

The Potential of Oil Shale

Stephen Mut, CEO

Shell Unconventional Resources Energy

National Academies

Trends in Oil Supply/Demand and the Potential for Peaking of
Conventional Oil Production

October 20-21, 2005

Washington, DC



World Petroleum Resources

Geologic Age

Billion Barrels

Oldest

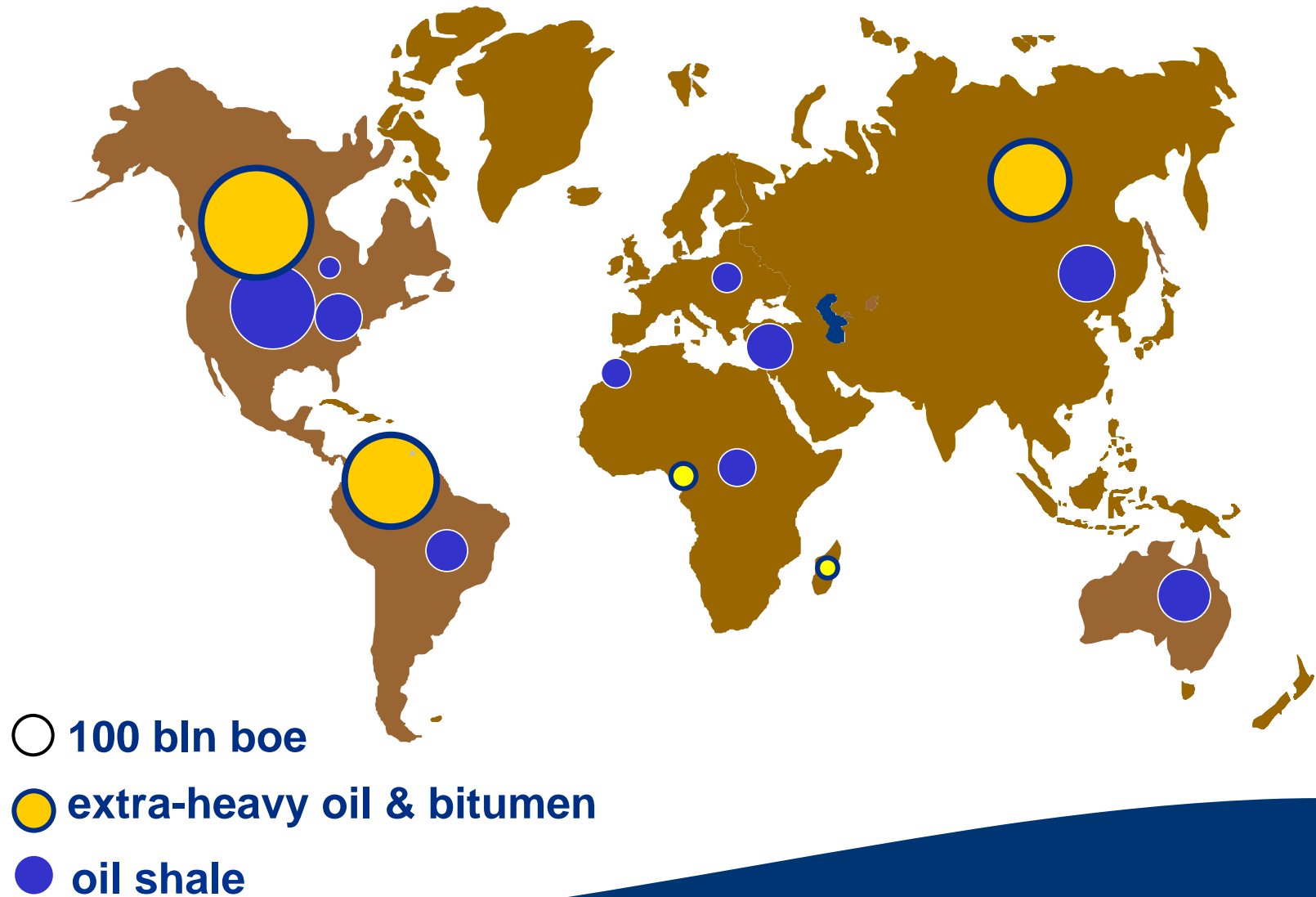


Youngest

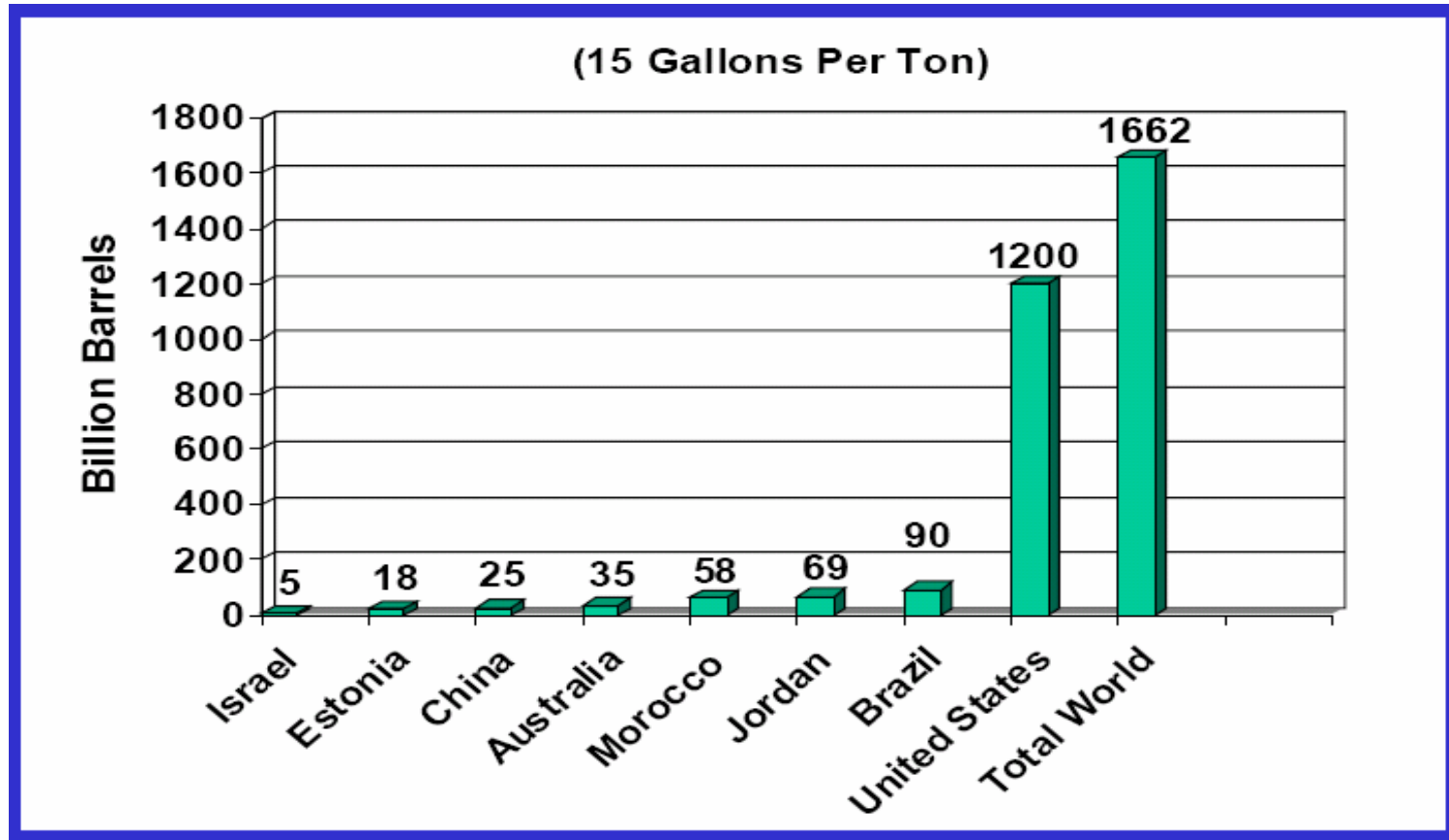
- **Light Crude Oil** 500 300 –
- **Heavy Crude Oil** 500 – 700
- **Tar Sand Bitumen – Primarily Located in Venezuela and Canada** 2000 - 6000
- **Oil Shale – Located in the USA, Russia, China, Estonia, Australia, Brazil and About 20 Other Countries** 4000 2000 –

Russia, China, Estonia, Australia, Brazil and About 20 Other Countries


Unconventionals Potential



Major World Oil Shale Resources



Major Oil Shale Technologies

- Mining and Surface Retorting
 - In-Situ Retorting
 - In-Situ Conversion
- 

In-Situ Conversion Process (ICP)

What is it?

