

RESULTS BASED MANAGEMENT FOR ENERGY IN JORDAN

WITH REFERENCE TO THE USE OF OIL SHALE

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□ Acknowledgements

- Energy Sector in Jordan
- Oil Shale in Jordan
- Results Based Management
- Oil Shale Technologies
- Roadmap for Oil Shale
- Conclusions



Oil Shale Stone



Oil Shale Burning

Energy Sector in Jordan

□ Electricity



□ Oil and Gas



□ Renewable



➤ Solar

➤ Wind

➤ Biogas

□ Oil Shale



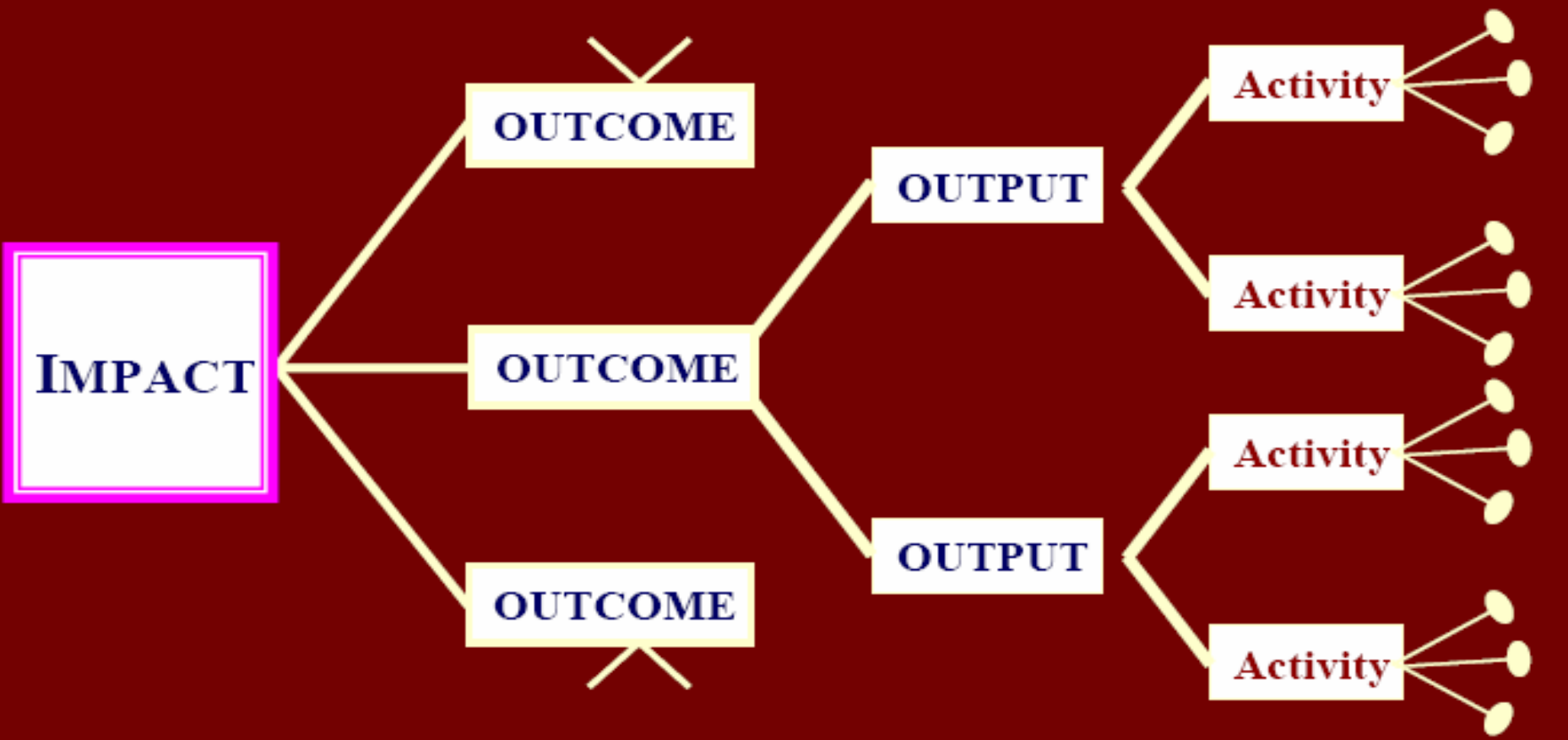
What is the Results Based Management-RBM?

RBM is an approach that seeks to focus efforts and resources on the expected results of a project.

RBM builds on traditional management approaches such as management by objectives or activities, but shifts the emphasis from inputs and activities to results.

Considering oil shale as a promising source of energy and a challenging and hot issue where the stakeholders exchange the know-how and technical services, sustainability and maintaining the on-going momentum, should lead to a road map that involves strategic, operational and tactical planning.

