International Chamber of Shipping

Shaping the Future of Shipping

# Reducing $CO_2$ Emissions to Zero: The 'Paris Agreement for Shipping'

## Implementing the Initial Strategy on Reduction of GHG Emissions from Ships (adopted by the UN International Maritime Organization)


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The International Chamber of Shipping (ICS) is the global trade association representing national shipowners' associations from Asia, the Americas and Europe and more than 80% of the world merchant fleet.

Established in 1921, ICS is concerned with all aspects of maritime affairs particularly maritime safety, environmental protection, maritime law and employment affairs.

ICS enjoys consultative status with the International Maritime Organization (IMO).

# Reducing $CO_2$ Emissions to Zero: The 'Paris Agreement for Shipping'

In April 2018, the UN International Maritime Organization (IMO) adopted a high level strategy for the further reduction of shipping's greenhouse gas emissions. I was very encouraged by the willingness of governments, on all sides of the debate, to co-operate and move to a centre position. This is the epitome of how IMO works.

The result is a truly ground breaking agreement – 'a Paris Agreement for shipping' – that sets a very high level of ambition for the future reduction of $CO_2$ emissions. I am confident this will give all industry stakeholders the clear signal they need to get on with the job of developing zero $CO_2$ fuels, so that the entire sector will be in a position to decarbonise completely, consistent with the 1.5 degree climate change goal.

The agreed IMO objective of cutting the sector's total greenhouse gas by at least 50% by 2050, as part of a continuing pathway of further reduction, is very ambitious indeed, especially when account is taken of current projections for trade growth as the world's population and levels of prosperity continue to increase.

While some governments would have preferred to see the adoption of even more aggressive targets, it should be remembered that a 50% total cut by 2050 can realistically only be achieved with the development and widespread use, by a large proportion of the fleet, of zero $CO_2$ fuels. If this goal is successfully met, the wholesale switch by the industry to zero $CO_2$ fuels should therefore follow very swiftly afterwards.

We now expect discussions at IMO to begin in earnest on the development of additional $CO_2$ reduction measures, including those to be implemented before 2023. ICS will continue to participate constructively.

**Esben Poulsson**
Chairman
International Chamber of Shipping

# A 'Paris Agreement for Shipping'

In April 2018, the UN IMO adopted a ground breaking strategy setting very high levels of ambition to phase out $CO_2$ emissions across the sector, including a 50% total cut by 2050.

ICS is confident that new technology will eventually deliver, whether using fuel cells or batteries powered by renewable energy, new fuels such as hydrogen, or some other solution not yet anticipated. These exciting possibilities are explored elsewhere in this booklet.

Meanwhile, the shipping industry and its global regulator, IMO, have a good story to tell with respect to reducing $CO_2$ emissions and the mitigation of dangerous climate change.

Most importantly, in April 2018, the IMO Marine Environment Protection Committee (MEPC) adopted a comprehensive initial strategy for the further reduction of the international shipping sector's total $CO_2$ emissions, as a response to the Paris Agreement on climate change. In view of the complex politics involved, agreement by IMO upon such an ambitious strategy is a truly significant achievement. But the huge challenge that lies ahead will be for industry to successfully deliver.

According to the International Council on Clean Transportation (ICCT), the total $CO_2$ emissions from international shipping were about 8% lower in 2015 than in 2008, despite a 30% increase in maritime trade. Delivered with a combination of technical and operational measures – including improved speed management and the introduction of innovative technologies – this is an impressive level of total emissions reduction, especially as shipping has no control over the ever increasing demand for its services.

Moreover, as a result of amendments to Annex VI of the MARPOL Convention, adopted by IMO in 2011 – the first such global agreement to apply to an entire industrial sector – new ships delivered from 2025 must be at least 30% more $CO_2$ efficient than ships constructed before 2013.

# Initial IMO Strategy on Reduction of GHG Emissions from Ships

*Adopted on 13 April 2018 (key extracts)*

## Vision

IMO remains committed to reducing GHG emissions from international shipping and, as a matter of urgency, aims to phase them out as soon as possible in this century.

