READY4DC

Whitepaper on the Preliminary Conclusions of READY4DC Working Group 2:

Legal and Regulatory Aspects of a Multi-Vendor Multi-Terminal HVDC Grid

Deliverable 2.2

READY4DC

ABOUT READY4DC

The future electricity network envisioned by READY4DC will be characterized by a growing role of multi-terminal multi-vendor (MTMV) High Voltage Direct Current (HVDC) solutions within the current (alternate current) AC transmission networks both onshore and offshore. READY4DC is contributing to this synergistic process by enabling commonly agreed definitions of interoperable modelling tools, model sharing platforms, clear processes for ensuring interoperability, and an appropriate legal and political framework.

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Table of Contents

EXECUTIVE SUMMARY

This deliverable analyses various legal and regulatory issues that play a role in the development of a multi-vendor, multi-terminal HVDC grid: the cooperation required between different actors, standardisation, patents and licenses; the division of risks and liability between different companies. The gaps are presented alongside possible directions for addressing the barriers. The most important conclusions are:

First, the governance of a MV MT HVDC grid is best served by a clear legal and regulatory framework. The current framework is based on AC networks and, when HVDC technology is used, on point-to-point connections. The future legal framework for HVDC should be based on two legs: first, in public law (European Directives, Regulations and Network Codes), the principles and division of roles and responsibilities between different actors should be made clear. Moreover, specific standards that are agreed upon should be reflected in the European Network Codes. Secondly, next to public law, there is also need for certainty in the form of agreements under private law. This can be done in the form of an umbrella agreement between all involved parties on the aim and general rules of the cooperation towards the development of a HVDC grid, and a standardized bilateral agreement that developers and vendors can use as addition to the procurement contract each time the HVDC grid is extended. The contents of such agreements are discussed further in another Horizon Europe project: InterOPERA.

One of the topics to be adopted in the legal framework is the division of roles and responsibilities. It is sometimes said that the ownership and other roles regarding a HVDC grid should be decided before the development starts. However, the conclusion of WG2 is that the ownership of the grid can very well vary between different parts, as long as these parts are interoperable. Moreover, it is important that the grid planning and operation are coherent. However, these aspects can be decoupled from ownership. Furthermore, over the lifetime of the grid (multiple decades), the ideas on ownership, development, roles and responsibilities will probably change several times. We should therefore not aim to clarify everything prior to starting development, but we must instead ensure that the MT MV HVDC grid works regardless of the exact ownership division. Nonetheless, it is important to know how the roles and responsibilities are divided in the next phase. This deliverable includes a list of roles per (type of) entity.

Another important topic in the legal framework for HVDC grids is how to reach standardization in a situation with multiple vendors who have different IP and trade secrets. This deliverable highlights different options, such as for example bilateral or multilateral information sharing and the (dis)advantages of the usage of technology pools. Depending on the precise options that are chosen in standardization, the risk of respectively violating competition law or ill-suited use of intellectual property rights will increase or decrease. This is of particular concern for trade secrets usage, which due to the lack of a clearly defined legal framework carries with it distinct risks. No matter which option is chosen, it is always important that there is access on 'FRAND' terms (fair, reasonable and non-discriminatory) and that competition law is respected. In this regard, a standard-setting organization can help to create the standard, but here again it is important that the specifications are based on open and reasonable criteria. An important question in this regard is to what extent interoperability can be reached without sharing IP (or how the amount of IP to be shared can be limited as far as possible). This presupposes that IP needs to be shared in the first place. Depending on the ability of all relevant stakeholders to reach a shared philosophy for MTMV grid operations and the precise specifications required for interoperability, it may not be necessary to share (large amounts of) IP. This depends on the clearness of the interface regarding the roles and responsibilities of all relevant parties. An important question in MTMV HVDC

standardization is therefore: to what extent is it feasible to expect stakeholders to reach a shared design philosophy and to what extent can the specifications accommodate that?

