ALASKA GAS HYDRATE PLANNING WORKSHOP

USGS
science for a changing world

August 17-18, 2005
Anchorage, Alaska

ALASKA GAS HYDRATE PLANNING WORKSHOP

August-17, 2005, Wednesday

8:30 a.m. **Registration**

9:00 a.m. **Welcome and Introductions**
Robert Swenson, Alaska Division of Geological and Geophysical Surveys

9:05 a.m. **Alaskan Government Interests and Workshop Goals**
Mark Myers, Alaska Division of Oil and Gas

9:40 a.m. **U.S. Department of Energy Gas Hydrate Program and Perspective**
Ray Boswell, United States Department of Energy

10:00 a.m. **Historical Review Through Current Programs – Assessment and Prospecting**
Tim Collett, United States Geological Survey

10:45 a.m. **Break**

ALASKA GAS HYDRATE PLANNING WORKSHOP

August-17, 2005, Wednesday - Continued

11:00 a.m. **USDOE-BPXA Collaborative Research Project Update – Production Modeling and Resource Evaluation**
Robert Hunter, ASRC Energy Services

11:45 a.m. **Gas Hydrate Research Review**
Shirish Patil, University of Alaska, Fairbanks

12:25 p.m. **Lunch**

1:30 p.m. **Industry Perspectives – Historical Background and Current Interest**
Invited Alaska Industry Stakeholders

2:30 p.m. **Breakout Sessions – Introductions and Directions**
Robert Swenson, Alaska Division of Geological and Geophysical Surveys

4:30 p.m. **Reconvene General Session – Preliminary Review of Progress**

5:00 p.m. **Adjourn**

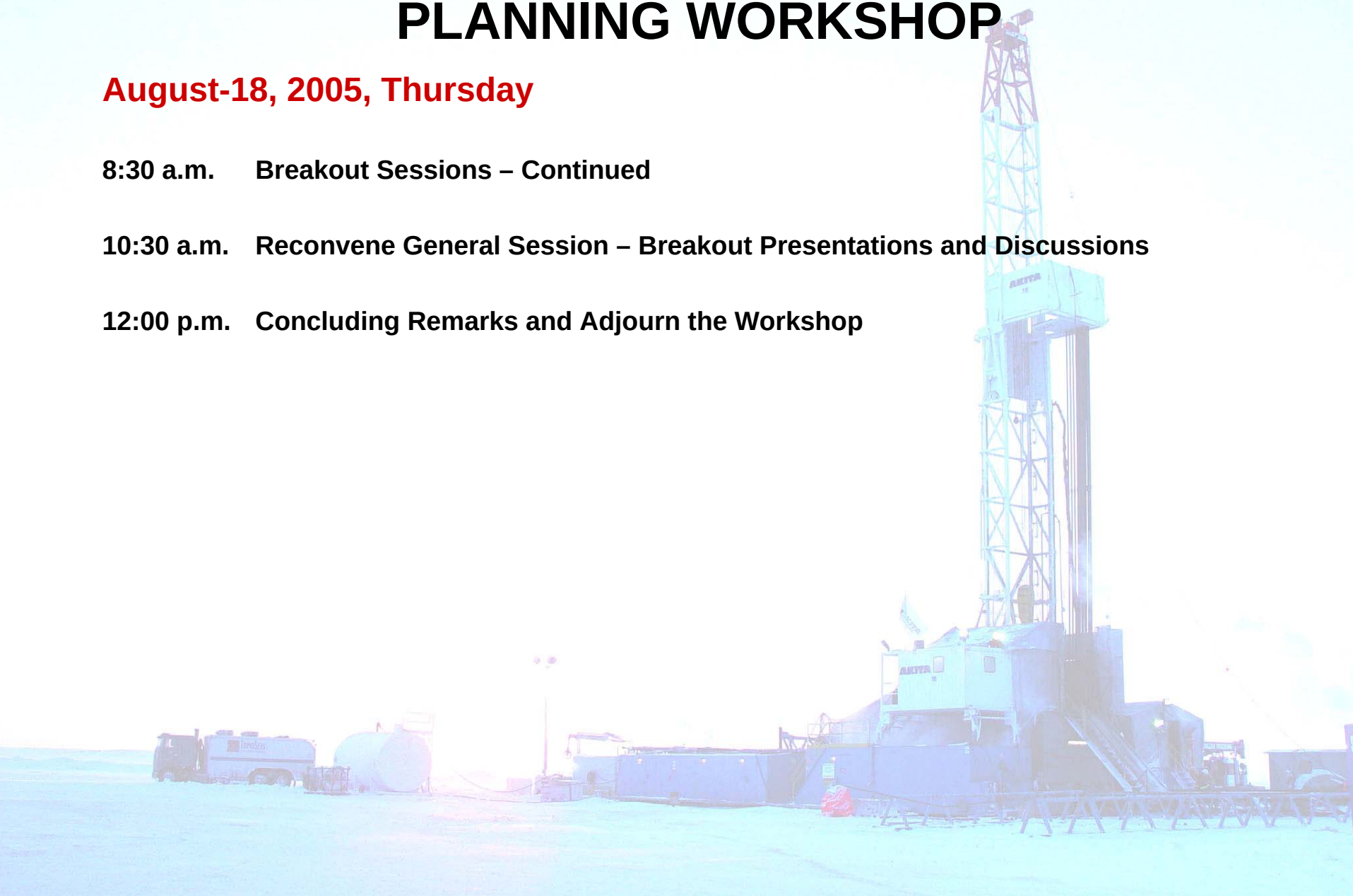
ALASKA GAS HYDRATE PLANNING WORKSHOP

August-18, 2005, Thursday

8:30 a.m. Breakout Sessions – Continued

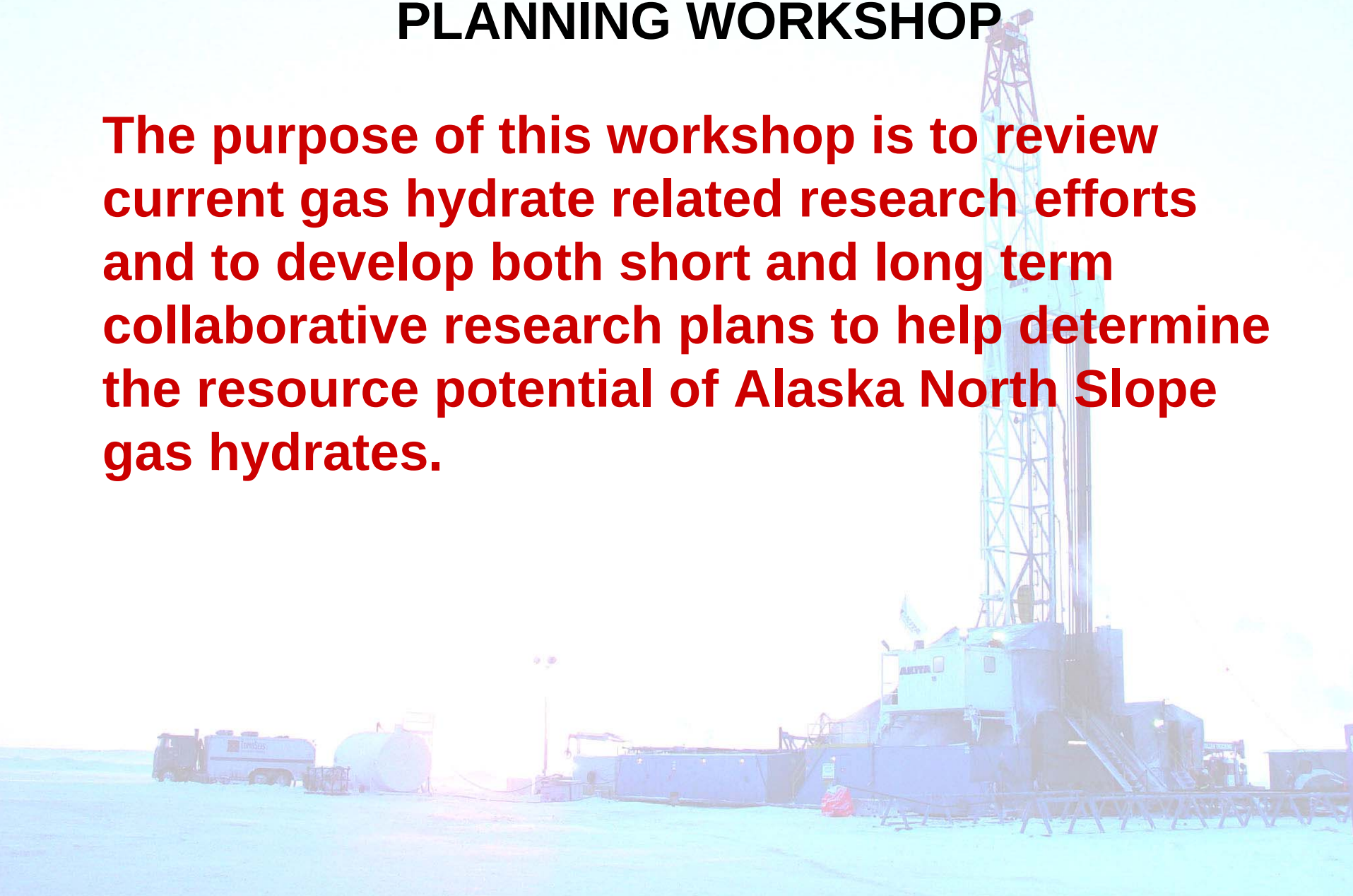
10:30 a.m. Reconvene General Session – Breakout Presentations and Discussions