RBM Approach Models



| | | |
|------------------|--------------------|-------------------|
| STRATEGIC | OPERATIONAL | TACTICAL |
| GOAL | OBJECTIVES | INPUT |
| Long-term | Medium-term | Short-term |

- ✓ **Organizational**
- ✓ **Political**
- ✓ **Administrative**
- ✓ **Intellectual**

- ✓ **Physical Resources**
- ✓ **Human Resources**
- ✓ **Technologies**

Activities

**R
E
S
U
L
T
S**

Vision for the 21st century

Using oil shale in Jordan is manifested by:

- ❑ Having the will of the wise leadership
- ❑ Defining the roles of all stakeholders
- ❑ Enhancing international cooperation
- ❑ Employing science & technology
- ❑ Attracting investors
- ❑ Using RBM approach

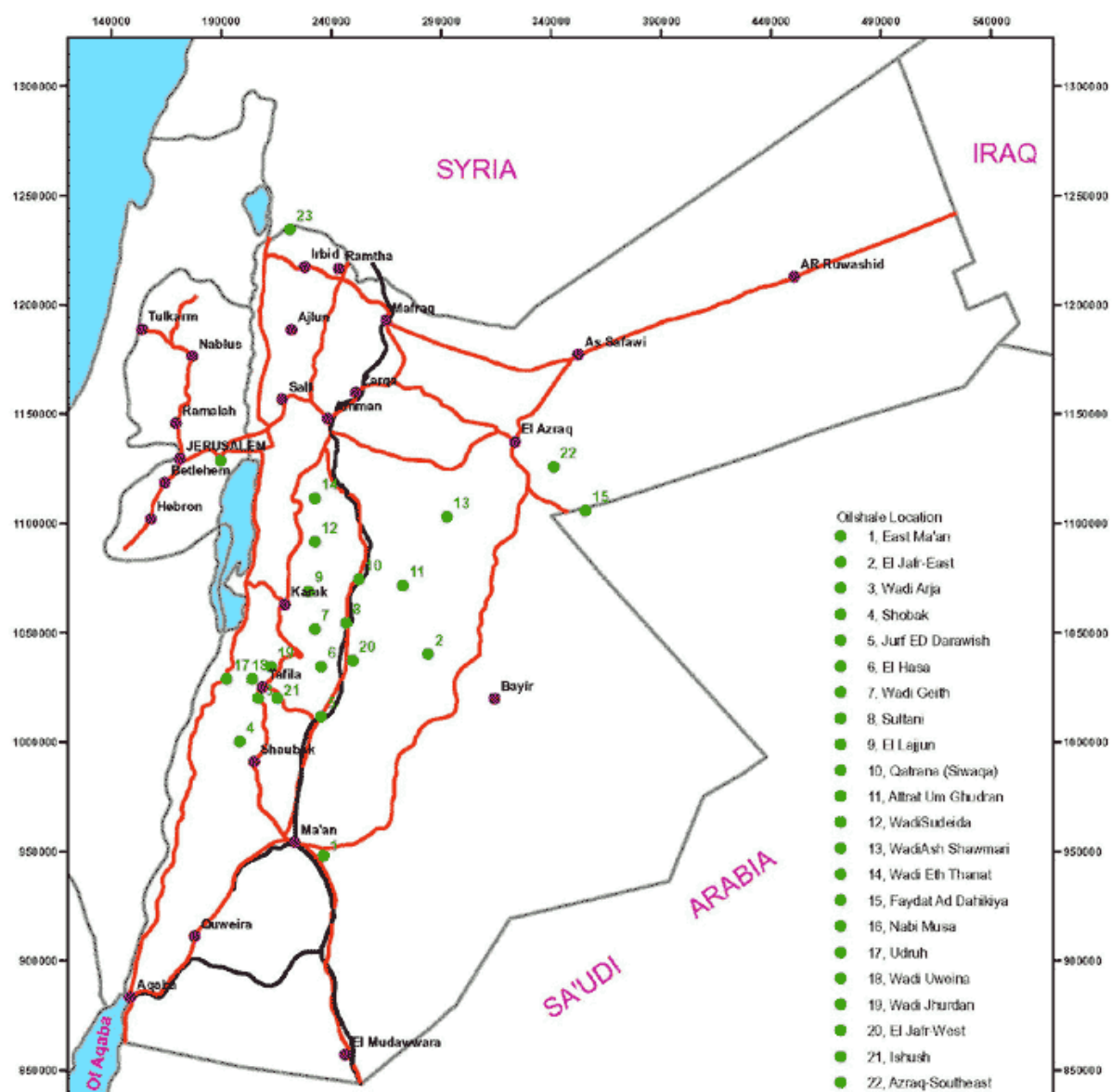
RBM may be considered as a powerful tool to realize this vision to make Jordan depend on its natural resources.

Vision for 21st Century

Oil Shale is manifested by:

- New Technology**
- Industry Interface**
- Roles of stakeholders**
- International cooperation**



