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Clean Air Regulatory Agenda – Regulatory Framework for Industrial Air Emissions

**Information Sharing at Flaring and Venting Regulators
Workshop- June 15, 2007**

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Objectives

- Share information on proposed approach with Canadian flaring and venting regulators
- Provide clarification and answer questions, as needed
- Extend invitation to participate or receive information on Environment Canada's consultations with on-shore and off-shore upstream oil and gas sector (Environment departments in each jurisdiction and other federal departments have already been engaged)

The Federal Government is following through on its October commitment

- The Notice of Intent (October 21, 2006) publicly stated the Government of Canada's commitment to develop a regulatory framework for air emissions
- The government consulted extensively with key stakeholders in November-December 2006
- Individual Canadians had the opportunity to submit formal comments over a 60 day period
- Consultations and formal comments were instrumental in shaping/refining the Regulatory Framework for Air Emissions



Regulatory Framework addresses more than just industrial emissions

- Actions for transportation will include a mandatory fuel-efficiency standard for autos
- New standards and regulations will also be developed for rail, marine, aviation, and on-road and off-road vehicles and engines
- New performance standards for consumer and commercial products
- Actions to improve indoor air quality





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Greenhouse Gases



Greenhouse gas emission targets

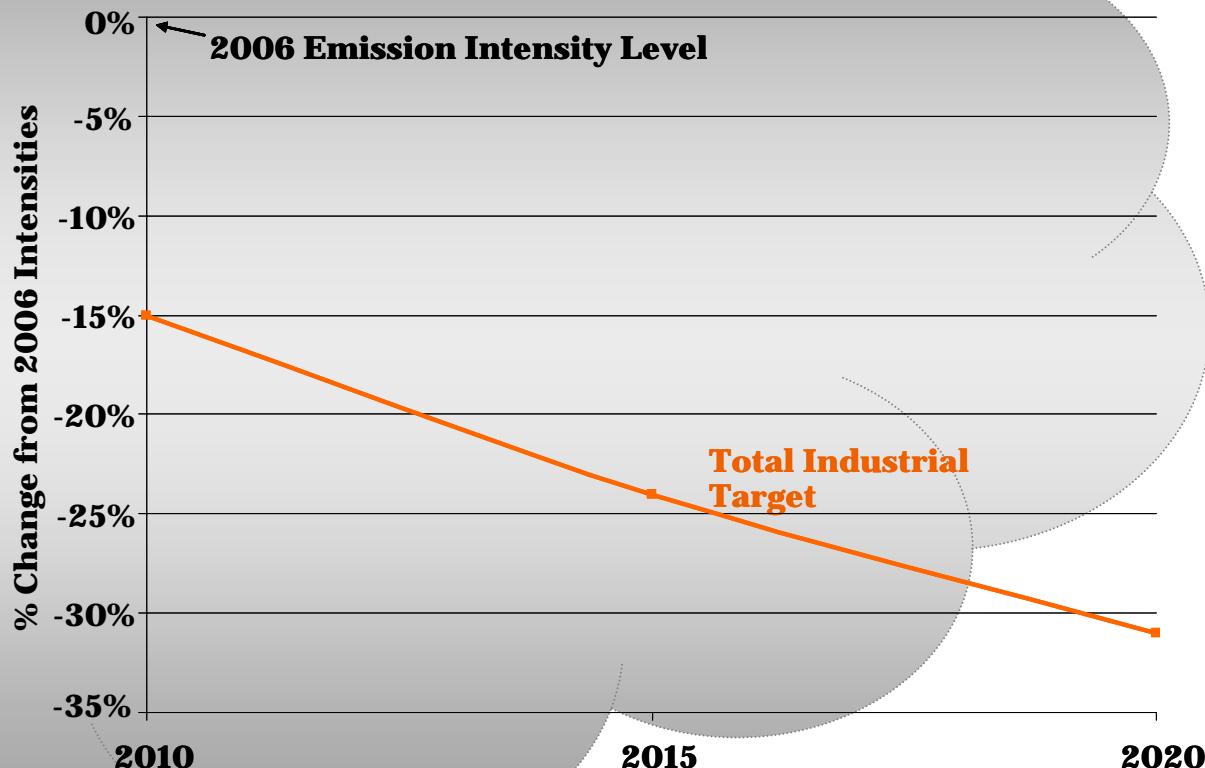
Target

Existing facilities

- 6% improvement each year from 2007 to 2010, giving an enforceable 18% reduction from 2006 emission intensity in 2010
- 2% annual improvement thereafter