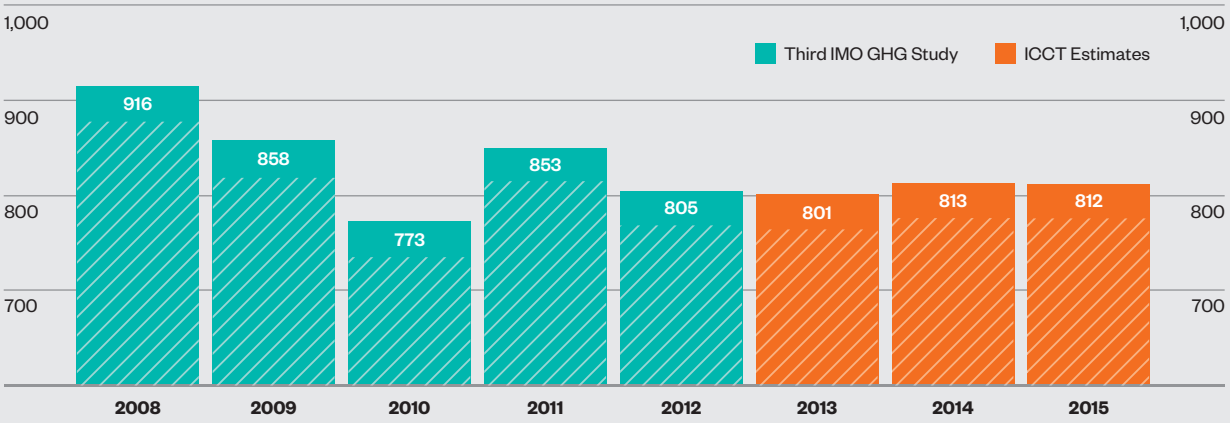
## Levels of Ambition

1. **Carbon intensity of the ship to decline through implementation of further phases of the energy efficiency design index (EEDI) for new ships**
   To review with the aim to strengthen the energy efficiency design requirements for ships with the percentage improvement for each phase to be determined for each ship type, as appropriate;
2. **Carbon intensity of international shipping to decline**
   To reduce $CO_2$ emissions per transport work, as an average across international shipping, by at least 40% by 2030, pursuing efforts towards 70% by 2050, compared to 2008; and
3. **GHG emissions from international shipping to peak and decline**
   To peak GHG emissions from international shipping as soon as possible and to reduce the total annual GHG emissions by at least 50% by 2050 compared to 2008 whilst pursuing efforts towards phasing them out as called for in the Vision as a point on a pathway of $CO_2$ emissions reduction consistent with the Paris Agreement temperature goals.

*(The strategy also includes a list of candidate measures for further $CO_2$ reduction that will be considered by IMO, including measures that could be implemented before 2023.)*

## Total International Shipping $CO_2$ Emission Estimates

**Million tonnes per year**




*Source: Third IMO GHG Study & ICCT*

ICS recognises that society demands even more. Shipping, by far, is already the most $CO_2$ efficient form of commercial transport. But the sheer scale and size of the industry means that annual emissions from international shipping currently account for about 2% of the world's total.

There is a mistaken perception among some climate policy makers that shipping has somehow 'escaped' being covered by the obligations of the Paris Agreement. While it is true that international shipping (and aviation) is not covered by the non-binding $CO_2$ reduction commitments that governments have made with respect to their national economies, the United Nations Framework Convention on Climate Change (UNFCCC) has determined that responsibility for addressing the sector's emissions clearly rests with IMO – the only body that can do this effectively because international shipping emissions cannot be covered under national quotas.

IMO is required to make progress reports to the annual UNFCCC Climate Change Conference, as it did at the latest Conference (COP 23) held in Bonn in November 2017, which ICS also attended. ICS participated at several side events in order to communicate the industry's ambitions for serious $CO_2$ reduction. The next UNFCCC Conference, in Poland in December 2018, will be particularly important as governments and IMO will be required to make full reports on progress made since the Paris Agreement was adopted in 2015.

The vision of the IMO strategy agreed in April 2018 – which is based on a proposal originally made by the industry – is to phase out $CO_2$ emissions from shipping as soon as the development of new fuels and propulsion systems can make this technically possible.

