

# RETAIL LNG, A FUTURE GROWTH MARKET FOR LNG

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Patron



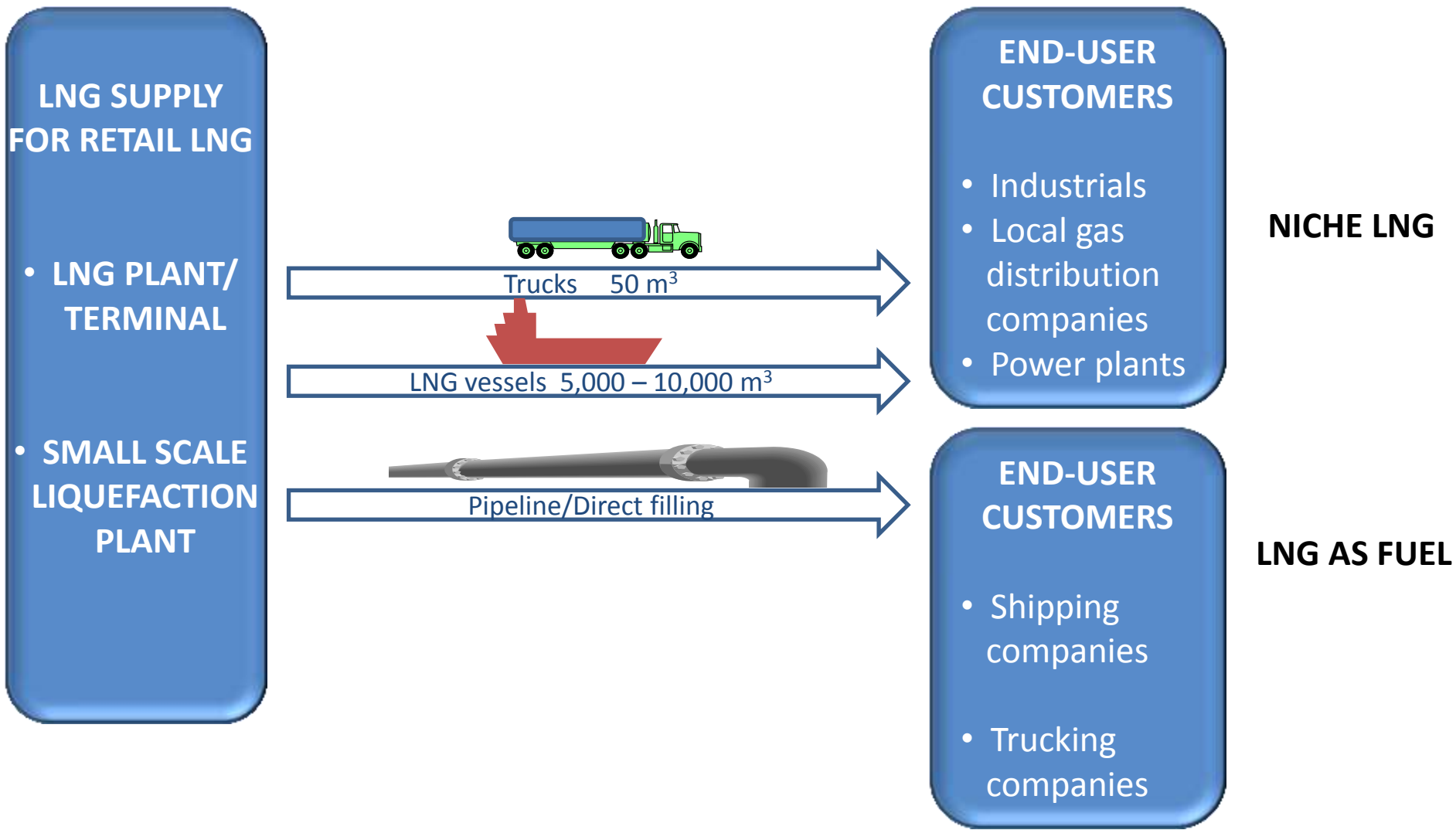
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# Retail LNG: one word for different concepts



