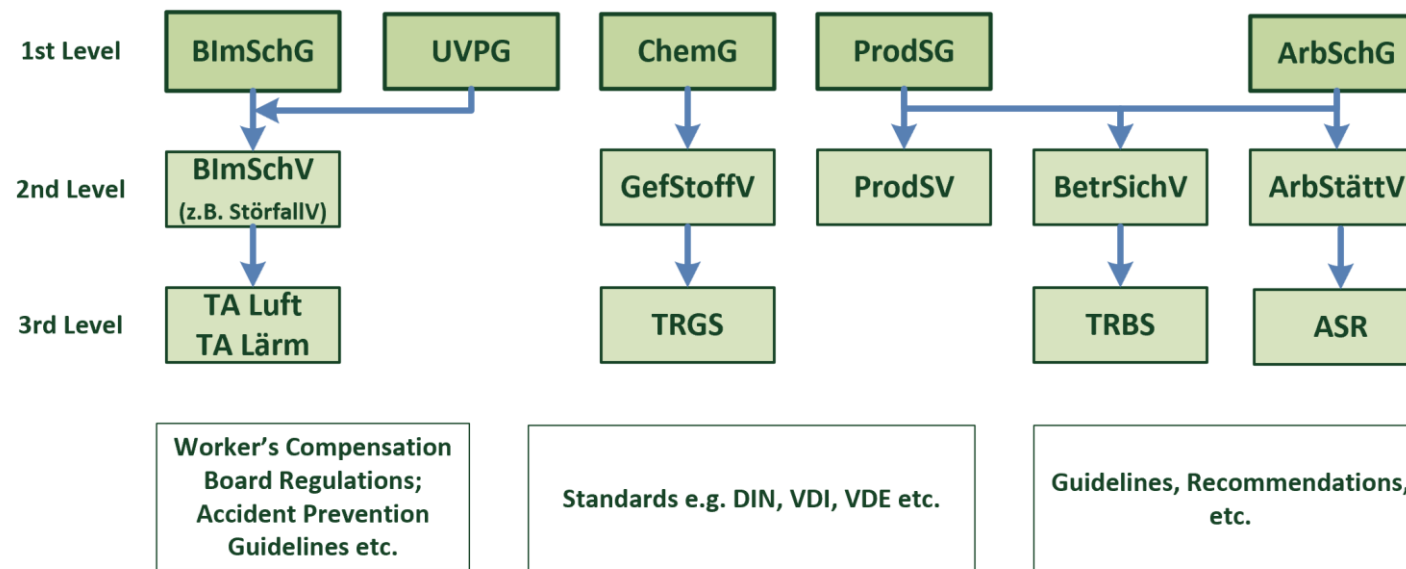


Land-based Regulations & Standards Gap Assessment for hydrogen bunkering installations in Germany

RH2INE Sub-study 1b, SuAc B1&B2

German Legal Framework (1/3)

- Legal framework in Germany includes the following three levels:



- Top relevance: BImSchG** = Bundes-Immissionsschutzgesetz (Federal Immission Control Act) to prevent immissions of any kind to people

German Legal Framework (2/3)

- The further laws are
 - **UVPG** = Environmental Impact Assessment Act (Gesetz über die Umweltverträglichkeitsprüfung)
 - **ChemG** = Chemicals Act (Chemikaliengesetz),
 - **ProdSG** = Product Safety Act (Produktsicherheitsgesetz) and
 - **ArbSchG** = Labour Protection Law (Arbeitsschutzgesetz).
- The **second level: regulation level** detailing the corresponding law and provided prescription for execution, e.g. “Bundes-Immissionsschutz-verordnungen” (BImSchV; Federal Immission Control Regulations (ordinance)) is a set of approx. 50 regulations which apply to different areas of immissions.
- The most relevant regulations for hazardous substances within the context of the BImSchG are:

German Legal Framework (3/3)

- **4. BImSchV** (Verordnung über genehmigungsbedürftige Anlagen, i.e. the regulation on facilities subject to authorisation) defining the range of facilities for which a permit is required.
- **9. BImSchV** (Verordnung über das Genehmigungsverfahren, i.e. the regulation on the procedure to obtain a permit)
- **12. BImSchV** (“Störfallverordnung” (StörfallV)), i.e. the Major Accident regulation setting the executive requirements.