12:00 p.m. Concluding Remarks and Adjourn the Workshop



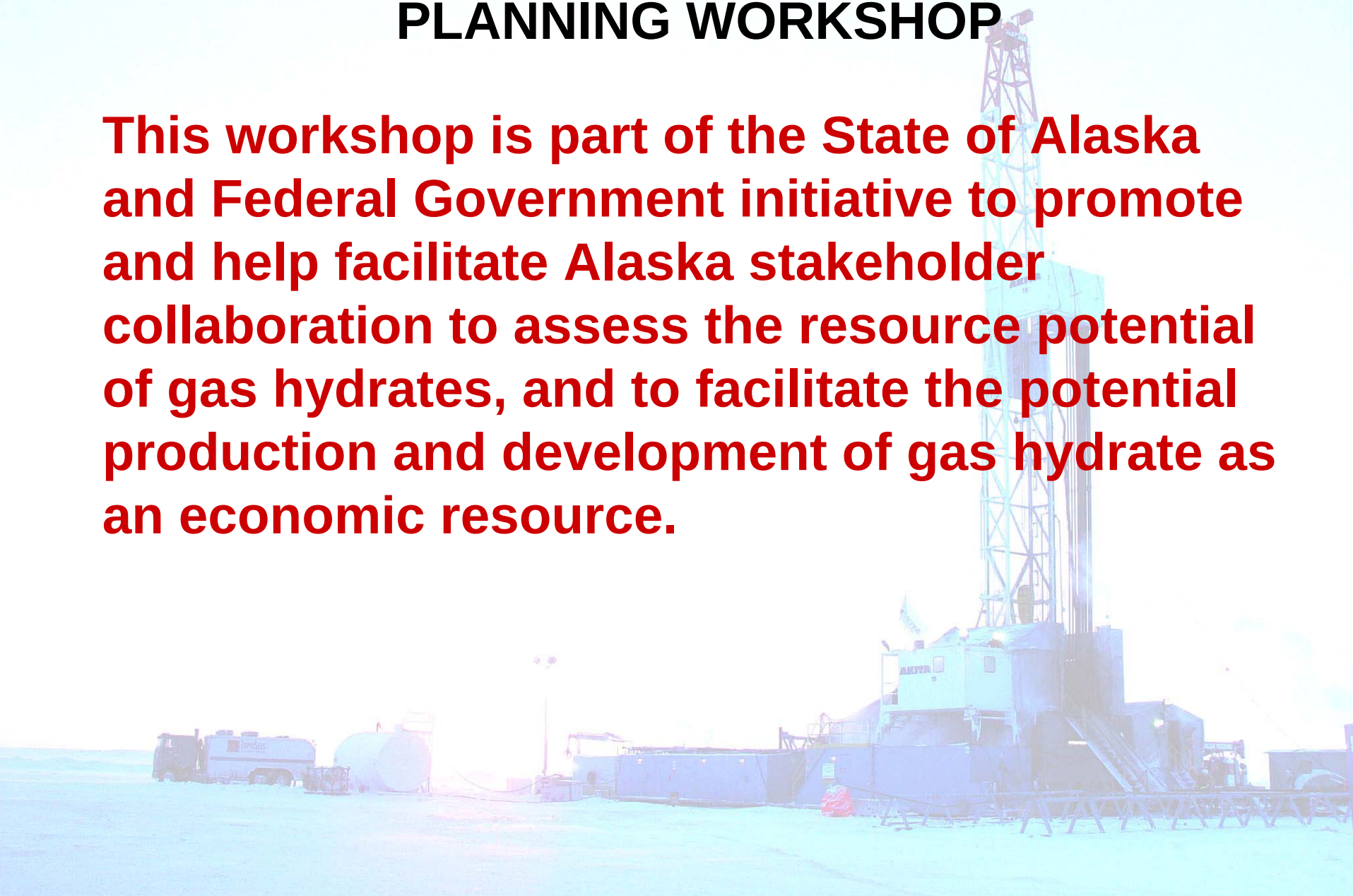
ALASKA GAS HYDRATE PLANNING WORKSHOP

The purpose of this workshop is to review current gas hydrate related research efforts and to develop both short and long term collaborative research plans to help determine the resource potential of Alaska North Slope gas hydrates.