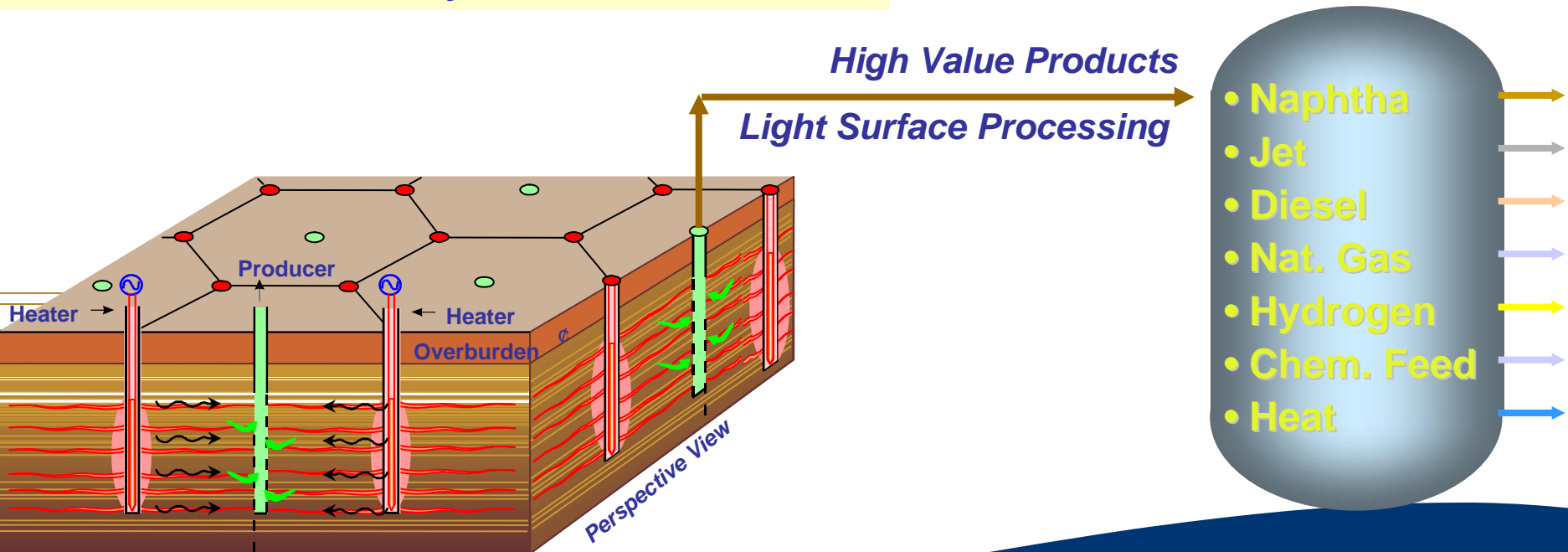
- Enhancement of natural maturation of kerogen by *slow* heating
- Results in:
 - thermal cracking
 - in-situ hydrogenation
 - high sweep vapor phase production
 - high API oil
- Temperature limited to boiling point of diesel, i.e. essentially no bottoms

How is it done?

