

Emissions Inventory for the Arctic Air Quality Modeling Study

2015 International Emission Inventory Conference

Presented by

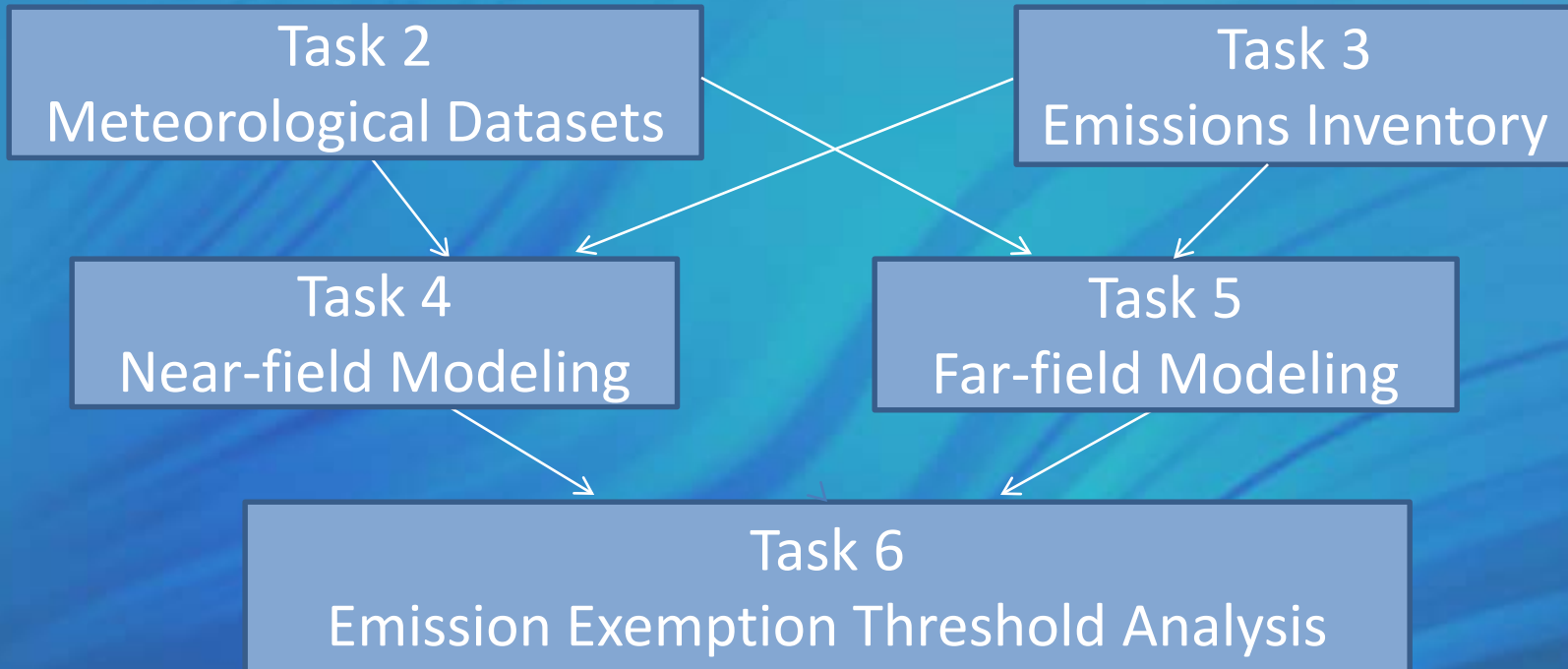
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Arctic Air Quality Modeling Study