BImSchG - Details (1/2)

- **Objective:** protect people and environment against harmful environmental effects by air pollution, noise, vibrations and other operations.
- To achieve this, the **BImSchG connects to other areas of legislation** by requiring e.g. in § 50:
„In the case of spatially significant planning and measures, the areas intended for a specific use are to be assigned to one another in such a way that harmful environmental impacts and serious accidents within the meaning of Article 3 number 13 of Directive 2012/18/EU in operational areas on those exclusively or predominantly used for living areas and other areas in need of protection, in particular publicly used areas, important traffic routes, leisure areas and, from the point of view of nature conservation, particularly valuable or particularly sensitive areas and publicly used buildings, are avoided as far as possible“ (Translation DNV).

BlmSchG - Details (2/2)

- **An EU harmonized approach for risk assessment (including criteria) is missing for non-Seveso small scale hydrogen bunkering facilities and activities (as compared to Seveso activities to be addressed within the StörfallV).** GAP 1
- Jurisdiction of the **European Court** (EuGH) request to take this into account in the **Federal Building Law (BauG)** (§§ 9, No. 23c and 24, 34) and **ensure safety distances** as regulated in BlmSchG §3, i.e. **these requirements have to be taken into account already on the level of urban land use planning and in particular in all building activities (regulation missing).** GAP 2
- To calculate the safety distances, a recommendation of the **Kommission für Anlagensicherheit** (KAS; commission of plant safety) of the federal government has been devised (**KAS-18**), which describes all details of the required calculation.
- **KAS-18: Leitfaden: Empfehlungen für Abstände zwischen Betriebsbereichen nach der Störfallverordnung und schutzbedürftigen Gebieten im Rahmen der Bauleitplanung - Umsetzung § 50 BlmSchG; Kommission für Anlagensicherheit beim Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit; 2. überarbeitete Fassung; November 2010 (Guideline to determine safety distances).**

BlmSchG - Details (3/4)

- **Prospective operators of facilities** within the scope of the BlmSchG have to observe safety distances (“Achtungsabstände”).
- The KAS-18 recommendations are based on a **deterministic procedure** (i.e. it does not consider the actual risk) representing the hazardous substance inventory by a single leak of a defined **leak diameter (typically 25 mm)** and using state-of-the-art release, atmospheric dispersion, fire and explosion models to calculate the toxic and flammable consequences in terms of **ERPG-2 values, heat radiation and explosion overpressure** and their range to certain limit values to derive the safety distances.
- These safety distances are **implemented in the urban land use plans by the local authorities** and are **mandatory for the permits of all newly planned facilities**.

BlmSchG - Details (4/4)

Annotation: In the following, “hydrogen” denotes gaseous or liquid hydrogen carriers if not indicated otherwise.

- As **KAS-18 is a recommendation** (which nevertheless has become a de-facto guideline for the time being), presently an official guideline (technical guideline for safety distances (“TA Abstand”) is in the discussion phase but it is open when and whether this will be published.
- **At present, KAS-18 is just a recommendation without regulative validity. A regulation (“TA Abstand”) should be released which addresses the hazard of hydrogen and recommends models suitable for this application.**

GAP 3

12. BImSchV (Störfallverordnung)

- BImSchG is further detailed in the major hazard regulation (**12. BImSchV**, “Störfallverordnung”, 15.03.2017); applies to all major hazard facilities and prescribes required actions in case that **the hazardous substance inventory exceeds certain limits**.
- **At present the 12. BImSchV addresses hydrogen in general, but there are no specific regulations for high pressure / low temperature hydrogen.** GAP 4
- If **Lower limit** (column 4 of app. I; for hydrogen (no. 2.44) 5,000 kg) is exceeded: **operational area** (“Betriebsbereich”) belongs to the “**lower class**” (“untere Klasse”) and the general requirements (basic duties (“Grundpflichten”) of the StörfallV apply, i.e. the requirements of §3 to §8.

