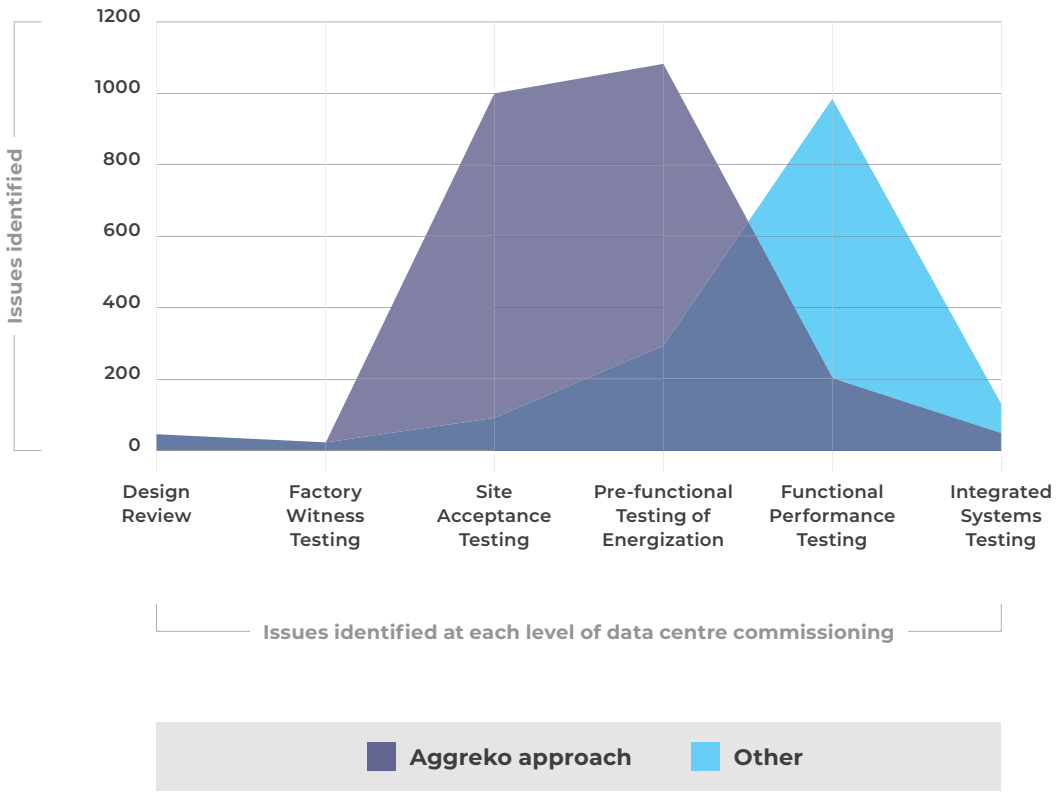
If robust testing is not undertaken at the various testing & commissioning stages, then the consequences can be significant: for instance resulting in a data centre that is inefficient and costly to run, not to mention the potential fallout to brand reputation, the bottom line and services should critical equipment fail to come online. Data centre contractors, owner and operators can also face large financial penalties, if they fail to meet completion deadlines and lack of required testing can lead to voiding OEM's warranties..

Data centres need constant power and cooling to function, and with the right level of testing at the commissioning phase, the resilience of this critical equipment can be assured. But what do tests for new equipment involve? And how can data centre managers, those responsible for new build facilities and commissioning engineers ensure that they are taking a best practice approach when testing critical equipment?

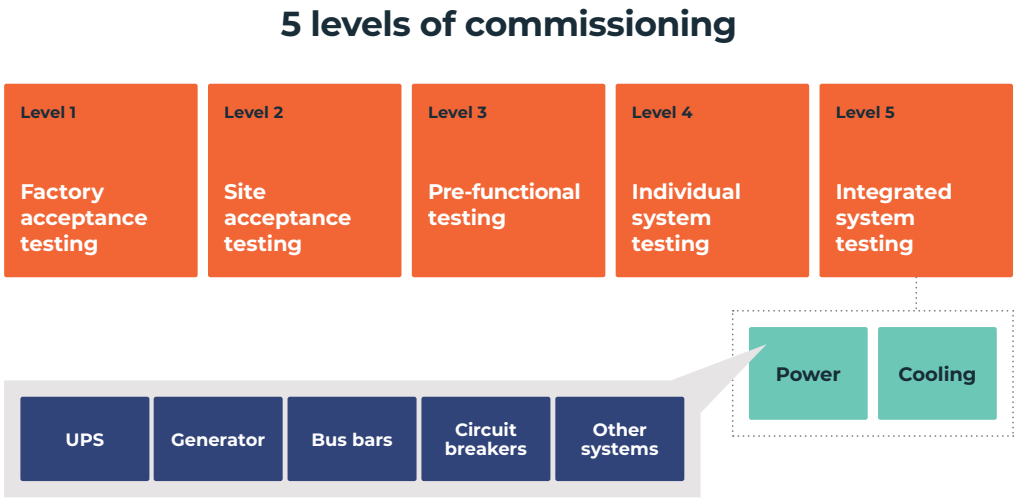
A best practice approach to testing and commissioning

While commissioning is typically one of the last steps involved in the construction of a new data centre, it is one of the most important for the success of the facility. In fact, there are huge benefits to be made by considering testing and commissioning as early on as possible, even during the design review of a new facility. This means as many issues as possible can be discovered early on, avoiding any additional project costs as a result of changes to wiring, piping and sequencing at a later stage. It can also help limit any delays to the completion date of your new data centre, too.

Aggreko approach to successful commissioning



During the construction of your new data centre, there are five key testing levels that need to be completed when commissioning critical power and cooling infrastructure.



