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Maritime stakeholders have to navigate an ever more complex regulatory environment. Z-Joule's **Fernando Alvarez** suggests that Compliance-as-a-Service (CaaS) is a new business model that could facilitate compliance with a raft of global and regional rules

Over the last 15 years, the shipping segment has seen the introduction of substantial regulations regarding the origin and composition of maritime fuels and the efficiency of the vessels consuming these fuels. These regulations include SECAs, NECAs, CII, EEDI, EEXI, EU-ETS, RED II, and, as of 1 January 2025, FuelEU Maritime. Additionally, in April 2025, the IMO is likely to approve the so-called mid-term GHG reduction measures (MTM) at MEPC 83.

The different geographical scope and timing of these regulations, coupled with dozens of adjustments or exceptions for various fuel production pathways, vessel types, and operating profiles, create a veritable maze of compliance for vessel operators. Moreover, there is significant commercial uncertainty regarding the availability and pricing of new fuel alternatives and the machinery these require. Together, these factors create a complex problem for vessel operators: what is the optimal compliance strategy? That is, how can each operator comply with all regulations while minimising the cost of doing so?

It is in this context that Compliance-as-a-Service (CaaS) emerges as a promising business model, designed to help operators navigate a complex regulatory landscape while optimising compliance strategies and minimising associated costs.

> 'The sheer number of possible compliance strategies makes it computationally difficult to identify the most cost-effective approach, even for a small fleet'

EVERYTHING-AS- A-SERVICE (XAAS)

Over the past two decades, the 'Everything-as-a-Service' (XaaS) business model has transformed many economic segments, including IT (Software-as-a-service), mobility (Vehicle-as-a-service), and energy (Battery-as-a-service), to name a few. Many other variants of the XaaS model have emerged, all sharing a few key characteristics:

(a) Reduced up-front capital expenditure (CapEx). XaaS allows the end user to leverage complex or costly assets without the need for a large up-front investment. Rather, the end users typically pay as they use the asset.

(b) Fractional utilisation and pooling. Given that not all end-users will access the assets simultaneously or with the same intensity, it is possible to fulfill the needs of multiple users with a smaller asset pool, relative to a case where each end-user

would acquire the assets needed to cover their own peak demand.

(c) Outsourced management. XaaS centralises the management and maintenance of the assets, reducing the need for each end-user to retain the relevant competence in-house.

(d) Cost transparency and predictability. The XaaS provider absorbs some of the cost risks and fluctuations as part of their offering, and charges the end-user a monthly or yearly fee as a function of their utilisation of the services.

COMPLIANCE AS A SERVICE

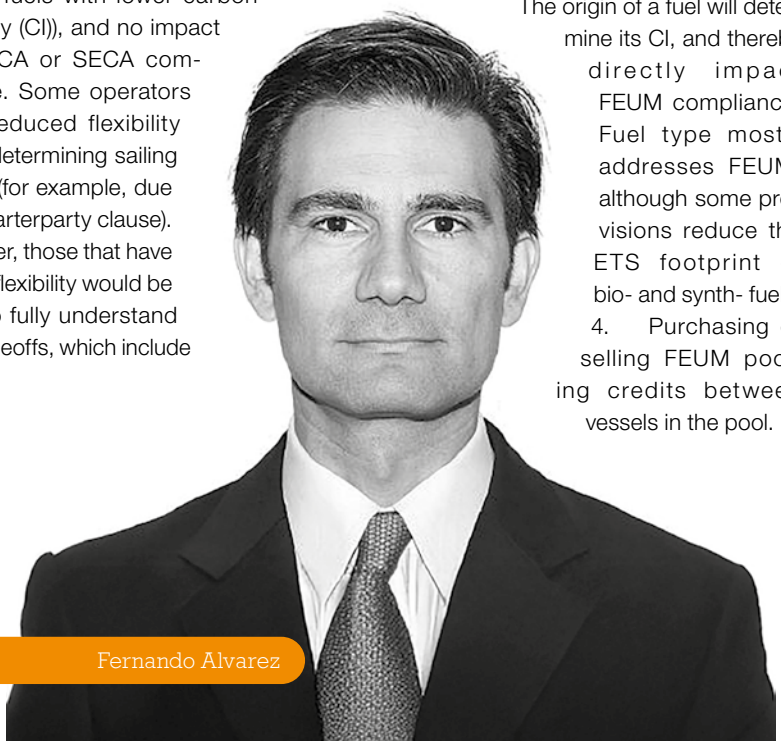
Is it possible to build an emissions compliance service for the shipping segment with these core characteristics? Yes, with some qualifications.

