

26th World Gas Conference

1 – 5 June 2015, Paris, France



Thematic Session PGC D-4

Study Group Report: Life Cycle Assessment of LNG

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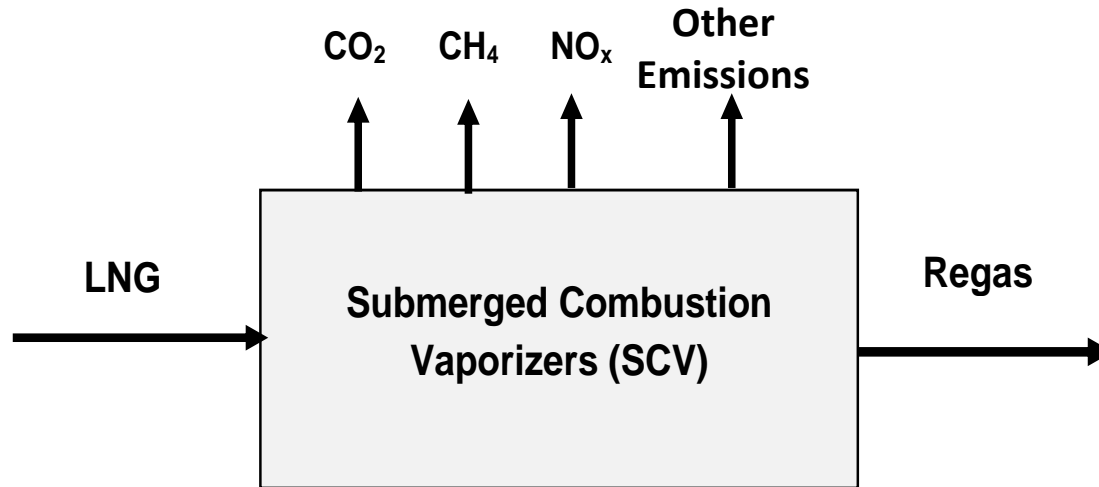
Study Group Report: Life Cycle Assessment of LNG

- **Study Objective: Develop ISO Standards-Compliant Life Cycle Inventory (LCI) Data to Support Life Cycle Assessment (LCA) of LNG Chains.**
- **Key ISO Standards:**
 - ISO 14048: “Principles and Framework”
 - ISO 14044: “Requirements and Guidelines”
 - ISO 14047: “Illustrative Examples...Impact Assessment Situations”
 - ISO 14048: “Data Documentation Format”
 - ISO 14049: “Illustrative Examples...Goal and Scope Definition and Inventory Analysis.”

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- **Relevance to LNG Chains (“Getting the LNG Chain Right”):**
 - “Large scale” LNG trade
 - From receipt of natural gas at liquefaction plant to send out of natural gas from regasification plant.
 - “Modular” approach: 4 liquefaction technologies, 5 liquefaction power sources, 4 marine LNG carrier types, 5 regasification technologies.
 - Additional considerations: NGL removal, feedgas characterisation, process conditions.
 - Air emissions – CO₂, CH₄, NO_x, total CO₂e, “criteria” emissions.

