



Potential Development of United States Oil Shale Resources

March 28, 2007

**Khosrow Biglarbigi
INTEK, INC.**

Presented at the 2007 EIA Energy Outlook Conference, Washington, D.C.



Acknowledgements



U.S. Department of Energy



Office of Naval Petroleum & Oil Shale Reserves



Office of Petroleum Reserves



Task Force for Unconventional Fuels



Department of Energy



Department of Defense



Department of the Interior



Colorado



Kentucky



Mississippi



Utah

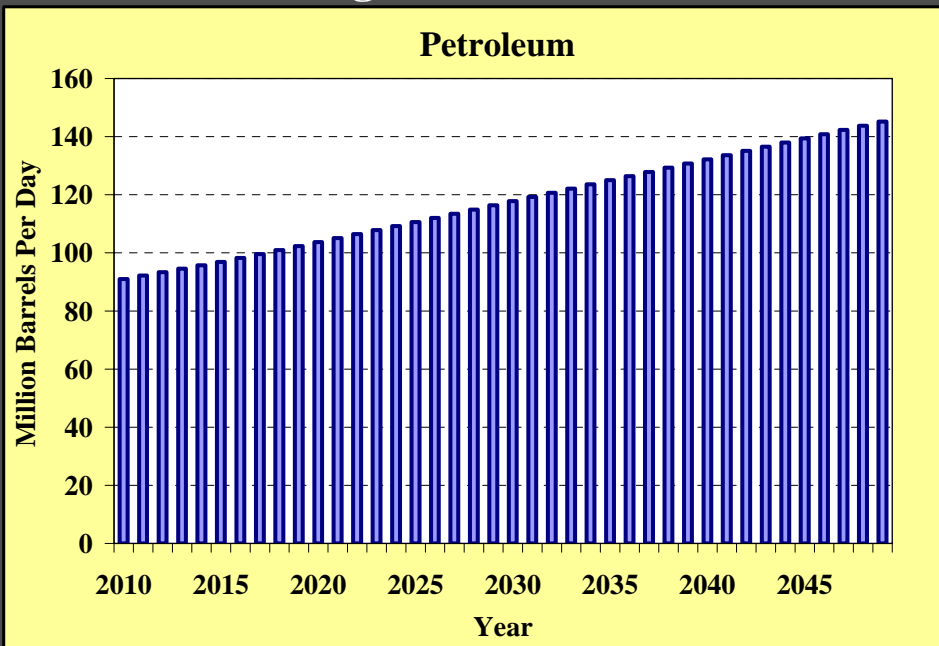


Wyoming



World Oil Supply and Demand

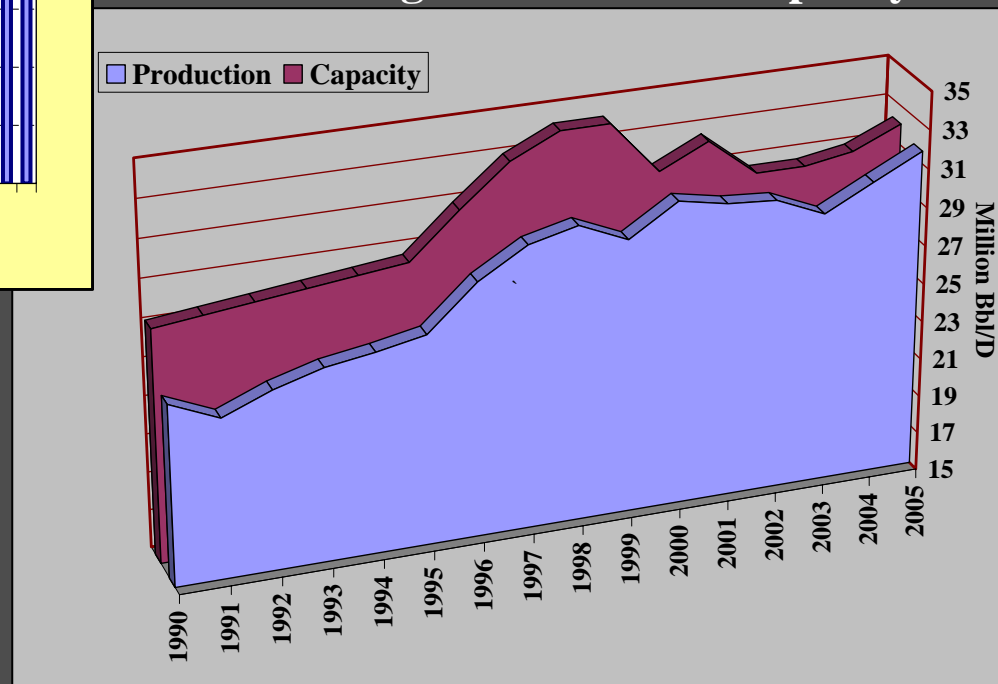
Growing World Demand



Source: Energy Information Administration
(AEO 2006)

