

# Regulations for bunkering LNG

CCNR round table LNG, 13-11-2012

Erik Büthker,  
chairman of Dutch standards committee LNG refuelling stations



Realiseren van blijvende kwaliteit

Ballast Nedam

What is a standard, the role of standards

Dutch standard on LNG refuelling stations, PGS 33 part 1

LNG bunkering for ships, PGS 33 part 2

International standards development

Conclusion

# Projecten van Ballast Nedam



# Subsidiaries of Ballast Nedam



Clean fuel

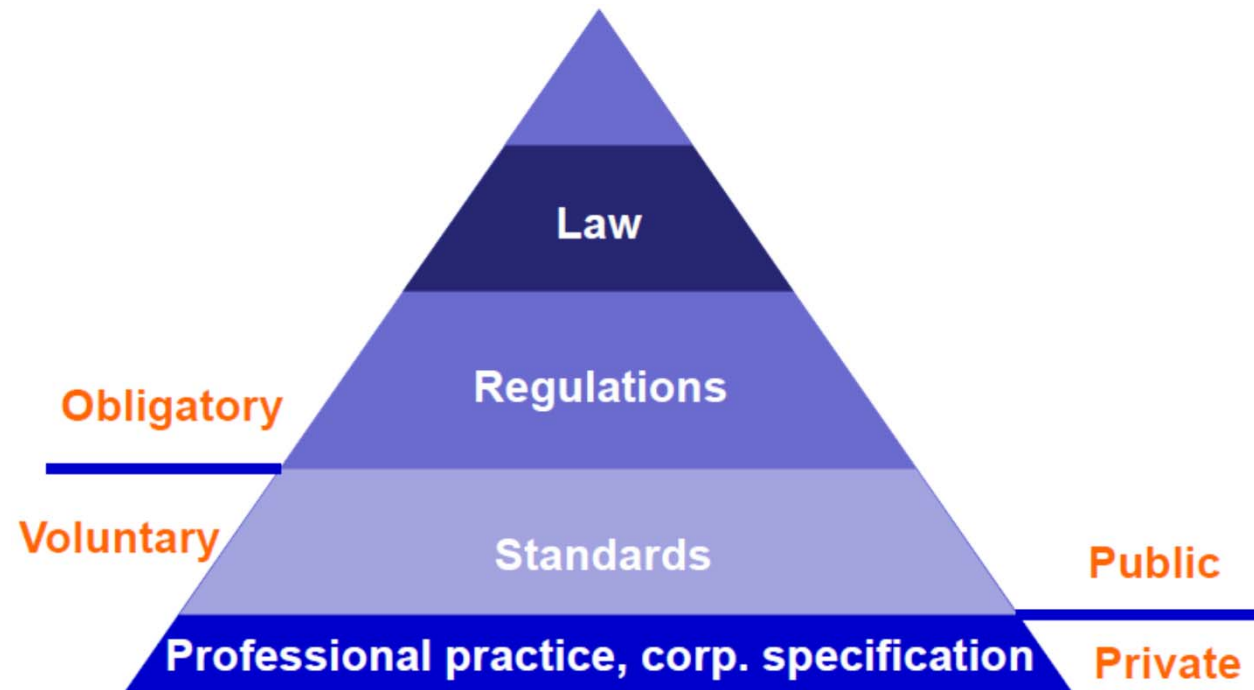


C | N | G Net



# What is a standard

- Standards voluntary in application documents
- Established by all interested parties
- Reflects consensus



## To overcome International trade barriers

- refuelling coupling car/filling station
- pressure levels for LNG storage

## International certification of components and systems

- clear specifications and test methods
- no trade barriers caused by local regulations