To reiterate, zero emissions is something which ICS believes is achievable, but only provided that governments acknowledge the enormity of this challenge and take active steps to help facilitate the development of new propulsion technologies and the massive investment in bunkering infrastructure that will be required if zero $CO_2$ fuels are eventually to be made available on a worldwide basis.

In the meantime, regardless of enormous projected increases in maritime trade – due to population growth and economic development – IMO has set a very ambitious goal of cutting the sector's total emissions by at least 50% by 2050 compared to 2008. In addition, for as long as shipping remains dependent on fossil fuels, IMO has now set a goal of improving the sector's efficiency by at least 40% by 2030 and by 70% by 2050.

Prior to the critical IMO meeting in April 2018, ICS – in co-operation with other industry associations – played a central part in persuading governments to develop this ambitious response to the Paris Agreement. This was initiated by an important submission which the industry made to IMO in early 2016, just a few weeks after the Paris Agreement was adopted. This was followed by various detailed industry submissions to IMO during 2017.

IMO Member States have now agreed on very high levels of ambition for the further reduction of the sector's total $CO_2$ emissions, which clearly set out a direction of travel towards zero $CO_2$ emissions. Indeed, these $CO_2$ reduction objectives are actually far more ambitious than the pace of reduction that will be delivered by the commitments that governments have so far made with respect to the world economy as a whole. According to UNFCCC, the world's total $CO_2$ emissions will continue to increase at least until the 2030s whereas the shipping industry's $CO_2$ is already on a trajectory of serious reduction, IMO having now agreed with the industry's suggestion that the baseline year for measuring shipping's emissions is 2008, when $CO_2$ emissions were at their highest.

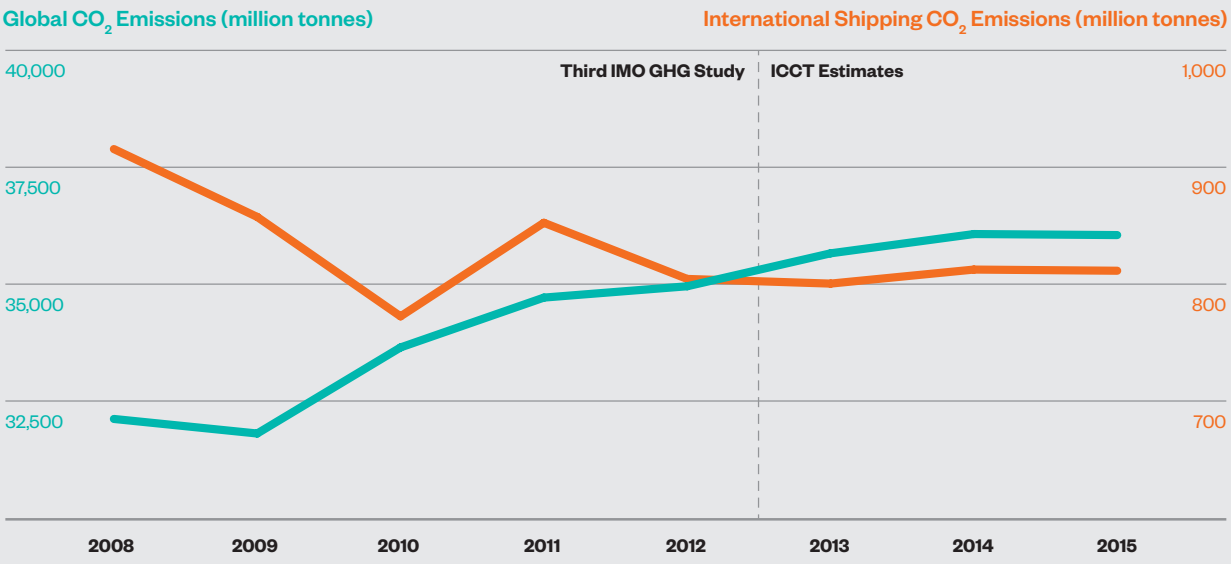
Most importantly, IMO has also agreed a comprehensive list of potential candidate measures for achieving these real $CO_2$ reduction objectives, in the short, medium and longer term. Detailed consideration of these measures will begin during 2018, with a further dedicated meeting on $CO_2$ reduction planned before the end of this year.