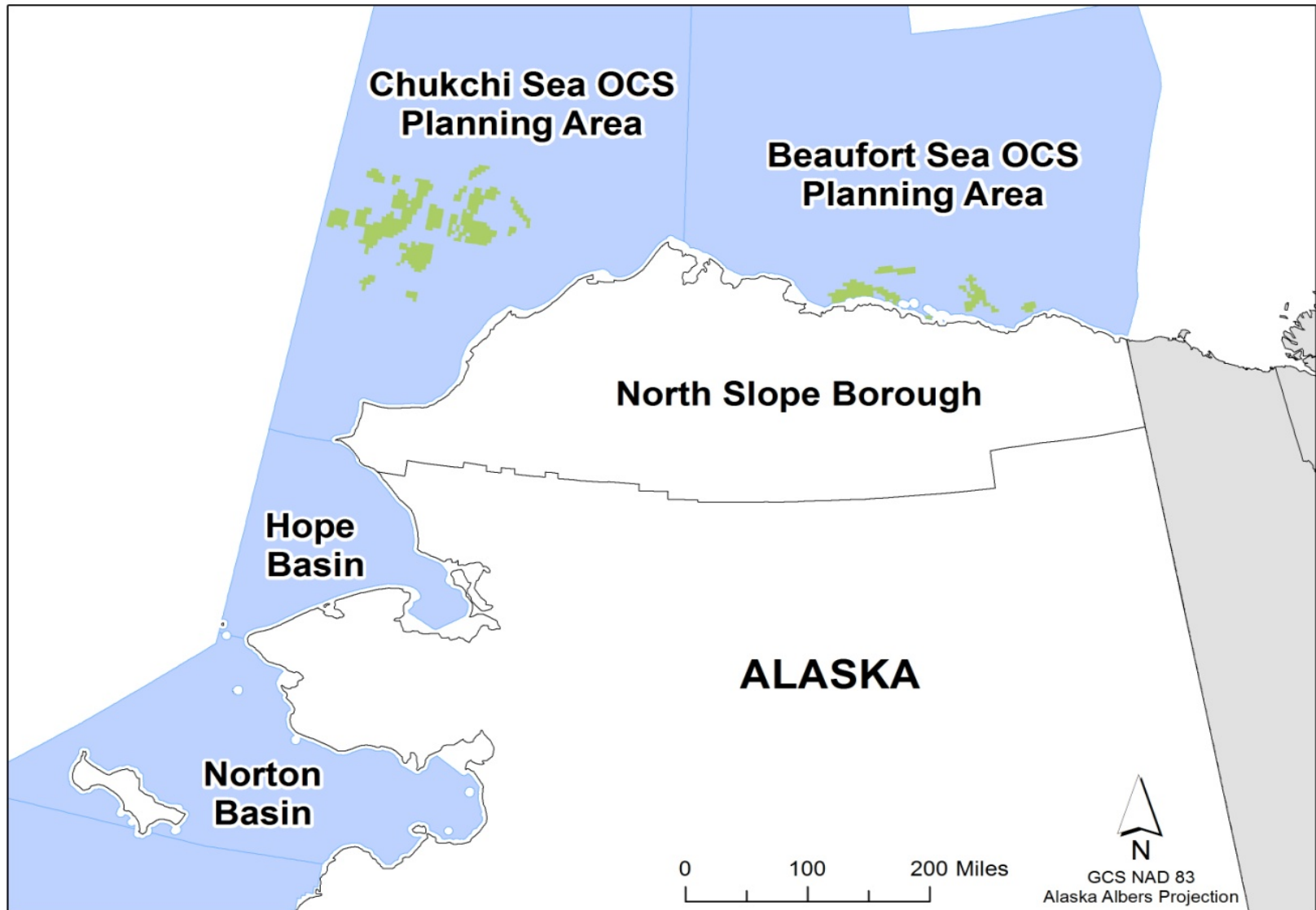


Overall Objective: Assess potential air quality impacts from oil and gas exploration, development and production on the Alaska OCS and in near-shore state waters.

Presentation Overview: Emissions Inventory for the Arctic AQ Study

- Inventory Scope
- Emission Sources and Methods
 - Baseline Inventory Results
- Projections Inventory Methods
 - Projections Inventory Results
- Next Steps

Arctic AQ Modeling Study Domain



Emissions Inventory Scope

- Pollutants - CAPs, HAPs, GHGs, H₂S, NH₃
- Domain - North Slope Borough and BOEM Planning Areas
- Sources - Anthropogenic sources within the domain
- Annual Emissions
 - Baseline, generally 2011 or 2012
 - Projections, based on “full build out” scenario
- Spatial Resolution - Geographic coordinates or surrogates

Offshore Sources

Emission Sources

- Seismic survey operations
- Exploratory drilling
- Commercial marine and research vessels
- Aircraft