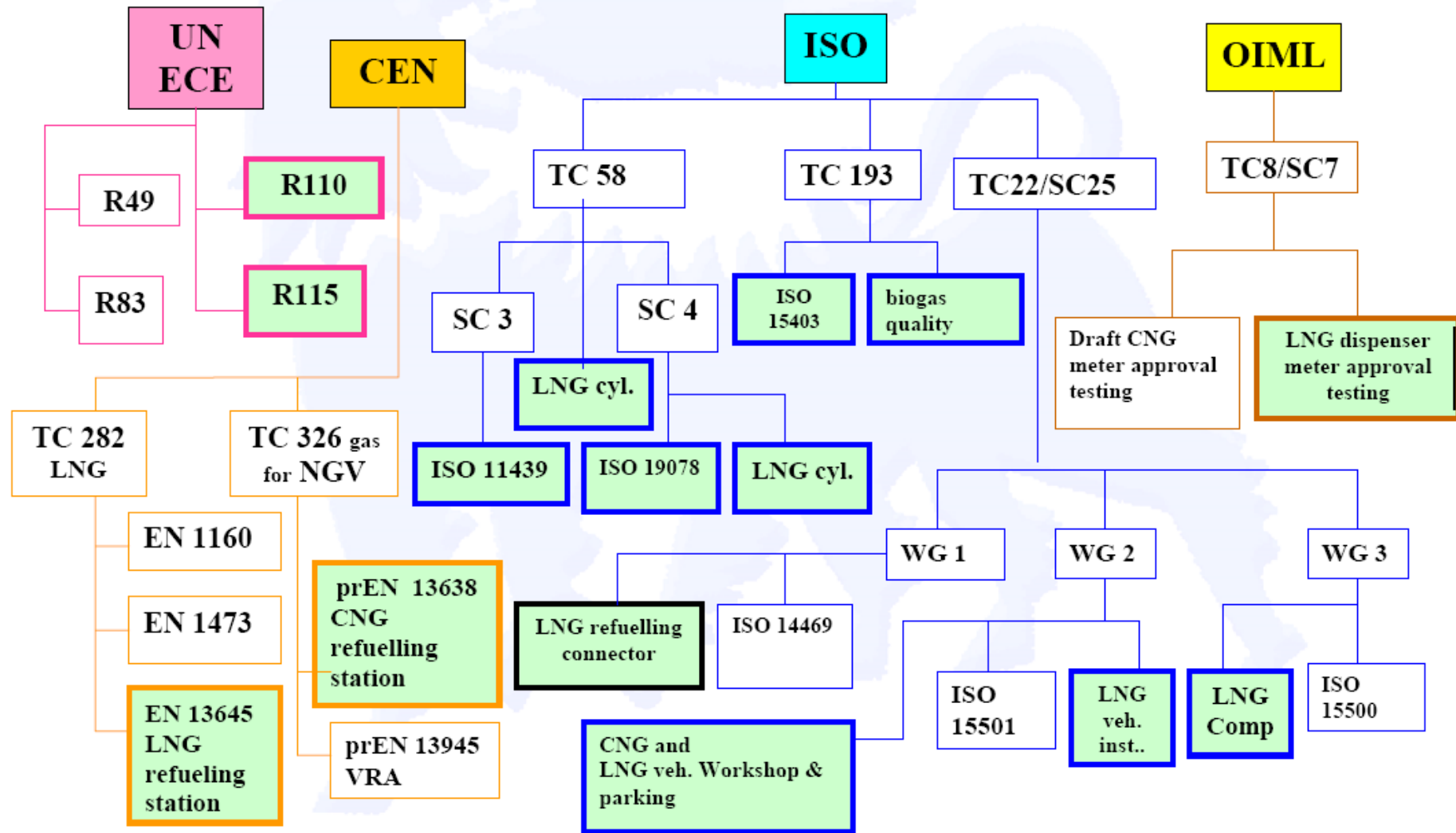
## International accepted safety level

- minimal safety requirements
- safety distances at LNG refuelling station

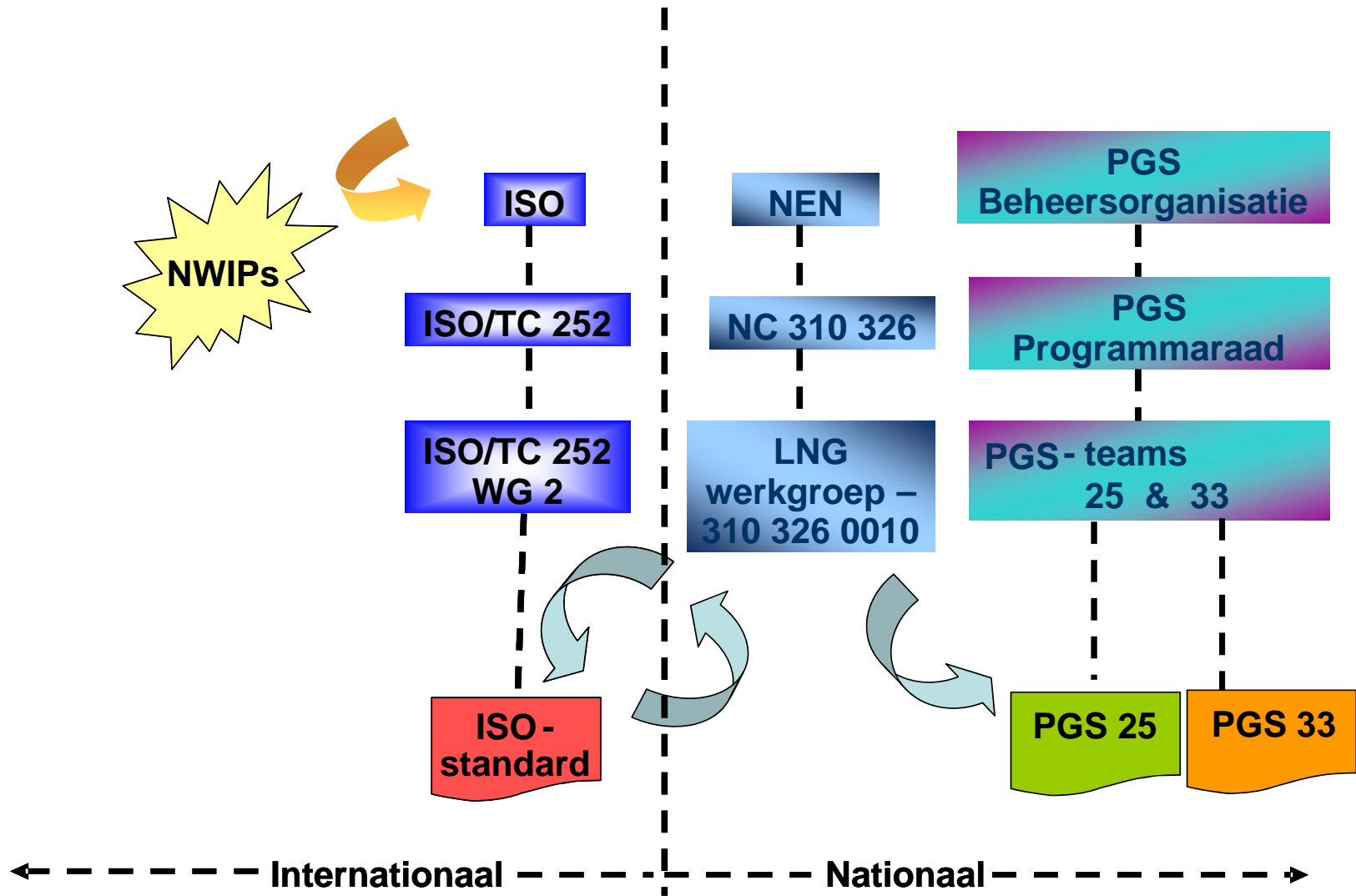
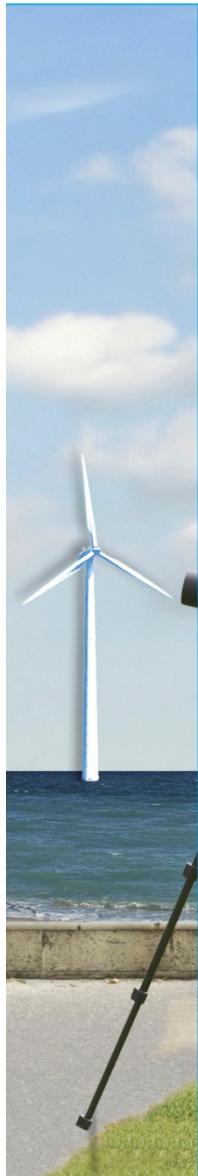
## Standards are necessary to introduce a “new” fuel to get market acceptance

- clear specifications and test methods
- no trade barriers caused by local regulations





