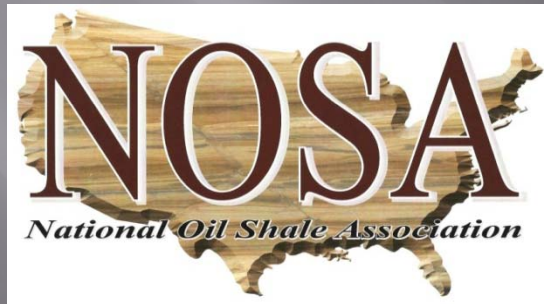


# THE PROMISE AND PERIL OF OIL SHALE COSTS AND BENEFITS OF DEVELOPMENT

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## AN INDUSTRY PERSPECTIVE

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Disclaimer – the views presented are the authors views, and not the views of any one industrial firm or of the National Oil Shale Association as a whole.

# INTRODUCTION

- ▣ THE PROMISE AND PERIL OF OIL SHALE
  - THERE IS NO OIL SHALE INDUSTRY, AND NEVER HAS BEEN ONE THE U.S.
  - ONLY A HUGE RESOURCE AND THE POTENTIAL FOR MAKING ITS DEVELOPMENT ECONOMIC AND SUSTAINABLE
  - MAY NEVER BE AN INDUSTRY
- ▣ TECHNOLOGY IS THE KEY
  - CONTINUING CURRENT R,D&D IS IMPORTANT
- ▣ MISCONCEPTIONS ABOUND
  - E.G. INFERIOR HYDROCARBON RESOURCE, FEDERAL LEASING UNNECESSARY, SOCIAL IMPACTS ARE ALL NEGATIVE
- ▣ STIGMA OF BLACK SUNDAY

# WHAT HAS CHANGED SINCE BLACK SUNDAY

- ❑ NO FEDERAL GOVERNMENT FUNDING OR RUSH TO MEET FEDERAL PRODUCTION MANDATES
- ❑ EVOLUTION OF TECHNOLOGIES AND ENVIRONMENTAL MITIGATION STRATEGIES AND STRICTER REGULATIONS
- ❑ FOCUS ON INSITU TECHNOLOGIES IN THE DEEP PICEANCE BASIN OF COLORADO AND NEED FOR FEDERAL RESOURCES IN THAT REGION
- ❑ SUCCESSFUL COMMERCIALIZATION OF SURFACE TECHNOLOGIES DEVELOPED ABROAD
- ❑ DELIBERATE AND EXPENSIVE PRIVATE RESEARCH, DEVELOPMENT AND DEMONSTRATION PROGRAMS

# WHY IS INDUSTRY INVESTING \$MILLIONS ON R,D&D

- ▣ LONG TERM PROFIT POTENTIAL
- ▣ NEW TECHNOLOGIES WITH THE POTENTIAL OF COMPETING WITH CONVENTIONAL PETROLEUM
- ▣ PROVEN NON-U.S. OIL SHALE TECHNOLOGIES THAT PROVIDE LESS TECHNICAL AND INVESTMENT RISK
- ▣ HUGE & WELL DEFINED DOMESTIC RESOURCE WITH NO DISCOVERY RISK OR OFFSHORE POLITICAL RISK
- ▣ POTENTIAL TO ADD \$BILLION TO ASSETS IF PROJECTS ARE ECONOMICALLY VIABLE
- ▣ POTENTIAL FOR SMALL COMMERCIAL OPERATIONS

## Progress on BLM R,D&D Leases



- ❑ Some allege no progress is being made on R,D&D leases
- ❑ Leases were issued by BLM in 2007 – 10 year leases
- ❑ State and BLM requirements
  - 4-quarters of hydro data
  - Detailed development plan
  - Permit approvals
  - Reclamation bonding
- ❑ Example - AMSO has all permits to begin work
- ❑ Other projects are also moving ahead

# OIL SHALE COSTS



Unocal Plant Circa 1980's

- ▣ Historically oil shale has been more expensive than conventional oil & gas production
- ▣ Detailed cost estimates were performed by developers in the 1970's but they are of little use today
- ▣ Current R,D and D is focused upon improving economic return, reducing investment risk, and proving environmental mitigation strategies
- ▣ Estimated costs of shale oil production range from \$20 to around \$80 per barrel depending upon the technology and level of project maturation
- ▣ Initial demonstration plants are needed to define costs and technical parameters

# OIL SHALE BENEFITS FOR THE PUBLIC

- ▣ Revenues from taxes, royalties and fees
- ▣ High paying jobs
- ▣ Infrastructure improvements
- ▣ Long lived industry/ large reserve base
- ▣ Security of oil supply
- ▣ Potential to drive down gasoline prices long term