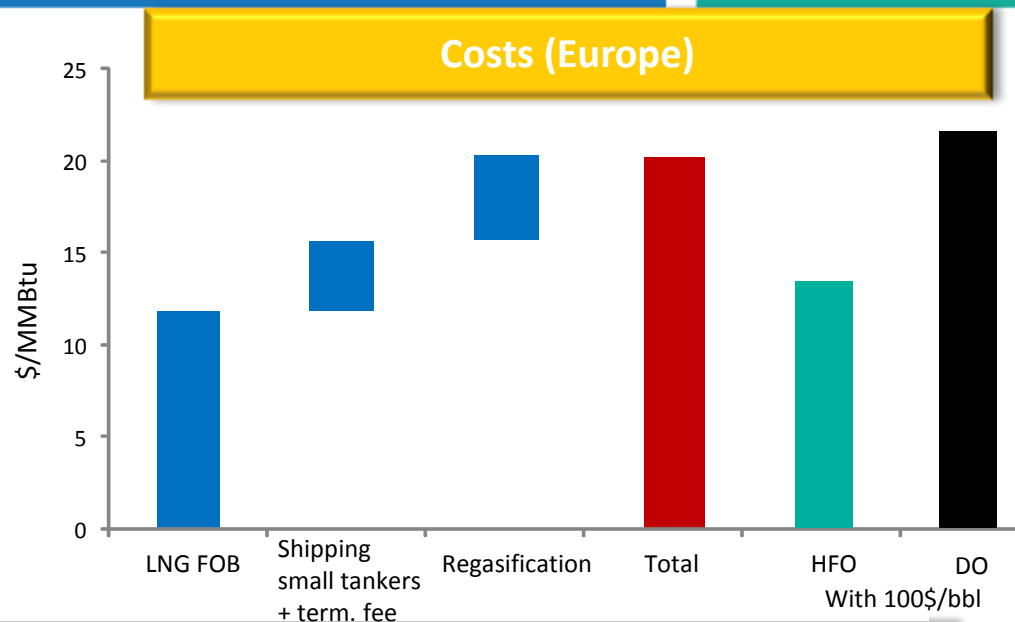
## Retail LNG: the main uses

	Uses	2025 target market (mtpa)	Clients	Competitor
<b>Niche LNG</b>	Remote islands	10-15	Power plants	HFO, LPG, Diesel
	Remote areas (inland)	5-10	Power plants, Local distribution companies, industries	HFO, LPG, Diesel
<b>LNG as fuel</b>	Sea-going shipping – worldwide	30	Shipping companies	HFO, MDO
	Inland shipping (Europe)	2.5	Inland Shipping companies	HFO, MDO
	Trucks	>10	Trucking companies	Diesel