# International versus national standards







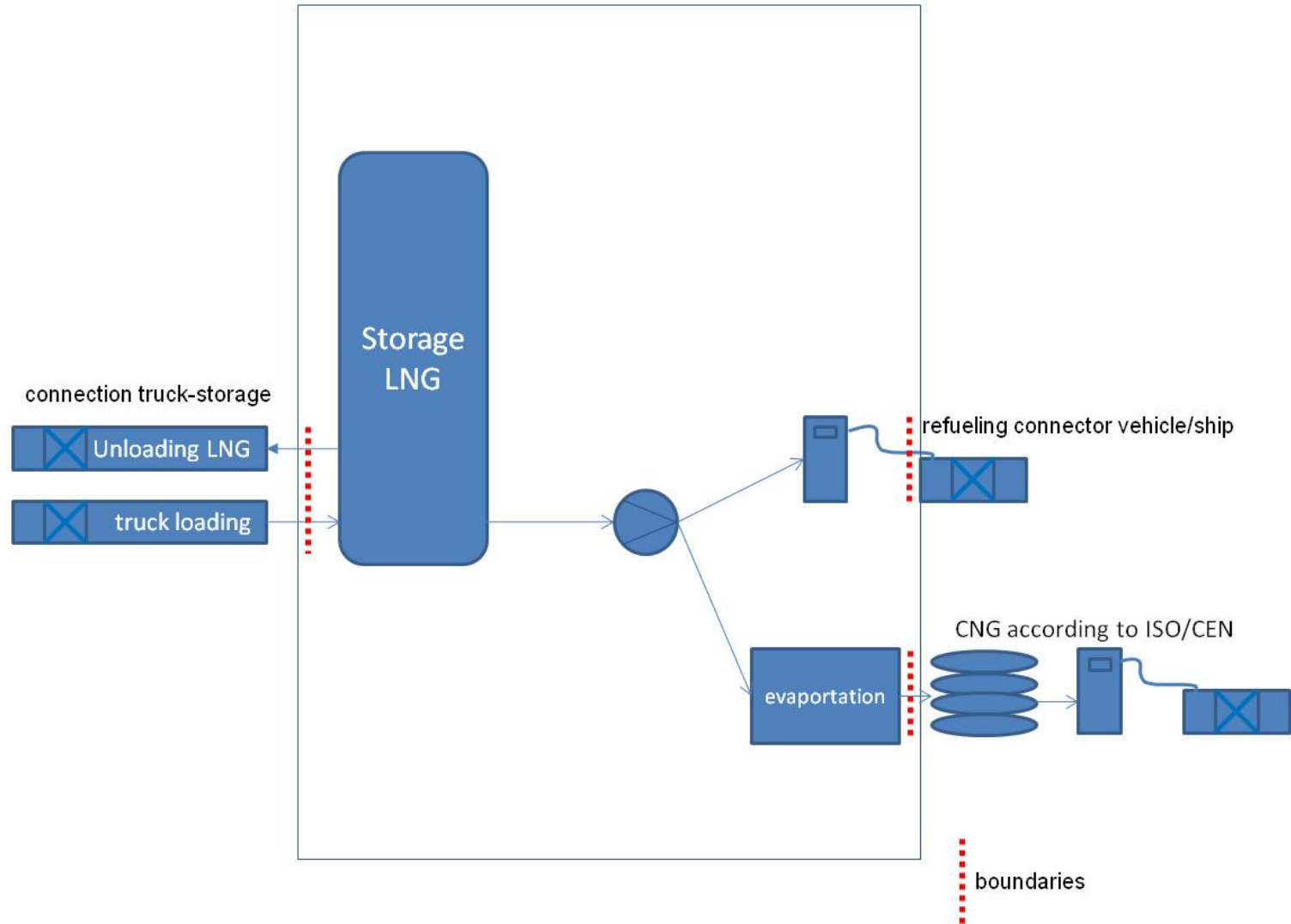
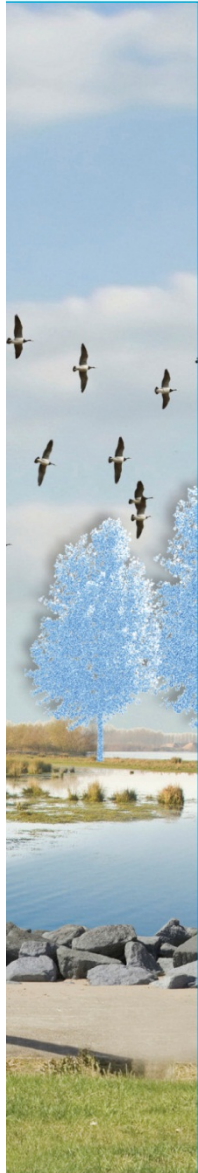
PGS is a Dutch national guideline that gives an interpretation of legislation into practice. It describes the state of the art, written into:

- rules
- recommendations
- criteria
- conditions

Covering

- Safety on the job
- Environment safety
- Transport safety
- Fire safety

# PGS 33 part 1 LNG truck refuelling





Land based installations for LNG road transport

Land based to ship bunkering of LNG will be covered by part two of PGS 33

Floating LNG refuelling stations (bunker barges) not covered by PGS 33, Possible a NPR

LNG Road Transport of is covered by ADR

LCNG is covered



General construction and design

Operational requirements

- maintenance, periodic inspections
- procedures for filling the storage

Certification

- Atex, PED

Internal safety distances

External safety distances

Safety precautions

- Purpose: prevention of occupational & fire hazards (avoid domino effects)
- Within frameworks of OHS- and Fire safety regulations
- to be protected: installations, workers and visitors
- fit to practical criteria, e.g engineering basic principles
- based on credible incident scenarios

## Credible scenario

a: ~ 1-2 mm leak valve  
10 g/s LNG

b: Ignition

c: Jet fire

d: Heat radiation flux

Max 37,5 kW/m<sup>2</sup> to  
protected installation

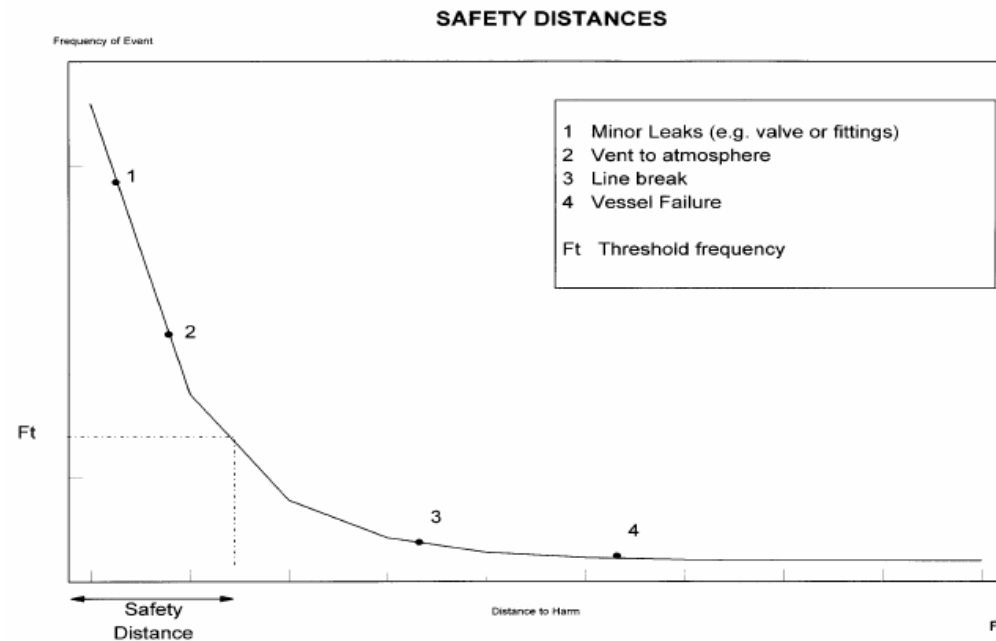
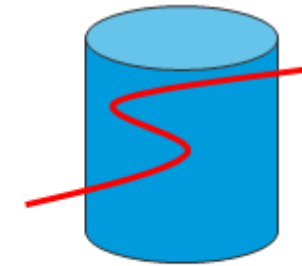
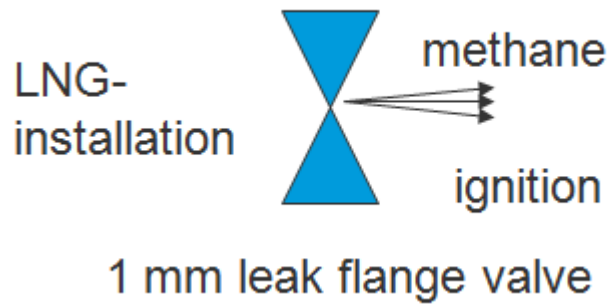


Figure 1

# Internal safety distances



Nearby installation

- Scenario 1,2, a leak of 10 g LNG/s
- Scenario 3 flow of LNG out of a refuelling hose
- Scenario 4 extreme impact

