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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

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- 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

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- 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

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- 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

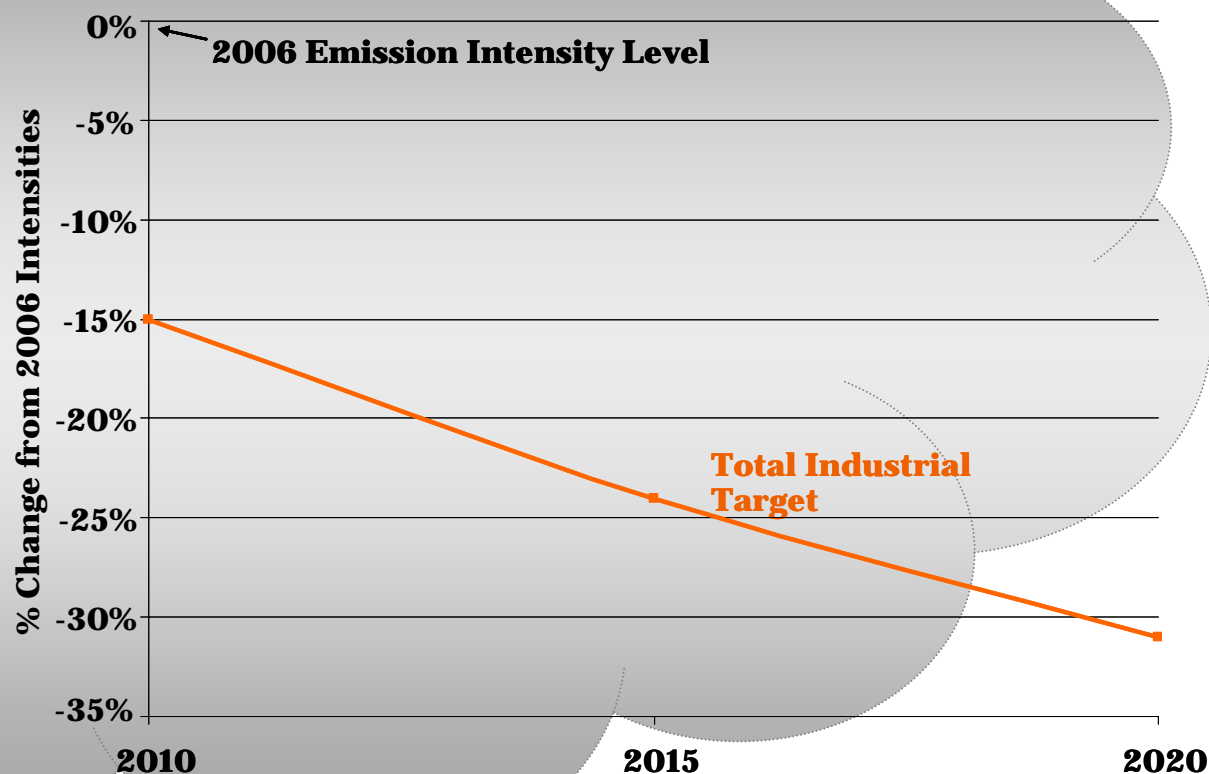
## Target

### 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

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- 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

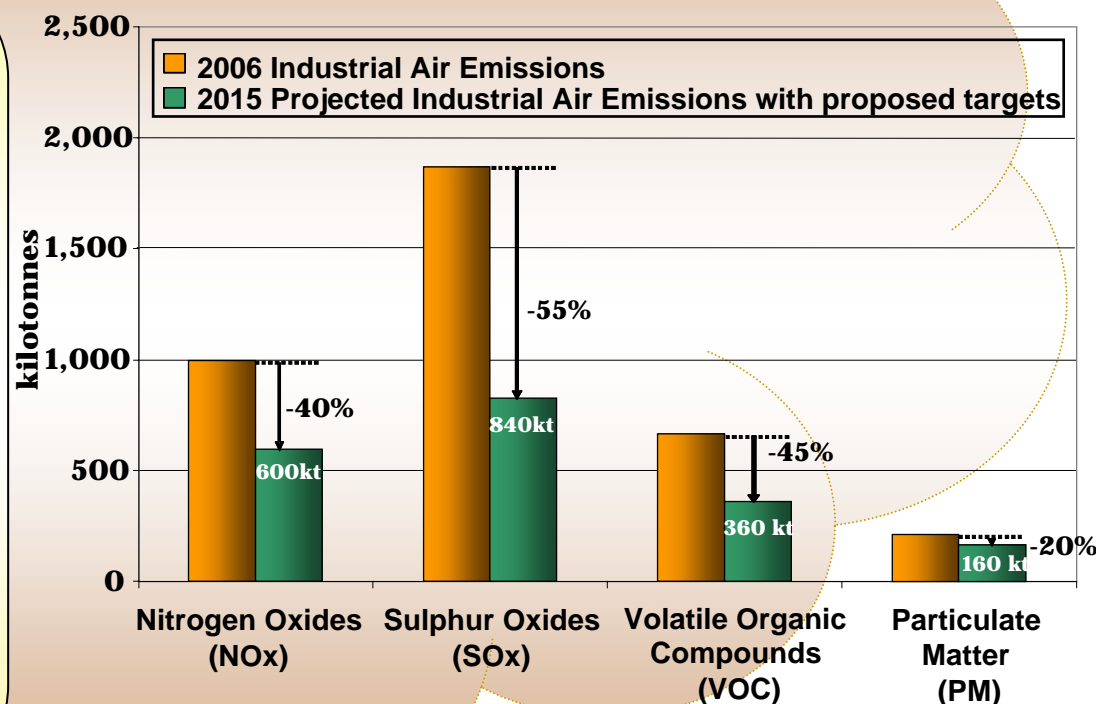
**NATIONAL CAPS for 2012 to 2015**  
(% reduction from  
2006 emissions)