The list of candidate measures contains a number of proposals by governments for potential new regulations, some of which may prove controversial. These include mandatory speed restrictions, operational indexing of individual ships and, less controversially, consideration of further improvements to the existing Energy Efficiency Design Index (EEDI) that might apply to new vessels delivered after 'Phase 3' has been implemented in 2025. ICS member national associations will begin developing detailed input on all these proposals during the course of 2018.

Most controversial among the possible candidate measures is further consideration of applying some kind of Market Based Measure (MBM) to international shipping.

UN Climate Conference (COP 23), Bonn, November 2017

## Reduction in International Shipping Emissions Compared to Increase in Global $CO_2$ Emissions




*Source: Third IMO GHG Study & ICCT*

The position of ICS is that it remains deeply sceptical of MBMs as a means of further incentivising $CO_2$ reduction. Fuel is already by far the largest cost for shipowners (far greater than the capital costs of owning a ship) and this is expected to increase dramatically as a result of the global IMO sulphur cap which will take effect in 2020. Shipowners already have all the incentive they need to explore every possible means of reducing their $CO_2$ emissions through technical and operational measures alone, as demonstrated by the impressive fuel efficiency improvements achieved since 2008.

However, in the event that IMO decides to develop an MBM, the clear preference of the global industry would be for a bunker fuel levy payable to some kind of IMO climate fund, with some of the funds deployed to support research into new low carbon technologies or to support the rollout of the expensive new bunkering infrastructure that will be required to supply zero $CO_2$ fuels, particularly in the ports of developing nations.

If IMO decides that an MBM is politically necessary, ICS believes that a fuel levy would be the mechanism least likely to cause serious market distortion, as opposed to some kind of emissions trading system (ETS), something to which the industry is completely opposed. As discussed elsewhere in this booklet, ICS has therefore welcomed the decision by the European Union, in November 2017, not to incorporate international shipping into the existing EU ETS.

Despite continuing doubts about the desirability of an MBM, the member national associations of ICS are political realists and have therefore been involved in intensive discussions for the past two years about how a fuel levy system might conceivably work in practice, so that ICS will be in a position to come forward with detailed ideas, for discussion with IMO Member States, should this turn out to be necessary.

The adoption by IMO in April 2018 of an ambitious initial $CO_2$ reduction strategy is a major achievement, as it had to take account of the legitimate concerns of emerging economies, such as China, India and Brazil, about the potential impacts on maritime trade and their economic development, consistent with the UN's Sustainable Development Goals.

ICS recognises that the IMO strategy, as agreed so far, also involved significant compromise on the part of many EU Member States, as well as by many other nations, including some Small Island Developing States (SIDS) whose very existence is threatened by climate change.

It should be remembered, however, that this is only an initial IMO strategy, which will be further developed by IMO Member States before being fully finalised in 2023. It is possible that the current levels of ambition agreed by IMO will be revisited in the near future, taking account of the results of the next IMO Green House Gas Study, which is scheduled to be conducted in 2019, using information from the new IMO $CO_2$ Data Collection System and the fuel consumption data that will soon be provided by individual ships to IMO on a mandatory basis.

Nevertheless, it is very important that the high levels of ambition that have already been established by the initial IMO strategy will be viewed by climate policy makers as a substantial step, sufficient to discourage unhelpful unilateral action, not only by the EU, but also by nations such as Canada, and individual U.S. States such as California and New York.

Unilateral or regional responses on this issue would lead to disastrous consequences for the global maritime regulatory regime which is vital for underpinning the provision of efficient maritime services. But most importantly, tackling $CO_2$ from shipping is a global problem. The dramatic move toward zero $CO_2$ emissions from internationally trading ships can only be achieved successfully through measures that are adopted by IMO for global application.

# Developing Zero $CO_2$ Fuels

The vision of the shipping industry, also articulated by the IMO Green House Gas strategy adopted in April 2018, is to achieve zero $CO_2$ emissions as soon as the development of new fuels and propulsion systems will allow.

