

OR Annual report 2020

Appendices



High temperature geothermal resources: Production, enthalpy, injection and drawdown



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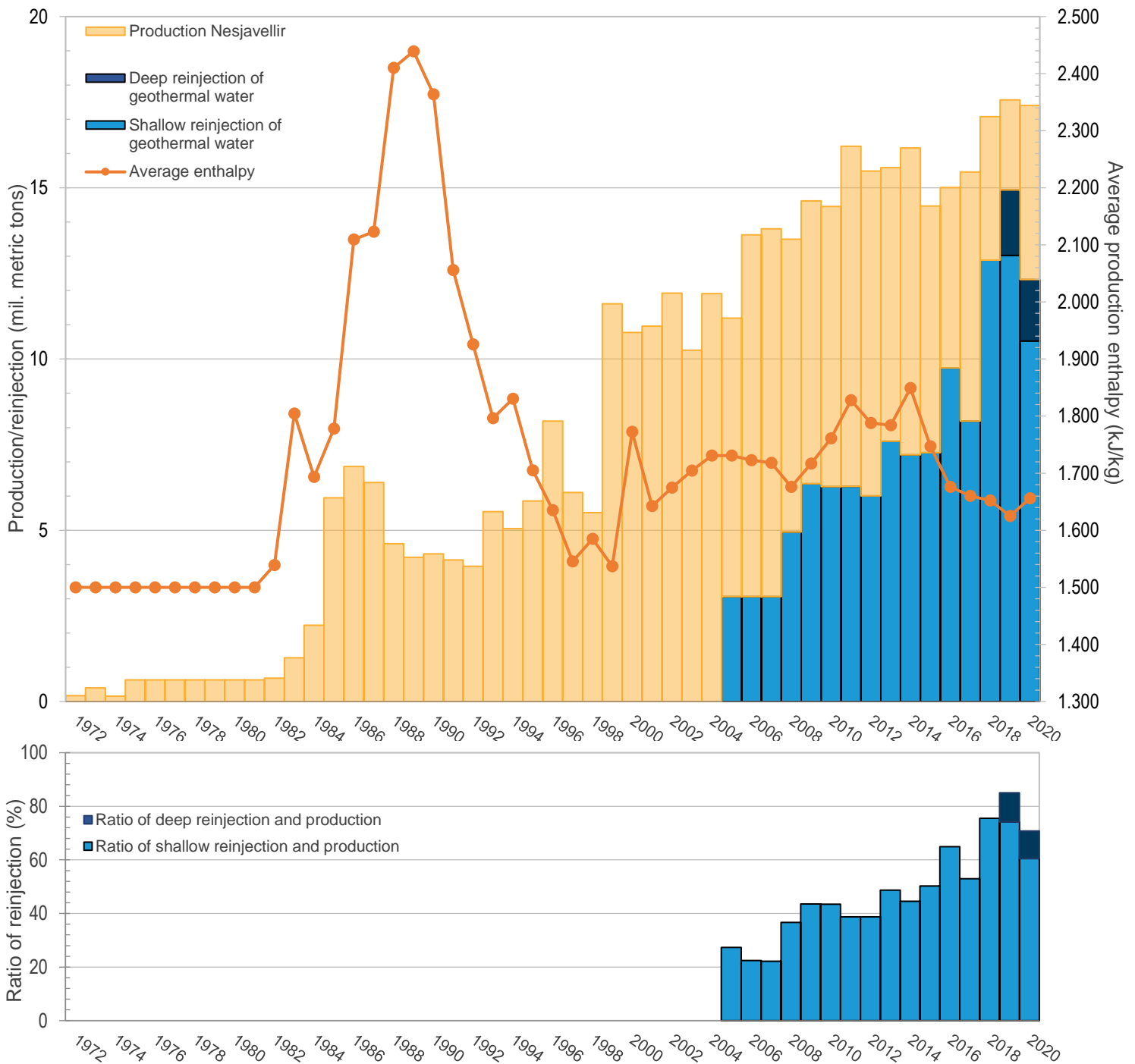
Cover photo: Gretar Ívarsson

Nesjavellir power plant

Production at Nesjavellir, enthalpy and reinjection by point of release

Production at Nesjavellir (million tons per annum) from 1972 to 2020, weighted average enthalpy (kJ/kg) and reinjection of geothermal water and heated groundwater (million tons per annum).

