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# The Downstream Petroleum Sector Water Conservation, Efficiency, Productivity (CEP) Plan – Progress Report

## Presentation to the Alberta Water Council

October 28, 2015

# Overview

## Purpose:

- Inform AWC on CEP progress for the Downstream Petroleum Sector

## Discussion:

- Who is the Canadian Fuels Association?
- Downstream Petroleum Industry Sector Overview
- Sector CEP Scope
- Water Use in the Downstream Petroleum Sector
- AB *Water for Life* Goals
- Sector Water Demand and Use
- Sector Summary of CEP Water Use Reduction
- Sector CEP Metrics
- Water Supply / Demand Challenges
- Sector CEP Opportunities
- Questions?



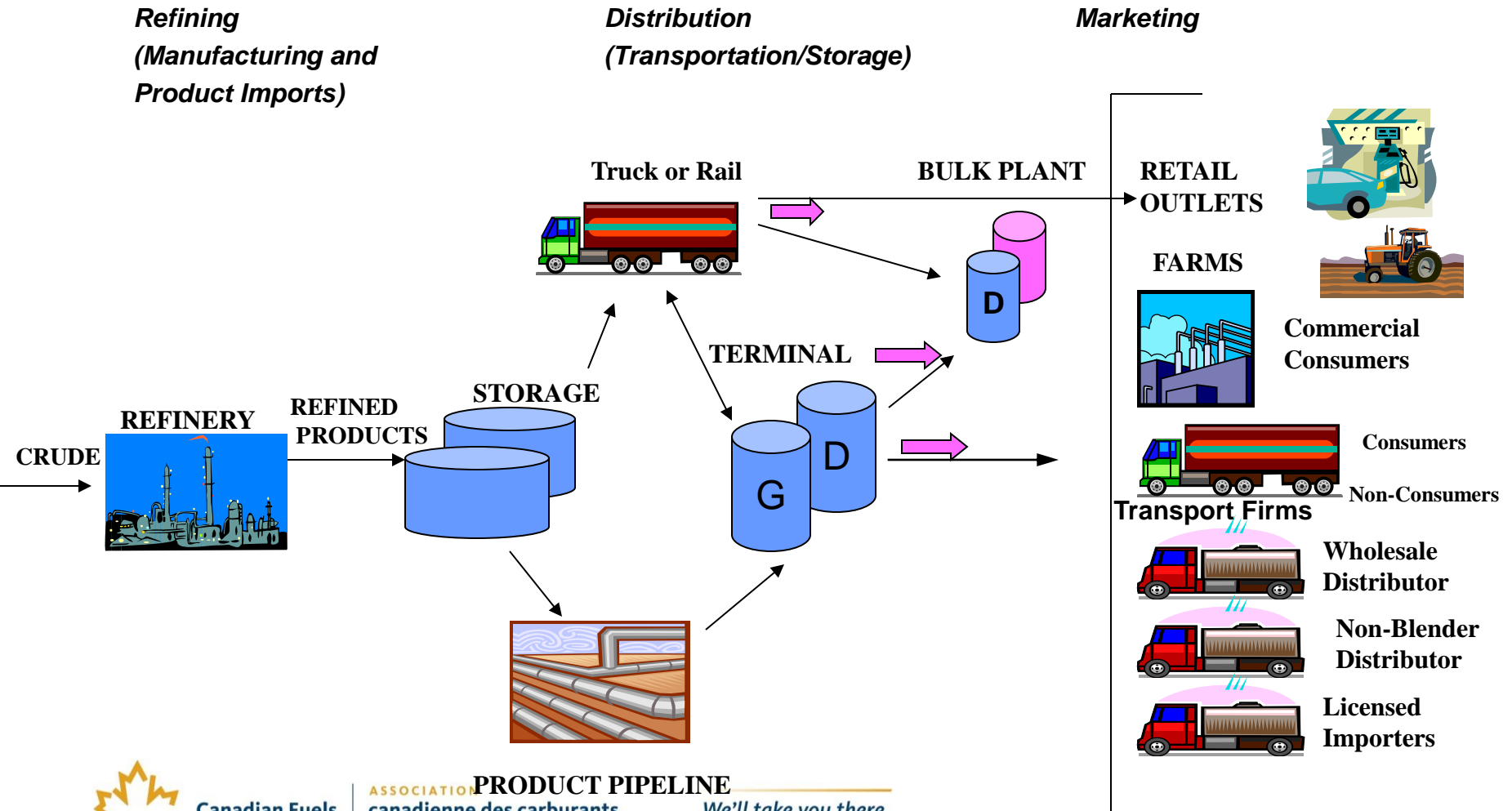
# Canadian Fuels Association - Who we are

