Reducing Onshore Natural Gas and Oil Exploration and Production Impacts Using a Broad-Based Stakeholder Approach:
Final Project Status

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Interstate Oil & Gas
Compact Commission

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INTERSTATE Oil & Gas COMPACT COMMISSION

Research Details

- Funding provided by the U.S. Department of Energy's National Energy Technology Laboratory (NETL) in Tulsa, Oklahoma
- LINGO (Low Impact Natural Gas and Oil): initiative demonstrating a new operating paradigm to minimize environmental impacts of O&G operations
- IOGCC/ALL Consulting

Research Contributors

- **Lead Researchers**
  - Interstate Oil & Gas Compact Commission
  - ALL Consulting
- **PAC States**
  - California Division of Oil, Gas & Geothermal Resources
  - Montana Board of Oil & Gas Conservation
  - Nebraska Oil and Gas Division
  - North Dakota Oil and Gas Division
- **Industry**
  - Devon Energy

Research Objectives

- **Primary project objective:** develop a handbook of reasonable and prudent practices aimed at preventing or minimizing E&P impacts
- **Primary project goal:** support increased access to federal lands and mineral estate

Project Focus

- To evaluate onshore oil and gas exploration and production lifecycle environmental impacts with a focus towards:
  - Avoiding impacts
  - Minimizing impacts
  - Mitigating any unavoidable impacts

Project Overview

- **Completed:**
  - Task 1 – E&P Practices Research
  - Task 2 – Interviews, Field Reconnaissance and Case Studies
  - Task 3 – Impact Analysis
  - Task 4 – Handbook preparation
- **In progress:**
  - Task 5 – Technology Transfer

Task 1: Practices Research

- Identify low impact practices and technologies from the viewpoint of diverse stakeholders
  - Industry Groups
  - Governmental Agencies
  - Non-Governmental Organizations

Task 1: Practices Research

Incorporated documents such as:

- *Reasonable and Prudent Practices for Stabilization (RAPPS) of Oil and Gas Construction Sites* – IPAA
- MT HB790 committee findings and associated testimony
- *A Guide to Practical Management of Produced Water from Onshore Oil and Gas Operations in the United States* – DOE
- *Best Management Practices for Oil and Gas Well Site Construction* – Ohio DNR
- *Oil and Gas at Your Door? A Landowners Guide to Oil and Gas Development* – OGAP
- *Doing it Right, a Blueprint for Responsible Coal Bed Methane Development in Montana* – NPRC
- *The Western Heritage Alternative* – BCA

Task 2: Interviews

Included representatives of:

- Devon Energy Corp. and other E&P firms
- PAC and other State O&G Agencies
- Federal land and resource management agencies
  - BLM
  - USFS
- Individual ranchers/farmers/landowners
- Non-governmental organizations:
  - Citizens for Resource Development (WY)
  - Montana Cattleman's Association
  - Oil and Gas Accountability Project

Task 2: Field Reconnaissance

- Bighorn Basin – Established fields
- Fort Worth Basin – Barnett Shale Play – E&P in a highly urbanized area
- Powder River Basin – CBNG – area has been subject of public scrutiny as well as the site of innovative, low-impact solutions
- Williston Basin – Bakken Play, MT and ND

Tasks 1 and 2: Results

- Discovered initial objective too ambitious
- Interviews and research identified the three most prevalent or controversial categories:
  - Surface disturbance
  - Wildlife – greater sage grouse
  - Air emissions

