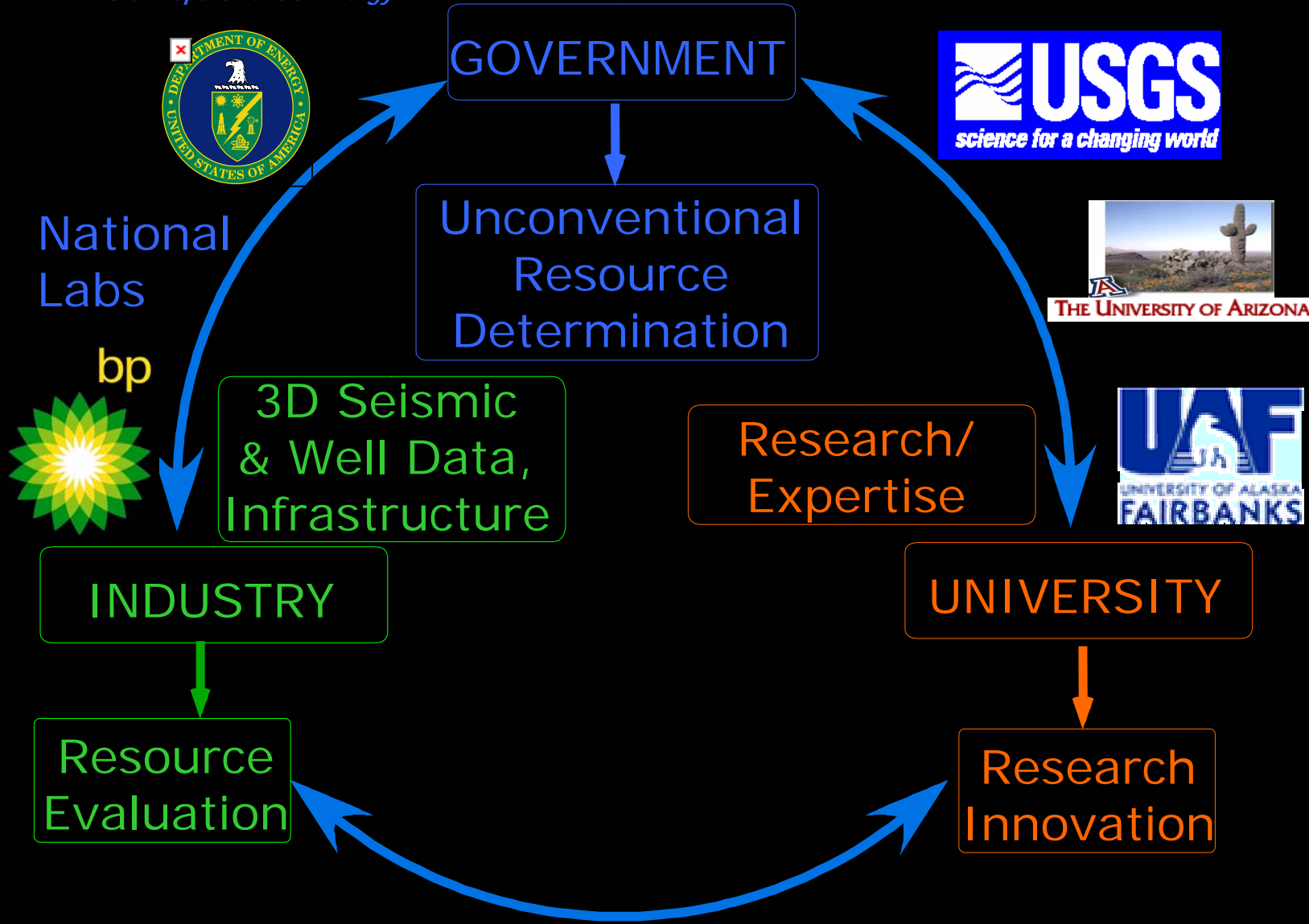




# Methane Hydrate Research Alignment and Interaction

U.S. Department of Energy



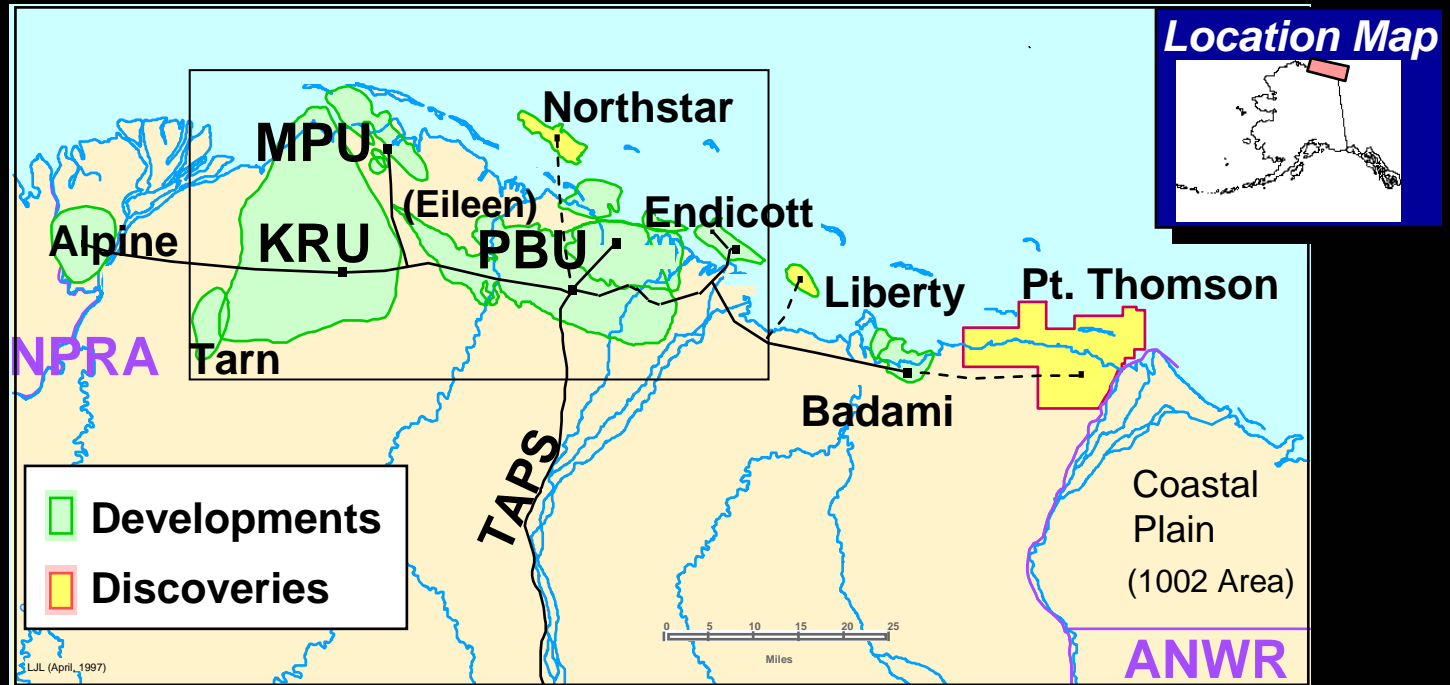