Battlement Mesa, Colorado – a town built for oil shale development in the 1980's

# OBSTACLES FACING INDUSTRY

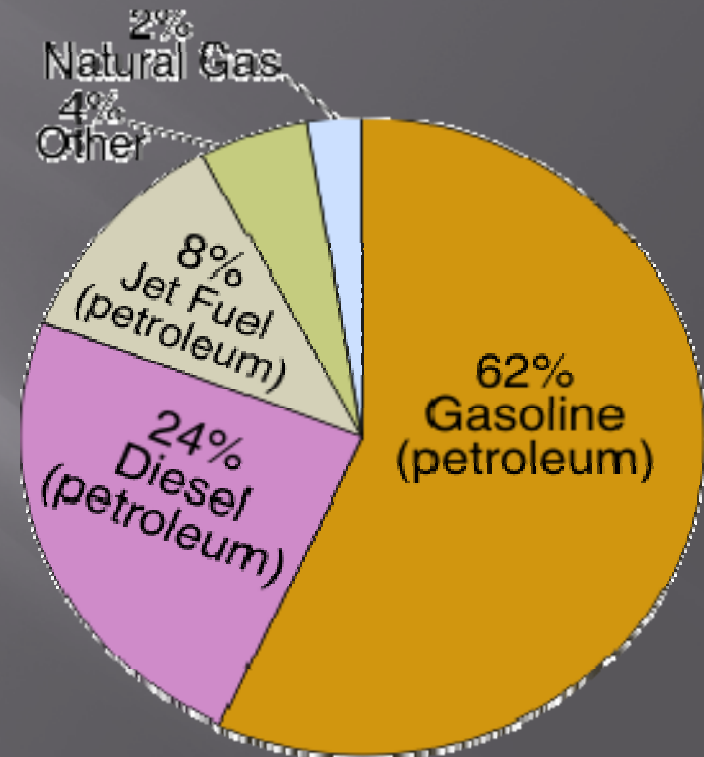


Estonian Oil Shale Plant

- ▣ Technical
  - Few commercially demonstrated technologies – long lead times
- ▣ Political
  - Federal and regional opposition, and stigma of 1980's collapse
- ▣ Environmental
  - Carbon management, water, air & wildlife issues have technical solutions that will be expensive
- ▣ Regulatory
  - Limited access to federal oil shale resources
- ▣ Social & Economic
  - Social benefits obscured by external emphasis upon impacts
- ▣ Investment Risk

# SUMMARY AND CONCLUSIONS

- ❑ Petroleum is becoming harder to find and more expensive.
- ❑ 94% of the U.S. transportation system runs on liquid fuels made from petroleum
- ❑ Oil shale is one of the U.S. domestic energy resources that can reduce the societal cost of increasing oil importation.
- ❑ A balance between public costs and benefits is the desired end result.
- ❑ Technology is the key to whether oil shale will in the end become competitive with petroleum



94% of Transportation Fuels in the US come from Petroleum

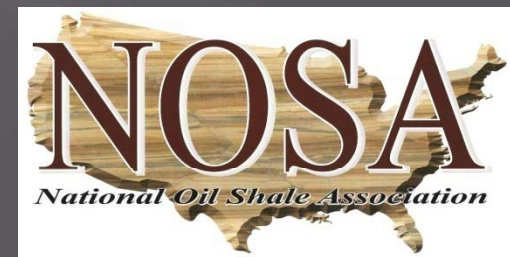
# CONTACT INFORMATION

NOSA IS A NOT-FOR-PROFIT ORGANIZATION THAT STANDS FOR RESPONSIBLE DEVELOPMENT OF U.S. OIL SHALE TO BENEFIT THE LONG TERM ENERGY NEEDS OF THE NATION.

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# OIL SHALE PROJECTS

Shell\*

Chevron\*

AMSO\*

(w/TOTAL)

Exxon

OSEC\*

(w/Petrobras & Mitsui)

EcoShale

Paraho (STI)

Enshale



Shell Mahogany Project Freeze Wall 2009

\*BLM R,D&D Lease Holder

# ADDITIONAL OIL SHALE PROJECTS



EnShale Pilot Plant in Utah

- ▣ Schlumberger
- ▣ AuraSource
- ▣ Quasar Energy LLC
- ▣ Percy Kean Clean Technologies
- ▣ IEP
- ▣ Mountain West Energy
- ▣ PetroProbe
- ▣ University of Denver
- ▣ Phoenix-Wyoming
- ▣ Natural Resources Recovery
- ▣ Millennium Synfuels
- ▣ Chattanooga Corporation
- ▣ CRE Energy
- ▣ Global Resources
- ▣ Natural Soda/Sentient
- ▣ General Synfuels International
- ▣ ConocoPhillips
- ▣ Encana
- ▣ Anadarko