Challenges and Solutions for AVIVA DC3

AVIVA (aka Norwich Union) is set to open its third data centre (DC3) on a Greenfield site in the UK

Norwich Union belongs to the Aviva group which itself is the world's 5th largest insurance group. Norwich Union is also the UK's most prominent insurance services provider and a leading supplier of life and pension products throughout Europe. The company is also growing long-term savings businesses in global markets including Asia, Australia and the US. With over 59,000 employees serving more than 40 million customers, Norwich Union depends upon reliable, fully-functioning IT systems to maintain its business success.

The initial DC project began in May 2006 with Bowmer & Kirkland as shell contractor, responsible for base build phase 1 works and construction (completion April 2007). Fit out was being handled by EMCOR (completion August 2008) while WSP was lead designer and handling M&E. The architects were LSI while Arcadis AYH handled project management and QS; structures were the responsibility of Ramboli Whitbybird.

Base requirements for AVIVA were 2,250 sq. m. net IT (white space) in a single volume, column-free space with capability to double in size; Tier-3 resilience/availability (concurrent maintainability of all systems); 1.5kW/sq, m. average with flexible low, medium and high density zones; flexibility for water-cooled HD racks (manufacturer to be pre-selected); energy efficient design plus free cooling; full technical installation at day one and no planned outages or shutdowns for 15 years.

Now for the additional challenges – IBM Germany was appointed by AVIVA as the design authority. The internal environmental conditions had to be maintained during failure scenarios: site power outage/generator start-up/chiller restart and duty chiller failure/standby start-up. Chilled water to the HD racks had to be maintained stable at less than +/-1 degree C in these scenarios. CFD studies within the hall had to demonstrate airflows and the impact of local failures. Full load testing of the IT hall (3.4MW) including HD racks (1.7MW). Finally there had to be full load Integrated Systems Testing (IST) under every failure scenario – this is set to last 12 weeks (currently underway) and involves over 600 scenarios.

There are 96 LCP+ HD Racks with 24kW per rack (0.75 density factor) with heat exchanger pumping units located at one end of the hall. A substation has been built on-site for future use. There is a 7.6MVA grid supply, with an estimate of 6.8MVA maximum demand for phase 1 (assuming the DC3 is fully loaded). That's 21,895 tonnes carbon dioxide per year with free cooling or 24,029 tonnes without (grid supplied electricity is 0.422kg carbon dioxide/kWh).

Only the building and offices had to comply with Part L of Building Regs, as the process load is exempt. No local planning requirement for (10-20%) on-site energy from renewable sources.

The practical measure applied are: all AVIVA power is purchased on a green tariff from Scottish and Southern; there is free cooling and an elevated chilled water temperature of 10 degrees C; there are variable speed drives on all fans and pumps, and UPS module optimisation; there are zero ODP refrigerants; and heat recovery for on-site offices and workshops.

Other renewables considered were: photovoltaics, wind turbines (both insignificant), ground source geothermal/water source (couldn't work/not enough water); CCHP tri-generation (no carbon savings); and bio-fuels (a possibility but yet too happen). A potential lies in low grade heat available for adjacent developments – but "no-one wants it."

There are 23 CRAC units (aka RACUs – room air cooling units), and 24 heat exchanger pumping units (HEPUs) with four HD racks per HEPU @ 100 kW. IBM threw in the technical question "what would happen if two chillers failed?" Space is too limited here to discuss the detailed work WSP did – suffice to say WSP utilised TRANSYS modelling software from the University of Strathclyde. The summary is that this was a 10,000 node model with motorised control valves, chiller start times and variable volume pumping all simulated.

Run options were N, N+1 and N+2 chillers, with chiller load = 90% (N, i.e. 4 chillers), 70% (N+1, i.e. 5 chillers), 60% (N+2, i.e. 6 chillers) – the impact of 2x12 cu. m. and 2x6 cu. m. buffer storage was examined, with the chilled water travel time to "RACU 28" equal to 16 minutes.

The output decisions? Two 12 cu. m. mixing buffer vessels were added to the design. The BMS action in case of chiller failure is to reset the chilled water supply setpoint to 6 degrees C and return to the normal setpoint when the system has recovered.

The requirements were for 96 water-cooled cabinets of 24kW each, and AVIVA narrowed the choice down to Knurr, Rittal, AFCO, Schroff, CMU and HP. It was one week's work to test each manufacturer, under a mock-up and load test scenario. Ultimately it was down to Knurr and Rittal with the latter winning.

For CFD studies, WSP utilised 6 Sigma DC software for typical simulations of steady state at maximum load; HD rack failure (doors open); RACU failure/maintenance; and chiller failure/standby restart. For heat load testing, WSP went to Argos and utilised 8 x 96 3kW fan heaters. The DC3 electrical design was tested through simulating the electrical network using Paladin DesignBase software.

AVIVA is to close its DC1 centre which is 18 years old. DC2 is much newer and will continue. The DC3 IT migration begins this August, the first servers going live in September – and there are no planned shutdowns or outages before 2023.

Here, Rittal has shown once again its technological leadership and the client AVIVA got what it wanted.

United Kingdom, August 2008

Components: TS8 IT Server Racks & 200mm Extension Pieces, making the overall rack depth 1400mm, TS8 Communications Racks for Medium and Low Density Areas., LCP+, Kelvin WWHEX, CMC, Fully Installation and other Rittal Accessories

Turnkey Solutions: Rittal enabled design and build out of secondary loop chilled water pipe services to support LCL+ HD Design from Kelvin WWHEX Units branching off of Primary Chilled water Services.

Maintenance & SLA: Rittal has also engaged on Pro-Active Maintenance Schedule to support Norwich Union FM Team, this is backed up with an agreed SLA on Critical Spares and Response Times to maintain Up Time Availability.

Rittal has enabled a Tier 3+ design for Norwich Union.

For more detailed information please contact Rittal Limited

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