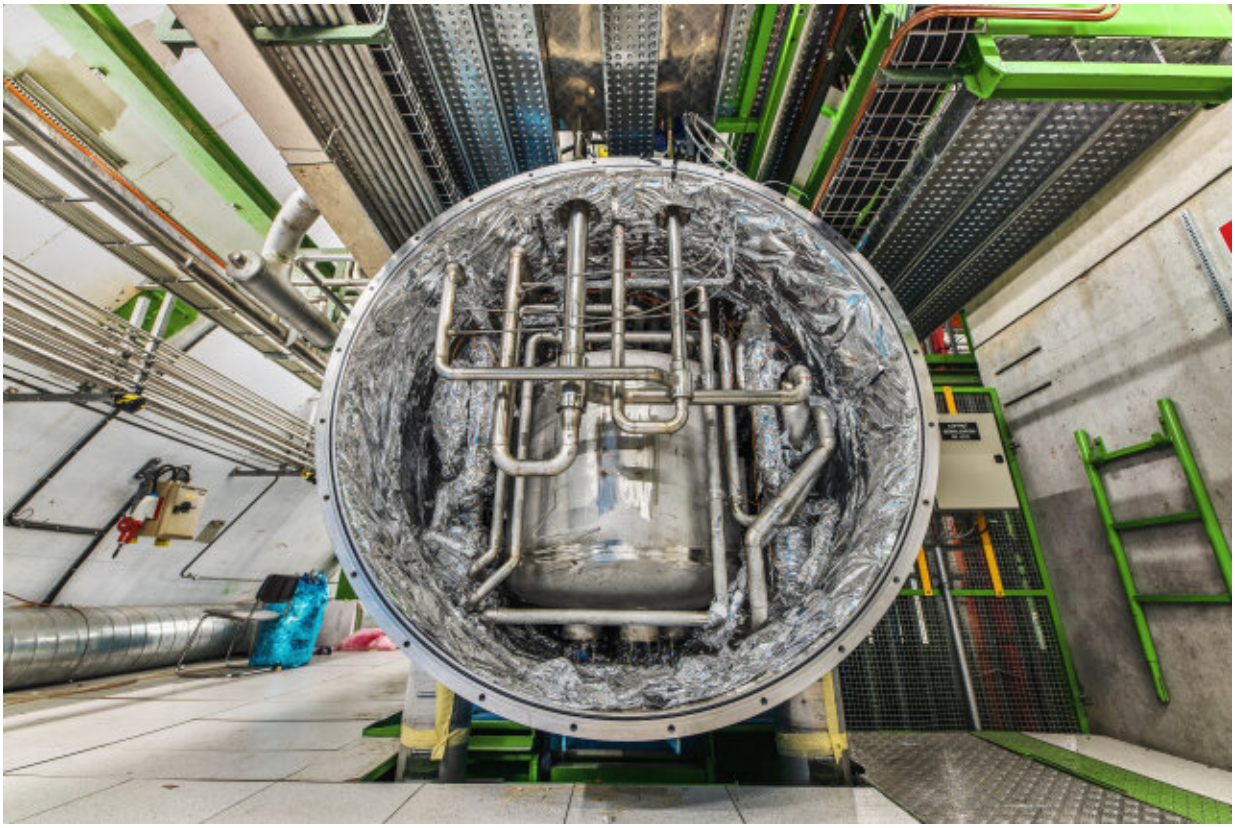
LS2 report: Before the return of the cold

April 30 2019, by Anaïs Schaeffer



One of the LHC cold boxes, located in an underground cavern at point 4 of the ring. Liquid helium is stabilised and stored in a tank at a temperature of approximately 4.5 K. Credit: CERN

Since the start of January, the liquid helium flowing through the veins of the LHC's cooling system has gradually been removed the accelerator and, one by one, the eight sectors of the LHC have been brought back to

room temperature. "It takes about four weeks to bring a single sector from its nominal temperature of 1.9 K (-271°C) back to room temperature," explains Krzysztof Brodzinski, an engineer working on the operation of the LHC's cryogenic system. At least 135 tonnes of helium are required to supply the whole of the LHC's cryogenic system. Once it has been brought up to the surface, some of this precious cooling agent is stored at CERN and the remainder (about 80 tonnes) is entrusted to the suppliers for the duration of LS2.