Level 1: Factory acceptance testing

Before the delivery of equipment, it is essential that equipment has undergone factory acceptance testing. This is a means of evaluating equipment both before and after it has been assembled, to confirm that it has been built and operates in accordance with the design specifications.

Factory acceptance testing helps ensure the equipment meets the required standards for quality, safety, functionality and compliance, so you can have every confidence in the equipment before it is deployed to site. It also means any potential issues are quickly identified before the plant arrives at your data centre, helping you cut costs and any associated downtime from resolving these problems.

For instance resistive and reactive load bank testing will simulate electrical loading for generators and UPS systems to ensure 100% performance at full load; both leading and lagging power factors. Applying a reactive load allows you to test the synchronization of these back-up systems.

Level 2: Site acceptance testing

Once the equipment has passed factory acceptance testing and it has been delivered to site, it then needs to undergo site acceptance testing. This is undertaken by the OEM and/or installing contractors and serves to make sure the equipment meets the demands outlined in your specification and inspected for damage before it enters the facility. Full load test documentation for quality auditing purposes, including method statements and schematics are also included.

Level 3: Pre-functional testing

The pre-functional check and startup of the equipment is the responsibly of the installing contractor and OEM's technician. Pre-functional testing specifics will generally be prepared by the commissioning team and distributed to the installing contractors. It is at this point the functionality of the equipment is verified; is each device is properly installed, wired, torqued, meggered etc prior to initial energization. Devices are then energized and processed through the OEM start-up process with device performance/acceptance documented.

Level 4: Individual system testing

As individual system testing implies, at this stage each piece of equipment is tested on an individual basis, to evaluate whether it is operating as intended. Having passed Level 3, UPS modules, generators, PDU's, bus-bar systems and other equipment are subjected to full functionality testing. Testing can include load burn-in generally using load banks or thermal imaging to to detect hotspots.

Level 5: Integrated system testing

This provides an opportunity to test your data centre's performance at full load, and as an integrated whole for all critical systems, including power, cooling and IT infrastructure. integrated system testing should ensure that all critical systems respond appropriately to varying loads, staged machinery failures and any potential utility problems. Factors such as environmental conditions and failure scenarios are other key considerations at this final stage, to ensure you can rely on your data centre's critical infrastructure no matter what.

It is best practice to use loadbank testing to run simulations during the initial commissioning of equipment for a new centre, and then at least once a year as part of a comprehensive maintenance plan.

The outcomes of effective testing and commissioning

There are many gains to be made from effective loadbank testing and commissioning for critical power and cooling plant. By following the outlined five-level programme, you can rest assured that your new data centre can take advantage of the following benefits.

Reduced downtime

This approach will prevent or greatly reduce the opportunity for unplanned downtime to occur. By ensuring mission critical equipment is properly installed and that systems are fully integrated, you have taken every possible precaution to check that equipment is operating as expected.

Lower lifecycle costs

With the performance of your critical power and cooling infrastructure optimised, you can enjoy lower operations and maintenance costs throughout the lifetime of your data centre. The impact this can have on your data centre's bottom line should not be underestimated.

Enhanced safety

The right level of testing throughout the commissioning phase of a new data centre will create a safer data centre environment. Any problems will have been raised and remedied, so owners and operators can now focus on implementing effective maintenance procedures for electrical and mechanical equipment.

Benchmarking opportunities

Thorough testing of power and cooling plant at the commissioning phase will provide you with extensive data and documentation, which you can then use to help measure the impact of any system changes or operating trends. These insights can even be used to help anticipate any future issues or evaluate maintenance decisions in the coming years.

Healthy returns

The cost savings realised by undertaking thorough loadbank testing will far outweigh the cost of the commissioning project itself. You can expect a healthy return on your investment, safe in the knowledge that you have not only protected the availability and performance of your new data centre but reduced the total cost of ownership of its critical infrastructure, too.

Setting the standard

Not only are load demands for data centres increasing on a daily basis, but the impact of disruption from the cloud and edge computing, as well as advances in colocation and hosting services, are all being felt too.

For decision makers responsible for building and sustaining new data centres, a recent Gartner report recommended that it is possible to seize a competitive advantage by creating 'an asset inventory of infrastructure products, people, processes and providers to start the process of simplifying, standardising and rationalising the enterprise data centre'.

Standardisation is the key word here. While data centres are complex facilities – and it is unlikely that there will be a set template that data centres will want to adhere to anytime soon – there is a growing trend to move towards standardised designs, equipment and facilities, and with good reason.

The benefits to standardisation are numerous for the data centre market: reduced costs and simplified system processes for those operating data centres and those servicing them; the ability to shorten lead times for equipment providers and maintenance teams; and solutions that are easily scalable to help save data centres both time and money. This is particularly true for IT operations that span multiple data centre sites, with standardisation enabling you to take full advantage of efficiencies in design, installation, operation, maintenance and costs.

Finally, with the Uptime Institute reporting that more than 70 per cent of all data centre outages are caused by human error and not by a fault in the infrastructure design, standardisation can help minimise this risk too.

The same is true of the testing and commissioning process. Previously, the commissioning process and the testing involved would differ between data centre sites. Yet a consistent framework for testing during the commissioning phase of a new data centre can reap real rewards.

It is this strategy that we adopt at Aggreko. We see huge benefits to be gained from standardisation in the data centre industry and have advocated this approach for many years. We are a global business and all of our equipment is modular, ensuring we have a standardised fleet available for the data centre market. This means that, no matter where in the world your new data centre is located, you will receive the same testing and commissioning programme, ensuring the resilience and consistency of your power and cooling plant.

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