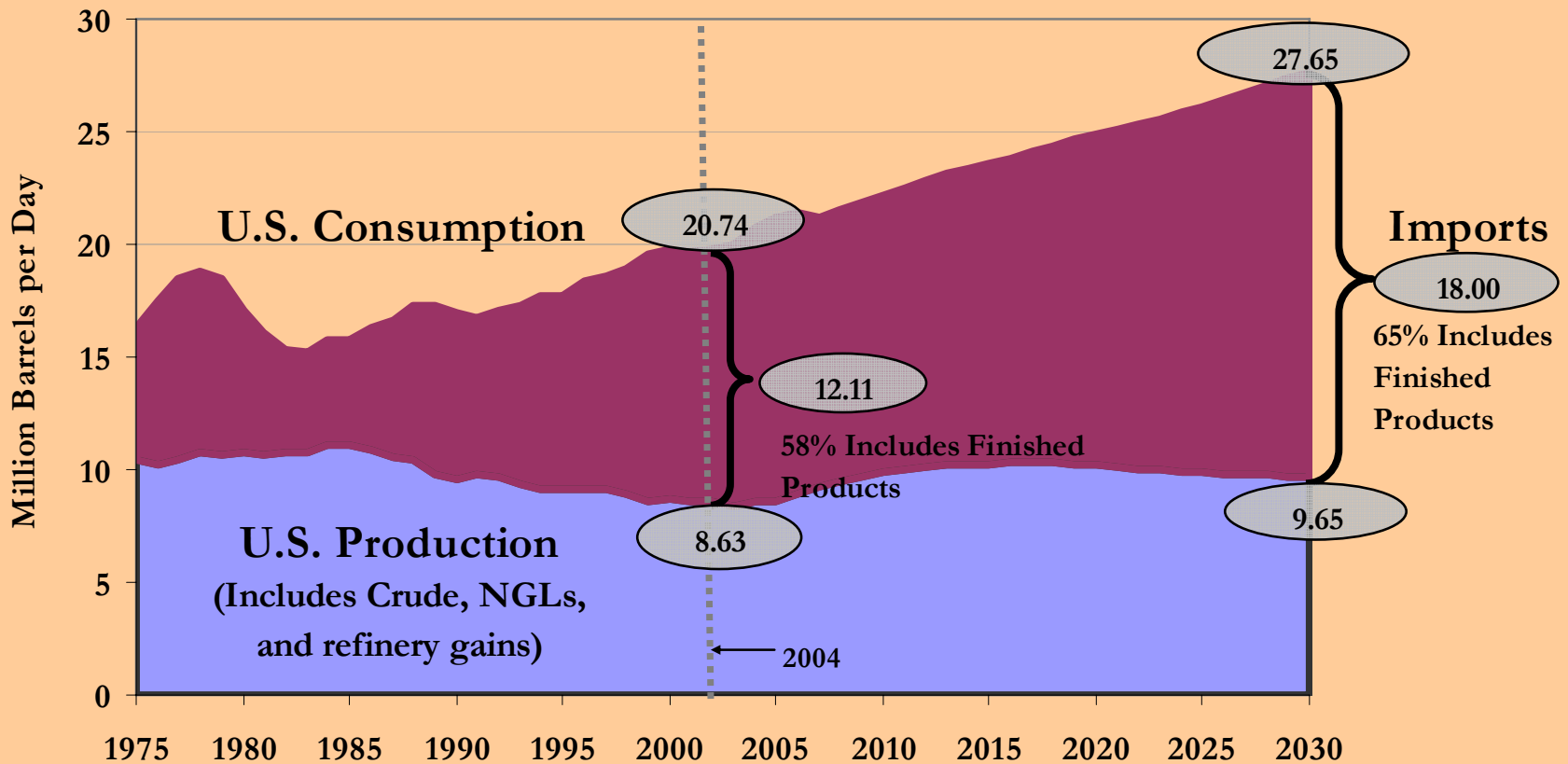
- Demand Growth of 15MMBbl/D (by 2025)
- OPEC Excess Capacity of 1 MMBbl/D (in 2005)
- Where Would the Balance Come From?

Diminishing OPEC Excess Capacity





Reason for Concern at Home: Ever Rising Oil & Refined Products Imports



Source: U.S. DOE EIA "Annual Energy Outlook 2006".



