A Sustainability Assessment of LNG as a Marine Fuel: A Development Opportunity for the Arctic?

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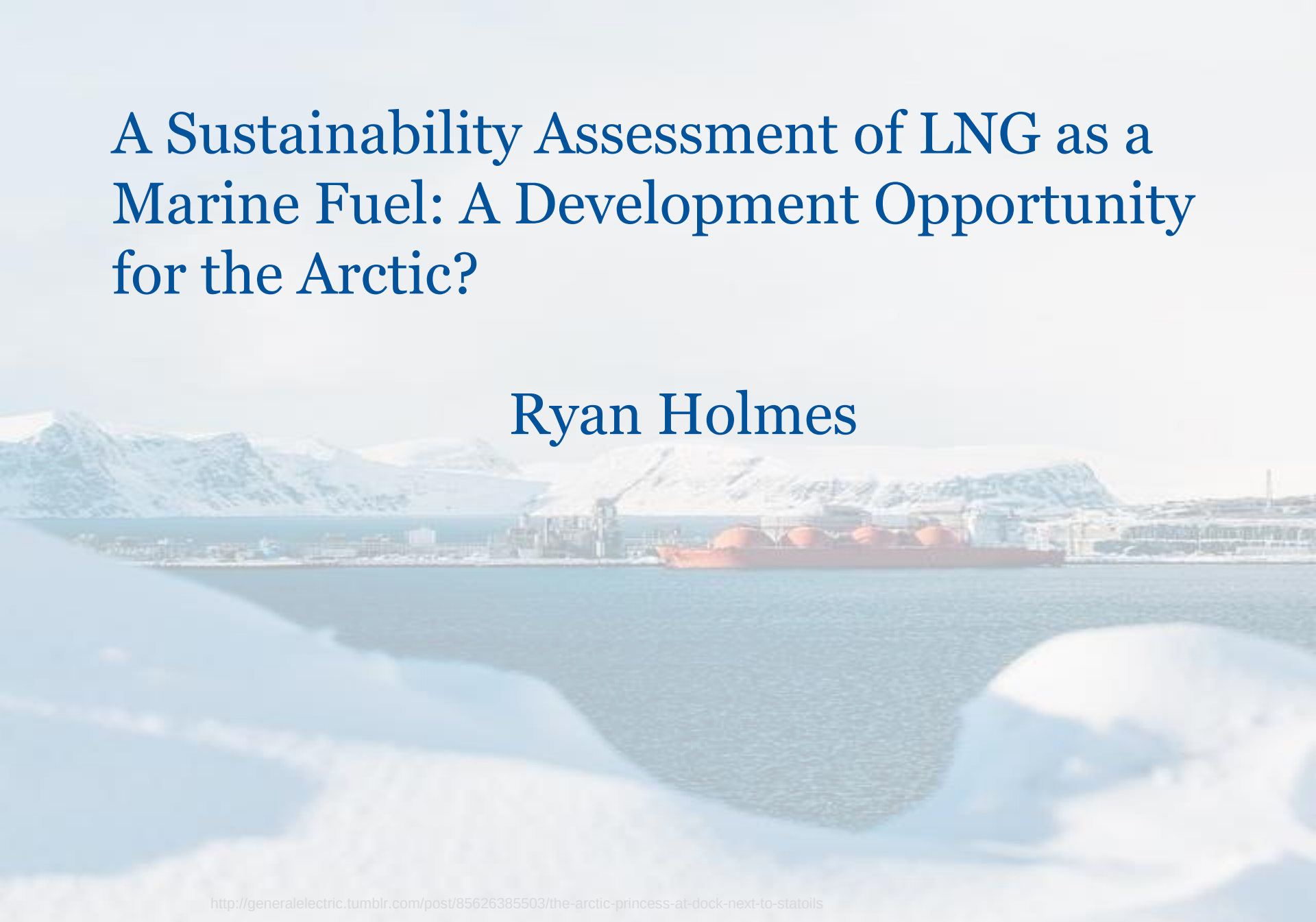

http://generalelectric.tumblr.com/post/85626385503/the-arctic-princess-at-dock-next-to-statoils

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The Transition Toward LNG

What's Driving it?

- International Maritime Organization Regulations
  - Fuel Sulphur Content Limits
  - NO_x Emissions Limits
  - Emissions Control Areas

Comparison of global & ECA fuel sulphur content limits	
Effective Date	Global sulphur content level
1 January 2012	3.5%
1 January 2020	0.5%
Effective Date	ECA sulphur content level
1 July 2010	1.0%
1 January 2015	0.1%
Source: Burel et al. 2013	

LNG Background

- Natural gas cooled to -161˚ C
- Safety Record
- Emissions Factors
- Price Factors

Abatement strategy	Emissions reduction (%)		
	SO_x	NO_x	PM
Low S marine diesel (from 0.5 to > 0.1% S)	-80	0	0
Liquefied Natural Gas	-90	-80	-100
Source: Burel et al. 2013			

Why The Arctic?

- Environmentally Important & Sensitive Area
- Increased levels of development interest
- Arctic Sea Routes
  - Environmental Impact
  - Infrastructure Requirements
- Unique & Complex Governance

MARITIME AND ENERGY GOVERNANCE AND THE ARCTIC OPPORTUNITY

Governance

- Maritime Governance
- Energy Governance
- Exploring the Arctic
  - Uniting Energy & Maritime Governance

Maritime Governance

- International Maritime Organization
  - United Nations Convention on the Law of the Sea (UNCLOS III)
  - International Convention for the Prevention of Pollution from Ships (MARPOL)
- European Union
  - Marine Strategy Framework Directive
  - Integrated Maritime Policy

Energy Governance

- Intergovernmental Agencies
  - International Energy Agency
- Summit Processes
  - Group of Eight
- Multilateral Development Banks
  - Asian Development Bank

Arctic Governance

- Arctic Council
  - 8 Arctic States & Indigenous Membership
  - Non-Arctic States & NGO Observer Status
- Increasing Influence of Non-Arctic States
- Heavily influenced by IMO/UNCLOS
- Tension over disputed territorial boundaries

Governance Trends

- Expanding role of non-state actors
  - NGO's, Corporations
- Maritime: regional cooperation & coordination
  - EU, Arctic Council
- Energy: Developing nations & emerging markets
  - India, China
- Arctic: Increased role of non-Arctic stakeholders
  - Non-Arctic States, NGO's, corporations

Looking forward:

- What are the socio-economic costs of the transition to LNG for shipping?
- How do governance actors view the transition to LNG in shipping?
- Cost Benefit Analysis
- Discourse Analysis

Cost Benefit Analysis

- Project/Policy Definition
- Identification of Physical Impacts of the Policy/Project
- Valuing Impacts
- Discounting of Costs and Benefit Flows
- Applying the Net Present Value Test
- Sensitivity Analysis

Hanley & Barbier 2009

Thank You

http://uk.reuters.com/article/melting-arctic-ice-opens-new-shipping-channel-for-novelty-[illegible] /