12. BImSchV (2)

- If the **Upper limit** (column 5 of app. I; for hydrogen (no. 2.44): 50,000 kg) is exceeded, the operational area belongs to the “**upper class**” (“obere Klasse”) -> extended requirements (extended duties (“erweiterte Pflichten”) of the StörfallV apply, i.e. the requirements of §9 to §12.
- **§ 9-12**: requirement to supply a **safety report** (“Sicherheitsbericht”) including a detailed hazard analysis with a model simulation of a set incidents resulting from such hazards and a concept for incident prevention and mitigation. The safety report is usually available for concerned parties and has to be brought up to date every 5 years.
- **§ 10** requires an **emergency preparedness plan**
- **§ 11 a** requests detailed information of the public about the existing hazards and how the public should react in case of incidents.

4. BImSchV

- Vierte Verordnung zur Durchführung des Bundes-Immissionsschutzgesetzes (Verordnung über genehmigungsbedürftige Anlagen – 4. BImSchV) vom 2. Mai 2013 (BGBl. I S. 973) (Regulation concerning facilities requiring a permit)
- This regulation defines which facilities require an officially issued permit.
- Under 1.2.2 plants are mentioned used for generation of power, steam or hot water in a combustion plant using e.g. hydrogen.
- 4.1.12 mentions plants for the production of hydrogen.

Further regulations associated with the BImSchG

- **37. BImSchV:** Verordnung zur Anrechnung von strombasierten Kraftstoffen und mitverarbeiteten biogenen Ölen auf die Treibhausgasquote (Ordinance on the offsetting of electricity-based fuels and processed biogenic oils against the greenhouse gas quota)
- **38. BImSchV:** Verordnung zur Festlegung weiterer Bestimmungen zur Treibhausgasminderung bei Kraftstoffen (Ordinance laying down further provisions on greenhouse gas reduction in fuels)
- **EEG:** Erneuerbaren-Energien-Gesetz (Gesetz für den Ausbau erneuerbarer Energien, renewable energy law, 2017)
- **EnWG:** Energiewirtschaftsgesetz (Gesetz über die Elektrizitäts- und Gasversorgung, Law on the supply of electricity and gas).
- *These regulations are addressing energy political aspects and are not relevant for safety related aspects.*

UVPG

- **UVPG (Gesetz über die Umweltverträglichkeitsprüfung), Environmental Impact Assessment (EIA) Act**, i.e. the law requiring an EIA for new or modification projects.
- **ENVIRONMENT** covers
 - people (health),
 - animals and plants as well as biodiversity,
 - soil and water,
 - air, climate and landscape as well as cultural heritage and other tangible goods etc.
- The authority decides on the necessity of an EIA and fixes details and depth of the EIA.
- There is an obligation for an EIA for new projects as well as projects with a risk of major accidents.
- A detailed report has to be delivered to the authority allowing formal public objections.