The Opportunity:

Most Concentrated Hydrocarbon Deposits on Earth

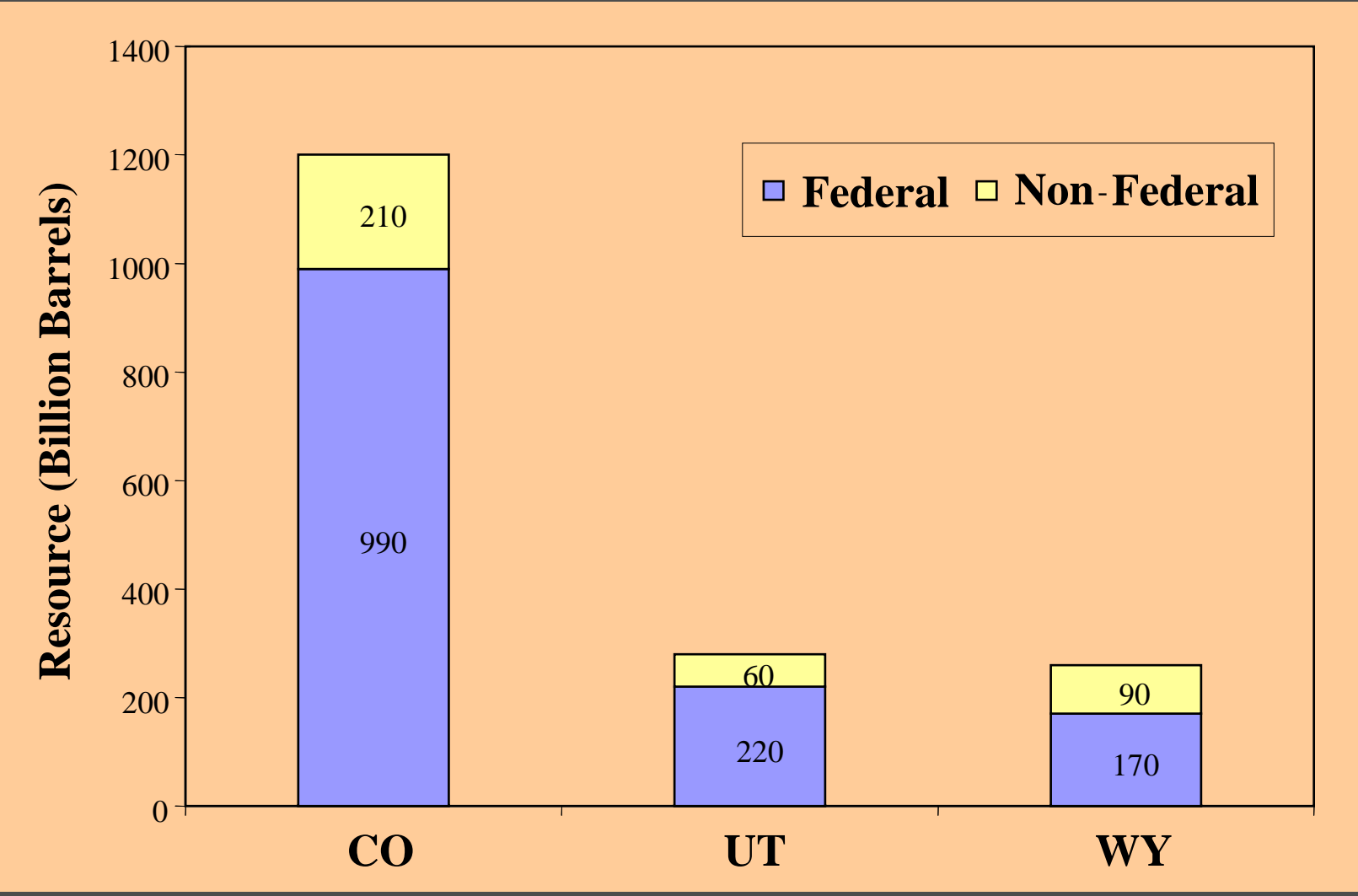


- Over 6 trillion barrels of resource nationwide
- Nearly 2 trillion barrels in rich deposits in Western states
- Colorado, Utah, and Wyoming





Western Oil Shale Ownership (80% on Federal Lands)