- NO<sub>x</sub> – 600 kt Cap (~40%)
- SO<sub>x</sub> – 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



# Air pollutant compliance options

## Ways to comply

### In-house Reductions

- Fuel switching
- Equipment and Process Upgrades
- Control technologies

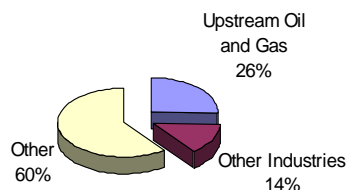
### Domestic Trading for NO<sub>x</sub> and SO<sub>x</sub>

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

Pursue discussions on Canada- US trading for NO<sub>x</sub> and SO<sub>x</sub>

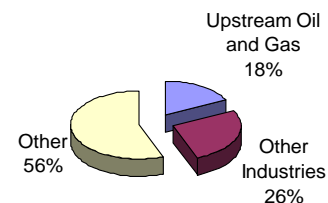
# Contribution of Upstream Oil & Gas (excluding oil sands)

**National VOC Emissions  
in 2005**



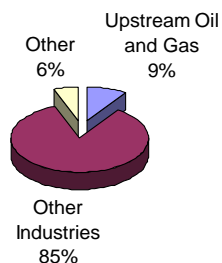
Total 2005 VOC emissions\*: 1,935 kt

**National NO<sub>x</sub> Emissions  
in 2005**



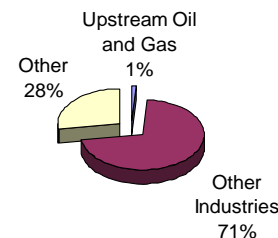
Total 2005 NO<sub>x</sub> emissions\*: 2,377 kt

**National SO<sub>2</sub> Emissions  
in 2005**



Total 2005 SO<sub>2</sub> 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)

# Benchmarking Approach

## Upstream Oil & Gas (excluding oil sands)

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- 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)*

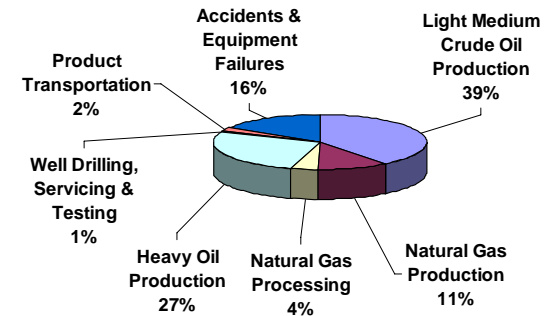
Pollutant	Sector target (in kt/y)	2015 projected emissions (kt)	% reduction in 2015	2006 estimated emissions (kt)	% reduction in 2015 from 2006 levels
SOx	145	170	-15%	195	-25%
NOx	235	428	-45%	424	-45%
VOC	160	400	-60%	495	-65%
PM	Reductions achieved through meeting above caps				
Benzene	1.3	Not Available	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 Canada<sup>6</sup>
- VOCs originate from all conventional upstream oil and gas activities
  - >200,000 facilities, many small and large individual sources at each facility



2000 VOC Emissions (540 kt)<sup>1</sup>

- 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

# VOCs – Assessed Emission Reduction Potential

## Upstream Oil & Gas (excluding oil sands)

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- 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

<b>Pollutant</b>	<b>Sector target (in kt/y)</b>	<b>2015 projected emissions (kt)</b>	<b>% reduction in 2015</b>	<b>2006 estimated emissions (kt)</b>	<b>% reduction in 2015 from 2006 levels</b>
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

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- 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



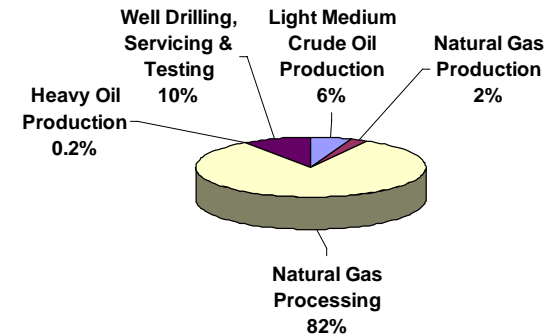
# SO2 Emissions & Sources

## 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)<sup>1</sup>

# SO<sub>2</sub> – Benchmarking Sour Gas Processing Emissions Performance (cont'd-1)

Upstream Oil & Gas (excluding oil sands)

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- 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

# SO<sub>2</sub> – 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

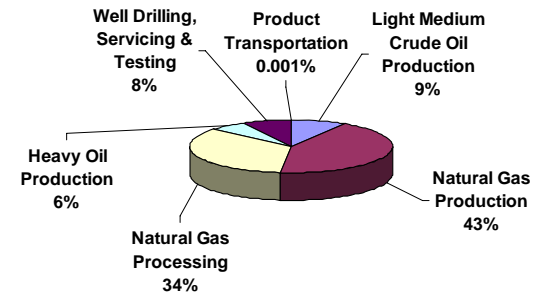
Pollutant	Sector target (in kt/y)	2015 projected emissions (kt)	% reduction in 2015	2006 estimated emissions (kt)	% reduction in 2015 from 2006 levels
SO <sub>x</sub>	145	170	-15%	195	-25%



# 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 emissions<sup>1</sup>
    - 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 emissions<sup>2</sup>



2000 NOx Emissions (369 kt)<sup>1</sup>

# 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/KW hr
    - 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

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

# Benzene – Assessed Emission Reduction Potential

## Upstream Oil & Gas (excluding oil sands)

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- 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