Methods & Data

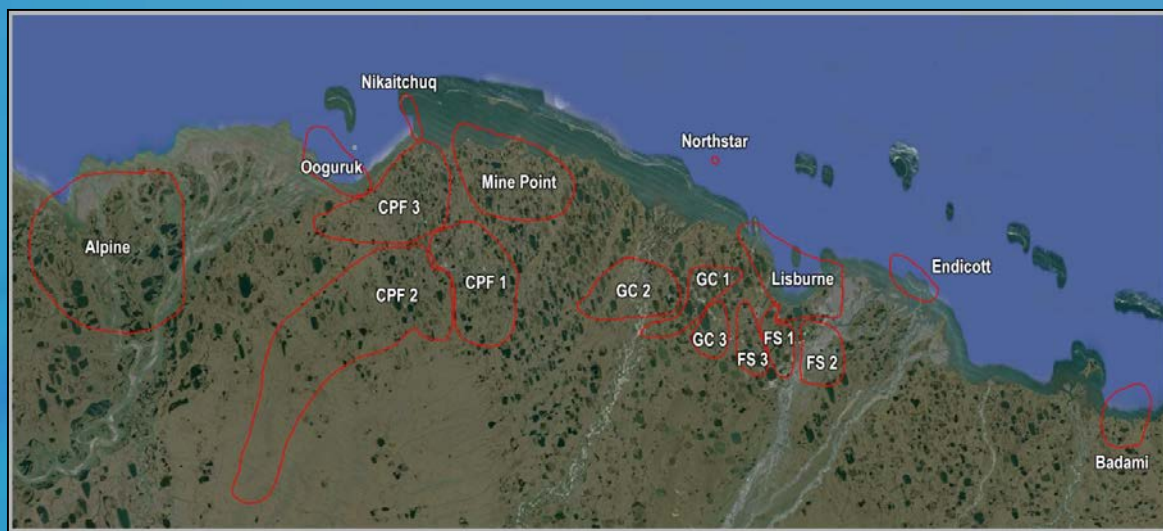
- GHG, Regulated Emissions, and Energy use (GREET) model emission factors
- HAP speciation factors
- Derived vessel activity in kW-hrs from Internet sources, Marine Exchange of Alaska
- FAA's Emissions & Dispersion Modeling System (EDMS)



Onshore Oil & Gas

Emission Sources

- Seismic surveys
- Exploratory drilling, well completions
- Prudhoe Bay, other North Slope fields



Methods & Data

- G & G permits
- Drilling rig permits
- 2011 NEI
- ADEC permit data
- GHGRP subparts W and C for Reporting Year 2012
- EPA's Nonpoint Oil and Gas Emissions Estimation Tool



Airports

Emission Sources

- 16 designated airports
- Fixed wing, helicopters for commercial and general aviation
- Auxiliary Power Units (APUs)
- Ground Support Equipment (GSE)



Methods & Data

- EDMS
- Landing and Take-off (LTO) cycle data from local sources
- FAA/EPA LTO data in place of enplanement data from local sources



Trans-Alaska Pipeline System (TAPS)

Emission Sources

- Pump stations
- Fugitives
- Pigging operations
- Pipeline replacement, repair
- (On-road and aerial surveillance)



Methods & Data

- Pump stations: U.S. NEI
- Fugitives: National production-based emission factors, scaled miles of pipeline
- Pigging: Methane-to-Markets guidance

Onshore Sources - Combustion

Emission Sources

- Power plants
- Fuel combustion
- Waste burning, WWT
- Gasoline refueling



Methods & Data

- 2011 NEI
- WebFIRE emission factors
- Fuel, waste, WW effluent quantities: Local sources, NSB Public Works



Onshore Sources - On-Road, Nonroad

Emission Sources

- On-road: Dalton Highway, TAPS patrols, in Prudhoe Bay oil fields
- Wintertime idling
- Nonroad: snowmobiles, ATVs, recreational marine, construction equipment
- Unpaved road dust



Methods & Data

- Emission factors from MOVES2014, 2011 NEI (ADEC) inputs
- VMT for Barrow, scaled
- “Project Scale” mode used for idling EFs
- NONROAD2008a
- Dust: AP-42 equation, Dalton Highway silt content