Oil Shale Conversion Technology

Surface Process

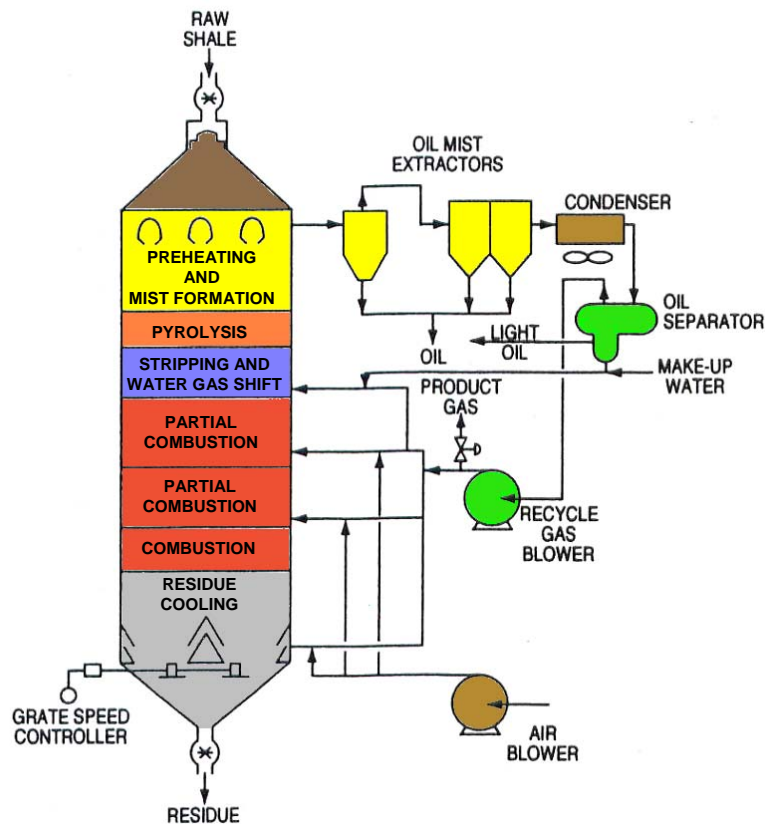


In-Situ Process



Example Surface Retort Technology

Gas Combustion Retort

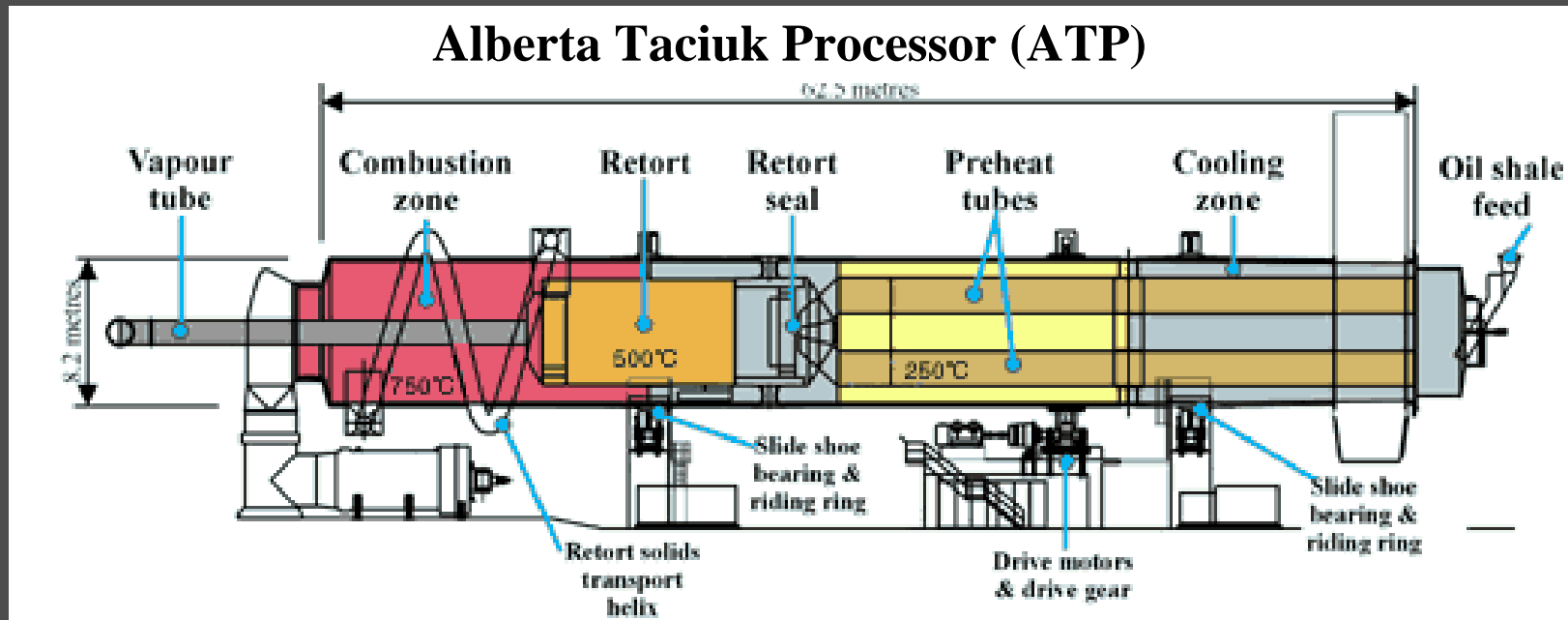


- Originally developed by
 - Cameron Engineering
 - Bureau of Mines
- Most successful
 - High thermal efficiency
 - High retort efficiency
- Variations of GCR
 - Petro-six operating in Brazil
 - Paraho Process being tested for a major project abroad