# Niche LNG: Remote islands

Potential volumes / Growth

10 -15 mtpa by 2025



## Key success factors

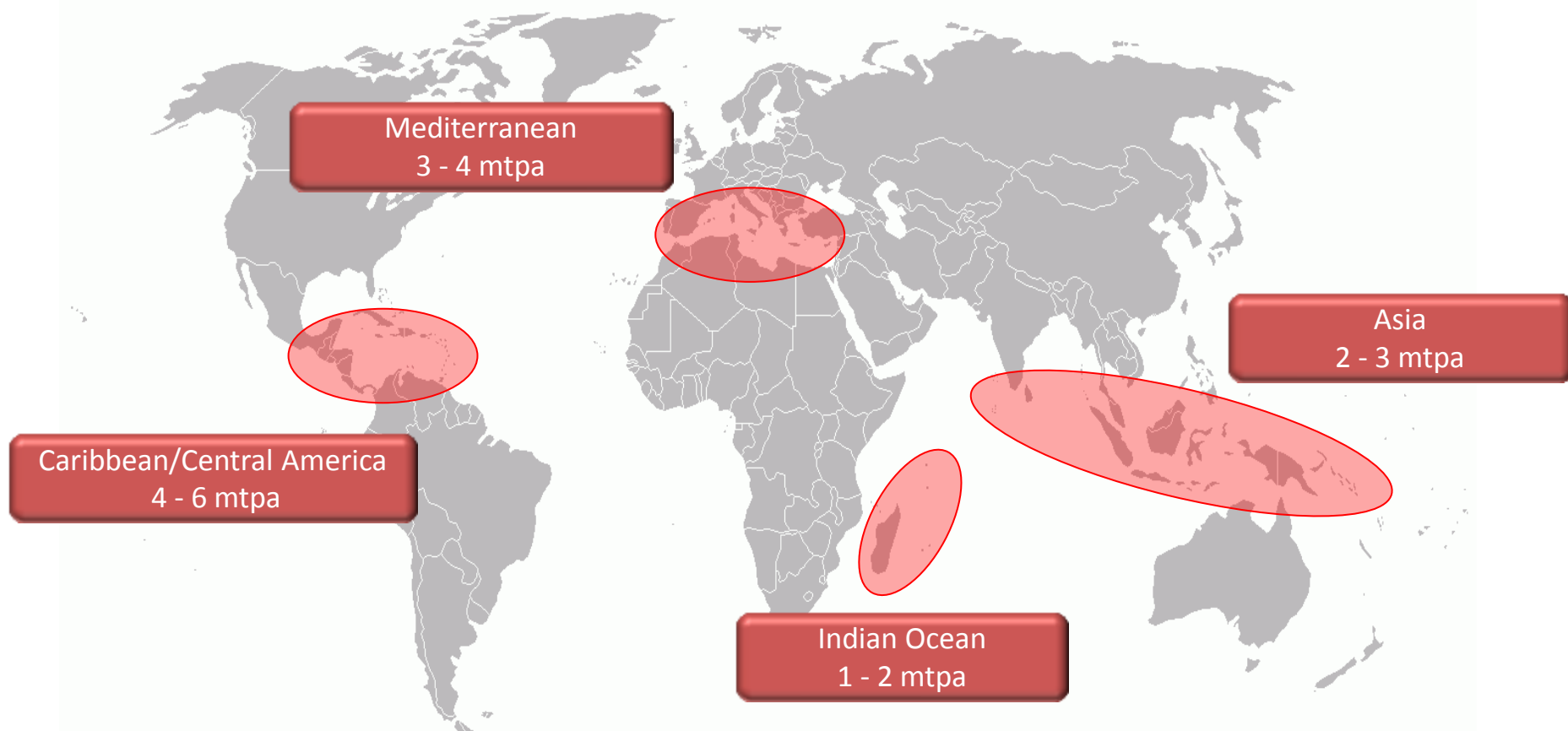
- Need to decrease heavy dependence on expensive liquid fuels
- Increasing environmental sensitivity

## Hurdles

- High unit costs due to low volumes : storage, marine facilities, regasification for small volumes
- High shipping costs depending on volumes and distance (\$2.5 to \$4/MMBtu)
- Counter Party Risk: limited local market alternative / fall-back
- Need to design specific small –scale LNG chains

