Methanol – An Emerging Clean-Burning Marine Fuel

Jason Chesko, Senior Manager, Global Market Development

September 24, 2014

methanex the power of agility

A RESPONSIBLE CARE® COMPANY

Overview

- Methanex
- Methanol Industry
- Methanol – An Emerging Marine Fuel
  - Regulations driving change
  - Options
  - Commercial developments
  - Stena case study

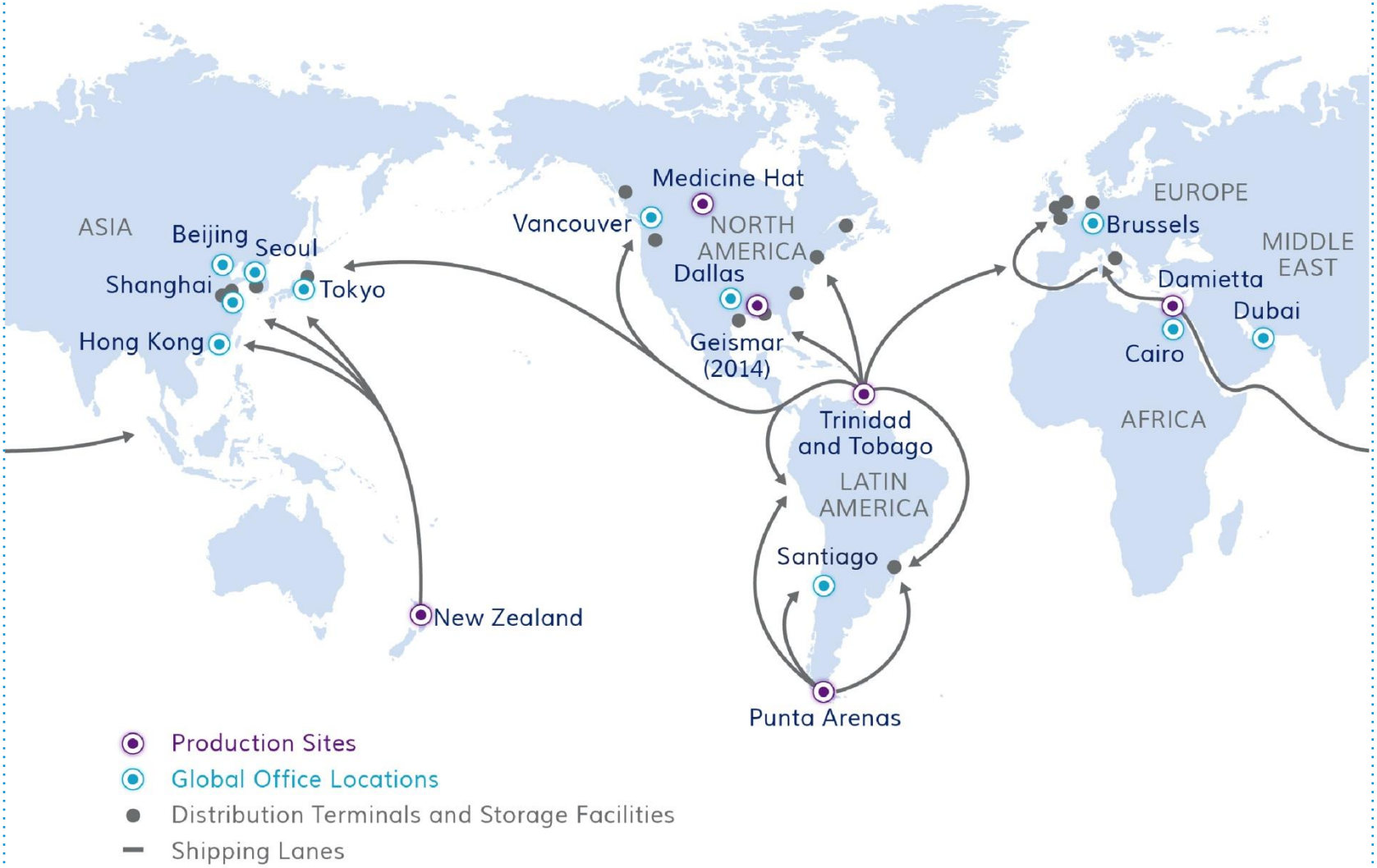
Methanol / Methanex Overview

About Methanex

- Largest supplier of methanol in all major markets: ~18% overall merchant market share[1]
- Production capacity: ~9 million tonnes
- ~$7 Billion Enterprise Value / $3 Billion Revenue (2013)
- Wholly-owned Waterfront Shipping subsidiary
- A Responsible Care® company
- Approximately 1,100 dedicated employees globally
- A publicly traded company:
  - NASDAQ Global Market (“MEOH”)
  - TSX (“MX”)

[1] Merchant market share represents share of total sales to non-integrated consumers of methanol. Source: Methanex

Methanex's Global Operations



Methanol

- Has diversified end uses

Traditional Uses (60% of Demand)

Formaldehyde
Wood Industry, Pharmaceuticals, Automotive

Acetic Acid
Fleece, Adhesives, Paints

Methyl Methacrylate
PMMA- LCD screens, automotive

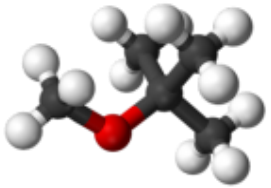
Methyl Chloride
Silicones

Energy & MTO
(40% of Demand; High Growth)

Fuel Blending

DME (di-methyl-ether)