# Gas Hydrate Resource and Prospect Requirements

- 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

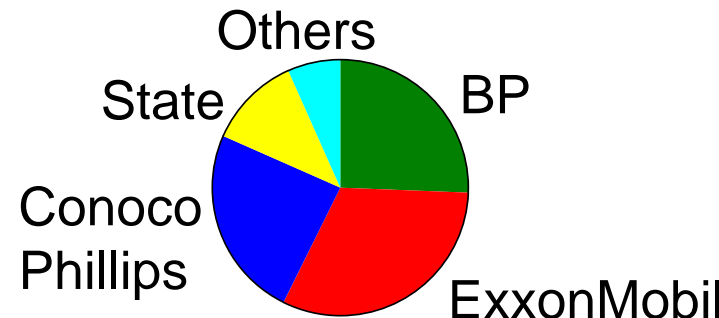


# Alaska North Slope (ANS) Development Infrastructure



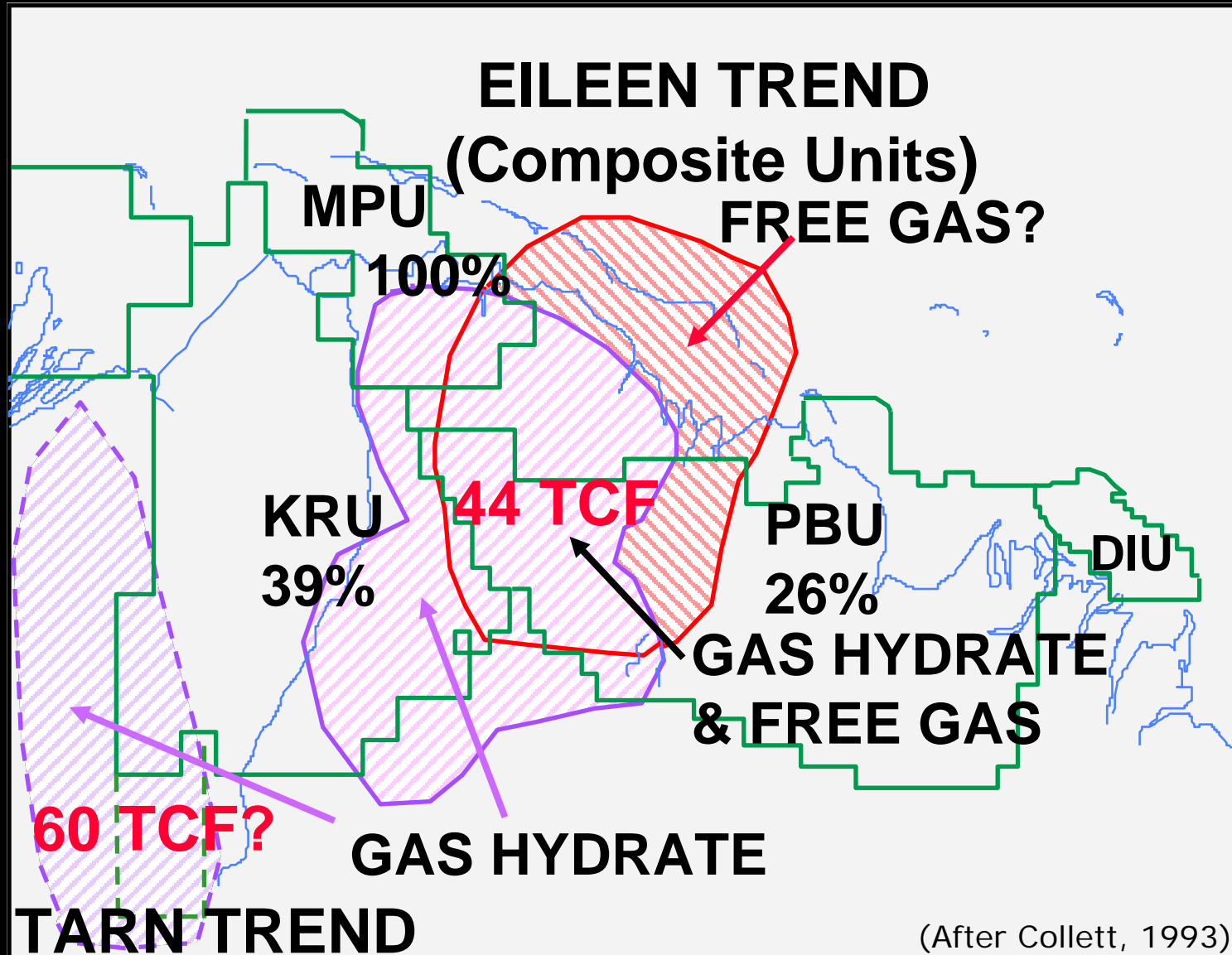
- North Slope Proven Gas = 35 TCF
- Prudhoe Bay 8 BCF/Day Production
- Reinjected Gas → Reservoir Energy

