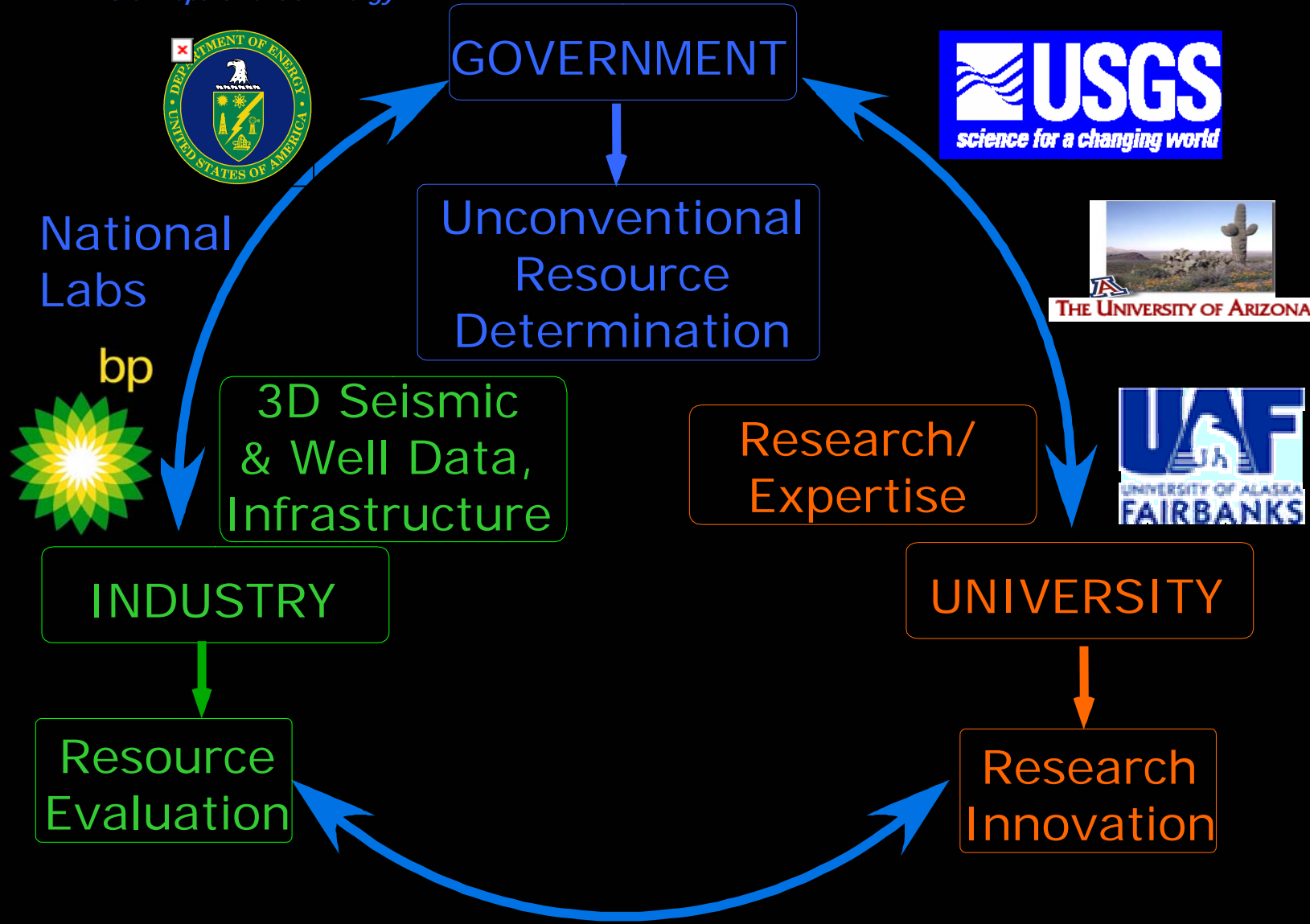




Methane Hydrate Research Alignment and Interaction

U.S. Department of Energy



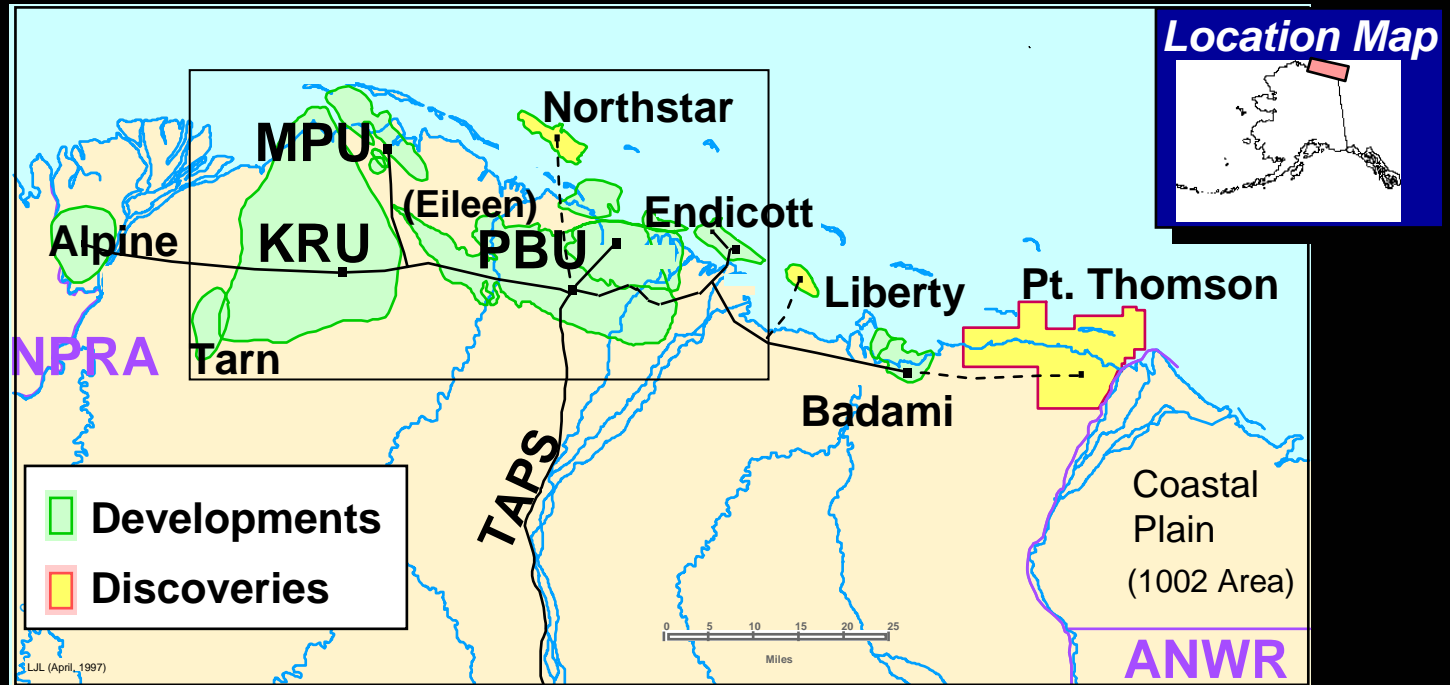


Gas Hydrate Resource and Prospect Requirements

- Petroleum System Components
- Industry Infrastructure
- Industry Acreage Access
- Production Technology (Familiar)
- Economics and Risk Assessment
 - Ultimate Recovery Potential?
 - Daily Production Rate?
 - Operating Cost?
 - Profitability?
- Research Support in Aligned Areas: Gulf of Mexico and Alaska

