

# LNG Quality - Background and Outlook

Report of the IGU working group PGCD 1

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6 June 2006, Amsterdam



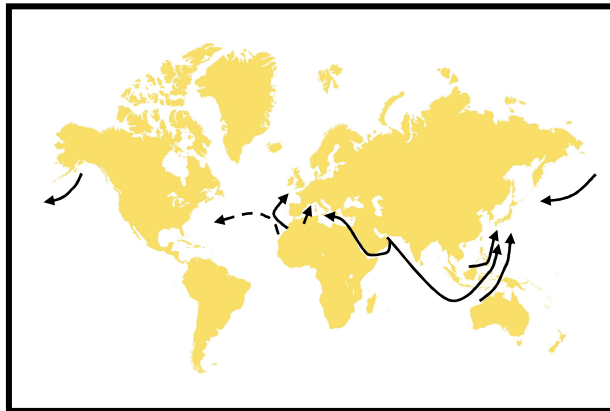
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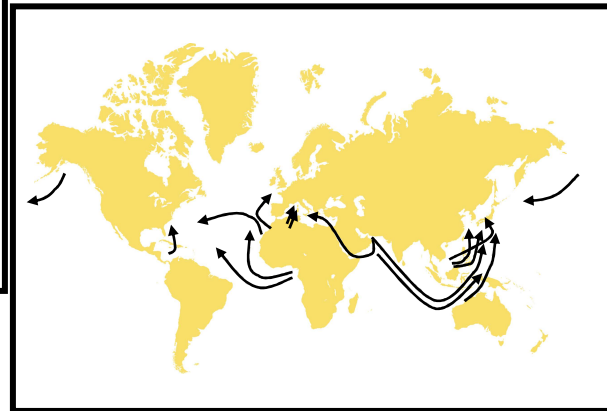
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# Will growth bring quality convergence?



**1990**  
**56 Mt**  
**(4% of global gas)**



**2004**  
**131 Mt**  
**(7% of global gas)**

Source: Shell



**2020**  
**500 Mt**  
**(17% of global gas)**

## LNG Quality

- All “the same”? (No, it’s not!)
- How many distinct qualities will be traded in 2020?



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# Contents

- Some basic facts (not too many)
- Inherent quality inflexibility
  - Suppliers, consuming countries
- The situation today
- Future trends & Recommendations



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# What determines LNG quality?

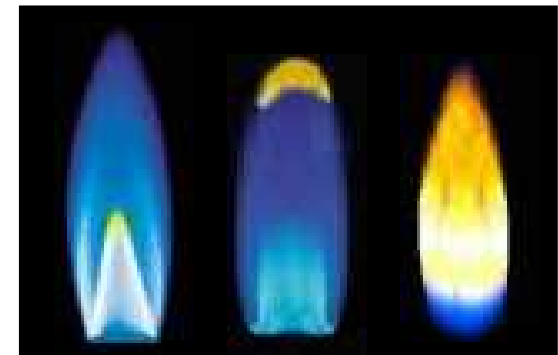
## Focus on:

- High Heating value (HHV) -> energy content
- Wobbe index -> Gas interchangeability

## Also important:

- Higher hydrocarbon content: C2, C3, C4, C5+
- Sulphur components
- Nitrogen (inert – link to ageing)

Units: we used standard conditions  
(ISO 13443:1996) (15°C/15°C/1 atm)



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# Definition of the Wobbe Index

$$WI = \frac{HHV}{\sqrt{Rd}}$$

where: *WI* = Wobbe Index; *HHV* = High Heating Value; *Rd* = relative density of the gas to air

- Measure of energy input to the flame of a burner
- Key Interchangeability parameter - gases within WI band achieve:
  - Control of NO<sub>x</sub> and other emissions
  - High efficiency of burners
  - Safe operation of equipment