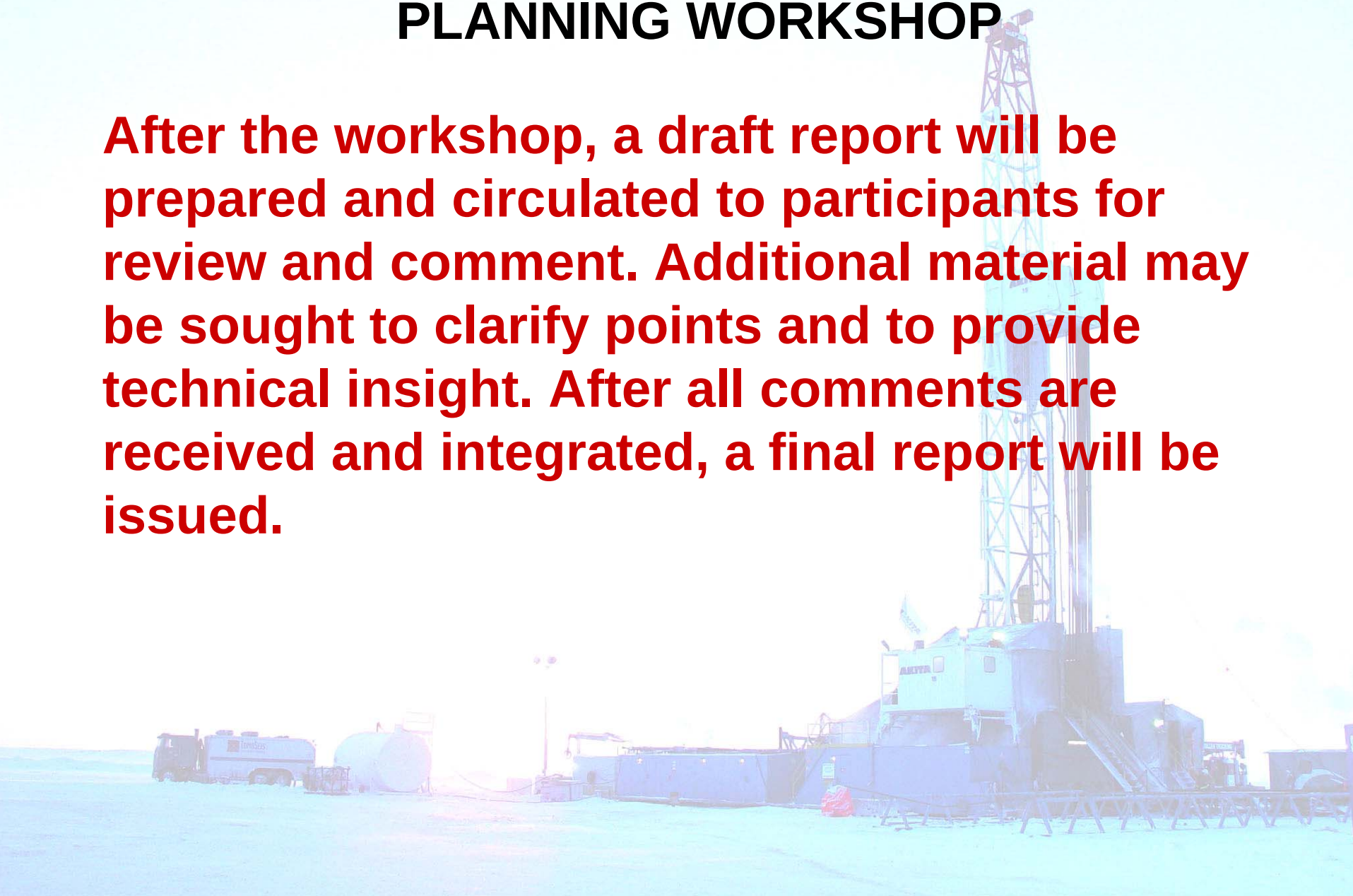
ALASKA GAS HYDRATE PLANNING WORKSHOP

This workshop is part of the State of Alaska and Federal Government initiative to promote and help facilitate Alaska stakeholder collaboration to assess the resource potential of gas hydrates, and to facilitate the potential production and development of gas hydrate as an economic resource.



ALASKA GAS HYDRATE PLANNING WORKSHOP

After the workshop, a draft report will be prepared and circulated to participants for review and comment. Additional material may be sought to clarify points and to provide technical insight. After all comments are received and integrated, a final report will be issued.



Unlocking Alaska's Natural Gas Hydrates: State of Alaska Perspective

Presented to

2005 Gas Hydrates Planning Workshop

August 17 - 18, 2005

Dr. Mark D. Myers

Director, Division of Oil and Gas
State Geologist, Division of Geological and Geophysical Surveys

Alaska Department of
Natural
Resources

http://www.dog.dnr.state.ak.us/oil

ALASKA GAS HYDRATE PLANNING WORKSHOP

Workshop Goals

- ***Critically examine existing geologic models for the occurrence of gas hydrates. Review present assessments of the energy resource potential of gas hydrates. Examine existing production modeling and testing results.***
- ***Identify and assess the technologies and exploration methods needed to detect gas hydrates and identify potential prospects.***
- ***Identify critical geologic/geophysical data requirements to further assess the volume of natural gas within gas hydrate accumulations and prospects.***
- ***Consider new gas production testing and modeling efforts.***
- ***Identify the potential technologies needed to economically produce gas from gas hydrates.***
- ***Identify potential synergies with other industry opportunities.***
- ***Identify additional organizations interested in working toward a goal of gas hydrate development – Gain Alaska stakeholder collaboration, develop an implementation plan and time-table.***

To: **The Honorable Pete V. Domenici, Chairman**
Senate Committee on Energy & Natural Resources

From: **Dr. Mark D. Myers, Director, Alaska Division of Oil and Gas**
Senator Gene Therriault, Chair,
Alaska Legislature, Legislative Budget and Audit Committee
Representative Ralph Samuels, Vice Chair,
Alaska Legislature, Legislative Budget and Audit Committee

Subject: **State of Alaska Briefing Document on Proposal to Reauthorize Methane Hydrate Research and Development Act of 2000, Public Law 103-193, 114 Stat. 234**

Date: **January 24, 2005**

Executive Summary

Currently, 59 bcfd of natural gas is consumed daily in the United States. The Energy Information Administration estimates that domestic demand for natural gas will increase to 77 bcfd by 2015, and to 84 bcfd by 2025. If the Alaska natural gas pipeline currently envisioned is built, the 35 tcf of known Alaska reserves could satisfy 4.5 bcfd of the total domestic demand for a period of two decades. Alaska's vast gas resources are estimated to also include 250 tcf of undiscovered conventional resources, 590 tcf of onshore (100 tcf within or near existing North Slope infrastructure), and more than 32,000 tcf of offshore gas hydrates, which could supply a much greater percentage of domestic demand for generations to come, particularly if two conditions are met: 1) gas hydrates can be commercialized; and 2) the rules for access to and expansion of an Alaska natural gas pipeline encourage competition in the exploration for and development of Alaska natural gas. The latter condition is currently the subject of rule-making by the Federal Energy Regulatory Commission. However, the former—commercialization of gas hydrates—is at risk absent Congressional action in 2005. Congressional action is needed to reauthorize Pub. L. 106-193, 114 Stat. 234 (2000), the Methane Hydrate Research and Development Act, and to fund research and field testing under that Act. It is proposed that the Act be reauthorized for a period of five years, with appropriations of no less than $10 million/year in years 1-3 and $20 million/year in years 4-5.

The large quantity of hydrates that underlie the existing Kuparuk River, Milne Point, and Prudhoe Bay Fields could in itself remove all potential reserve risk from year 20-35 and beyond for an Alaska natural gas pipeline producing at 4.5 bcfd. Reducing reserve risk will have a positive effect on project financing and potentially result in a lower tariff, which in turn could lead to increased exploration and early expansion of the pipeline.

Introduction

Sharply rising U.S. consumption of natural gas coupled with increasing worldwide gas demand intensify the need to find additional sources of natural gas. An increasingly global LNG market is developing based on these growing international energy demands, and upon the enormous natural gas reserves in the Middle East and other areas of the world. Reliance on these supplies worsens the U.S. trade deficit, places the U.S. natural gas market increasingly in direct

STATE OF ALASKA
THE LEGISLATURE

2005

Source
HCS SJR 5(O&G)

Legislative Resolve No.
3

Urging the United States Congress to reauthorize the Methane Hydrate Research and Development Act.

BE IT RESOLVED BY THE LEGISLATURE OF THE STATE OF ALASKA:

WHEREAS 59 billion cubic feet a day of natural gas are consumed in the United States; and

WHEREAS the Energy Information Administration estimates that domestic demand for natural gas will increase to 77 billion cubic feet a day by 2015 and to 84 billion cubic feet a day by 2025; and

WHEREAS Alaska has 35 trillion cubic feet of proven reserves of natural gas on the North Slope; and

WHEREAS the United States Geological Survey estimates Alaska's onshore natural gas hydrates in place at 590 trillion cubic feet, 40 to 100 trillion cubic feet of which are in place in the central portion of the North Slope in close proximity to or underlying existing producing fields, and an additional 32,375 trillion cubic feet of gas hydrates are in the Beaufort Sea and Chukchi Sea offshore; and

WHEREAS none of the completed gas hydrate energy assessments has predicted how

109TH CONGRESS } HOUSE OF REPRESENTATIVES { REPORT
1st Session SENATE 109–____

DOMENICI-BARTON ENERGY POLICY ACT OF 2005

2005.—Ordered to be printed

_____

_____, from the committee of conference, submitted the following

CONFERENCE REPORT

[To accompany H.R. 6]

The committee of conference on the disagreeing votes of the two Houses on the amendment of the Senate to the bill (H.R. 6), to ensure jobs for our future with secure, affordable, and reliable energy, having met, after full and free conference, have agreed to recommend and do recommend to their respective Houses as follows:

That the House recede from its disagreement to the amendment of the Senate and agree to the same with an amendment as follows:

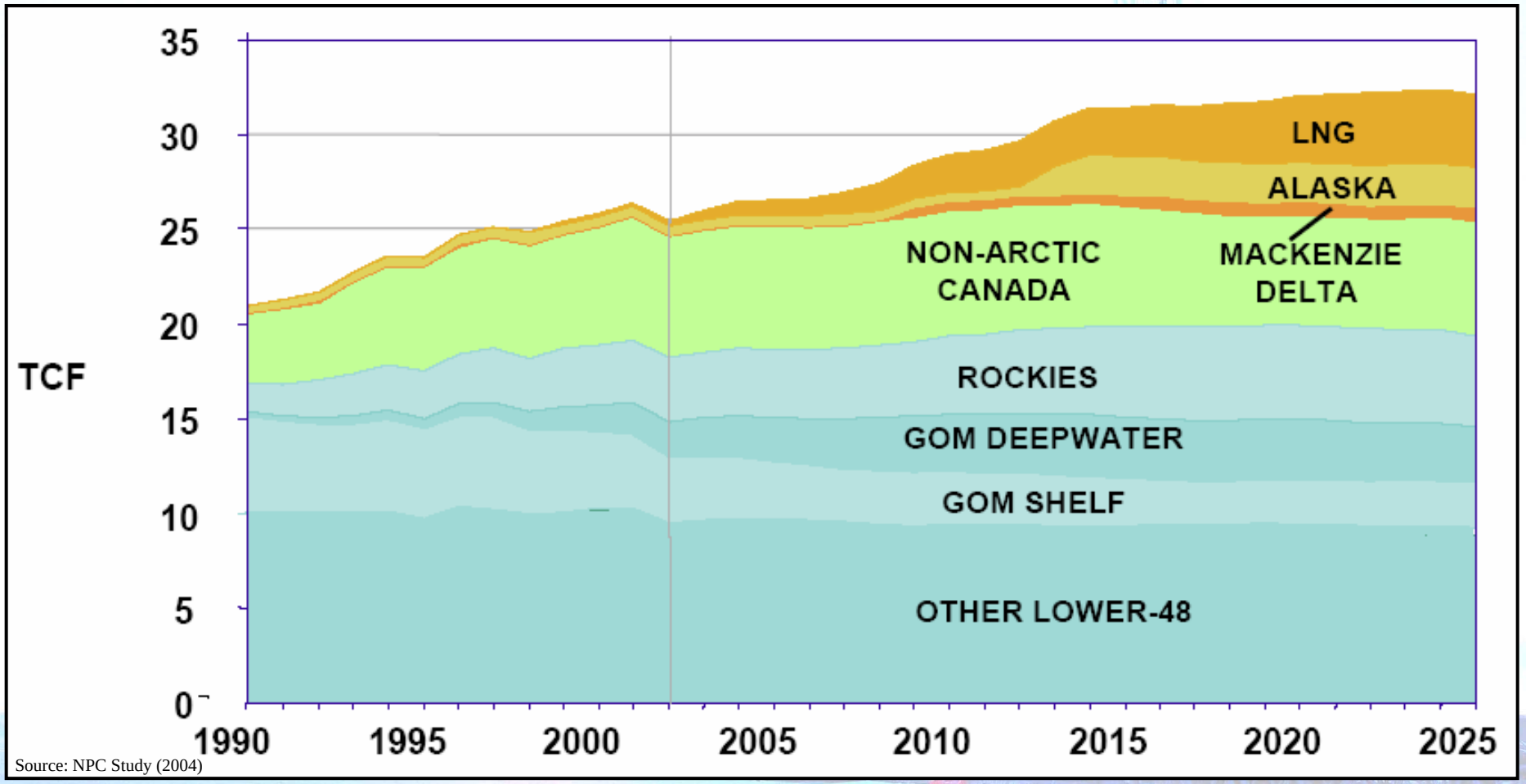
In lieu of the matter proposed to be inserted by the Senate amendment, insert the following:

SECTION 1. SHORT TITLE; TABLE OF CONTENTS.

(a) SHORT TITLE.—This Act may be cited as the "Domenici-Barton Energy Policy Act of 2005"

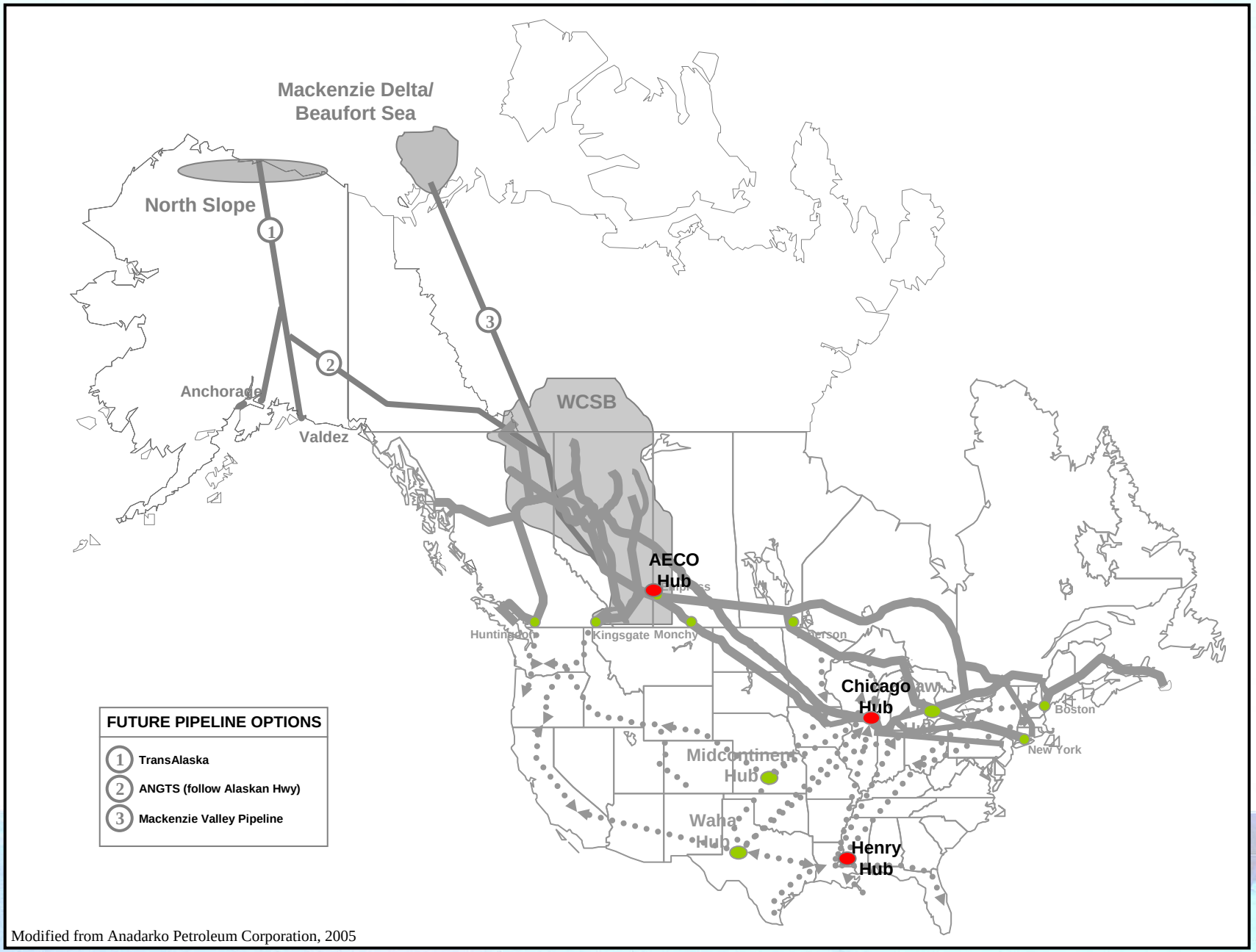
(b) TABLE OF CONTENTS.—The table of contents of this Act is as follows:

Projected North American Gas Demand and Supply



Source: NPC Study (2004)