## Alaska Gas Owners



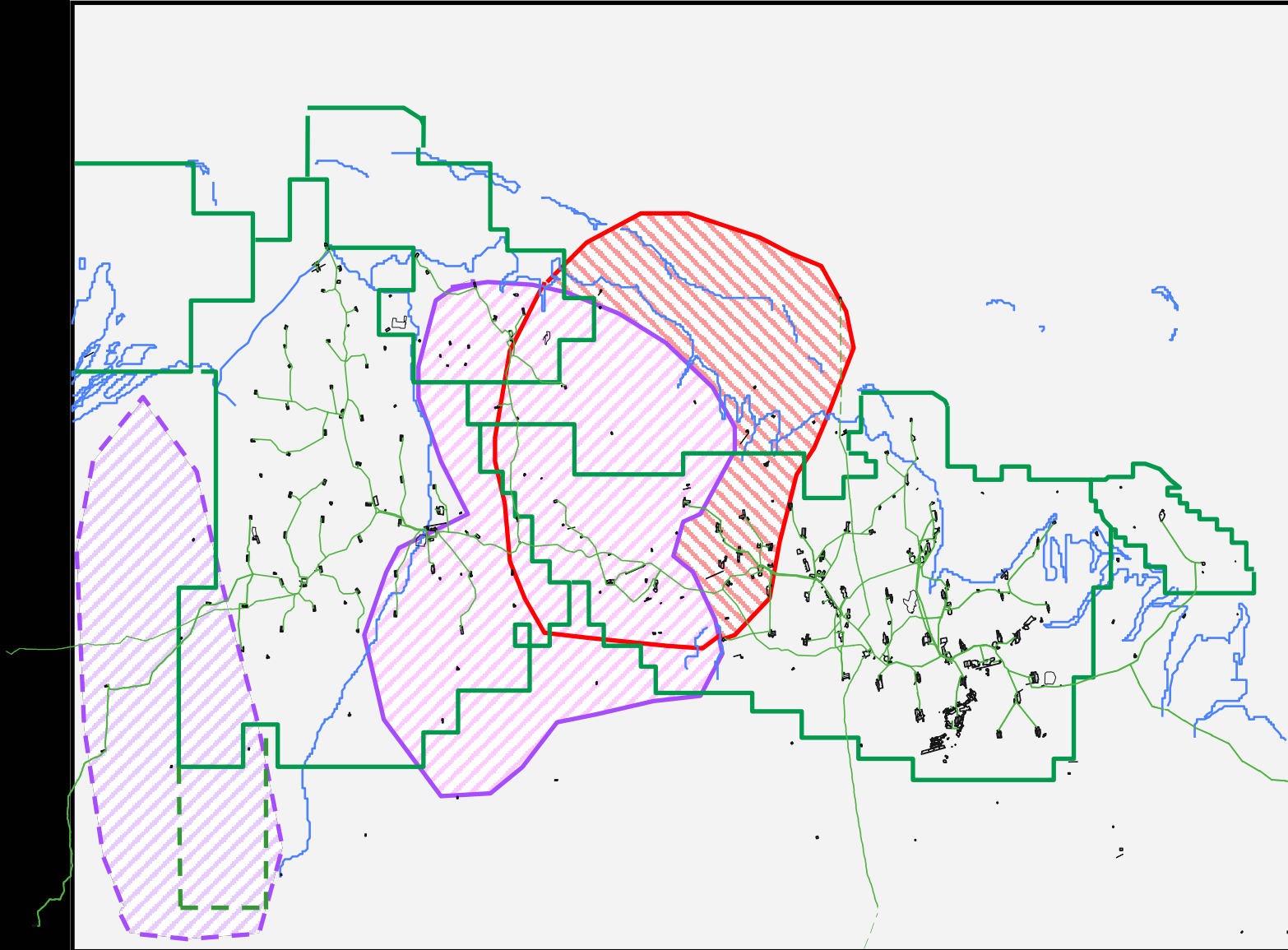


# ANS Methane Hydrate Estimated In-Place Resource





# 