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Revision and Optimization of a Solution Mining Plan in Response to Changes in Project Costs, Schedule, Economics and Corporate Goals

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Abstract

The time that a gas cavern storage project spans, in terms of conception, feasibility, engineering design, permitting, construction and operations, is several years in length.

During this time, project budgets incur changes as a result of inflation, labor rates, and actual bids from suppliers and contractors; schedules are affected by material deliveries and weather. Economics acquire pressure from changes in market fundamentals, forward prices in natural gas and interest rates. Services customers desire may change and challenge original design assumptions. Increased oil and gas exploration and production activity result in decreased rig availability and increased day rates. In 2008, an aggressive competition for contractors, materials and equipment resulted in increased labor and material costs industry-wide. Strong escalations in steel costs also occurred. In the face of all this, how does one preserve the original project returns and business case sold to the board members?

The Golden Triangle Storage Project, with duration of nearly seven years (2005 to 2012) faced many of the same challenges. The solution mining of Cavern #1 began in late February, 2009, approximately 4 ½ months later than original project design. Thereafter, the leaching plan for Cavern #1 was reexamined to identify areas where measures could be implemented to improve the project schedule and return. Bottlenecks in the piping were identified. Injection and disposal pump horsepower curves were studied for opportunities to optimize leaching facilities. Similarly, the influence of increased injection rates on disposal well performance, and possible well interference, was considered. Additional sonar surveys and leaching simulation were employed to insure cavern shape and development. Results showed that modifications of the facility, coupled with changes in assumptions, positively impacted project returns and start-up dates. Raw water injection rates were increased from 3,600 gallons per minute to 4,100 gallons per minute. Additionally, modifications in schedule encouraged the use of hedges to reduce pad gas costs and mitigate risk.

The start-up for Cavern #1 will commence in fall, 2010. Cavern #2 will begin leaching in the summer, 2010, and will begin service in spring, 2012.

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