Finally, the division (and shift) of liability is an important theme in this Deliverable. The shift from turnkey HVDC systems to MV MT HVDC systems can impact risks and associated liabilities in several ways. In turnkey systems, a single vendor assumes responsibility for the entire project, including design, installation, and commissioning. In these systems, the liability for faults or damages or malfunction resulting from the system falls on the turnkey vendor. In contrast, in multi-vendor systems, responsibility is divided among several vendors and the party that determines how they interoperate, potentially increasing the risk of interoperability issues and making it difficult to allocate liability in the event of faults or damages.

In an early development phase of MV MT HVDC systems, risks can potentially be limited by connecting several turn-key systems to each other. If interoperability issues occur, the system can be separated and operated as individual turnkey systems. Thus, such systems can be an adequate intermediate step to multi-vendor interoperability with less drastic change of risk allocation and liabilities. To minimize risks and associated liabilities in multi-vendor HVDC systems, it is important to clearly define roles and responsibilities in procurement contracts (as mentioned above) and establish clear guidelines for system integration and testing. Additionally, thorough testing of interoperability can help identify and address potential faults or damages before they become major issues. Finally, having a clear plan for allocating liability in the event of a fault or damage can is essential to minimize disputes and ensure that the responsible party is held accountable.

1. INTRODUCTION

A multi-vendor, multi-terminal HVDC requires coordination and governance, standards and protection of IP – issues that are regulated by law. A stable and enabling legal framework forms an essential basis for investment in HVDC technology. This Deliverable describes the main legal framework on several topics relevant for an interoperable HVDC network. First, it covers the cooperation required between different actors, namely Governance and Cooperation between Undertakings (in light of competition law). Then, the Deliverable covers the legal framework on standardisation, patents and licenses. There is an interdependence between these topics, for example because an industry standard may rely on many licenses and patents. The next important issue in the legal framework is the division of risks and liability between different companies. When too much risk is concentrated within one company, this will make that company reluctant to invest. A final issue in the legal framework is the EU Network Codes, which are currently not adapted to multi-terminal HVDC systems.

For each topic, the legislative status quo is shortly explained and the legislative gaps or questions are identified. Where possible, possible solutions are analysed, and recommendations are made where relevant. Sometimes, the recommendation is rather to avoid a certain issue than to address it specifically. Moreover, it must be noted that the development of a legal/regulatory framework for the cooperation between vendors and project developers in a meshed HVDC system is a complex and long-term process. This Deliverable should therefore not be considered as final result but rather as input for policymakers and future research projects. This Whitepaper contains the *preliminary* results of Ready4DC WG2. After a period of stakeholder interaction and review, a Whitepaper with the *final* results of WG2 will be published (October 2023).

2. GOVERNANCE

Governance is a wide concept. In this context, it entails the process of governing the roll-out of multi-terminal, multi-vendor HVDC grids. Governance does not lie with one actor, but instead is process in which many different actors play a role. A crucial element in governance is the division of roles and responsibilities between these different actors. This is partially laid down in legislation: for example, TSOs have to adhere to certain rules and responsibilities when they procure a new system. However, there are many steps in the development of an HVDC system, and regarding the shift from single vendor to multi-vendor systems, not all steps have a clear division of roles and responsibilities. For example, what happens in terms of liability for interoperability when grid owner A connects to an existing HVDC grid of owner B? Which party takes the initiative for a grid extension on the HVDC side? Next to concrete questions such as the ones mentioned above, parties can keep waiting for each other to take the first step, leading to unnecessary delays. Finally, if the division of responsibilities (and the liability stemming from responsibility) lies too much towards one party, this may also reduce the willingness to invest in HVDC systems.

The issue of governance is not limited to WG2, as it is a central theme of READY4DC. The gaps identified with regard to governance are not necessarily legal by nature, but legislation and regulation is one of the ways to clarify the roles and responsibilities of different actors and to increase certainty for all.

