GEOTHERMAL Scoring Assessment Guidelines

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Section/Region: ______________________ University: ____________________________

Judge's Name: _______________________________

INTRODUCTION AND TEAMWORK (5 marks)

(Includes presentation format and executive summary)

The concept of the competition is to have each team interpret a dataset and make a robust technical industry-style presentation of the assigned basin, or area within the basin, demonstrating results of the assessment of the hydrocarbon or geothermal energy production, or for CO2 storge potential including regional geology, hydrocarbon systems, plays and prospect concepts.

The introduction is important to setting the stage for the presentation. Judges should have a clear idea of what will be presented so they can begin to form an understanding of the effectiveness of the team's presentation style. Judges will also look for evidence of teamwork and interaction in their work and presentation. High quality teamwork should manifest itself in the quality of the interpretation and presentation. All the team members should participate equally in the presentation.

REGIONAL CONTEXT (10 marks)

1. When working on Geothermal project, it is crucial for the team to have a complete awareness and understanding of the regional context as it serves as the cornerstone for comprehending other sections in a logical sequence. This includes geological dynamics, including the movements and interactions of tectonic plates, sedimentary basin classification and evolution (if applicable), environmental context, and the connection of these geological aspects to geothermal play elements. This section is pivotal because the understanding of play concepts is influenced by regional geological comprehension. The team should demonstrate a robust understanding of regional elements and their connection to geothermal heat play elements. This comprehensive regional knowledge is essential for a thorough understanding of geothermal projects.
2. For Geothermal projects look for demonstration that denotes good reservoir quality through relevant geologic elements required for such characterization. The project should show the impact of the study on the company and communities. Furthermore, how sustainable this can be moving forward.

INTEGRATED GEOTHERMAL SYSTEMS ANALYSIS (25 marks)

(Includes play-scale systems analysis, summarized with play element and composite maps, 2D/3D data and well log interpretations, regional stratigraphy, reservoir & seal presence and quality, heat generation/source, and fluid pathways).

1. Team must demonstrate the ability to incorporate the interpretation and understanding of regional controls into an integrated view of the petroleum, geothermal and/or subsurface carbon storage, which might include multiple plays.
2. For successful Geothermal projects, understanding and defining the geothermal system's nature and characteristics are crucial for exploration, development, and utilization. This involves creating a conceptual model based on surface exploration data, with updates as subsurface information becomes available. Key elements include identifying play types, reservoir rock characteristics, and factors such as heat transfer, geologic controls, and fluid types for estimating the system's potential capacity. Thorough understanding of geological and tectonic factors is essential, involving quantitative structural geology evaluation and "3D" modeling.
3. The team must showcase the ability to apply subsurface understanding to delineate potential geothermal opportunities based on in situ or engineered conditions. Screening criteria should be well-defined and consistently applied, addressing the type of geothermal that would be suitable and viable for the area of interest. In addition, the team needs to demonstrate the impact and sustainability of their proposed project to the company and the community.

WELL & ANALOG ANALYSIS (10 marks)

(Includes subsurface fluids, pressure/temperature regimes, field analogs and hydrocarbon dry hole analysis).

1. For Geothermal projects, teams should confirm identified play models and deepen their understanding of reservoir properties like temperature, pressure, and fluid composition. This involves comprehending expected reservoir performance, predicting production rates, and generating maps. Products for consideration include corrected temperature-depth profiles, reservoir temperature maps, wellbore logging cross-sections, fluid composition analysis, injection/production test result maps, and analysis from pressure test data.
2. The team should be able to showcase their understanding of the geothermal energy system they want to develop and justify why it is more suitable for the area of study through multidisciplinary approach to screening and selection of reservoirs for geothermal energy.

