CHALLENGES FACED BY DOMESTIC BULK CARRIERS IN DECARBONIZATION AND TOWARDS GREEN OPERATIONS

AGENDA

01 THE TARGETS

02 THE SHIPS AND THEIR ENVIRONMENT

03 CURRENT AND FUTURE FUELS

04 OTHER TECHNOLOGIES

05 FINANCIAL

06 FUTURE UNCERTANTIES

ENVIRONMENTAL TARGETS

IMO TARGETS

- 40% reduction in GHG per work done by 2030
- 70% reduction in GHG per work done by 2050
- 50% total GHG reduction by 2050
- EEXI/EEDI
- CII

NORTH AMERICA EMISSION CONTROL AREA

- SO_X
- NO_X

BWTS

- Additional fuel consumption

UNDER WATER RADIATED NOISE

- Fuel Efficient
- Quieter/Noise reduction

Under Review


Thunder Bay
Lac Supérieur
Two Harbors
Minnesota
Duluth/Superior
Marquette
Michigan
Sault Ste. Marie
Escanaba
Cheboygan
Wisconsin
Rogers City
Minneapolis
St Paul
Green Bay
Lac Huron
Lac Michigan
Milwaukee
Muskegon
Saginaw
Goderich
Oshawa
Toronto
Hamilton
Lac Ontario
Sarnia
Port Colborne
Buffalo
Waukegon
Detroit
Windsor
Lac Érié
Chicago
Monroe
Erie
Burns Harbor
Toledo
Conneaut
Ashtabula
Lorain
Cleveland
Iowa
Omaha
Illinois
Pennsylvania
Pittsburgh
Ohio
Columbus
Indianapolis
Indiana
Cincinnati
West Virginia
Kansas City
St Louis
Missouri
Kentucky
Nashville
Virginia
Baltimore
Washington
Delaware
Maryland
Philadelphia
New Jersey
New York
Océan Atlantique
Québec
Baie-Comeau
Saguenay
Nouveau-Brunswick
Belledune
Québec
Bécancour
Trois-Rivières
Sorel
Moncton
Montréal
Valleyfield
Ottawa
Saint John
Johnstown
Ogdensburg
Maine
Vermont
New Hampshire
Oswego
Albany
Massachusetts
Boston
Connecticut
Rhode Island
CSL CANADIAN FLEET OPERATIONS

THE SHIPS

- A mix of bulkers and self-unloading bulk carriers
- Very long lifespan, 40-50 years
- Operating profile:
  - Large % of time maneuvering
  - Large % of time in locks
  - High power consumption in port
  - Approx. **30% in open water sailing**
- 9-10 month season