# Global Potential of Niche LNG : Remote Islands

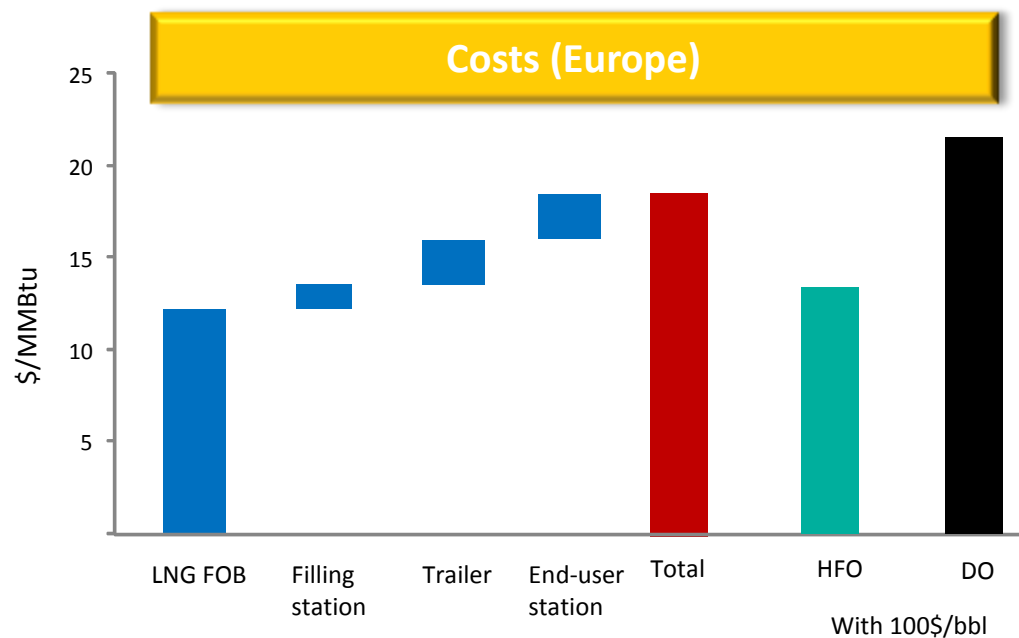
➤ A quick overview of the global market



# Niche LNG: Remote areas inland

Potential volumes / Growth

5 -10 mtpa by 2025



## Key success factors

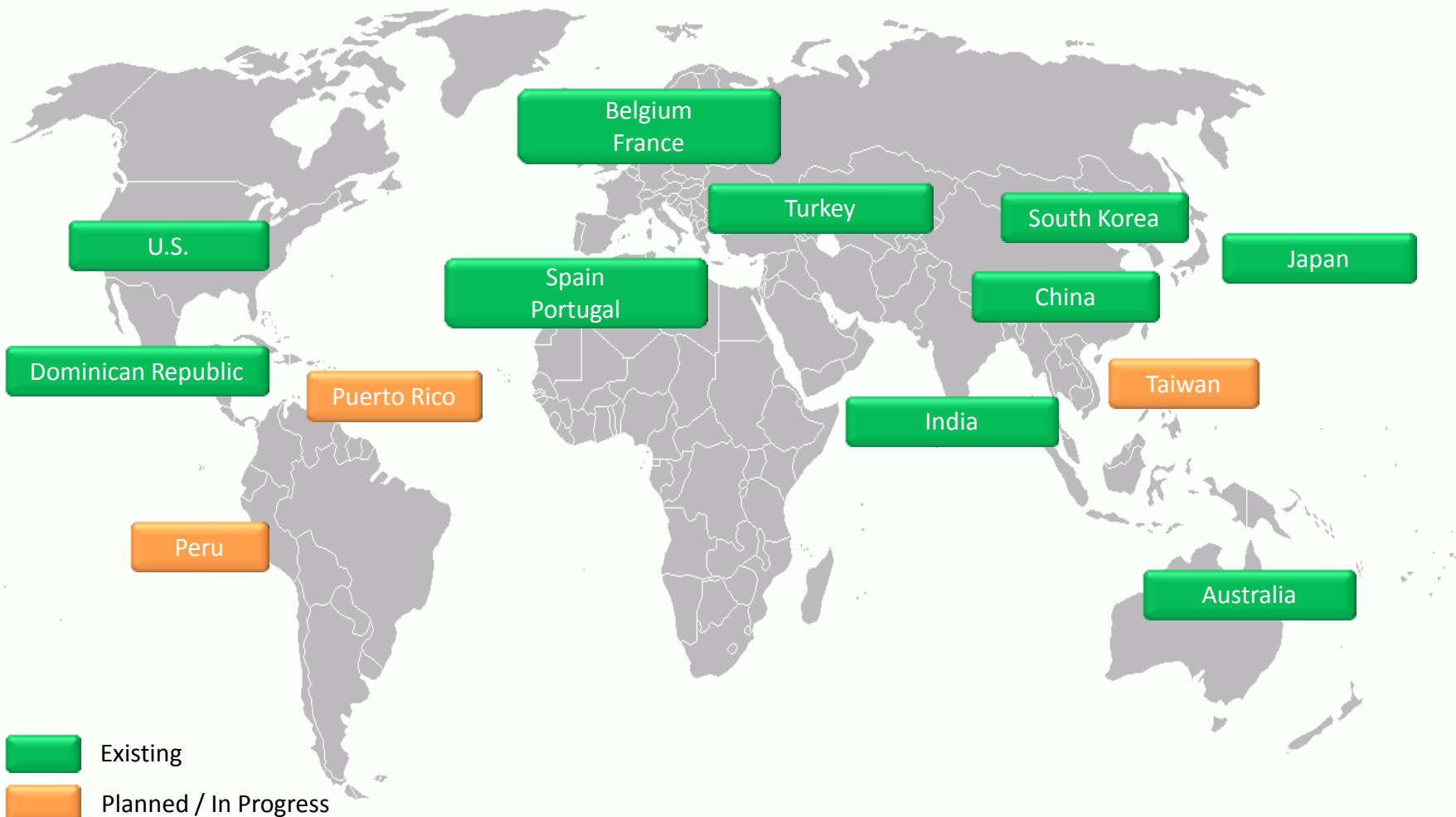
- Costs are stable and well-known
- Large range of suppliers for most of the equipments
- Safety records are good