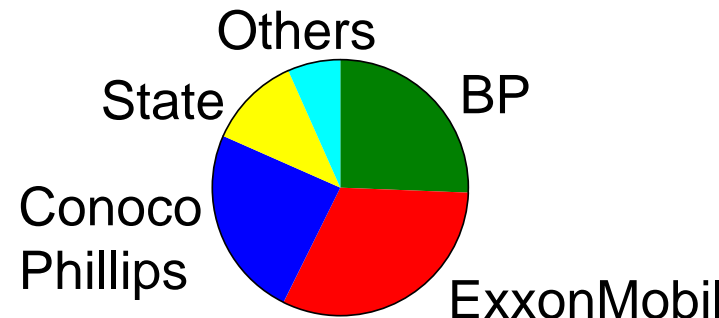


Alaska North Slope (ANS) Development Infrastructure



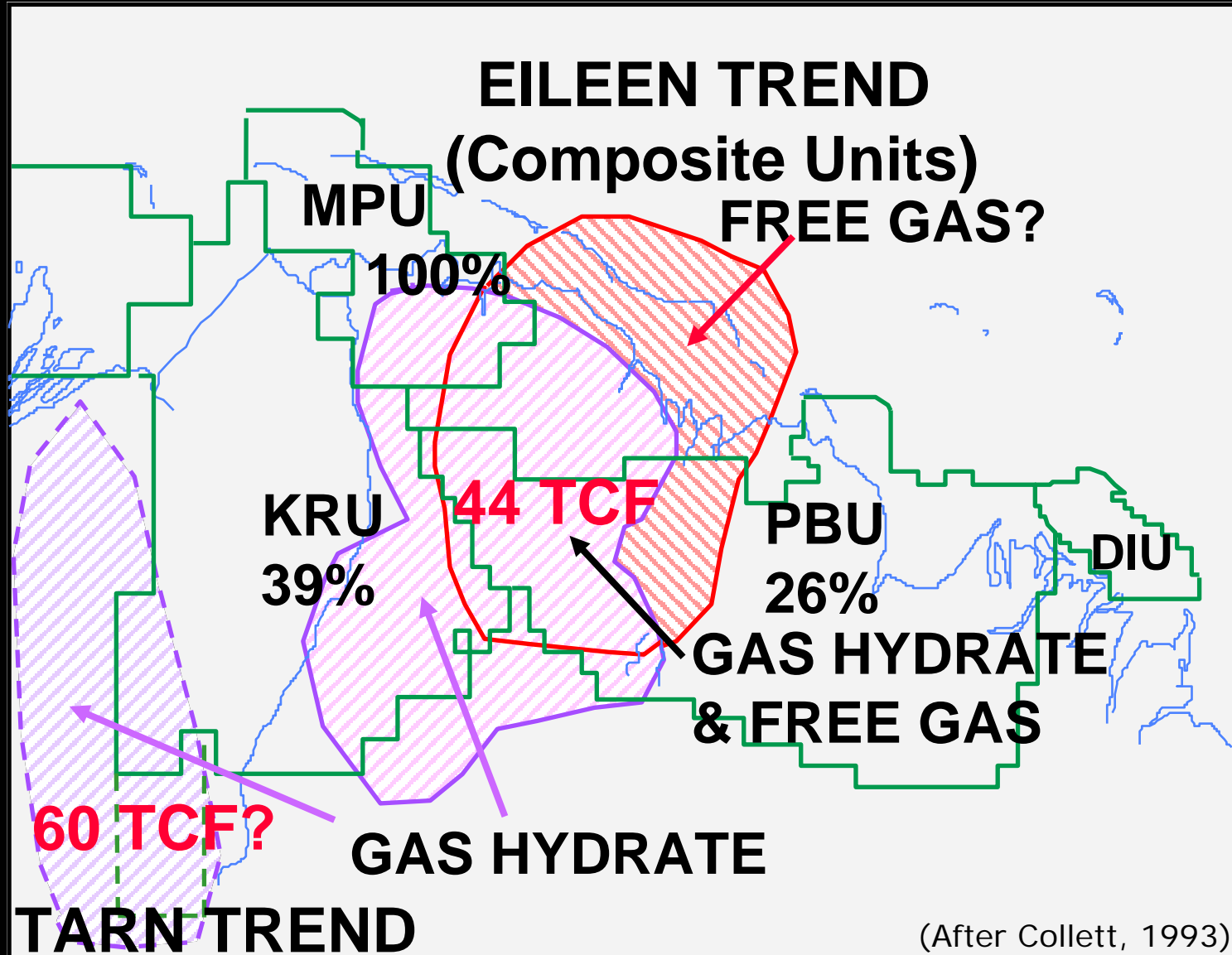
- North Slope Proven Gas = 35 TCF
- Prudhoe Bay 8 BCF/Day Production
- Reinjected Gas → Reservoir Energy