MTO
Methanol-to-Olefins

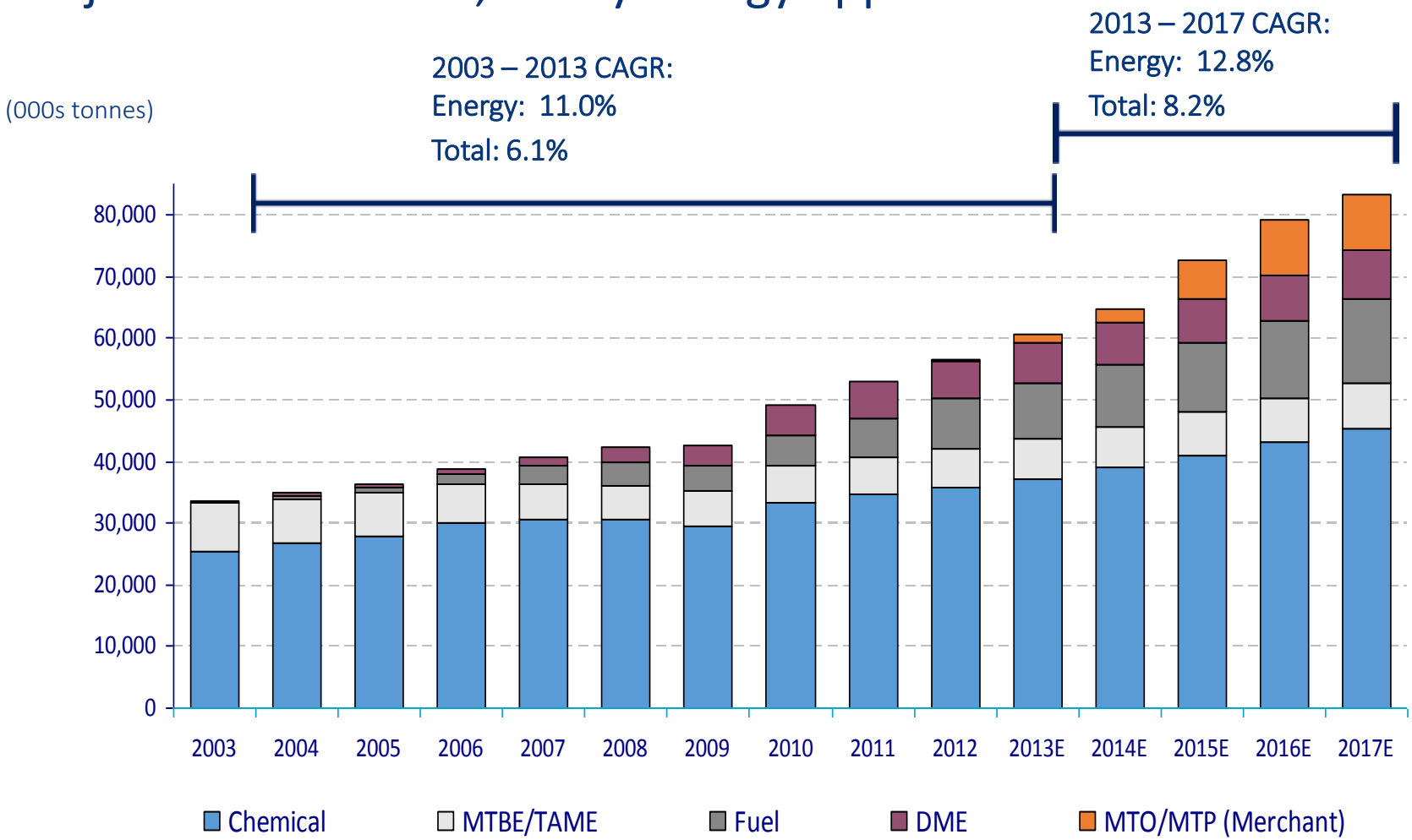


MTBE

Marine Fuels

Methanol Demand Growth

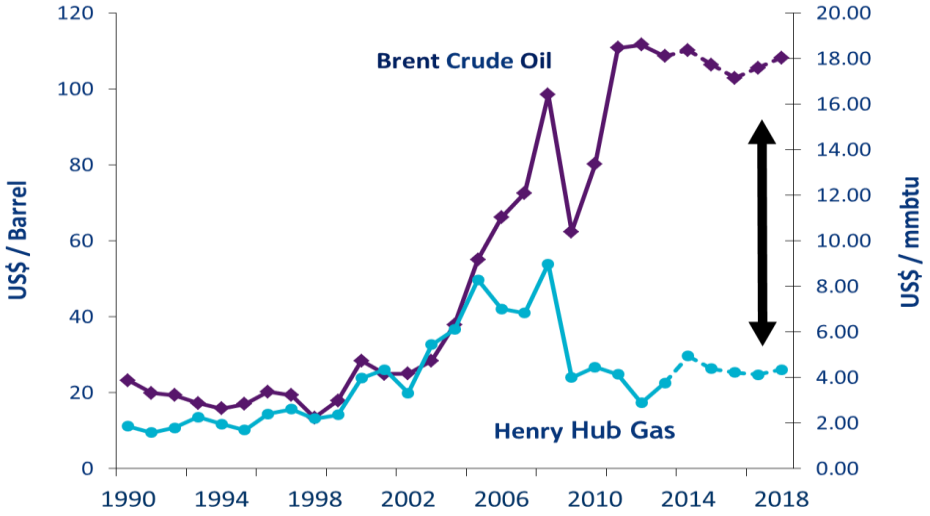
- Projected 8.2% CAGR, led by energy applications



Source: IHS Chemical 2014 Update, July, 2014. Excludes integrated methanol demand for methanol to olefins and propylene

Methanol Energy Applications - Growth Drivers

- Economics
  - Lower energy cost
  - Liquid fuel – low infrastructure costs, easy to transport
- Clean-burning / meets more stringent environmental regulations
- Energy security
- A safe fuel which biodegrades quickly (compared to petroleum fuels) in case of a spill
- Renewable Options