- **Module Representation**

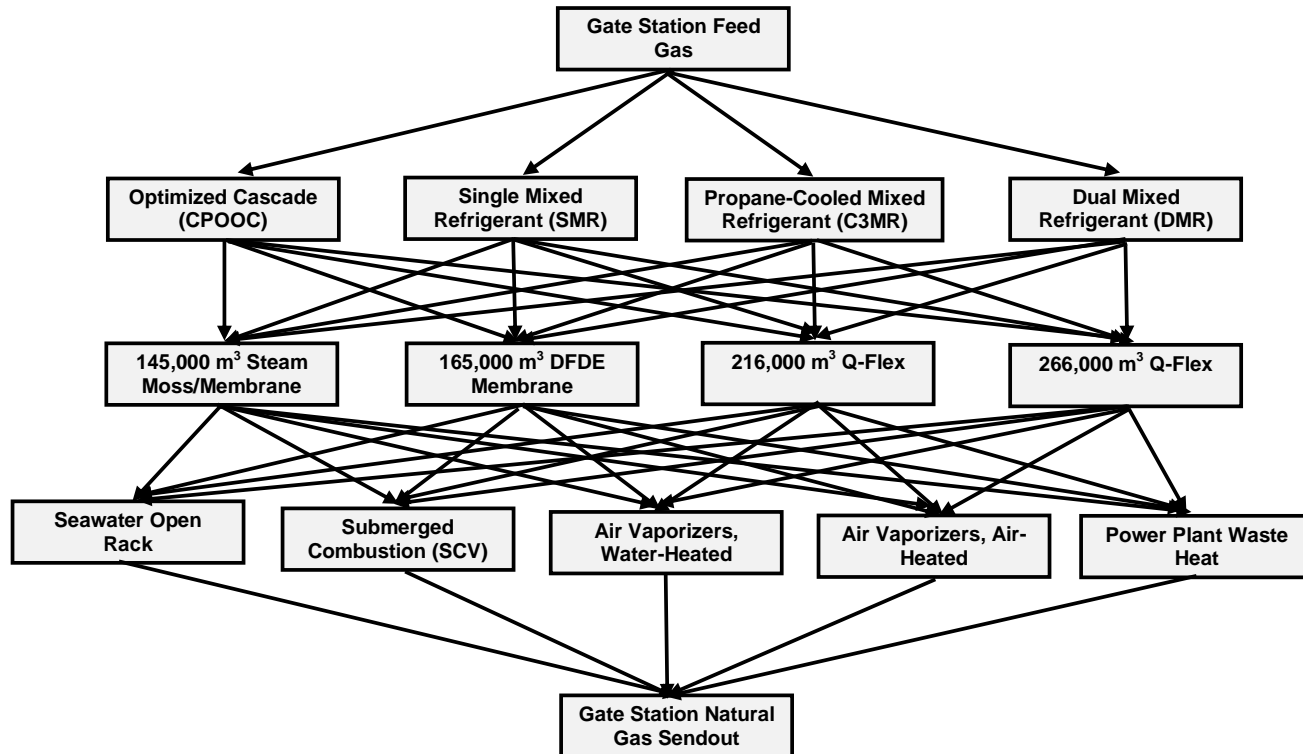


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Pre-Treatment
and Liquefaction

Marine Transport
incl. Berthing

Regasification
(Regas)



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- Case Study: Center for LNG LCA – LNG v Coal for Power Generation**

Phase of LCA	Low GHG Case		High GHG Case	
	CO ₂ -e (tonnes/MW h)	% Of Total	CO ₂ -e (tonnes/MW h)	% Of Total
Well Drilling	2.05E -03	0.4%	2.48E -03	0.4%
Extraction	1.51E -02	3.0%	1.83E -02	3.2%
Processing - Dehydration	8.51E -05	0.0%	1.03E -04	0.0%
Processing - All Other	2.57E -02	5.2%	3.12E -02	5.5%
Transport (To Liquefaction)	8.83E -03	1.8%	1.07E -02	1.9%
Liquefaction	3.73E -02	7.5%	7.04E -02	12.5%
Shipping	1.61E -02	3.2%	3.72E -02	6.6%
Regasification	7.49E -04	0.2%	2.38E -03	0.4%
Transport (To Power Gen)	2.61E -02	5.2%	2.61E -02	4.6%
Power Generation	3.65E -01	73.5%	3.65E -01	64.7%
Total:	4.97E -01	100.0%	5.64E -01	100.0%

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- **Report Part One: LNG Background**
 - Relevance to the Four Pillars
 - LNG and its Role in World Energy
 - Life Cycle Assessment and LNG
 - Center for LNG Case Study.
- **Report Part Two: IGU LCI Development**
 - Study Goals, Range of Application, Interest of Realisation, Target Groups, Publication or Other Accessibility to the Public
 - Role of LCI Within LNG and LCAs, Objectives, and Approach
 - The Product System, Technical System Boundaries, Study Limitations, Data Presentation.

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- **Key Features of Study Group Approach**
 - “Modular Approach” to LNG Chains
 - Utilisation of Expert Contractor Support (Pace Global Under Center for LNG Sponsorship)
 - Expansion of Data Development – Statoil SCEET Modeling
 - Emphasis on Data Tool Development for IGU Member Analysis of LNG Chains
 - Transferrable to Continuing IGU under Sustainability.

Study Group Report: Life Cycle Assessment of LNG

- **Key Contributors:**

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