ExxonMobil's Electrofrac Process for *in-situ* oil shale conversion

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ExxonMobil's Electrofrac process is an energy efficient method for converting oil shale to producible oil and gas. The method heats the oil shale *in situ* by hydraulically fracturing the oil shale and filling the fracture with electrically conductive material, forming a heating element. The shale oil and gas are produced by conventional methods.

Electrofrac research has included small-scale experiments, numerical modeling, and resource description work addressing critical technical issues. This presentation provides an overview of the research, highlights of which are listed below.

- Laboratory experiments demonstrating the following
  - Hydrocarbons will be expelled from heated oil shale even under *in situ* stress.
  - Electrical continuity of the fracture heating element is unaffected by kerogen conversion.
  - Calcined petroleum coke is a suitable conductive material for use as the fracture-heating element.
- Modeling including the following
  - A Piceance Basin geomechanical model that shows most of the Green River oil shale is in a stress state favoring vertical, rather than horizontal, fractures.
  - Heat conduction models that show several fracture designs can deliver heat effectively.
  - A phase behavior model that shows volume expansion is a large potential drive mechanism. *In situ* oil shale can expand by 70% upon kerogen conversion.

Resource description work indicating that Piceance Basin oil shale is sufficiently thick and rich for commercial development by the Electrofrac method.