The huge technical challenges and research required should not be underestimated and, taking account of the new bunkering infrastructure that would also be required, the worldwide availability of zero $CO_2$ fuels could take at least another 30 years to deliver. However, ICS is now engaged in a number of initiatives with various industry stakeholders, including engine manufacturers and academics, to explore what the path to a zero $CO_2$ future might be.

The greater use of LNG and biofuels may well form part of the interim solution, supplemented by renewable sources such as wind and solar. But the ultimate goal of zero emissions can only be delivered with genuine zero $CO_2$ fuels that are both environmentally sustainable and economically viable.

## Batteries

Advances in chemistry and technology could eventually mean that even large ocean going ships powered by batteries, using renewable sources of energy, could potentially become a viable zero $CO_2$ alternative.

Although currently only suitable for ships engaged on short voyages, there is potential to apply battery hybrid technologies widely used in the automotive sector. There are already ferry conversions and offshore support vessels using hybrid propulsion to optimise efficiency and reduce fuel consumption. Engines can run at a constant stable load, with batteries either boosting output or being recharged by the engines according to operating conditions.

In the longer term, there seems to be a genuine potential to utilise batteries as the primary source of power even for larger ships. Such batteries would probably be extremely large, but with appropriate adjustments to the ship the loss of cargo capacity could be offset by eliminating fuel tanks and conventional engine machinery.

Large batteries are currently expensive, and their high energy density imposes additional risk management requirements. The availability of sufficient rare metals to manufacture batteries with necessary power might also limit viability.

Adopting pure battery power operations – including more frequent port calls to permit recharging – will require radical adjustments to how ships are operated and careful route management. A global recharging infrastructure would be needed with access to electricity from renewable energy, capable of recharging extremely large and high capacity batteries quickly. But the challenges involved might not be insurmountable.

## Hydrogen

Significant research is underway to develop energy efficient processes for producing hydrogen from water using thermochemical processes (unlike most commercially available hydrogen which is currently derived from fossil fuel feed stocks). The main challenges for hydrogen as a marine fuel are the cost of production, transport and storage. An appropriate bunkering infrastructure will also be needed.

Hydrogen can be utilised by direct combustion in a conventional engine. But fuel cells are more efficient and avoid NOx emissions. However, fuel cell stacks (the component where energy conversion takes place) have a finite life, which can be quite short in terms of the service life of a ship.

Hydrogen has a lower energy density than conventional fossil fuels and would need careful risk management. It has a very wide flammable range and very low minimum ignition energy, while embrittlement of metals might lead to leakages. However, hydrogen could be reformed on board ship from almost any feed stock in order to ease fuel storage and handling, and to minimise the safety risks.

At atmospheric pressure, liquid hydrogen would need to be cooled below -252°C, significantly below the temperature required to liquefy LNG. Compressed gaseous hydrogen would probably be impractical on longer voyages.

## Ammonia

As an alternative to liquefied or compressed hydrogen, ammonia could be used as a hydrogen carrier, avoiding the necessity for a cryogenic plant on board. (Methanol is also being explored as another possible hydrogen carrier.) Liquefaction of ammonia, at far higher temperatures than for hydrogen, is possible under pressure (similar to propane gas). Ammonia can also be stored as an aqueous solution which is safer.

Although 'green' ammonia production (like hydrogen) from renewable sources is more energy intensive than traditional processes, the increased availability of carbon free electricity generation could make this viable.

Ammonia could be used as a fuel itself, but technical difficulties mean it is more likely to be used with hydrogen fuelled systems after dehydrogenation, avoiding the cryogenic systems necessary for the carriage of liquid hydrogen or the limited voyage length required if using compressed hydrogen gas.

The principal concern about using ammonia as a marine fuel is safety. Exposure to gaseous anhydrous ammonia can cause caustic burns, lung damage and death. Some types of fuel cell stack are incompatible with ammonia, so that even very small quantities of ammonia remaining after reforming into hydrogen could seriously affect performance. Nevertheless, as with battery technologies, the challenges involved might not be insurmountable.