Alaska Gas Owners



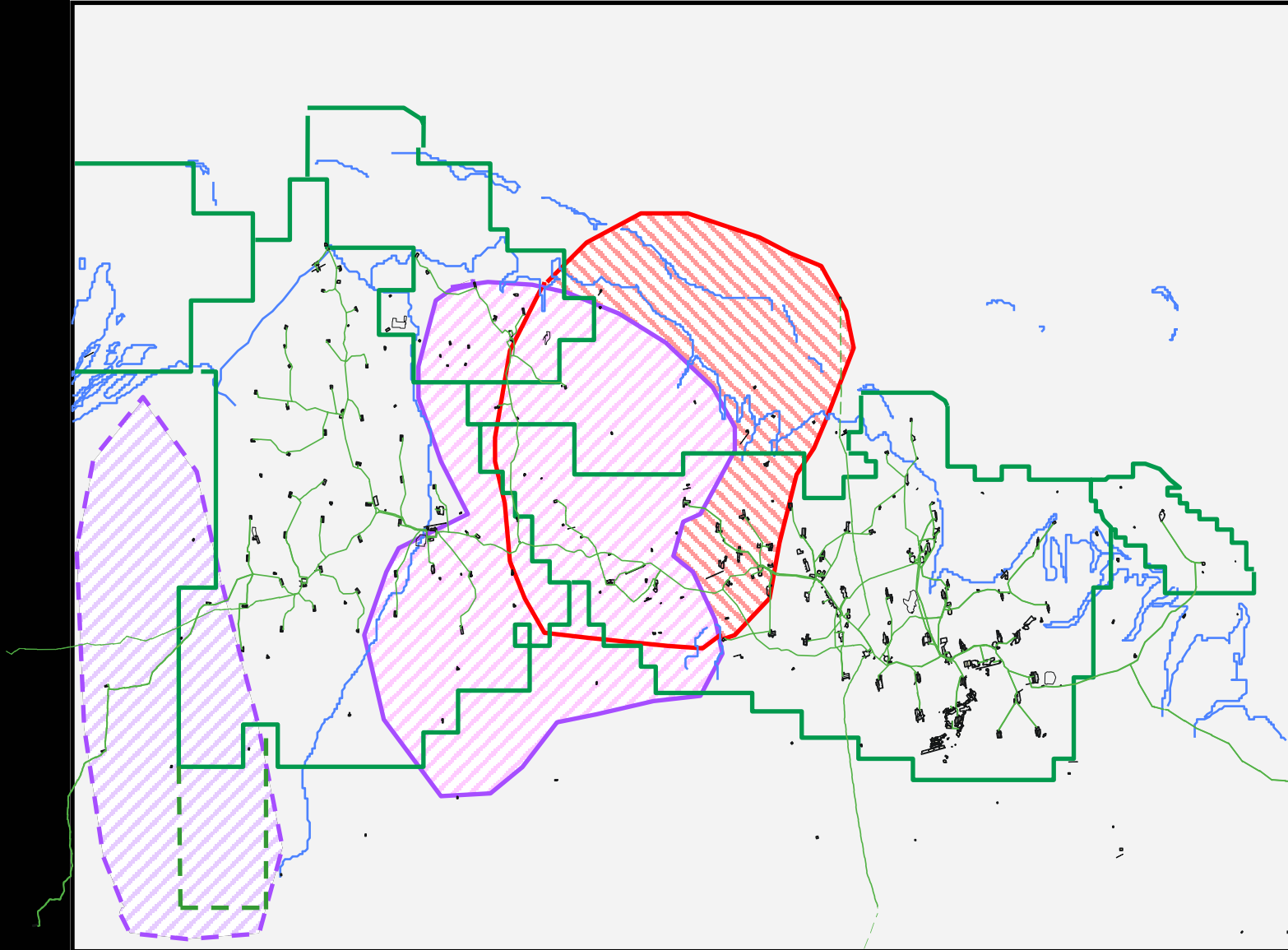


ANS Methane Hydrate Estimated In-Place Resource





Alaska North Slope Development Infrastructure



bp



BP – DOE Gas Hydrate Project

Year/Phase/

DOE Cost

2001

Project Proposal

DOE-Industry Alignment

2002

Wells of Opportunity – Acquire Data

\$2.0

2003

Characterize Reservoir/Fluid

Verify In-Place Resource

Drilling/Production RE/PE Studies

2004

Reservoir and Economic Modeling

\$3.6

2005

Production Test, Reserves Calc.