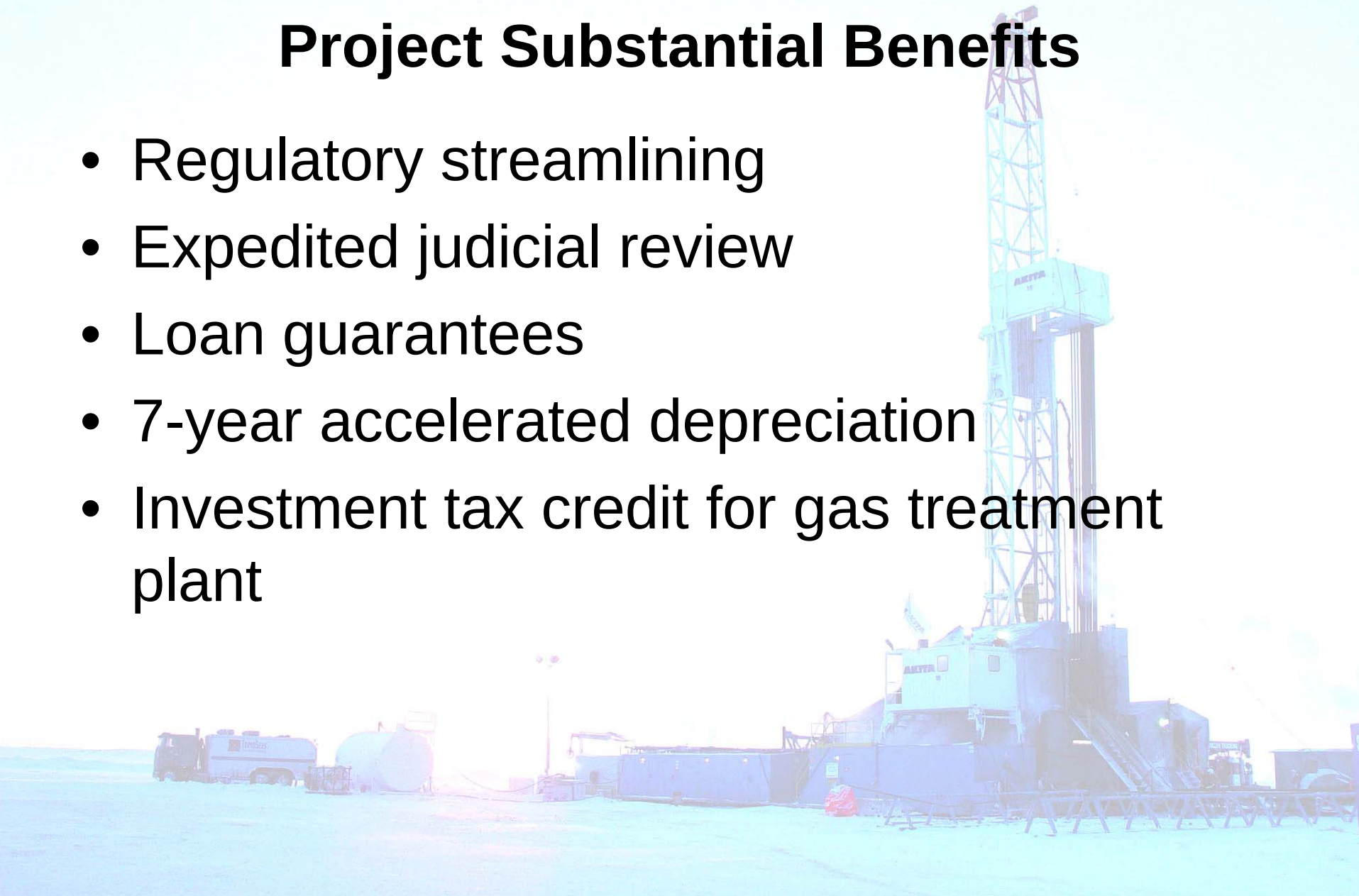
Proposed Northern Natural Gas Pipelines



Modified from Anadarko Petroleum Corporation, 2005

Federal Legislation Provides Project Substantial Benefits

- Regulatory streamlining
- Expedited judicial review
- Loan guarantees
- 7-year accelerated depreciation
- Investment tax credit for gas treatment plant



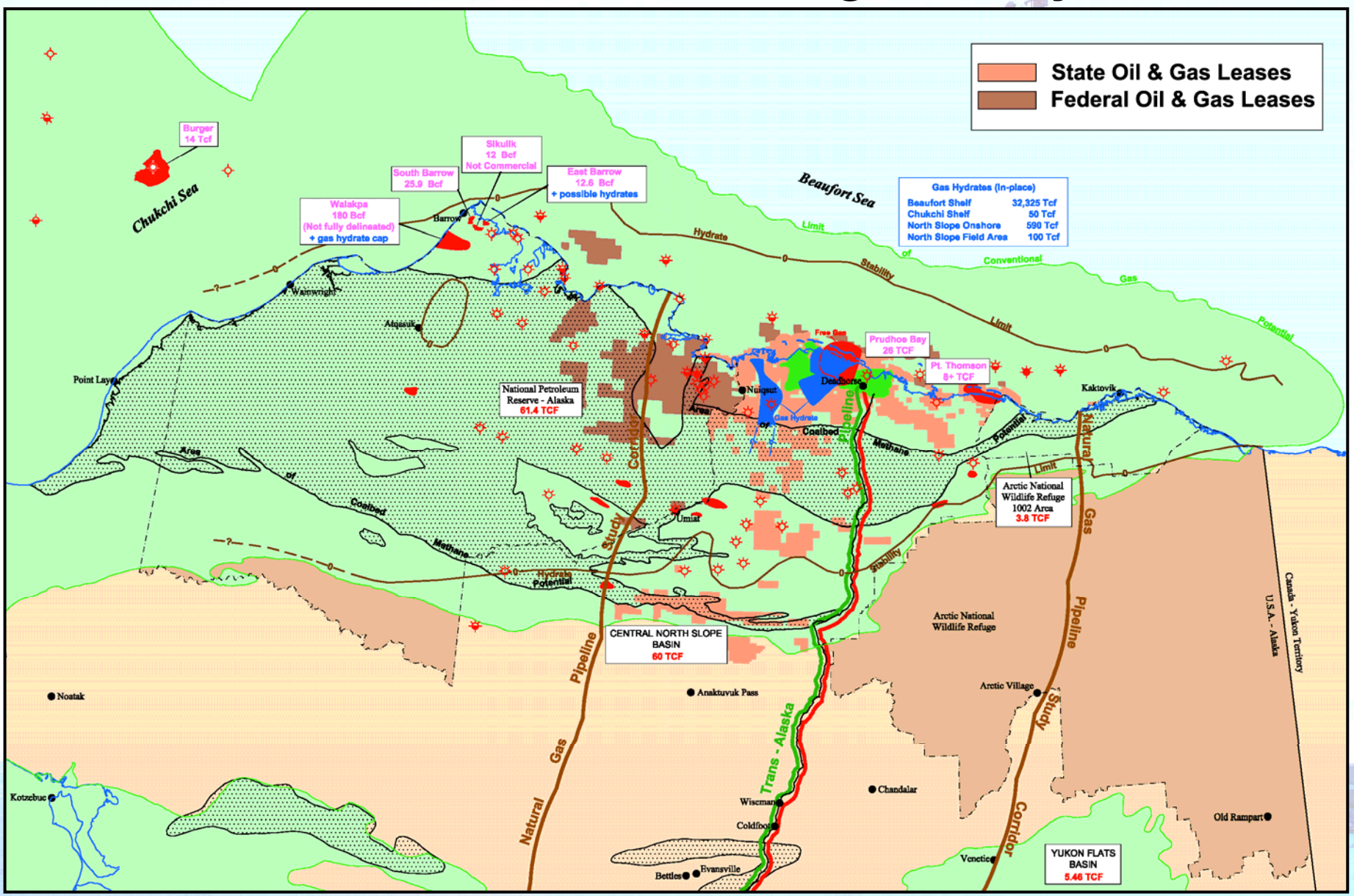
Useful Life of a Gas Pipeline

Reserves (Tcf)		Project Life (Years) Pipeline Capacity BCF/Day (4.5)	(5.6)
Known Resources	33	20.1	16.1
	36	21.9	17.6
	40	24.36	19.6
Undiscovered Resources	60	36.5	29.4
	100	61.5	48.9
	150	91.3	73.4