- Canadian Fuels represents the industry that produces and supplies Canada's transportation energy needs
- We engage government and other stakeholders with a focus on environment, health and safety policy, and regulation
- We provide context and content for policy-makers
- Canadian Fuels has demonstrated long term continuous improvement
- We seek a 'convergence of interests' where the policy objectives of government can be achieved without affecting Canadians' access to a secure, reliable and competitively-priced supply of fit-for-purpose fuels

## Canadian Fuels members:

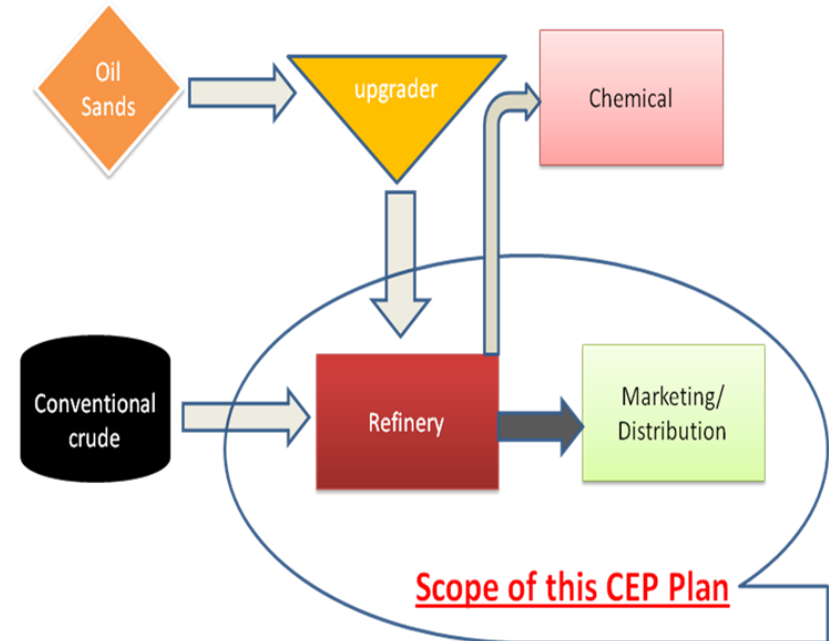


# Downstream Petroleum Industry – Sector Overview



# Scope of the CEP Plan for AB Downstream Petroleum Sector

The downstream sector includes crude oil refiners, product distribution terminals, associated pipelines, truck, rail and marine transportation and retail wholesale gasoline/diesel and lubricants marketers



**Upstream operations, upgraders and petrochemical plants are outside of the scope of this plan**





# Water Use in the Downstream Petroleum Sector

- In refineries, approximately 60% of intake water is used for the cooling system and is returned back to the source after being treated to a high quality
- Approximately 35-40% is used in the refining process by direct contact with crude or production of steam and hydrogen
- Approximately 1% of intake (including municipal sources) is used for sanitation
- Contaminated water from refinery is treated in waste water treatment plants before it is returned back to the environment
- Marketing and distribution operations are not significant users of water and typically source water from municipal systems and occasionally from groundwater sources



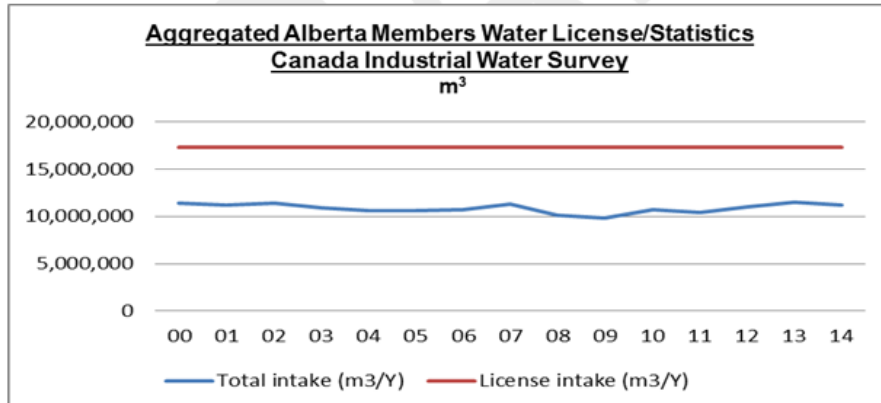
# Sector view of the AB *Water for Life* Goals

The 3 *Water for Life* Goals are:

1. Safe, Secure Drinking Water Supplies
  2. Healthy Aquatic Systems
  3. Reliable, Quality Water Supplies for a Sustainable Economy
- Goals 1 and 2 are met by advanced waste water treatment systems at facilities. For example, water returned to the North Saskatchewan has been treated to levels well below Federal Fisheries Act refinery effluent guidelines (details in backup slides)
  - Goal 3 is met by the Sector's overall water use footprint, which represents < 0.1 % of AB's total water allocation, and < 2 % of AB industry's water allocation

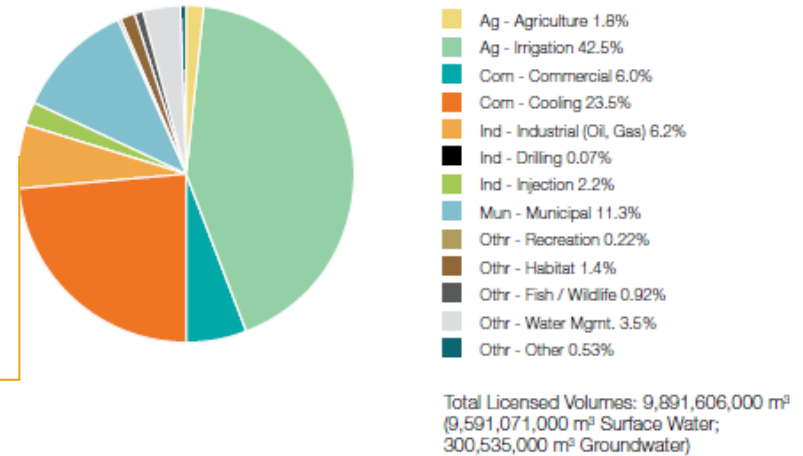


# Petroleum Sector Water Demand and Use



**AB refinery water intake is ~60% of allowable license limit**

**Water Allocations in Alberta\***  
by Specific Purpose (2009)



Source: Facts about Water In Alberta, Dec 2010: GoA – AEP website

**Downstream petroleum sector water allocation is included in the Industrial (Oil, Gas) sector and represents < 0.1% of AB Total water allocation, and < 2% of AB Industrial (Oil, Gas) water allocation**





# Sector summary of CEP and water use reduction

- The downstream petroleum industry has improved water use efficiency over the reporting period through continuous improvement (operating and technological), in spite of regulatory changes requiring more use of energy and water
- Water use by the petroleum refineries in Alberta to 2014 has improved by **15.2 %** on a normalized basis (m<sup>3</sup> water use/m<sup>3</sup> crude throughput) from the base year (2000-2002 average)
- In 2009 (the initial CEP reporting year), the sector had improved water use by 30% on a normalized basis from the base year. The period 2009 – 2014 saw increased water use due to 3 factors:
  1. Response to environment regulations affecting quality of products
  2. Economic / Market Trends
  3. Crude slate changes requiring refinery reconfigurations
- The sector will continue to advance opportunities identified in the CEP plan to improve water use, while balancing social, economic, and environmental priorities



# AB Downstream Petroleum Sector CEP Plan Metrics

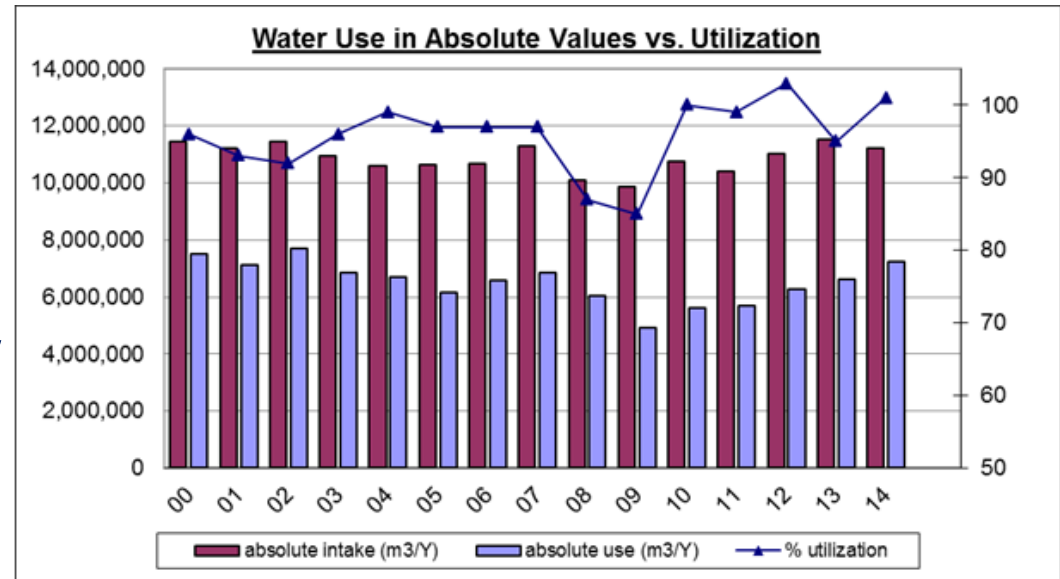
Alberta Sector CEP Plan Metrics						
Component	Units	2000/2002 (Base Year)	2009	2014	%Units 2014 F(U) vs. Base Year	%2014 F(U) vs. Base Year
Refinery Throughput	1000m3 /day	60.7	58.9	69.6	8.90	14.66
Refinery Utilization		95%	85%	101%	6%	6.32
Water Intake (actual)	Mm3	11.4	9.9	11.2	0.20	1.8
Water Discharge (actual)	Mm3	3.9	4.9	4.0	(0.10)	(2.6)
Water Use (actual)	Mm3	7.5	4.9	7.2	0.30	4.0
Water Use (normalized)	m3/m3 crude	0.33	0.23	0.280	0.05	15.2
Water Intake (normalized)	m3/m3 crude	0.51	0.46	0.44	0.07	13.6
Water Intake License	Mm3	17.3	17.3	17.3	0.00	0.00
% License Utilized		66%	57%	65%	0.01	1.75
Refinery Effluent Quality (% of allowable limits)		<15%	<10%	<10%	<5%	
F= Favorable (U)= Unfavorable						



