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Monitoring production at Hellisheiði power plant, Iceland – Overview

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Hellisheiði power plant is one of two geothermal power plants built around the volcanic mountain Hengill, one of the largest geothermal areas in Iceland. Exploration drilling began in 1985 and production phase began in 2006. Since 2011 the installed capacity at Hellisheiði has been 303 MWe and 133 MWth, with the potential to expand thermal production up to 400 MWth. As of beginning of 2019 there have been 80 deep wells drilled and all were planned to be utilized. Out of the 80 wells, 43 are production wells, 11 are monitoring wells, 17 are injection wells, 7 are not in utilization and 2 are new production wells still in warm-up phase.

The monitoring of production has increased over the lifetime of Hellisheiði power plant. There are continuous single-phase flow meters inside and in vicinity of the power plant. The wellhead pressure is measured weekly or biweekly, most frequent of all monitoring in the field. The power output of each production well is measured annually or more frequently, along with chemical sampling. Pressure and temperature are measured in production and monitoring wells annually or more often, both inside the main production zone and at the outskirts of it. Tracer tests are performed annually or less frequently. Seismic activity and deformation are monitored continuously in an area around the production and campaign measurements on deformation, gravity and GNNS are biannual or less frequent.

The wellhead pressure, power output of each well, chemical and pressure and temperature in the reservoir are input data for a comprehensive reservoir model, along with structural knowledge from the tracer tests analysis, surface geology and more. The reservoir model is updated annually or more frequently and utilized for analyzing changes in production capacity, production density, draw-down in reservoir and more. Along with production and reservoir studies, there are numerous on-going studies focusing on areas which are related to or affected by utilization at Hellisheiði.

Although monitoring production at Hellisheiði is extensive, there is room for improvement. As of next year, there will be continuous readings of wellhead pressure. Continuous pressure and temperature readings in monitoring wells will likely start soon. There are on-going projects focusing on development of continuous two-phase flow meters downstream of production wells. The analysis from the reservoir model would improve with better input data, leading to a better understanding of the effect of production. Other studies which are being looked at could improve the output and interpretation of the reservoir model, e.g. an interlink with a well simulator.