When cargo becomes fuel: Complexities of boil-off and reliquefaction in LNG shipping

As LNG carriers evolve, boil-off is becoming a growing source of legal and commercial disputes. Understanding the risks, and addressing them early in the charterparty, has never been more important.

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The transportation of liquefied natural gas ('LNG') will always involve a small part of the liquid cargo evaporating during carriage. This evaporation of the cargo, which varies in amount from ship to ship depending on design, is completely normal and necessary and is referred to as 'boil-off'.

Owners will typically warrant a set amount of boil-off in the charterparty, but various factors can affect this, including charterers' instructions, weather conditions, mechanical defects, deviations and delays. Standard charterparties also do not account for vessels that can reliquefy boil-off on board, meaning this capability may not be reflected in the charter terms. The design of most modern LNG carriers enables boil-off to be used for propulsion of the ship – so alongside the standard fossil fuel bunkers which the vessel will also have on board, the vessel will normally use boil-off to fuel the ship. This means that boil-off, whilst being a natural result of transporting the cargo, also forms an intrinsic part of the vessel's speed, performance and bunker consumption warranties. These complexities surrounding boil-off show why it is a fertile area for disputes, which need to be carefully addressed ideally at the contracting stage.

Common disputes and how to avoid them

There are various factors which may increase the amount of cargo which becomes boil-off. These include matters such as higher temperatures of LNG (which vary from terminal to terminal), being requested to backload cargoes which may increase the temperature of the cargo, cargoes having higher nitrogen quantities (where nitrogen burns more quickly), or lower quantities of cargo being loaded or severe weather being encountered, both of which result in greater 'sloshing' (the movement of cargo in the tanks caused by the movement of the ship) and cargo heating. Owners may wish to include in the charterparty an exclusion for these matters in the boil-off warranty.

In the event that excess boil-off is used as fuel beyond the agreed allowances, Owners may wish to include an express provision in the charterparty entitling them to compensation for the value of the fuel savings provided to Charterers. Without such a clause, Owners may effectively subsidise Charterers' fuel costs without recognition or reimbursement.

Whilst the ShellLNGtime contracts may set out that any excess boil-off is excluded from the fuel consumption, such that Owners are not penalised twice, the contracts may need to be reworked further to allow for Owners to earn credit for any fuel savings.

Parties may also wish to set out whether the boil-off rate is calculated on the basis of the volumetric capacity of the tanks, equating to 100% of the capacity, or the cargo capacity of the tanks which is typically around 98% of the capacity, given a vapour space will normally be left in the tank for safety reasons. Calculating boil-off on 100% capacity would suit owners, whereas calculating on the lower capacity would suit charterers.

Where the cargo is not owned by the charterer, but by a separate receiver, the head charterparty terms should be incorporated into the bill of lading in order to enable Owners to rely on the agreed boil-off allowances. Without those allowances incorporated into the bill of lading, an owner may be liable for excess boil-off, even if below agreed quantities in the charter. Whilst any bill of lading claims may be subject to Hague-Visby defences such as the 'inherent vice' provision, it would still require Owners to show the boil-off was in an amount which was attributable to the properties of the cargo and not at an increased level due to an ineffective containment system or other engineering issues.

Traditionally, in the LNG trade, less importance has been placed on the bills of lading compared to other trades. This is partly because LNG cargoes are rarely resold and the bill of lading doesn't play a major role in pricing since payment is based on the volume delivered at the discharge port, not at the load port. However, complacency on that front (and forgetting to incorporate law and jurisdiction clauses into bills of lading) has resulted in Owners facing cargo claims in unwanted jurisdictions where Owners may have less protection.

Many issues and disputes arising from boil-off can arise due to misunderstandings – for example by the Charterers giving voyage instructions which perhaps lack clarity or which inadvertently will impact boil-off. So for example, if Charterers give instructions to only use boil-off gas as fuel and also maintain a daily average speed, it is important for Owners to consider whether those instructions will result in the vessel exceeding the maximum boil-off rate and inform Charterers of this, to avoid potential disputes arising at a later stage.