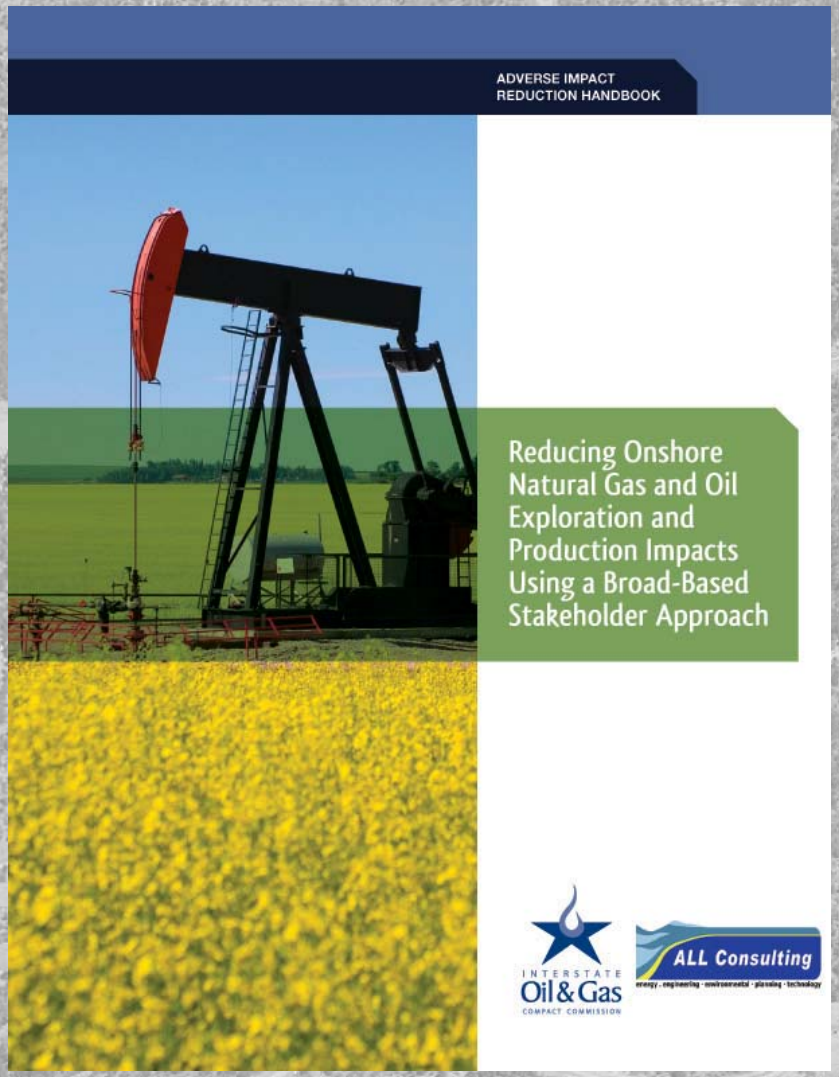
Task 3: Impact Analysis

- Further investigated the three focus categories and identified case studies
- Why greater sage grouse?
  - Representative of issues facing wildlife
  - Highly controversial with potential to significantly impact future development
- Initiated a regional study of greater sage grouse within the Powder River Basin

Task 4: The Handbook

- The Final document will be available in December 2008:
  - Brochures are available here at this meeting
  - Handbook will be available for download from:
    - IOGCC www.iogcc.state.ok.us
    - ALL Consulting www.all-llc.com

Handbook


ADVERSE IMPACT
REDUCTION HANDBOOK
Reducing Onshore Natural Gas and Oil Exploration and Production Impacts Using a Broad-Based Stakeholder Approach
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Task 5: Technology Transfer

- January 2007 *The History and Current Conditions of the Greater Sage Grouse in Regions with Energy Development*
- Presentations:
  - March 2008 air emissions presentation at Am. Chem. Soc. *Energy and the Environment Symposium* in Duncan, OK
  - November 2008 IPEC, Albuquerque, NM
  - November 2008 IOGCC. Santa Fe, NM

Preliminary Findings
Surface Disturbance

Surface Disturbance Introduction

- Wide range of issues
  - Common
  - Site-specific
- Stakeholders have differing views on mitigation
- Case studies illustrate application of new and emerging technologies and practices
- Many have applicability to other oil and gas projects across the United States

Surface Disturbance Introduction

- Common elements:
  - Wells, well pads, centralized facilities
  - Roads, utility corridors, construction
  - Produced water management
- Land use/demographic categories
  - Rural Farming and Ranching
  - Urban (suburban)
  - Established (vintage) vs. Emerging fields
  - Scenic and Wildlife
  - Sensitive (categorized) Areas
  - Public or Indian Ownership

Case Study
Rural & Emerging Field

- Rural Farm/Ranch/Scenic/Wildlife/Public Lands Case Study
  - Cabin Creek (CBNG), PRB, WY
  - ~130 wells over ~10 square miles of farmland, ranchland, scenic viewsheds, wildlife habitat
  - Patchwork of state, federal and private (fee) surface and minerals
  - Complex land use and wide mix of stakeholders created a challenging planning and design process

Case Study
Rural & Emerging Field

- Resulted in a superior design
  - Roads engineered in rugged terrain were laid out to minimize surface disturbances
  - Utility corridors parallel roads where possible
  - Wildlife concerns – burial of utilities, timing and no surface occupancy stipulations

