Minimizing Methane Leakage in Natural Gas Trade

Creating ‘Club Goods’ for LNG Exporters, Importers, Shippers and Maritime Fuel Users

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Disclaimers

Preliminary report, not final report

Views expressed are mine, and not necessarily ICTSD’s
Outline of Comments

1. The problem(s)
2. Existing international arrangements
3. Potential new international arrangements
4. Conclusions
   - Solutions to methane leakage problems
   - Political economy of ‘club goods’
1. The problem(s)
Methane leakage in LNG trade

Methane GWP
86 at 20 years and 34 at 100 years
(IPCC, AR5, WG 1, 2013 report)

Increases in...
• LNG transported in international shipping
• LNG as a maritime shipping fuel
Drivers of increases in LNG in trade

Shale gas: US and other countries

Ukraine crisis: changes in trade patterns

IMO: new fuel efficiency regulations
How much of a problem?

Don’t know:
LNG export liquefaction, LNG import regasification
Shipping – LNG transport and fuel (see studies by ICCT)
Variations in US studies (see Brewer, ICTSD study)

Not very big now:
Only small fraction of total world ghg emissions

Likely to increase significantly:
Natural gas production/consumption (see IEA studies)
Shale gas deposits and prices (see Brewer, ICTSD study)
Projections of LNG export and import facilities
   (see Appendices 1 and 2 of this presentation)
LNG transport ship fleet (see industry projections)
LNG in trade
Source: www.bp.com - also see Appendix 3
Total’s LNG export liquefaction facilities

Source: www.total.com
Total’s LNG import re-gasification facilities
Source: www.total.com
LNG liquefaction export facility
Statoil: Melkoya, Hammerfest, Norway
(largest in Europe, developed by Linde of Germany)
FLNG ‘Ship’
(500 meters long; for deployment off coast of Australia)
Re-gasification import facility:
(largest in Europe, South Hook, Milford Haven, UK, Wales)
2. Existing international arrangements

Climate and Clean Air Coalition (CCAC)/UNEP
Clean Energy Ministerial (CEM)
Energy Charter Treaty (ECT)
G-8 [7]
Global Methane Initiative (GMI)
International Energy Agency (IEA)
International Maritime Organisation (IMO)
International Standards Organisation (ISO)
UN Environment Programme (UNEP)
UN Framework Convention on Climate Change (UN FCCC)
UN Inter-governmental Panel on Climate Change (UN IPCC)
World Bank (including GEF)
World Trade Organization (WTO)
Needed: Better Methane Monitoring, Reporting, Verification (MRV)

Export liquefaction facilities

Ships’ LNG cargo

Ships’ LNG fuel

Import re-gasification facilities
3. New international arrangements

>Certification/declaration of leakage rates by ... exporters, shippers, importers

>Independent verification

>In relation to agreed allowable leakage rates
Next steps

• Expand dialogue in international venues, including but not limited to the IMO, IEA, UNEP/CCAC

• FCCC/COP-21: strengthen methane MRV, including LNG export and import facilities; endorse concept of LNG international trade methane leakage agreement

• Begin creation of Preparatory Committee as prelude to negotiating development of new arrangements
Illustrative structure

IEA
IMO
UNEP (CCAC)
Preparatory Committee
UNFCCC
WTO

CEM  ECT  GEF  GMI  ISO  UNCTAD  UNIPCC  UNDP  UNIDO  World Bank
Bi-lateral, regional and plurilateral trade arrangements
Illustrative process

Preparatory Committee 2016-17 → Negotiating Conference 2018-19 → Implementation by various agencies – e.g. IMO, ISO, WTO, FCCC - 2020
4. Conclusion

Does it ‘have legs’ ...

• As solution to LNG methane leakage problem?

• As source of lessons about ‘club goods’?
Methane leakage problems

There are reasons to be concerned.

Problem is only small fraction of total ghg problem.

Cost-effective technical solutions exist.

What about the political economy of participation and compliance? Create ‘club goods.’
Issues about creating ‘club goods’

Conditions that facilitate/inhibit efforts?

- Economic: structure of industry
- Political: who has how much influence
- Cultural: sensitivity to climate change

(The IMO is not the ICAO – see Appendix 4)

Regulatory capture?

- Neglected topic in climate change and other international regime studies
More issues about creating LNG trade ‘club goods’

Two sets of issues with different national government interests, industries, and international organisations

I. LNG export liquefaction and import regasification
   Govt: National natural gas systems and regulations
   Indus: Natural gas drilling, extracting, refining, distributing firms
   IOs: FCCC, WTO, others

II. Shipping
   Govt: National maritime subsidies and trade protection
   Indus: Ship building firms and maritime shipping firms
   IOs: IMO, WTO, others
For more information...