The light blue colour shows the volume of geothermal water (million tons per annum) re-injected into wells. The red line shows the enthalpy of the geothermal fluid (kJ/kg) from 1972 to 2018 since the heat is a yardstick for the energy content of the geothermal fluid. In 2020 approximately 70% of the produced fluid was reinjected below upper groundwater layers, thereof around 10% reinjected in the geothermal reservoir.

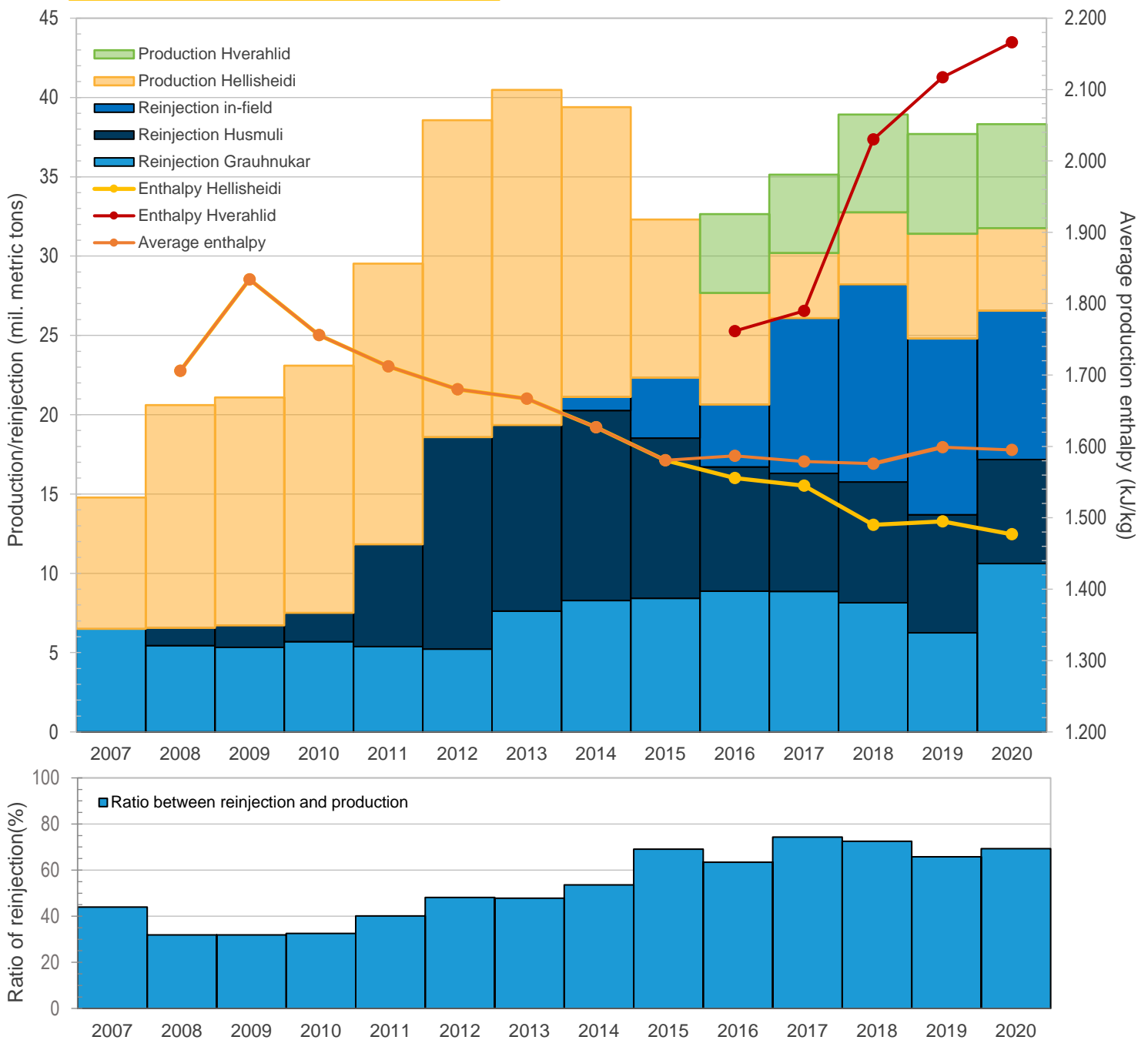


Hellisheidi power plant

Production at Hellisheidi and Hverahlid, enthalpy and reinjection by point of release

Production at Hverahlid (million tons per annum) in 2020, production at Hellisheidi (million tons per annum) from 2007 to 2020 and reinjection (million tons per annum) by release route.