## Nuclear

Nuclear fuels are a proven technology that could be readily applied to many merchant ships in order to eliminate $CO_2$ emissions completely. Only a small nuclear reactor would be required, with a life of many years, removing the need for ships to refuel or carry bunkers. Russia successfully operates a number of nuclear ice breaking vessels in the Arctic. However, it is currently assumed that widespread use of nuclear fuels is unlikely to be viewed as politically acceptable by the majority of governments, due to concerns about safety and security.

# Emissions Trading and Market Based Measures

In November 2017, the European Union decided that international shipping will not be incorporated into the EU Emissions Trading System (ETS) as part of the wider overhaul it is undertaking of its existing ETS for $CO_2$ emissions. This important decision – which followed intensive negotiations throughout 2017 between EU Member States, the European Parliament and the European Commission – is a very welcome development.

In conjunction with the European Community Shipowners' Associations (ECSA), ICS has consistently argued that the application of a regional EU ETS to all ships calling at EU ports, regardless of flag, would have been completely inappropriate and would have led to serious market distortion. Many ships would have simply diverted to non-EU ports (including potentially a post-Brexit United Kingdom) in order to minimise exposure to the EU system. Moreover, the unilateral application of the ETS to shipping could have generated trade disputes with China and other Asian nations, as happened several years ago when the EU tried unsuccessfully to impose its ETS on international aviation.

Notwithstanding the industry's doubts about the real $CO_2$ reductions that can be delivered via Market Based Measures (MBM), the only appropriate forum to have this debate is IMO. But the application of emissions trading – a system designed for heavy industries such as power generation and steel and cement production – would have been far too complicated to apply to an industry such as shipping which comprises thousands of companies, most of which are Small and Medium Sized Enterprises (SMEs). Given that many of the companies potentially included are located outside of the EU, this would have also greatly complicated efforts by the European Commission to reform the ETS which, since its establishment, has actually done little to reduce $CO_2$ emissions, other than to encourage those industries which generate significant emissions to relocate their activities elsewhere.

But this EU decision does not remove the pressure from IMO. The terms of the EU political agreement are that continued exclusion from some form of regional MBM may be dependent on IMO adopting some kind of alternative measure by 2023, which is understood to mean that the EU believes there should indeed be a global MBM. Moreover, the European Commission will be required to make an annual report to the European Parliament and EU Member States on progress being made by IMO. In effect this could mean that, if at any time, the European Commission deems progress insufficient, it may seek to justify the need to continue working on unilateral measures. Nevertheless, the EU decision in 2017 represents a recognition that IMO is the best forum in which to have the debate about the appropriateness or otherwise of applying an MBM to shipping.

Despite the industry's serious reservations about emissions trading, ICS is conscious that many other non-EU nations are now establishing carbon taxes and ETS systems as a policy tool. Regardless of the hostility of the Trump Administration to the Paris Agreement on climate change, many individual U.S. States have established carbon markets which are now linking up with Canadian provinces to form a single North American trading system. Many governments in Asia, most notably China, are also setting up emissions trading systems. It will therefore be vital to ensure that IMO continues to make real progress in addressing $CO_2$ from shipping, in order to discourage any suggestion that these local carbon taxes and ETS systems should be applied on a mandatory basis to visiting foreign flag ships.

ICS continues to assert that policy makers will achieve far more by focusing on additional technical measures and the development of new fuels that will deliver genuine $CO_2$ reductions from shipping. But compared to the nightmare of participating in regional ETS systems, a global fuel levy would clearly be preferable for the vast majority of shipowners should IMO eventually decide that MBMs are in fact required for international shipping.

# Operational Efficiency Indexing: The Industry is Strongly Opposed

ICS remains strongly opposed to the concept of IMO establishing a mandatory system of operational efficiency indexing for application to individual ships. This is because of the potential inaccuracies of such a metric and the significant danger of market distortion.

$CO_2$ efficient ships are correctly rewarded by the market because their lower fuel costs make them more commercially competitive. The ultimate purpose of operational efficiency indexing, however, is to penalise individual vessels twice, on the basis of a theoretical and arbitrary operational rating that has little relation to the actual $CO_2$ emissions of the ship in real life.