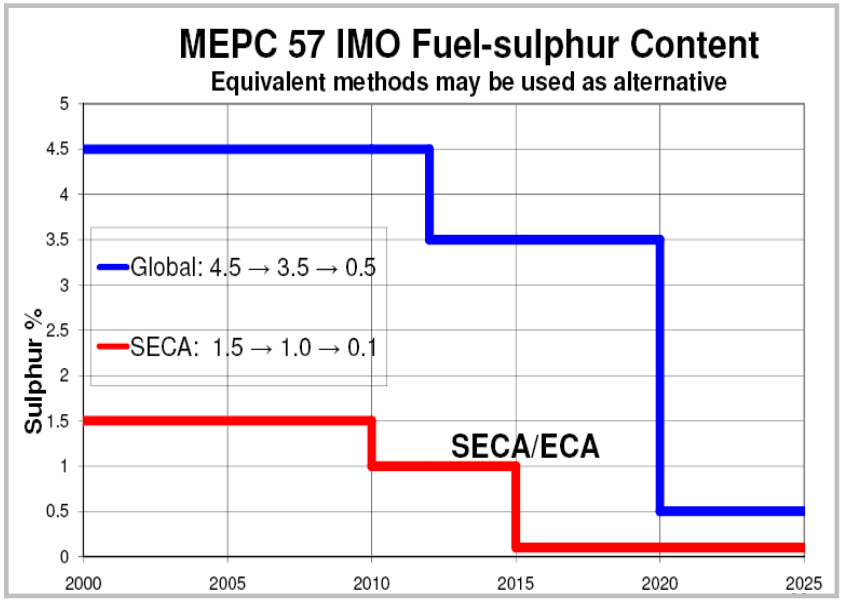
Source: Historical data and forecast from IHS Chemical, July 2014

Methanol – An Emerging Clean-Burning Marine Fuel

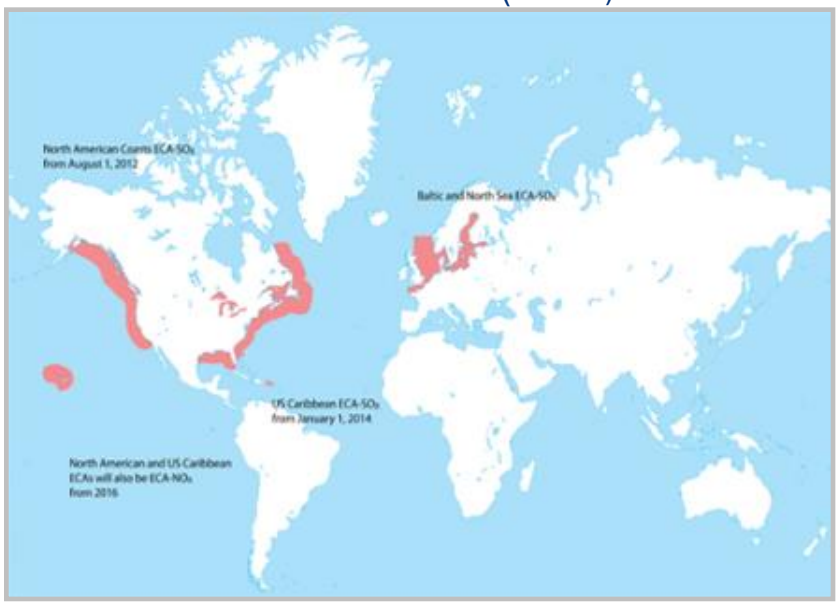
Marine Fuel Regulations Driving Change

- Regulations – shift from Heavy Fuel Oil (HFO) to lower sulphur alternatives
  - SECA / ECA target 0.1% by 2015
  - IMO global target 0.5% by 2020

