

LNG som drivstoff til skip

Økonomiske betingelser for videre utvikling

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Agenda

- Status og forventet utvikling
- Alternative drivstoff – LNG får tøff konkurranse
- Under hvilke forhold vil LNG utvikle seg til en foretrukket løsning?

48 LNG fuelled ships in operation worldwide

Ships in operation

Year	Type of vessel	Owner	Class	Year	Type of vessel	Owner	Class
2000	Car/passenger ferry	Fjord1	DNV	2012*	Car/passenger ferry	Fjord1	DNV
2003	PSV	Simon Møkster	DNV	2012	PSV	Eidesvik	DNV
2003	PSV	Eidesvik	DNV	2012	PSV	Olympic Shipping	DNV
2006	Car/passenger ferry	Fjord1	DNV	2012	PSV	Island Offshore	DNV
2007	Car/passenger ferry	Fjord1	DNV	2012	General Cargo	Nordnorsk Shipping	DNV
2007	Car/passenger ferry	Fjord1	DNV	2012	PSV	Eidesvik Shipping	DNV
2007	Car/passenger ferry	Fjord1	DNV	2012	PSV	Island Offshore	DNV
2007	Car/passenger ferry	Fjord1	DNV	2012	Car/passenger ferry	Torghatten Nord	DNV
2008	PSV	Eidesvik Shipping	DNV	2012	Car/passenger ferry	Torghatten Nord	DNV
2009	PSV	Eidesvik Shipping	DNV	2012	Car/passenger ferry	Torghatten Nord	DNV
2009	Car/passenger ferry	Tide Sjø	DNV	2013	PSV	REM	DNV
2009	Car/passenger ferry	Tide Sjø	DNV	2013	RoPax	Viking Line	LR
2009	Car/passenger ferry	Tide Sjø	DNV	2013	Car/passenger ferry	Torghatten Nord	DNV
2009	Patrol vessel	Remøy Management	DNV	2013	Harbor vessel	Incheon Port Authority	KR
2009	Car/passenger ferry	Fjord1	DNV	2013	General Cargo	Eidsvaag	DNV
2010	Patrol vessel	Remøy Management	DNV	2013	RoPax	Fjordline	DNV
2010	Car/passenger ferry	Fjord1	DNV	2013	High speed RoPax	Buquebus	DNV
2010	Patrol vessel	Remøy Management	DNV	2013	Tug	CNOOC	CCS
2010	Car/passenger ferry	Fjord1	DNV	2013	Tug	CNOOC	CCS
2010	Car/passenger ferry	Fjord1	DNV	2013	Car/passenger ferry	Norled	DNV
2010	Car/passenger ferry	Fosen Namsos Sjø	DNV	2014	Car/passenger ferry	Norled	DNV
2011	PSV	DOF	DNV	2014	Tug	Buksér & Berging	DNV
2011*	Chemical tanker	Tarbit Shipping	GL	2014	RoPax	Fjordline	DNV
2011	Car/passenger ferry	Fjord1	DNV				
2011	PSV	Solstad Rederi	DNV				

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Excluding LNG carriers and inland waterway vessels