Reservoir and Economic Modeling

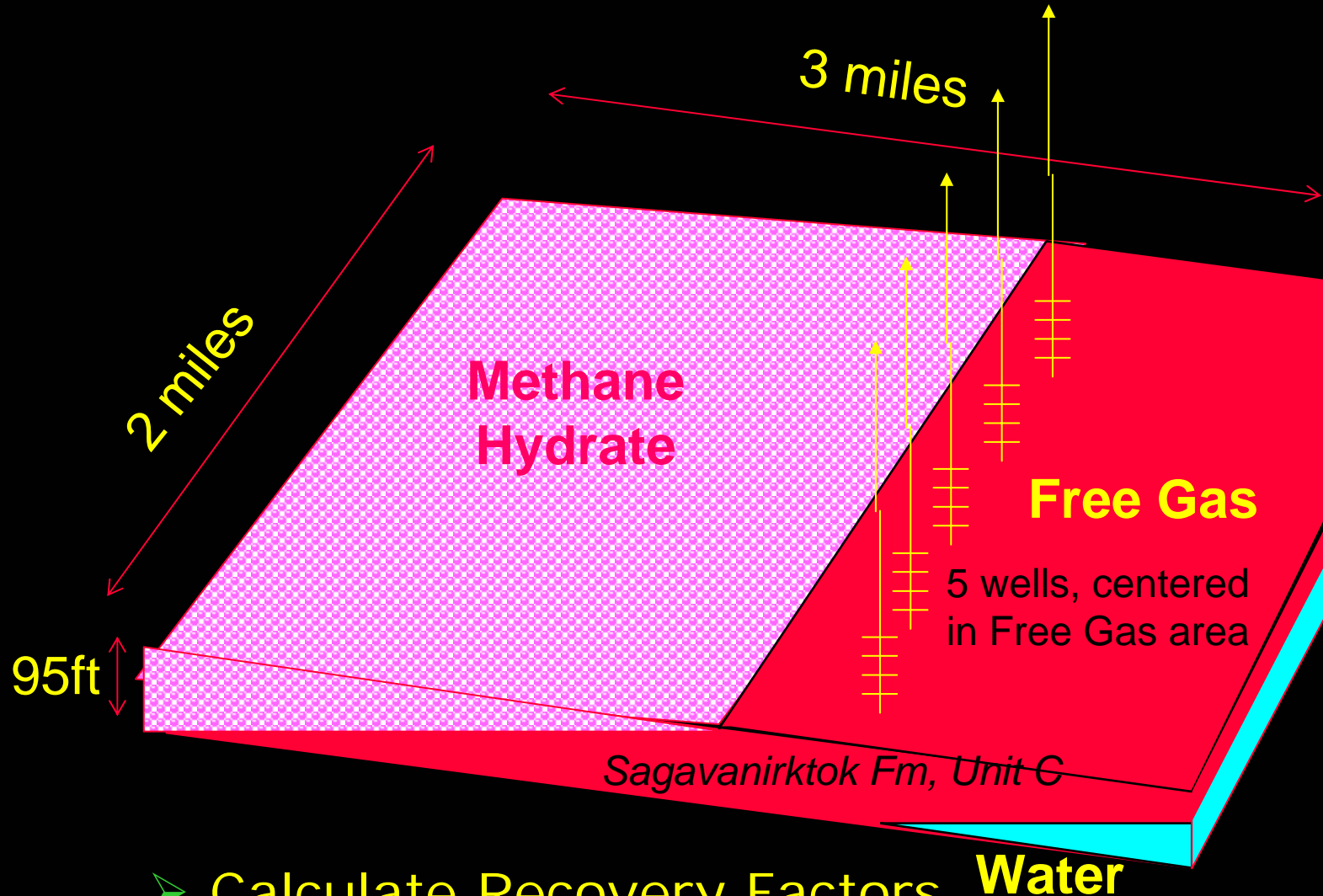
2006

\$7.6

Possible Pilot Development



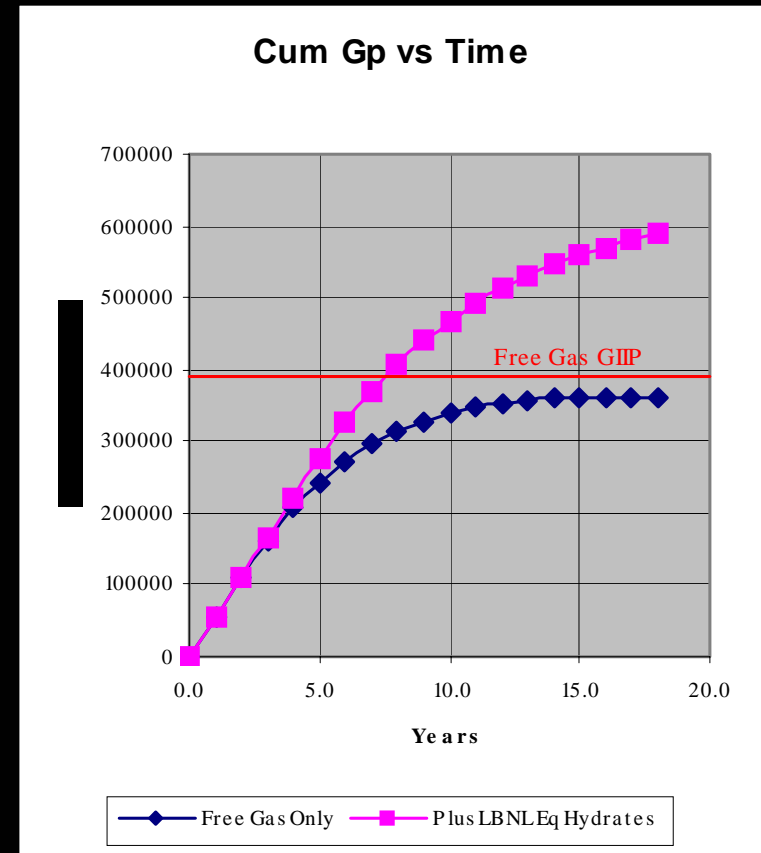
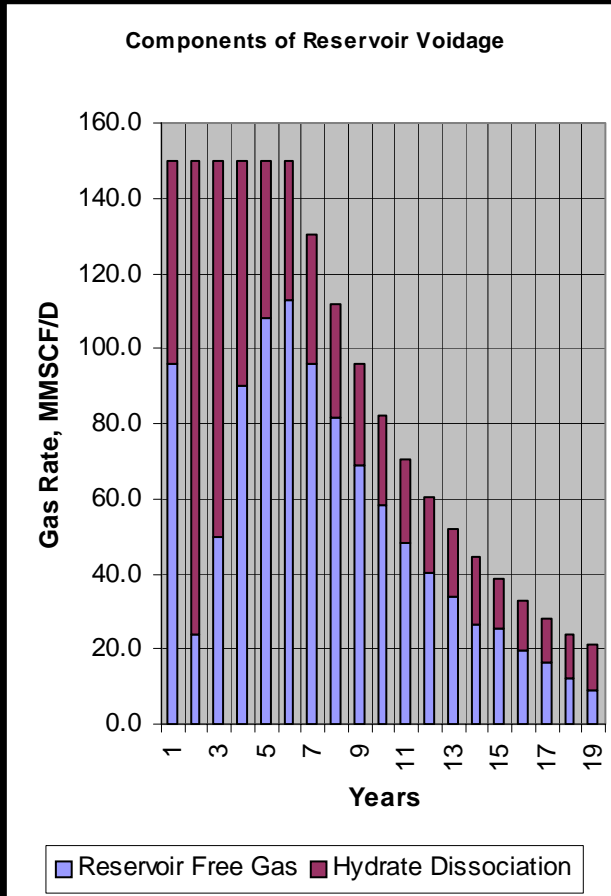
Preliminary Reservoir Model (LBNL-BPXA-USGS-UAF-RS)



- Calculate Recovery Factors
- Develop Production Scenarios



Preliminary Reservoir Model Gas Hydrate Dissociation



- Significant Production Increase due to Free Gas Dissociation from Gas Hydrate
- Significant Uncertainties: Use with Caution