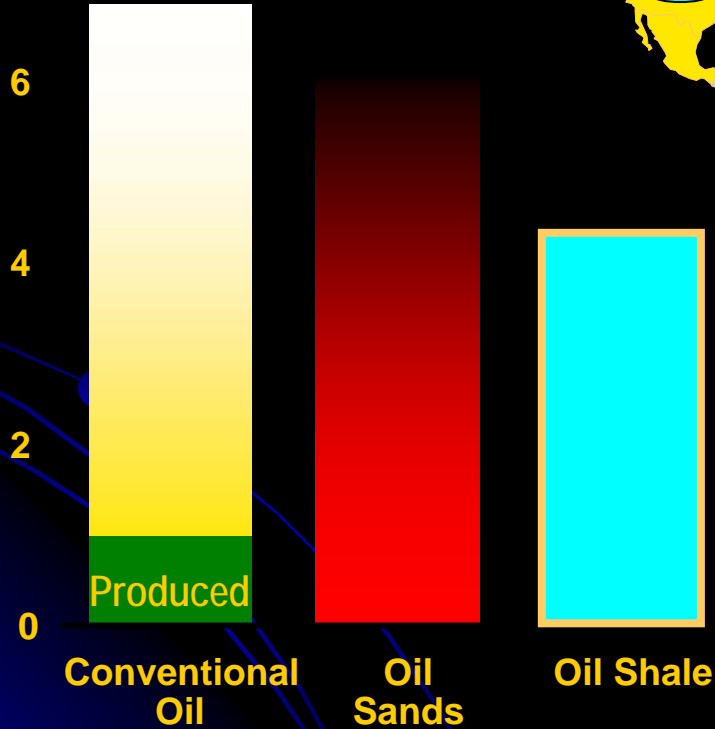


Oil Shale in Jordan

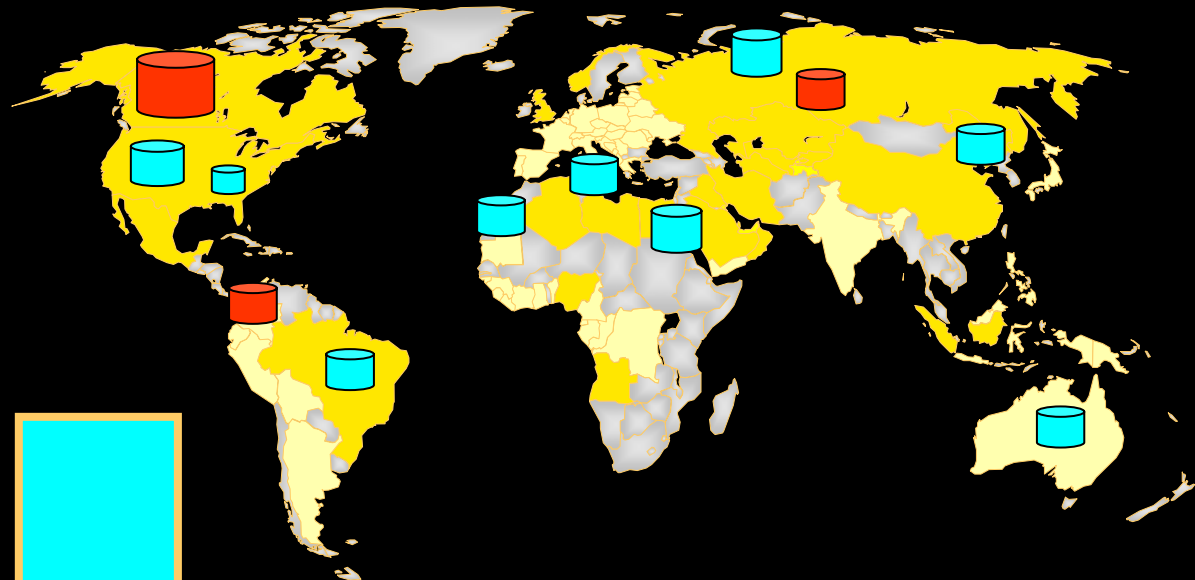
Large Oil Resources Exist

Oil in Place

Trillions of Barrels

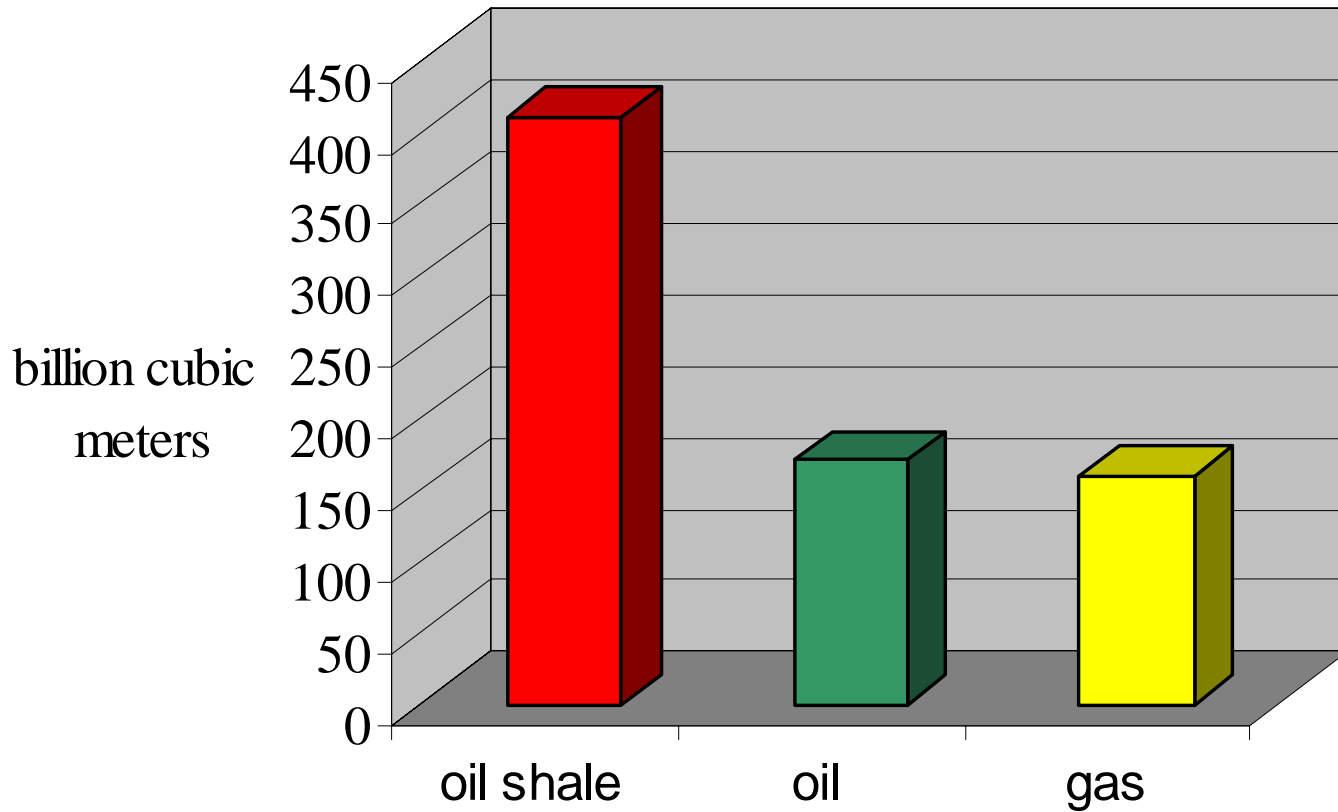


Locations of Major Deposits



-  Conventional Oil
-  Oil Sands
-  Oil Shale

Oil Shale Resources

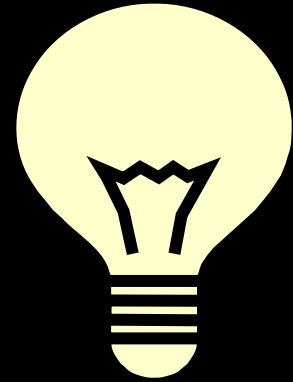


Oil Shale World Resources %

| 1999 | | 2002 | | 2003 | | 2005 | |
|---------------|-----|---------------|-----|---------------|-----|----------------|-----|
| country | (%) | country | (%) | Country | (%) | country | (%) |
| US | 61 | US | 78 | US | 70 | US | 72 |
| Australia | 17 | Russia | 7.4 | Russia | 15 | Brazil | 5.4 |
| Jordan | 11 | Brazil | 2.5 | Zaire | 3.3 | Jordan | 4.2 |
| Brazil | 4.5 | Jordan | 1.0 | brazil | 2.7 | Morocco | 3.5 |
| Ukraine | 3 | Australia | 1.0 | Italy | 2.4 | Australia | 2.1 |
| Morocco | 2.1 | Estonia | 0.5 | Morocco | 1.8 | China | 1.5 |