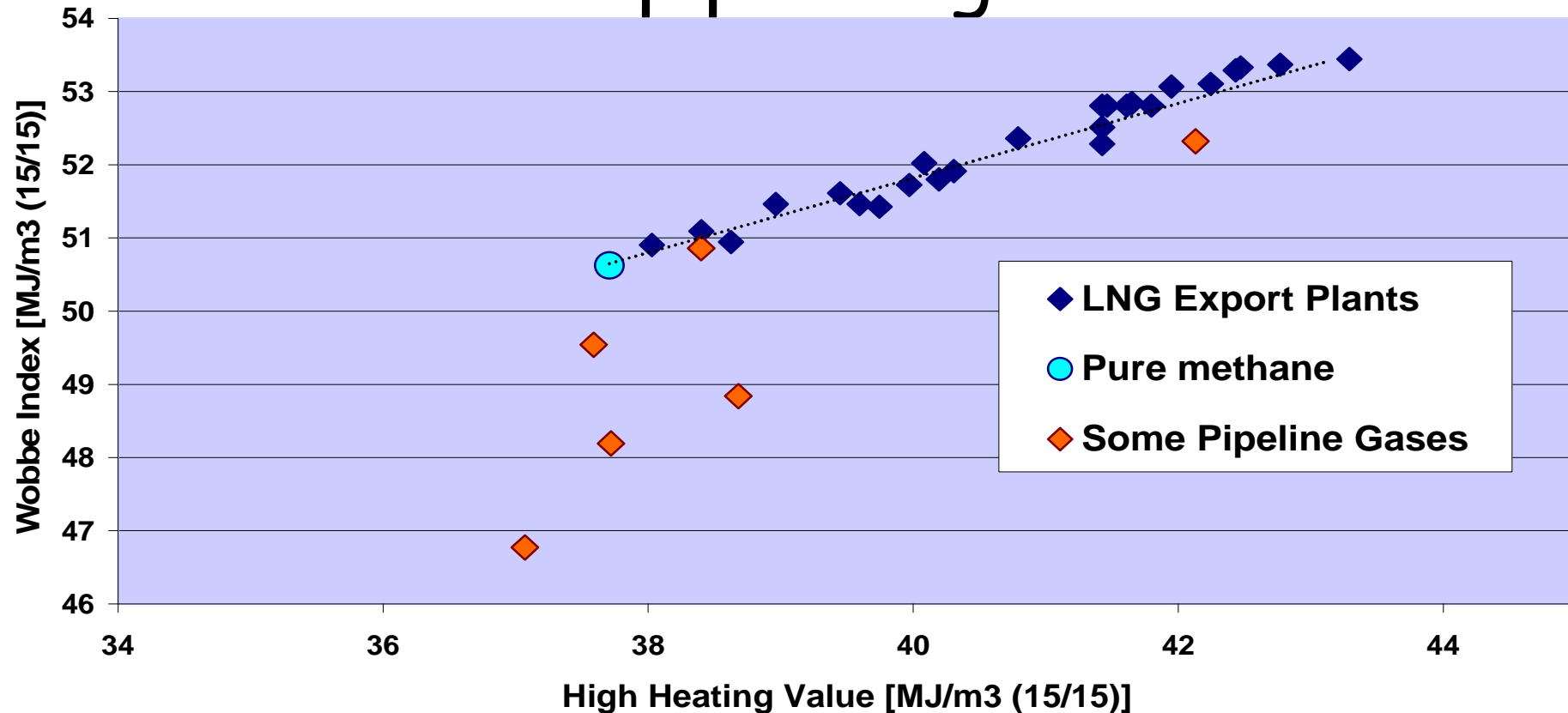
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# Continuum of LNG qualities vs pipeline gases



LNG is a relatively consistent product compared to pipeline gas:

- 5% range of Wobbe Index from leanest to richest LNG
- 12 % range of High Heating Value



