RELATIVE PERMEABILITY

CTV VI

Relative Permeability

As no site-specific Claimed as PBI Injection Zones relative permeability data were available, data obtained from cores in Claimed as PBI , which has a similar geologic age and depositional setting, were used for the computational simulation. Two samples from well Claimed as PBI were used to normalize, average, and denormalize the relative permeability (see **Figure 1** for well location). The gas-water relative permeability Corey model was used to match the laboratory data.

Gas-water Corey model Gas:

$$k_{rgw}(s_g) = k_{rgwc}\left(\frac{s_g - s_{gc}}{1 - s_{wr} - s_{gc}}\right)^{n_g} \quad (1)$$

where S_g = current gas saturation
s_{gc} = critical gas saturation to water displacement, 0.05
k_{rgwc} = maximum gas relative permeability to water displacement, 0.32
n_g = gas relative permeability curvature to water displacement, 2.55

Gas-water Corey model Water:

$$k_{rwg}(s_w) = k_{rwgc}\left(\frac{s_w - s_{wr}}{1 - s_{wr} - s_{gc}}\right)^{n_w} \quad (2)$$

where S_w = current water saturation
s_{wr} = residual water saturation to gas displacement, 0.54, scale up to 0.25 during dynamic modeling
k_{rwgc} = maximum water relative permeability to gas displacement, 0.447
n_w = water relative permeability curvature to gas displacement, 3.10

There are two facies defined in the model: sand and shale. Only one set of relative permeability was used for each facies. **Figures 2** shows the relative permeability curves used in the Base Case and sensitivity cases (Base case, Case G, and Case H.

During pre-operational tests, additional cores will be collected, more special core analysis will be acquired, and the model will be updated accordingly. Additionally, as discussed in Section 4.2.2 of **Attachment B**, several sensitivity analyses have been conducted to investigate the uncertainty related to these parameters.

Figure 1. Location of wells with core data used for permeability transform and constitutive relationships

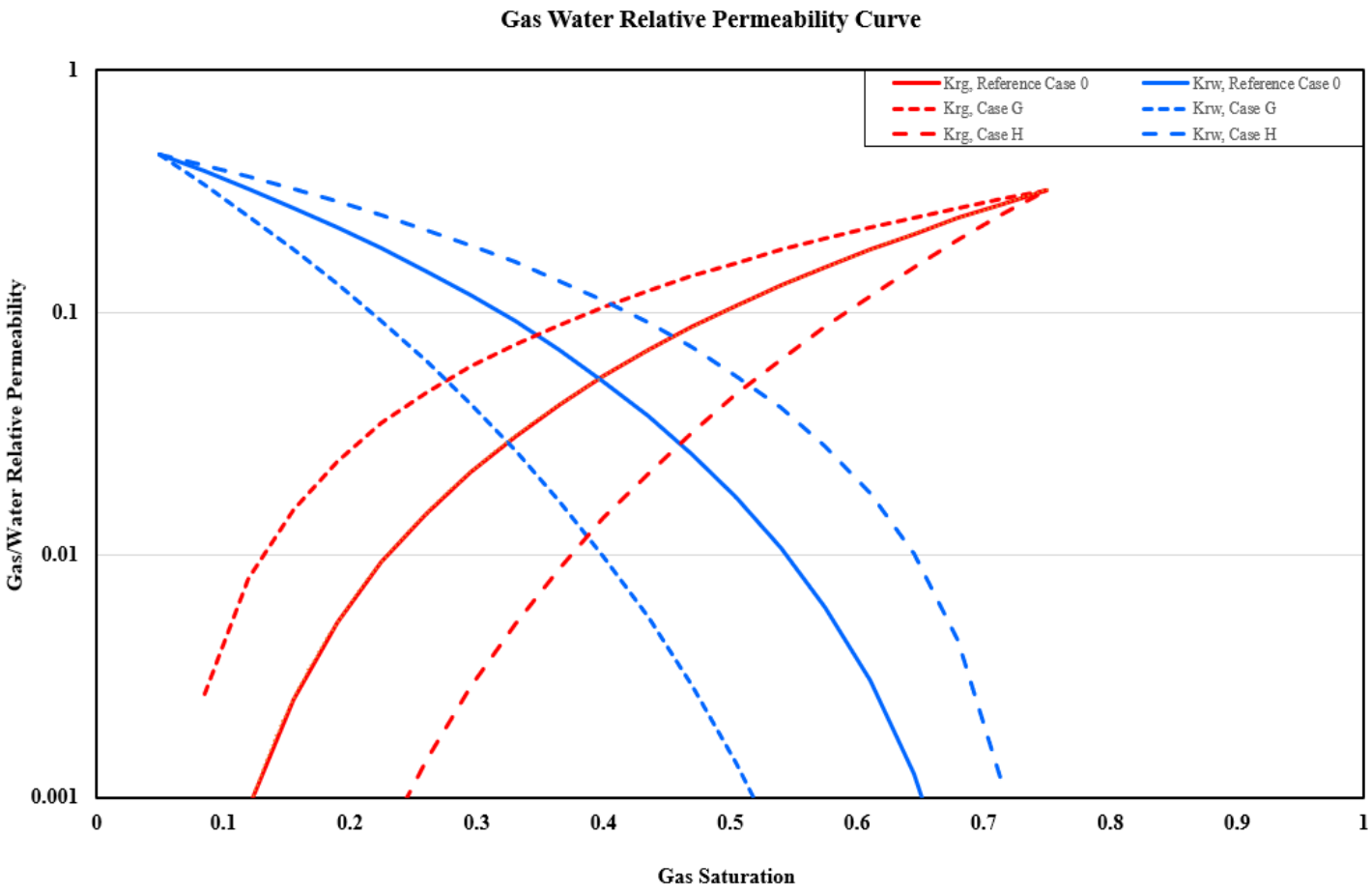

Figure 2. Relative permeability curves for Gas-Water System.