| Thailand | 0.4 | China | 0.5 | Jordan | 1.1 | Estonia | 1.1 |
| Israel | 0.3 | France | 0.2 | Australia | 1.0 | Israel | 0.3 |
| Turkey | 0.1 | | | Estonia | 0.5 | | |
| | | | | China | 0.5 | | |
| | | | | Canada | 0.5 | | |
| | | | | France | 0.2 | | |



Highlights on Oil Shale



Is there oil in shale rock?

How oil is produced from shale rock?

How much oil can be harvested?

What is the production capacity of a Retort?

- ❑ **There is actually no oil in shale rock.**
- ❑ **The rock contains organic matter that forms an oil compound only after it is heated and vaporized.**
- ❑ **The Oil-Tech process may be viewed as drastically speeding up the millions of years that nature would require to produce oil from the same geological ingredients**

Oil Harvesting



1000
Barrels
Retort



Spent Shale is used for

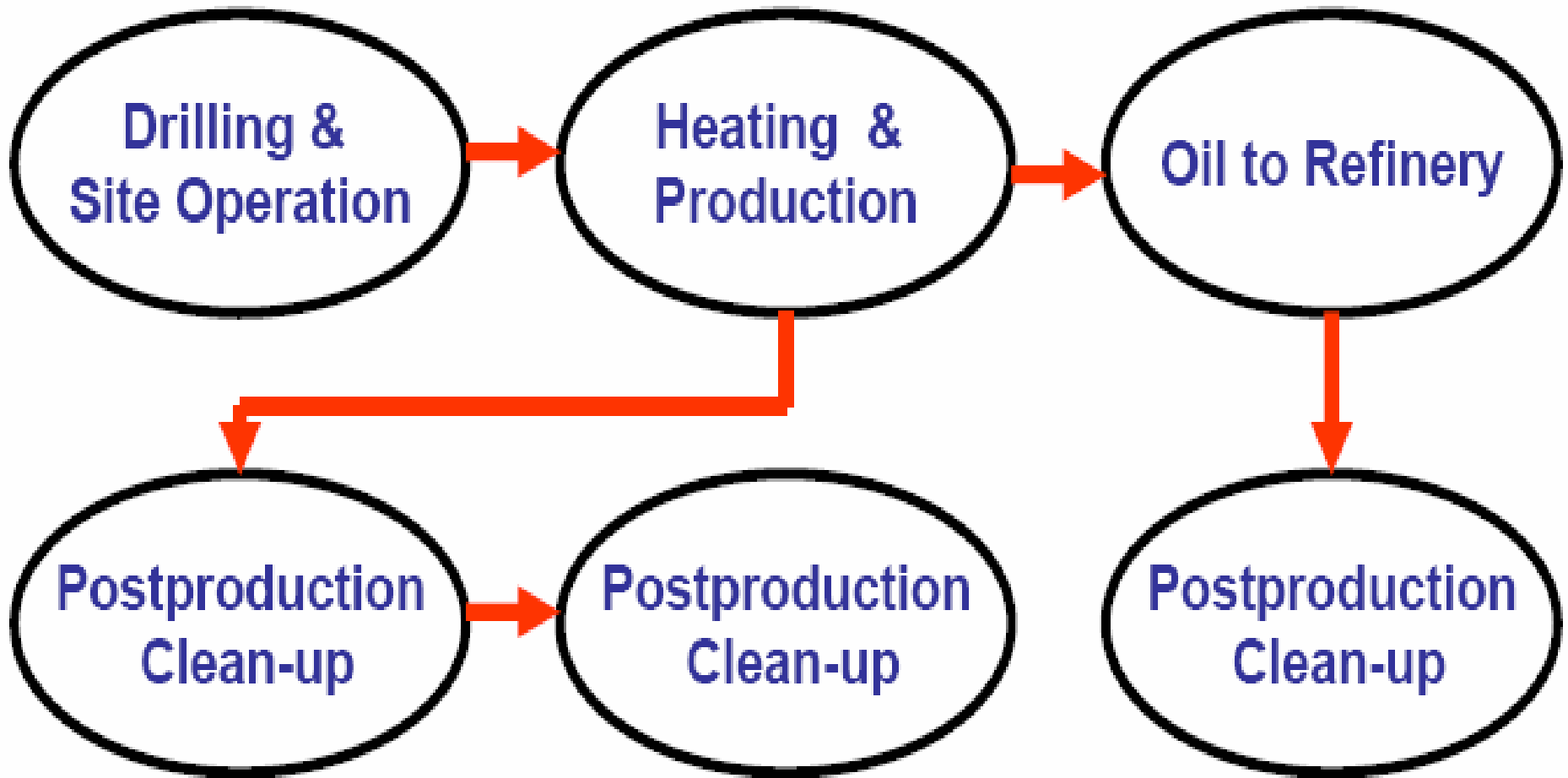
- Adhesives
- Resins
- Cement Production
- Building materials
- Insulation
- Other uses