HFO

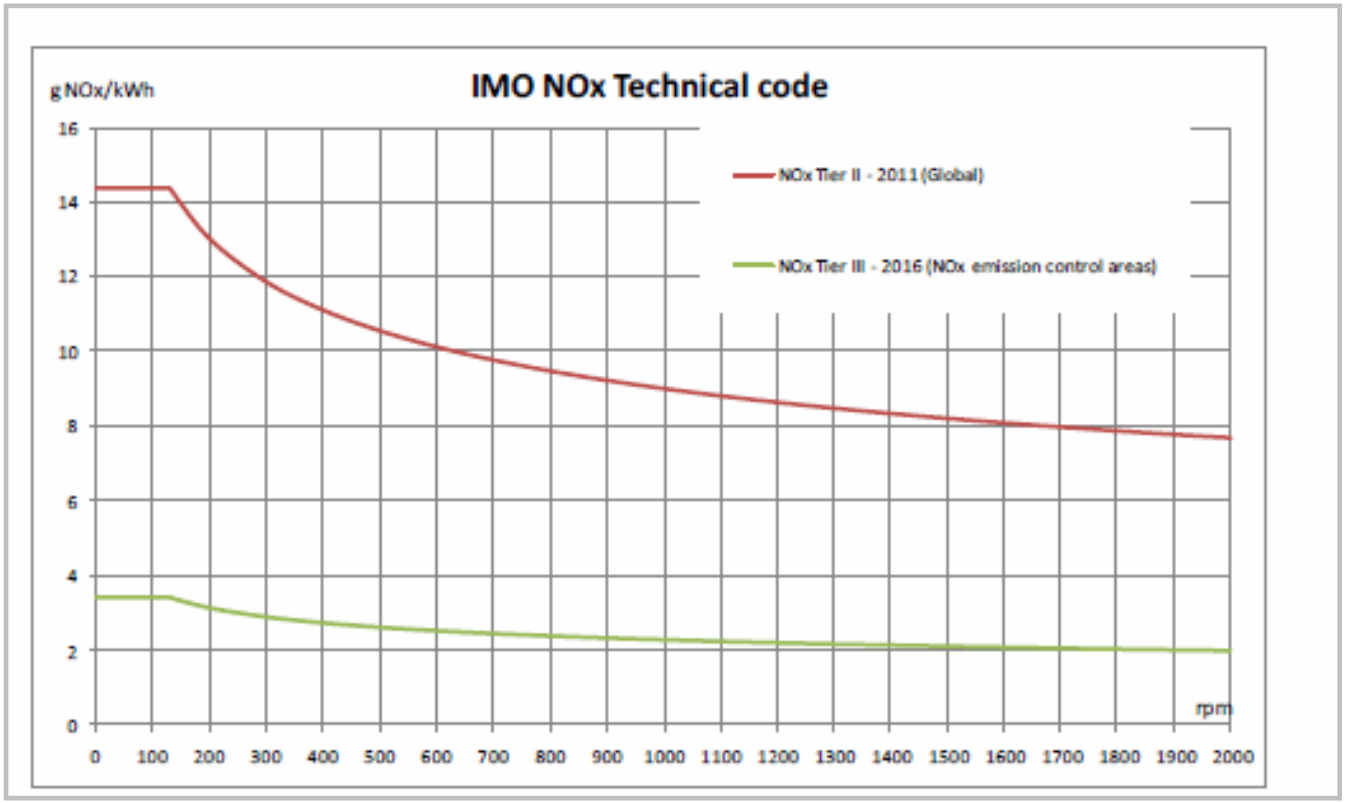


Global Emission Control Areas (ECA's)



NOx Emissions Regulations

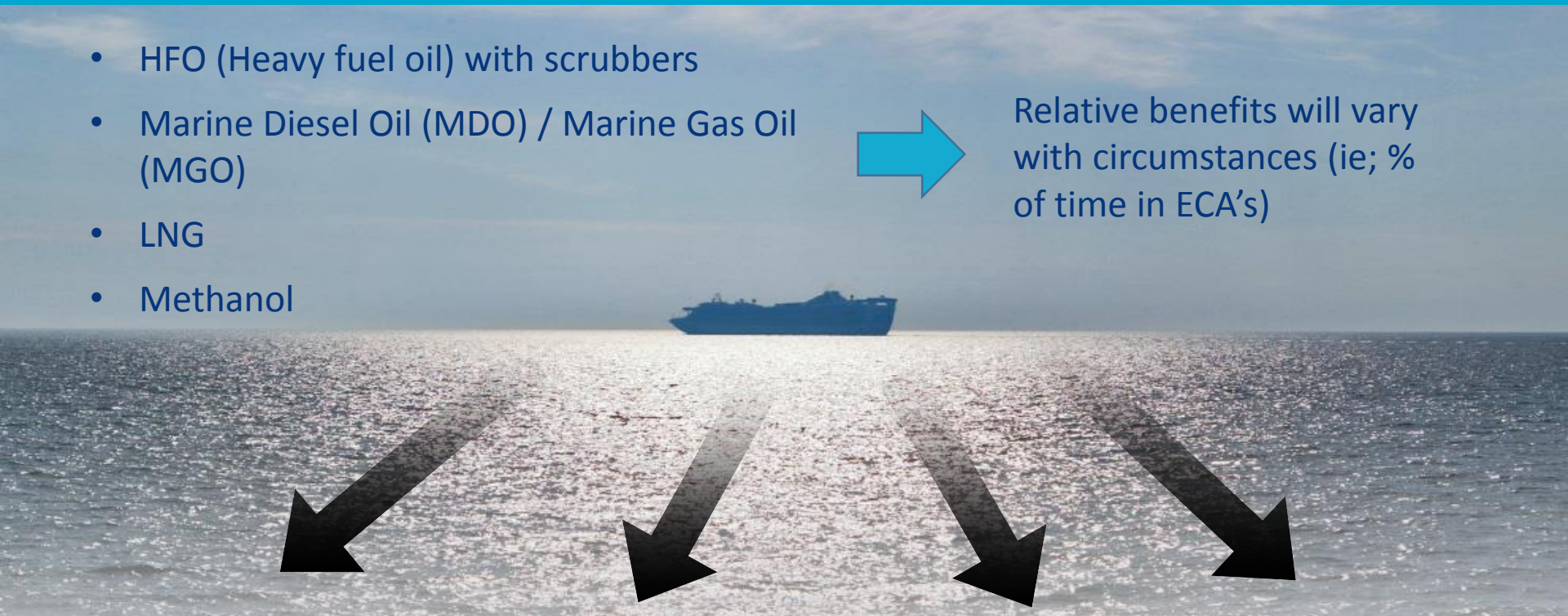
- Regulations to meet Tier III NOx emissions in North America ECA for new build vessels 2016+
- Potentially expanding to other regions