New facilities

- 3 year grace period
- Clean fuel standard
- 2% annual improvement



Greenhouse gas compliance options

Ways to comply



In-house reductions

Climate Change Technology fund: one fund/two components

- Deployment & Infrastructure: focus on opportunities for near term emission reductions: access as % of total target over 2010-2017 period - 70%, 65%, 60%, 55%, 50%, 40%, 10%, 10%
- Research & Development: focus on new transformative technologies: access over 2010-2017 period - 5 Mt annually
- Explore credit for certified project investments
- Contribution rate to funds (\$/tonne over 2010-2017 period) - \$15, \$15, \$15, \$20, \$20 escalating with GDP

Trading

- Domestic inter-firm trading
- Access to domestic offsets
- Access to the Clean Development Mechanism at 10% of firms' total target
- Actively explore Canada-US linkages

Credit for early action of 15 Mt

- With a maximum of 5Mt any given year



Where estimated Upstream Oil and Gas GHG reductions would be

Estimated Reductions					
	Sector Average	For Existing Facilities		For All Facilities	
	Estimated Fixed Process Emissions (% of Total Emissions)	Estimated % Reduction from Year 2006 Emission Intensity	Estimated Mt Reduction from Levels Projected for That Year	Estimated % Reduction from Year 2006 Emission Intensity	Estimated Mt Reduction from Projected Emission Levels
2010	0%	18%	6.9	18%	6.9
2015	0%	26%	8.9	26%	8.9
2020	0%	33%	8.4	33%	8.4



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Air Pollutants



Air pollutant targets are aligned with the best in the world

- Benchmarking to other jurisdictions
 - Examined the most stringent standards for each pollutant in each sector in Canada (provinces), in the U.S., and internationally
 - Where no benchmark exists, targets developed based on specific activities and equipment in similar sub-sectors (e.g.: oilsands)
 - Adjustment to Canadian circumstances where appropriate
- Identified sectoral targets based on these stringent regulatory emissions requirements
- Calculated national caps for the four main smog-forming pollutants

