



**AVENIR ADVANTAGE**

**SEEM**  
Clear Carriers

March 2021

# **BUNKER GUIDANCE**

## **for Alternative Fuels in German Seaports**

Final Report / German version available on  
<https://www.dmz-maritim.de/wp-content/uploads/2021/03/Studie-Bunker-Guidance-2021.pdf>



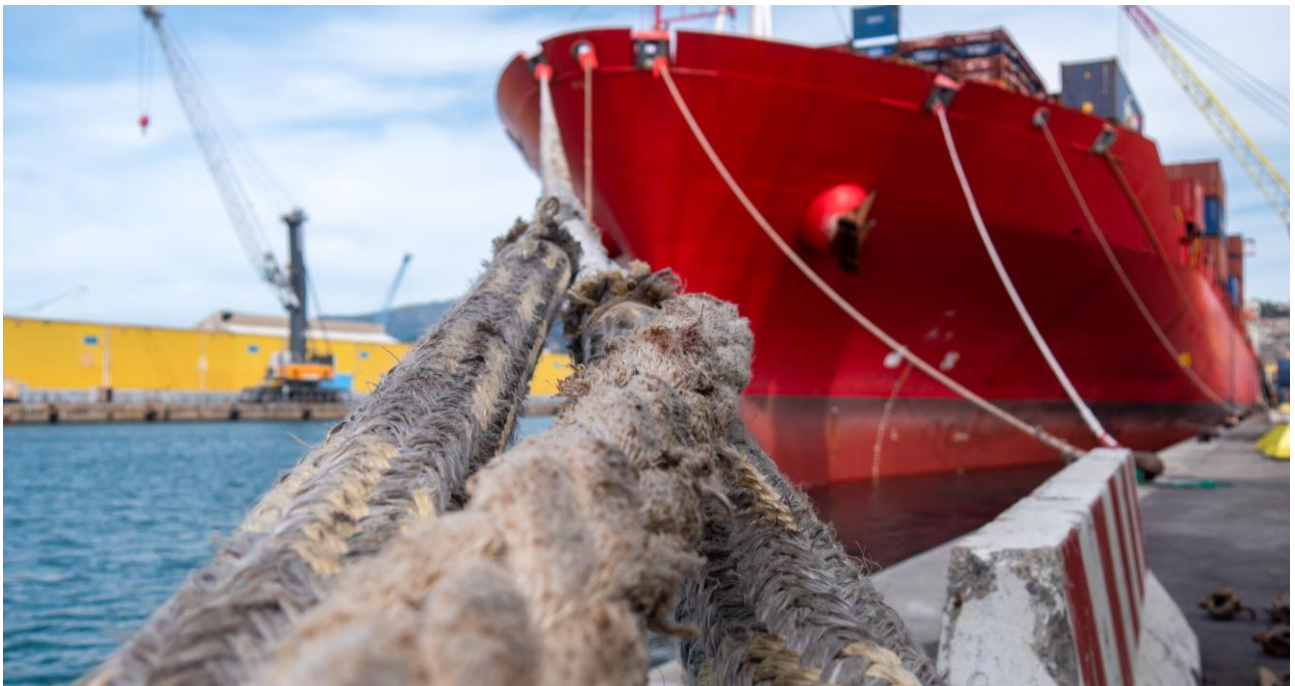
Bright ideas. Sustainable change.



Aufnahme rechtlicher Regelungen und Erarbeitung eines bundesweiten Leitfadens für einheitliche Vorschriften zum Bunkern von komprimierten und verflüssigten Gasen sowie Kraftstoffen mit niedrigem Flammpunkt in deutschen Seehäfen

# Volume 1

## SUMMARY



## 1. Summary

### 1.1 Foreword

Founded in 2017, the German Maritime Centre (DMZ) is an independent, publicly funded, cross-industry think tank based in Hamburg. It focuses on future topics such as non-fossil fuels, zero-emission propulsion systems, modern safety systems and autonomous shipping. The focus is on questions of design as well as the implementation of research, development and innovation in the maritime sector. They serve to increase knowledge, further develop the state of the art and strengthen the international competitiveness of Germany as a location for the sector.

In the summer of 2020, the German Maritime Centre commissioned the company Ramboll to record legal regulations and develop a nationwide guidance for uniform regulations on the bunkering of liquefied gases as well as fuels with a low flash point in German seaports. The guidance is intended to create greater certainty of assessment for those involved in the process when preparing and implementing the approval of land- and seaward bunkering operations. This explicitly includes alternative fuels that are currently still being developed or tested and are expected to have a large market potential with regard to global emission reduction targets. This approach offers the possibility of shaping framework conditions at the federal state and port level in a forward-looking manner that is independent of the type of fuel.

