Greenhouse Gas Reduction Project

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Gas wells are frequently treated with water and sand to make them productive.

After treatment, natural gas is injected into the tubing in the well to enable the well to return the water back to the surface.

The Greenhouse Unit is used to separate natural gas from the water. The natural gas is compressed, measured, and sold onsite into a pipeline.

The water and a small volume of sand are collected in a portable tank.

The water is pumped into EPA approved water disposal wells.
Improvements from historical venting of flowback gas

- Natural gas was previously vented to the atmosphere during the flowback
  - 50 wells per year
  - Venting for approximately 3 days
  - Producing 100 to 200 MCFPD
  - Resulting in 15 MMSCF/year to 30 MMSCF/year of natural gas that is sold instead of vented as a result of this project.

A key aspect of the success of the project is the BP gas gathering.
Factors that contributed to success of the project

- Gas pipeline owned by BP
  - Lower pressure line requires less compression horsepower for gas sales
  - Metering requirements are clearly defined and already well understood
- No liquid hydrocarbons simplifies separation
- Weatherford’s vision and commitment
- Equipment is utilized about 75% of the overall time for a completion operation.
Economics

• Completion
  – Cost of greenhouse unit - approximately 30% more than a conventional air cleanout unit.
  – Cost of gas sold - roughly equal to the additional cost of the greenhouse unit.
  – Elimination of venting – priceless

• Well Maintenance - challenges to application
  – Flowback accounts for only about 10% of well maintenance
  – Artificially lifted wells are not vented
Future plans

• Completion
  − Two greenhouse gas units will be used to eliminate venting from most new wells during the completion work
  − Reverse circulating will be used on some wells. This approach also is designed to eliminate venting

• Well maintenance
  − Reduced cost will allow for increased use for well maintenance.

• Open hole cleanout
  − Pilot test to be evaluated