Example Surface Retort Technology

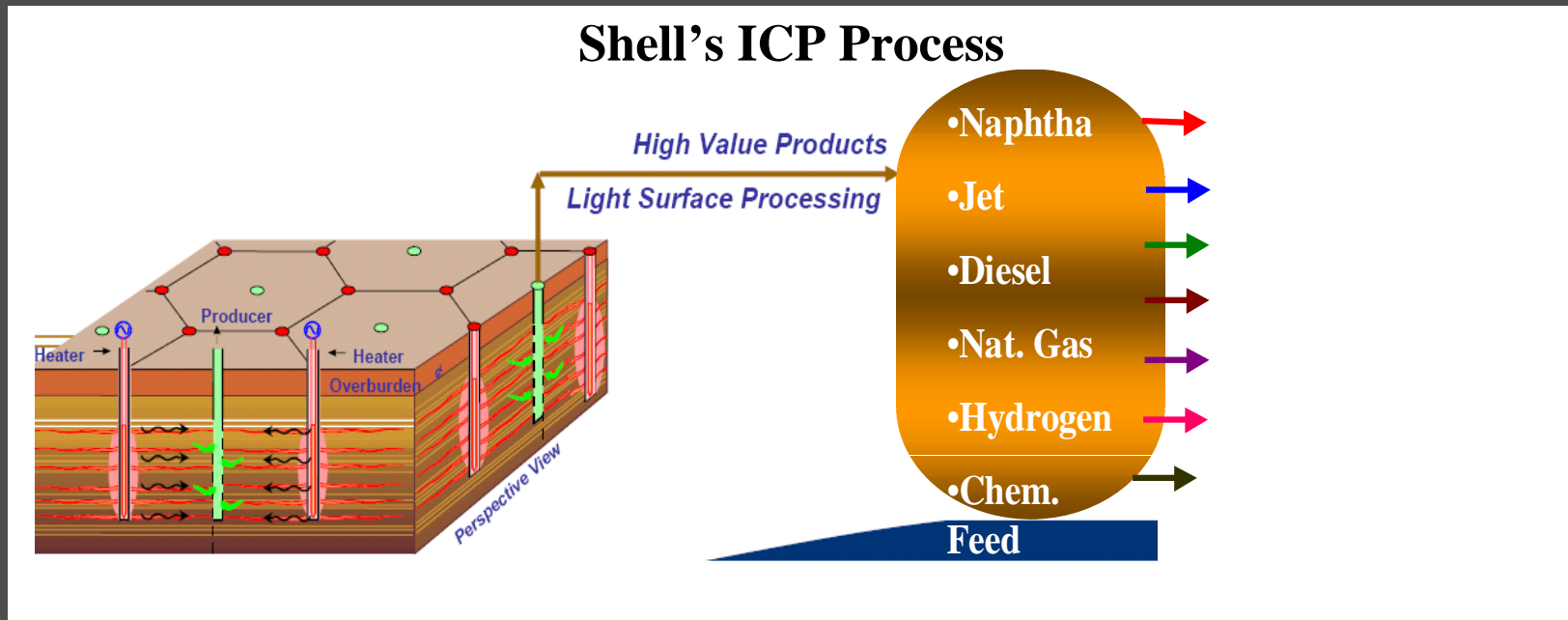
- Initially designed for extracting bitumen from tar sands
- Selected for oil shale conversion in Australia (SPP)
- OSEC to apply ATP for its RD&D efforts in Utah





