

NH<sub>3</sub> Storage and Safety Session:  
Facilitated by John Mott, Australia

# The Benefits of Ammonia Fuel for Transport, Storage, and Safety



# Why are we here?

- ▶ We believe ammonia has a significant part to play in our future:
  - Carbon-free fuel
  - Energy independence
  - Naturally occurring substance

# ASTI - Ammonia Safety and Training Institute

- ▶ Non profit training organization devoted to promoting the safe handling and use of ammonia in all of it's forms.
- ▶ Over 30 years - trained thousands in four continents

# ASTI

- ▶ Member of the ASTI Board of Directors
- ▶ Some ASTI objectives
  - ❑ Prevent them all or stop them small
  - ❑ Demystifying ammonia for the world
  - ❑ Teaming industry, government and public safety

# Ammonia - Self Alarming

- ▶ The fear factor is critical, virtually all mammals can smell it at 5 ppm
- ▶ At 25 to 50 ppm it will drive most out of the area - Permissible Exposure Level
- ▶ At 500 ppm unbearably irritating but generally no long term effects for short exposure

# Ammonia - Easy to Transport

- ▶ Transport at ambient temperature in 20 - 25 bar vessels
- ▶ Transport at atmospheric pressure at -33C
- ▶ Pump thru pipelines at ambient temperature

# Ammonia - Easy to store

- ▶ Store large quantities at atmospheric pressure in insulated refrigerated tanks at -33C
- ▶ Store smaller quantities at ambient temperature in 20 - 25 bar vessels

# Ammonia - Easy to Liquefy

- ▶ LNG - 15%
- ▶ NH<sub>3</sub> - 5%

\*Amount of the fuel gas stream which needs to be used to liquefy the rest



# Ammonia - Safe Combustion

- ▶ LFL's
  - 1.8% to 2.2% hydrocarbons
  - 15% ammonia
- ▶ Ammonia has a very high LFL
- ▶ Difficult to ignite in the open air