# **Annex No. 2: Technical specification/Technical Tender (Form)**

**ID No. PRO-2022/213**

**TECHNICAL SPECIFICATION / TECHNICAL TENDER FORM**

**Purchase of Incukalns underground gas storage production wells hydrodynamic testing using sand and water detectors**

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| **CUSTOMER REQUIREMENTS** | **TENDERER’S OFFER** |
| 1. **Short description of the object**   The Incukalns Underground Gas Storage Facility (Incukalns UGS) is located 40 km north-east of Riga, Latvia. The gas storage facility is a Cambrian aquifer reservoir, represented by medium- to weakly cemented, medium-fine-grained quartz sandstones with siltstone interlayers, with an average thickness of 60 m. The reservoir lies at a depth of 700-800 m and has good reservoir properties (permeability up to 4 Darcy, porosity up to 32%). The reservoir formation contains sodium chloride water with salinity of 106 g/l, reservoir temperature ~22оC.  Reservoir pressure during storage operation varies from 35 bar (min) in March (after gas withdrawal) to 105 bar (max) in October (after injection), hydrostatic pressure 70 bar. The period of minimum reservoir pressures (below hydrostatic pressure) from February to June.  There are 93 production wells at the Incukalns UGS. The flow rates of the wells vary from 630 to 200 thousand m3/day. Most of the production wells are equipped with packers. The average accepted depression on the reservoir is 3 bar. Reservoir particles (sand) were detected in ~30% of the wells. Water factor about 200 grams per 1000 m3.   1. **Target of the work**   The purpose of gas dynamic tests is to obtain actual values of filtration resistance (coefficients *a* and *b*) of Incukalns UGS wells, to determine maximum productivity of wells at depressions on reservoir, not causing solid particles of rocks and formation fluid based on data obtained from sand and fluid detectors.   1. **Main types and composition of work to be carried out by the CONTRACTOR**    1. Well tests are carried out into the gas pipeline without venting the gas in the atmosphere. The use of a borehole pressure gauge during the survey is not accepted. The well is controlled from the Incukalns UGS control room during the test.    2. Well operation time with observed sand in gas flow should not exceed 15 minutes.    3. The CONTRACTOR provides a detailed description of the methodology and a standard programme for gas-dynamic test of production wells at the Incukalns UGS using sand and liquid sensors.    4. The test methodology should include a description of the equipment, mathematical and software tools used. The test methodology shall be agreed with the Technological Supervisor and the Incukalns UGS Geological Service. In case of comments, the CONTRACTOR shall make appropriate corrections to the survey methodology.    5. The test programme shall be agreed with the Geological Service, Gas Field Service, and the management of the Incukalns UGS.    6. CUSTOMER prepares the necessary work permits and prepares the boreholes for the surveys and testing.    7. Gas dynamic tests of Incukalns UGS production wells are carried out into the pipeline during the initial gas withdrawal period (at maximum reservoir pressures) using sand and fluid sensors. The works are carried out jointly with the Incukalns UGS Geological Service.    8. Interpretation of the results of the gas dynamic tests of the production wells of the Incukalns UGS shall be carried out by the CONTRACTOR on site. The CONTRACTOR delivers the preliminary conclusion on the test results to the CUSTOMER within 24 hours. 2. **Expected results and reporting form**    1. As a result of the work carried out, corresponding information on each well should be obtained and reported:       1. the parameters that determine the well's performance are filtration resistance coefficients *a*, *b* and *skin* factor.       2. the value of the depression (bar) at which the reservoir fluid and/or sand is observed at gas flow out.       3. based on the above parameters, what is the maximum safe flow rate (without sanding) the well can operate at reservoir pressures in the range from 100 to 30 bara (in 10 bar increments).    2. The final report should contain a methodology and analysis of the results of all the wells tested, recommendations for establishing maximum allowable rates (flow rate and reservoir depression) and recommendations for technological monitoring of liquid and solid impurities content control in the Incukalns UGS well production.   4.3. The contractor shall submit a final report to the client in one paper copy and electronically in \*.*doc* and \*.*pdf* format with an electronic signature.  4.4. The final report shall be submitted to the representative of the technological supervision for reviewing. The observations of the technological supervision and the Geological Survey shall be corrected by the CONTRACTOR within a period of ten days.  **5. Scope of work and time frame**  5.1. Gas dynamic tests will be carried out in all the production wells which are participating in the withdrawal process in the current year (the amount may change from 50 – 60 wells). The Works shall be carried out until the end of year 2023.  5.2. The scope of work may be reduced or increased depending on the production capacity of Incukalns UGS at the time of the work, at the same price per well.  5.3. Tests are carried out during the initial period of gas withdrawal period (at maximum reservoir pressures), in accordance with the work programme, but no later than December 20 of the current year.  5.4. The date of performance of the obligations under the Contract shall be the date of approval by the CUSTOMER of the final certificate of acceptance of the completed work, subject to the condition that all obligations under the Contract have been complied with. |  |

We hereby certify that the data and information submitted are true and fair.

Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Given name, surname:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Position: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Date:\_\_\_\_\_\_\_\_\_\_\_\_