Proposed JIP:
Recovery Factor Benchmarking Phase 2

Background: During 2023, OREC RM developed a Recovery Factor Benchmarking tool together with Neptune Energy. This initial phase of the project (**Phase 1**) focused on building a well organised searchable spreadsheet based on NPD open data (Fact Pages) which aimed to help production and exploration engineers establish base line recovery factor estimates along with their corresponding ranges (uncertainty). The database will form essential quantitative input (and uncertainty) to prospect evaluation, economic robustness during field development, and assessing in-fill targets in mature fields.

Following the initial phase of the project (Phase 1), discussions were held with NPD who encouraged a Phase 2 which includes further work on the database and making the database more widely available by forming a joint-industry project through FORCE.

Data compiled into the database from the NPD Fact Pages included, initial in-place volumes, produced hydrocarbons and final expected production estimates. In addition, numerous (ca 25) categories were recorded for each field in order to determine what impacts final recovery factors and to help sort the data so that specific field-types can be investigated. These categories include:

- Areas of the NCS
- Stratigraphy
- Dry well-heads versus wet well-heads
- Facilities
- Years of production
- Complexity parameters
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Phase 2: After discussions with both Neptune and NPD, OREC RM is offering to make the tool available to other oil companies through a FORCE JIP and to develop the RF Benchmarking further to add more depth to the database, generate more information for data analysis and improve its useability by developing a web-based tool. In addition, extensive data analysis will be carried out, including presentation of the results as a series of ready to use recovery factor plots. Phase 2 developments will include:

1. Inclusion of formation characteristics (reservoir complexity).
2. Estimation of recovery factor development over time (correlated with field types).
3. Plotting of production profiles and normalised production profiles for filtered data.
4. Extensive data analysis of recovery factors and production profiles, using the available categories for filtering and analysis, including statistical analysis tables and visual plots.
5. Development of a web-based search and display tool with interactive plotting and analysis.

Note the precise make-up of the Phase 2 deliveries will be discussed and adjusted after discussions with companies who commit to working with OREC RM in this JIP.

The Tool: The RF Benchmarking Phase 1 uses a searchable Excel spreadsheet. This will be developed during Phase 2 into an user friendly, web-based, search and analysis tool which will be made available to companies committed to the JIP.

The tool will be an interactive, easy to use software where specific categories can be selected and on-the-fly plots, ranges and statistics will be displayed. This will be a web-based system where users can search their own defined categories and make their own plots. A significant advantage of keeping the tool online will be to ensure users have access to the very latest data. If funding allows, the tool will also be developed so that report quality plots can be produced, and a macro function will be introduced so that specific plots can be reproduced as the production database becomes updated.

Deliverables:
The project deliverables will depend on the number of companies who join the JIP project prior to the initiation date (15 October 2023). OREC RM is dependent upon 3 or more companies to commit to the deliverables outlined above: i) field production data and recovery factors, ii) field characterisation, iii) web-based searching, plotting and analysis tool, and iv) a separate data analysis and plotting report.

The database will be presented as a user interactive tool which will be available to each company committing to the JIP.

Project Schedule:
The project Phase 2 is scheduled start-up 15 October 2023 and will be completed by 31 March 2024. Companies committed to Phase 2 will be encouraged to comment on the precise deliverables of the JIP, in addition to any further developments after the project completion. OREC RM required firm commitment (i.e. PO submission) by the project start date.
The Phase 2 database will be updated to include the published data for end 2023.

It is proposed that the database will be updated and improved for the following 3 years as part of this project. The yearly updates will be delivered during Q1 each year until 2027. After 2027, further updates to the database may be offered but with an additional, yet to be decided, yearly fee.

Project Costs:
The project cost per company is NOK 350 000,- this will be paid split between with an initial 50% payment and the final 50% payment on project completion. By committing to the project, an additional annual fee of NOK 50 000,- will be paid by each company for yearly updates up to and including 2027.
If companies wish to commit to the project after 15 October 2023 project start-up, a late payment fee of NOK 100 000,- will be added to the initial cost. It may be possible to purchase the database after Phase 2 of the project has been completed, but no price has yet been determined.