Example In-Situ Conversion Technology

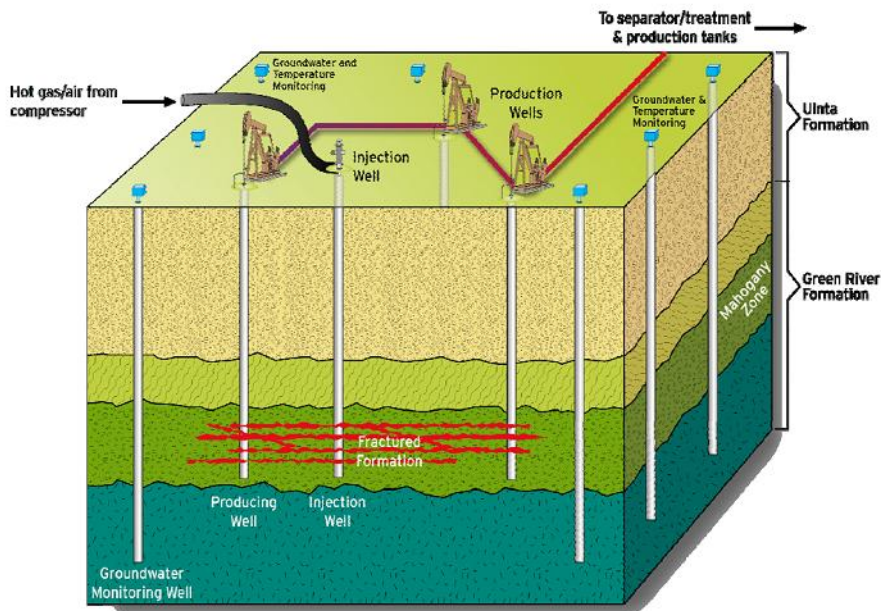
- Developed by Shell Petroleum
- Currently in “pilot” phase in north-western Colorado
- Shell to apply technology at three other sites in Colorado



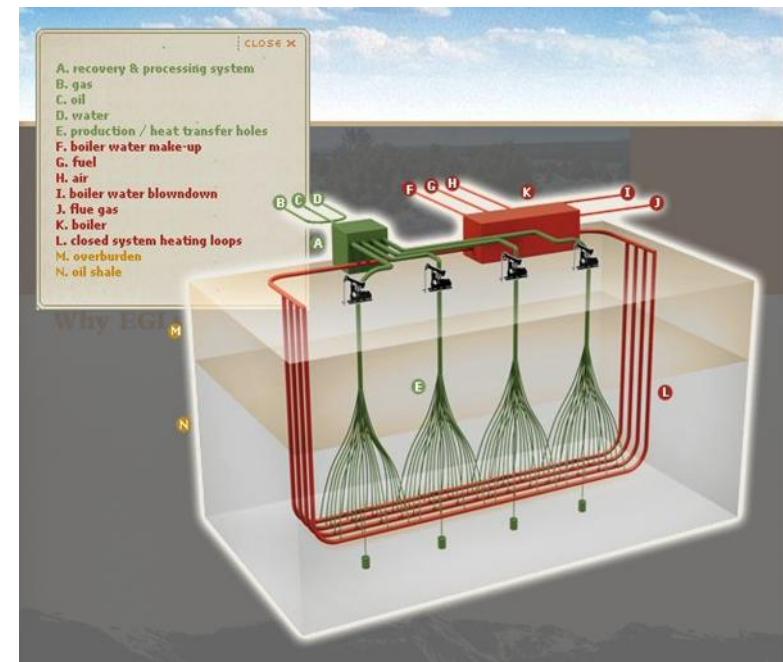
Other Examples of In-Situ Conversion Technology

Pilot tests under development
in Colorado

Chevron Process



EGL Resources Process





R&D Leasing Program

- **DOI awarded five (5) RD&D leases in 2006**
 - Shell Frontier
 - Chevron U.S.A.
 - EGL Resources
- **A sixth lease is being finalized for award (OSEC LLC)**
- **Lease size and duration:**
 - Initially, 160 acres (per)
 - Option to expand to 5,120 acres (if technology is successful)
 - The RD&D phase is for ten (10) years
- **Companies have started process for operations**



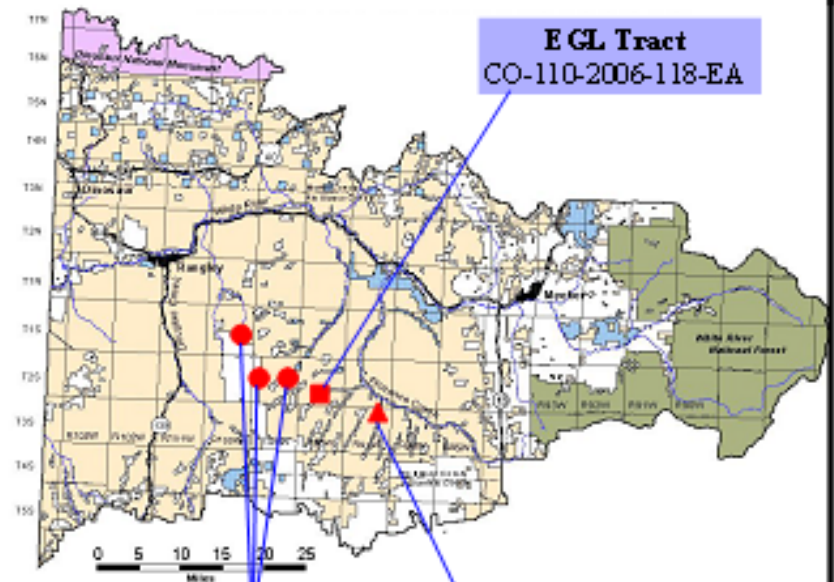
Location of Oil Shale R&D Leases

Utah Uinta Basin



White River Mine
OSEC Project
UT-080-06-280

Colorado White River Resource Area



Shell Tracts
CO-110-2006-117-EA

EGL Tract
CO-110-2006-118-EA

Chevron Tract
CO-110-2006-120-EA

Source: INTEK, INC., 2007



A New Model Developed by NPOSR

National Strategic Unconventional Resources Model

Version 1.0

Developed For:



U. S. Department of Energy
Washington, D. C.

Developed By:

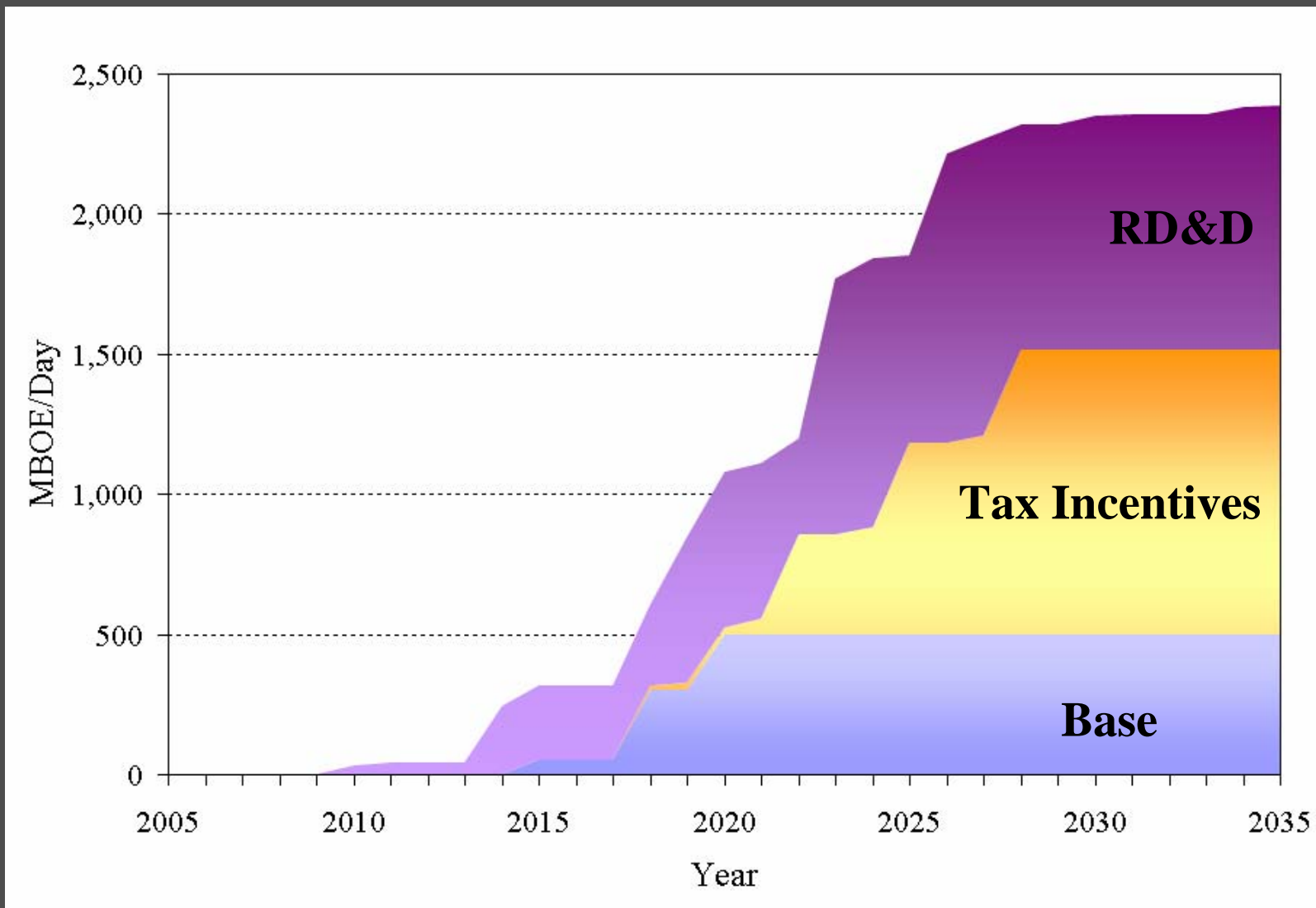
INTEK, Inc. (Subcontractor)
AOC Petroleum Support Services LLC
Contract: DE-AC01-03FE67758
Arlington, Virginia



Start



Projected Production Potential (BOE) (Shale Oil in the U.S.)