Oil Shale and Old Technologies

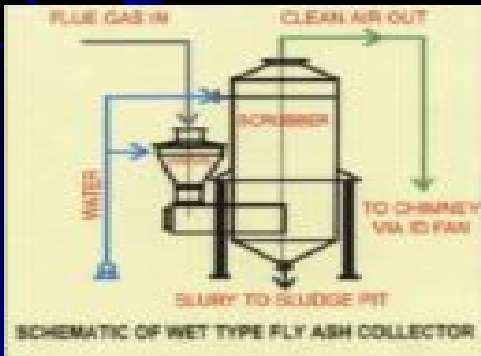
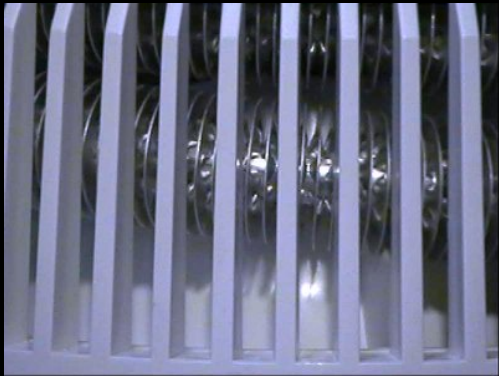
- Add water/heat to get Oil
- Needs Lots of Water