* **Conversion project**

53 confirmed LNG fuelled newbuilds

Confirmed orderbook

Year	Type of vessel	Owner	Class	Year	Type of vessel	Owner	Class
2014	Ro-Ro	Norlines	DNV	2015	LEG carrier	Evergas	BV
2014	Ro-Ro	Norlines	DNV	2015	LEG carrier	Evergas	BV
2014	Patrol vessel	Finish Border Guard	GL	2015	LEG carrier	Evergas	BV
2014	Car/passenger ferry	Society of Quebec	LR	2015	Bulk ship	Erik Thun	LR
2014	Car/passenger ferry	Society of Quebec	LR	2015	Container Ship	Brodosplit	DNV GL
2014	Car/passenger ferry	Society of Quebec	LR	2015	Container Ship	Brodosplit	DNV GL
2014	Tug	Buksér & Berging	DNV	2015	PSV	Siem Offshore	
2014	PSV	Harvey Gulf Int.	ABS	2015	PSV	Siem Offshore	
2014	PSV	Harvey Gulf Int.	ABS	2015	Container Ship	TOTE Shipholdings	ABS
2014	PSV	Harvey Gulf Int.	ABS	2016	Container Ship	TOTE Shipholdings	ABS
2014	PSV	Harvey Gulf Int.	ABS	2016	Icebreaker	Finnish Transport A.	LR
2014	Gas carrier	SABIC	BV	2016	PSV	Siem Offshore	
2014	Gas carrier	SABIC	BV	2016	PSV	Siem Offshore	
2014*	Product tanker	Bergen Tankers	LR	2016	Chemical tanker	Terntank	