Air pollutant emission targets

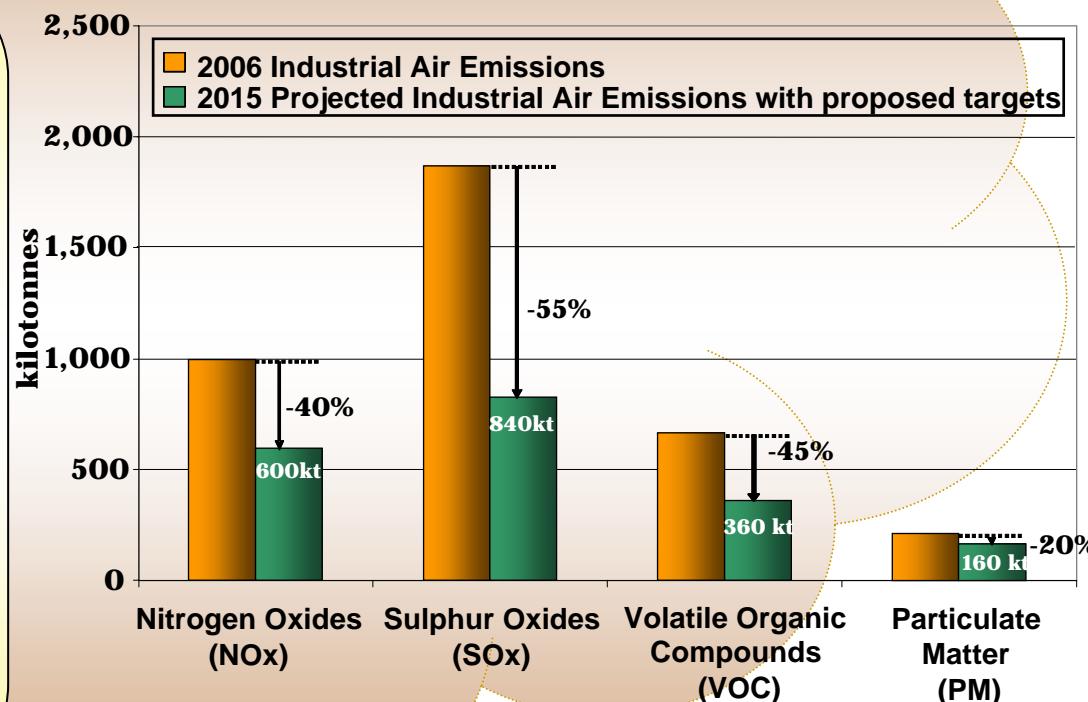
Targets

NATIONAL CAPS for 2012 to 2015
(% reduction from
2006 emissions)

- NOx – 600 kt Cap (~40%)
- SOx – 840 kt Cap (~55%)
- VOCs – 360 kt Cap (~45%)
- PM – 160 kt Cap (~20%)

+
SECTOR SPECIFIC CAPS for 2012
to 2015

ALL TO BE VALIDATED BY JUNE
2007, INCLUDING THE DATE OF
COMING INTO FORCE



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Air pollutant compliance options

Ways to comply

In-house Reductions

- Fuel switching
- Equipment and Process Upgrades
- Control technologies

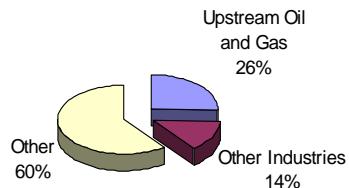
Domestic Trading for NOx and SOx

- Cap and trade system
- Feasibility of offsets will be assessed

Pursue discussions on Canada- US trading for NOx and SOx

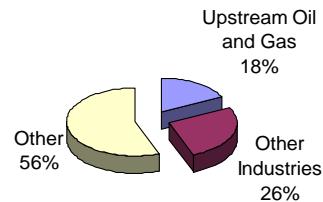
Contribution of Upstream Oil & Gas (excluding oil sands)

National VOC Emissions in 2005



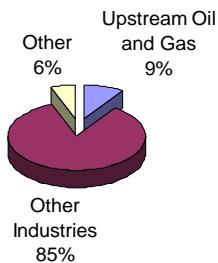
Total 2005 VOC emissions*: 1,935 kt

National NO_x Emissions in 2005



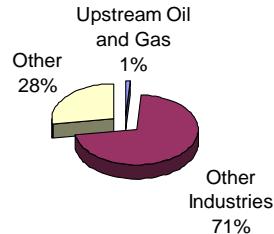
Total 2005 NOx emissions*: 2,377 kt

National SO₂ Emissions in 2005



Total 2005 SO₂ emissions*: 2,058 kt

National TPM Emissions in 2005



Total 2005 TPM emissions*: 768 kt

*Excluding open sources

Source: Environment Canada, Pollution Data Division (PDD), 2005 CAC Emissions Inventory (March 2007)



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Benchmarking Approach

Upstream Oil & Gas (excluding oil sands)

- Review of Regulatory Regimes
 - Canada – Federal & Provincial
 - No facility limits for substances
 - Process unit requirement or limits in Alberta & British Columbia
 - Alberta is the leading Canadian jurisdiction
 - United States – Federal & States
 - No facility limits for substances
 - Process unit requirements or limits at the Federal level & in some States
 - State requirements are generally set in non-attainment areas
 - Federal level has the leading U.S. requirements in many cases
 - State level requirements for non-attainment areas may have some more stringent requirements in some instances

Benchmarking Approach (cont'd-1)

Upstream Oil & Gas (excluding oil sands)

- Review of Regulatory Regimes – cont'd
 - European Union, Australia, Norway, United Kingdom, Germany, Austria, New Zealand
 - Limits based on a permit by permit basis, based on best available technology
 - Varying requirements for on-shore vs. off-shore & policy driver for that jurisdiction – GHG, acid rain, smog
- Review of Technology Options
 - Considered implementation of best available technologies or better operating practices and potential reduction of emissions
 - Reviewed Canadian facility emissions performance