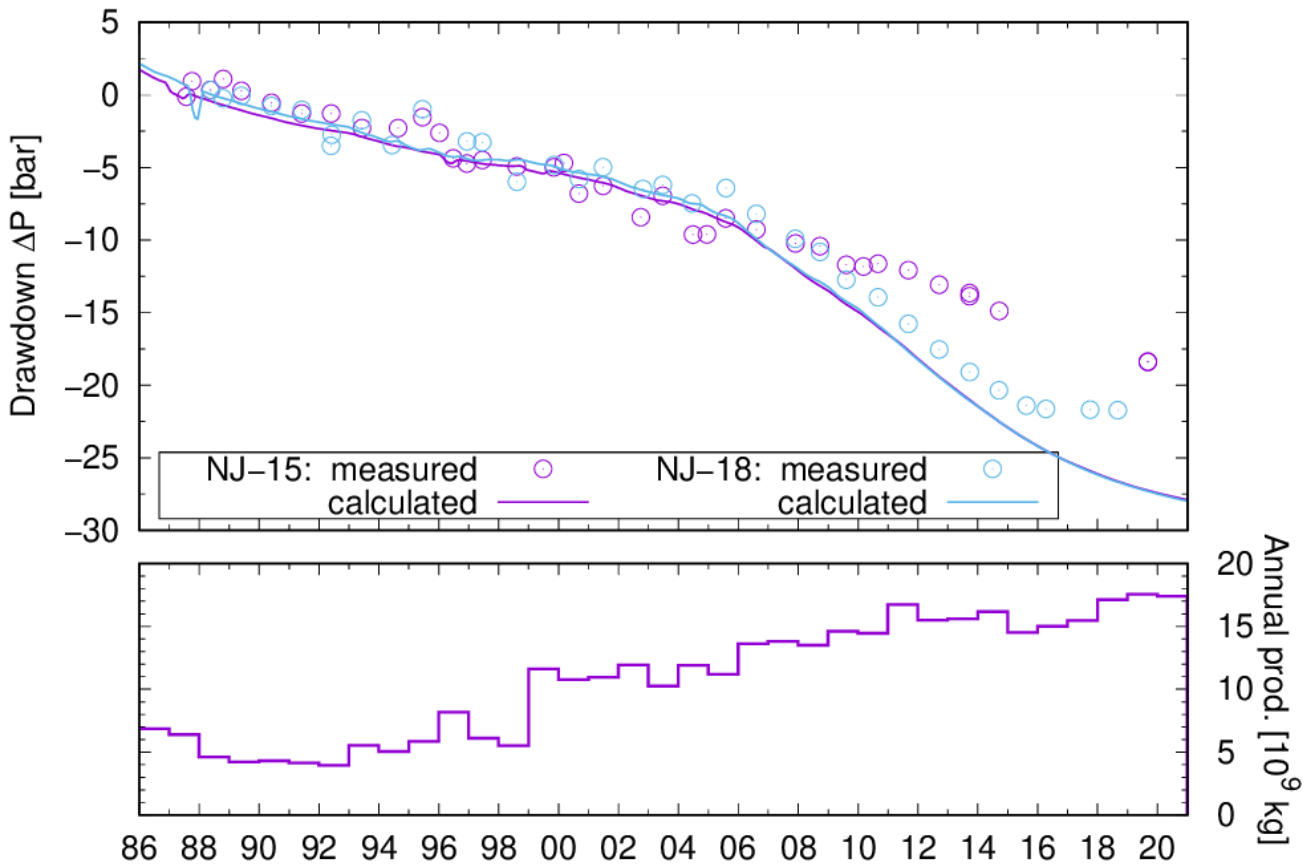
The blue colours show the volume of geothermal water (million tons per annum) re-injected into the field in the production wells that are not used for steam production, in re-injection wells in Grauhnukar and Husmulu and in boreholes at Threngsli. The orange curve shows the enthalpy of the geothermal fluids (kJ/kg) from 2007 to 2020, since the heat is a yardstick for the energy content of the geothermal fluid. The heat increased in 2009, after the high-enthalpy wells were connected to the steam utility of the plant in mid-2008 and again in 2016 with the influx of steam from Hverahlid. The green line shows the enthalpy of the geothermal fluid in Hverahlid, which rose significantly in 2018 with the addition of available steam. The lower figure shows the ratio of the renewal, i.e. mass balance of the system. In 2020 approximately 70% of the produced fluid was reinjected.



