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International Hydrogen and Fuel Cells Activities in Ports

A Call to Action

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Nature of Ports Industry
One Planet – All Connected

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International Port Community

AAPA
American Association of Port Authorities
Alliance of the Ports of Canada, the Caribbean, Latin America and the United States

aiVP
The worldwide network of port cities

ICHCA International Ltd
International Cargo Handling Co-ordination Association

PIANC
The World Association for Waterborne Transport Infrastructure

ESPO
EUROPEAN SEA PORTS ORGANISATION V.Z.W./A.S.B.L.

IAPH
International Association of Ports and Harbors

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World Port Sustainability Program

http://www.sustainableworldports.org/

- Part of the International Association of Ports and Harbors
- Conceived in May 2017, launched in March 2018 at Port of Antwerp
- Objective of program is to contribute to Sustainable Development Goals of the United Nations.
- Builds on the World Ports Climate Initiative that IAPH started in 2008
- Provides a portal of projects and initiatives of port-related partner organizations
- Will report regularly about the sustainability performance of the global ports sector

IAPH
International Association of Ports and Harbors

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Global Ports Involved With Hydrogen and Fuel Cells

- **Europe**
  - Rotterdam, Netherlands
  - Valencia, Spain
  - Orkney Harbours, UK
  - Hamburg, Germany
- **Asia**
  - Japan
- **Australia/New Zealand**
  - Hastings, Australia
  - Auckland, New Zealand
- **North America**
  - Long Beach, California
  - Los Angeles, California

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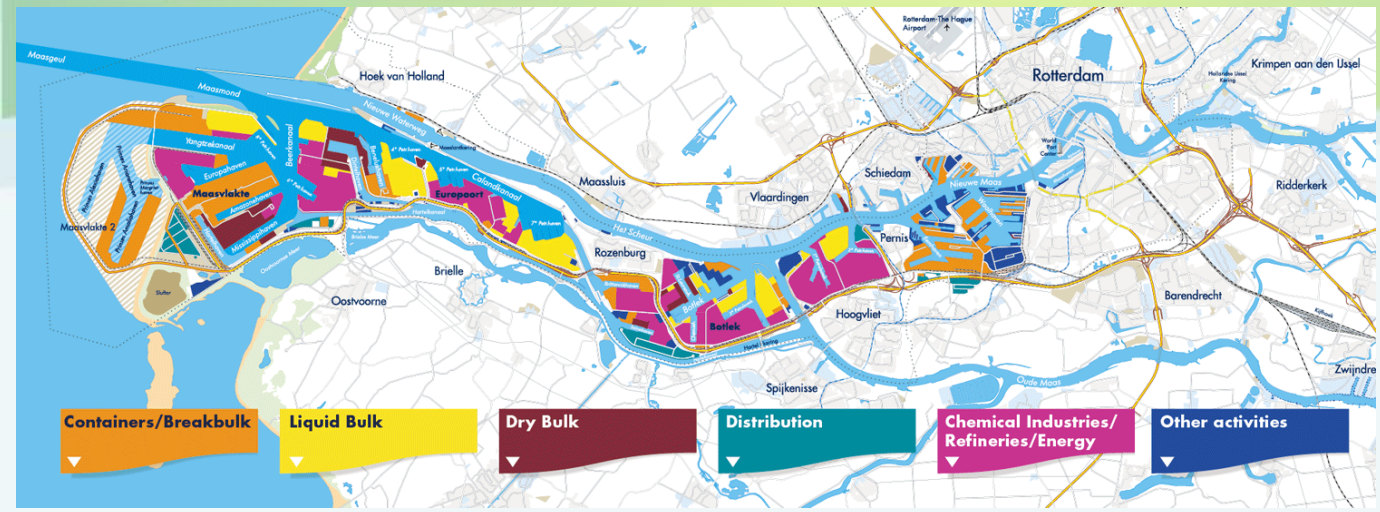
Global Ports Involved With Hydrogen and Fuel Cells

