



Located in a former NATO munitions bunker, the Green Mountain data centre leverages an adjacent fjord for cost-effective, sustainable cooling.  
 Photo courtesy of Green Mountain – Photographer: Knut Bry

## Zero emissions data centre cools servers with gravity-enabled sea water distribution

Norway’s Green Mountain colocation data centre attains PUE of 1.2

The Green Mountain data centre, located on the island of Rennesøy, near Stavanger, Norway, boasts a Power Utilization Efficiency (PUE) rating of 1.2 and has established itself as one of the most efficient data centres in the world. Co-developed by Smedvig a Norwegian shipping firm, Ergogroup, a leading Nordic IT services firm, and Lyse Energi, a Norwegian electric utility, the data centre is buried deep inside a mountain (250 meters / 1,150 feet) on the island and abuts a cold water fjord. Situated in a former NATO munitions bunker, the Green Mountain data centre is unique and innovative for several reasons.

First, the data centre itself is powered by cheap, reliable, low carbon hydropower. Three main power lines from separate hydroelectric plant grids supply ample, redundant power to the data centre. Second, the data centre is cooled by seawater from the nearby fjord, and gravity is a key factor in the distribution of that cold water to the data centre.

According to Knut Molaug, CEO of Green Mountain, “This data centre relies

exclusively on renewable energies, and the data centre produces zero CO<sub>2</sub> emissions.”

The data centre is also one of the most secure in the world. The original heavy, 0.5m / 1.6 ft-thick NATO blast doors are still in place and tunnels deep in the ground are the only means of access.

“Most facilities that are buried in a hillside, although extremely secure, pose a problem for efficient cooling and heat rejection. But we use an adjacent fjord to cool the facility. It’s a cost-effective and efficient solution to the problem – cooling costs are reduced by around 30% when compared to traditional mechanical cooling.”

### High reliability, low cost

Under operation since 2013, the Green Mountain data centre achieved a “Tier III Certification of Constructed Facility” designation from the Uptime Institute in Q2 of 2015. A Tier III data centre requires no shutdowns for equipment replacement and maintenance. A redundant delivery path for power and cooling is added to the redundant critical components of Tier II so that each and



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every component needed to support the IT processing environment can be shut down and maintained without impact on the IT operation.

Over 13,600 square meters (146,389 square feet) of space distributed across six halls are in place to help support the critical uptime needs of colocation customers. The facility has been designed to scale to 25MW.

One of the most innovative features of the facility is its use of seawater cooling. In a typical data centre, chilled water has to be generated via chillers, large refrigeration units often located in basements that require a significant amount of electricity to operate. The chilled water produced is then pumped throughout the facility in order for data centre servers to remain cool. Eliminating the need for chillers allows the Green Mountain data centre to consume far less energy than typical data centres that require the use of chillers.

"The water temperature in the fjord at 100 meters is a constant 8 C (46 F) all year round," said Molaug. "The water is brought into the cooling station via an inlet into a trough that sits directly below the station and minimizes the amount of pumping that is required. The chilled water is then circulated throughout the facility using a fully duplicated (2N) infrastructure. The chilled water feeds into in-row coolers used alongside hot aisle containment. Power densities range from 2-6kW/m<sup>2</sup>, but the system can accommodate up to 20kW/m<sup>2</sup>."

#### Schneider Electric provides sustainable solution

"When we decided to implement the idea of this green data centre, it was essential for us to select contractors and suppliers that had the most energy-efficient and economical solutions available in the market. We chose Schneider Electric as one of our main designers and equipment suppliers," said Molaug. "I estimate that 60 to 70% of all the equipment purchased was supplied by Schneider."

Schneider Electric installed datacenter infrastructure management (DCIM) tools, control components, and about 12,000 measuring points. The hardware



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implementation included Symmetra MW UPSs, Canalis LV busway, Prisma LV Distribution, SM6 + transformers, MV/Citect Scada, Uniflair technical room coolers, and InfraStruxure hot aisle containment systems with in-row coolers and racks.

"The DCIM systems are currently used for on-site environmental monitoring, but we may eventually allow customers to remotely monitor IT equipment and other infrastructure," said Molaug.

Schneider Electric also helped design the cooling system that uses gravity to bring the cold water from the fjord to the data centre's cooling station. This is done without using any power and without relying on refrigerant gases. This design helped the facility win the Datacenter Dynamics "Green Data Centre of the Year" award in 2013.

The Green Mountain data centre customers stand to benefit from this low cost, high efficiency implementation. These are corporate customers with worldwide facilities who wish to reduce their carbon footprint across their portfolio of data centres, who wish to improve their "green credentials," and who want to reduce their spending on power. "Green Mountain wholesale customers can achieve the low 1.2 PUE consistently – every hour, every day of the entire year," said Molaug.

"Throughout this process, we have discovered that Schneider Electric shares the same values as we do: renewable energies, optimization of existing infrastructure, and sustainability," he said.



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