

Design of a geothermal monitoring network in a coastal area and the evaluation system

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In Seockmodo Island (area of 48.2 km²) located at the northwest of South Korea, a renewable energy development project to install photovoltaic 136 kW and geothermal 516.3 kW is initiated. Since the 1990s, more than 20 deep geothermal wells for hot springs, greenhouse and aquaculture have been developed along coastal areas. The outflow water of each site has the pumping capacity between 300 and 4,800 m³/day with the salinity higher than 20,000 mg/l, and the maximum temperature shows 70 °C. Because of the required additional well drillings, the increased discharge rate can cause serious seawater intrusion into freshwater aquifers, which supply groundwater for drinking and living purposes from 210 wells. In order to manage the situation, advanced management skills are required to maintain the balance between geothermal energy development and water resources protection. We designed real-time monitoring networks with monitoring stations for the sustainable monitoring of the temperature and salinity. Construction of borehole temperature monitoring for deep and shallow aquifer consists with the installation of automated temperature logging system and cellular telemetry for real-time data acquisition. The DTS (distributed temperature sensing) system and fiber optic cables will be installed for the logging system, which has enough temperature resolution and accuracy. The spatial distribution and the monitoring points can be determined by geological and hydrological situations associated with the locations of current use and planned facilities. The evaluation of the temperature and salinity variation will be conducted by the web-based monitoring system. The evaluation system will be helpful to manage the balance between the hot water development and the fresh water resources conservation.