Drawdown in Nesjavellir, Hellisheidi and Hverahlid

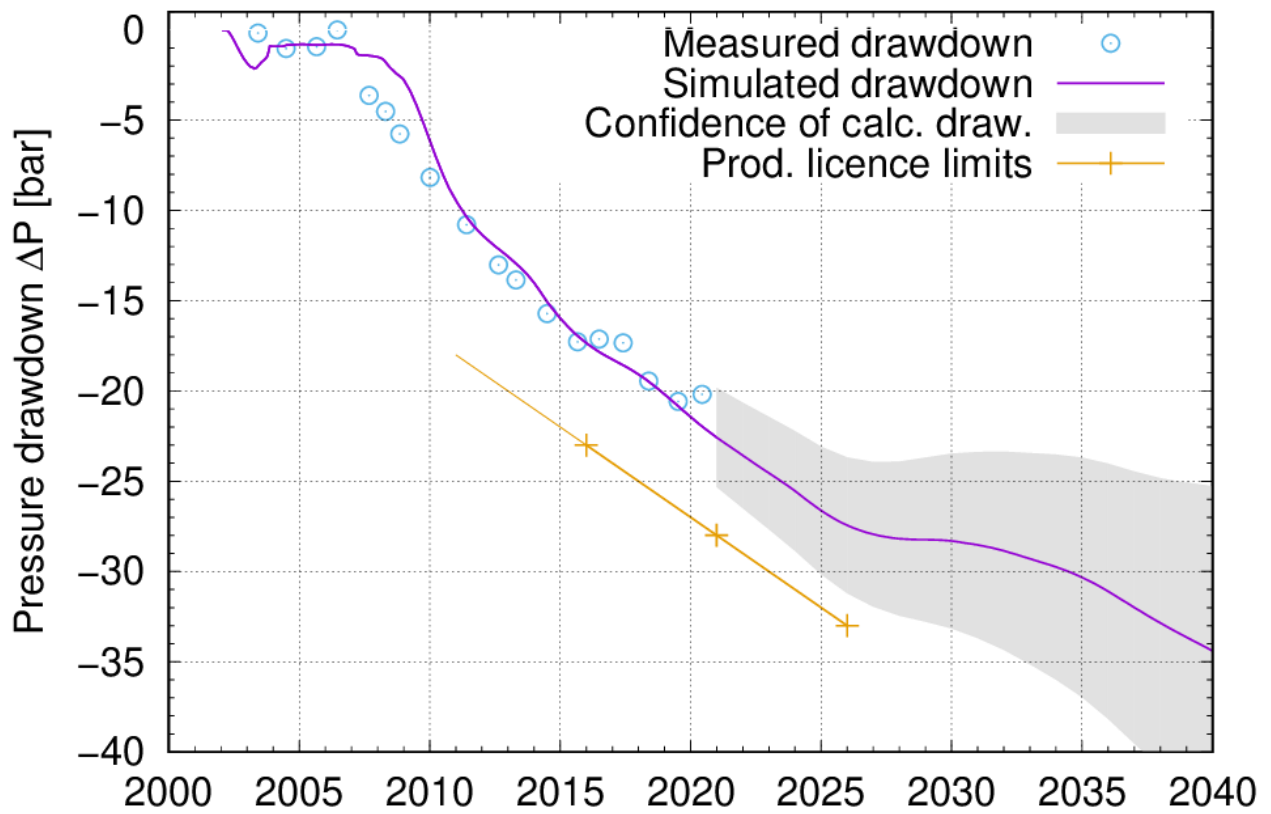
By connecting production wells in Hverahlid to the Hellisheidi Power Plant, the management of the production fields are more controllable. More consistency has been established between new measurements of the wells' production rates and simulations than before.