2014	General Cargo	Egil Ulvan Rederi	DNV	2016	Chemical tanker	Terntank	
2014	General Cargo	Egil Ulvan Rederi	DNV	2016*	Ro-Ro	TOTE Shipholdings	ABS
2014	PSV	Remøy Shipping	DNV	2016*	Ro-Ro	TOTE Shipholdings	ABS
2014	Car/passenger ferry	AG Ems	GL	2016	Car carrier	UECC	LR
2014*	Car/passenger ferry	AG Ems	GL	2016	Car carrier	UECC	LR
2014	Car/passenger ferry	Samsøe Municipality	DNV	2016	Car/passenger ferry	Boreal Transport	
2014	Ro-Ro	Sea-Cargo	DNV	2016	Car/passenger ferry	Boreal Transport	
2014	Ro-Ro	Sea-Cargo	DNV	2017	RoPax	Brittany Ferries	BV
2015	PSV	Siem Offshore	DNV	2017	Container Ship	Crowley Maritime	DNV GL
2015	PSV	Siem Offshore	DNV	2017	Container Ship	Crowley Maritime	DNV GL
2015	PSV	Simon Møkster	DNV	2018	Container Ship	Matson Navigation	DNV GL
2015	PSV	Harvey Gulf Int.	ABS	2018	Container Ship	Matson Navigation	DNV GL
2015	PSV	Harvey Gulf Int.	ABS				

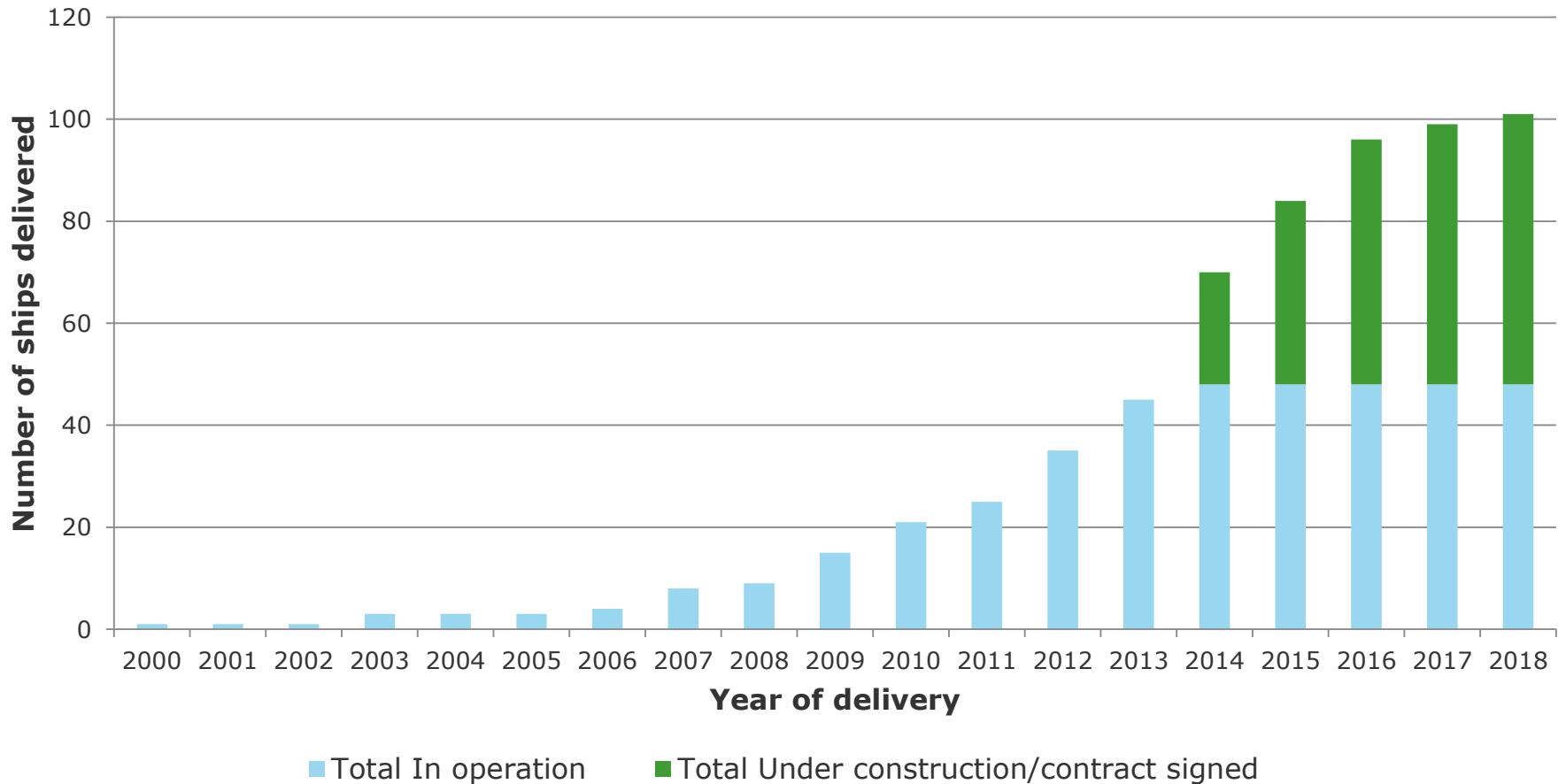
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Excluding LNG carriers and inland waterway vessels