International Maritime Organisation. Energy efficiency and the reduction of GHG emissions from ships. www.imo.org


Appendix 1: LNG Export Liquefaction Facilities

<table>
<thead>
<tr>
<th></th>
<th>A. In existence as of 2013</th>
<th>B. Under construction as of 2014</th>
<th>In existence or under construction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total: 69 facilities</td>
<td>Total: 28 facilities</td>
<td>Total: 97 facilities</td>
<td></td>
</tr>
<tr>
<td>in 23 countries</td>
<td>in 8 countries</td>
<td>in 25 countries</td>
<td></td>
</tr>
<tr>
<td>Australia</td>
<td>8</td>
<td>Australia</td>
<td>14</td>
</tr>
<tr>
<td>Indonesia</td>
<td>9</td>
<td>Indonesia</td>
<td>1</td>
</tr>
<tr>
<td>Qatar</td>
<td>14</td>
<td>Qatar</td>
<td>-</td>
</tr>
<tr>
<td>Russia</td>
<td>2</td>
<td>Russia</td>
<td>3</td>
</tr>
<tr>
<td>US</td>
<td>1</td>
<td>US</td>
<td>4</td>
</tr>
<tr>
<td>18 other countries</td>
<td>35</td>
<td>4 other countries</td>
<td>6</td>
</tr>
</tbody>
</table>

Source: Computed by the author from IGU, World LNG Report, 2014; App. I and II
## Appendix 2: LNG Import Re-gasification Facilities

<table>
<thead>
<tr>
<th>A. In existence as of 2013</th>
<th>B. Under construction as of 2014</th>
<th>A+B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total: 94 facilities in 26 countries</td>
<td>Total: 26 facilities in 11 countries (4 new)</td>
<td>Total: 120 facilities in 30 countries (26 + 4)</td>
</tr>
<tr>
<td>China 9</td>
<td>China 4</td>
<td>13</td>
</tr>
<tr>
<td>EU (8) 17</td>
<td>EU (4) 5</td>
<td>22 (EU 8)</td>
</tr>
<tr>
<td>Japan 21</td>
<td>Japan 5</td>
<td>26</td>
</tr>
<tr>
<td>US 12</td>
<td>-</td>
<td>12</td>
</tr>
<tr>
<td>15 other countries 35</td>
<td>5 other countries 12</td>
<td>47 in 20 other countries</td>
</tr>
</tbody>
</table>

Source: Computed by the author from IGU, World LNG Report, 2014; App. III and IV
## Appendix 3: LNG trade partners (2013, mtpa, rounded)

<table>
<thead>
<tr>
<th>Exporters/Importers</th>
<th>Aus</th>
<th>Indo</th>
<th>Mal</th>
<th>Nig</th>
<th>Qatar</th>
<th>Top 5 Sub-total</th>
<th>Other</th>
<th>Sub-total</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>&lt;1</td>
<td>7</td>
<td>16</td>
<td>3</td>
<td>19</td>
</tr>
<tr>
<td>India</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>11</td>
<td>12</td>
<td>1</td>
<td>13</td>
</tr>
<tr>
<td>Japan</td>
<td>18</td>
<td>6</td>
<td>15</td>
<td>4</td>
<td>16</td>
<td>59</td>
<td>29</td>
<td>88</td>
</tr>
<tr>
<td>Korea</td>
<td>-</td>
<td>6</td>
<td>4</td>
<td>3</td>
<td>14</td>
<td>27</td>
<td>14</td>
<td>41</td>
</tr>
<tr>
<td>Taiwan</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>6</td>
<td>13</td>
<td>-</td>
<td>13</td>
</tr>
<tr>
<td>Other</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>6</td>
<td>25</td>
<td>31</td>
<td>33</td>
<td>65</td>
</tr>
<tr>
<td>Sub-total</td>
<td>22</td>
<td>17</td>
<td>25</td>
<td>17</td>
<td>77</td>
<td>158</td>
<td>80</td>
<td>238</td>
</tr>
</tbody>
</table>

Source: Computed by the author from IGU, World LNG Report, 2014; Table 3.2. Discrepancies in sub-totals are result of rounding data in the original source.
Mandatory measures to reduce emissions of greenhouse gases (GHGs) from international shipping entered into force on 1 January 2013.

The amendments to MARPOL Annex VI Regulations for the prevention of air pollution from ships, which entered into force on 1 January 2013, add a new chapter 4 to Annex VI on Regulations on energy efficiency for ships to make mandatory the Energy Efficiency Design Index (EEDI), for new ships, and the Ship Energy Efficiency Management Plan (SEEMP) for all ships.

Recent work in the Marine Environment Protection Committee

2013 MEPC 65: 2013 guidelines agreed, EEDI extended to other ship types

2012 MEPC 64: Guidance and interpretations approved

2012 MEPC 63: Adoption of four sets of guidelines intended to assist in the implementation of the mandatory Regulations on Energy Efficiency for Ships in MARPOL Annex VI

MEPC 65 - Update of GHG emissions estimate gets go-ahead

MEPC 65 (May 2013) approved the terms of reference and agreed to initiate a study for an updated greenhouse gas (GHG) emissions’ estimate for international shipping, following discussion in an expert workshop, which met earlier this year, on the methodology and assumptions to be used.

Studies and reports

Assessment of IMO-mandated energy efficiency measures for international shipping (2011)

Expert Group (MBM-EG) feasibility study and impact assessment of proposed market-based measures (2010)

Intersessional meeting of IMO’s Working Group on GHG from Ships (March 2011) considered the development of suitable MBMs

Second IMO GHG Study 2009