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

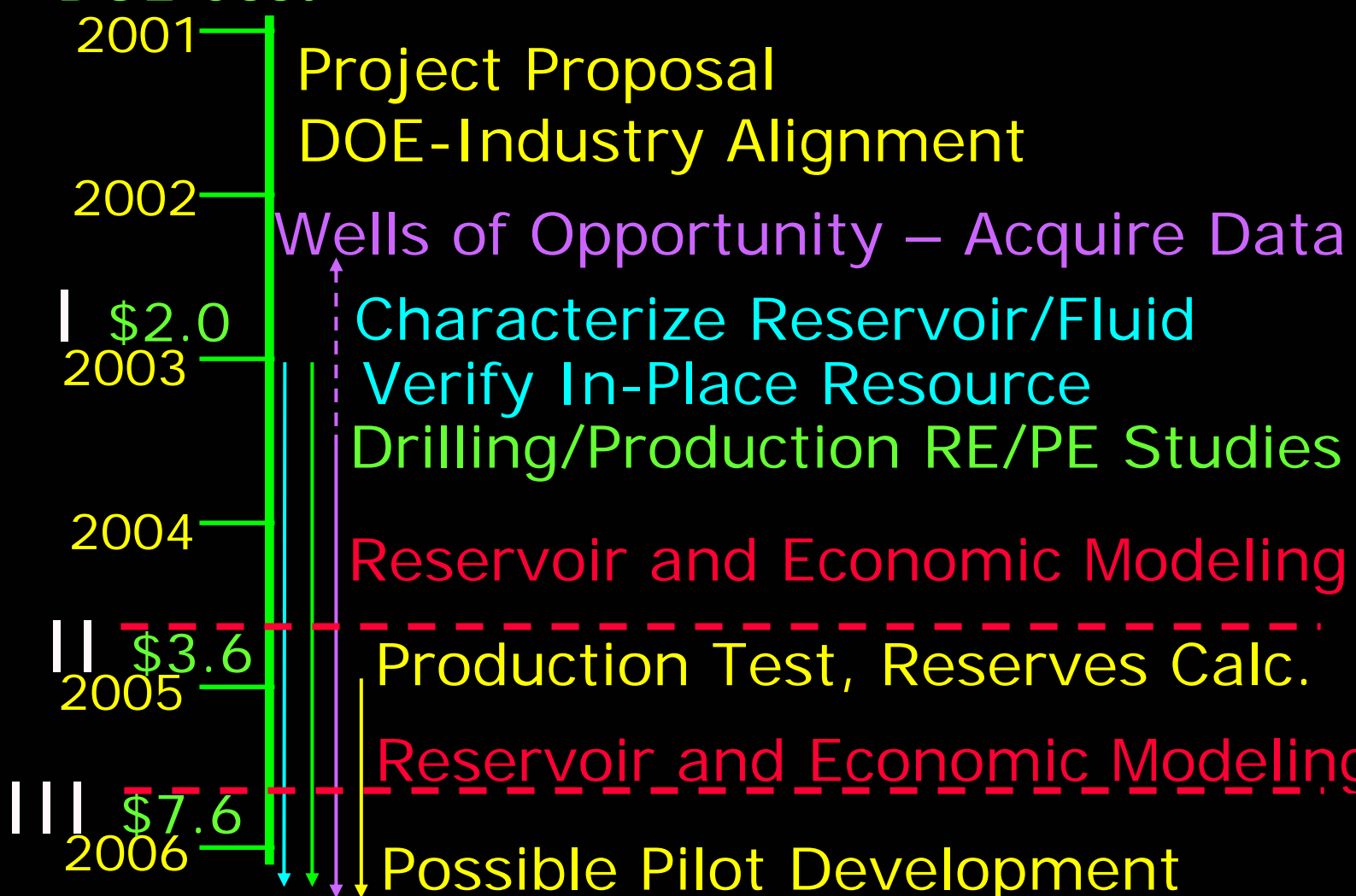
Production Test, Reserves Calc.