* **Conversion project**

There are currently 101 confirmed LNG fuelled ship projects

Development of LNG fuelled fleet

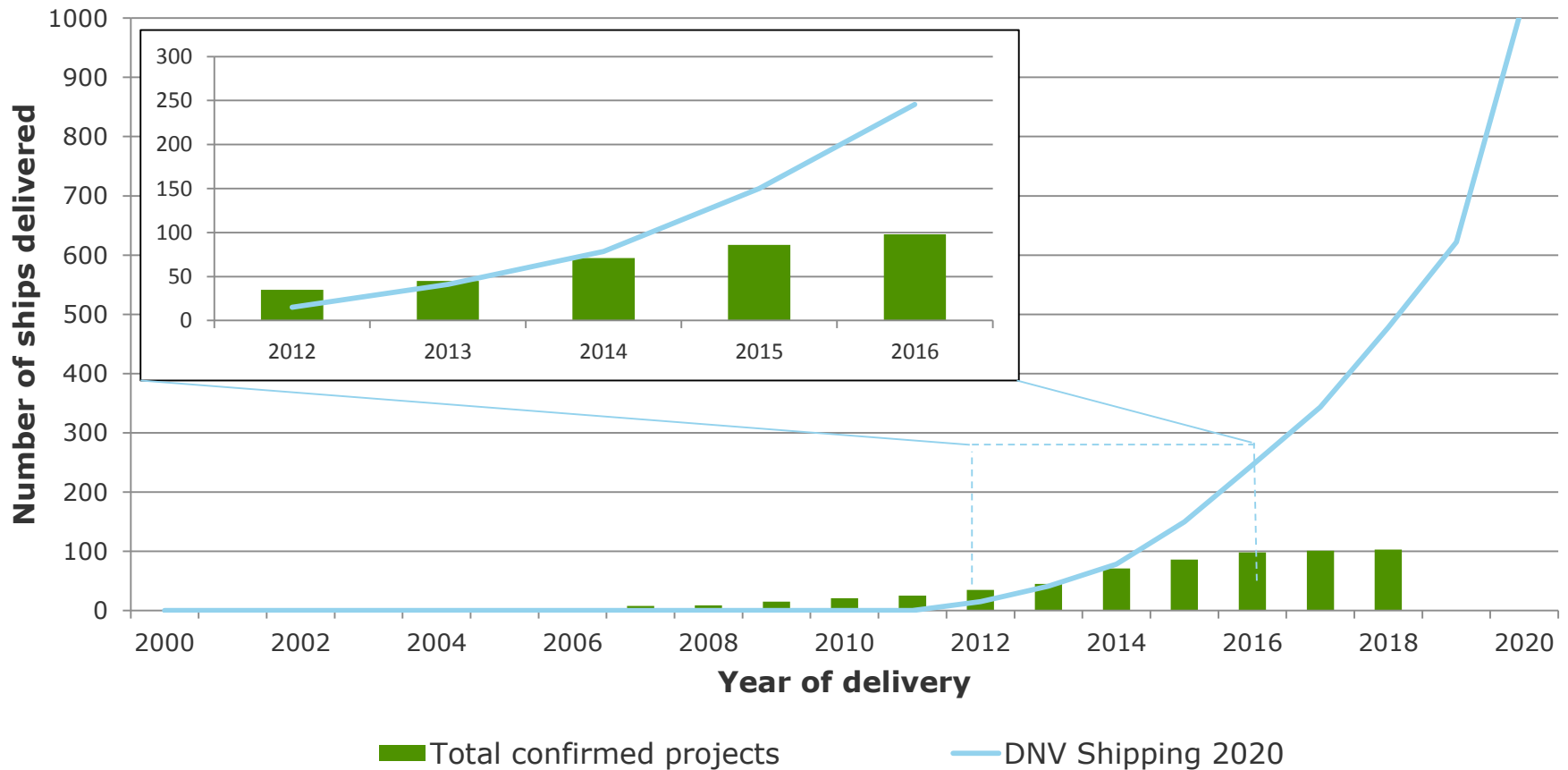


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Excluding LNG carriers and inland waterway vessels

Current development is in line with DNV GL projections Will the exponential growth continue?

