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Project Summary

Literature Survey of Environmental Concerns Associated with In Situ Coal/Oil Shale Operations

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In situ goal gasification and in situ oil shale retorting exhibit a number of unique areas of environmental concern. Available data are summarized to assess the potential impacts on four areas: (1) groundwater due to leaching of residual materials left underground, (2) those due to subsidence, (3) air quality due to percolation of gases up through the overburden with subsequent release to atmosphere, and (4) those due to co-produced solid wastes consisting of particulate matter coated with condensed hydrocarbons. Impacts on groundwater are the greatest environmental concern; subsidence is of somewhat less, but still significant, concern.

This Project Summary was developed by EPA's Air and Energy Engineering Research Laboratory, Research Triangle Park, NC, to announce key findings of the research project that is fully documented in a separate report of the same title (see Project Report ordering information at back).

Introduction

Development of *in situ technologies* for the recovery of coal and oil shale has been underway in the United States since the early 1970s and later 1960s, respectively. Because in situ processing is designed to eliminate or, in the case of modified in situ oil shale retorting, greatly reduce the mining operations normally associated with conventional fossil fuel recovery operations, a number of unique environmental concerns are associated with these in situ processes. All are directly related to the in situ processing of the respective resources. This task was commissioned with the objective of collecting and evaluating existing information on these environmental areas of concern associated with underground coal gasification and in situ oil shale retorting.

Conclusions

Specific findings for each technology are presented in the full report. The following summarizes potential environmental problems found during the course of the study.

Impacts on Groundwater

In situ processing results in the formation of pyrolysis products and ash materials that remain underground. As groundwater flows into these areas, leaching of these materials occurs and contamination of the groundwater results. Depending on the degree of contamination, treatment of this groundwater may be required to prevent transport of contaminants away from the area.

Subsidence

In situ processing involves the removal of large quantities of material. The void volume created may be of sufficient size to cause subsequent failure of the overburden material above the area where processing is conducted, leading to deformation of the ground surface with both vertical and horizontal components of displacement. Subsidence may also enhance the potential for groundwater contamination.

Post-Operational Gas Leakage

At termination of in situ operations, the void volume created underground is filled with gases at pressure. Depending on the geologic conditions and subsidence potential, there may be a potential for these gases to percolate through the overburden material to the surface, with subsequent leakage to the atmosphere.

Co-Produced Solid Wastes

The raw gases escaping to the surface during in situ processing contain varying amounts of particulate matter. This particulate matter is removed from the gases and is coated with condensed organic materials which are also contained in the raw product gases. Disposal of this material may require special handling depending on its properties.

Recommendations

Substantial deficiencies are apparent in the data base for both technologies. Pre-operational baseline groundwater quality data were not gathered at either underground coal gasification site. Field data for groundwater at in situ oil shale retorting sites are essentially nonexistent. In the latter case, the qualifier must be added that sites where testing has occurred were dry or nearly so, making monitoring either impossible or extremely long-term. Where possible, future operations should include sufficient pre-operational groundwater monitoring, so that more meaningful results can be obtained.

Documentation of quality assurance/quality control procedures utilized to ensure analytical data validity and a detailed historical description of groundwater sampling/preservation/analyses procedures also would enhance the ability to assess the data. Availability of raw data would also be helpful.

In the area of subsidence, the major deficiency is the lack of a predictive model. Major efforts have been underway to overcome this, but the complexity of the problem does not promise near-term succes. Until such a model is available, assessment of the potential for the occurence of subsidence will remain more qualitative than quantitative.

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The complete report, entitled "Literature Survey of Environmental Concerns Associated with In Situ Coal/Oil Shale Operations," (Order No. PB 86-209 780/AS; Cost: $11.95, subject to change) will be available only from:
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