PROSPECT EVALUATION AND RISK ASSESSMENT (20 marks)

1. For Geothermal projects teams should create integration maps, including a reservoir overview and a risk map.
   Develop digital models indicating reservoir heat content and generating capacity, calibrated with comprehensive well test and reservoir response data (e.g., pressure decline and interference, tracer tests). If a reliable numerical model is unattainable, consider using the P90 (low side) outcome from a volumetric assessment, heavily relying on output testing of existing wells.If a reliable numerical model is unattainable, consider using the P90 (low side) outcome from a volumetric assessment, heavily relying on output testing of existing wells.
2. Geothermal project teams must assess reservoir quality and potential risks, including induced seismicity, fault reactivation, and geochemical reactions. Evaluation of subsurface conditions, such as temperature regimes and fluid characteristics, is essential.
3. Provide recommendations for future technical work, data acquisition, and exploration strategies to ensure a thorough understanding of geothermal resources and associated risks.
4. The team should be able to showcase their understanding of geothermal energy and which of their identified opportunities would be more suitable for the area of study through multidisciplinary approach to screening and selection of reservoir(s) for geothermal energy.

PROJECT SUSTAINABILITY (5 marks)

A review of measures to mitigate the social and environmental impact of any proposed project and to achieve the sustainability goals of the United Nations.

1. Teams should prioritize measures to mitigate social and environmental impacts in alignment with the United Nations' sustainability goals. This involves minimizing carbon emissions, ensuring sustainable power generation, and developing local low-carbon industries related to renewable energy technologies.
2. Teams are urged to comprehend potential impacts on local communities, proposing goodwill projects in health, education, clean water supply, infrastructure development, and electrification, including cascaded use development cases. Attention to Environmental Justice considerations, using tools like EJ Screen, is crucial, with teams developing a concise plan addressing community benefit. Engaging the local community is essential, transferring sustainable knowledge as geothermal energy projects progress.
3. For Geothermal projects the team should be able to show an auditable and repeatable workflow deployed to delineate the reservoir play, understanding of the type of aquifer, its impact over time with respect to depositional facies and projections on the sustainability of the project.

CREATIVITY AND INNOVATION (10 marks)

This section invites students to look for development of new concepts and methods for finding conventional, unconventional (where appropriate) and /or alternative resources.

1. For Geothermal projects, teams should attempt to show how the project will increase power system efficiency, optimize drilling technologies, test underground thermal energy storage, trial of new exploration methods, pilot closed loops and/or smart systems, and lead to better predictive 3D models, and how this can further reduce the burden on the use of fossil fuels for electricity or heating/cooling.
2. Teams should also consider innovative methods in drilling, interpreting subsurface data, and applying cutting-edge exploration techniques beyond traditional seismic and well log interpretation. This may include the use of advanced geophysical methods, remote sensing, or machine learning algorithms and foster creativity by integrating data from various disciplines, such as geology, geophysics, geochemistry, and engineering to identify and characterize geothermal resources and base expectations on the locations of thermal anomalies.
3. Teams must think of innovative ways to make the most possible use of the heat source, whether it is a high or low enthalpy system, and take advantage of modern technological techniques to achieve this.

QUESTION AND ANSWER SESSION (15 marks)

The ability of the contestants to effectively answer technical questions takes them beyond the prepared work and influence of their advisors. This often allows the best teams to distinguish themselves. Asking effective questions that allow the teams to demonstrate their teamwork and depth of understanding of their area is a critical responsibility of the judges.

OVERALL ASSESSMENT (100 marks)

The overall assessment should reflect the verbal summation and discussions of the judges based on their impression of the team with respect to the overall technical quality of the work, the quality of the presentation, how well the team handled questions, and the individual summary sheet filled out by the judges. This summary should be the basis for the overall ranking of the teams as well as any feedback you would give to the team. Throughout the presentation teams should make clear what they have generated versus what they have obtained through literature. Slides should be clear and uncluttered with all figures including adequate labeling, scale bars etc. Presentation style and delivery is important but should not overshadow the quality of the technical work and original/innovative thinking shown by the teams.