Example Benefits of Oil Shale Development Cumulative (Over 25 Years)

Item	Unit	Base	With Tax Credit	With RD&D
Production	Billion Bbls	0.8	1.4	2.2
Direct Federal Revenues¹	Billion \$	11	15	29
Direct Local/State Revenues²	Billion \$	7	13	23
Direct Public Sector Revenues³	Billion \$	18	28	52
Contribution to GDP	Billion \$	71	146	255
Value of Imports Avoided	Billion \$	52	108	215

1 – Federal Revenues are the sum of Federal Business Taxes plus Royalty payments

2 – State Revenues are the sum of State Business Taxes, production taxes, plus the state portion of Federal Royalty payments

3 – Public Sector Revenues are the sum of Direct Federal and Direct State Revenues



Oil Shale Environmental Challenges

- **Emissions**

- Heating shale can generate gases including SO₂, NO_x, CO₂, particulates, and water vapor
- Technology exists to control / reduce emissions
- And to sequester

- **Land Impacts**

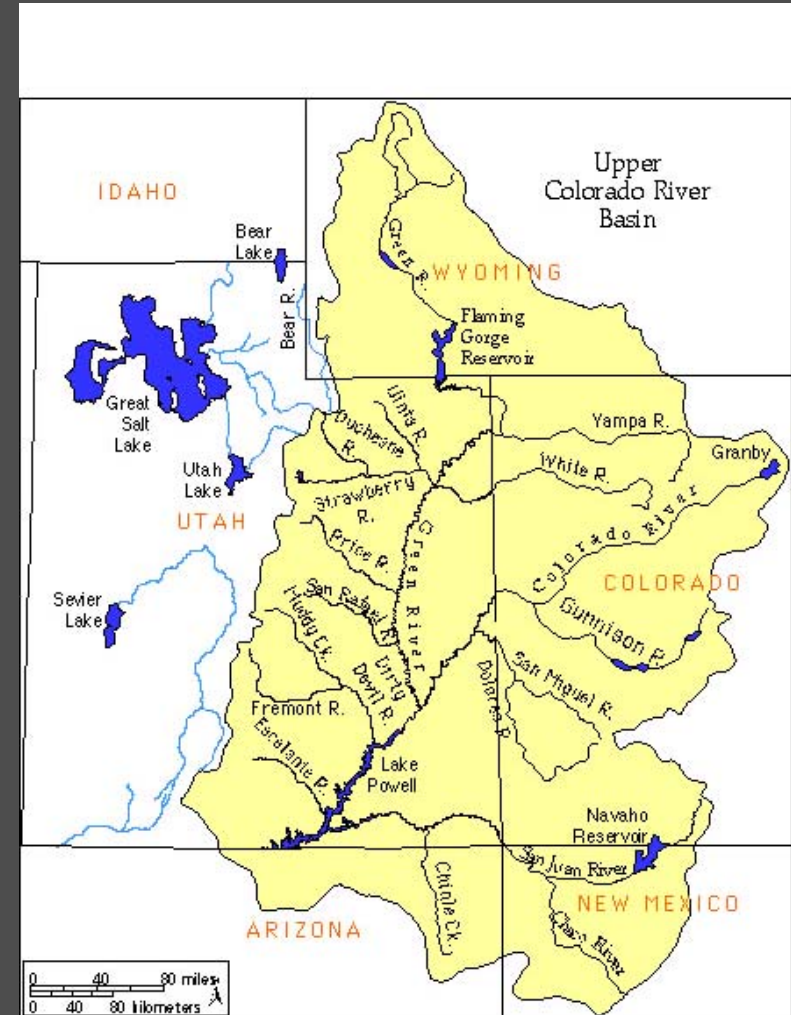
- Disturbance depends on processes
- 31 square miles per 1 MM Bbl/d capacity
- Land can be reclaimed
- For in-situ, similar impact as conventional oil and gas operations



Environmental Challenges

- **Water Impacts**

- Estimates range from 1-3 barrels of water per barrel of shale oil
- Demonstration needed to attain reliable data
- In-situ processes are challenged to protect groundwater
- In the West, water will be drawn from local and regional sources





Summary

- Over **2 trillion** barrels of in place resource
- The most concentrated hydrocarbon deposits **on Earth**
- Conversion technologies are **advancing rapidly**
- A unique opportunity to provide **long term sustained production**
- Production potential of up to **2.5 MMBbl/Day**
- Substantial **economic benefits** to the Nation
- **Requires concerted effort** by the private sector, Federal & State governments, and local communities