# Water Supply and Demand Challenges

Water demand in AB refining during the CEP review period has been influenced by:

- Response to environment regulations affecting quality of products, i.e. low sulphur gasoline/diesel
- Economic / Market Trends
- Crude slate changes requiring refinery reconfigurations



**Resulting in addition of energy using units**

**Despite these challenges, at YE 2014 vs. the base year a 15% reduction in normalized water use has been achieved**



# Overview of Sector CEP Opportunities

- Many opportunities for water CEP have been examined and implemented in the downstream petroleum industry
- The sector continues to look for additional opportunities to be a more efficient user of water
- Marketing and distribution operations have invested to upgrade operations to prevent water contamination due to leaks and spills, while facility rationalization has reduced demands on municipal water systems
- Refinery discharge data has been reported to Environment Canada since 1974 and effluent quality is well within the guidelines under the Federal Fisheries Act (details in backup slide). In addition, Alberta Environment & Water prescribes site specific limits for each refinery in their respective water licenses



# Application of CEP Opportunities

- The CEP opportunities cannot be uniformly applied to all refineries or other operations, due to...
  - complexity of each operation
  - design of the facilities
  - life cycle stage of the facilities
  - specific company business operating plans
- Each CEP opportunity has been evaluated by analyzing cost/benefit and feasibility of application





# Specific Downstream Sector CEP Opportunities

15 Opportunities were identified in the original Petroleum Sector CEP Plan:

1. Re use of water from other sources such as Municipal Treatment Plants
2. Optimization of wastewater disposal via deep well, possible redirection of select streams of contaminated water to Waste Water Treatment Plant (WWTP)
3. Reduce evaporative losses from cooling towers where applicable by maintenance and upgrades
4. Use of air fans in place of water cooling
5. Reduce leaks in steam lines/traps and improve condensate collection systems for recycling
6. Improve the de-salter unit which results in less contaminated water
7. Segregation of storm water from contaminated water and recycling of clean storm water
8. Improve the operation of WWTP to allow recycling of water in process areas
9. Reduce possibility of leaks & spills by improving maintenance & providing rapid response to spills
10. Continue upgrading marketing facilities to prevent impact on surface and groundwater
11. Superheating stripping steam
12. Heat Exchanger monitoring and maintenance
13. Boiler Feed Water Blowdown monitoring
14. Use higher pressure steam
15. Internal re use and recycling of process water



# Downstream Sector CEP Opportunities: Summary

- Some of these opportunities have been implemented, and some represent ongoing continuous improvement (CI)
- The Petroleum sector expects that any future CEP gains will be incremental from CI efforts
- No major capital expenditures are expected which may result in a significant +/- in water use
- AB Refineries in this CEP plan do not expect any significant +/- in water demand in the next 5 years