Case Study
Urban

- Emerging Urban (Suburban) Case Study
  - City of Flower Mound, TX (Barnett Shale)
  - Oil and gas development subject to multiple set-back requirements
  - Variances through low impact approaches:
    - Horizontal drilling from smaller well pads
    - Vegetation and tree avoidance or replacement
    - Location of wells in visually hidden areas
    - Aesthetic upgrades to fences and facilities
    - Upland and riparian mitigation plans

Case Study
Wetland

- Categorized Areas Case Study:
  - Joaquin, TX - East Texas O&G field
  - Categorized wetlands require lengthy permit review process through Army Corps of Engineers, no guarantee of approval
  - Conducted wetlands survey and identified suitable upland well site locations
  - Horizontal drilling from proximal upland habitat avoided drilling in wetlands
  - Small upland areas required careful well pad configuration

Preliminary Findings Greater Sage Grouse

Greater Sage Grouse Introduction

- Assembled greater sage grouse data for the states of MT and WY (1949-2006)
- Recent efforts to collect population data are unprecedented
  - Increased interest is partly because of the increase in oil and gas development activities

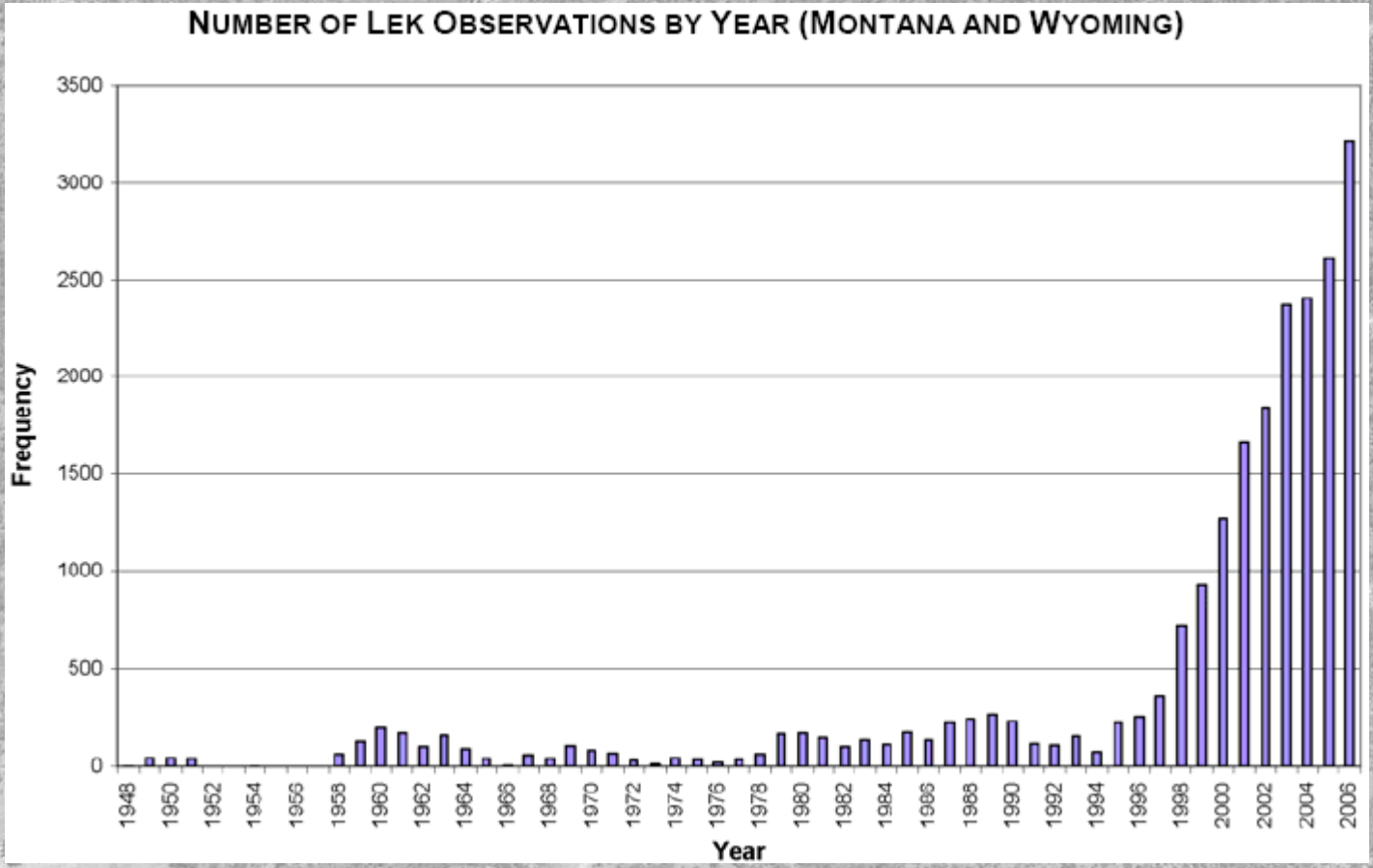
Data Limitations

- The MT and WY combined greater sage grouse database is severely limited:
  - Of 75,388 lek observations only 13,023 (17%) observations statewide are of sufficient quality for detailed analysis
  - Of that, there are only 1,733 peak male counts from 470 lek complexes located within the Powder River Basin
  - Private land data not available in some cases

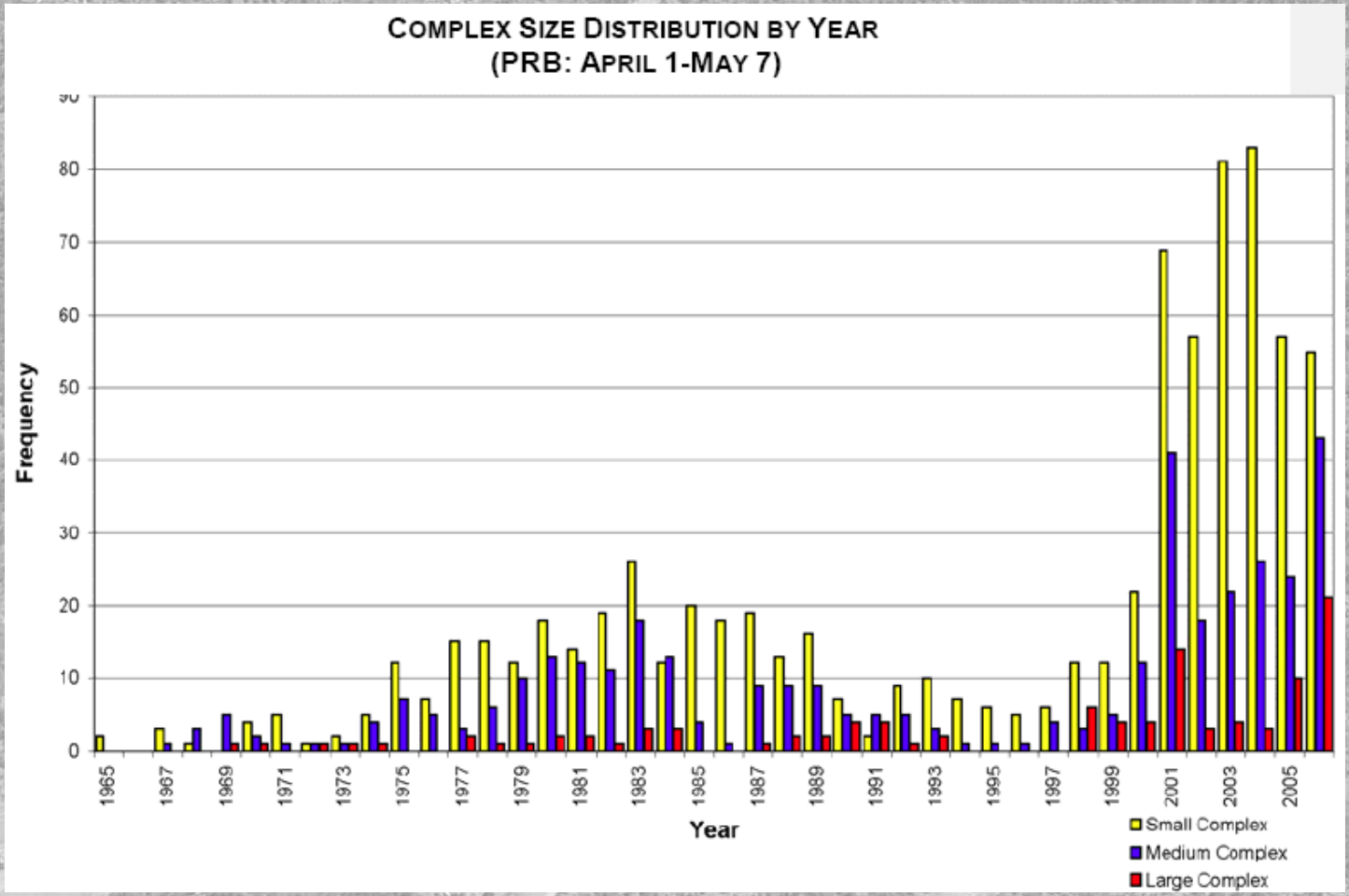
Nature of the Data

- Most of the scientifically sound population data has been collected since 1997:
  - 72% of all known leks in MT and WY have been “discovered” since 1997
  - 79% of the qualified observation data has been gathered since 1997
  - Standardized survey guidelines were first recommended in 2001