Where cargoes contain excessive amounts of nitrogen, this could pose new problems for the vessel; high nitrogen quantities could affect the temperature of the cargo which may have an impact on the vessel's containment system and given nitrogen boils off more quickly than methane, this could also potentially result in excess boil-off. Some thought should be given to clauses to address that risk, including potentially giving Owners a right to take cargo samples on loading to be able to evidence any arguments on excessive nitrogen at a later stage. Standard form LNG contracts do not provide Owners with a right to take samples of cargo and this might be a prudent solution to tackle another issue which is becoming increasingly troublesome in the LNG space: the presence of long chain hydrocarbons. The effect of long chain hydrocarbons affects the vessel whereby heavier hydrocarbons settle and solidify, thus clogging the vessels strainers, pipelines and pumps. All of which leads to a problematic dispute both legally and operationally between Owners and Charterers. While further information on long chain hydrocarbons is beyond the scope of this article, to minimise such disruption, Owners can look to minimise the consequences by having the ability to sample the cargo prior to loading or inserting a clause addressing how to handle and whom to bear responsibility in their Charter Party.

Boil-off disputes may also increasingly intersect with environmental issues. LNG is predominately methane, which is a greenhouse gas over 25 times more potent than CO2. When boil-off gas escapes unburned due to venting or engine inefficiencies (methane slip), its environmental impact becomes significant. As environmental regulations continue to evolve and intensify, charterparty terms are likely to increasingly address emissions responsibilities to help prevent disputes and ensure compliance.

What Members should consider

Whilst all LNG carriers will create boil-off, some LNG carriers will be able to reliquefy that boil-off. Some vessels will be able to fully reliquefy all boil-off and some will only be able to partly reliquefy boil-off depending on the design of the ship.

Owners with reliquefaction capabilities will wish to include an express provision that if a vessel can reliquefy boil-off, a charterer's contractual right to immediately deduct excess boil-off is amended to reflect that. A standard LNG charterparty which does not provide for reliquefaction will need reworking and ideally there would be a clear agreement on how boil-off warranty calculations are done when the reliquefaction plant is in use.

If a vessel is capable of full reliquefaction, boil-off warranties may seem unnecessary. However, it is still sensible to include something to protect Owners in the event that the reliquefaction equipment stops working; otherwise Charterers might try to claim or deduct more than the actual loss.

Available insurance solutions

Most charterparties typically allow for excess boil-off and boil-off during off-hire periods to be deducted from sums due to Owners. This will normally be agreed as a contractual mechanism which entitle Charterers to make a deduction without Owners being able to raise any contractual defences. For example, a Hague-Visby defence of 'inherent vice' which might at first glance seem applicable given the nature of the cargo, will not be applicable under standard charterparties which entitle Charterers to make deductions from hire or freight for excess boil-off or boil-off during off-hire periods. Under ShellLNGtime1, (see clause 29d) it is provided that the Hague-Visby rules will not apply to any provision in the charter relating to boil-off.

The result of this contractual mechanism is that Owners will usually not be able to rely on their P&I insurance to cover certain boil-off deductions, despite those claims essentially being cargo claims. That is because a contractual liability which is more onerous than the Hague-Visby rules and falls outside the scope of P&I cover. It has also been opined by the General Average Adjusters advisory committee that when a General Average ("GA") incident occurs, boil-off used will not necessarily be recoverable under GA. That is because boil-off will not be considered an extraordinary sacrifice given it arises from the ordinary characteristics of the cargo.

Given that these boil-off claims can be large and complex there may not always be obvious available remedies for Owners to recover these losses. Gard may offer insurance products that can assist Owners in relation to boil-off. Owners should contact their underwriter to discuss appropriate insurance solutions which Gard can help prepare.