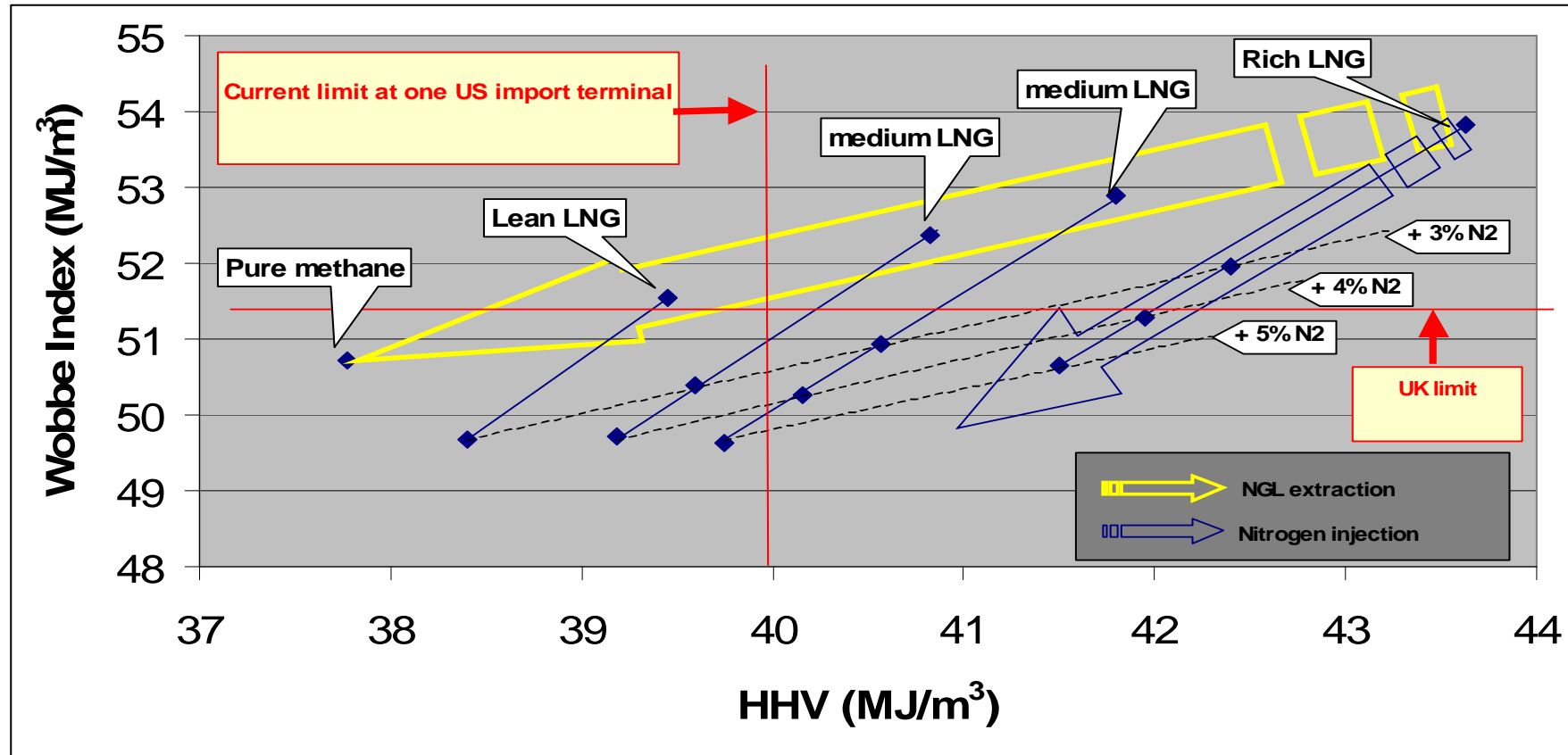
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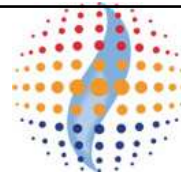
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# Adjusting Wobbe Index and High Heating Value



- NGL extraction/injection effective to manipulate the high heating value
- Inert injection effective to lower the Wobbe Index



# LNG producers' constraints on quality flexibility

- Capex - Quality flexibility is costly
- Operational flexibility - Avoid too stringent quality commitments
- Drive to monetise all molecules
  - “take out valuable & marketable products”
    - Local LPG, C<sub>2</sub> market?
  - “monetise rest as LNG”
- Making lean LNG often costly

**But: wish to access diverse markets**



Courtesy Woodside



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# Quality requirements of major markets

- Japan, Korea are used to high Wobbe LNG
  - Large established LNG markets, optimised for LNG chain
  - Quality adjustment by LPG blending
- EU: wide tolerance (e.g. Spain)
  - Established pipeline gas markets
  - EU drive for acceptance of broad range (EASEE-gas)
- US and UK require Low Wobbe LNG
  - Recently growing LNG markets (used to pipeline supply)
  - Quality adjustment by inert blending
- Emerging LNG markets (e.g. China, India)
  - Often driven by price
  - Ready to accommodate different qualities



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# Flexibility constraints on the market side

- LPG blending limited due to gas engine requirements and cost (e.g. Japan)
- Large number of existing gas appliances
  - Old appliances often not very tolerant to quality changes
  - Costly to change, safety risk (e.g. UK - ~ 46 million burners)
- Pipeline gases with inerts have to be interchangeable
  - E.g. Thailand
- Gas turbine manufacturers only give guarantees tied to relatively constant fuel quality (e.g. USA)
- **But: wish for security of supply through diversity of sources**