Resource Assessments

- **Alaska's gas can make a huge contribution to reducing our nations dependence on foreign sources of energy.**
- **Federal and state geologists believe that the 35 TCF of gas from Prudhoe Bay and Pt. Thomson is just the tip of the iceberg.**
- **North Slope and offshore conventional mean technically recoverable undiscovered resource potential exceeds 236 TCF.**
- **Gas hydrates first confirmed in 1972 drilling, coring and testing in the northwest corner of the Prudhoe Bay field, 5 years prior to field start-up.**
- **North Slope and offshore potential gas hydrate resource estimated in excess of 32,000 TCF, of which 529 TCF is estimated to be onshore.**
- **The in-place gas hydrate resources in the Prudhoe/Kuparuk Milne Pt. field area alone is 100 TCF.**

Gas Potential - North Slope Area with Oil & Gas Leasing Activity



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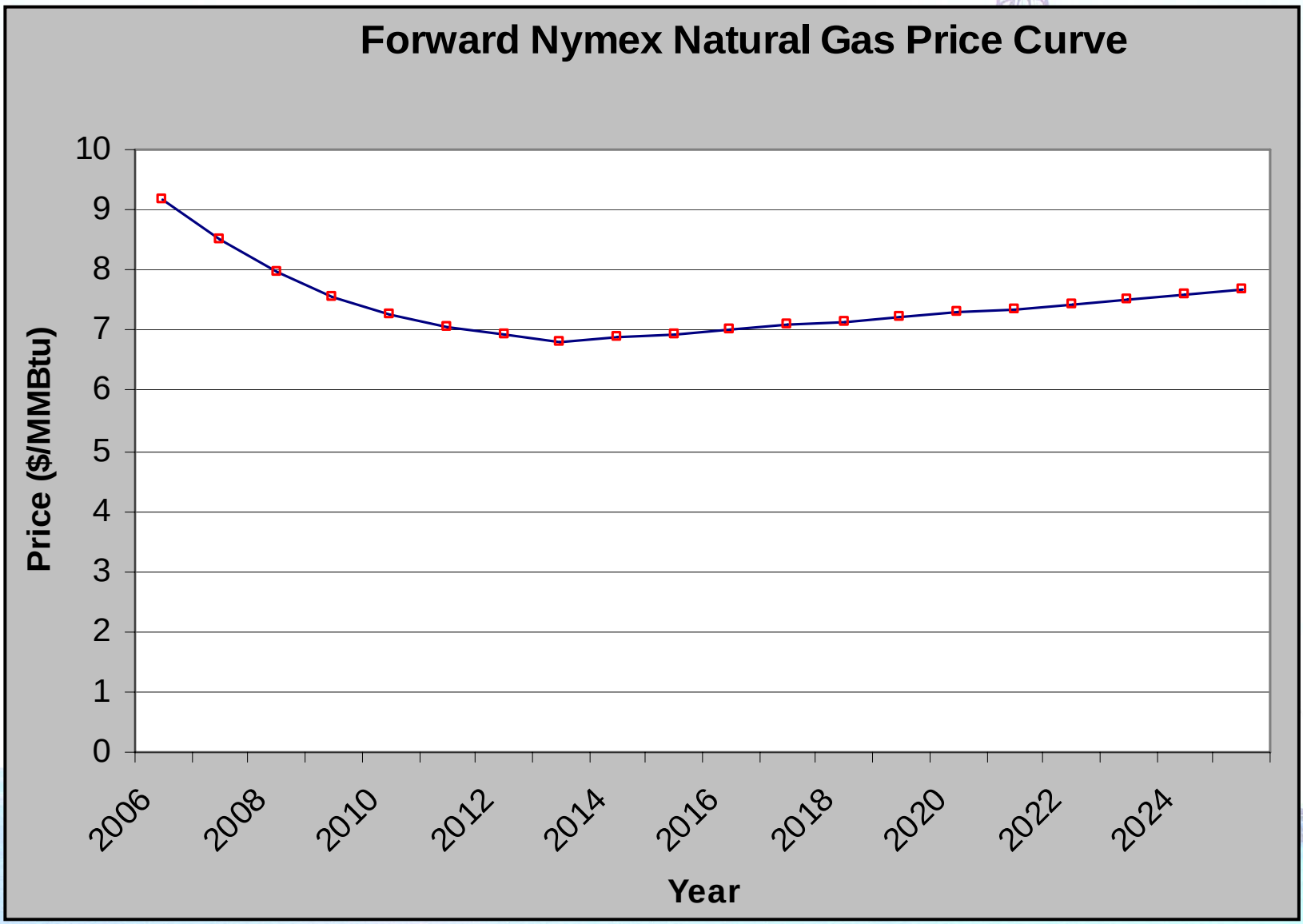
Natural Gas Futures Prices

Basis - Henry Hub (Erath, Louisiana)

Prices through 2013 are live quotes

2014 forward are based on 1% annual escalation



End

ALASKA GAS HYDRATE PLANNING WORKSHOP

Proposed Breakout Topics

Group 1. Geological and engineering data – acquisition and evaluation

Group 2. Gas hydrate reservoir modeling and production testing

Group 3. Industry synergies and opportunities

ALASKA GAS HYDRATE PLANNING WORKSHOP

Proposed Breakout Topics

Group 1. Geological and engineering data – acquisition and evaluation - *Collett*

Group 2. Gas hydrate reservoir modeling and production testing - *Griffin*

Group 3. Industry synergies and opportunities - *Swenson*

Breakout Questions: Group 1 - Geological and engineering data – acquisition and evaluation

- ***Are the present geologic/reservoir models for the occurrence of gas hydrate adequate? What is the role of the 'petroleum system' in the formation of gas hydrate accumulations?***
- ***Are published gas hydrate assessment results useful? If not, how can they be improved?***
- ***Are existing gas hydrate exploration techniques adequate? If not, how can they be improved?***
- ***Are ANS hydrate occurrences continuous or patchy? What are the vertical and horizontal extent of the ANS gas hydrate occurrences? Can existing conventional seismic data be used to evaluate gas hydrate accumulations or are optimized high resolution surveys required? Why do we not see BSR seismic features on the ANS?***
- ***What geologic/geophysical/geochemical data is required to better understand the formation and occurrence of gas hydrates?***
- ***What type of industry, government, and academic managed data could be made available to this effort?***
- ***What existing and/or new well logging (NMR, electromagnetic, etc) and geophysical (AVO, velocity inversion, 3C, etc) technologies can be used to identify and characterize gas hydrate prospects?***
- ***Is additional petrophysical core data required to further develop our understanding of hydrates? How do natural samples of gas hydrates differ from laboratory grown samples?***
- ***Do we understand the nature of gas hydrate occurrence at the pore scale? What are affects of pore water salts, pore size variations, gas chemistry, etc?***

Breakout Questions: Group 2 - Gas hydrate reservoir modeling and production testing

- ***What have we learned from existing production testing and modeling results? What additional work needs to be done? How can they be improved?***
- ***Are additional laboratory studies needed to develop and calibrate existing production models?***
- ***In comparison, what are the advantages and disadvantages of the existing gas hydrate production models? Is there a need for a code comparison study?***
- ***What existing and new technologies (i.e., drilling, completion, secondary stimulation – thermal, CO2, bacterial, etc.) could potentially be applied to the production of gas hydrate?***
- ***Is additional production testing needed to verify existing production models? What type of testing should be considered? What type of data needs to be collected from future production test?***
- ***Can we apply conventional economic models to further our understanding of gas hydrate production?***
- ***What characteristics of hydrates or hydrate-formation matrices will be limiting to production , e.g., permeability, heat transfer?***
- ***What type of data is needed to understanding the movement of fluids (water and gas) in a hydrate-bearing reservoir? Where does gas hydrate occur in a porous media and how does it affect reservoir permeabilities?***
- ***Can we identify candidate hydrate sites for additional geological/geophysical data acquisition and production testing? Should future testing be focused on the gas hydrate only and/or the underlying free-gas accumulations?***
- ***What are the potential problems associated co-produce water? What environmental issues associated with water disposal?***

