



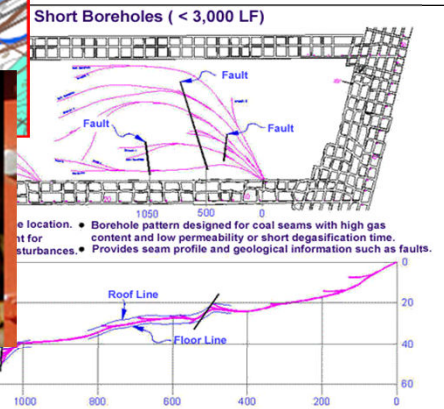
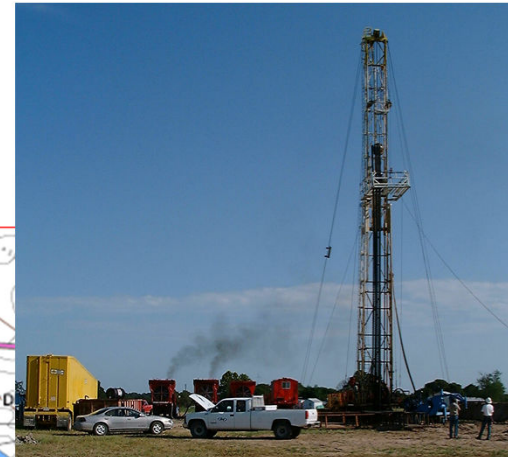
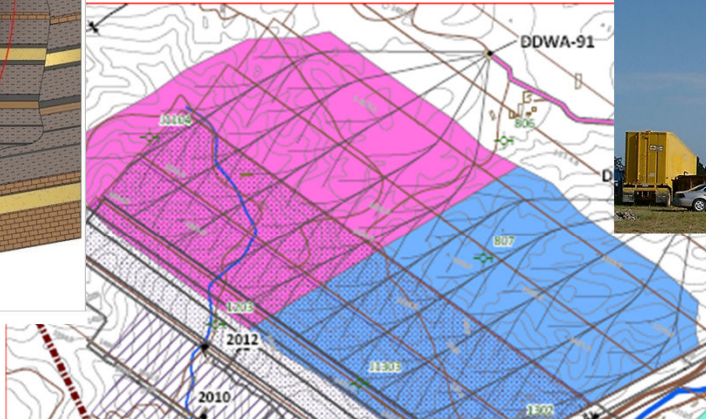
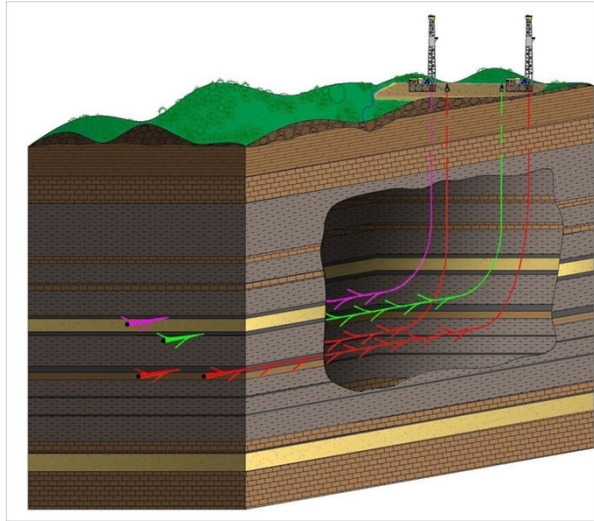
Overview of Advanced Drilling Technologies

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**Practices and Technologies: Coal Mine Methane Recovery
and Utilization in Ukraine**
21& 22 September 2011



Advanced Drilling Technology = Increased Safety



Sources: REI and Raven Ridge Resources

Statement of Problem

- Most coal in the Donbass is mined at depths greater than 500m, seams are often very gassy and outburst prone.
- Seams have low permeability caused by high in situ stresses. Coal is often sheared, limiting available options for pre-mine drainage.
- In more than 40 mines, boreholes must be used to drain gas from minable coal seams and adjacent strata in order to ensure safe operation of the mines.
- Additional investment in gas drainage systems is urgently needed.

Indicators of Successful Solution

For drilling technology to be successfully applied it must:

- Maintain the safety drillers and miners
- Effectively drain gas from low permeability coal
- Be employed to create effective drilling patterns that can be used to achieve adequate gas drainage
- Have the capacity to penetrate overpressured geologic structures (e.g. the footwall of high angle reverse faults)
- Must be capable of controlling high fluid pressures
- Cope with voluminous coal fines

Improved Drainage is Defined By

- Increased safety for miners
- Increase in volume of gas drained per meter of drilled borehole
- Fewer failed boreholes
- Higher concentration of methane in produced gas
- Extended productive life prior to mine-through

Possible Solution: Long Reach Directional Drilling

- Advanced steerable drilling is becoming more commonplace for both underground and surface to in-seam drilling systems; also available with coiled tubing drilling systems
- Advanced underground steerable systems come from Australia and USA.
- Petroleum industry is the birthplace of directional drilling and is best source of most advanced surface to in-seam systems
- Larger surface rigs with greater capacity and longer reach equipped with a variety of steerable downhole assemblies are available in Europe and Central Asia

Reasons Directional Drilling Can Achieve Desired Results

- Can accurately place boreholes in desired position within the seam or other strata, across a footwall or an overpressured structure
- Can achieve high penetration rates
- Can drill many holes from one location and many months or years in advance of mining resulting in higher volume of gas drained from coal
- Provides detailed geologic information
- Advance drilling technology is available in Ukraine

Thank you!