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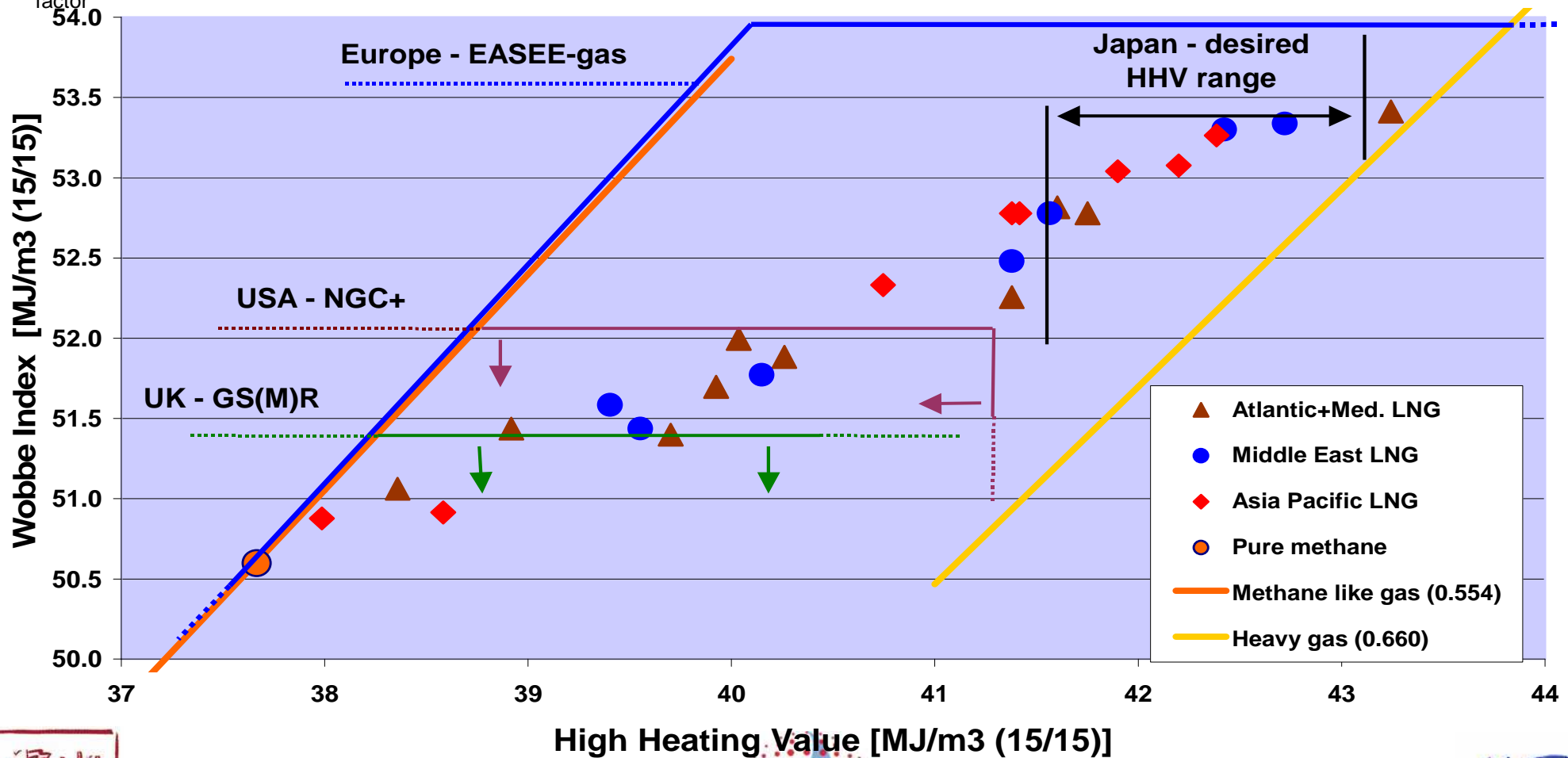


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# Gas Quality Requirements of Major Markets with average quality\* of LNG at loading

\* The quality of gas produced at export plants varies due to a variety of factors including operational issues, ramp-up and availability of feeding fields and plant load factor



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# Future trends in LNG quality

- Likely two distinct LNG quality bands remain:
  - High Wobbe LNG ( $WI > 52 \text{ MJ/m}^3$ ) in Far East
  - Low Wobbe LNG ( $WI < 52 \text{ MJ/m}^3$ ) in UK, USA
- Cost of supply (COS) of Low Wobbe LNG likely to be higher than COS High Wobbe LNG (on per energy basis)
- Some large export projects may develop capability to supply both bands
- Smaller export projects will have to choose



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# Recommendations

- To exporters
  - Supply matching LNG to get a good price (adjustment is costly - discount for “off-specification” LNG)
  - Large producers: investing in flexibility may pay off (e.g. Qatar)
  - Medium quality gives good position to access all markets (e.g. Yemen)
- To importers
  - Flexibility gives trading advantage (e.g. Spain)
  - Don’t overspecify – it’s easy, but costly
  - New LNG importers should go for largest possible quality range
  - Promote flexible gas appliances where possible



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Thank you for your attention



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