Nesjavellir



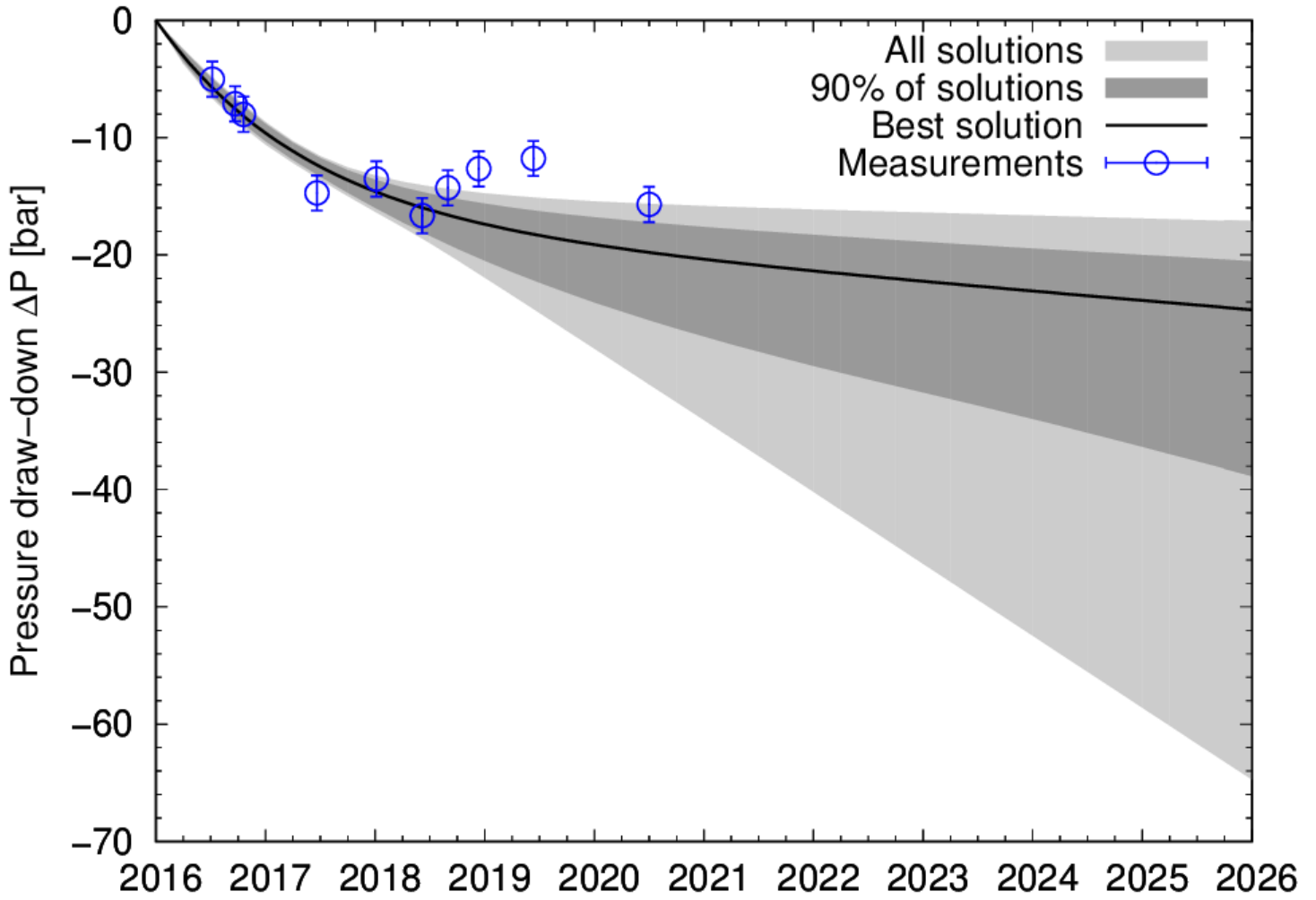
Drawdown (bar) and average annual production (kg/s) in Nesjavellir 1980-2018. A comparison between the measured and calculated drawdown appears in the upper part of the figure and the annual average production in the lower part. Solid curves show simulated results, while dots show measured values in wells at a depth of 800-1000 m. The red curve shows the drawdown in well NJ-18 and the blue curve in well NJ-15. The NJ-15 well came into operation in 2015 and was therefore not measured until 2020.

Hellisheidi



Comparison of the measured and estimated pressure drop, the so-called drawdown (bar), in well HE-4 in Hellsheidi 2000-2040. The crosses are limits according to the power plant licence. A line is drawn between the crosses, but the points are drawn according to 2011 when the licence entered into force. The confidence of the simulated pressure drawdown is shown in grey.

Hverahlid



A comparison of the measured and calculated pressure drops, the so-called drawdown. Confidence of calculated drawdown is shown in grey.