Long-Term Hydrate Pilot Discussion: Proposed Technical Goals

1) **Gather sufficient reservoir production data to enable prediction of commercial-scale long-term reservoir production with high confidence**

   Why: *Industry will not sizably invest in hydrate development unless economic risk can be greatly reduced since the upfront cost of a commercial application will be quite large and payback times will be long. Very large uncertainty currently exists on hydrate reservoir performance since prior pilots were short and thus largely only dependent on the near-wellbore region, required little heat to transfer from outside reservoir, and did not strongly probe the impact of heterogeneity in the disassociation front.*

   a) **Key Data Collection Tasks**

      i. Perform logging and collect pressure cores during drilling of all wells – saturation & sediment props

      ii. Gas production & composition, water production & chemistry, and bottomhole P & T versus time

      iii. Offset well pressure and temperatures

      iv. Occasional transient well test data (*e.g.,* pressure build-up and decay fine time-increment data)

      v. Distributed T and P data along perforated length (*e.g.*, to assess the uniformity of inflow)

      vi. Sand production amounts and samples

   b) **Pre-assess the amount and types of data required (based on expected production rates) to reasonably constrain commercial-scale simulations**

      i. Perform simulations based on expected pilot to assess amount of reservoir which experiences substantial flow (e.g., gas depletion; pore volumes of water flowthrough, etc.)

      ii. Test sensitivity of long-term predictions to ability to fit short-term/low rate

         a) generate a several potential geologic realizations of the expected area (e.g., with different degrees of heterogeneity and different geologic & thermal parameters) then,

         b) fit short term/low rate simulation results to a reference case by reasonably adjusting perms, saturations, etc. and then

         c) comparing how the fitted models agree when run under commercial-like conditions (e.g., high rates and long times)

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2) Assess ability to predict performance *a priori*

Why: *Reasonably accurate* a priori *predictions are necessary to justify larger pilots and commercial activity. However, it is currently unclear whether hydrate performance can be reasonably predicted due to not having perfect knowledge of reservoir heterogeneities and the modeling complexities of disassociation front roughness and of geomechanical coupling*

a) Prior to the pilot simulate expected performance and identify P10-P50-P90 performance values. Have several groups independently generate predictions and compare the predictions (*e.g.,* do the predicted P10-P90 ranges of different groups or modeling approaches overlap?)

b) Compare *a priori* simulations with pilot results as the results are obtained

3) Demonstrate that long-term problem-free production is feasible at a reasonable cost

Why: *Although sand control is a fairly mature activity in O&G production, sanding has been an issue in several of the small-scale pilots. Hence, it remains to be shown that hydrate disassociation will not expensively complicate sand control and facility operations, particularly in the event of shut-ins and restarts.*