Summary of Air Pollution Targets

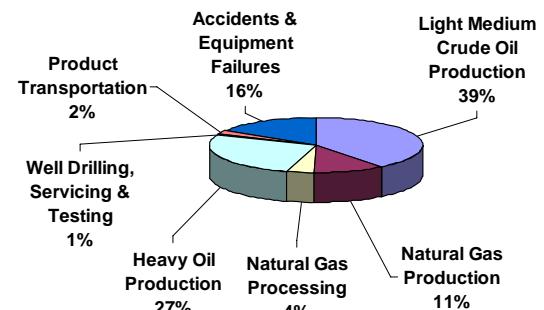
for upstream oil & gas (excluding oil sands)

Pollutant	Sector target (in kt/y)	2015 projected emissions (kt)	% reduction in 2015	2006 estimated emissions (kt)	% reduction in 2015 from 2006 levels
SOx	145	170	-15%	195	-25%
NOx	235	428	-45%	424	-45%
VOC	160	400	-60%	495	-65%
PM	Reductions achieved through meeting above caps				
Benzene	1.3	Not Available	Not Available	1.9	-35%

VOCs & Benzene Emissions & Sources

Upstream Oil & Gas (excluding oil sands)

- 26% of total 2005 VOC emissions in Canada
- Over 10% of total 2003 benzene emissions in Canada⁶
- VOCs originate from all conventional upstream oil and gas activities
 - >200,000 facilities, many small and large individual sources at each facility
- Main sources of VOCs
 - Tanks ~ 32%
 - Equipment Leaks ~ 25%
 - Venting ~ 20%
 - Accidents & Equipment Failures ~ 16%
 - Loading Losses ~ 3%
 - Dehydrators ~ 2%
 - Combustion ~ 2%
- Glycol dehydrators are the main source of benzene from upstream oil and gas



2000 VOC Emissions (540 kt)¹

VOCs – Assessed Emission Reduction Potential

Upstream Oil & Gas (excluding oil sands)

- 10% reduction from all reported venting sources
- Additional 68% reduction from reported venting sources for heavy oil production in Saskatchewan
 - Heavy oil production only occurs in Alberta & Saskatchewan
- 70% reduction in fugitive emissions & storage tanks
- 50% reduction in loading losses
- 30% reduction from accidents & equipment failures – as a result of better operating practices
- 33% reduction from unreported venting sources
- 35% reduction from dehydrators

VOCs & Benzene – Sector Specific Target

Upstream Oil & Gas (excluding oil sands)

- Targets set by calculating the potential emissions reductions that result from:
 - VOCs – implementing various technology or better operating practices
 - Benzene – implementing 1 tonne per year per dehydrator limit
- Manage VOCs, in part, through regulated codes of practice

Pollutant	Sector target (in kt/y)	2015 projected emissions (kt)	% reduction in 2015	2006 estimated emissions (kt)	% reduction in 2015 from 2006 levels
VOC	160	400	-60%	495	-65%
Benzene	1.3	Not Available	Not Available	1.9	-35%

Framework will be implemented working with provinces/territories, industry and stakeholders

- Work being undertaken is to:
 - Validate sector-specific air pollutant targets by Fall 2007, including their date of coming into force
 - Translate greenhouse gas target structure into sector-specific regulatory targets
 - Address the scope of offsets system and the administration of technology fund
 - Develop sector-specific air emissions regulations
- Finalize air pollutant regulatory framework by fall 2007
- Begin publication of draft regulations by spring 2008
- Finalize all regulations by 2010



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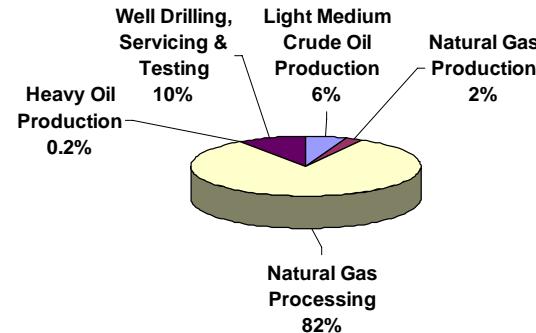
Annex



SO₂ Emissions & Sources

Upstream Oil & Gas (excluding oil sands)