Ongevalsescenario	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Risicobron				
Risico-ontvanger	LNG-installatie	LNG-installatie	Afleverzuil	Vulpunt/opstelplaats tankwagen
LNG-installatie <sup>a)</sup>	Minimaal 0	N.v.t	N.v.t	N.v.t
Overige kwetsbare onderdelen van de inrichting <sup>b)</sup>	N.v.t	Minimaal 3 m	Minimaal 2 m plus slanglengte	N.v.t
Vulpunt/opstelplaats tankauto	N.v.t	N.v.t	N.v.t	Maximaal 5 m <sup>c)</sup>



## Purpose:

Prevention of major incidents + land use planning within framework of external safety regulations Based on risk approach (probability x consequence) + risk standards

## To be protected:

persons in the environment of establishment

iso risk contours based on harmonised risk calculations methods (QRA, SAFETI-NL)

Iso individual risk contours

IR  $10^{-5}/y$

Risk standard NL

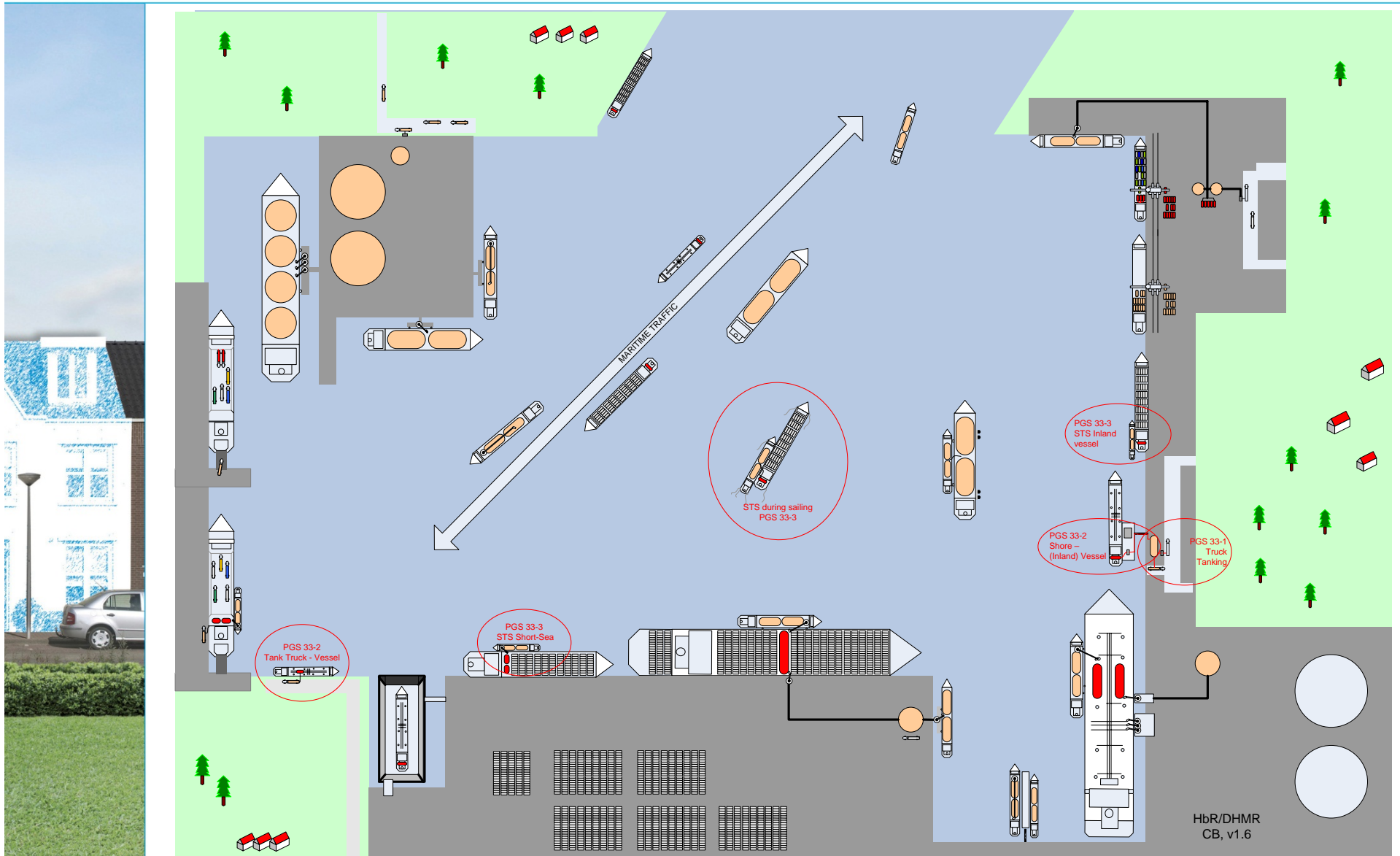
IR  $10^{-6}/y$

IR  $10^{-7}/y$

IR  $10^{-8}/y$

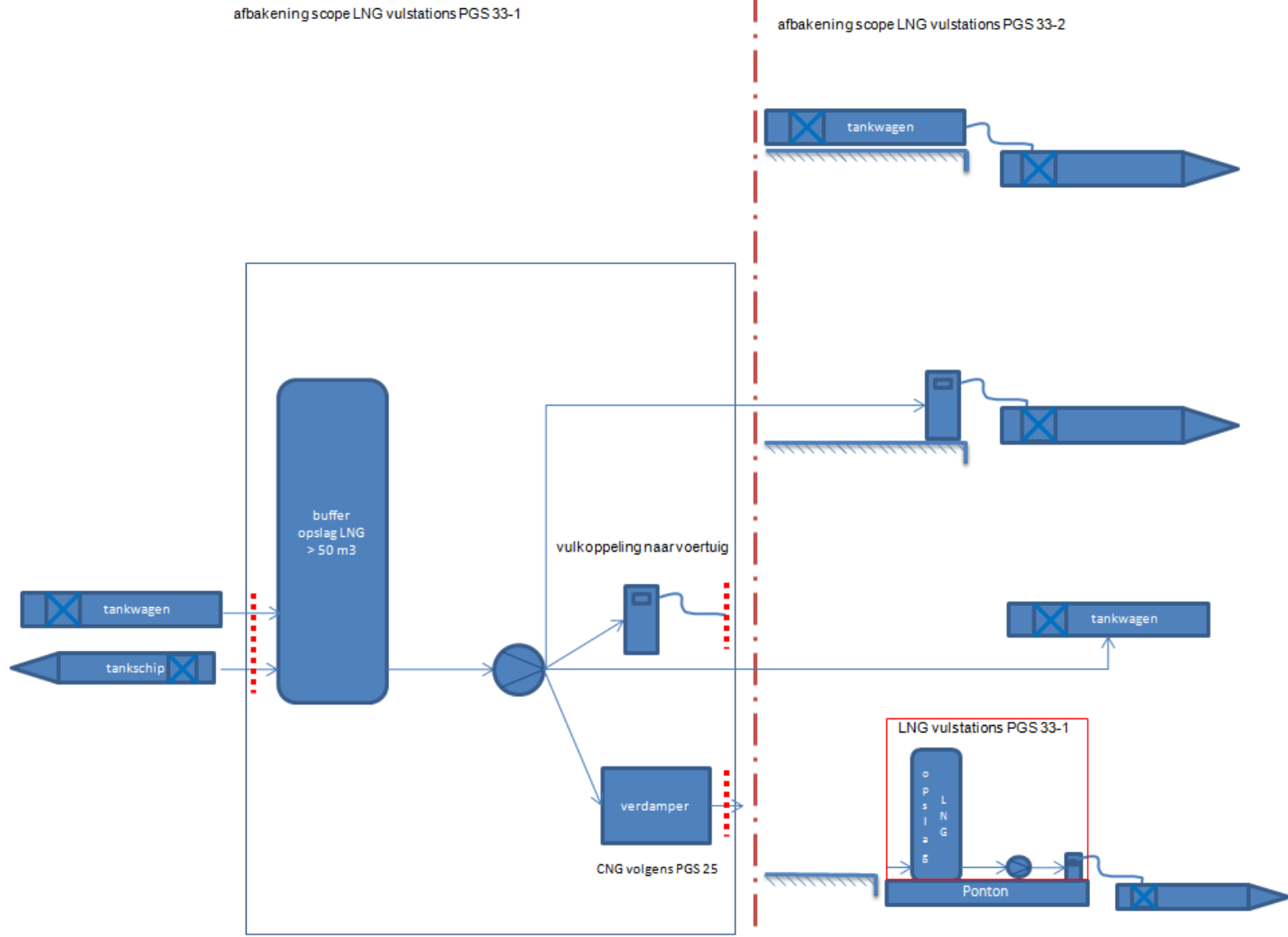
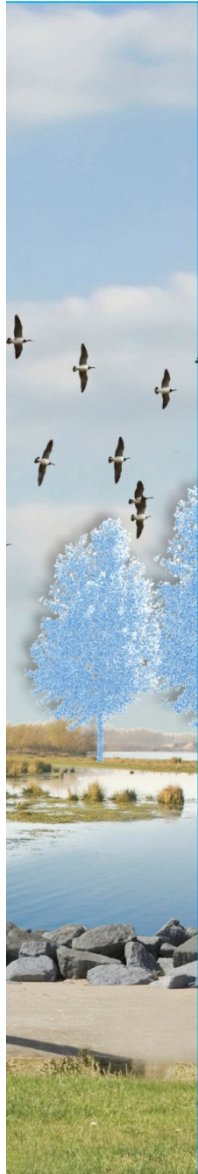


