Unconventional Fuel Has Already Emerged as Key Part of Oil Industry. Among unconventional oil resources globally shale is largest opportunity.
Global supply uncertainties, with significant growth in China, the Middle East, and Latin America are expected to continue to pressure oil markets.
BLM: 1.2 Trillion barrels recoverable oil in Utah, Colorado & Wyoming.
Red Leaf controls oil shale leases containing approximately **1.5 billion** barrels of oil on Utah School Trust Lands – about 17,000 acres.
ECOYHALE IN-CAPSULE PROCESS

Economical
- Uses Standard Mining Equipment
- Produces a Higher Quality Oil (A.P.I.)
- High Volume and Scalable
- Avoids Costly Steel and Welding

Environmental
- Patent Pending
- Amenable for Carbon Sequestration
- Rapid Surface Reclamation
- Protects Surface Waters and Aquifers
- Reduces CO2 by two thirds
- Impounds Spent Shale to EPA Standards
- No Process Water Required
The EcoShale In-Capsule Process requires ZERO process water for extraction of the kerogen oil.

- Significantly reduces cost of extraction
- Addresses one of the primary environmental considerations.
- Eliminates cost for treatment of contaminated water following extraction
The EcoShale In-Capsule Process results in premium yields and no bottoms, resulting in premium prices for downstream sales.

Typical Yields of Produced Shale Oil versus Crude Oil

- Naphtha and lighter (IBP to 330° F)
- Jet fuel (330 to 480° F)
- Diesel (480 to 650° F)
- Vacuum Gas Oil (650 to 1000° F)
- Residue (1000° F+)

Brent

WTI

Tosco

EcoShale

Typical refinery output
The Technology

Visualization created by Visual Influence, Inc.

Time: 76 hours

Oil Shale Rubble Bed

Flexcrete Insulation (Pilot Plant Only)

Bentonite Amended Soil Seal

Shale Oil Distillate

Prompt Shale Oil

Temperature Scale:

60 F | 144 F | 228 F | 312 F | 396 F | 480 F | 564 F | 648 F | 732 F | 816 F | 900 F
The Technology

Visualization created by Visual Influence, Inc.

Time: 322 hours

Oil Shale Rubble Bed

Flexcrete Insulation (Plant Plant Only)

Bentonite Amended Soil Seal

Shale Oil Distillate

Prompt Shale Oil

Temperature Scale: 60 F to 900 F
The Technology

Visualization created by Visual Influence, Inc.

Time: 1226 hours

Oil Shale Rubble Bed
Flexcrete Insulation (Pilot Plant Only)
Bentonite Amended Soil Seal

Shale Oil Distillate
Prompt Shale Oil
EcoShale Process: Environmental Process
In-Capsule Recovery & Reclamation
Pathway To Commercial Projects

I. Laboratory Phase
- Basic Research
  - analysis
  - physical & thermo properties
  - chemical studies
- Applied Research
  - batch tests
  - process variables
  - prelim. model
- Bench and PDUs
  - semi-cont. testing
  - prelim. kinetics
  - process model
  - prelim. econ.

II. Field Testing Phase
- Pilot Plants
  - core proc. integ.
  - heat & mass balances
  - kinetics
  - control strategy
  - product quality
- Semi Works
  - eng. scale-up
  - I & C verification
  - environmental controls
  - commercial design & econ.

III. Commercial Phase
- Demo Plants
  - commercial scale-up
  - final design
  - confirm economics
  - operating procedure & debottleneck
  - milestone
- Commercial Plants

2009
SOME FINAL THOUGHTS

• OS HAS A SMALL SURFACE FOOTPRINT
  • ETHANOL WILL DISTURB 40 TIMES MORE LAND THAN OIL SHALE
• HIGH QUALITY FEEDSTOCKS FROM OS CAN BE PROroduced ECONOMICALLY
  • SEVERAL COMPANIES ARE INVESTING PRIVATE DOLLARS IN OIL SHALE DEVELOPMENT TODAY
• ECOSHALE HAS LOW CO2 EMISSIONS WITH CAPACITY FOR CCS
• ECO SHALE USES NO PROCESS WATER
• U.S.A. WILL BECOME HOME TO LARGE PROVEN RESERVES
• THE OIL WILL BE 4.5 TIMES THE QUALITY OF CANADIAN BITUMEN
• U.S. CAN BE THE LEADER ON INNOVATIVE TECHNOLOGIES FOR CLEAN & EFFICIENT ENERGY
• OS CAN BE A KEY PART OF ECONOMIC STABILITY IN THE COUNTRY, STATES AND FOR LOCAL, RURAL COMMUNITIES