Maritime shipping accounts for about 2.9% of global CO<sub>2</sub> emissions worldwide.<sup>1</sup> As in other industries, new emission standards for greenhouse gases must be met in shipping. In 2018, the International Maritime Organization (IMO) adopted a first strategy to reduce greenhouse gas emissions with corresponding savings steps until 2050.<sup>2</sup>

Alternative fuels, such as Liquefied Natural Gas (LNG), methanol, ammonia or hydrogen, enable a substantial reduction of the pollutant emissions caused by shipping, in particular by using electricity-based manufacturing processes or blending in bio-contents. The European Union (EU) refers to a selection of these alternative fuels and the necessary infrastructure in Directive 2014/94/EU. A reference to maritime shipping is currently only made in the directive through the provision of an adequate number of LNG bunkering facilities in seaports. Other fuel alternatives for maritime transport are not considered in the directive, which is currently under revision.<sup>3</sup>

In order for investment to be made in shipping tonnage with alternative propulsion concepts, the reliable provision of alternative marine fuels is required. This connection can be outlined as follows using LNG as an example: Even before the introduction of regulations to limit various pollutant components in the fuel for shipping (also outside Emission Control Areas in 2020)<sup>4</sup>, the technical maturity for the use of LNG as a marine fuel was given. The use of LNG propulsion was and is one of the possible compliance strategies to meet the outlined emission regulations.

It would therefore have been expected that the fleet growth of LNG-powered vessels would already be high in 2018 and 2019. However, a more dynamic growth in ship orders with LNG or dual-fuel propulsion compared to previous years is only evident in 2021. Comparably, the number of LNG bunker vessels available worldwide also increased only marginally before 2020, by an average of three per year. In 2020, eight more were already added. Up to 17 more LNG bunker ships are expected to enter service in 2021.<sup>5</sup>

As of February 2021, 191 ships worldwide have pure LNG or dual-fuel propulsion, with a further 238 ship units on order. Around two-thirds of the fleet in service operate within European trade lanes (incl. Norway). On the other hand, more than two-thirds of the fleet on order are intended for deployment

*For Bibliographie please refer to Final Report*

<sup>1</sup> cf. IMO, 2020a.

<sup>2</sup> cf. IMO, 2018.

<sup>3</sup> cf. Europäisches Parlament und Rat, 2014a.

<sup>4</sup> cf. IMO, 2005.

<sup>5</sup> cf. DNV GL, 2021.

outside Europe or for global deployment.<sup>6</sup> The example of Europe's largest bunker market, the port of Rotterdam, can be used to demonstrate the maritime industry's increasing demand for LNG. At around 210.000 m<sup>3</sup>, LNG bunker sales in 2020 were almost triple as much as in 2019<sup>7</sup>, and Rotterdam is expected to see a further increase in volumes in 2021. Estimates for the German seaports as a whole assume LNG bunker sales of around 25.000 to 35.000 m<sup>3</sup> in 2020.

As the availability of LNG as a marine fuel increases (security of supply), so does the market penetration and thus the interest of the maritime industry in globally equivalent procedures and regulations for LNG bunkering operations (legal certainty). The chain of arguments outlined here as an example for LNG can also be applied, with slight modifications, to other alternative marine fuels currently being developed and tested. According to current knowledge, these include in particular hydrogen, ammonia and liquefied petroleum gas (LPG), as compressed gases or gases liquefied under pressure or cryogenic, as well as methanol, as a fuel with a low flash point<sup>8</sup>.

## 1.2 Study objectives and procedure

The aim of this study is to develop a uniform legal and procedural situation for bunkering operations including alternative marine fuels for the German seaports. This can promote the provision and use of corresponding seaside and landside bunkering facilities.

The study is divided into three volumes. Volume 1 contains an introduction to the topic and a summary of the study results. Volume 2 provides a comparative analysis of the legal framework at federal, state and port level in Germany as well as in selected EU member states and presents examples of good practice from German and European seaports. In addition, reference is made to standards, guidelines, norms, studies, etc. of supra-regional or international institutions. The alternative fuels depicted there are outlined in each case. If there is no reliable information on alternative fuels, LNG is used as an example. The Guidance on LNG Bunkering to Port Authorities and Administrations of the European Maritime Safety Agency (EMSA) is particularly appreciated.