Development of LNG fuelled fleet

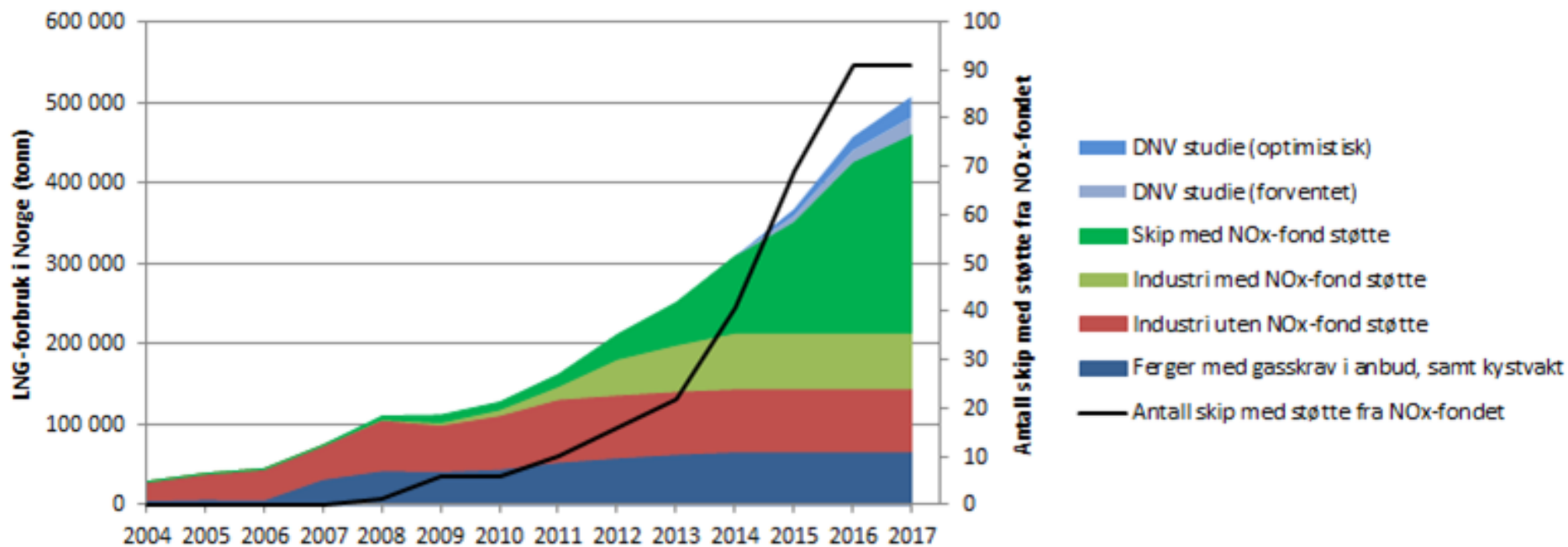


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Excluding LNG carriers and inland waterway vessels

Forbruket av LNG i Norge vil øke kraftig fremover, utover dagens produksjonskapasitet

LNG-forbruk i Norge 2004-2017



For the first time (in 100 years) the maritime industry is faced with a fuel choice

Global solutions

MGO

**HFO
(+scrubber)**

LNG

**Biofuel,
Methanol
+++**

Hydrogen

Battery

Local alternatives

LNG has the potential to become a very good alternative for large parts of the world fleet, but look out for the competition

