

Exploration and Production of Gas Hydrates

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*Fire in Ice: Implications for Energy Development
and the Carbon Cycle*

Rice University

HEI

What have we learned in Recent Years?

- Hydrates are widespread along continental margins and in Arctic regions
- Shales typically have low hydrate concentrations
- Coarse clastics can have high concentrations of hydrate
- Commercial production of gas from hydrates is most feasible from coarse clastics
- BSRs are not consistent hydrate indicators

Which Hydrates are Going to Be Produced?

Hydrates occur in a variety of forms:

- Dispersed in shales
- Filling fractures
- Mounds on the seafloor
- Filling porosity in sands and gravels

What is Required for a Hydrate Prospect?

- Reservoir rock, seal, trap
- Hydrocarbon source, timing, and migration
- Infrastructure
- Access to acreage
- Production technology

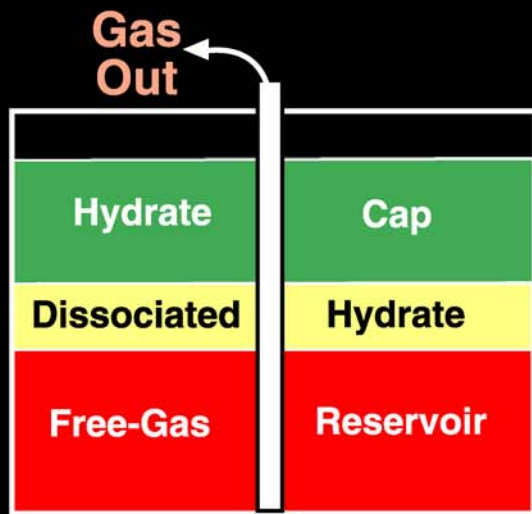
Result: Gulf of Mexico and Alaska are the prime exploration targets

Business Issues

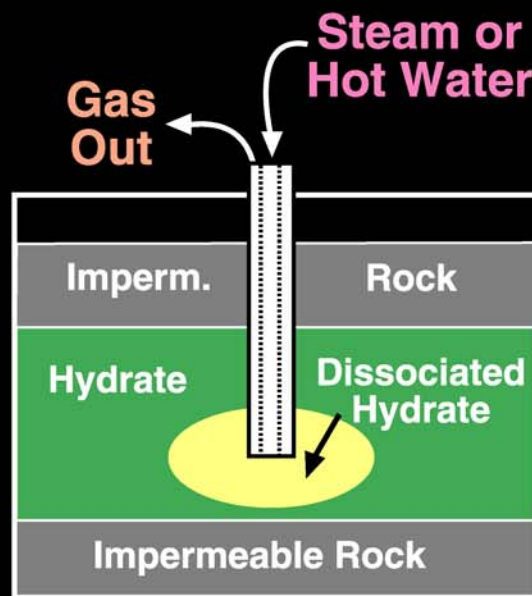
- Total Recoverable per Well
- Rate of Production
- Operating Expense
- Gas Price
- Competition from LNG