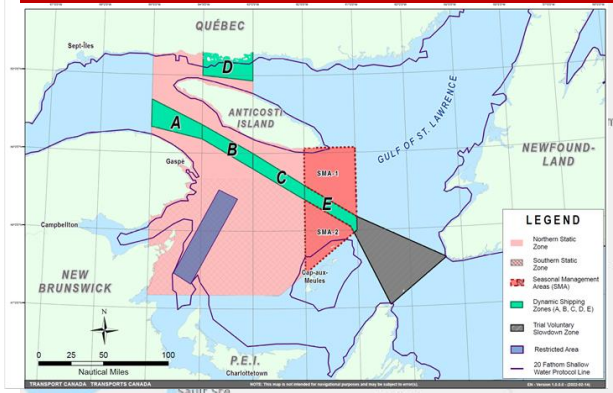
THE SHIPS

THE SHIPS

SPEED RESTRICTIONS - SEAWAY

Item	Column I - From	Column II - To	Maximum Speed Over The Bottom (Knots)	
			Column III	Column IV
1.	Upper Entrance South shore Canal Buoy A1	Lake St. Louis Buoy A13	10.5	10.5
2.	Lake St. Louis Buoy A13	Lower Entrance Lower Beauharnois Lock	12 (upd) 14 (dnb)	11 (upb) 13 (dnb)
3.	Upper Entrance Upper Beauharnois Lock	Lake St. Francis Buoy D3	9 (upb) 10.5 (dnb)	9 (upb) 10.5 (dnb)
4.	Lake St. Francis Buoy D3	Lake St. Francis Buoy D49	12 (upb) 13.5 (dnb)	12 (upb) 13.5 (dnb)
5.	Lake St. Francis Buoy D49	Snell Lock	8.5 (upb) 10.5 (dnb)	8 (upb) 10.5 (dnb)
6.	Eisenhower Lock	Iroquois Lock	11.5	10.5
7.	Iroquois Lock	McNair Island Lt. 137	13	10.5
8.	McNair Island Lt 137	Deer Island Lt. 186	11.5	10.5
9.	Deer Island Lt. 186	Bartlett Point Lt. 227	8.5 (upb) 10.5 (dnb)	8 (upb) 10.5 (dnb)
10.	Bartlett Point Lt. 227	Tibbetts Point Traffic Lighted Buoy Mo (A)	13	10.5
11.	Junction of Canadian Middle Channel and Main Channel abreast of Ironsides Island	Open Waters between Wolfe and Howe Islands through the said Middle Channel	9.5	9.5
12.	Port Robinson	Ramey's Bend through the Welland By-Pass	8	8
13.	All other canals		6	6

SPEED RESTRICTIONS – GREAT LAKES



AVAILABLE FUELS

AVAILABLE FUELS

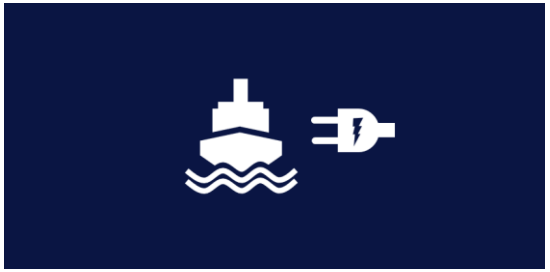
- **IFO 180/380**
- **MGO**
- **LNG**
- **BIO** – Not Currently Recognized by Canada/IMO

Annual demand for fuel on the Great Lakes and St. Laurence River is approx. **400,000T**

Annual demand at Long Beach CA, is approx. **870,000T**

NEXT GENERATION ENERGY SOURCES

e- 



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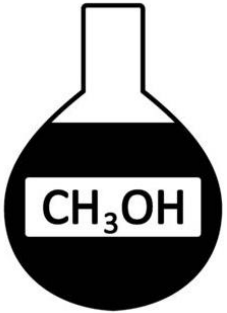
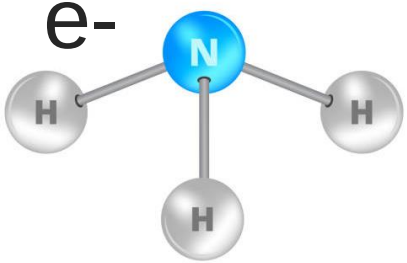
e- 

e- 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Hamilton
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Sarnia
Port Colborne
Buffalo
Waukegon
Detroit
Windsor
Lac Érié
Chicago
Monroe
Erie
Burns Harbor
Toledo
Conneaut
Ashtabula
Lorain
Cleveland
Iowa
Omaha
Illinois
Pennsylvania
Pittsburgh
Ohio
Columbus
Indianapolis
Indiana
Cincinnati
West Virginia
Kansas City
St Louis
Missouri
Kentucky
Nashville
Virginia
Baltimore
Washington
Delaware
Maryland
Philadelphia
New Jersey
New York
Océan Atlantique
Québec
Baie-Comeau
Saguenay
Nouveau-Brunswick
Belledune
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Bécancour
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Sorel
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OTHER TECHNOLOGIES

Technology	Pros	Cons
Just In Time Arrival	Reduces CO_2 Reduces vessel idle time	High level of collaboration needed Lack of international standards Marginal gain in CO2 reduction
CCS	Reduces CO_2	High CAPEX & OPEX What to do with the captured carbon? Loss of cargo capacity
Weather Routing	Reduces CO_2	Marginal gain in CO2 reduction
Low Friction Paint / Hull Cleaning	Reduces CO_2	Cost Removed during canal transits
Fuel Cells	Eliminate CO_2	Availability Maturity at large scale
Electrification/Batteries	Eliminate CO_2	Low energy density High weight penalty
Solar and Wind	Reduces CO_2 Renewable	Weather dependent Small impact to environmental footprint of vessel Bridges

FINANCIAL CHALLENGES

- Next gen fuels are expensive
- Need for shore side investment
- Customers
- Technology maturity
- Short season, aggressive ROI
- Limited market growth
- Need for incentives