Alternatives

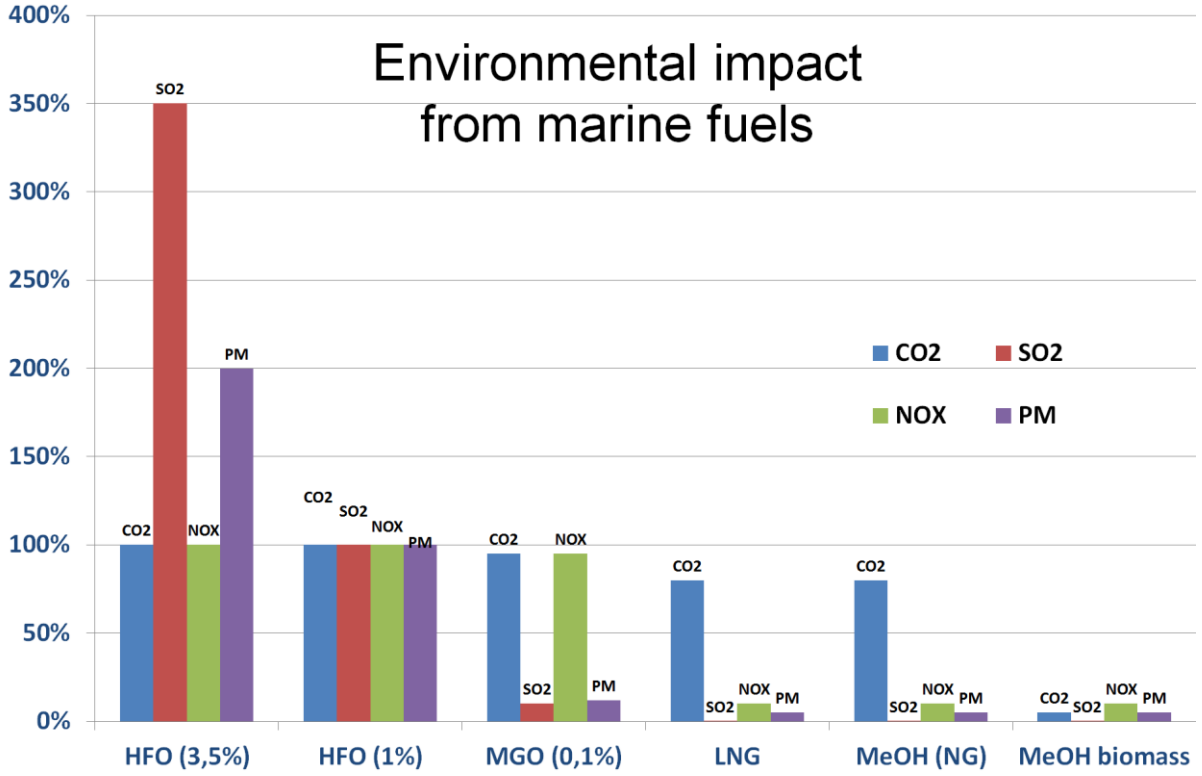
- HFO (Heavy fuel oil) with scrubbers
- Marine Diesel Oil (MDO) / Marine Gas Oil (MGO)
- LNG
- Methanol

Relative benefits will vary with circumstances (ie; % of time in ECA's)



HFO	MGO	GAS	Methanol
+ Aftertreatment	(Low Sulphur fuel) as fuel	as fuel	as fuel

Environmental Impact



Methanol:

- Achieves International Maritime Organization (IMO) targets
- Achieves lower NOx, CO2, and PM emissions than other alternatives

Source: Stena (4-stroke engine testing)

MGO

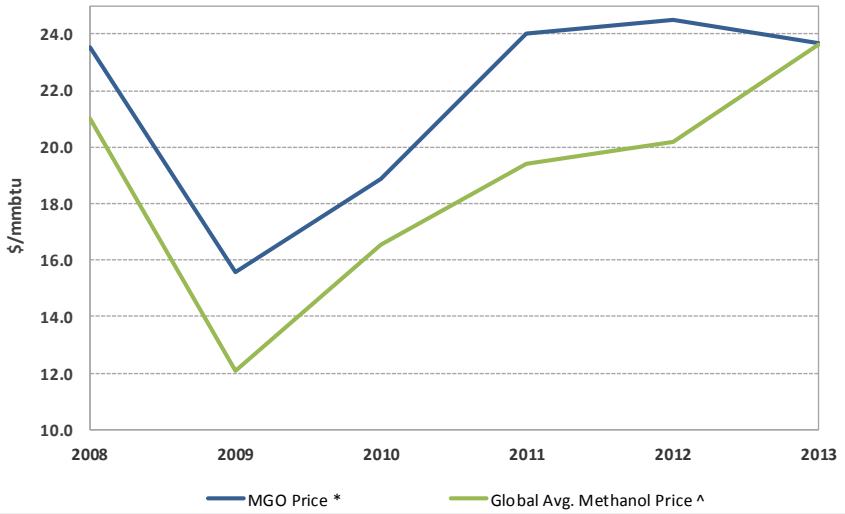
Benefits

- Straight forward alternative
- Minor engine modification from HFO (limited to no conversion costs)
- Bunkering system in place

Disadvantages/Risks

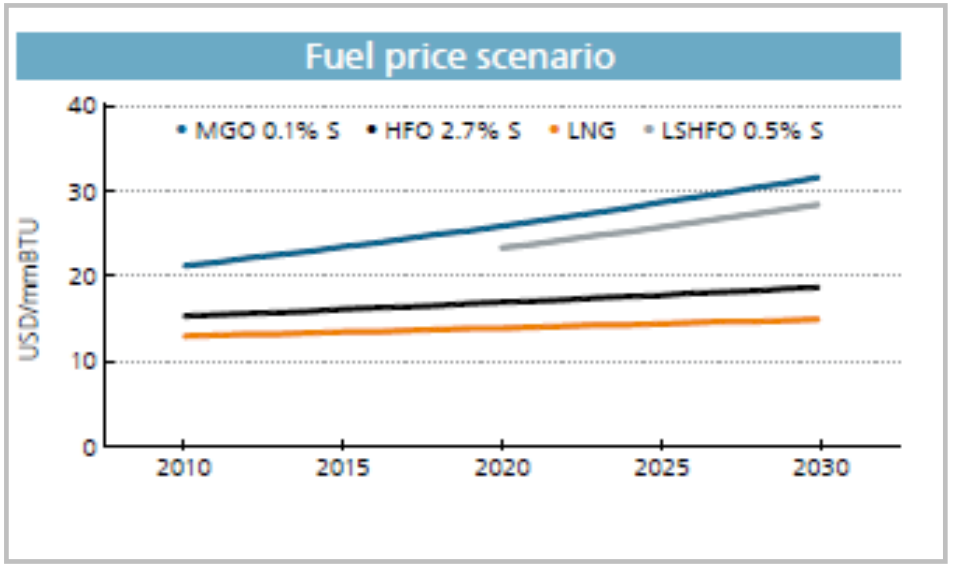
- No flex-fuel options
- Fuel Price – high historically & risk of demand pull from new regulations in 2015+
- Does not help with NOx for newbuilds 2016+

Energy Price Comparison | MGO vs Methanol (mmbtu basis, LHV)



* Calculated as the average of Singapore 0.5% MGO, San Francisco 0.5% MGO, and Rotterdam MDO pricing (LQM) when data is available. Source: Bloomberg & LQM

^ Simple average of NE China Spot, USGC Spot, and Rotterdam T2 Spot prices from CMAI.