Area	Segment	LNG	HFO (+ scrubber)	MGO	Battery
Norway	Ferry	X		X	X
	OSV	X		X	
	Tug	X		X	X
	Fishing	X		X	
	Short sea	X	X	X	
	RoPax	X	X	X	
Europe	All	X	X	X	
North America	All	X	X	X	
International	Deep sea	X	X	X	

X= Technically feasible and potentially financially viable

The industry will adopt the solutions that seem to promise the lowest cost of transportation over time, to stay competitive

I DAG

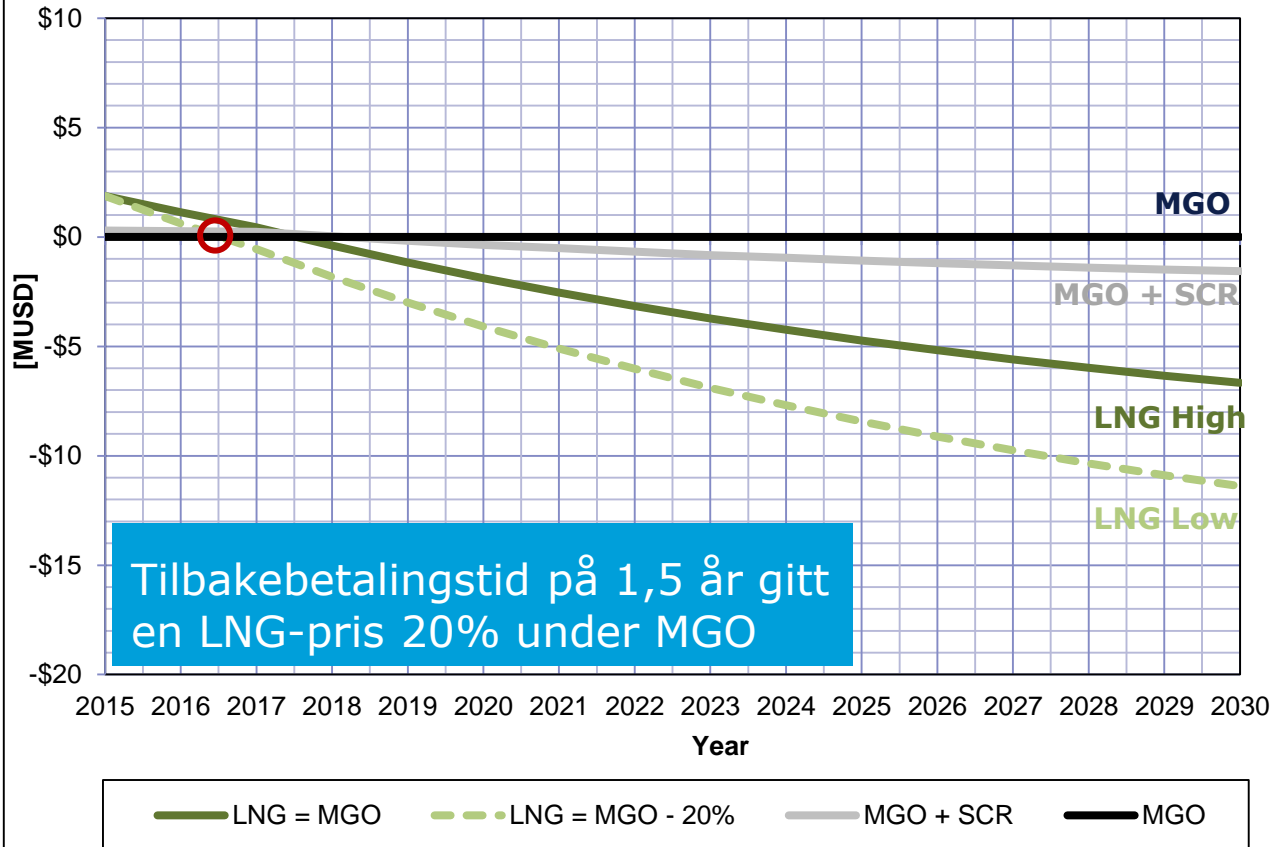
- Merinvestering for LNG drevet PSV
45-50 MNOK
- Støtte fra NOx-fondet
Inntil 80%
- Ytterligere avgiftsfordeler i Norge
NOx og CO2