Reservoir and Economic Modeling

2006

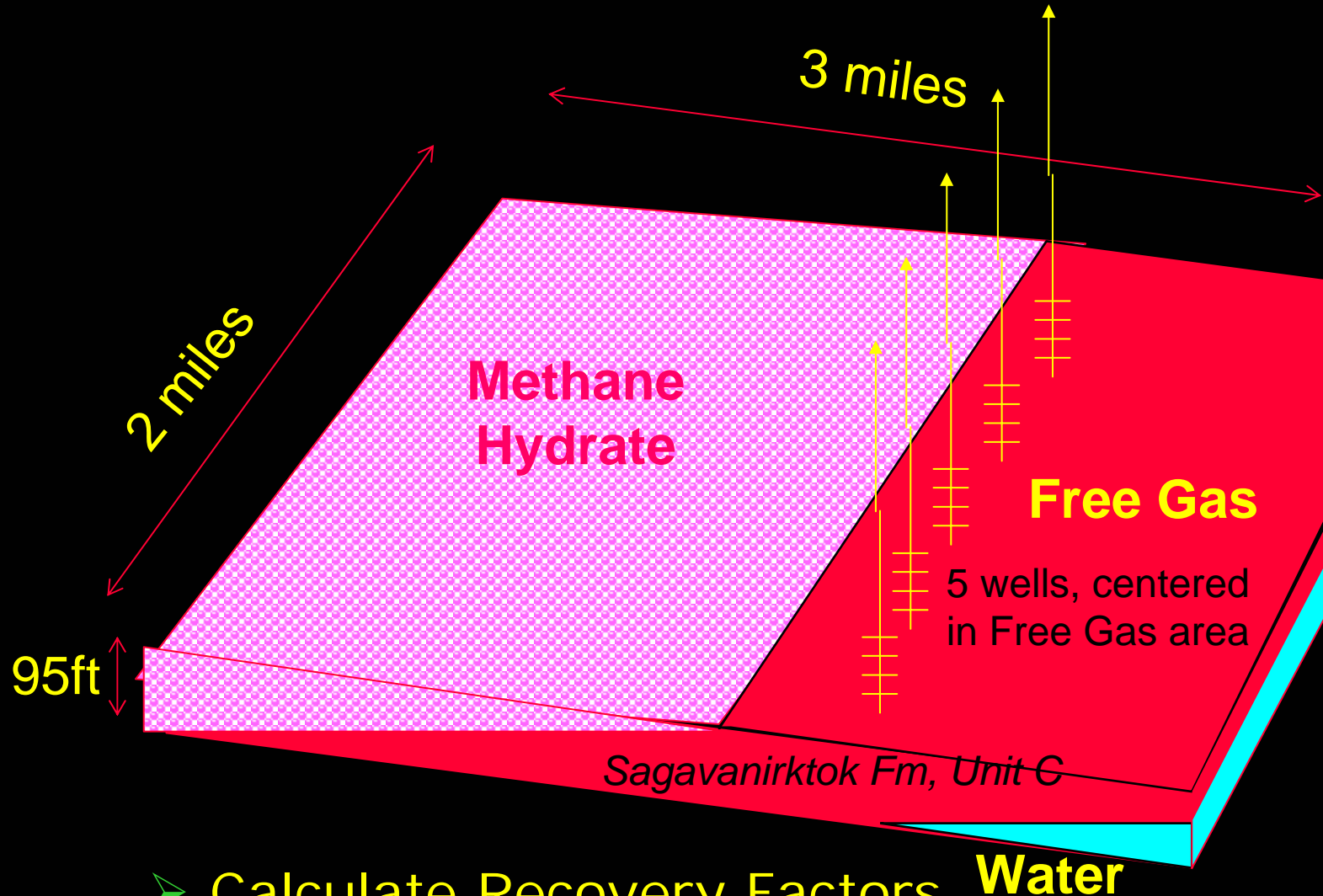
\$7.6

Possible Pilot Development