Gas Hydrate Production Methods

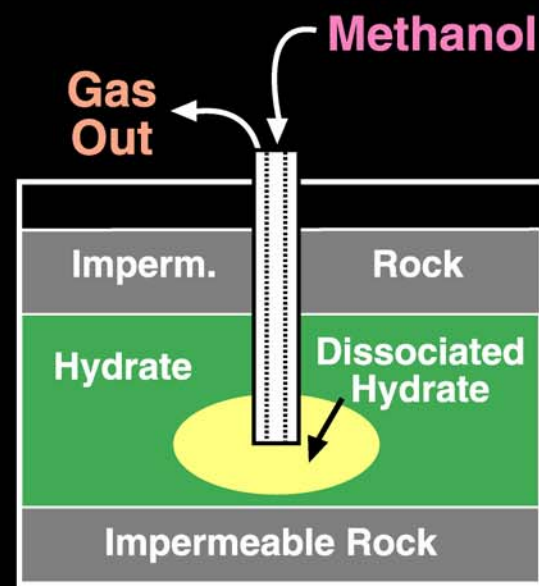
Depressurization



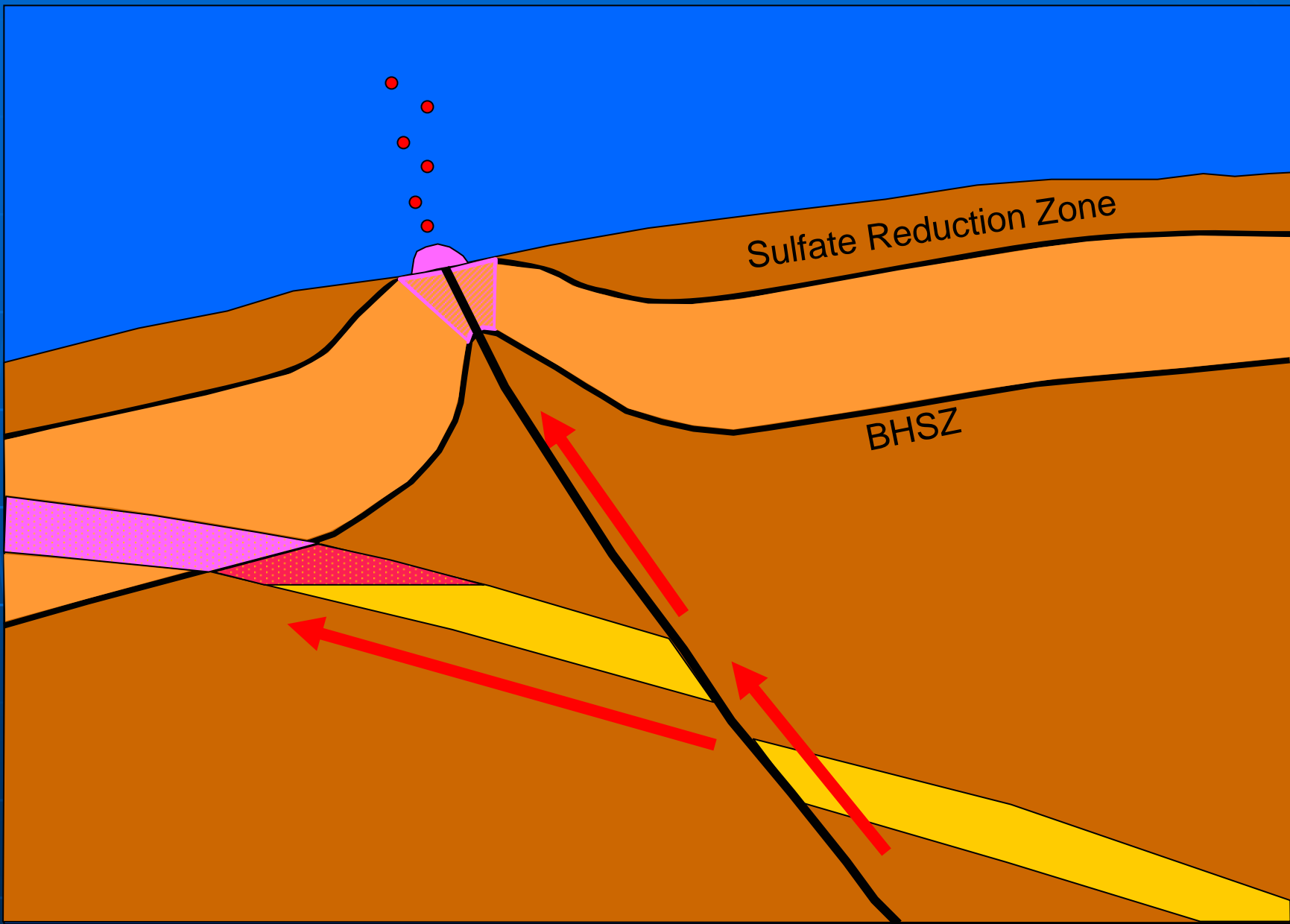
Thermal Injection

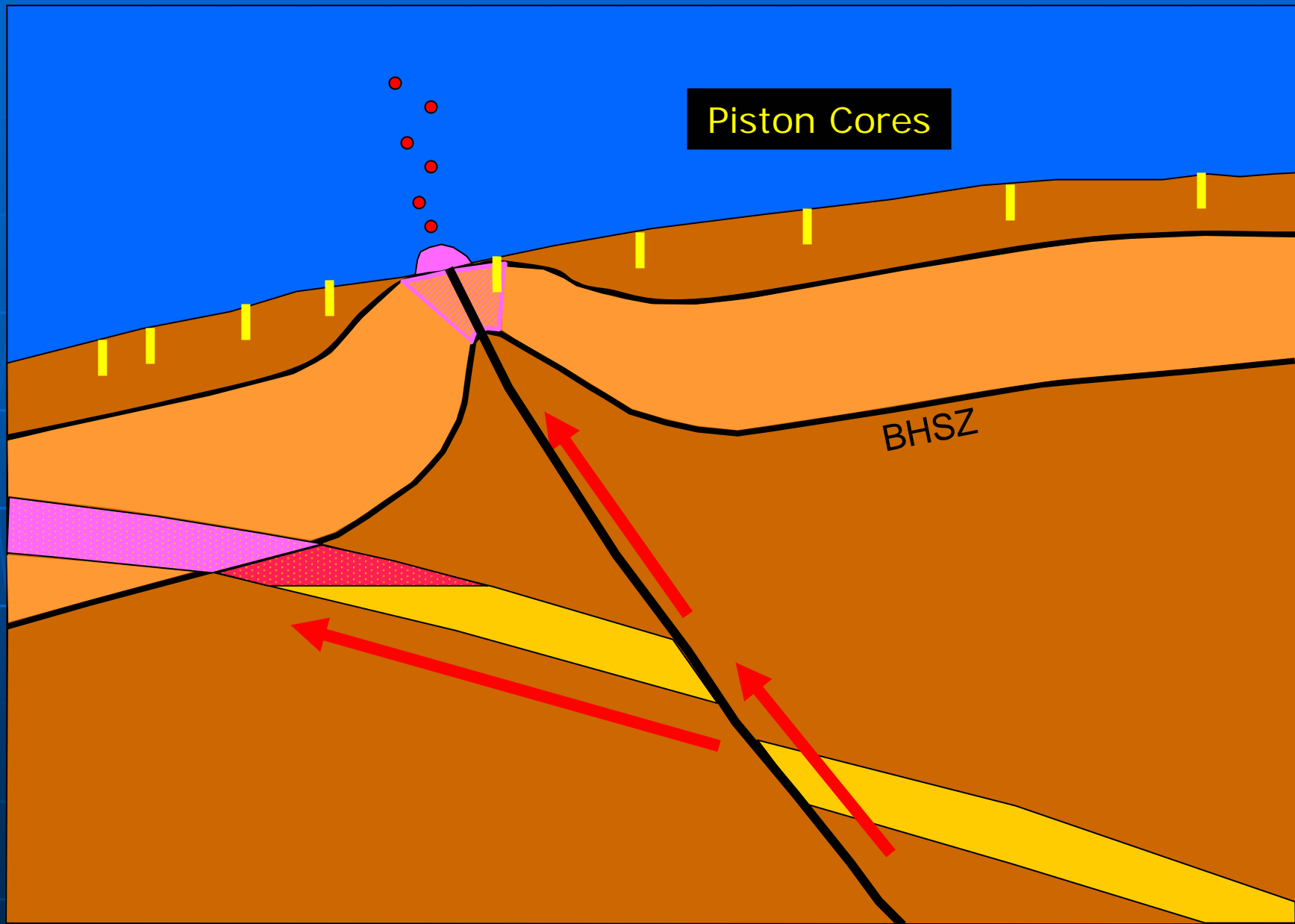


