14.1 **Applying Hydrous Pyrolysis to In Situ Oil-Shale Retorting**

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Hydrous pyrolysis involves heating organic-rich rocks in the presence of liquid water at temperatures between 300 and 365ºC for 24 to 120 h. If the organic matter is oil prone, a liquid oil is generated within and expelled from the rock and accumulates on the water surface within the reactor. The similar physical and chemical character of this expelled oil to natural crude oils makes hydrous pyrolysis a useful experimental approach in studying natural petroleum generation in source rocks as they subside within sedimentary basins. Although the application of water vapor in surface retorting of oil shale has been shown to improve the quality of the oil product, liquid water in surface retorting is encumbered by the cost of retorts capable of operating at pressures of 2,000 to 3,000 psi. It is more feasible to apply hydrous pyrolysis to *in situ* retorting where these high pressures can be maintained with liquid water at certain depths in the subsurface. Using a typical subsurface lithostatic pressure gradient of 1 psi/ft, *in situ* retorting in the presence of liquid water at 360°C would require heating depths in excess of 2,800 ft. This restricts hydrous *in situ* retorting to basins where thermally immature oil shale exists at greater depths than currently considered for *in situ* retorting. Two examples where potential oil shale meets these conditions are in the Uinta and Illinois basins. We refer to this deeper *in situ* retorting in the presence of liquid water as enhanced natural oil generation (ENOG). Although various technical and economic aspects of ENOG need to be addressed with respect to well configurations and heating and fracturing rocks at these deeper depths, the advantages include enhanced thermal conductivity with water as a medium and use of existing subsurface formation water rather than ground waters.