Let's begin by laying out the pieces of regulation that the service would target. From the list of regulations provided at the top of the article, CaaS should target SECAs, NECAs, CII, EU-ETS, FEUM (which indirectly includes RED II), and IMO MTM. On the other hand, EEDI and EEXI relate to vessel design and construction, rather than operation, and therefore would not be natural candidates for an ongoing compliance service.

To comply optimally with the target regulations, an individual operator would have the following controls at their disposition:

1. Vessel speed. Speed has a direct impact on CII and EU-ETS, but only second-order impact on FEUM (as it burns less fuel, the vessel needs smaller quantities of fuels with lower carbon intensity (CI)), and no impact on NECA or SECA compliance. Some operators have reduced flexibility when determining sailing speed (for example, due to a charterparty clause). However, those that have speed flexibility would be wise to fully understand the tradeoffs, which include the potential to generate additional revenues with the vessel.
2. Fuel type. Here we refer to the fact that alternative-fuel vessels are typically also capable of running on conventional fuels such as very low sulphur fuel oil (VLFSO) and marine gasoil (MGO). Depending on the price and availability of the alternative fuels, the vessel might choose to utilise conventional fuels for a portion (or the entirety) of some voyages. Fuel type selection impacts compliance with NECAs, SECAs, EU-ETS, CII, and FEUM.
3. Fuel origin. We make a distinction between fuel type (e.g. VLSFO, MGO, ammonia, LNG, LPG, methanol) and fuel origin (e.g. fossil, biological, or synthetic[1]). The origin of a fuel will determine its CI, and thereby directly impact FEUM compliance. Fuel type mostly addresses FEUM, although some provisions reduce the ETS footprint of bio- and synth- fuels.
4. Purchasing or selling FEUM pooling credits between vessels in the pool.
5. Banking or borrowing FEUM credits across years for a given vessel[2].
6. Paying penalties and levies.

> 'By joining the CaaS, the compliance-long participants allow the compliance-short participants to apply a fraction of those assets towards their compliance needs, but without a large up-front investment'



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Fernando Alvarez

The sheer number of possible compliance strategies makes it computationally difficult to identify the most cost-effective approach, even for a small fleet. This challenge is further compounded by regulatory and commercial uncertainty, tracking and reporting requirements, and the need to manage pooling transactions across fleets. With these considerations, a complete CaaS offering would ideally provide the following:

- Possibility to purchase and sell pooling credits.
- Access to alternative fuels under attractive terms by establishing frame agreements with fuel suppliers.
- Compliance planning, to help operators understand the cost and risk of different strategies under different commercial scenarios.
- Expertise and guidance on existing and forthcoming legislation.
- Expertise and guidance on the availability, technical properties, pricing, and quality of shipping fuels, with particular emphasis on alternative fuels.
- Emissions tracking, processing and submitting of compliance paperwork.

A HEALTHY POOLING MECHANISM ENABLES CAAS

It is the opportunity to purchase and sell pooling credits across fleets that enables the CaaS business model. Referring to the key features of XaaS listed above, it is only through pooling that the CapEx reduction and fractional utilisation benefits can be achieved in CaaS. Participants in a CaaS fall into two categories: compliance-long and compliance-short. In essence, the compliance-long participants have incurred an up-front CapEx in order to deploy alternative fuel vessels (which are typically more expensive than conventional vessels). By joining the CaaS, the compliance-long participants allow the compliance-short participants to apply a fraction of those assets towards their compliance needs, but without a large up-front investment.

Given the criticality of cross-fleet pooling to the viability of CaaS, we now explore some risks related to the stability of the pooling mechanism. The EU has set a relatively modest 2% intensity reduction target for the period of 2025-2030. Based on a quick calculation, we estimate that this requires credits covering about 3 million $mtCO_2eq$ per year[3]. There is a possibility that this could be too soft of a requirement. Referring to recent report-

ing from DNV[4] and Clarkson's[5], it appears that there might already be enough LNG vessels to supply all of the FEUM pooling credits required between 2025-2030. If we add vessels sailing on biodiesel, ammonia, and bio-methanol to the supply side, it is not unlikely that we could witness a surplus of pooling credits[6].

This is not such a far-fetched scenario. Recall the initial introduction of the EU-ETS carbon instruments, where allowances were over-supplied, and prices dropped below €20 per metric tonne (p/mt)[7]. If the CaaS is structured to charge its clients as a percentage of the value of the credits exchanged, and the value of these credits plummets, the profitability of the CaaS would suffer.

Conversely, what if there was a critical shortage of pooling credits in the market? It is conceivable that some compliance-long players would simply choose not to offer their credits. They might do so out of competitive concerns (to deny an opportunity to competing fleets) or due to their ESG policy (pooling allows compliance-short players to delay any net emissions abatement initiatives). In the absence of a liquid market for credits, the viability of CaaS could be jeopardised.

