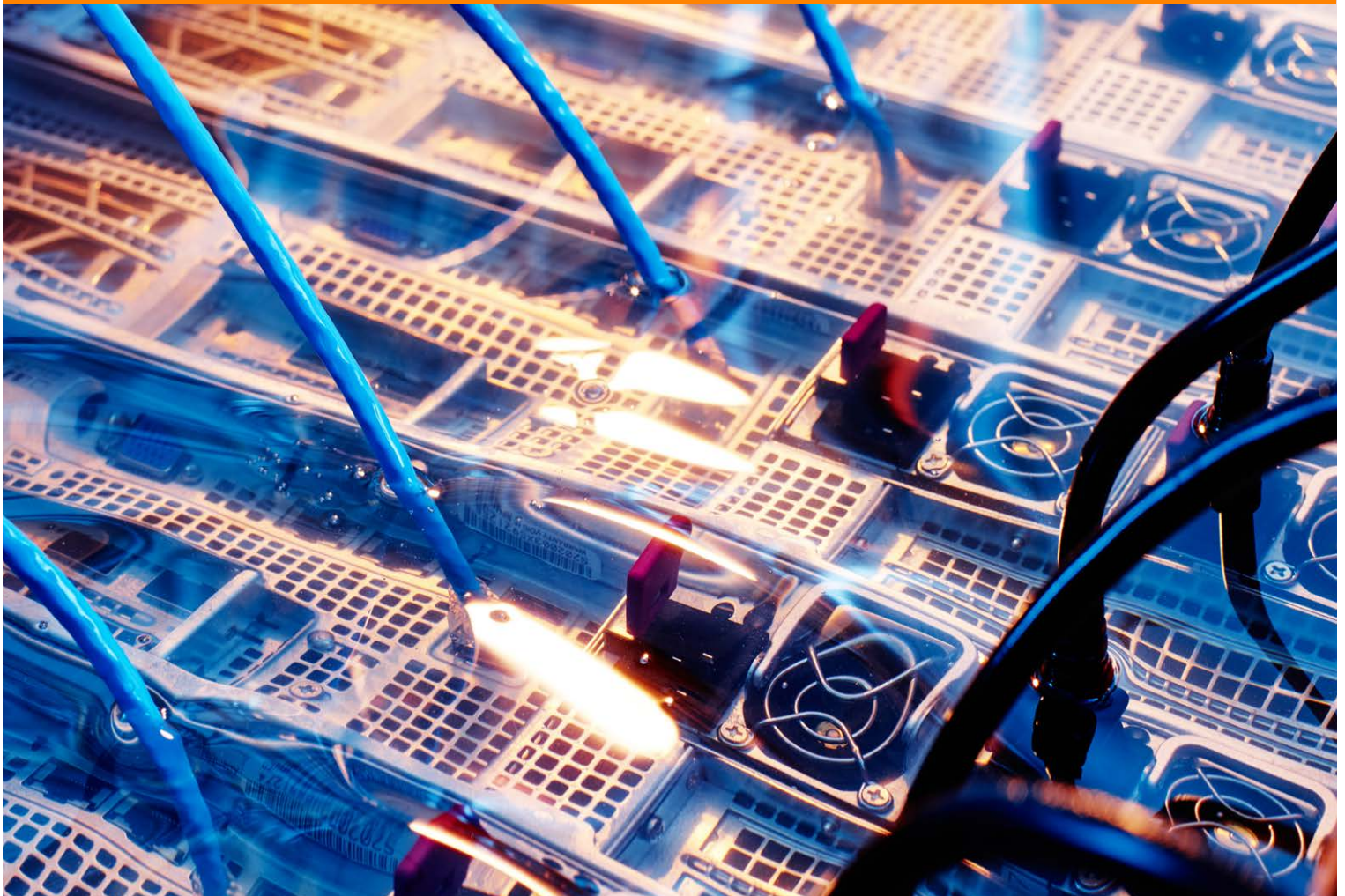




A DATA CENTRE COOLING SOLUTION THAT'S COOLING THE PLANET





SEISMIC DATA PROCESSING IS ONE OF THE BIGGEST USERS OF COMPUTER POWER ON EARTH

DownUnder GeoSolutions (DUG) is an Australian-owned high-tech geosciences company.

