



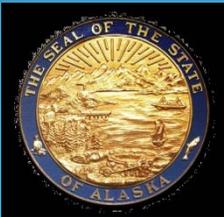
State of Alaska
Governor's Climate Change Sub-Cabinet
Stakeholder Process

Oil and Gas Technical Working Group

Alaska Forum on the Environment

February 2 – 6, 2009

Diane Shellenbaum, AK Dept. of Natural Resources



Overview

- Oil and Gas Technical Working Group Participants
- Role
- Process
- Options/Recommendations

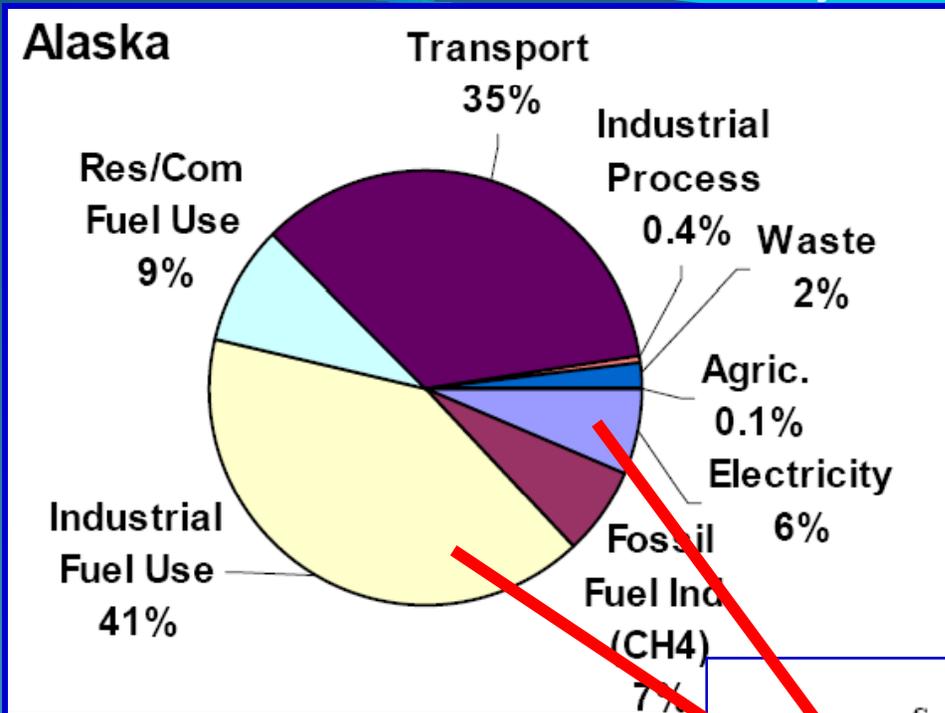
Oil and Gas Technical Work Group

- Collaboration of Oil and Gas experts from Government, Public, and Industry
- Review emissions inventory and Identify GHG Reduction Options
- Provide input to Mitigation Advisory Group

Alaska Gross GHG Emissions by Sector (2005)

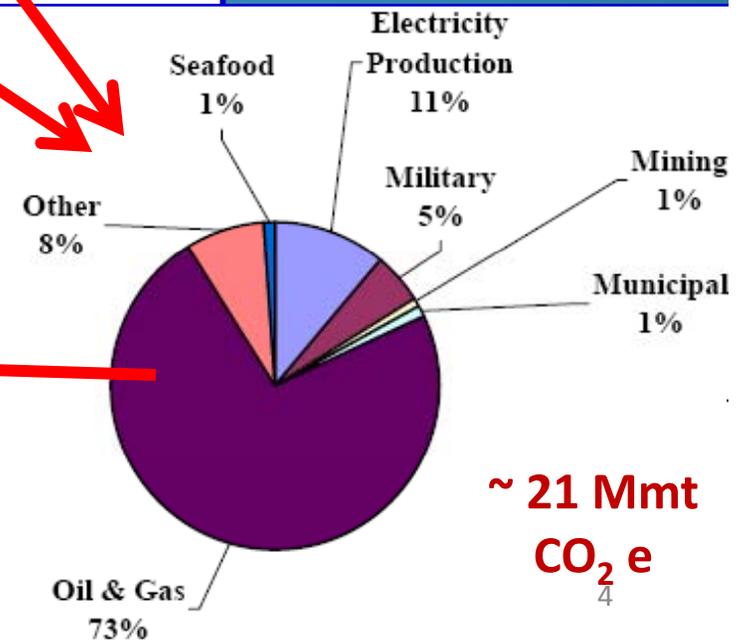
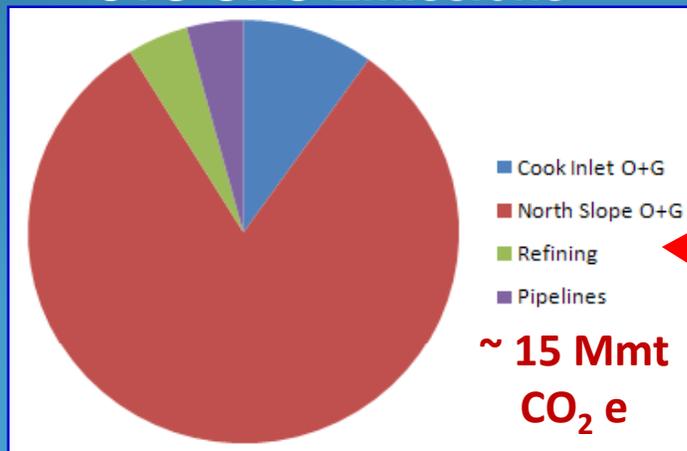
~ 52 Mmt CO₂ Equivalent