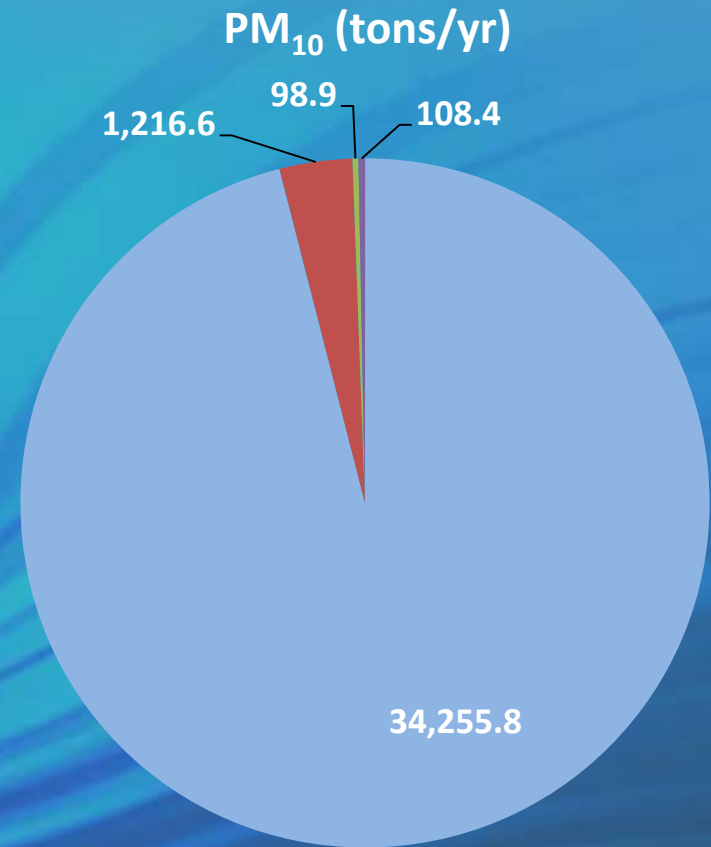
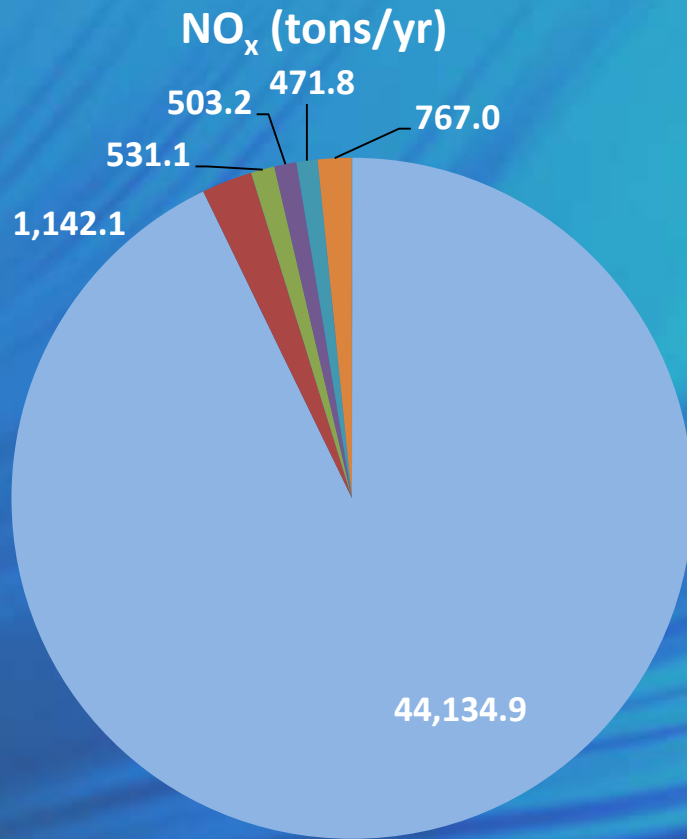
Baseline Emissions Inventory

tons/year

Sector	NO _x	SO ₂	VOC	CO	PM ₁₀	PM _{2.5}
Offshore	1,816	38	106	249	36	27
Onshore	45,734	1,235	2,886	14,002	35,644	4,771
Total	47,550	1,273	2,992	14,251	35,679	4,798

Sector	CO ₂	CH ₄	N ₂ O	CO ₂ e	HAP	H ₂ S
Offshore	139,983	1	7	141,933	18	1
Onshore	13.6x10 ⁶	8,792	29	13.8x10 ⁶	390	4
Total	13.7x10⁶	8,793	36	13.9x10⁶	408	5