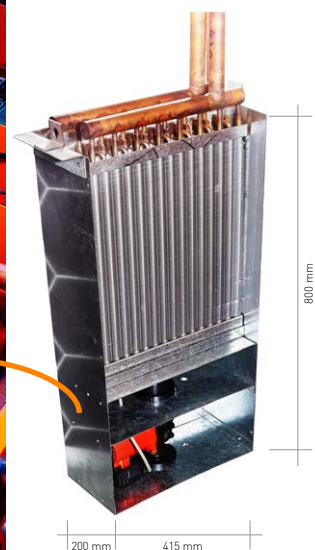
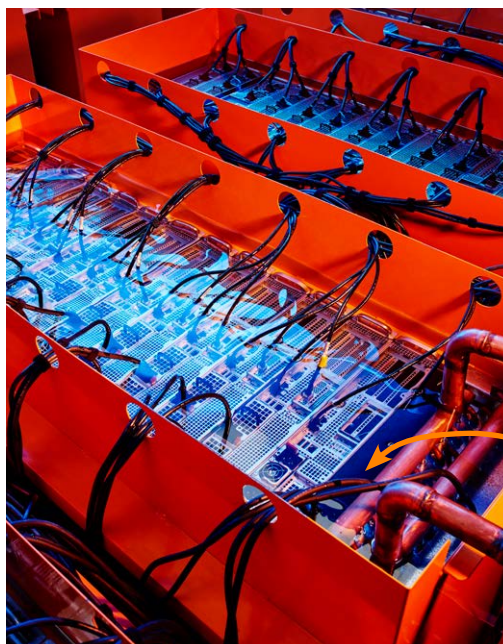
To provide its services to the industry, DUG has invested in one of the largest supercomputer networks in the world, with data centres in Perth, Houston, London and Kuala Lumpur. The Perth cluster, affectionately known as "Bruce", is the largest supercomputer in the southern hemisphere at 22 petaflops (PF). All four data centres have been recently upgraded and DUG's global compute power now exceeds 50 PF. Not surprisingly, supercomputers of this size generate considerable heat

and require efficient cooling technology. Installations such as these are traditionally air-cooled, which is inefficient, expensive, and environmentally unfriendly. DUG has developed (Patent Publication WA 2017/091862 A1) an advanced, flexible, and modular dielectric-fluid cooling solution which greatly reduces energy usage and costs and increases the life and efficiency of the hardware. DUG now boasts some of the greenest compute centres in the world.

THE POWER OF INNOVATION

The cooling system fully submerges standard, high-performance computing (HPC) servers into specially-designed tanks that are filled with polyalphaolefin dielectric fluid. The fluid is non-toxic, non-flammable, biodegradable, non-polar, has low viscosity, and most importantly, will not conduct electricity. The unique part of this design is that the heat exchangers are very simple and submerged in the tank with the computer equipment, meaning that no dielectric fluid ever leaves the tank. A water loop runs through the rooms and to each heat exchanger.

The dielectric fluid is cooled and circulated around the extremely hot components in the compute servers. This innovative oil-cooling solution has high thermal capabilities and a large operating temperature range.



The fluid is able to be cooled using whatever cooling water sources are available on site: ranging from conventional chilled water to warm water-based systems such as cooling towers, ground loops, or even seawater heat rejection.