(~0.7% US Emissions)

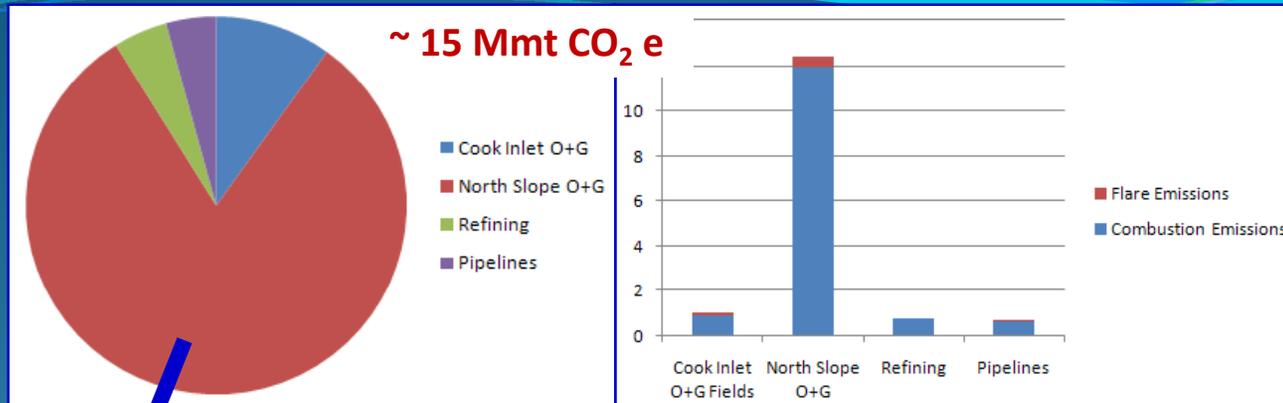


Alaska Title V GHG Emissions

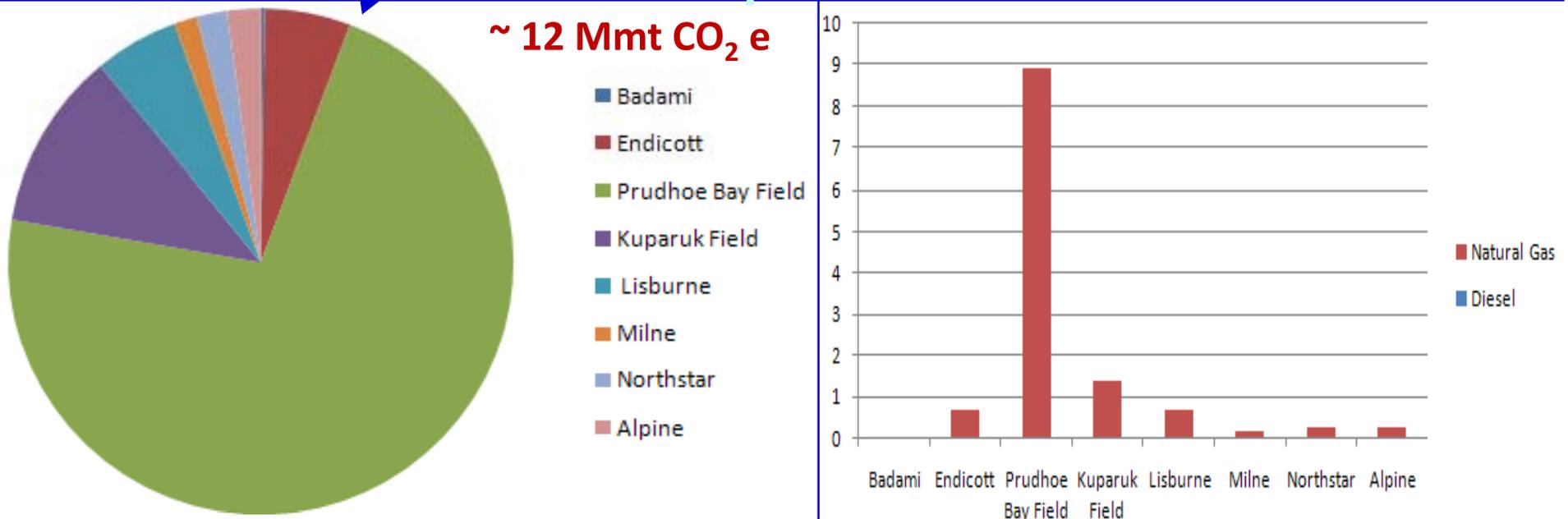
O+G GHG Emissions



Alaska Title V O+G GHG Emissions



North Slope O+G Emissions



North Slope emissions predominantly due to combustion of natural gas

Generated from ADEC Alaska Industrial Inventory Calculator.xls. Based on 2002 fuel consumption. Spreadsheet used to prepare DRAFT - Alaska DEC Summary Report of Improvements to the Alaska Greenhouse Gas Emission Inventory, January 2008

Inventory Analysis Conclusions

- 15 Mmt CO₂e for O&G of 52 Mmt CO₂e Alaska Gross GHG emissions
- 12 Mmt CO₂e from NS Operations, Fuel gas consumption largest component
- Option recommendations address inventory conclusions
- Many lessons learned from North Slope can be applied to Cook Inlet

TWG working Options February 2, 2009

Conservation

1 Overall conservations activities, ie reduce liquid fuel consumption, other best practices

2 Reduce Fugitive Methane Emissions

Thermal Energy Efficiency

3 Electrification of Oil and Gas Operations, with Centralized Power Production and Distribution

4 Improved Efficiency Upgrades for Oil and Gas Fuel burning Equipment

5 Use of Renewable Energy Sources in Oil and Gas Operations

Carbon Capture and Sequestration (CCS)