In expert discussions and a workshop with service providers (especially infrastructure and terminal operators), LNG bunkering suppliers and receivers, organisations of hazard prevention, approval and port authorities, as well as politicians and administrators, extensive and valuable information was exchanged on LNG bunkering and approval procedures in practice.

Volume 2 contains a guidance to harmonise the legal and procedural situation of alternative marine fuel bunkering, based on the previously developed recommendations. It explains how uniform rules for safe and efficient bunkering of alternative fuels could be developed at the level of the German seaports and the respective federal states responsible for them. In addition to those involved in the process in the federal administration, in the federal states and in the German seaports, bunker suppliers and recipients as well as terminal operators potentially involved in the bunkering process are also addressed. For these target groups, the study's recommendations are intended to provide greater certainty of assessment with regard to:

- the initial legal situation (legal text),
- the approval of the bunkering of alternative fuels (using LNG as an example),
- the preparation and evaluation of risk assessments, and
- the assessment of local conditions.

<sup>6</sup> cf. DNV GL, 2021.

<sup>7</sup> cf. Port of Rotterdam, 2021b.

<sup>8</sup> cf. IMO, 2017: International Code of Safety for Ships Using Gases or Other Low-flashpoint Fuels 2.2.28 Part A, 2 General "Low-flashpoint fuel means gaseous or liquid fuel having a flashpoint lower than otherwise permitted under paragraph 2.1.1 of SOLAS regulation II 2/4." in connection with § 2.1.1 of International Convention for the Safety of Life at Sea chapter II-2, Regulation 4 Probability of ignition "no oil fuel with a flashpoint of less than 60°C shall be used".

The recommendations are based on the following five guiding principles:

1. From specific to general; from exception to rule
2. Use of good practice examples and empirical values
3. Assessing local or port-specific characteristics
4. Pursuing a risk-based (probabilistic) as opposed to an exclusively consequence-based (deterministic) approach
5. Maintaining the performance of the port (conditions for the implementation of simultaneous operations (SIMOPS))

### 1.3 Summary of the study results

#### *Field of action: Legal texts with reference to the bunkering process*

The groupings of fuels made in the German legal texts are characterised by great heterogeneity. Likewise, the bunkering of alternative marine fuels is treated very differently. At the time of the study, the bunkering of alternative marine fuels was/is explicitly dealt with in state law in the Port Ordinance (HafVO) of Mecklenburg-West Pomerania (MV) ("refrigerated liquefied gases") and in the Port Safety Ordinance (HSVO) of Schleswig-Holstein (SH) ("refrigerated liquefied gases, gases under pressure or flammable liquids with a flash point below 55°C") and permitted with the approval of the port authority. In the other federal states, the bunkering of alternative marine fuels is currently generally only possible with an exceptional permit. In the Netherlands, Belgium and Sweden, the responsibility for the approval of such bunkering operations is usually transferred to the ports without further restrictions, unlike in Germany. However, all regulations in the countries mentioned have in common that, in addition to the port authorities, other approval authorities must also be involved in the approval process. These check the criteria of bunkering that are within their competence (e. g. environmental law or operational safety). The legal foundations at national level are generally based on the implementation of European legislation.

The reference ports considered in the Netherlands, Belgium and Sweden deal with the bunkering of alternative marine fuels, especially LNG, much more extensively in the legal texts at port level than the German seaports. In Germany, only the Port Ordinance (HBO) of Brunsbüttel Ports provides more detailed information. Some German port locations, such as Emden, Bremerhaven, Brunsbüttel, Hamburg and Rostock, prepared risk assessments on their own or ordered independent bodies to prepare them. On this basis single permits or exceptional permits are granted.

Considering the recommendations to harmonise the legal texts with reference to the bunkering process, two fields of action emerge:

- Legal texts at federal state level
- Legal texts at port level

The aim of the legal text adjustments is to develop a routine process that enables the bunkering of alternative marine fuels with the approval of the competent authorities in order to be able to dispense with exceptional permits.

It is recommended that in the legal texts of the German federal states:

- a paragraph is inserted that generally allows the bunkering of alternative fuels subject to approval by the competent authorities.
- LNG and other fuels potentially to be used for the self-supply of ships are subsumed under the designation "compressed or liquefied gases and other fuels with a low flash point". This grouping creates a legal basis not only for LNG but also for other alternative marine fuels, such as LPG, ammonia, hydrogen and methanol.
- it is considered that too detailed contents may limit the space for port-specific particularities and therefore reduce the potential of an area-wide implementation of the recommendations.