Breakout Questions: Group 3 - Industry synergies and opportunities

- ***Gas hydrates are often described as a big pay-off but high risk opportunity, with any potential pay-off far off into the future. What type of project partnership might be able to deal with this complex opportunity?***
- ***What are some of the industry synergies that could contribute to the potential production of gas hydrates? Could the produced gas and water from hydrates be used for other industry applications on the ANS? Are there synergies for the co-production of hydrates with conventional oil and gas on the ANS?***
- ***What have been the benefits and drawbacks of historical industry, government, and academic cooperative projects?***
- ***What can government do to facilitate our understanding of the resource potential of gas hydrates?***
- ***Which industry, government, and academic organizations could contribute to developing our understanding of the energy resource potential of gas hydrates?***
- ***What is the potential time table for implementing cooperative research and development opportunities?***
- ***Are there examples of business models for the development of other unconventional resources that can be applied to gas hydrates?***
- ***Of the currently identified hydrate accumulations, which ones show the greatest promise of near term testing programs using existing infrastructure.***
- ***How can all current Alaska stakeholders benefit from a collaborative research effort and access to critical data.***

2005 Alaska Gas Hydrate Planning Workshop

Group 3

Industry Synergies and Opportunities

Key Components in a Comprehensive Research Program:

- Identify All Stake Holders
- Steering Committee
  - Industry Buy In at High Levels
  - Government Buy in at High Levels
  - Properly Scoped Options
- Technical Advisory Board
  - Identify Common Goals
  - Build on current work
    - Access to Existing Data
  - Vision and Plan
  - Research and applied focus
    - Practical Application of Technology
- Keep Multiple Options Open
  - Joint Industry Partnership
  - State/ Federal Collaboration
  - Current BP Project
  - Location of Testing
    - Currently Leased Land
    - State Land Not Leased
    - Borough / Privately Owned Land
    - Native Corporation lands
- Timing
  - Why Now
  - Time line for Key Decisions
  - Gas Sales Potential
- Integrated Team (field to lab) with Appropriate Champions
  - Provide Education opportunities
- Continuity of Funding
  - Appropriate Funding

Action Items

- Identify a ad hoc interest group for research actions under the energy bill in Alaska
  - Representation from:
    - Industry
    - Federal - Ray
    - State
    - University
    - North Slope Borough
    - Etc.
- Industry Discussion
  - Identify Location and Facility Access Options
  - BP to Share Stage 1 DSP with PBU and GKA Partners
- Identify public education plan
- Technical Advisory Committee
  - USGS Led group of stakeholders and Research entities
  - Identify all options available to move research plan forward

How do we Stimulate Activity in Hydrate Research and Development?

- Government Funding
- Incentives
- Shared Burden
- Adequate Funding in Cash or in Kind
- Near Term Use for Gas
- Near Term Use for It’s Technology
- Increasing / Balancing Long-term vs. Short-term Benefits
- Synergy with Current Production
- Minimize Impact on Current Operations
- Streamline Regulations
- Marketing Worldwide’
- Sharing Data

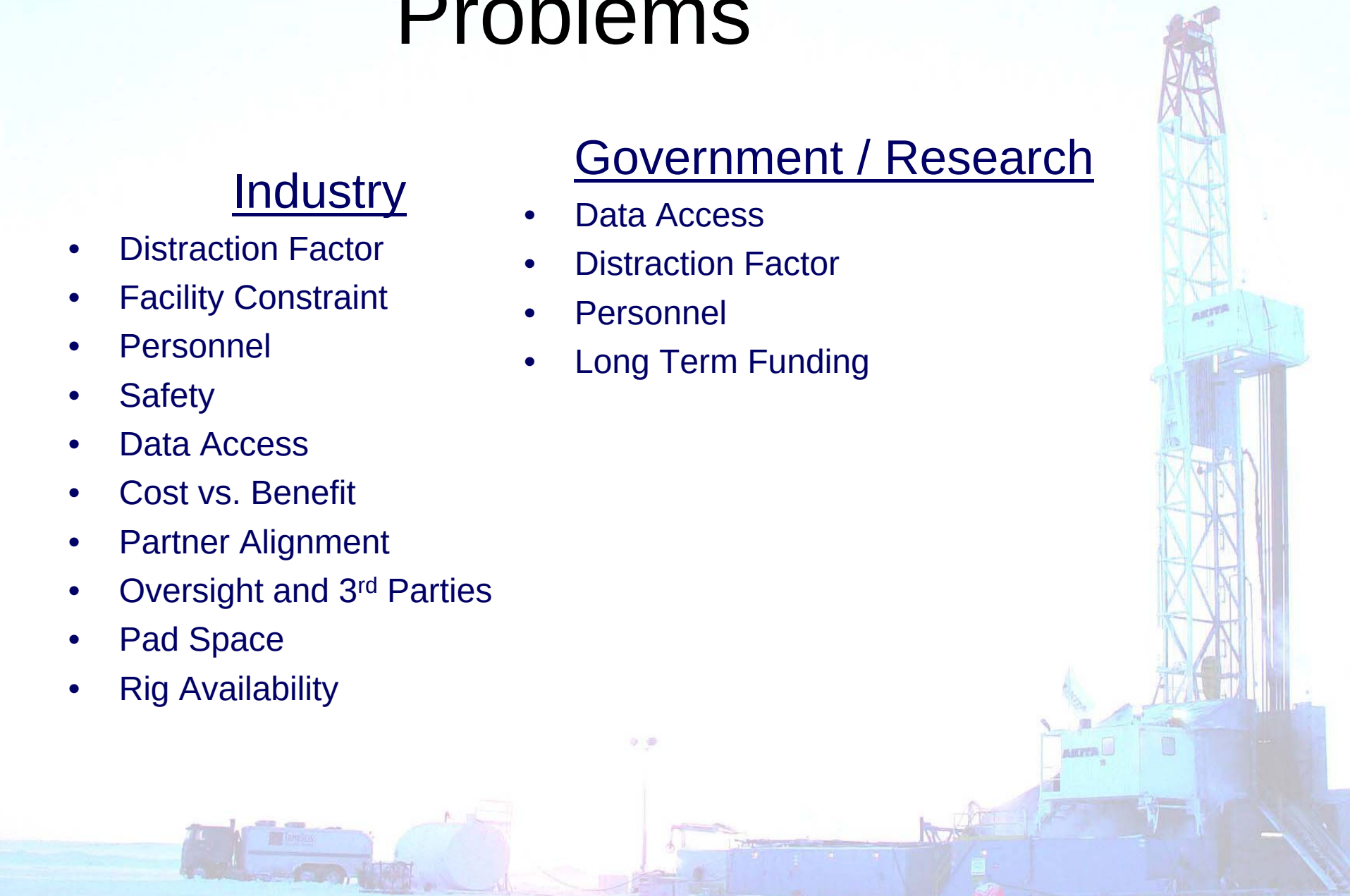
Problems

Industry

- Distraction Factor
- Facility Constraint
- Personnel
- Safety
- Data Access
- Cost vs. Benefit
- Partner Alignment
- Oversight and 3rd Parties
- Pad Space
- Rig Availability