For example, the fuel consumed by two identical ships during two similar voyages will vary considerably due to factors such as currents, ocean conditions and weather. Similarly, fuel consumed by individual ships, particularly those in tramp sectors, may vary considerably from one year to the next, being dependent on changing trading patterns and the nature of charters over which the ship operator has little control.

The merits of operational efficiency indexing, which ICS strongly disputes (and which are very different to efficiency standards for ship design) will be debated further at IMO as it develops its $CO_2$ reduction strategy. ICS has therefore been frustrated by the European Union's decision to pre-empt these IMO discussions by proceeding with the implementation of its regional system for collecting data on individual ship emissions.

The EU Regulation on the Reporting, Monitoring and Verification (MRV) of $CO_2$ emissions applies to all ships trading to Europe, with the apparent intention of eventually developing this into some kind of regional operational efficiency indexing system.

In November 2017, ICS and ECSA submitted detailed comments to a European Commission consultation on the possible alignment of its MRV Regulation with the global $CO_2$ Data Collection System (DCS) that has now been established by IMO and which will be up and running by 2019. The EU had previously underlined its willingness to consider this alignment in order to help persuade non-EU governments to agree to the establishment of the IMO DCS.

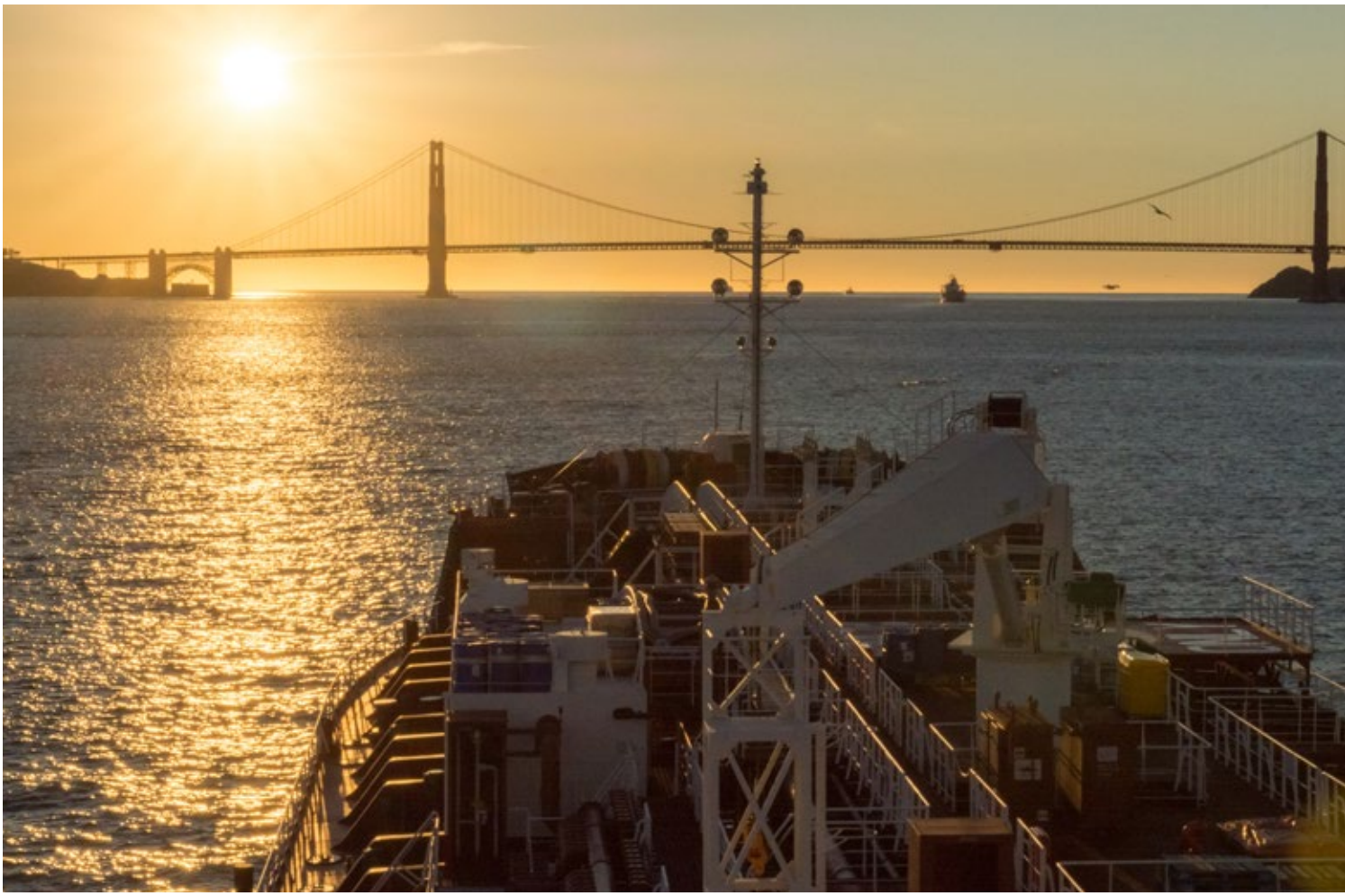
The DCS adopted by IMO in 2016 was viewed as an acceptable compromise between those IMO Member States which are interested in having reliable information about fuel consumption and $CO_2$ emissions in order to inform the development of future IMO work, and those nations that wished to collect more detailed information about fuel efficiency and so called 'transport work'.