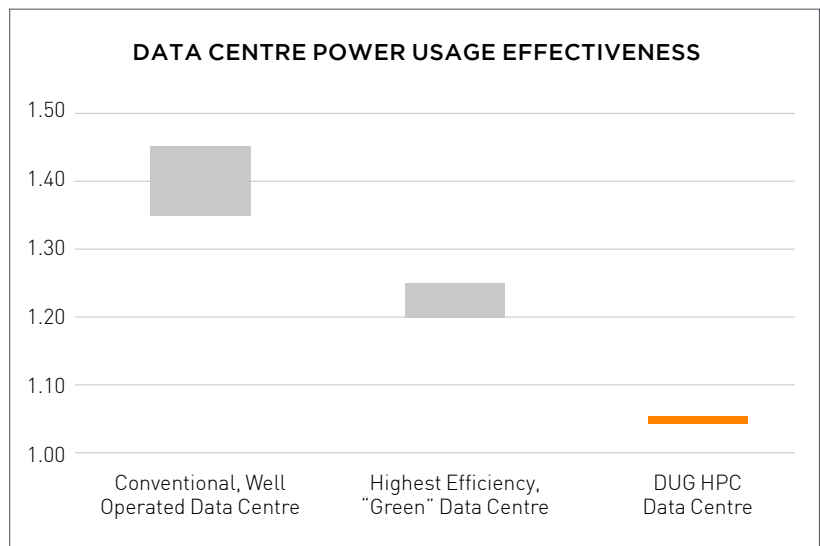
AS A RESULT DUG'S DATA CENTRES HAVE THE FOLLOWING ADVANTAGES:

- Power costs are reduced by up to 45%
- The thermal qualities of the fluid allow the data centre to "ride-out" outages in cooling
- Hardware and electrical components last longer with less oxidation and wear and tear
- Failures due to thermal expansion/contraction are eliminated
- Installation and running costs are significantly lower than conventional data centres

THE POWER TO SAVE

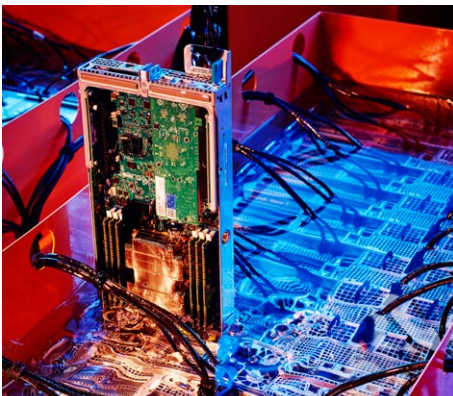
Traditionally, companies like DUG spend half of their revenue on their compute centres. Energy use can be a significant expense in a conventional data centre. With DUG Cool, the thermal qualities of the fluid mean that condensed water-cooling chillers can be used rather than refrigeration. This saves 25%-30% of total power usage. Removing all server fans, which aren't needed in a fluid-immersion system, reduces power consumption by a further 20%. That's a total saving of up to 45%.

The running costs of HPC systems are commonly evaluated using the Power Usage Effectiveness (PUE) metric. The table beside summarises PUE for typical operators and DUG HPC.



A combined energy cost savings of up to 45% mean that DUG is able to build the largest supercomputing systems in the world with a PUE of under 1.04.

THE POWER OF LONGER LIFE



Submerging computers into dielectric fluid has some surprising advantages. Electrical components last longer due to the lack of oxidation of physical joints, solder joints, wires, and connecting materials. The >1000x thermal effectiveness of the fluid (vs. air) provides far greater thermal stability and prevents runaway heat events. Even if you switch off the chillers, the fluid has such high thermal capacity that temperatures increase gradually, giving far more time to react. In our experience, fluid-immersed computers have a much higher mean time to failure, considerably reducing maintenance costs and expensive down-time.

The fluid itself is also extremely long lasting, with current indications that it has a lifespan of 20 years. In addition, its clean material safety data sheet (MSDS) means that there are no restrictions on its transport, storage, or usage.



DownUnderGeoSolutions