Issues that have been identified so far are:

- Coordination now takes place on a bilateral basis between vendor and TSO/developer, whereas coordination within a larger structure is necessary to reach interoperability between different sub-systems/vendors and across multiple TSOs/developers. There is no legal basis for such a larger HVDC structure yet.

Coordination and cooperation within a larger structure requires a legal basis, both in the system of public law, such as European energy law, which describes the powers and roles of different actors *vis-a-vis* each other, and in private law, in the form of agreements directly between these different actors. The latter is addressed in the Horizon Europe project InterOPERA: here, the development of a multi-vendor cooperation framework is envisaged. Such a cooperation framework could be a combination of two legal instruments: first, a general umbrella agreement signed by all parties relevant for the development of a Multi-Vendor Multi-Terminal (MVMT) grid can provide the basis for cooperation and lay down the goals and rules of this cooperation. As a second step, a model agreement can be developed to ensure interoperability each time an addition to the existing grid is made. This model agreement will then be an addition to the bilateral contract between the owner of the existing grid and the vendor of the new part.

The former, a legal basis of public law, depends on several choices that are not so much legal but rather political in nature. Examples are which entity/entities have a coordinating and decisive role in the development of a MTMV grid: the owners/operators of the onshore grid, in a process such as the Ten Year Network Development Plan (TYNDP), which is embedded already in EU energy law;[1] a new entity that is founded specifically to develop an offshore HVDC grid. Another possibility is that the coordination of the development of an offshore HVDC grid is moved from the technical sphere (assessment of the grid constraints and potential projects) towards the political sphere (strategic development and linkages between countries). The legal framework in public law should reflect the political decision-making on these topics. Therefore, it is important that policy-makers decide on this topic. The topic can be detailed further by analysing which roles and responsibilities there are and how they should be divided amongst existing or new entities.

- As the roles and responsibilities of the different parties in a multi-vendor situation are not entirely clear yet, customers are locked in single vendor systems, even though multi-vendor systems could lead to several benefits in terms of easy extendibility, speed of implementation, enhanced competition, lower costs.

Different roles and responsibilities can be discerned. In a recent position paper,[2] ENTSO-E discerns 'network planning', 'asset design and building', 'ownership', 'maintenance' and 'operation',[3] and lists the considerations for five models that divide these tasks, namely between 'onshore TSOs', 'offshore TSO'

[1] Regulation 2019/943, art. 30(1)b and art. 48. The TYNDP is developed by ENTSO-E in cooperation with the respective TSOs and after an opinion of ACER.

[2] ENTSO-E, 'Assessment of Roles and Responsibilities for Future Offshore Systems', Brussels, Nov 2022, available at https://eepublicdownloads.blob.core.windows.net/public-cdn-container/clean-documents/Publications/2022/entso-e_pp_Offshore_Development_Assessment_roles_responsibilities_221118.pdf.

[3] Dismantling and removal is not explicitly mentioned as role or responsibility in the ENTSO-E paper. However, it is wise to discuss dismantling and removal sufficiently early in order to give upfront clarity on this topic.

and three degrees of competitiveness. Other splits of tasks could also be possible, and other ways of dividing the tasks are also possible. Two important considerations in this regard are:

First, the division of roles and responsibilities does not have to be the same for the entire interconnected grid: it is possible to have a combination of different systems, as long as certain topics, such as grid planning/development, the interoperability of different parts of the grid and operation/maintenance are well coordinated. Moreover, grid planning/development can be organised by a combination of actors (for example onshore and offshore TSOs and a Regional Coordination Centre (RCC)), interoperability can be reached by a standardisation process and a clear division of liability in case of malfunctioning when a new asset is added to the grid (see section xxx below). Operation and maintenance could be coordinated by a regional coordination centre, which entity performs the maintenance can also vary throughout the network. Hybrid options are also possible, such as special purpose vehicles with ownership shares of both TSOs and market investors.