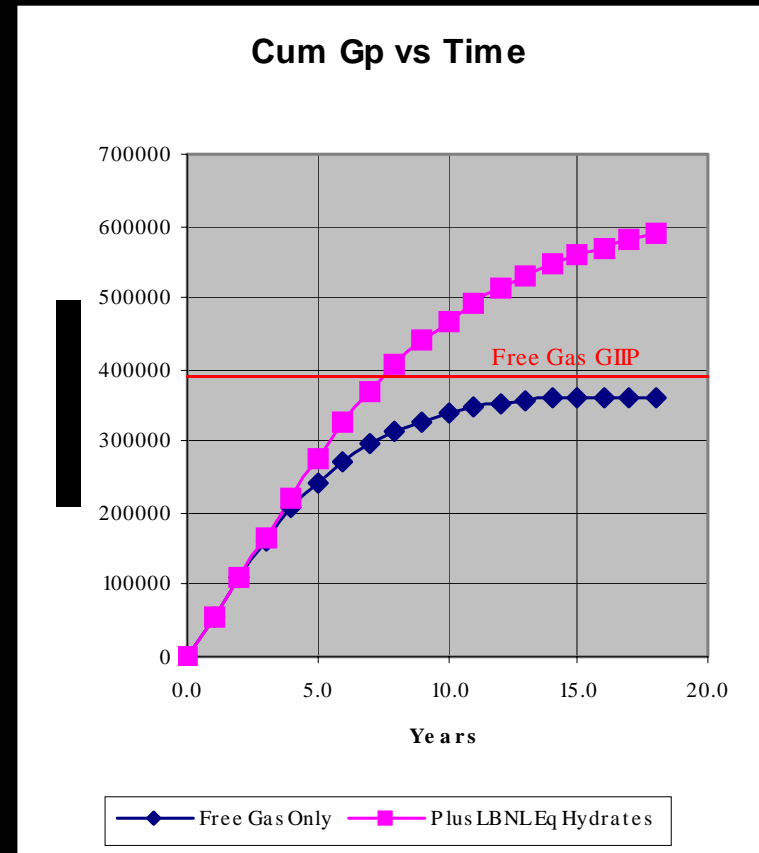
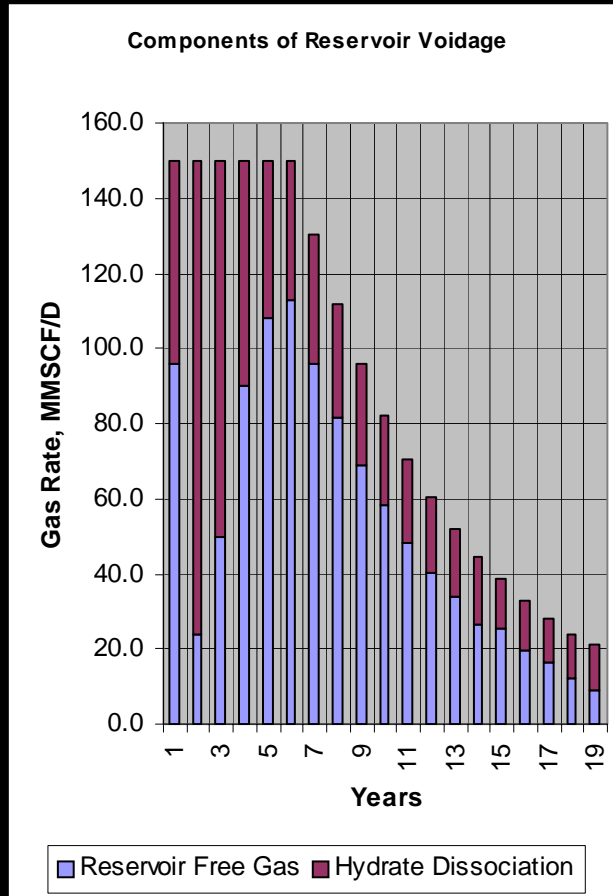
# Preliminary Reservoir Model (LBNL-BPXA-USGS-UAF-RS)