Technical rules „Anlagensicherheit“

- Associated to the 12. BImSchV are the technical rules „plant safety“ („Technische Regeln Anlagensicherheit“, TRAS) which are developed under the guidance of the KAS.
- This set of technical rules is slowly developing and covers aspects of specific hazards, e.g. heavy rainfall and flooding (TRAS 310) or safety related rules for ammonia based refrigeration systems (TRAS 110)
- **So far, no TRAS is available addressing the specific hazards related to hydrogen and also not for hydrogen bunkering installations / stations for vessels.**

GAP 5

Betriebssicherheitsverordnung (BetrSichV)

- **Betriebssicherheitsverordnung** (BetrSichV; Operational Safety Regulation) (implements directive 89/655/EEG as replaced by 2009/104/EC in German law and addresses the safety of all machinery and other working equipment as required by health protection. It replaces the former *Druckbehälterverordnung* (pressurized vessel regulation) and applies to pressurized vessels as potentially used for hydrogen service.
- **BetrSichV requires** that
 - a thorough **hazard analysis** is performed for all working equipment (machinery, vessels etc.) also in abnormal operational states,
 - details on **incident preventive and mitigation measures** are provided,
 - proper **maintenance** provisions are stated and documented and
 - **appropriate training of personnel** is ensured.
- I.e. the requirements of the BetrSichV are in line with the requirements of the StörfallV.

Technical rules / guidelines associated with BetrSichV

- Associated to the **BetrSichV** are various **guidelines** (called TRBS, i.e. “Technische Regeln Betriebssicherheit” (TRBS), technical rules operational safety)
- **TRBS 3151** (“Vermeidung von Brand-, Explosions- und Druckgefährdungen an Tankstellen und Gasfüllanlagen zur Befüllung von Landfahrzeugen”, avoidance of fire, explosion and pressure hazards at gas stations and gas filling systems for filling land vehicles) refers to hydrogen context.
- **TRBS 3151** defines the state of the art for all operations associated to high pressure flammable gases in particular with respect to:
 - construction and storage conditions,
 - explosion protection
 - fire protection,
 - lightning protection,
 - Blitzschutz
 - collision protection,
 - shutdown provisions and regular testing intervals.

At present, there is no TRBS addressing the specific hazards of hydrogen and also not for hydrogen bunkering installations or stations.

GAP 6

TRBS 3151

- For the manufacturer, certain standards and laws regarding structural safety must also be observed when building hydrogen filling stations.
- The manufacturer has to carry out acceptance tests, which are checked by a "notified body", usually on the basis of ISO 19880 and VdTÜV Merkblatt 514.
- Although these texts are not legally binding for the operator of a hydrogen site, the operator should use them as information source.

Further Laws and Guidelines

- Germany as federal republic allows federal states to issue laws and regulations, but with respect to chemical hazards and safety related issues federal law is applicable in the states as well (but in principle: “Federal law above state law”).
- With respect to the **operation of harbours**, local regulations and guidelines may be in place which may differ from federal state to federal state and from city to city.
- As an example the **Allgemeine Hafenverordnung** (AHVO; general harbour regulation) of the state of North-Rhine-Westphalia can be addressed. It covers the general operation of a harbour and the regulations for cargo handling (in particular the handling of hazardous goods and water pollutant). *It does not address individual substances as hydrogen or bunkering of hydrogen.*
- **Local harbours may have additional regulations** (HVOs) as e.g. the harbour of the cities of Cologne, Duisburg, Neuss and Düsseldorf. Usually the local regulations refer to the state regulations and add provisions for the local conditions. *The local harbour regulations are usually not substance specific either.*

Relevant German DIN Norms

The following DIN norms have been identified:

- DIN EN 17124:2019-07 Hydrogen fuel - Product specification and quality assurance - Proton exchange membrane (PEM) fuel cell applications for road vehicles; German version EN 17124:2018
- DIN EN 17127:2019-09 Outdoor hydrogen refuelling points dispensing gaseous hydrogen and incorporating filling protocols; German version EN 17127:2018
- **The DIN 17124 and 17127 is not applicable to marine applications.**