Supplements were identified for the HBO and further Port Regulations (HNO) of the German seaports which, on the one hand, preserve the design scope for port-specific particularities, but, on the other hand, contain important information for the bunkering parties and, at the same time, increase the user-friendliness and the safety level. For the bunkering of alternative marine fuels, it is recommended that the regulatory texts of the HBO and HNO be supplemented and at least:

- explicitly refer to the possibility of bunkering the respective fuel and the possible bunker concepts,
- specify the approval or notification requirements for bunkering operations,
- prescribe the use of the bunkering checklists of the International Association of Ports and Harbors (IAPH) in the version applicable at the time,
- determine the berths suitable for bunkering in general (differentiated by fuel type, if applicable), and
- refer to existing risk assessments or comparable documents.

In addition, it is recommended to intensify the dialogue among the competent (port) authorities, among the state governments (horizontally in each case) and also between these institutions (vertically) for the benefit of supplementing the legal texts in a way that is as harmonised as possible across locations or federal states.

### ***Field of action: Approval of the bunkering of alternative marine fuels***

In general, the following actors may be involved in the approval of bunkering operations:

- Bunker suppliers
- Bunker recipients
- Terminal operators
- Competent authority (usually port authority)
- Organisations for hazard prevention incl. the Waterways and Shipping Authority (WSA)
- Competent authorities according to the Federal Immission Control Act (BImSchG) and the Ordinance on Industrial Safety and Health (BetrSichV)

An approval process will generally proceed as follows: The bunker supplier and recipient submit their bunker concept, consisting of the bunker management plan as well as the compatibility check prepared for the bunkering operation, to the competent (port) authority, the Organisations for hazard prevention and, if applicable, the operator of the terminal where the bunkering is to take place. The aforementioned parties review the documents and advise the bunkering parties of any necessary adjustments and further documents to be submitted.

The previous procedure of the approval process is problematic for bunkering parties who are not familiar with the local conditions, as they are not aware of the authorities to be informed. Again, the German (port) authorities are confronted with a high approval effort when checking the documents for single permits.

With the IAPH Audit Tool, an internationally used instrument for the pre-qualification of LNG bunker suppliers already exists, which can also be applied to other alternative marine fuels in the future. It creates a systematic, transparent and independent process for communicating audit evidence and objectively assessing predefined system safety criteria for bunkering operations. As a result, certain evidence provided by bunker suppliers does not have to be re-submitted and checked before each bunkering operation but is fixed for the validity period of the certificate. Furthermore, the IAPH Audit Tool offers an open information platform on which the (port) authorities can exchange documents with each other and thus, for example, create greater transparency and process security. The information platform serves as a repository for:

- important basic documents (international standards, norms, etc.),
- a directory of local bunker suppliers,
- test results and documents of the bunker suppliers,

- information on the operational adjustment of bunker operations, and
- documentation of bunker operations (incl. incidents and accidents).

Based on the IAPH Audit Tool, the guideline lists key points that enable the competent (port) authorities in the German seaports to develop their own model for the pre-qualification of bunker suppliers, if required.

Notwithstanding the use of the IAPH Audit Tool, it is suggested that a digital platform accessible to all (port) authorities be created along the lines of the model listed above, on which basic documents and information on the bunkering of alternative marine fuels can be stored.

Another recommendation to simplify the approval process is the establishment of single desks at the bunker supplier (for the bunkering parties) and at the competent (port) authority (for the authorities). Associated with this is the representing responsibility for the exchange of documents and information. This ensures that both the documents of the bunkering parties reach the right places and that the authorities not directly involved in the port activities can adequately fulfil their responsibilities.

### ***Field of action: Harmonisation of risk assessments (modular toolbox)***

Currently, no LNG bunkering operations will be approved without risk assessments. These are prepared by bunker suppliers for their bunkering vehicles or facilities and by port authorities or independent bodies commissioned by them for ports. In order to harmonise the procedure and establish uniform safety levels, the study developed a modular toolbox for conducting risk assessments. Considering the respective material properties, this can be applied to any alternative marine fuel. This may result in specific safety measures and requirements for bunkering (e.g. control zones).

The toolbox follows both a consequence-based and a probabilistic approach to look at the possible failure scenarios of bunkering operations. Risk-reducing safety measures are recommended according to the model of the three levels of defence and taking into account the principle of ALARP (As Low as Reasonably Practicable).