Lek Observations



Lek Size Trends



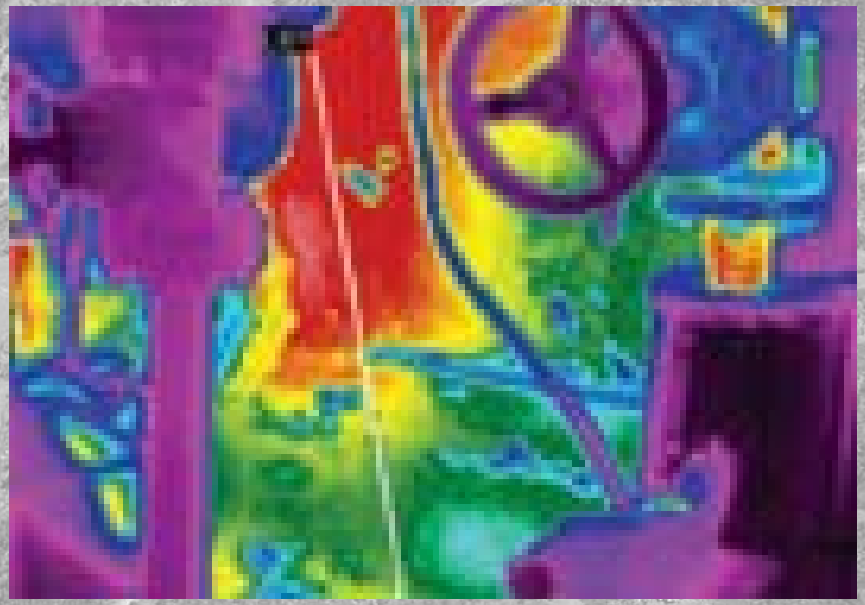
Greater Sage Grouse Summary

- Increasing efforts to gather high quality data are vital to understanding greater sage grouse population dynamics
- Based on the currently available data (old and new), a clear understanding of long-term population trends is very challenging

Greater Sage Grouse Future

- Sage-grouse management will have a significant bearing on land use practices in the western United States
- Not only for oil and gas, but also for agriculture, grazing, sport hunting, etc.
- Actions must be examined collectively to balance greater sage-grouse management strategies with potential land uses

Preliminary Findings
Air Emissions



Prevention of Emissions

- Prevention and minimization are the most effective means of air emissions reduction
- Achievable through:
  - Improved management practices
  - Improved operational practices
  - Reduction of waste and synergies

Air Emissions Operational Practices

- Equipment Upgrades
  - Low-bleed pneumatic devices:
    - Six month payout not uncommon
    - Natural Gas STAR partners have saved 11.2 BCF natural gas and $22.4 MM to date by upgrading pneumatic devices

Air Emissions Operational Practices

- Equipment Upgrades
  - Using minimum circulation rate on Vapor Recovery Units results in significant savings:
    - Less methane is lost to the atmosphere so more goes to market
    - Savings can be significant at larger facilities with payouts as short as three months

Air Emissions
Waste Reduction & Synergies

- Micro turbines:
  - Provide a low emissions source of power
  - Can burn low quality gas (>350 BTU)
  - Minimize utility construction and corridors

Air Emissions
Waste Reduction & Synergies

- Capture and reuse of CO_2
  - According to DOE, full use of CO_2 EOR could generate an additional 240 billion barrels of recoverable oil in the United States

Air Emissions Challenges

- O&G activities are the second largest anthropogenic source of methane emissions in the United States
- Methane is a greenhouse gas
- One of the O&G industry's challenges is to develop new energy sources while reducing greenhouse gas emissions

LINGO Summary

- Its been a long and interesting journey.
- Copies of the final Impact Reduction Handbook will be available in December 2008 and also for download from the IOGCC and ALL Consulting websites.
- Brochures are available here.
- We hope that you will find it useful.

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