Source: Morgan Stanley, Gemanischer Lloyd

HFO with Scrubbers

Benefits

- Can be cost effective solution [1]
- No engine or fuel system modification
- Retrofit process can be easier than other options

Disadvantages/Risks

- Added weight & loss of onboard space; may cause vessel imbalance
- Disposal of byproduct
- Limited renewable options to produce fuel
- Only benefits addresses SOx/Particulates, more capital may be required as regulations tighten
- Technology uncertainty
- No flex fuel option

[1] Morgan Stanley report (2013) cited $5.84 million as example of scrubber capex cost

LNG

Benefits

- Fuel price potentially cheaper where infrastructure exists
- Flex-fuel option
- Environmental benefits (lower SOx, Particulates, NOx)

Disadvantages/Risks

- Conversion expensive (requires engine replacement)
- Capital intensive infrastructure
- Lack of refueling infrastructure & standards
- Loss of onboard space
- Methane leakage concerns
- Price transparency

Methanol

Benefits

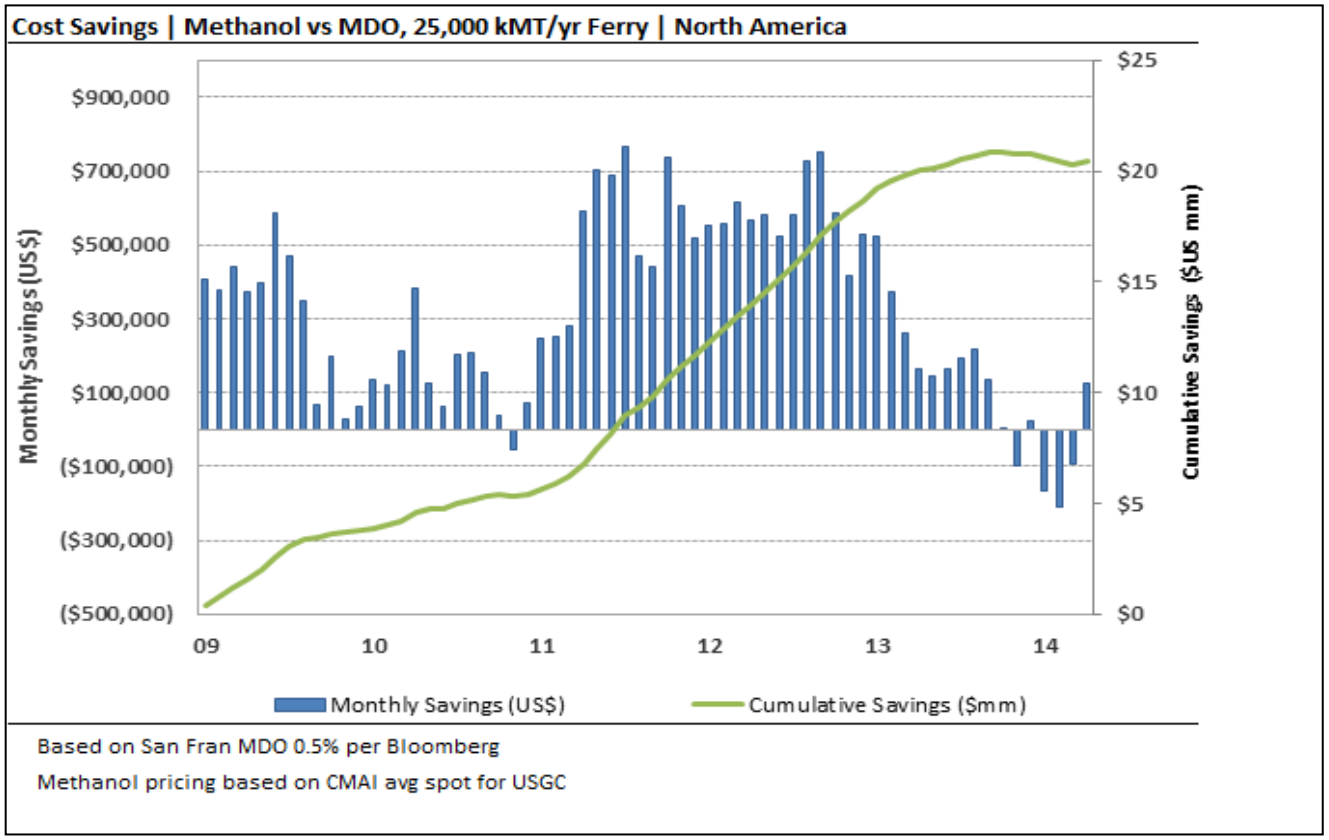
- Modest conversion & infrastructure cost
- Existing fueling infrastructure can be utilized
- Minor modifications (fuel system)
- Competitive fuel cost
- Flex-fuel option
- Renewable feedstock (low GHG potential)
- Environmental benefits (lower SOx, Particulates, NOx)

Disadvantages/Risks

- Fuel price uncertainty
- While modest, incremental conversion & infrastructure cost