Oil Shale with New Technologies

- Heat to get
- No need for Water

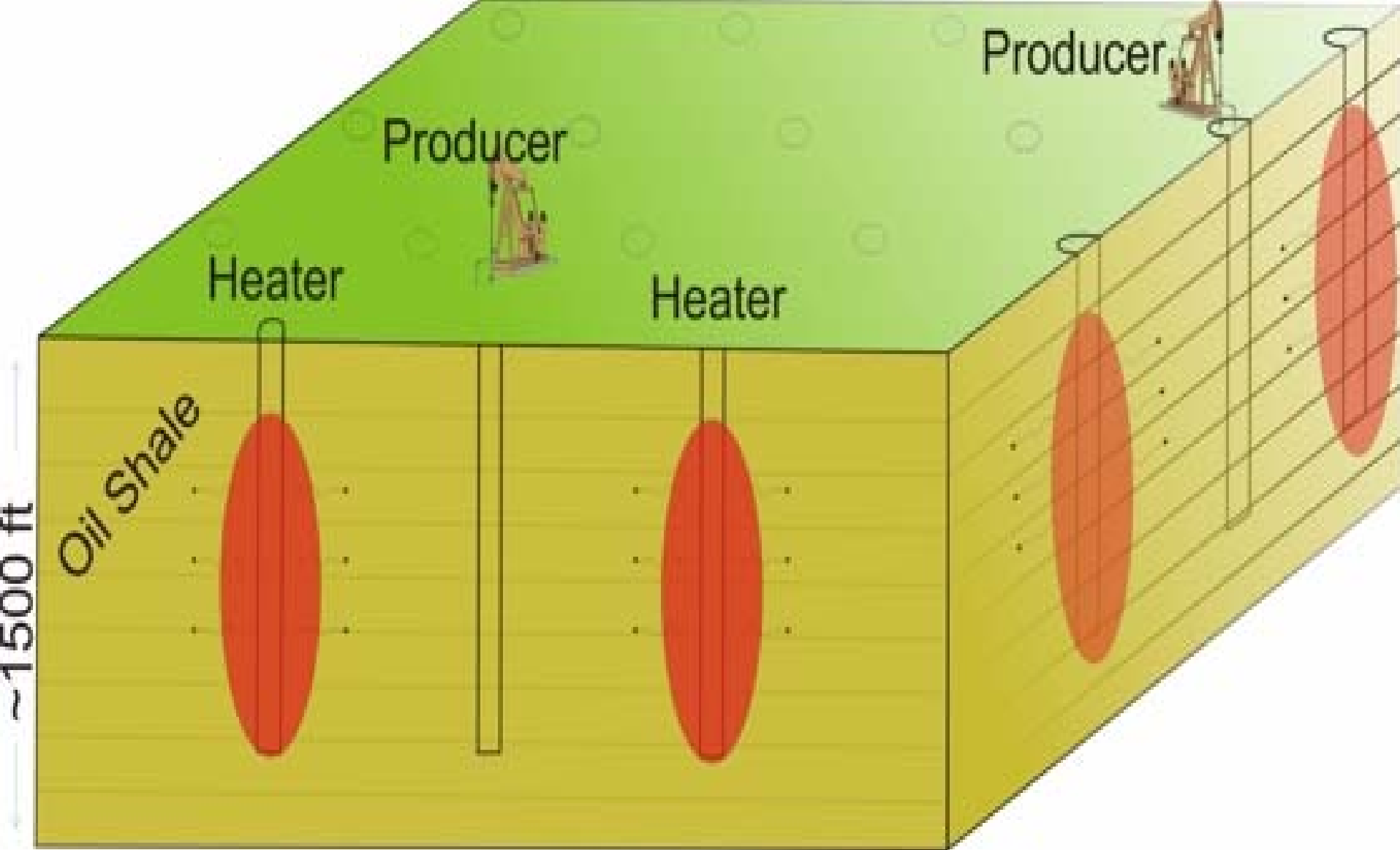


Major steps in Mining and Surface Retorting

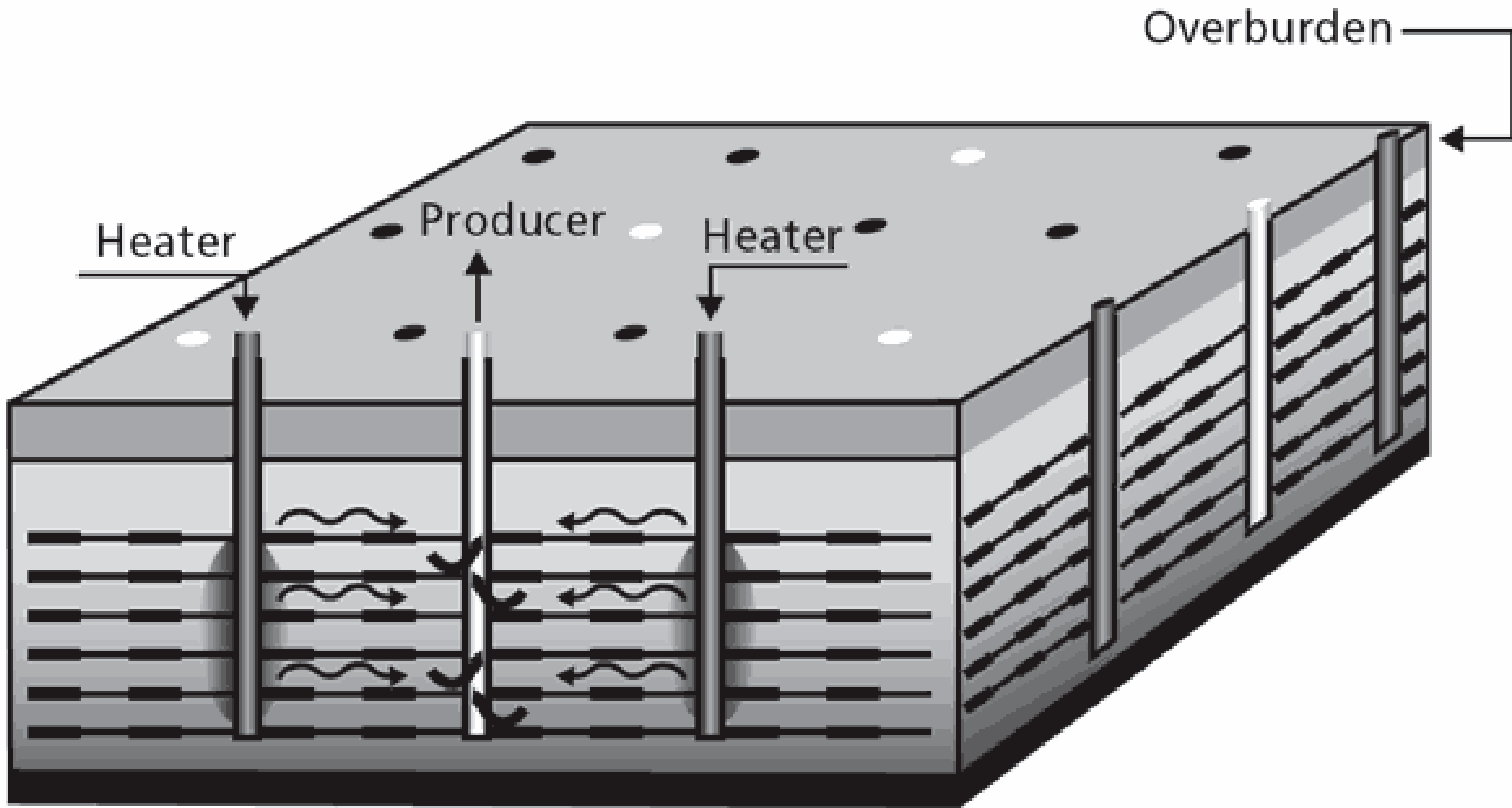




**Believe It Or Not! set Up On Crushed Oil Shale!
Put A Torch To This Rock And It Will Eventually Catch Fire!**



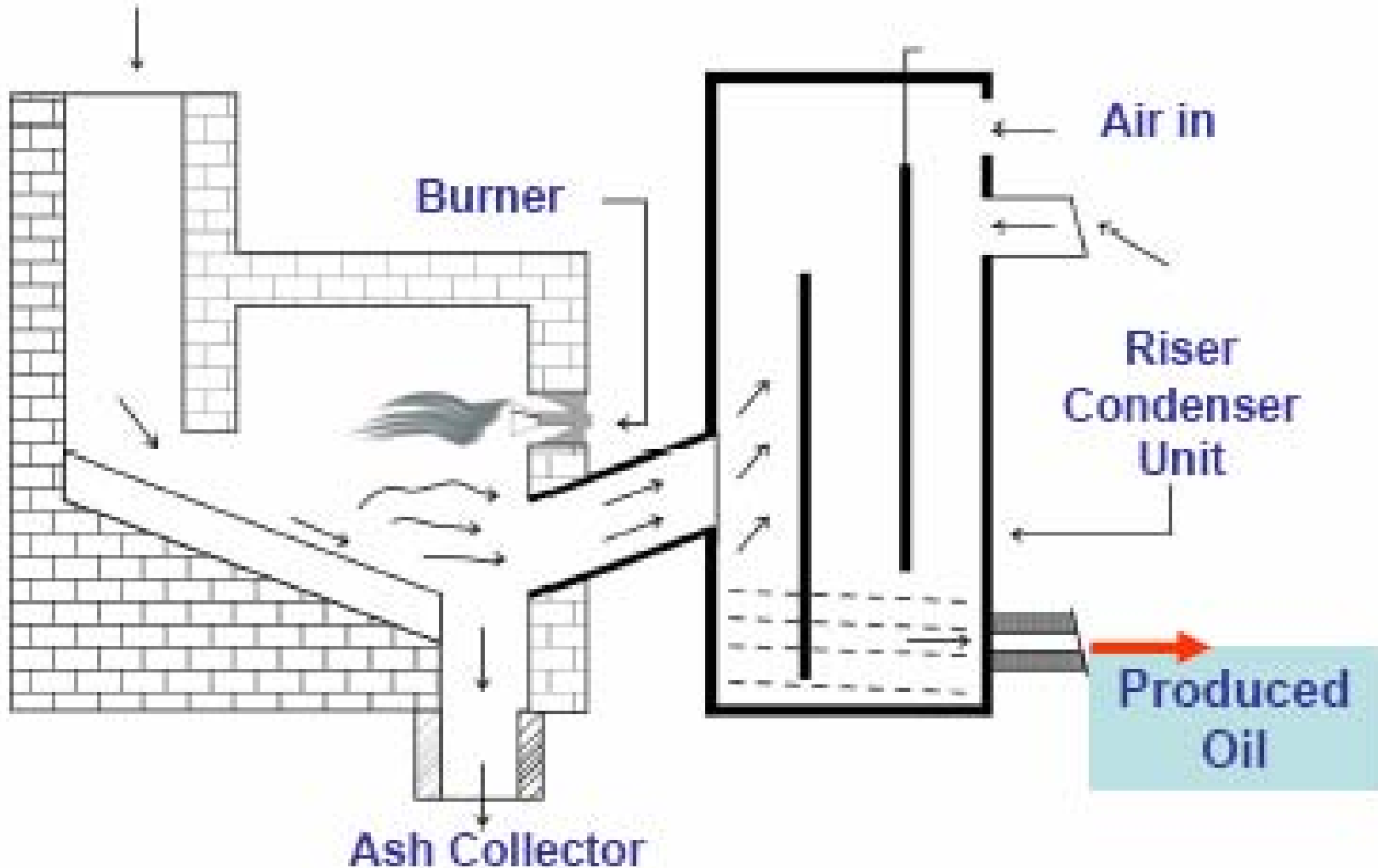
In-Situ conversion



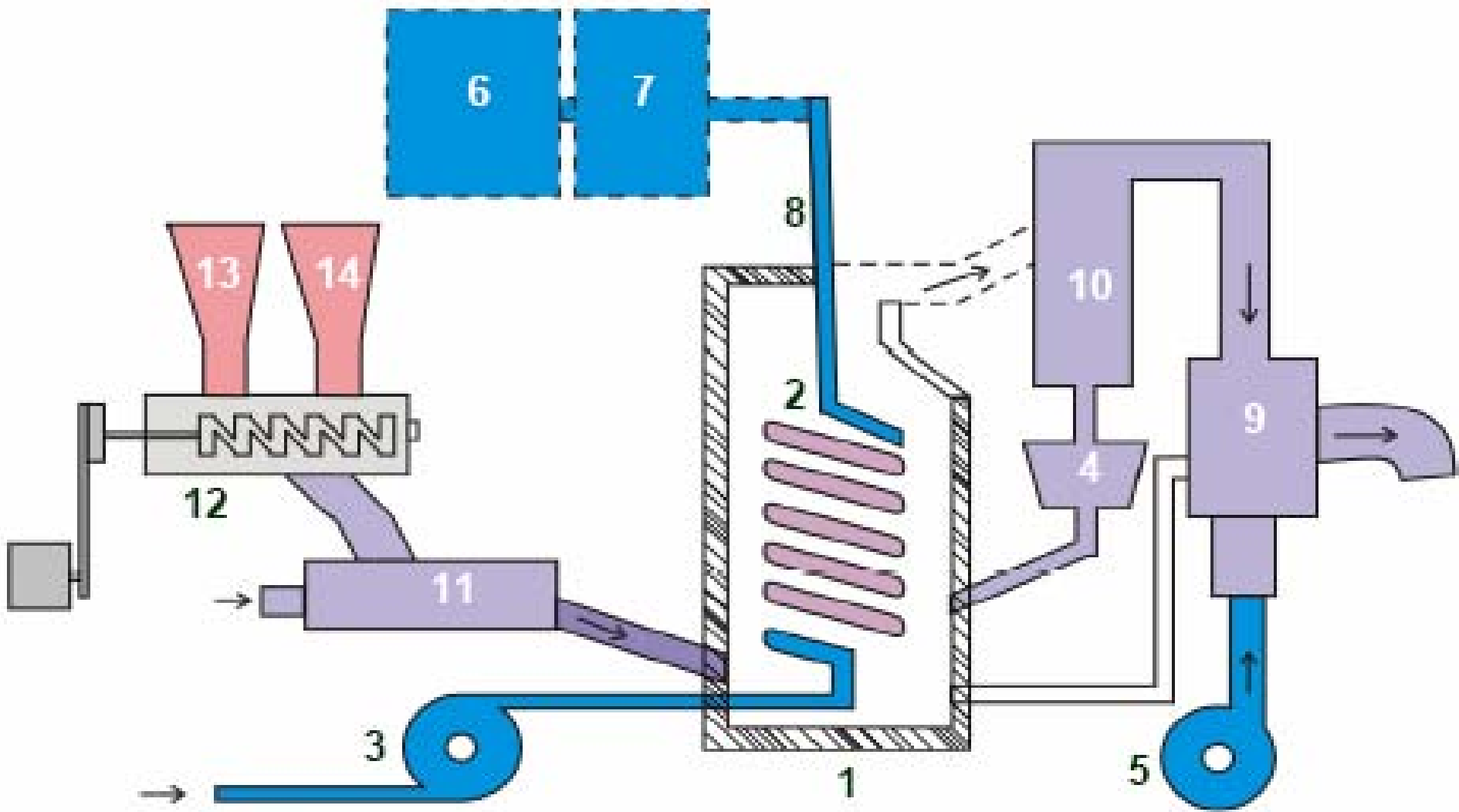
SOURCE: Adapted from material provided by Shell Exploration and Production Company.

RAND MG414-3.2

Oil Shale Feeder



Oil Shale Furnace and Condenser Unit



Oil Shale Furnace and Steam Generator



The New Technology Retort

Retort Control Room

2/11/2007





Condensing System Control



Dust Collector & Rock Processing Equipment

Retort facility in Uintah County, Utah, USA



Road Map

- **Power Supply**
 - Oil?
 - Gas?
 - Solar?
 - Wind?
 - Hydro?
- **Resources**
 - Water
 - Desalination
- **Other Projects**
 - 2-seas canal
- **Problems**
 - Environment
 - Expenditures
- **Plan of Action**
 - Budgeting
 - Time horizon
 - Risk

The Cost

