CCS 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 storage 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)
Includes geodynamics: plate tectonic setting, regional and environmental context, sedimentary basin classification; regional paleogeography; analogues for play elements and fields.
This is an important section as the understanding of the play concepts will be influenced by the understanding of the regional geology. Look for the team to demonstrate a strong understanding of the regional tectonics, how the basin formed, filled, and evolved through time and how this relates to the hydrocarbon and geothermal systems and play elements.
For CO2 storage projects, the team should:
1. Evaluate how the regional stratigraphic and structural setting influences the presence and quality of injection and confining zone(s).
2. Consider how the regional tectonic setting may influence the presence of leakage pathways. For example, describe the presence and geometry of faults and potential for fault reactivation.

INTEGRATED ENERGY 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).
For CO2 storage projects, the team should:
1. Utilize all available data, e.g., well, seismic, analogues, to identify and characterize potential injection zone(s) and confining zone(s); and create cross sections and maps to demonstrate injection and confining zone properties across the study area
2. Identify and characterize the Underground Sources of Drinking Water (USDWs) and demonstrate through maps, figures, and text, how it is isolated from the injection zone(s)
3. Construct a structural framework and highlight the risk of potential leakage pathways through faults, fractures and legacy wellbores, especially if those faults/fractures/wellbores transect both the injection and confining zones.
4. Identify and discuss the social, environmental and economic impact of a CCUS project in the area of study. The team should be able to discuss how the expected rate and volume of CO2 injection will not compromise the integrity of the injection zone or confining zone.

This section is where the team demonstrates the ability to incorporate the interpretation and understanding of regional controls into an integrated understanding of the petroleum, geothermal and potential emissions storage systems, which might include multiple plays. The team should be able to discuss the essential elements of the source, seal and reservoir and how they relate to the essential processes of burial, generation, migration, entrapment and preservation, all within a proper temporal arrangement. The integrated interpretation should be presented in easily understood documents which should include play element maps and play composite maps.

WELLBORE & ANALOG ANALYSIS (10 marks)
(Includes subsurface fluids, pressure/temperature regimes, field analogs and hydrocarbon dry hole analysis).
For CO2 storage projects, the team should be able to:
1. Identify injection zone(s) and confining zone(s)
2. Use petrophysical and geologic data from offset well to characterize the properties of the injection zone(s) and confining zone(s), including lithology, thickness, porosity and expected permeability
3. Confirm the presence or absence of hydrocarbons in injection zones.
4. Identify the depth of the lowermost Underground Source of Drinking Water (USDW)
5. Identify and characterize potentially permeable zones above the confining zone and below the lowermost USDW
6. Create cross-sections and/or maps to demonstrate how the injection and confining zone(s) vary across the study area
7. Utilize seismic and/or analogues to extrapolate data away from well control; create maps to demonstrate lateral variability

PROSPECT EVALUATION AND RISK ASSESSMENT (20 marks)
Teams working on CO2 storage projects should:
1. Identify potential sources of CO2 in proximity to the study area that could be captured for storage, e.g. industrial sources or direct air capture
2. Identify transportation options to connect the CO2 source with the injection site.
3. Determine whether the study area is suitable for enhanced oil recovery (EOR) or carbon sequestration (CCS); identify discrete opportunities in the study area and competitive opportunities (ex. Hydrocarbon potential beneath injection target could devalue the resource).
4. For each opportunity:
a) Demonstrate that the injection zone has suitable properties (e.g., porosity, permeability) to contain the desired amount of CO2. If the injection zone contains hydrocarbons, the team should demonstrate whether those hydrocarbons are likely to be mobilized by the injection of CO2.

b) Identify maximum injection and number of wellbores required for injection.
c) Identify the primary upper and lower confining zones and demonstrate that those zones have suitable properties (e.g., permeability) to prevent the migration of CO_2.
d) Identify and qualify the risk of leakage through pre-existing wellbores and faults or fractures.
e) If faults/fractures are present, determine the risk of fault re-activation and induced seismicity resulting from CO_2 injection
f) Qualify and potentially quantify the risk of adverse geochemical reactions between the CO_2 stream and the injection/confining zone, or between the CO_2 stream and the well construction materials
g) Ideally, the team will also describe the extent of the CO_2 plume and pressure front created by injection.
5. Rank opportunities in the study area considering geologic, social, and economic risk/uncertainty v. potential opportunity size

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.
For CO_2 storage projects:
1. Describe Environmental Justice considerations (e.g., EJ Screen tool) for the project location and prepare a brief plan that addresses community benefits or disbenefits.

CREATIVITY AND INNOVATION (10 marks)

(Includes play and prospect evaluation) Teams should think beyond the plays that have already been tested in the area and develop new play concepts (conventional and unconventional where appropriate) and /or alternative resources, such as geothermal energy. Look for evidence that teams have predicted new play concepts away from the current well control using their geological knowledge, and that they characterize the risk of untested plays.

For CO_2 storage projects, teams are encouraged to:
1. Describe options for enhanced oil recovery (EOR) and/or CO_2 sequestration
2. Identify opportunities for projects to be part of a circular CO_2 economy
3. Innovate on the types of injection zones and CO_2 trapping mechanisms
4. Identify ways to stack multiple opportunities (BECCS, energy + sequestration, BiCRS, SAF + Sequestration), Natural Gas + sequestration, decarbonized power and grid stability, etc.
5. MMV strategy and long-term liability.

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.

Note: If a judge has technical knowledge of the area a team has evaluated, the judge should base the evaluation on the overall quality of the team's technical work and presentation, not on how close the team's interpretation came to the judge's interpretation of the area. A judge can serve as a judge for a team from their alma mater without restrictions but must remain impartial.