Methanol Fuel Costs

- Methanol flex fuel engine allows you to switch between cheapest fuel (MGO/MDO or methanol)
  - Example: US$21 million savings 2009-2013 (~1-2 year payback period)

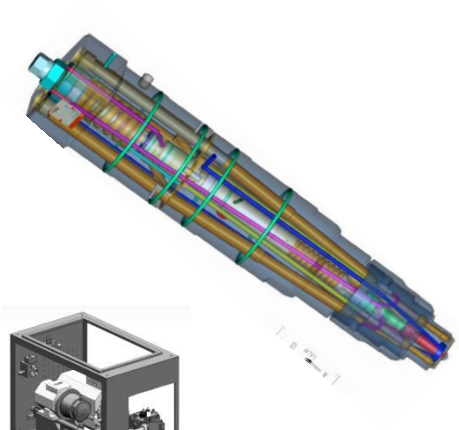


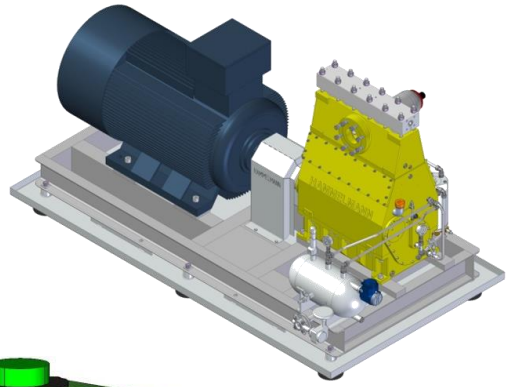
Methanol Infrastructure

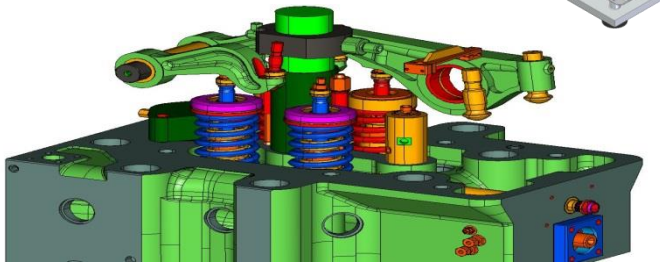
- Extensive existing terminal infrastructure + modest cost to build new terminal capacity; ability to use existing diesel infrastructure

* Terminal locations are representative based on available information and is not a complete list

Methanol Modifications Minor

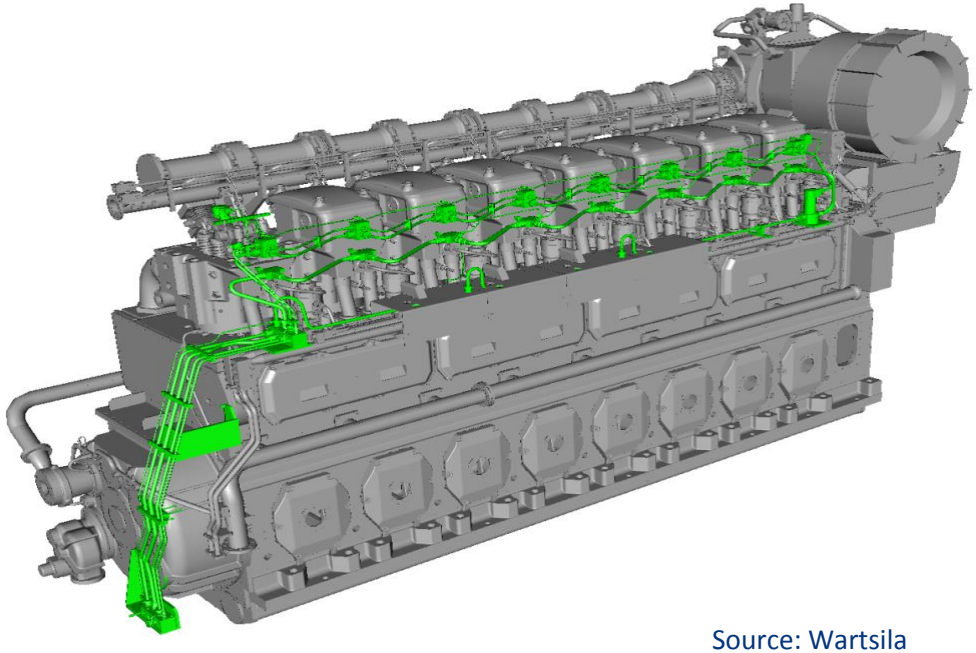






On-engine scope is limited to exchange of cylinder heads, fuel injectors and fuel plungers in existing fuel pumps.
A common rail system for methanol injection will be added on the engine.

In addition to the Engine related conversion includes the conversion kit a stand-alone high pressure methanol pump with belonging oil unit for supply of sealing oil and control oil to the fuel injectors.

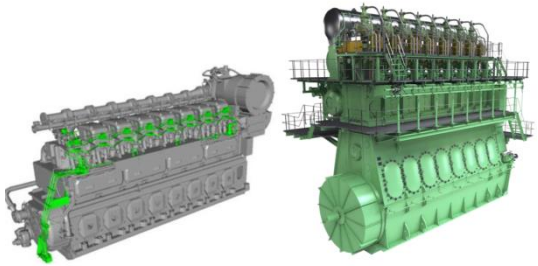


Source: Wartsila

Methanol Commercialization

- SPIRETH Project – technology confirmation
- Engine manufacturers developing methanol compatible engines
  - MAN – 2 stroke low speed engines
  - Wartsila – 4 stroke medium speed engines
  - Projects being proposed for smaller high speed engines (e.g. barges)
- Standards and regulations under development
  - Risk Classification Societies – DNV, Lloyd's Register
  - Marine fuels regulations being updated for methanol