The first four 1,000 barrel/day retort cluster will cost approximately \$6.5-\$7.0 million. Subsequent units will be less expensive as a result of amortizing tooling and fabrication costs and via volume purchasing of component parts.

The total requirement for a 20,000 barrel/day operation will be between \$50 and \$150 million, depending primarily on mining equipment and mining development costs.

Even the \$150 million capital expenditure would be recovered in less than one year.

Based on a 20,000 barrel/day mine, we estimate a cost range of \$12-28/barrel depending upon mining methodology, cogeneration and other processing factors.

Question



Can we adapt this technology in Jordan?

Answer

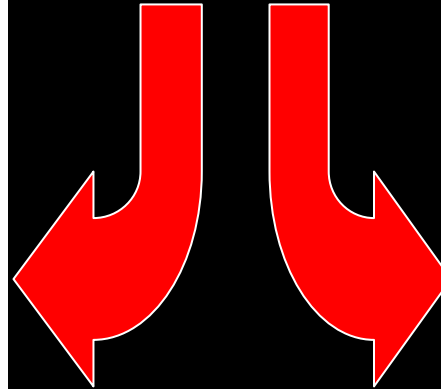
Conclusions

- ❑ Surface retorting is appropriate the oil shale in Jordan.
- ❑ The proposed system could easily be implemented and tested within a very short period of time.
- ❑ Within the foreseen future and considering the oil prices escalation, the proposed system is certainly pioneering as well as promising.

- ❑ The spent shale can be used as an additive to asphalt for paving roads, streets and highways.
- ❑ The spent shale could also be used to produce lime and construction material for concrete products.
- ❑ The spent shale and lime could be used in the chemical industries.
- ❑ The **Results Based Management** approach could be adapted for planning strategic projects such as the utilization of oil shale resources in Jordan.

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شكراً لكم

Thank you



- Jordan is poor in its resources but this sector preserved a sustainable growth with 5% in average, covering 99% of the country.

Capacity stands at 1,800 MW.

- Plants are fired by a combination of natural gas that is imported from Egypt, HFO and diesel.

✓ **Oil and Gas are imported.**



- Jordan meets its oil need from Saudi Arabia, Kuwait and United Arab Emirates.
- Risha gas field located near the Iraqi borders.
- Production \approx 35 million ft³/day
- Risha Power Station supplies Jordan with 10% of its electricity
- ✓ **Oil and Gas are still imported**



- 2 wind plants producing 3 GW/H
- Solar cells is lightening couples of remote villages
- Biogas factory at Rusaifeh dump producing 6 GW/H

Expansions are under way to increase the total capacity of the factory to 5 MW

✓ **Contribution to energy is small**