# Bunkering options





# PGS 33 part 2 LNG bunkering for ships





Off shore

On shore

Ship to  
ship

Ship to  
shore

**CEN**

- EN 1160** general characteristics and properties of materials in contact with LNG
- EN 1473** design of Onshore LNG installation > 200 tonnes
- EN 146201** storage tanks for liquefied gasses
- EN 12308** testing of gaskets for flanged joints on LNG piping

**CEN**

- EN 1474** design and testing of marine transfer systems, part 1 design and testing, part 2 hoses, part 3 offshore transfer system
- EN 1532** Ship to shore interface



## Off shore

### ISO TC 67 WG 10


Materials, equipment and offshore structures for petroleum, petrochemical and natural gas industry  
**PT1** Systems and installations for supply of LNG as fuel to ships including refueling connector  
**PT4** Properties of equipment in contact with LNG



## On shore

### ISO TC 67 WG 10

**PT3** Safety and risk assesment for onshore LNG plants (terminals)  
**PT5** Onshore LNG storage tanks



## Ship to ship

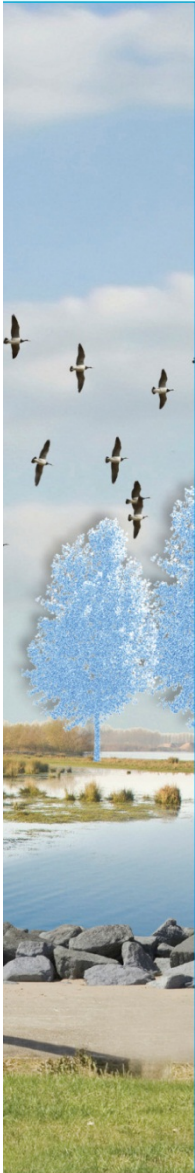


## Ship to shore

### ISO TC 67 WG 10

**PT2** Ship to shore interface (carrier to terminal)  
**PT6** LNG transfer system  
**ISO 28460** Ship-to-Shore interface and port operations

# PGS33 vs ISO 16924 LNG refuelling stations for trucks



PGS 33	ISO 16924: —
Design, construction and maintenance	
<b>Operation:</b> <ul style="list-style-type: none"> <li>• No boil off</li> <li>• -----</li> <li>• ----</li> </ul>	<b>Operation:</b> <ul style="list-style-type: none"> <li>• -----</li> <li>• Refuelling pressure</li> <li>• Dispenser metering</li> </ul>
<b>Safety</b> <ul style="list-style-type: none"> <li>• PED</li> <li>• ATEX</li> <li>• Safety distances</li> </ul>	<b>Safety</b> <ul style="list-style-type: none"> <li>• Minimal safety requirements E.g. Pressure relief valve, break away coupling, emergency stop</li> </ul>
<b>Inspection &amp; documentation</b> <ul style="list-style-type: none"> <li>• Complete installation</li> </ul>	<b>Certification</b> <ul style="list-style-type: none"> <li>• Component level</li> </ul>

PGS 33 guideline for LNG filling stations final about end 2012

Internal safety distances: very small;

Defining external safety distances follows separated but parallel procedure;

Lack of experience and knowledge of authorities with LNG; training is required

Knowledge transfer on standards for bunkering, CCNR could be a platform

Sailing on LNG will be realistic

- technical, economical, environmental
- regulations needed for transport of LNG as cargo over water



## Contact

Erik BÜthker, Business Development Manager

[e.buthker@ballast-nedam.nl](mailto:e.buthker@ballast-nedam.nl)

Phone number: +31 6 2150 1403

Ballast Nedam

Ringwade 71

3439 LM Nieuwegein

The Netherlands



Realiseren van blijvende kwaliteit