- 9% of total 2005 SO₂ emissions in Canada
- Main sources of SO₂
 - 98% of SO₂ from flaring
 - 82% of flaring from sour gas processing (over 200 facilities)
 - 2% from fuel combustion
- Sour gas processing includes:
 1. Sulphur recovery plants – recovery of sulphur, the remaining acid gas is incinerated
 2. Flaring plants – acid gas is flared
 3. Acid gas injection plants – acid gas is re-injected into reservoirs
- 30% of Canada's natural gas is sour and this proportion is increasing for conventional resources
 - Composition of raw natural gas varies and will require more processing depending on the sulphur content



2000 SO₂ Emissions (265 kt)¹

SO2 – Benchmarking Sour Gas Processing Emissions Performance (cont'd-1)

Upstream Oil & Gas (excluding oil sands)

- Average performance of flaring, sulphur recovery and injection plants were benchmarked
- Benchmarked using leading technology (injection)
 - Assumed an emission intensity of 1.0 tonnes/MMcm throughput
- Data available in excel file

SO2 – Sector Specific Target

Upstream Oil & Gas (excluding oil sands)

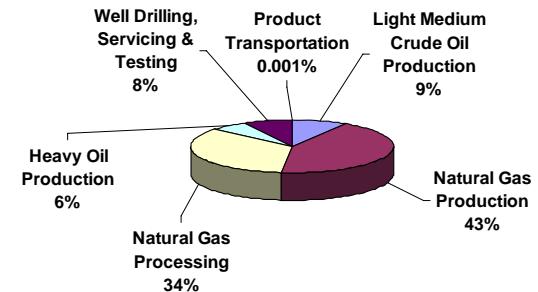
- Target set by calculating the potential emission reductions that result from achieving average Canadian emissions performance
- Assumed 15% reduction from 2015 forecast achievable based on:
 - 18% calculated reduction potential from benchmarking
 - Uncertainty in data
 - 2000 data set rather than more recent & only for matched data set
 - De-grandfathering achieved by 2015 rather than 2017

Pollutant	Sector target (in kt/y)	2015 projected emissions (kt)	% reduction in 2015	2006 estimated emissions (kt)	% reduction in 2015 from 2006 levels
SOx	145	170	-15%	195	-25%

NOx Emissions & Sources

Upstream Oil & Gas (excluding oil sands)

- 18% of total 2005 NOx emissions in Canada
- NOx originates from all conventional upstream oil and gas activities
 - >200,000 facilities, many more individual sources at facilities
 - Fuel combustion accounts for 99.9% of NOx sector emissions¹
 - Includes reciprocating engines, turbines, diesel engines, heaters/boilers
 - Reciprocating engines account for the majority of fuel combustion sources in this sector and represent 84% of NOx emissions²



2000 NOx Emissions (369 kt)¹

NOx – Assessed Emission Reduction Potential

Upstream Oil & Gas (excluding oil sands)

- New engines:
 - Half of existing engines changed out by 2015
 - Assumed:
 - New engines meeting most stringent US EPA limit of 2.7 g/KWhr
 - 84% of NOx emissions originates from reciprocating engines
- Existing engines:
 - Applied a 60% emission reduction potential for existing engines using new technology or better operating practices, such as REM Vue technology
 - Assumed:
 - 84% of NOx emissions originates from reciprocating engines
 - 75% of existing engines do not use low-NOx technologies

NOx – Sector Specific Target

Upstream Oil & Gas (excluding oil sands)

- Target set by calculating the potential emission reductions that result from:
 - Accelerated change out of existing engines to new which meet more stringent engine requirements
 - Implementation of new technology or better operating practices to existing engines

Pollutant	Sector target (in kt/y)	2015 projected emissions (kt)	% reduction in 2015	2006 estimated emissions (kt)	% reduction in 2015 from 2006 levels
NOx	235	428	-45%	424	-45%

Benzene – Assessed Emission Reduction Potential

Upstream Oil & Gas (excluding oil sands)

- 2003 most recent year with data on benzene emissions from glycol dehydrators - CAPP 2004 Benzene Report
- Calculated potential reduction based on all glycol dehydrators meeting a 1 tonne per year per dehydrator emission rate