WÄRTSILÄ & MAN



Methanol as a Marine Fuel – Commercial Developments

- Stena converting Germanica (2015) and potentially up to 25 ferries to methanol in Northern Europe
- Methanex (Waterfront Shipping) taking delivery of seven new methanol flex-fuel engine ships in 2016 (MAN's ME-LGI flex fuel engine)
- Significant interest developing in Europe, North America & Asia

Shipping Company Limited
A Responsible Care® Company

Case Study:
Stena/Effship Project

- Converting ferries to run on methanol (ECA 100% of time)
- Stena Germanica 2015 (potentially up to 25 vessels)

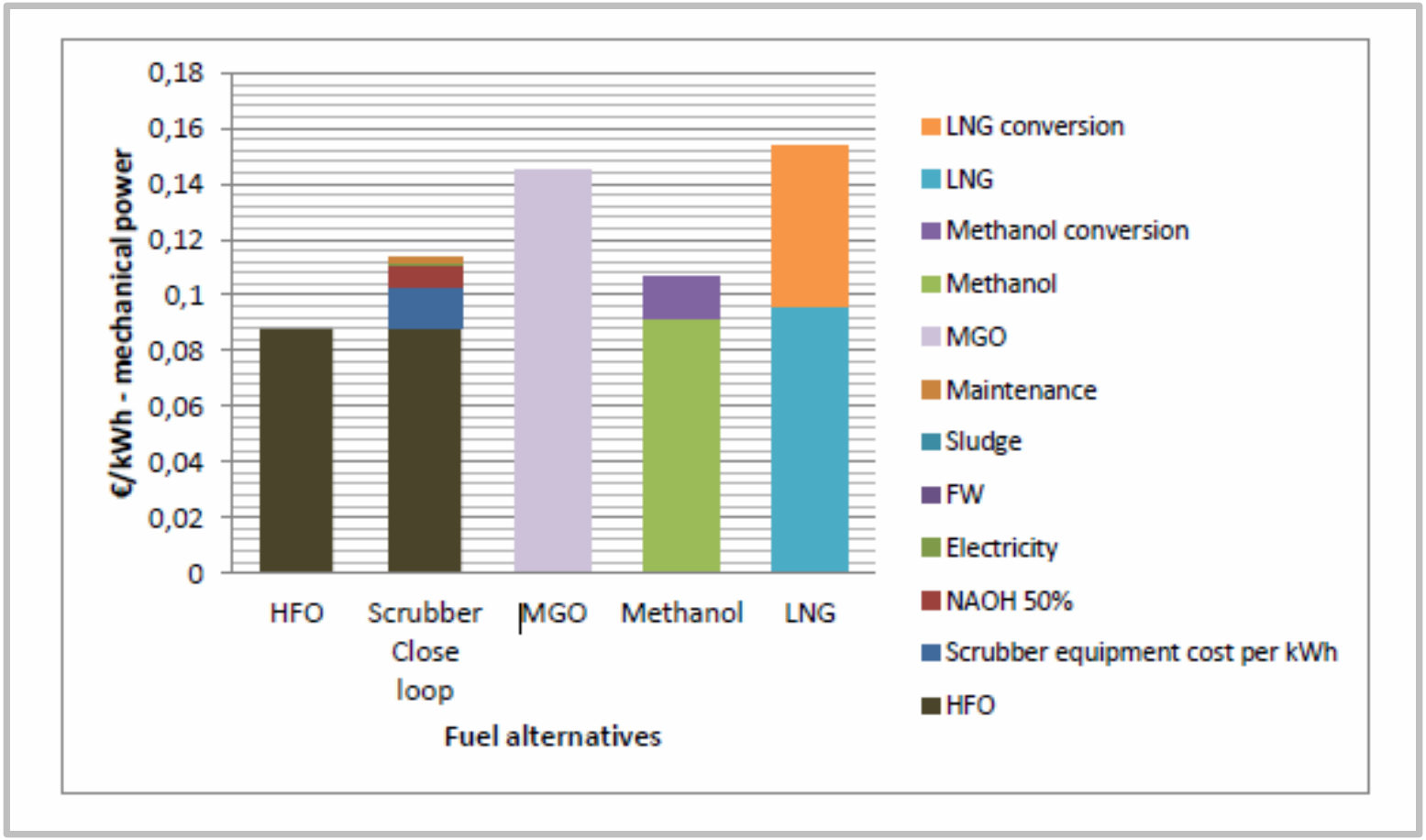
Case Study: Infrastructure Investment

- Methanol infrastructure significantly lower cost than LNG

Cost	Methanol (flex fuel engine)	LNG	MGO	Scrubber
Terminal Build	$7,100,000	$71,000,000	-	-
Bunker Vessel Conversion	$2,100,000	-	-	-
Bunker Vessel Build	-	$42,900,000	-	-
Feeder Boat Build	-	$71,400,000	-	-
Total Infrastructure	$9,200,000*	$185,300,000*	minimal	minimal

Source: Stena (25MW ferry conversion example)
* Costs in € converted to US$ at 1.428571

Case Study:
Conversion and Fuel Comparison



Source: Effship Project Summary Report, 2013 (* Costs do not include infrastructure development). Fuel cost based on market price 2012. Conversion based on 5 years pay-back and 6% interest

Methanol – An Emerging Marine Fuel Alternative

- ✓ Clean Burning
- ✓ Economical Fuel Cost
- ✓ Modest Investment Cost
- ✓ Existing Infrastructure
- ✓ Fuel Flexibility
- ✓ Renewable Options

Thank You

Contact Information:
Methanex Corporation
Jason Chesko
Senior Manager, Global Market Development
(604) 661-2680
jchesko@methanex.com

methanex
the power of agility

A RESPONSIBLE CARE® COMPANY