ICS support for this IMO compromise was given with the understanding that the DCS should be simple for ships to administer and primarily be based on fuel consumption. Most importantly, data relating to fuel consumption under the IMO system will remain anonymous. The purpose of the IMO DCS is to inform future policy making rather than to penalise or reward individual ships.

The EU MRV Regulation was adopted during 2015, and includes controversial provisions for the submission of data by ships on 'transport work' using different metrics to those now agreed by IMO in addition to data on fuel consumption. Moreover, the verification and certification method that has been developed by the EU will be overly complex. It seems that EU climate officials wish to ignore the tried and tested processes for statutory certification used in international shipping, and instead propose an additional administrative burden for ship operators.

But the greatest concern about the EU MRV Regulation is that commercially sensitive information will be published annually by the European Commission, along with ship name and company identifiers. This is with the intention of facilitating comparison of the supposed operational efficiency of individual ships – which is very likely to be inaccurate. In short, the EU Regulation contains many of the elements which most IMO Member States chose to reject when adopting the global $CO_2$ Data Collection System.

The EU Regulation is meant to be fully implemented during 2018, one year before the IMO DCS. In its response to the EU consultation, ICS emphasised that nothing less than



full alignment with the IMO DCS would be regarded as acceptable and that partial alignment would be seen as 'bad faith' by those non-EU States which had been encouraged to agree to the IMO system on the understanding that the EU would then fully align its unilateral regulation.

Disappointingly, the European Commission decided, in early 2018, to cancel a planned public meeting, having concluded that its consultation is now complete. Once the Commission has published its proposals for any change to the current MRV Regulation, these will then be subject to negotiation with EU Member States and the Parliament through the 'trialogue' process.

Despite going through the motions of a consultation, in reality it appears that the European Commission has no intention of recommending full alignment with the IMO system. Rather it is simply trying to identify what changes are necessary to make the EU regime compatible with that agreed by IMO. Unpalatable as this might be, this will probably require an acceptance by industry of the political reality that there will be two different reporting systems with different approaches to the verification of ship data.

However, ICS intends to maintain its strong objection to the publication by the Commission of data about individual ships, an objection which is shared by a number of non-EU Member States. ICS will also continue to oppose the development of any system of mandatory operational efficiency indexing that may be considered at IMO.

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ICS is the international trade association representing all sectors and trades of the shipping industry. Together with representatives of its member national shipowners' associations, ICS participates actively at the committee meetings of the International Maritime Organization (IMO), and contributes significantly to the development of IMO regulations which impact on international shipping. ICS also represents maritime employers as an official 'social partner' at the International Labour Organization. shipowners' associations.

*IMO in session in London*

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