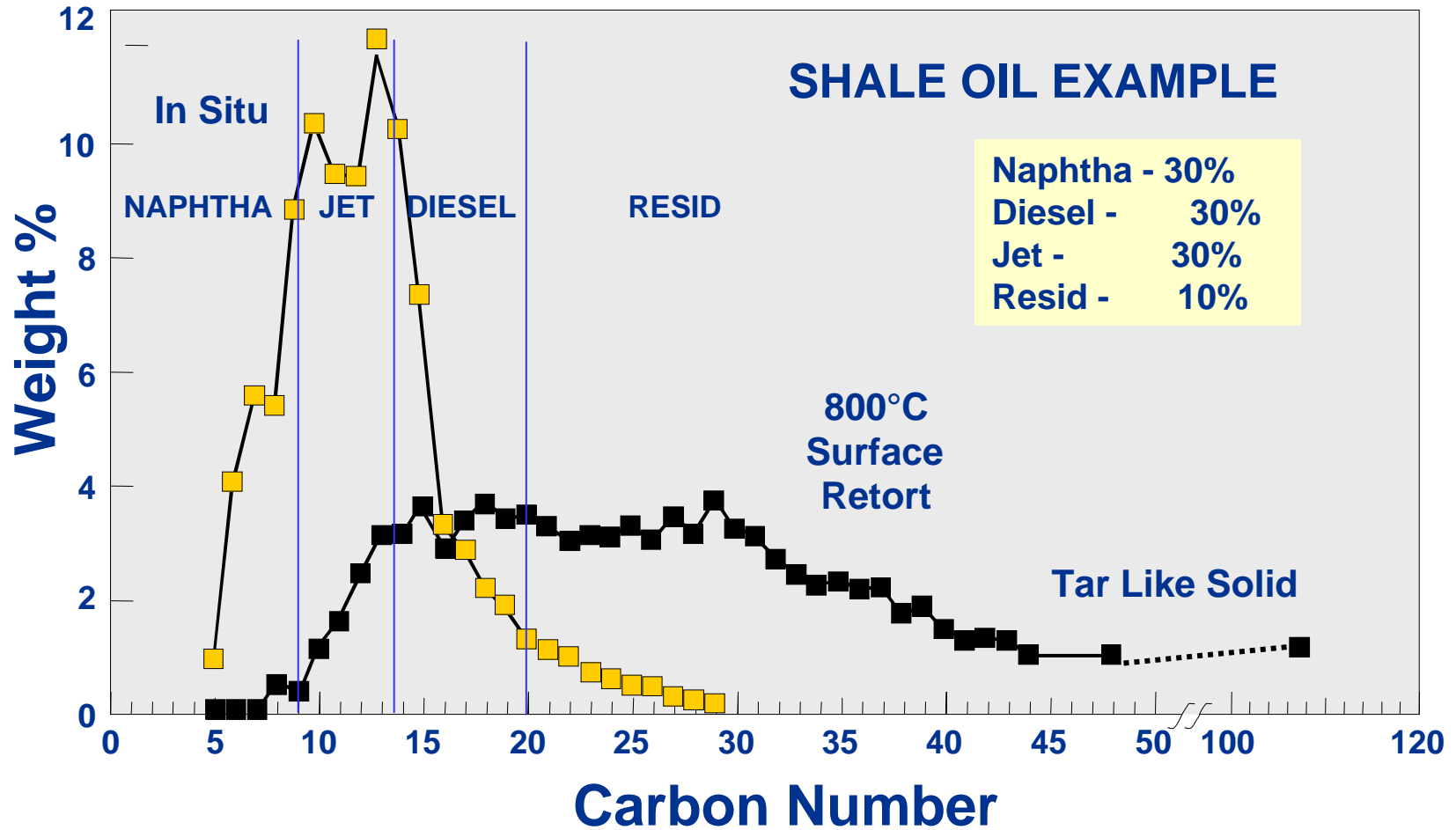
- Electric resistance
- Conductive heat transport

Current target resources:

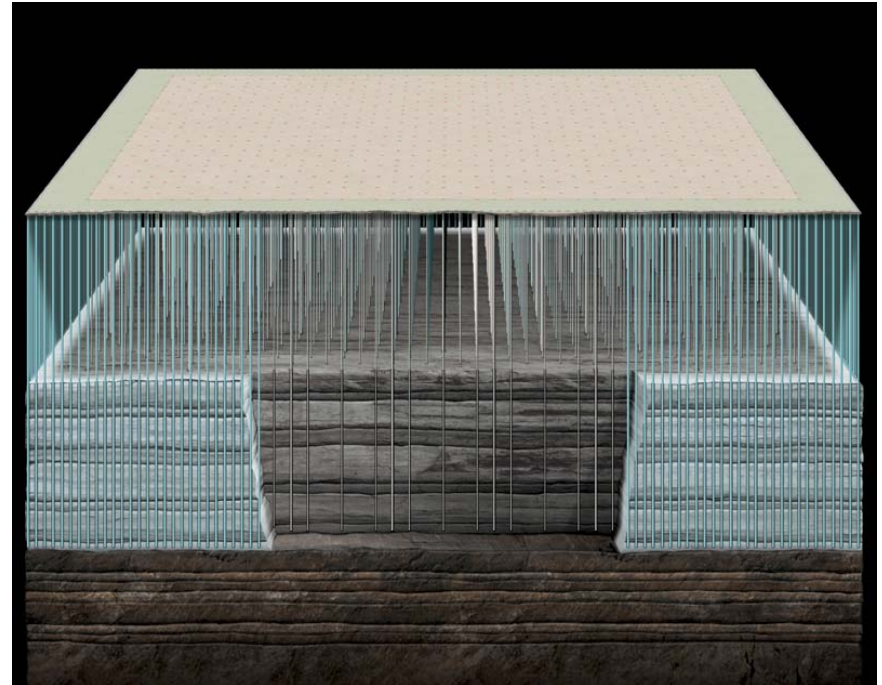
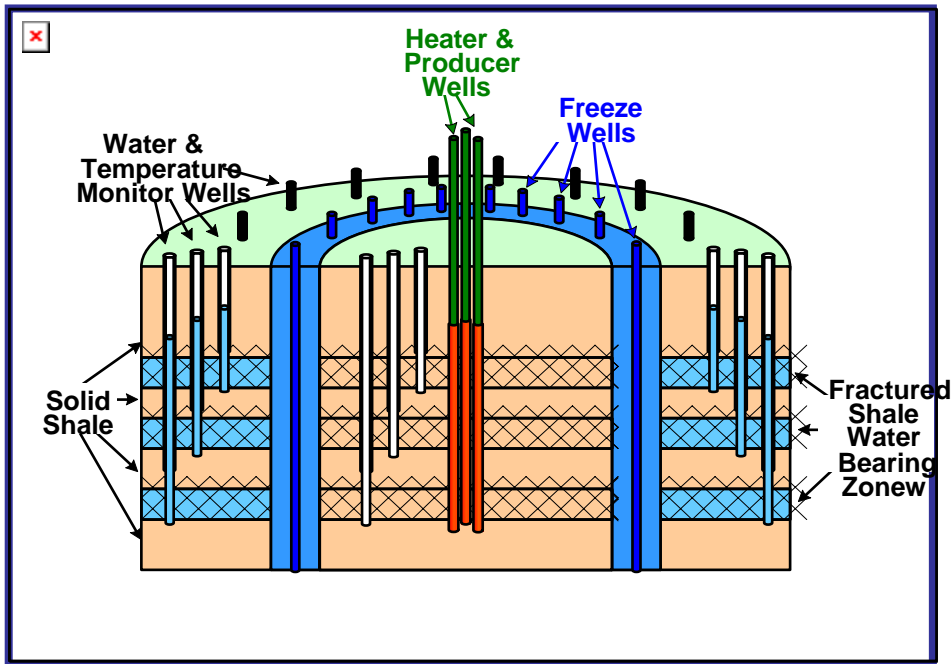
- Oil Shale
- Heavy Oil / Tar Sands



Better Feedstock For Upgrading



Containment and Isolation



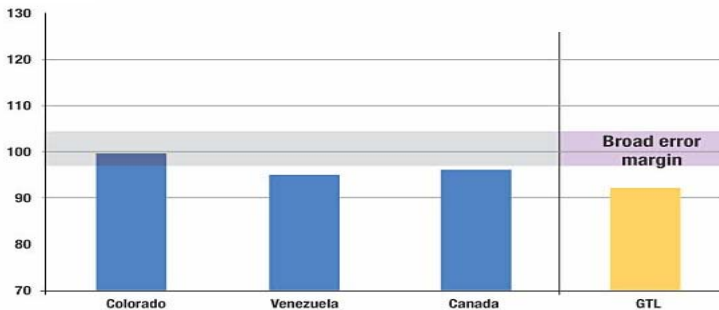
Carbon Dioxide

- Carbon rejection
- No residual upgrading
- Light touch refining
- All clean products

- High energy input
- Upgrading requirement
- Long range transportation to market

Energy intensity in production is offset by reduced refining requirement and no production of residuals

Greenhouse gas emissions relative to US crude basket



- Major improvement over other unconventional technologies
- Carbon sequestration for further improvement

ICP Can Also Work in Oil Sands



Conclusions

- Oil Shale is a Strategic Resource for the U.S.
 - Oil Shale Technology Has Advanced
 - Further Testing Is Necessary
 - End of Decade Commerciality Target
- 