FUTURE UNCERTANTIES

Fuels not recognized at IMO

- How to transition to a non-recognized fuel

Crewing

- Shortages
- Training
- Costs

Lifecycle Analysis of Fuel

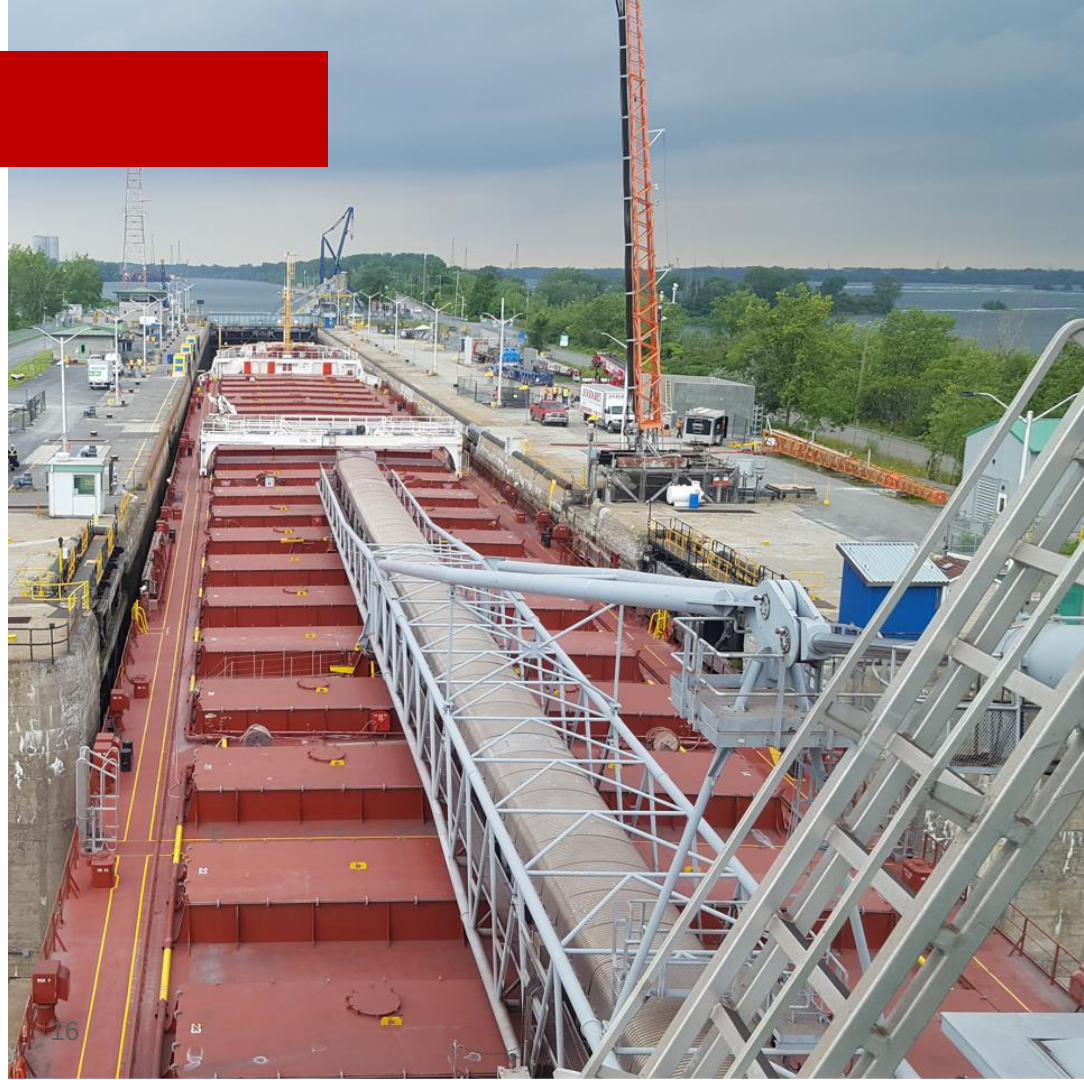
- Varies by region
- Varies by feedstock
- Reporting accuracy

Local restrictions

- Environmental regulations
- Public perception

OPPORTUNITIES

- Biofuel
- Renewable Methanol
- Shore Power
- Clean Fuel Standard
- Flexibility of Canada to regulate its domestic fleet
- IMO working on LCA for MEPC 79



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