Government / Research

- Data Access
- Distraction Factor
- Personnel
- Long Term Funding



Solutions

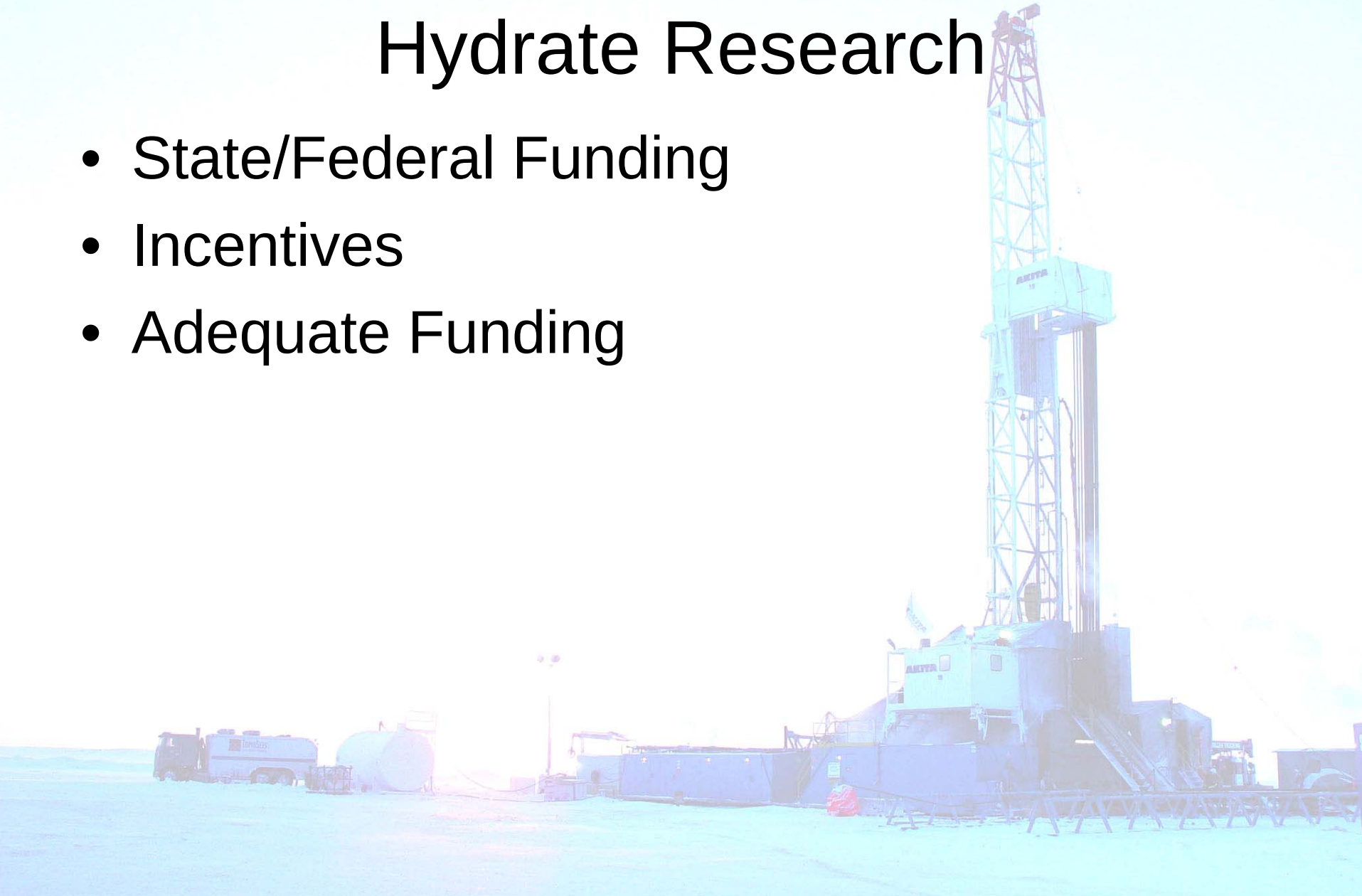
- Screening / Oversight Team
- Develop a Project
- Appropriate Location
- Appropriate Technology
- Optimize Project Plan

Key Questions

- How do we get a viable, comprehensive research effort prior to proving commercial viability?
- Key components in a comprehensive research program:
- Is there really a prize? When is the prize coming?
- What synergies are available for so stakeholders can benefit? Short Term and Long term goals both met.
- How do we stimulate activity in hydrate research and development?

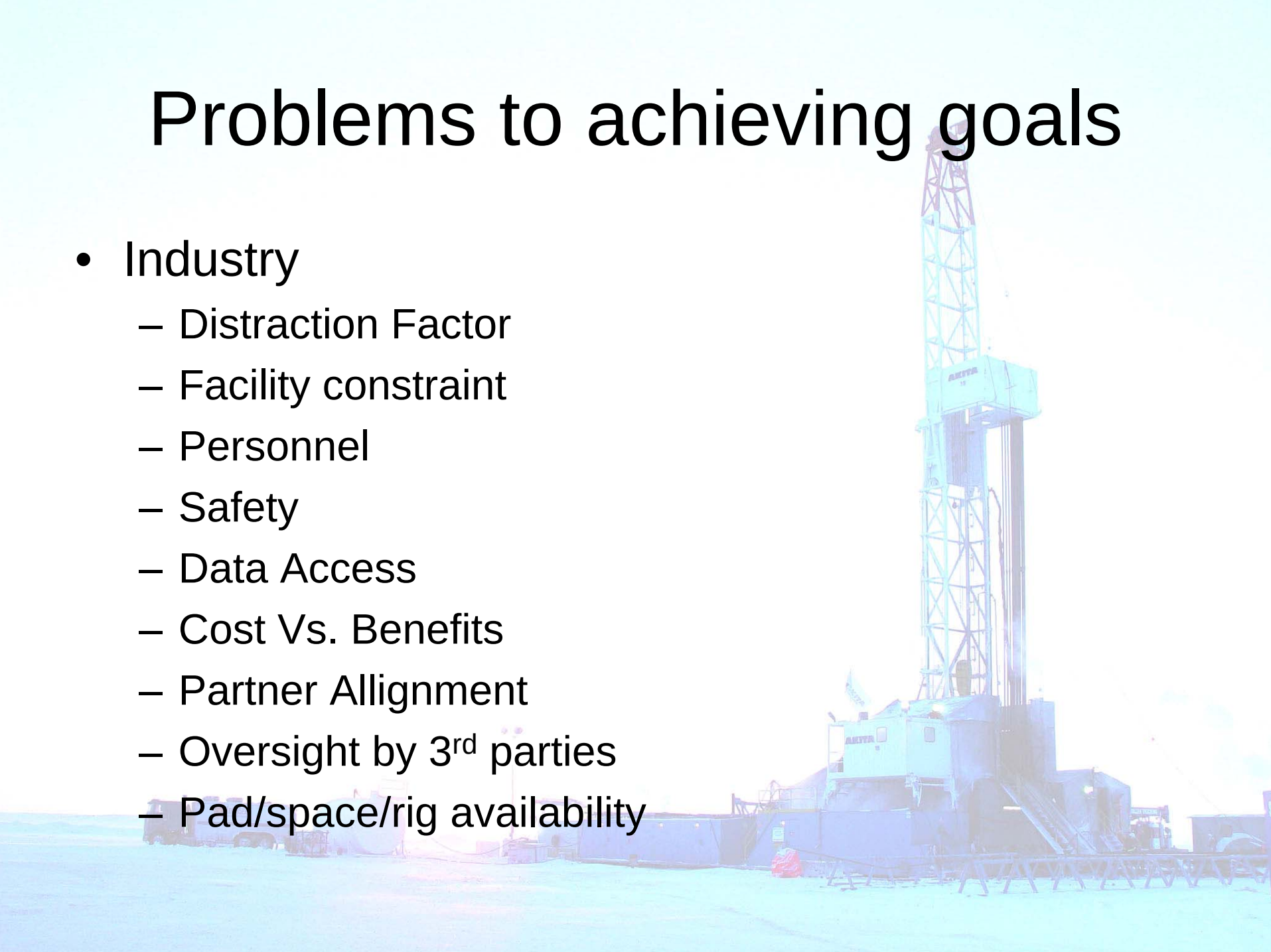
How do we stimulate activity in Hydrate Research

- State/Federal Funding
- Incentives
- Adequate Funding



Problems to achieving goals

- Industry
  - Distraction Factor
  - Facility constraint
  - Personnel
  - Safety
  - Data Access
  - Cost Vs. Benefits
  - Partner Allignment
  - Oversight by 3rd parties
  - Pad/space/rig availability



Problems to achieving goals

- Researchers/Government
  - Data Access
  - Distraction Factor
  - Personnel
  - Long Term funding, Continuity

Solutions

- Develop screening/oversight team
- Develop project between stakeholders
- Appropriate location defined
- Appropriate technology defined
- Optimize project plan