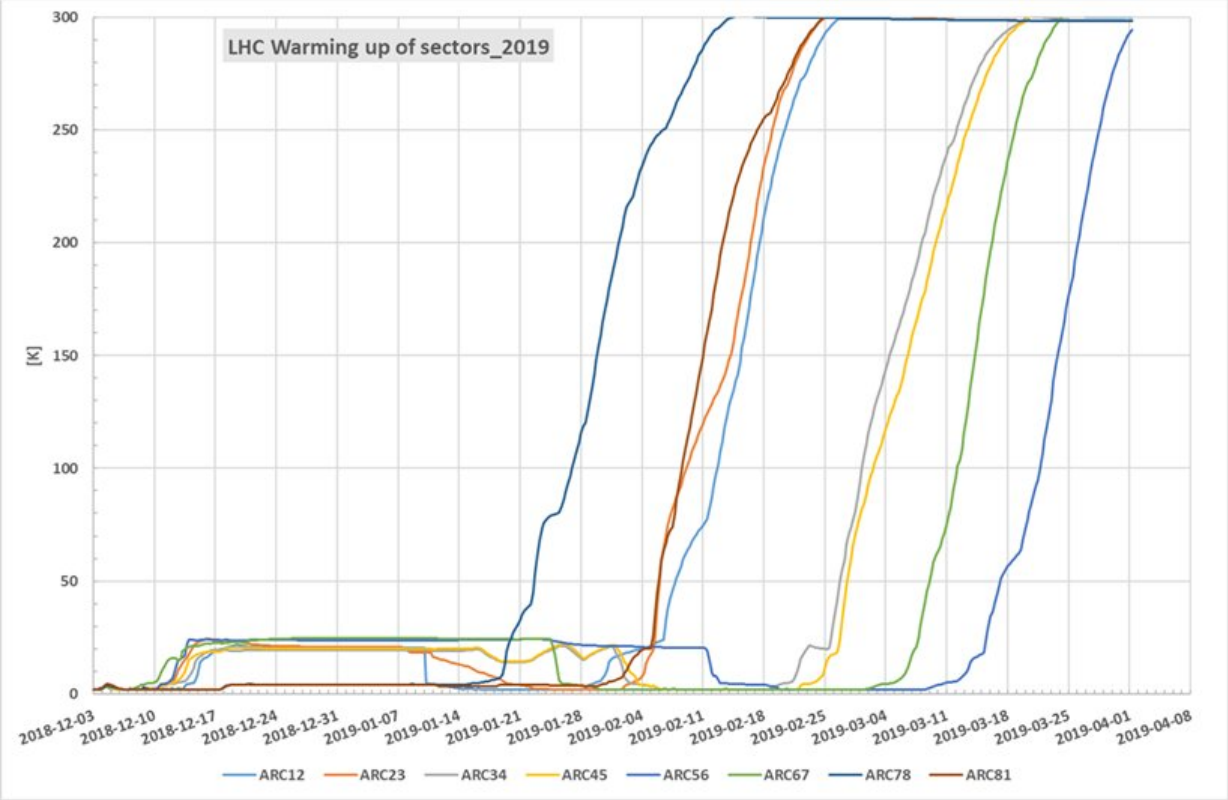
The 70 helium compressors are the first links in the LHC's cryogenic chain. They compress the helium, which is then cooled through expansion in the turbines of the cold boxes. During LS2, all the compressors will be sent away for a full service, mostly to two specialist centres, in Germany and Sweden. "Each of the 70 compressors must be taken apart and then reassembled, in order to check the condition of all parts and make replacements if necessary," explains Gérard Ferlin, leader of the Operations section in the Cryogenics group. "The 70 electric motors that power the compressors will be sent to Italy to be serviced."

As for the cold compressors used to lower the temperature of the helium from 4.5 K to 1.9 K, they're off to Japan. Six of them (of the 28 in the accelerator) showed signs of weakness after the last four years of LHC running and need to be worked on by specialists.

Of course, here at CERN too, the Cryogenics group has a lot on its plate: over 4000 preventive and corrective maintenance operations are planned between now and mid-2020, when cooling of the first sectors of the LHC will start all over again! "Many maintenance operations have been planned for a long time, particularly on the LHC's eight cold boxes (one per sector). The sensors, thermometers, valves, turbines, filters, etc. will be checked and validated or replaced," explains Gérard Ferlin. "We will also use the opportunity of LS2 to do some advance upgrades of one of

the cold boxes with a view to increasing its power ready for the HL-LHC."

Throughout LS2, the instrumentation team in the Cryogenics group will also support the DISMAC (Diode Insulation and Superconducting Magnets Consolidation – an article on this subject is coming soon) project team, particularly for the validation of the instrumentation of the cryogenic system. This is especially important given that certain magnets are being replaced and new diagnostic instrumentation is being installed on a pre-determined selection of beam screens.



Schedule for warming up all the LHC sectors for LS2. Credit: CERN

Provided by CERN