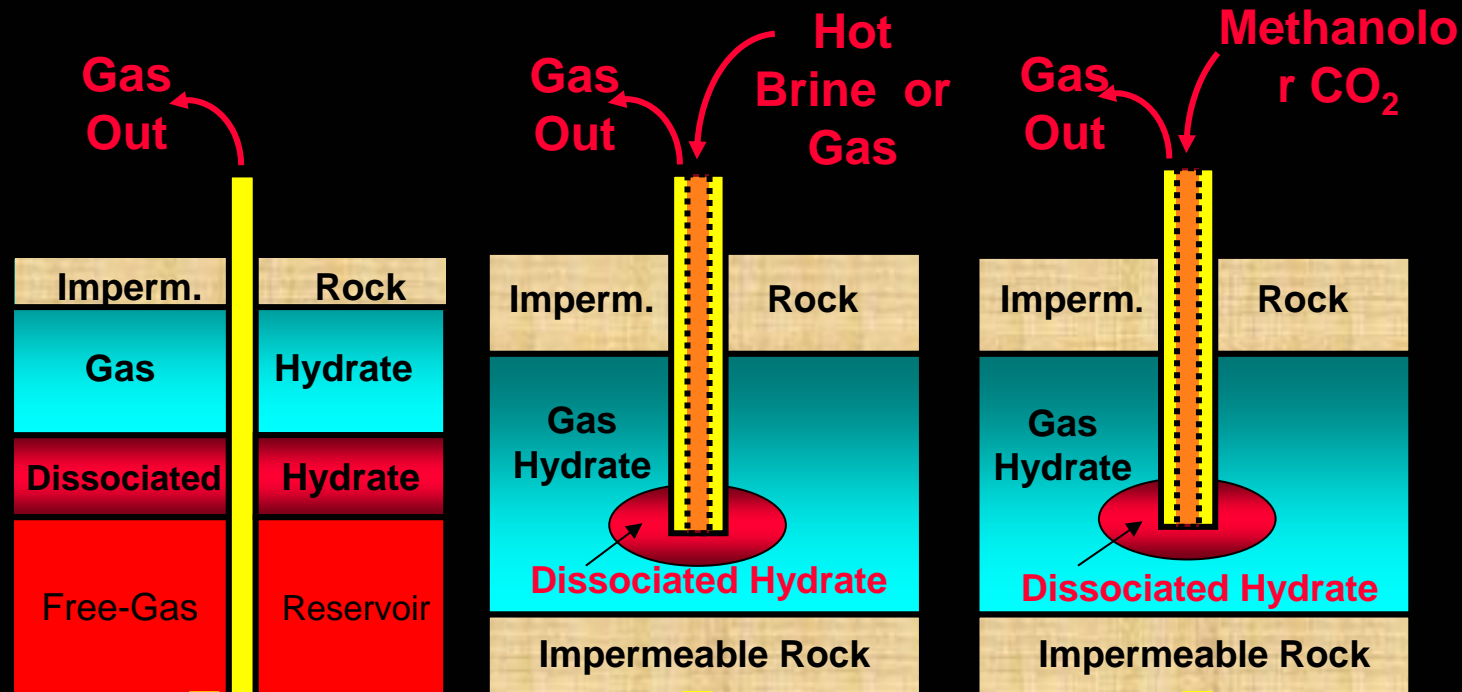
Productivity Challenges

Gas Hydrate Production Methods

Depressurization

Thermal Injection

Inhibitor or CO₂ Injection



After Collett, 2000

- Endothermic heat of dissociation
- Temperature recovery lag time
- Hydrate self-preservation

- Large energy in
- Heats Host Rock
- Possible in-situ Electromagnetic

- High cost
- PNNL Lab Testing
- Unk. Effectiveness



BP Alaska Gas Hydrate Project Summary

- Alaska North Slope: Premier Area/Time
 - Resource – Infrastructure – Alignment
- Characterize and Quantify Resource
- Determine Production and Economic Resource Potential
- Develop Drilling, Completion, Production Technology
- Benefit Industry and Government
 - Assess Technical/Economic Hurdles
 - Convert Potential Resource into Reserves
 - Develop Huge/Unconventional Resource
 - Use Gas for Reservoir Energy &/or Sales