Second, it is possible to develop the model of ownership, roles and responsibilities over time. The offshore grid will not be built in one night, and insights into which model of ownership and construction are best suited in terms of costs, risks, implementation time and coordination may change over time. The lifetime of offshore electricity cables is several decades, and experience from the previous decades learns that the political vision on the degree of competition, the benefits and disadvantages of vertical integration and the ownership of essential infrastructure in public or private hands can change over such a time span. Here, again, it remains important that coordination is guaranteed when the model changes.

For these two reasons, it is not necessary to wait for a clear division of roles and responsibilities for the entire MVMT grid. Instead, it is important to start with several pilots, and to evaluate these pilots well, as they may contribute to the decision-making on larger parts of the grid. For these first steps in the development of a MVMT grid, it is important that certain roles and responsibilities are clear, in order to avoid a circle of waiting for each other.

In light of the phasing above (distinction between pilots and final framework), it is important to discuss the division of roles and responsibilities in the coming years, in the pilot phase. The following is a proposal of roles and responsibilities in this phase:

Grid Developers and ENTSO-E

- determine the system needs
- identify projects that match these system needs
- describe the functional requirements for the infrastructure needed for these projects (link to WG3)

Wind Developers

- Develop wind assets that can be connected to a HVDC network
- Review whether the functional requirements for wind power plants connected to HVDC network will work in MVMT situations
- Contribute to the standardisation process from their perspective

Vendors and their Industry Associations

- Develop assets that answer the functional requirements referred to above
- Contribute to the standardisation process from their perspective

All of the above (in the context of projects such as Ready4DC, InterOPERA)

- Reach a fair division of liability between developers and vendors (see section xxx below)
- Develop a model agreement to this end, to ensure interoperability and to de-risk the investment

Regulatory Authorities and their Association

- Determine to which extent the development of a MTMV grid differs from the regular grid investments and what consequences this has for the (income) regulation model
- Provide clarity to project developers on this matter

As mentioned above, on the longer term (beyond the pilot projects), roles and responsibilities may change. The process to identify system needs is currently bottom-up based on the input from the various TSOs, based on scenario assumptions by ENTSO-E. However, in order to reach a more holistic approach to grid planning, it could also be that ENTSO-E takes a more active role and holistic vision of the grid. Moreover, this grid planning process mainly supports TSO goals for their own grids. Wind developers may have conflicting interests that would better be served by another grid configuration. It is important that the needs from third parties are made clear and that it is clear how third-party needs are incorporated in grid planning and selection of projects.

3. COOPERATION BETWEEN UNDERTAKINGS

Multi-terminal, multi-vendor HVDC systems require interoperability. Interoperability requires a degree of coordination between different actors. Coordination between different vendors (horizontal cooperation) and coordination between vendors and project developers (vertical cooperation) is regulated in EU competition law, via specific legislation and via the general rule of article 101 of the Treaty on the Functioning of the European Union (TFEU). Certain forms of cooperation are prohibited per se, others are allowed as long as certain thresholds are met. This section discusses the margins within cooperation can take place and where more certainty is required.

3.1 The Degrees of Certainty within EU Competition Law

The required interoperability in multi-vendor HVDC systems necessitates cooperation. However, as mentioned above, cooperation between undertakings is regulated by EU competition law. Vendors and TSOs wish to cooperate as long as this is allowed under EU competition law. Therefore, it is important that they have a degree of certainty about whether the envisaged form of cooperation is allowed, for example to make sure that in the end, vendors are allowed to bid in the commercial tender for a HVDC system. EU competition law knows various degree of certainty about whether a form of cooperation is allowed. They will be discussed below.

3.1.1 General Rule

First, the general rule on cooperation between undertakings is 101 TFEU. The article prohibits "(...) all agreements between undertakings, decisions by associations of undertakings and concerted practices which may affect trade between Member States and which have as their object or effect the prevention, restriction or distortion of competition (...)". This general rule is further substantiated in case law of the European Court of Justice (ECJ) and guidelines from the European Commission.

