

## 3M Novec 7100 Fluid Used in World's Largest Two-Phase Immersion Cooling Project

Revolutionary project built by BitFury and Allied Control to cool 40+ MW of ASIC clusters running a PUE of 1.02

The world's most powerful two-phase immersion cooling (2PIC) project, which will be deployed in a 40+ MW data center being constructed by BitFury Group, is currently underway in the Republic of Georgia. Designed and built by the Hong Kong-based engineering company, Allied Control, the 2PIC project will use [3M™ Novec™ 7100 Engineered Fluid](#), an immersion coolant with a low global warming potential. Allied Control is a pioneer in 2PIC, a field showing great promise in boosting data center efficiency.

Allied Control was recently acquired by BitFury Group, a leading Bitcoin Blockchain infrastructure provider and transaction processing company, which builds its own fully custom Application Specific Integrated Circuits (ASICs), PCBs, servers and data centers. BitFury strives to use renewable energy for all of its business operations and remains committed to maintaining the smallest carbon footprint possible. BitFury will leverage Allied Control's award-winning 2PIC technology with Novec fluid in the Georgia data center to deploy 28 nm and 16 nm ASICs more efficiently, saving energy and lowering operational costs while meeting goals of net carbon neutrality.

"With 250 KW per rack and not having reached the limits yet, we now have the ability to grow quickly and spread the cost of the cooling system over many hardware generations," said Kar-Wing Lau, vice president of operations at Allied Control."

3M has a long-held leadership position in immersion cooling. Over the past five years, 3M engineered fluids have been used in server cooling in a series of technology demonstrations and a number of increasingly ambitious deployments, which have been recognized by the industry for best in class energy efficiency.

2PIC involves placing hardware in an accessible tank of fluid coolant with a low boiling point, such as Novec 7100 fluid (61°C/142°F). As the hardware heats up in the tank, it boils the Novec fluid, and this change in state pulls the heat away from the components. The Novec fluid becomes a vapor, rises, condenses on a water-cooled condenser coil and falls back into the tank without the use of pumps. The streamlined system can deliver as much as 95 percent cooling energy savings with minimal fluid loss.

The ability to create densely packed circuit boards paired with high-performance during overclocking made 2PIC a natural fit for blockchain transaction processing, an industry with a need for processing power that is growing at unprecedented rates. This growth and progression can provide a roadmap for high performance computing as it evolves toward and beyond exascale.

"The PUE we've achieved leads us to the next level of data center cooling for high performance computing," said Valery Vavilov, BitFury CEO. "We've taken many steps to optimize our infrastructure for securing the blockchain and blockchain transaction processing that have led us to many different technological innovations. These experiences and technologies could be useful for next generation data center constructions of high performance computing and supercomputing."

Allied Control designed BitFury's setup in a matter of months, and at present, the ground-up build is in progress. Phase 1 of this project will include 40MW of IT load running at 1.02 PUE with plans for further expansion in the near future. News of the project comes ahead of the [2015 Supercomputing Conference \(SC15\)](#) in Austin, Texas, where 3M will have a demonstration tank of 2PIC with Novec 7100 fluid on display in booth #2710.

Founded in 2011 by Valery Vavilov and Valery Nebesny, BitFury has management offices in San Francisco, Washington, D.C., Hong Kong and Amsterdam, as well as data-centers in Iceland and the Republic of Georgia. BitFury derives sustainable advantage through its custom-made application-specific integrated circuits (ASICs), optimized to achieve the lowest power consumption coupled with the highest processing metrics – the parameters that drive mining margins. BitFury successfully delivered several prior generations of silicon and has a roadmap to at least double performance-per-watt every 6-12 months. BitFury’s management team and board include seasoned industry veterans with a history of execution in silicon engineering, operational build-up and capitalizing businesses. For more information on BitFury Group, please visit: <http://www.bitfury.com/>

3M’s Electronics Materials Solutions Division (EMSD) is improving electronics today and advancing the innovations of tomorrow. 3M Novec fluids are leading the way with safer, more sustainable solutions for cleaning, cooling and fire suppression. 3M battery materials create new potential for smaller, higher performing lithium ion batteries, and foldable, high-signal density cable is revolutionizing data center architecture. From the smartphone in your pocket to the cloud it’s connected to, EMSD solutions enable seamless integration and continuity for the digital age. Learn more about 3M EMSD at [3M.com/electronics](http://3M.com/electronics).

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BitFury's immersion cooling system using 3M® Novec® Engineered Fluid (Photo: BitFury)

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Two-Phase Immersion Cooling with 3M® Novec® Engineered Fluid can reduce cooling energy costs by 95 percent and reduce water consumption by eliminating municipal water usage for evaporative cooling. (Graphic: 3M)

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Two-Phase Immersion Cooling involves placing hardware in an accessible tank of fluid coolant with a low boiling point, such as 3M® Novec® 7100 Engineered Fluid (61°C/142°F). As the hardware heats up in the tank, it boils the Novec fluid, pulling the heat away from the components. The Novec fluid becomes a vapor, rises, condenses in a water-cooled condenser coil and falls back into the tank without the use of pumps. The streamlined system can deliver as much as 95 percent cooling energy savings.

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Two-Phase Immersion Cooling with 3M's Novec's Engineered Fluid can require 10 times less space and eliminates costly air cooling infrastructure and equipment associated with conventional liquid cooling, making it most effective for large-scale data center hubs. (Graphic: 3M)

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