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### Potential benefits of minerals and metals as added value to oil shale in Jordan

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It is already well documented that oil shale occurs beneath about 60% of Jordanian territory. The resource ranks as the fourth largest in the world, and already well proven reserves are reported to be about thirty five billion barrels of oil. The world's growing demand for energy, results in strong interest in the development of oil shale all over the world in general and in Jordan particular. Therefore, development of the oil shale deposits and production of petroleum-based fuel in Jordan will continue its already stimulated economic status. In Jordan, extraction of oil from oil shale is being considered, both by in situ conversion and by extraction and surface retorting. Despite the fact that recovery of shale oil from oil shale alone appears to be economically feasible, benefits from the spent shale are an added value that should be considered. The spent shale is useable in several major chemical, mineral, and medical applications, as animal feed additives, and as mineral components for production of cement critical for construction industries. These possible uses certainly will enhance the favorability of the economics of oil shale development and offer operational benefits. Moreover, it is well known that some black, organic-rich and/or bituminous shale hosts important base and precious metals. Although oil shale typically contains only trace amounts of similar base metals, these sometimes include uranium, vanadium, molybdenum, nickel, cobalt and others which are of high value. Therefore, the objective of this presentation and research is to re-examine Jordanian oil shale and to determine the products most likely to add value, and their beneficial use. However, because black shale and oil shale commonly host metals, especially precious metals, as finely disseminated native metal particles, determination of their presence and abundance will require application of various analytical procedures, most likely including non-conventional ones. We anticipate that the outcome of such analysis of oil shale, including particularly spent shale, will support development of commercial operations, with economic benefits and minimal environmental impact.