- 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





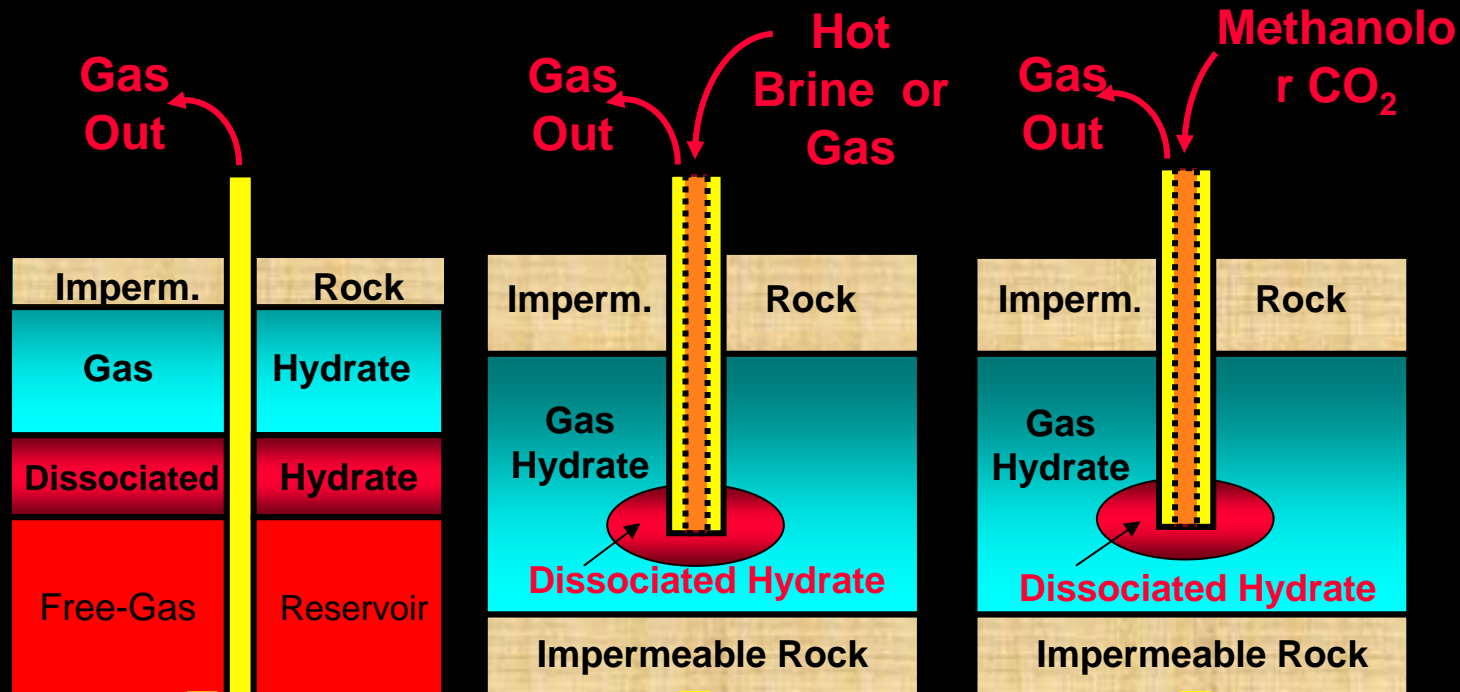
# Productivity Challenges

## Gas Hydrate Production Methods

### Depressurization

### Thermal Injection

### Inhibitor or CO<sub>2</sub> 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