LNG eller Diesel?

Operasjon i Norge, med avgiftsfordeler og NOx-fond støtte

Example 1: PSV

Cumulative discounted cost difference compared to baseline [MUSD]



ENGINE AND OPERATION

Time in ECA	100%
Installed power	8,000 kW
Baseline	Marine Gas Oil (MGO)

FUEL PRICE

MGO	1,000 USD/tonne + tax
LNG High	MGO parity
LNG Low	MGO parity - 20%

FINANCIAL

Discount rate	8%
Inv. decision	Newbuild
Tax regime	CO ₂ , SO _x and NO _x
CAPEX LNG	1,900,000 USD
CAPEX SCR	300,000 USD

Negative values means savings compared to fuel switch

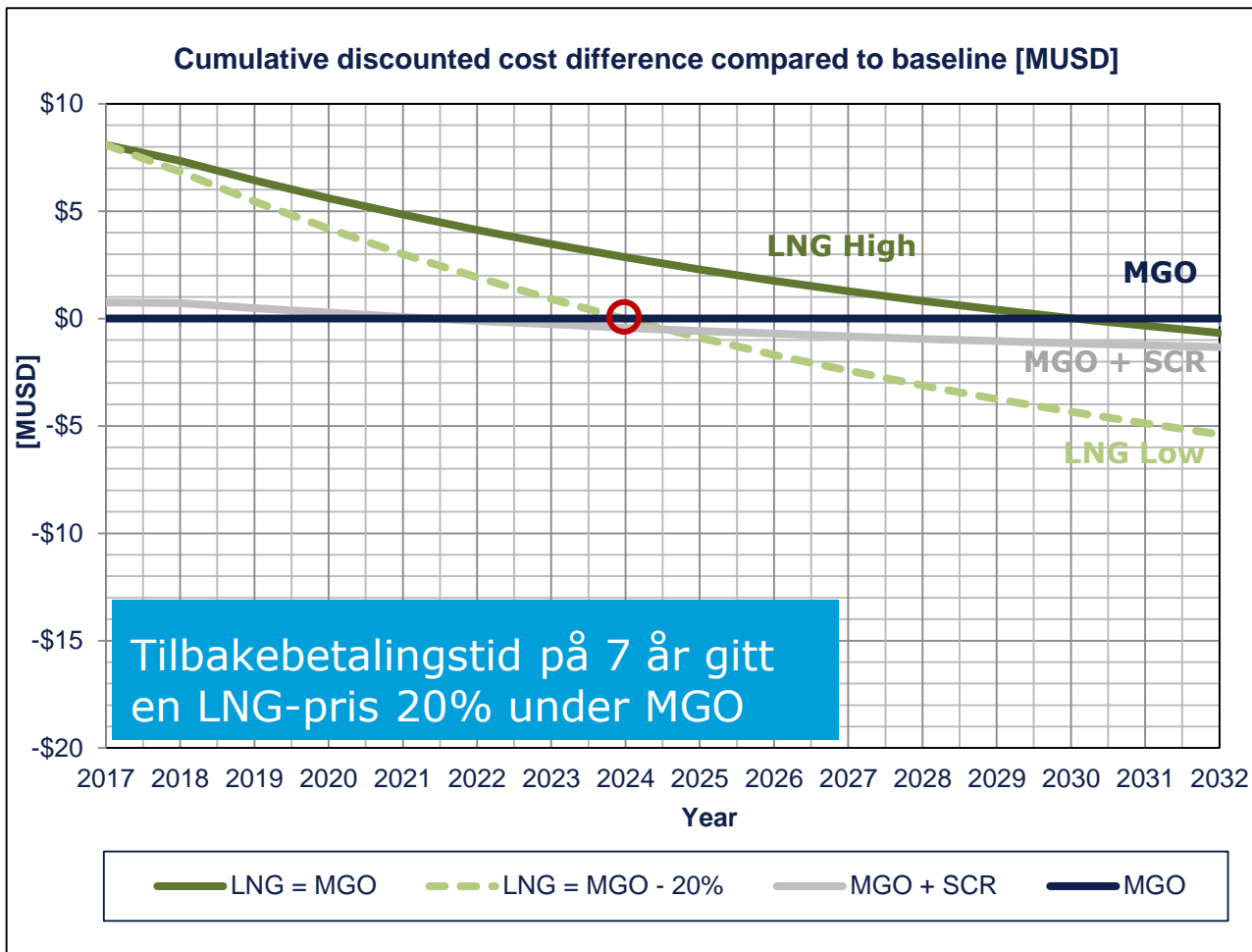
I MORGEN

- **NOx-fondet har nå mottatt søknader omtrent tilsvarende resterende midler (herav mange søknader om LNG skip)**
- **I nær fremtid må investering i LNG drevne skip realiseres uten NOx-støtte**

LNG eller Diesel?

Operasjon i Norge, uten NOx-fond støtte men med avgiftsfordeler

Example 2: PSV



ENGINE AND OPERATION

Time in ECA	100%
Installed power	8,000 kW
Baseline	Marine Gas Oil (MGO)

FUEL PRICE

MGO	1,000 USD/tonne + tax
LNG High	MGO parity
LNG Low	MGO parity - 20%

FINANCIAL

Discount rate	8%
Inv. decision	Newbuild
Tax regime	CO ₂ , SO _x and NO _x
CAPEX LNG	8,100,000 USD
CAPEX SCR	750,000 USD