In developing the toolbox, a focus was placed on the conditions for SIMOPS, which address the concerns of terminal operators and include simultaneous loading and unloading or passenger changes. It was found that the control zones identified in the risk assessment have the greatest impact on the possibility of SIMOPS. It is recommended that SIMOPS are generally excluded in the Safety Zone. Exceptions to this rule require appropriate technical and/or organisational measures (ALARP). In the Hazardous Zone as well as above it, SIMOPS must be excluded.

For the competent (port) authorities, the toolbox offers the opportunity to address port-specific particularities in advance and to promote compliance with any restrictions that may apply. It is recommended that German seaports map basic, restricted and non-possible berths for bunkering and state the essential bunker parameters. The mapping is to be carried out for each individual alternative fuel, but initially for LNG. Harmonising the scope and type of information to be exchanged promises to make the requirements for approval of bunkering operations transparent across locations, both from the port authorities' and the bunkering parties' perspective. An integration of the aforementioned open information platform, possibly with harmonised online forms, should be taken into account.

### ***Field of action: Assessment of local conditions***

Finally, the guidance includes assistance for the authorities involved at the respective site. Aspects that are necessary for an individual site-specific consideration have been added. They can facilitate the application of the developed toolbox for harmonised risk assessments in the respective local context.

The bunker concepts dealt with are combined with typical berth situations based on the port categorisation from the second volume of the study, so that a uniform structure is created for the risk assessment of all combinations of bunker concept and berth. This should make it easier for the German seaports to work

with the modular toolbox, considering their respective characteristics. In the assessment of berth situations, the control zones and risk acceptance criteria were identified as the most important criteria.

Based on the port-specific berth situations, it is suggested that the competent (port) authority derives a recommended bunker concept for the berths suitable for bunkering and displays it. The presentation can be done, for example, by means of the mapping model mentioned above.

Likewise, conditions for bunkering operations at selected berths in German seaports were assessed that go beyond legally prescribed requirements, such as an increased distance between the tank and the hull of the bunkering vessel to reduce the probability of tank damage in the event of a collision. In the event of an increased individual hazard potential due to local peculiarities, a selection of possibilities for reducing the probability of tank damage must be taken into account. These include constructional specifications as well as equivalence verifications or operational safety measures.

With the proposals for adapting the legal texts, harmonising the approval procedures and risk assessments as well as assessing local conditions in the seaports, this guidance outlines a variety of approaches for an adapted legal framework. This is needed to meet the requirements of the maritime sector for internationally equivalent procedures and regulations for bunkering operations with alternative fuels in German seaports as well.



## **AUFNAHME RECHTLICHER REGELUNGEN UND ERARBEITUNG EINES BUNDESWEITEN LEITFADENS FÜR EINHEITLICHE VORSCHRIFTEN ZUM BUNKERN VON KOMPRIMIERTEN UND VERFLÜSSIGTEN GASEN SOWIE KRAFTSTOFFEN MIT NIEDRIGEM FLAMMPUNKT IN DEUTSCHEN SEEHÄFEN**

### **ABSCHLUSSBERICHT**

Projektname **Bunker Guidance für alternative Kraftstoffe in deutschen Seehäfen**  
Projekt Nr. **301001093**  
Empfänger **Deutsches Maritimes Zentrum e. V.**



Dokumententyp **Abschlussbericht**  
Datum **2. März 2021**  
In Kooperation mit: **Juliet Tango Charlie Projektentwicklung und Beratung GmbH**  
**Jan Tellkamp**



Bildnachweise **Berichtsdeckblatt** © Avenir LNG  
**Band 1 Deckblatt** © Alexander | Adobe Stock  
**Band 2 Deckblatt** © Photocreo Bednarek | Adobe Stock  
**Band 3 Deckblatt** © BKHRB | Adobe Stock

Ramboll Deutschland GmbH  
Dierkower Damm 29  
18146 Rostock

Telefon: +49 381 252 952 0  
E-Mail: [rostock@ramboll.com](mailto:rostock@ramboll.com)  
Web: <https://de.ramboll.com>

Deutsches Maritimes Zentrum e.V.  
Hermann-Blohm-Str. 3  
20457 Hamburg

Telefon: +49 40 9999 698 – 40  
E-Mail: [Info@dmz-maritim.de](mailto:Info@dmz-maritim.de)  
Web: [www.dmz-maritim.de](http://www.dmz-maritim.de)

Ramboll Deutschland GmbH  
Werinherstraße 79  
81541 München

Amtsgericht München, HRB 126430  
Geschäftsführer:  
Jens-Peter Saul,  
Stefan Wallmann

BNP Paribas S.A. Niederlassung Deutschland  
IBAN: DE40512106004223034010  
BIC: BNPADEFFXXX