## Hurdles

- Varying tax and regulatory environments, especially in Europe

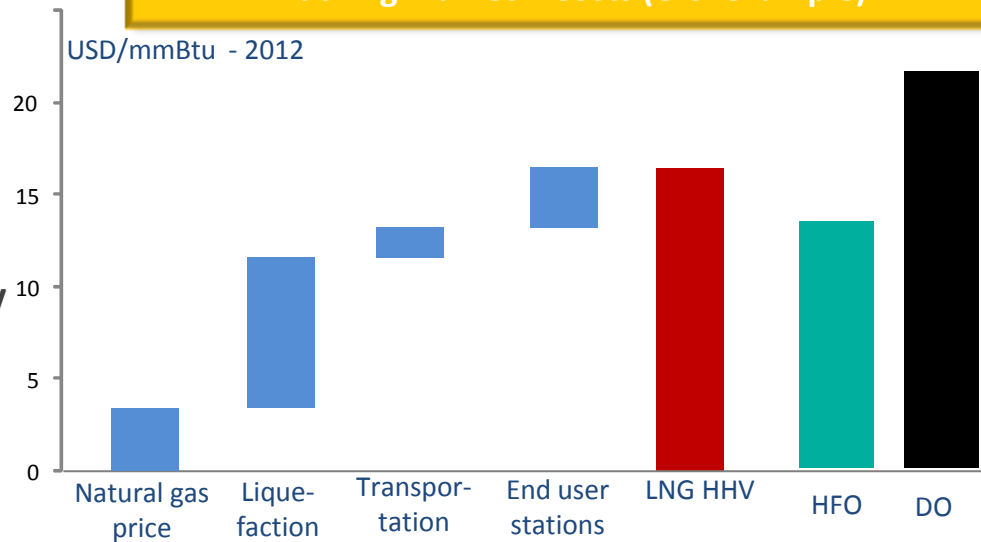
# Global Potential of Niche LNG/Inland

➤ A quick overview of areas developing terminals with trucking facilities



# Niche LNG: Inland – Everett terminal example

## Trucking market – Costs (U.S. example)



The Everett Marine Terminal opened in 1971 as a peak shaving facility, predominantly designed to supply LNG to peak shaving facilities via truck and has been essential to New England’s energy supply

- There is no underground gas storage in New England
- Everett terminal supplies LNG via truck to nearly all of the 31 customer-owned LNG storage tanks in region
- Majority of customers are LDC’s, small industries, greenhouses