# Thank You

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# Backup Slides



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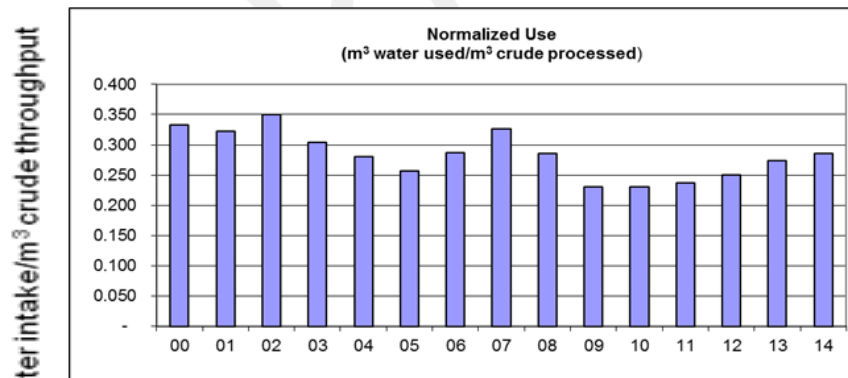
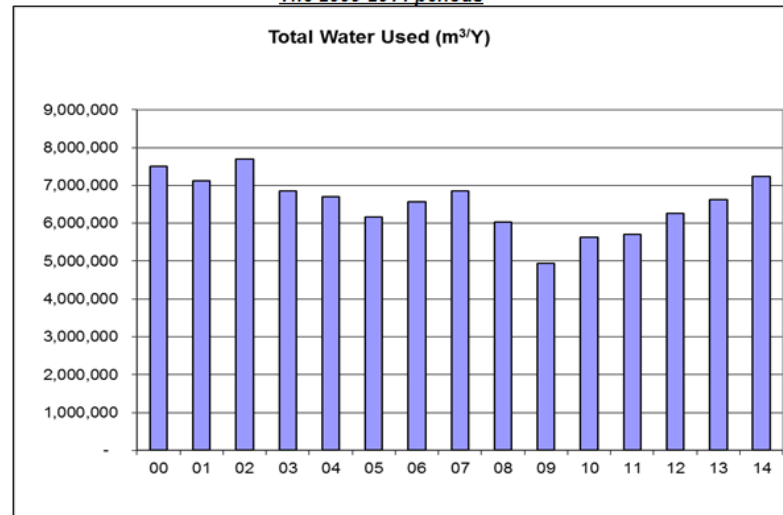
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# Sector Total and Normalized Water Use

The following charts show total and normalized water use during  
The 2000-2014 periods



m<sup>3</sup>water intake/m<sup>3</sup> crude throughput

A 15.2% reduction in normalized use from the base year has been achieved. Please note variation in refinery utilization and water use over years.

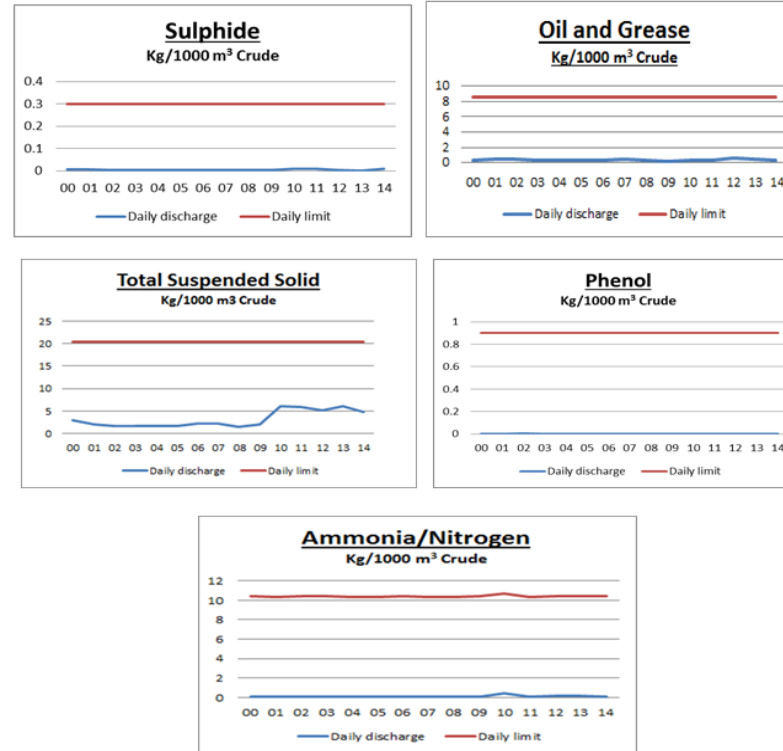




# AB Refinery Discharge/Effluent Quality

## Compliance with Federal Refinery Water Effluent Regulations

2000-2014



The above charts reflect the refinery effluent quality in accordance with the refinery effluent guidelines under the Federal Fisheries Act. Effluent quality has met and been less than 2% of allowable federal limits in the past 15 years. In addition, the Alberta government has prescribed site specific limits for each refinery in their respective water licenses.