6 CCS from High CO2 Fuel Gas at Prudhoe Bay

7 CCS from Combustion Sources in and near Existing Oil and Gas Fields - Focus North slope

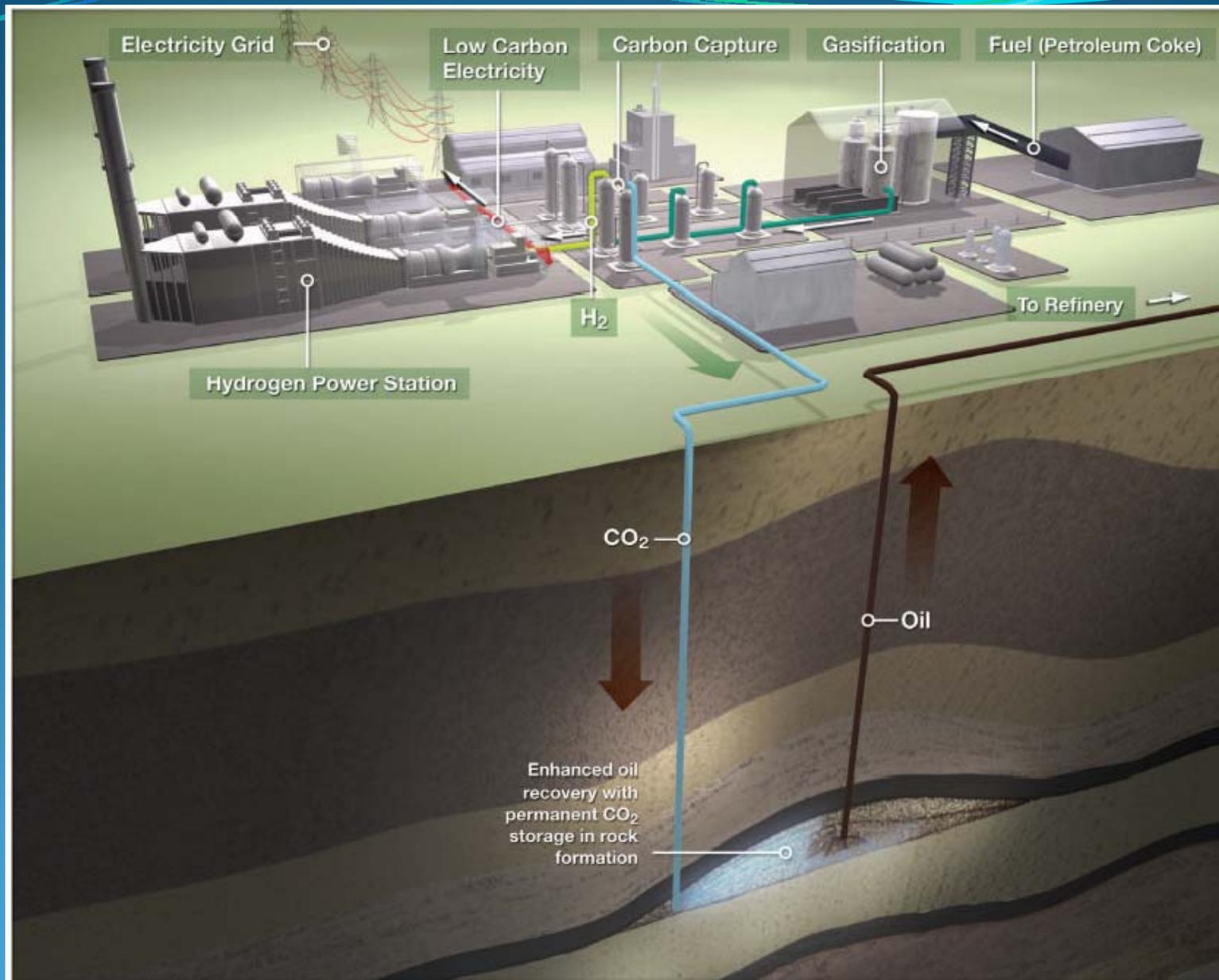
8 CCS away from Known Geologic Traps - (Interior Alaska)

Recommendations 1-2:

Conservation / Waste Reduction

- 1) Overall conservations activities, ie reduce liquid fuel consumption, other best practices
- 2) Reduce Fugitive Methane Emissions

Thermal Energy Efficiency at Oil and Gas Operations



Options 3-5: Thermal Energy

Efficiency at Oil and Gas Operations

- 3) Electrification of North Slope facilities with centralized power production and distribution
- 4) Improved efficiency upgrades for fuel burning equipment
- 5) Use of renewable energy sources for power generation