Inhibitor Injection



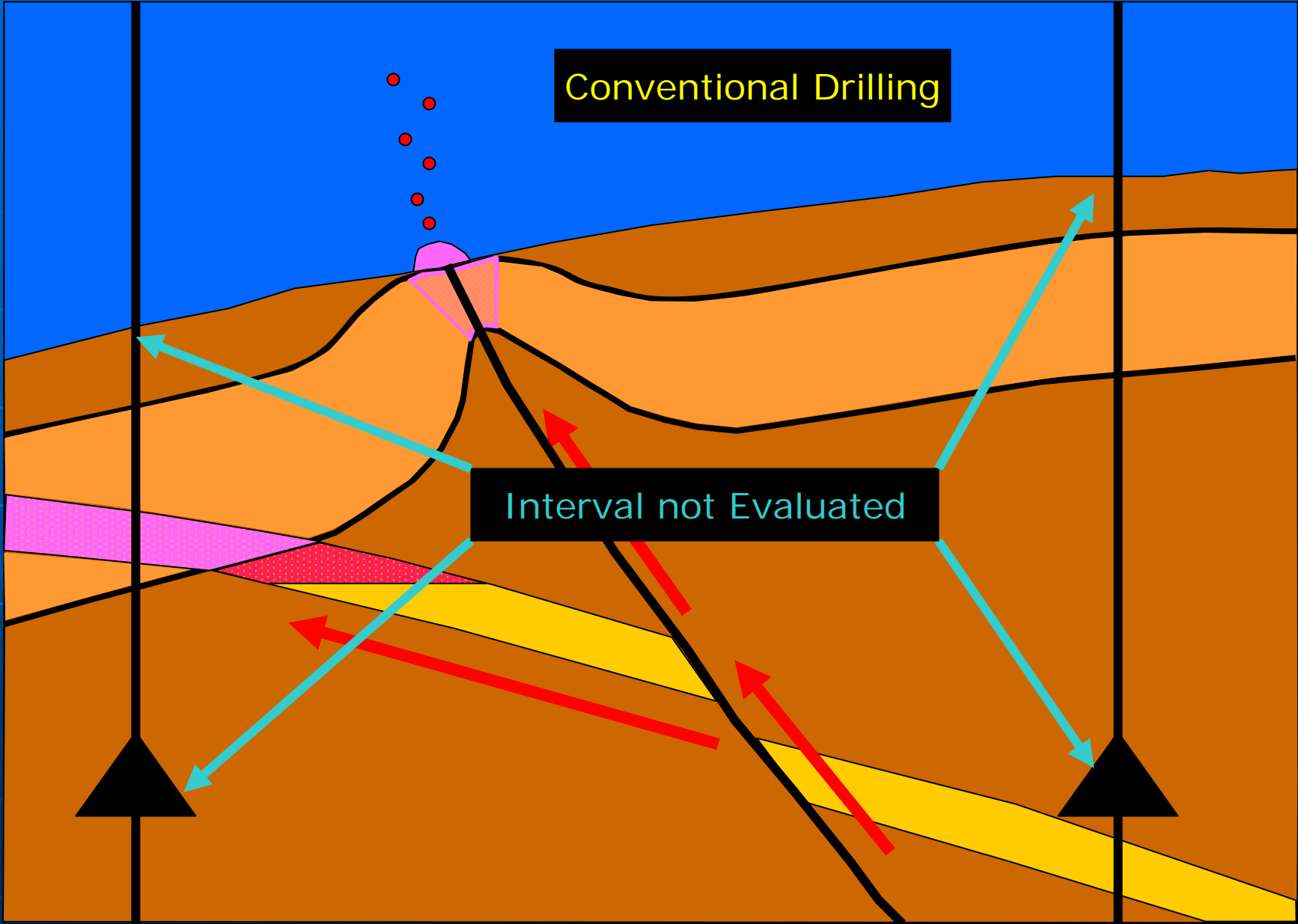
USGS

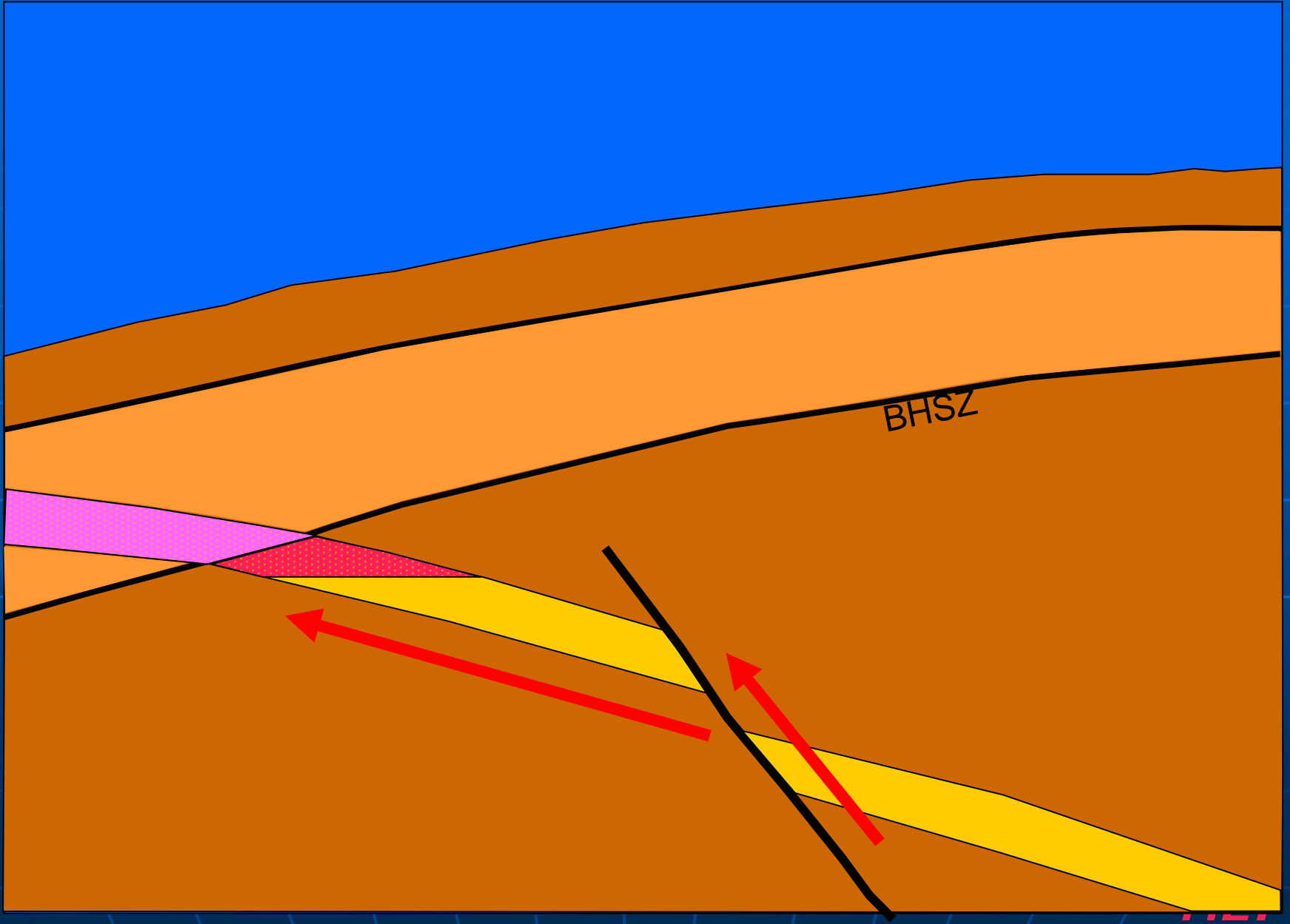




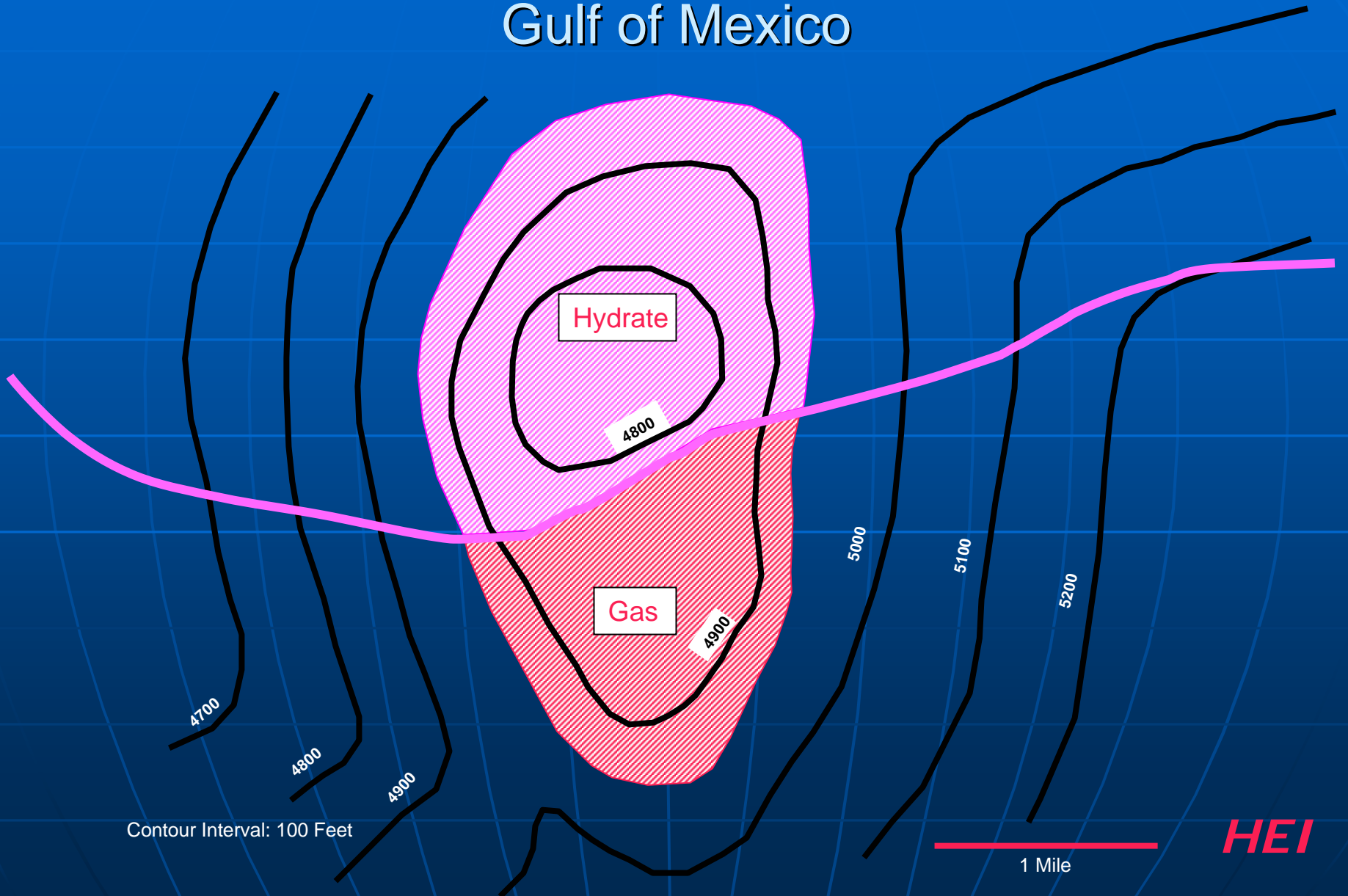