European Ports Interested in Hydrogen

- Port of Rotterdam, Netherlands
  - 3,000 companies on port land; 70 electricity generation facilities
  - Study by Wuppertal University states hydrogen is required by 2050
  - Export hydrogen from wind – existing pipeline Antwerp to Rotterdam
  - Interested in electric propulsion barges by hydrogen or battery



Port of Rotterdam

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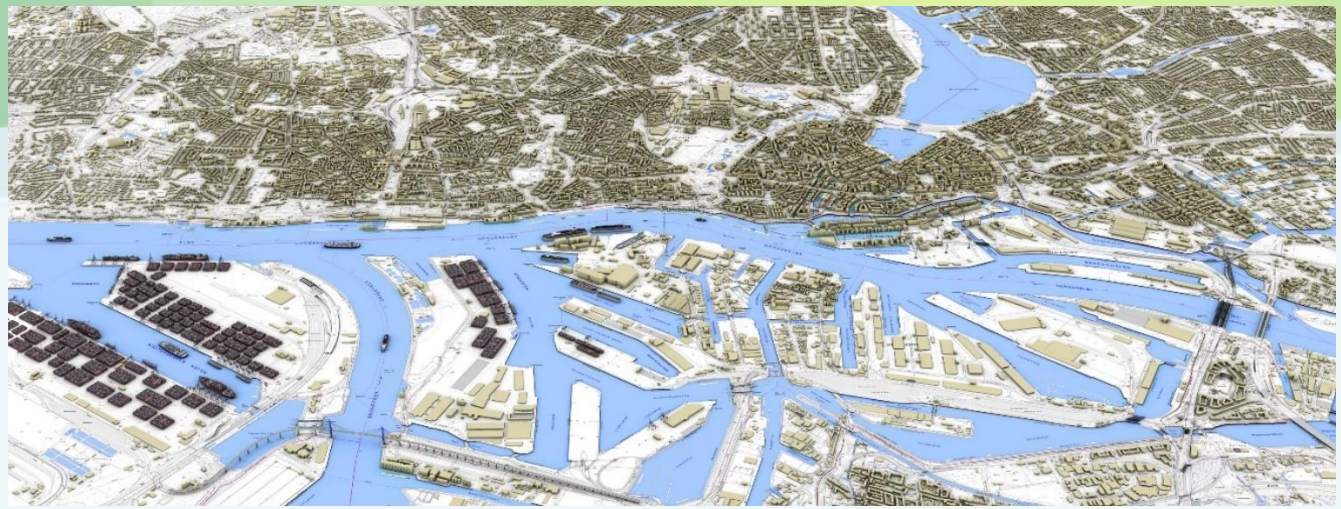
Global Ports Involved With Hydrogen and Fuel Cells

European Ports Interested in Hydrogen

- Port of Hamburg, Germany
  - Clean Air Action Plan – Reduce NOx; currently above EU limit
  - Testing dockside fuel cells for cruise ships and container vessels
  - Limited in authority to waterways, cautious about port competition
  - Port authority and terminals want to see a business case for H2



HPA Hamburg Port Authority

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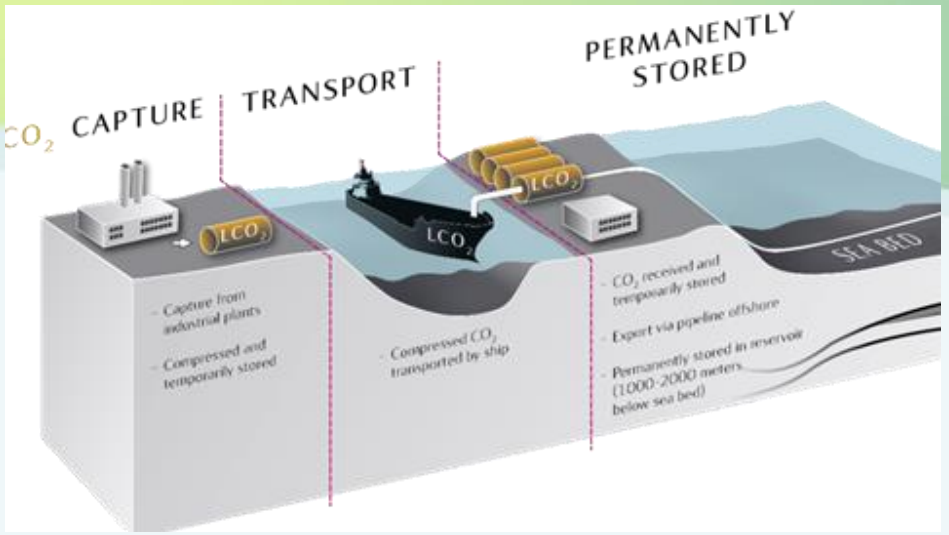
Global Ports Involved With Hydrogen and Fuel Cells