0.2 MTPA delivered by trucks  
10 000 loadings per year





# Niche LNG developments in Scandinavia

- Existing LNG Production Plants
- Planned LNG Production Plants
- Proposed LNG Production Plants
- Existing small scale export/bunkering facilities
- Proposed small scale export/bunkering facilities
- Existing LNG Terminals
- Planned and decided LNG Terminals
- Planned but not decided LNG Terminals
- SECA Area

Existing LNG Infrastructure



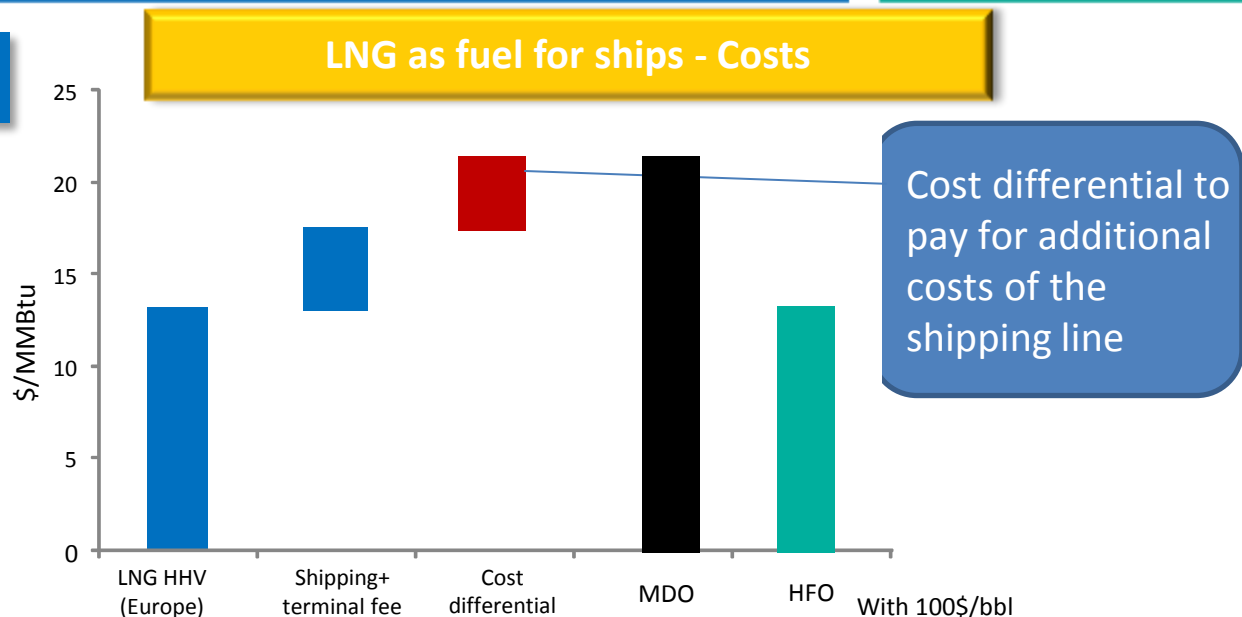
Scandinavian countries  
have already started  
developing significant retail  
LNG infrastructures, with  
strong government support

Current market ~0.5 MTPA

# LNG as fuel: Sea-going Ships

## Potential volumes / Growth

If LNG takes 5-10% of the sea transport market by 2025 :  
~30 mtpa



## Key success factors

- International Maritime Organization anti-pollution rules: the MARPOL convention has set limits on NO<sub>x</sub> and SO<sub>x</sub> emissions from ship exhausts. Deadline set in 2015 for Northern Europe's Sulfur Emission Control Areas.
- Large number of LNG terminals around the world in close proximity to ports
- Environmental concerns from end customers