Finally, we should consider a scenario where the forthcoming IMO MTMs do not harmonise with existing FEUM regulations. For instance, if the IMO imposes a global carbon intensity limit, but no pooling mechanism, this would almost certainly make FEUM pooling obsolete. In this case, vessels would have to comply with an emissions intensity requirement individually for sailings worldwide. By extension, they would comply individually with an emissions intensity requirement in the geographical scope of FEUM, and they would have no use for FEUM pooling credits. Here we see a clear mandate for the regulators to ensure that the market for emissions intensity trading remains healthy and effective.

In the absence of a pooling mechanism, it might still be worthwhile to establish a CaaS solution. This service could focus, for instance, in aggregating the buying power of many operators to secure bio- or synth- fuels on more attractive terms. The CaaS could also assist clients in performing all the required compliance reporting and tracking. However, these alone seem to be somewhat less compelling reasons to join a CaaS.

ROLES FOR DIVERSE PLAYERS

To finalise, let's explore how diverse stakeholders in the shipping segment might become CaaS providers or facilitators. In a previous article in *Bunkerspot*[8] we suggested that ship brokers have a natural role in this space. In addition, there could be interesting new business opportunities for others, as follows:

- Ship management companies. These companies already offer services in regulatory compliance and fuel sourcing. An extension into CaaS seems natural.
- Fuel Suppliers. Companies that produce or supply bio- and synth- fuels are in an interesting position, as pooling credits effectively reduce demand for their products. This is precisely the reason that they should offer CaaS. If a fuel supplier does not provide comprehensive compliance support to its customers, someone else will, possibly leading the customers away from the fuel supplier's products.

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- Insurers. It is possible to interpret compliance as an insurance risk. Established shipping insurers could write policies against compliance deviations and assist the operators by purchasing pooling credits or hedging on bio- and synth- fuel prices.
- OEMs, yards, and financial institutions. An OEM or yard might offer its alternative-fuel equipment at a reduced price up-front, in exchange for an option on any credits that might be generated by the vessel. They would then be in a position to establish a CaaS by reselling those credits. Financial institutions can construct an equivalent offer.
- Independent pooling services, such as Prosmar, AHTI Climate, BetterSea, and Zero44[9], which are essentially market-making platforms.

For incumbent players with a solid balance sheet and deep ties to the shipping segment, we would strongly recommend establishing an early presence in CaaS. We believe that complexity in the shipping decarbonisation and emissions compliance space will increase, and customers will come to expect innovative solutions from their existing suppliers.

As for start-up companies entering this space, we do highlight the need for financial prudence. The shipping segment takes its time to embrace new business models. In the last decade, we have seen multiple new ventures in shipping services that started with a sprint, using massive sums of venture capital or private equity money to grow and gain market share. However, they found out that they were actually running a marathon and ran out of funding or struggled to achieve profitability.

The emergence of CaaS marks the beginning of a transformative era in shipping services. Success in this space will require foresight, innovation, and a deep understanding of industry dynamics. Those who rise to the challenge will meet their customers' evolving expectations and position themselves to grow their market share while shaping the future of decarbonised maritime commerce.

1. Also known as electro-fuels or e- fuels.
2. Here we note that FEUM does not allow pooled vessels to borrow from their own future compliance balance.
3. See page 30, https://climate.ec.europa.eu/document/download/e3ddba7a-c068-4f87-a7c2-e98d63e56cf0_en?filename=swd_2023_54_en.pdf.
4. www.dnv.com/services/alternative-fuels-insights-afi--128171.
5. www.bunkerspot.com/global/63987-global-clarkson-research-alternative-fuel-vessels-represented-50-of-all-tonnage-ordered-in-2024.
6. There are several complications here, however, as the credit generation potential of these vessels will depend on their routing, fuel type and origin selection, and speed. Additionally, the supply of credits depends on the willingness of the compliance-long players to offer these credits into an external pool. Some might choose to bank the credits for their own use in the future, or even allow them to expire. This leads to a very interesting game-theoretical exercise, as the decision of the compliance-long players to bank credits depends on their expectation for future price developments, say in the 2030-2035 period. This again will depend on their expectations for the pace of adoption of decarbonization measures against the pace of future regulations.
7. By some accounts, the oversupply of allowances is still affecting the ETS mechanism negatively, see for example: https://carbonmarketwatch.org/2024/02/29/eu-ets-price-slump-the-spectre-of-oversupply-haunting-europe.
8. See Bunkerspot v21n6 Dec24-Jan25, pages 54-59.
9. This non-exhaustive list of new CaaS providers was obtained from www.zerocarbonshipping.com/news/fueleu-explainer-practicalities-of-pooling.

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