Ports Interested in Hydrogen Supply Chain

- Japan & Port of Hastings, Australia
  - US$388 million brown coal to liquified hydrogen project with Australian government and Kawasaki Heavy Industries
- Equinor (Norway) interested in producing hydrogen in Netherlands
  - Undergoing a feasibility study for export and storage in Norway



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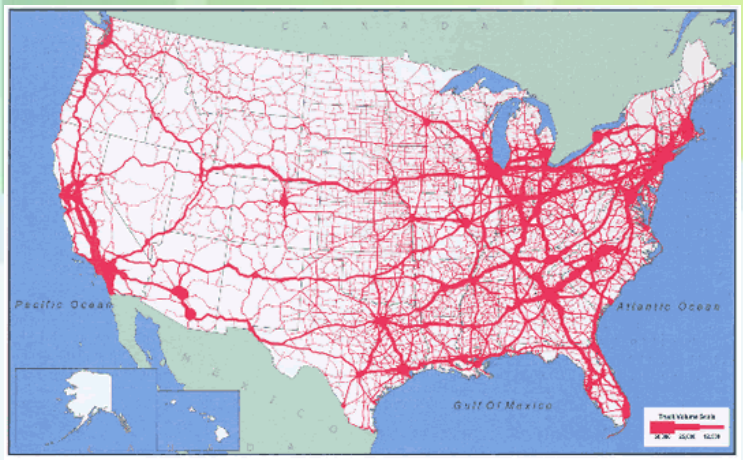
San Pedro Bay Ports
Los Angeles & Long Beach

- Both ports involved in hydrogen fuel cell projects
- POLB: 27 terminals; POLA: 22 terminals
- Total twenty-foot container units (TEU) throughput in 2017:
  - POLB: 7,544,507
  - POLA: 9,343,192



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Vehicles
Zero Emission Cargo Transport II

US Hybrid

HYDROGENICS
SHIFT POWER | ENERGIZE YOUR WORLD

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US EPA Ports Initiative

- Purpose is to improve air around ports across USA
- 2016 EPA National Port Strategy Assessment – Emission Reduction Strategies for:
  - Drayage Trucks
  - Rail
  - Cargo Handling Equip
  - Harbor Craft
  - Ocean Going Vessels

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Continuous Effort Required on Multiple Fronts

- Discussion Points from 2017
  - Stakeholders need to continue outreach and education efforts, encourage collaboration between policymakers and industry.
  - The industry needs to take advantage of funding opportunities, especially from the VW settlement.
  - The business case for hydrogen production in the ports needs to be developed. The permitting situation needs to be addressed.
  - Safety and concerns from the local unions, fire authorities and the Coast Guard need to be communicated and mitigated.

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Conclusion
Hydrogen is the future

- Ports around the world are making a concerted effort to reduce emissions and improve the air quality for their cities
- Fuel cells, powered by hydrogen, is emerging as one of the best possible options to replace diesel in heavy duty and maritime applications due to its longer range, quick refueling time, and ability to handle high duty demand cycles
- OEMs, industry, and government will need to continue to invest in hydrogen fuel cell technology to reach commercialization and bring down costs of components and fuel

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Thank You!

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Join us!

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