## Hurdles

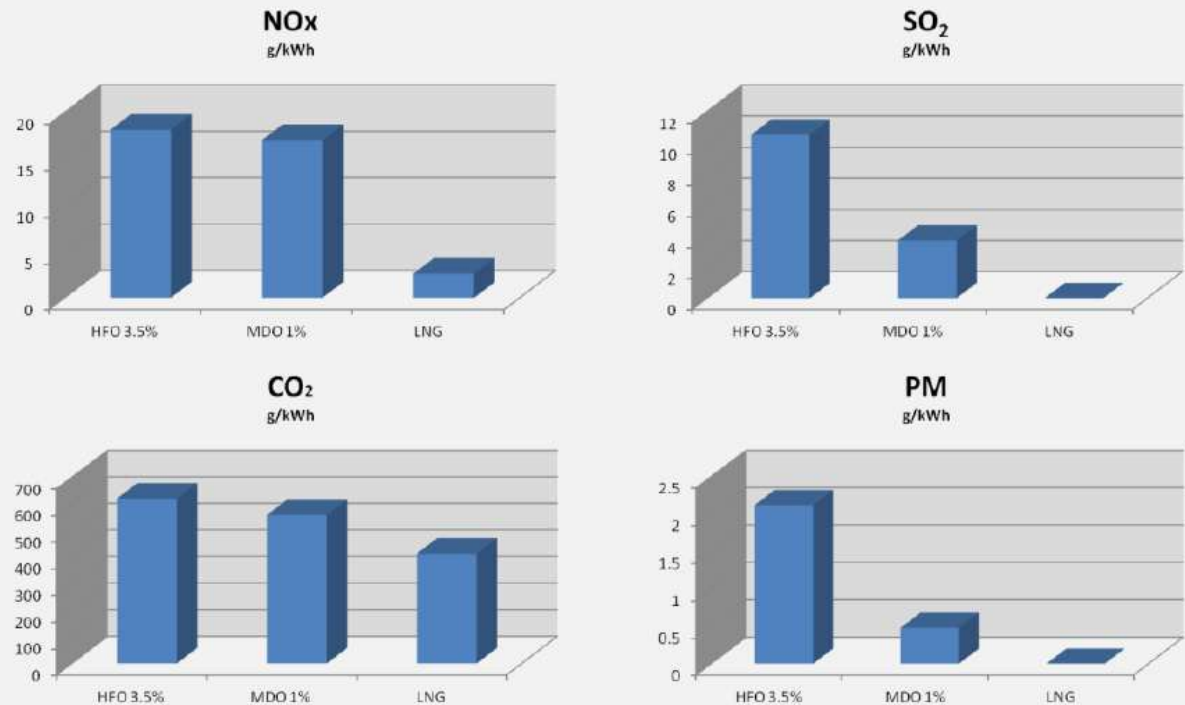
- Approval for LNG bunkering from relevant port / local authorities
- Technology, safety guidelines and regulations for LNG bunkering (barge to ship, shore to ship, boil-off)

# LNG as fuel: Sea-going Ships

## Key driver for LNG bunkering : Emissions



Emissions performance by fuel type



Source : Tri-Zen

# LNG as fuel: Sea-going Ships

## First moves ...

### Bunkering infrastructure development

~ 10 projects of LNG bunkering infrastructure development in the world lead by gas operators, usually in partnership with ship builders and ports operators

- Major active gas operators: Shell (Gb-Nl), Fluxys (Be), Vopak (Nl), Gasnor (No), Gaz Metro (Ca), Kogas (Kr), ...
- Associated ship builders: Korean ship builders with Kogas (Kr), Wärtsilä (Fn),
- Ports: Brunsbüttel (Ge),

### Ship conception

> 15 active projects in 2011  
Asian ship builders are leading the development of large commercial vessels

- Japanese ship builders (IHI, KHI, Oshima) active on the conception of large vessels (> 10,000 TEU containers, car carriers, ...)
- Korean ship builders projects concern more passenger vessels (ferries)
- Chinese ship builders working on bulker ship design

### Ship conversion

Around 20 active projects in 2011 with majority of ferry conversions lead by American and North-European ferry operator

- American Washington State Ferry, Lake Michigan Car Ferry Service,...
- Finnish Viking line

### Ship order

Several orders of small sized vessels (mainly ferries), majority by Norwegian operators  
One LNG commercial cargo ordered by Norwegian Nor Lines

- 1 order of 2 pure LNG fueled 5,000 dead weight ton cargo ships delivered in Oct 2013 from Norwegian Nor Lines to Chinese Tsuji Heavy Industries

20 existing LNG-fuelled vessels in operation, mostly in Scandinavia

# LNG as fuel for vehicles



LNG  
fueled ?