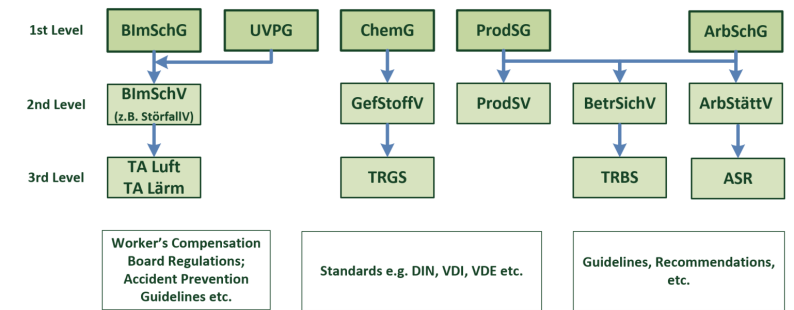
GAP 7

- DIN EN ISO 20519:2017-06 Ships and marine technology - Specification for bunkering of liquefied natural gas fuelled vessels (ISO 20519:2017); German version EN ISO 20519:2017
- **The DIN 20519 is not applicable for the bunkering of liquid hydrogen fuelled vessels.**

GAP 7

Identification of gaps in land-based regulations and standards in Germany (1/2)

- The legal framework shown in the Figure on slide 1 shows three levels:
 - **Level 1: LAWS:** This level does not refer to specific substances (e.g. hydrogen). As such only very general gaps can be identified.
 - **Level 2: Regulations:** these usually refer to hazardous substances as hydrogen, but on this level hydrogen is one under many hazardous substances (e.g. in the 12. BImSchV only limit amounts for class assignment are given for hydrogen).
 - **Level 3: Technical rules and guidelines** (e.g. TA Luft; TRBS): may be substance specific. Usually they address hydrogen, but usually limited to certain application areas. Gaps may be existing.



Identification of gaps (2/2)

- **Level 4** includes official and semi-official standards and recommendations, which have gained a more or less official acceptance; conformance of a permit application may be requested by the authorities, e.g. for KAS-18. As this level is substance specific, gaps with respect to hydrogen may be identified.
- The subsequent table contains all gaps identified and recommendations to close the gaps.

Gaps and Recommendations

GAP	Description	Type	Recommendation
1	An EU harmonized approach for risk assessment (including criteria) for non-Seveso hydrogen small-scale establishments and bunkering activities is lacking.	H	Develop an EU harmonized approach for risk assessment (including criteria) for non-Seveso small scale hydrogen bunkering facilities and activities (as compared to Seveso activities to be addressed within the StörfallV).
2	BlmSchG is missing adequate treatment of hydrogen (e.g. a specific hydrogen related BlmSchV)	L	Clarify if any additions to BlmSchG (e.g. a specific hydrogen related BlmSchV) in the context of the BauG may be required to address all hazards related to hydrogen)
3	A technical guideline for definition of safety distances ("TA Abstand") is missing (hazards of hydrogen should be taken into account)	L, K	At present, KAS-18 is just a recommendation without regulative validity. A regulation ("TA Abstand") should be released which addresses the hazard of hydrogen and recommends models suitable for this application.
4	12. BlmSchV does not provide adequate treatment of hazards due to very low temperature or very high pressure hydrogen	L	Check if LH2 needs specific treatment in the 12. BlmSchV in terms of potential hazards due to very low temperature or very high pressure hydrogen (GH2 falls under pressurised gases, i.e. it is included)
5	Technical details providing TRBS guidance for the specific hazards of hydrogen and hydrogen bunkering installations or bunker stations for vessels are missing	L, K	Provide TRBS guidance addressing the specific hazards of hydrogen and hydrogen bunkering installations or stations for vessels.
6	Treatment of the specific hazards of liquid hydrogen in the BetrSichV and in the associated TRBS are missing	L, K	Ensure that the specific hazards of liquid hydrogen are addressed appropriately in the BetrSichV and in the associated TRBS set of technical rules
7	International standards for hydrogen refuelling points and bunkering for maritime and inland vessels do not exist.	K	The development of technical ISO standards for bunkering hydrogen vessels is recommended. Note: CEN/TC 268/WG 5 considers to develop such standards.

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