Conventional Drilling

Interval not Evaluated





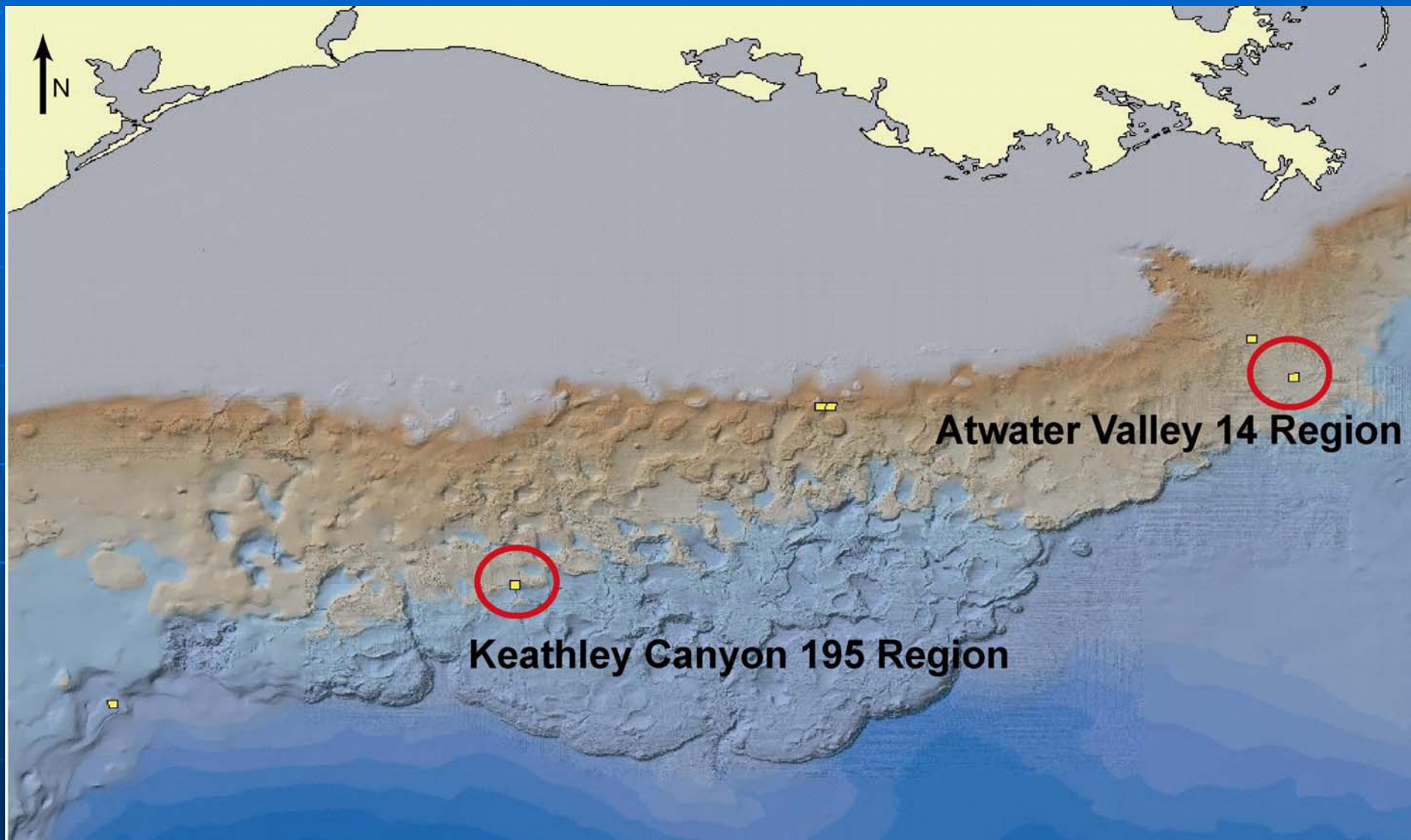
Hydrate Prospect Example Gulf of Mexico



Joint Industry Program (JIP)

- Led by ChevronTexaco
- Partners include US and International companies and agencies
- Major funding by the Department of Energy
- Focus on safety of offshore facilities
- Drilling & coring scheduled for 2nd Quarter of 2004

JIP Sites



Summary

- Commercial hydrate production will (at least initially) involve producing free gas beneath the phase boundary.
- There is good evidence for sands in the Gulf of Mexico that cross the phase boundary.
- By the middle of next year the JIP should have an excellent new data set for modeling.