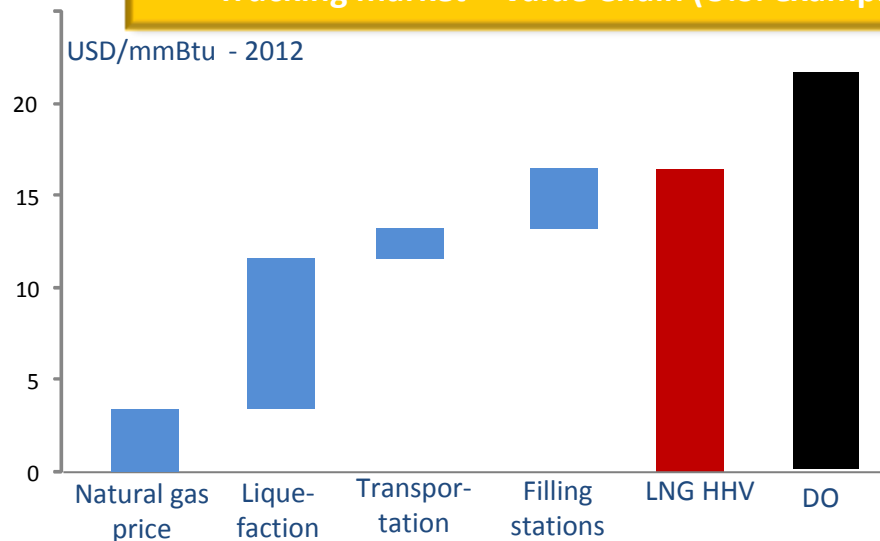
# LNG as fuel: Trucks

## Potential volumes / Growth

10% of truck fuel market in the US

> 10 mtpa

## Trucking market – Value Chain (U.S. example)



## Key success factors

- EU's "Transport 2050" Plan targets to cut carbon emissions by 60%
- ISO 16924 norm being elaborated : LNG vehicle filling stations
- Technology globally available
- Highways being equipped in the US

## Hurdles

- Differences in cross-border fuel pricing, regulations and taxes
- LNG metering - new methods of calculation have to be developed.
- Lower autonomy for trucks compared to diesel

# Focus on Asia - Highlights

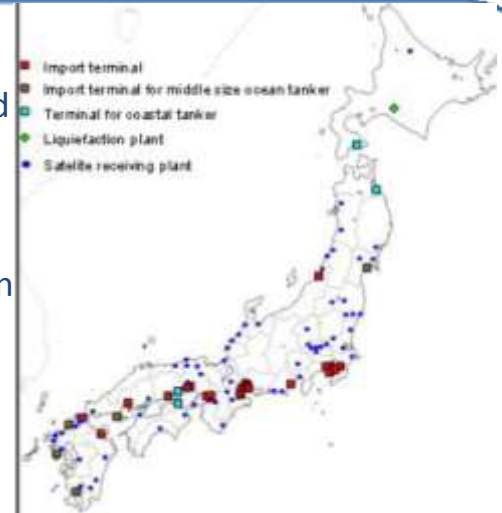
## CHINA

- ~ 20 liquefaction plants (~4 MTPA)
- Over 500 LNG fueled vehicles



## JAPAN

- Road trucks and rail tankers supply LNG to over 60 satellite and regasification plants



## INDIA

LNG truck loading bay at Dahej terminal

## SOUTH KOREA

Road trucks loading bays in 2 LNG terminals

## INDONESIA

8 small-scale terminals to be constructed by 2015  
Small-scale production projects under study

## AUSTRALIA

Small-scale production started in 1989, 2 plants active in 2009 (Alice Springs, Karatha), 2 other planned



# CONCLUSION





Thank you for your attention



*Artist impression from SLNG press release Aug. 2011*