Carbon Capture and Geologic Sequestration

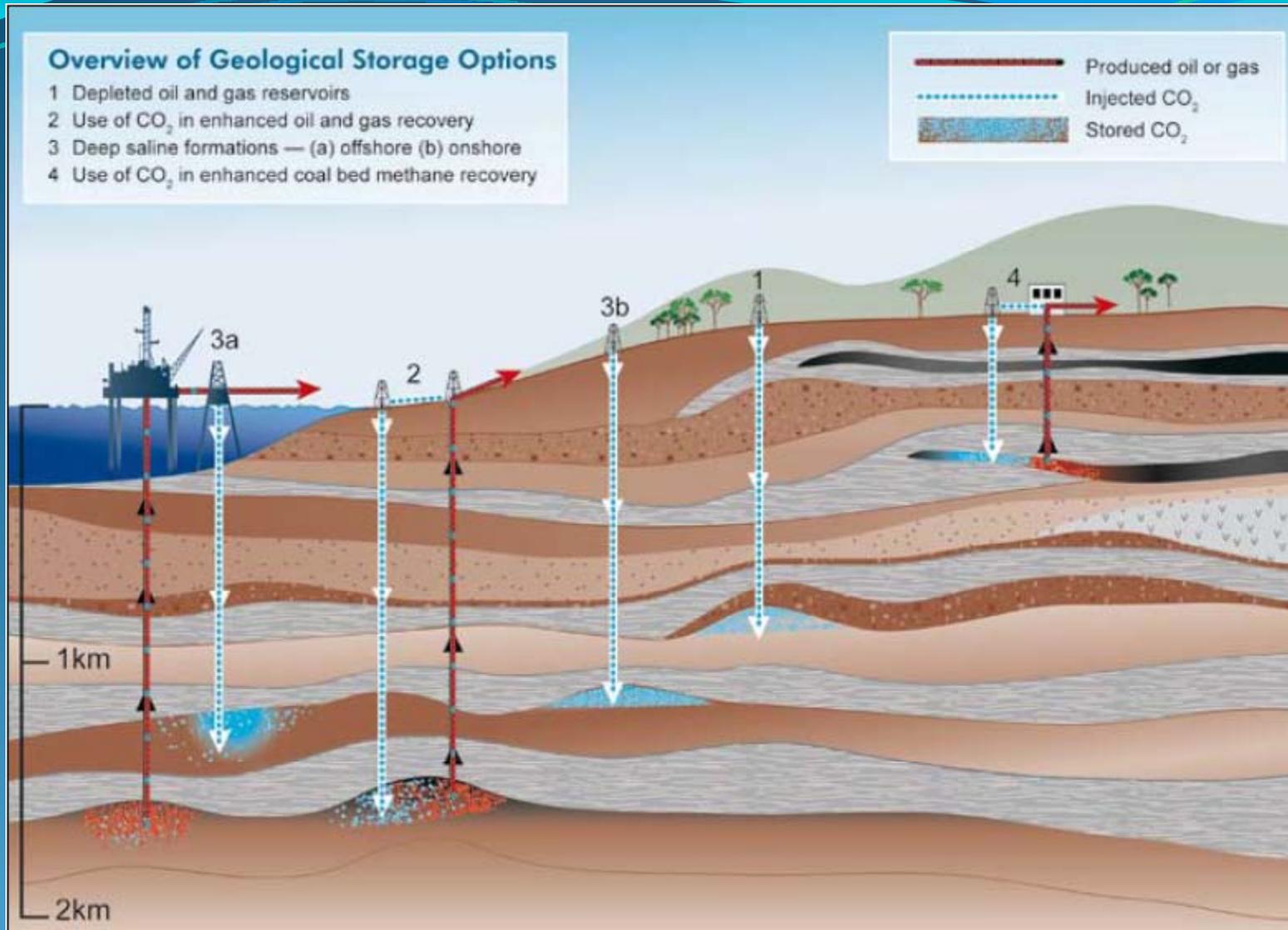


Figure TS.7. Methods for storing CO₂ in deep underground geological formations. Two methods may be combined with the recovery of hydrocarbons: EOR (2) and ECBM (4). See text for explanation of these methods (Courtesy CO₂CRC).

Recommendations 6-8: Carbon Capture and Geologic Sequestration*

- 6) CCS from fuel gas at Prudhoe, before combustion. Sequester in nearby reservoirs where enhanced oil recovery can be used.
- 7) CCS from Prudhoe generators exhaust gas, after combustion. Sequester in nearby reservoirs where enhanced oil recovery can be used.
- 8) CCS from Interior Power Plants. Ship CO₂ to known reservoir or explore for nearby sequestration site. (This option is much more difficult and expensive to enact without a proven reservoir.)

* Carbon capture is currently very expensive technology, untested in Alaska, and power (and water) intensive.

Conclusions

- Short Term: Best practices and Conservation can be implemented almost immediately. Analyze and minimize fugitive emissions
- North Slope has highest emissions for O&G sector, increased energy efficiency there could result in significant emissions reductions . Will require massive investments and changes to regulatory environment.
- North Slope Carbon Capture and Geologic Sequestration could be used to further significantly reduce emissions. Technology is in early stages, will require major facilities upgrades, and additional fuel will be burned.
- Many options also applicable to Cook Inlet

Research Recommendations

- Technical
 - CO₂ capture technologies for North Slope and Cook Inlet
 - Study where renewable energy sources co-exist with Oil and Gas operations
 - Feasibility of using hydrogen produced from methane as a fuel source
 - Feasibility of producing power on North Slope, capturing and sequestering the emissions there, and using long term transmission lines to deliver power to markets

Research Recommendations (cont.)

- Economic
 - Short and long term value of carbon
 - Short and long term value of natural gas
 - Impact of various incentives to encourage major capital improvement investments
- *If you have additional ideas on priority research needs for this area, attend the:
Climate Change Research Coordination Workshop
Thursday, February 5, 9:15-4:45 pm [Dena'ina Center]*

Thank you!

Your Input is Welcome!

You may follow the progress of this TWG and the Advisory Group, or provide comments by visiting :

<http://climatechange.alaska.gov/>

Your input may also be submitted on Comment Sheets available here at the AFE