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Resurrection of the Enhanced Hot Water Drill for the IceCube Upgrade Project

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The IceCube Neutrino Observatory will be upgraded to include seven more strings of instrumentation at the South Pole during the 2025/26 austral summer season. Construction of the original IceCube detector required drilling boreholes ~60 cm in diameter to depths of 2500 m. The IceCube Upgrade Project again requires drilling boreholes that are approximately 60 cm in diameter, but now to depths of 2600 m with extended operational hole lifetimes. To achieve this, the original Enhanced Hot Water Drill that originally delivered the 86 boreholes for IceCube has been resurrected, repaired, and upgraded. This effort started at the beginning of the project in 2018, and the first and only drill season for IceCube Upgrade is planned for 2025/2026. The process of recommissioning the 5 MW hot water drill system presented many challenges and offered many lessons. Much of the system had been distributed all over the world and was found in various states of condition. Many mechanical systems required repair and upgrades, and some subsystems needed to be replaced completely. The legacy motor drives and control system were determined to be obsolete and unusable, necessitating a system-wide replacement. In addition, the logistical landscape is vastly different from the original IceCube Project, and the operational processes needed to be remembered and relearned. An overview of the approach taken for this resurrection and some key takeaways will be presented.

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