



# Norden - Electric Transportation prg EleST - Electric Ship Traffic

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# Background

- More than 90 % of global trade is served by ship traffic (IMO 2011)
- No efficient global emission policies nor accords such as Kyoto
- 75 % growth from 2007 to 2022-2027 estimated (Guardian 2007)
- Emissions twice as much as airlines and 5 % of global total (Guardian 2007)
- In Baltic Sea:
  - 10 - 15 % of nitrogen emissions is caused by ship traffic (WWF 2009)
  - Ship traffic is increasing 5 % annually in Baltic Sea (WWF 2009)
- BUT, "all electric ships" are captivating the markets and this creates new sustainable possibilities for ship traffic's energy systems and solutions
  - Ship motoring is electricity based
  - Enables wide fuel carrier and energy conversion&supply chain options and possibilities

# Objectives

- Identify, specify and analyze most promising energy carrier, conversion and supply chain options for ship traffic (criteria: emissions, initial financials, development possibilities/sustainability, lifecycle emission targets (2020, 2050, 2100; important with biomass products, economics), suitability for different maritime segments)
- Specify and identify techno-economical development pathways and analyze the sensitivity of those
- Identify structural synergies on board (energy system structures and ship structures)
- Simulate energy system combination (on board systems vs. ashore; different energy carriers on board)

# Participants

- Aalto University
  - Department of Energy Technology (Heading the project)
  - Department of Maritime Research
- Chalmers University of Technology (Sweden)
  - Department of Shipping and Marine Technology, prof. Jonas W Ringsberg
- Norwegian University of Science and Technology (NTNU)
  - Department of Marine Technology, prof. Harald Valland
- Technical University of Denmark
  - Department of Chemistry, Energy and Materials Science Group, prof. Jens Oluf Jensen

# Activities

- Generate energy supply, conversion, carrier and combination network with all the relevant variables
- Identify needed criteria together with industry (possibly also pre weight some of the criteria)
- Combine criteria to energy network to form a simulation platform
- Simulate different ship traffic segments with this simulation platform and existing energy analysis tools (needed for instance for different biomass conversion processes)
- Identify upcoming technologies possibly contributing to this field
- Compare structural requirements and characters of different energy and energy carrier systems to ship structures -> identification of synergies, special possibilities etc.
- Analyze different energy carrier systems through ship safety aspects

# Research work team tasking

- Aalto University
  - Project Management
  - System level studies
  - Some fuel cells and hydrogen storage matters
  - System analysis and simulation
  - Ship safety
- Chalmers University of Technology (Sweden)
  - Ships' structural matters
- Norwegian University of Science and Technology (NTNU)
  - Ship motoring
- Technical University of Denmark
  - Fuel cells and hydrogen storage



# References

- WWF 2009  
[http://www.wwf.fi/ymparisto/meret\\_sisavedet/merenkulku/laivojen\\_paastot.html](http://www.wwf.fi/ymparisto/meret_sisavedet/merenkulku/laivojen_paastot.html)
- IMO 2011 <http://www.imo.org/About/Pages/Default.aspx>
- Guardian 2007  
<http://www.guardian.co.uk/environment/2007/mar/03/travelenvironmentalimpact.transportintheuk>