Negative values means savings compared to fuel switch

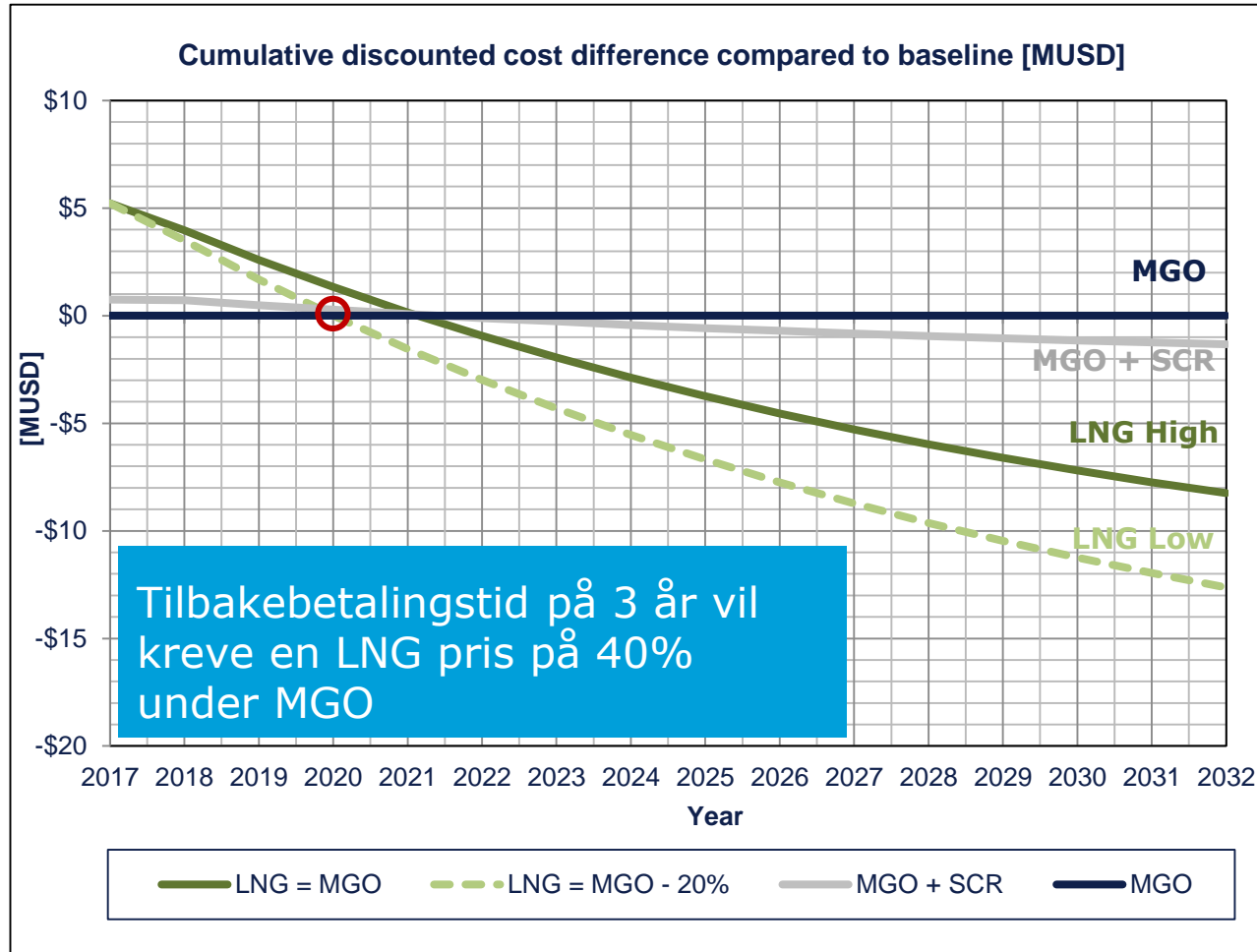
I MORGEN

- Avgiftsfordeler består, men industrien må tilpasse seg for at utviklingen skal fortsette
 - Investeringskostnad må ned
 - LNG pris må ned
 - Charter må gi tydeligere signal til offshore rederiene om at de ønsker å utløse disse besparelsene

LNG eller Diesel?

Operasjon i Norge, uten NOx-fond støtte men med avgiftsfordeler og 35% redusert investering

Example 3.1: PSV



ENGINE AND OPERATION

Time in ECA	100%
Installed power	8,000 kW
Baseline	Marine Gas Oil (MGO)

FUEL PRICE

MGO	1,000 USD/tonne + tax
LNG High	MGO parity - 20%
LNG Low	MGO parity - 40%

FINANCIAL

Discount rate	8%
Inv. decision	Newbuild
Tax regime	CO ₂ , SO _x and NO _x
CAPEX LNG	5,200,000 USD
CAPEX SCR	750,000 USD

Negative values means savings compared to fuel switch

Hva er ambisjonen til næringen for bruk av LNG som drivstoff for skip?

LNG foretrukket løsning for

2000

- Prosjekter utløst av myndighetene?

2010

- Prosjekter finansiert med vesentlige subsidier?
- Norsk nærskipfart med høy andel MGO operasjon som alternativ (uten NOx-støtte)?

2015

- Short sea med vesentlig andel ECA?

2020

- Deep sea med lav andel ECA?

Thank you for your attention

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