Results – Baseline Emissions Inventory



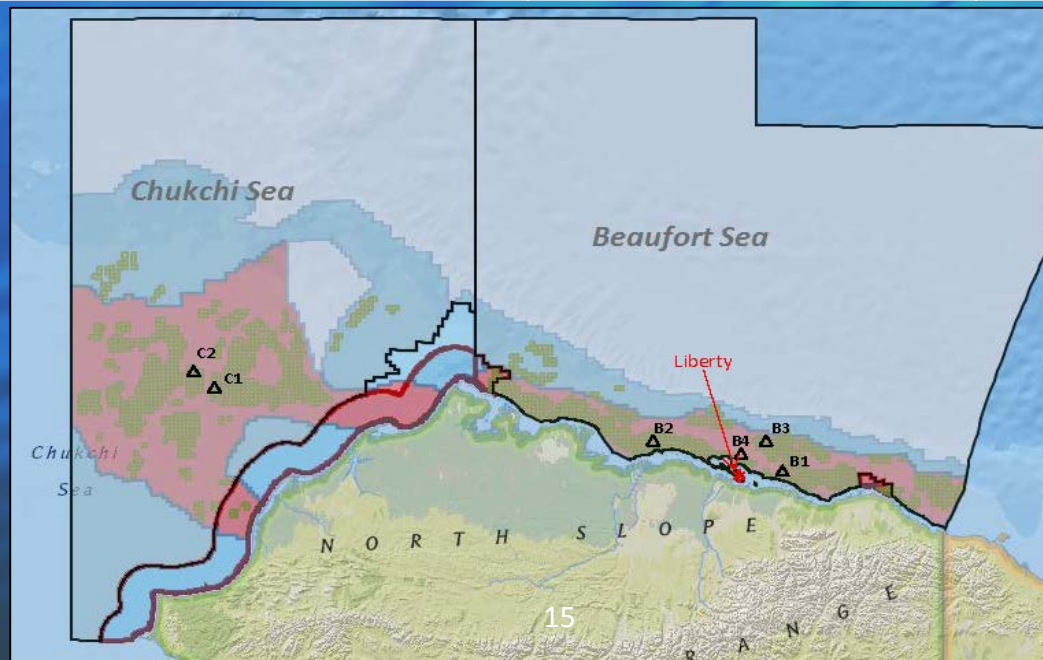
- Oil and Gas - Onshore
- Oil and Gas - Offshore
- Other Facilities
- Research Vessels
- Electricity Generating Facilities
- All Other

- Unpaved Roads
- Oil and Gas - Onshore
- Waste Incineration, Combustion, and Landfills
- All Other

Emissions Inventory Projections

BOEM Full Build-Out Scenario (Potential Production)

Activity	Beaufort Sea	Chukchi Sea
Production: Gas	167 BCF/yr	115 BCF/yr
Production: Oil, Condensate	132 MMbbl/yr	204 MMbbl/yr
No. of Platform Wells	215 Wells	260 Wells
No. of Subsea Wells	34 Wells	90 Wells



*Projected
Offshore
Development
Areas*

Projected Emission Changes Expected Under Full Build-Out Scenario

- Offshore Sources
 - Seismic surveys
 - Exploratory drilling
 - Pipelaying and support vessels
 - Platform construction, operation
 - Spills
- Onshore Sources
 - New oil and gas production facilities
 - New pipeline construction and operation
 - Liberty Island construction and drilling
 - New exploration base, air support base, search and rescue base
 - Increased TAPS throughput, air traffic
 - ULSD in all sources

Emissions Inventory Projections, tons/year Increases

Sector	NO _x	SO ₂	VOC	CO	PM ₁₀	PM _{2.5}
Offshore	14,436	1,330	771	3,013	348	294
Onshore	17,068	341	894	7,408	953	879
Total	31,504	1,671	1,665	10,421	1,300	1,173

Sector	CO ₂	CH ₄	N ₂ O	CO ₂ e
Offshore	2.8×10 ⁶	125,994	424	6.1×10 ⁶
Onshore	18.4×10 ⁶	26,601	77	19.0×10 ⁶
Total	21.2×10⁶	152,595	501	25.1×10⁶

Next Steps in the Arctic AQ Modeling Study

- Develop spatial surrogates
- Develop temporal profiles
- Estimate biogenic and geogenic source emissions
- Conduct AQ modeling
- Assess emission exemption thresholds

THANK YOU!

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