Met Office Life Blood

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Hello. My name is Peter Clayton-White. I'm the building services engineer for the Met Office. I'm an electrical engineer by profession and I'm here to talk to you about saving the life blood of the Met Office which is electricity. In the main, electricity is generated using fossil fuels. Burning fossil fuels gives off carbon dioxide and this carbon dioxide is damaging the climate of the planet. The Met Office consumes around 4 mega watts of electricity, this is the equivalent of shall we say 666 domestic electric ovens running at full load. In addition to powering the equipment on your desks, electricity is also used to power the supercomputers and IT equipment in the IT halls. Also, the equipment in the IT halls needs cooling and electricity is used to power that as well. Last year, the Met Office emitted 19,000 tonnes of CO2. This short video is to explain how the electricity comes to the site and how we're making efforts to reduce its consumption. And we'll now go over to where the electricity comes into site over at the main switch room.

We take our electricity supply from Western Power distribution at 11,000 volts, it's then distributed all around the site in a high voltage ring circuit. We take in one of the IT hall blocks as an example. We take two power supplies from the ring circuit to feed two transformers. Each transformer is large enough to do the duty of the other one. From one of the transformers the supply is then passed to an uninterruptable power supply or UPS. The two functions of the UPS are as follows. Function number one is to provide a clean, transient free electricity supply to the IT equipment in the halls. And the function two is to provide electricity backup to the halls in an event that we have a mains power failure and it keeps the electricity to the halls running until the generators have had a chance to start and supply the site load.

I spoke earlier about the fact that we took our electricity supply at 11,000 volts, fed it through a transformer and then to a UPS and then on to the IT halls. Each time we do an electrical conversion we have loses and each of these loses is usually given off in a form of heat. And the heat again is coming again from the electricity generators so its all got its own CO2 loss. Take the transformers as an example. They're 98.5% efficient, there's not a lot we can do about that, it's fixed. But we can, if we move down the food chain a little bit, look at a UPS. And a UPS takes its electricity in at 400 volts alternating current, or AC. Inside, transforms it, transforms it and converts it to DC electricity which has got approximately a 5% loss in it. This DC then has a big battery bank feeding into it and then out from the DC side is an inverter which converts it back to AC, again with approximately another 5% loss. We then send this alternating current electricity down to the supercomputer nodes which promptly, when it arrives there, is converted back into DC again to feed the computing equipment inside. If we could remove the conversions we can save energy, energy costs and in addition save CO2 emissions.

The solution to the problem is by removing some of the conversion processes from the UPS and at the supercomputer. We purchased a DC rectifier which converts AC to DC and then has a battery supply, similar to the UPS, to provide backup in the event of a mains failure and then we fed the supercomputer directly on DC electricity. This has given us overall approximately a 10%

reduction in energy. Interestingly enough the supercomputer itself requires 3% less energy to run on DC as it did on alternating current. This has given us, with the Monsoon system, 68 tonnes a year of CO2 emissions reduction and if we applied it phase two of the supercomputer that will gives us 881 tonnes a year reduction in CO2 emissions.

This work has been unique and groundbreaking. The Met Office is the first place in the world to operate a supercomputer on DC electricity. We also had a number of hurdles to cross getting it up and running because there were a number of safety issues, because equipment is not normally supplied for DC. On the day of commissioning the system, the Americans sent their quality and safety expert over and he went through our system with a fine toothcomb and I could tell that he didn't have a lot of faith in what he thought we were trying to achieve and at the end, after his inspections and we'd switched the supercomputer on, I looked at him and said "You didn't think we knew what we doing, did you?" And he looked at me with a twinkle in his eye and he smiled and he never said a word. But I also feel very privileged to have been working on this groundbreaking project for the Met Office.