Based on the existing legislation and application in practice, the following options are possible:

AGREEMENT DOESN'T AFFECT COMPETITION

If an agreement or form of cooperation does not affect competition, there is no violation of competition law. However, it is risky to trust on this option if there may still be an effect on competition. With the cooperation needed for interoperability, it is likely that the agreements needed for this affect competition.

SAFE HARBOUR

When the combined market shares of the undertakings cooperating in a certain market are relatively low, an agreement is unlikely to restrict competition. Thus, agreements below this threshold are in a "Safe Harbour". The percentage of market share considered a safe harbour differs per type of cooperation, so for commercialisation agreements, it is only 15%, whereas for R&D agreements it is 25%. However, the agreements required to achieve interoperability should aim for cooperation with a sufficiently high percentage of the market – especially where the ultimate goal is standardisation. Therefore, it is unlikely that the safe harbour percentages will be met. It must be noted that agreements that are anticompetitive by nature (such as hardcore cartels) are not allowed, even if they are below a certain market share.

EFFICIENCY GAINS: 101(3) TFEU

If a form of cooperation covers a large percentage of the market, and it restricts competition, it can still be allowed when it leads to efficiency gains. An individual exemption is possible if the following four (cumulative!) criteria are met:

1. Contribution to improving the production or distribution of goods or to promoting technical or economic progress
2. a fair share of the resulting benefit the consumers
3. The restriction of competition must be indispensable to the attainment of the objectives in the first criterion.
4. Not eliminate competition in respect of a substantial part of the products in question

The case law of the ECJ contains few references to this article, leaving much room for the Commission to interpret these rules. In order to clarify when these rules are applicable in different situations, the European Commission has drafted Guidelines and Block Exemption Regulations. These will be discussed below.

3.1.2 Shift of the Burden of Proof

If the Commission or other competition authorities is of the opinion that a particular standard violates EU competition law, then they will have the burden of proof. However, if undertakings wish to defend their cooperation based on the fact that it leads to efficiency gains, the burden of proof shifts to the undertakings. This threshold concerns art. 101 (3) TFEU and allows a company that violates section 1 of art. 101 TFEU to justify that.

In the Guidelines, the relevant burden of proof for proving either a violation or justification of EU competition law is consequently left unclear. If a company finds itself at exceeding the threshold of art.

101 (1) TFEU, the burden of proof will shift and the standard of proof will rise. A company will then also have to prove the other three criteria of art. 101 (3) TFEU, which are not found in any of the other thresholds. The Commissions soft law therefore lacks clarity when determining whether a standard is in compliance with competition law.

3.1.3 Block Exemption Regulations

A high degree of certainty about whether a form of cooperation is allowed can be obtained when the cooperation falls under one of the so-called "Block Exemption Regulations". There are three block exemptions within the scope of competition law and IP licensing that are relevant for the cooperation necessary to achieve an interoperable multi-vendor HVDC system. These are related to R&D agreements, specialisation agreements and technology transfer agreements:

- Regulation No 1217/2010 of 14 December 2010 on the application of Article 101(3) of the Treaty on the functioning of the European Union to categories of research and development agreements
- Regulation No 1218/2010 of 14 December 2010 on the application of Article 101(3) of the Treaty to categories of specialisation agreements.
- Regulation No 316/2014 of 21 March 2014 on the application of Article 101(3) of the Treaty on the Functioning of the European Union to categories of technology transfer agreements

Please note: these Regulations are under revision and will presumably be changed per July of 2023. There are no large changes envisaged based on the draft new versions, but this section will be updated where necessary after the adoption of the new Regulations.

If any activities are caught within the scope of these Regulations, that activity cannot be considered a violation of any substantive obligation under EU competition law.

3.1.4 R&D Agreements

Regulation 1217/2010 concerns research and development agreements. A research and development agreement constitutes an agreement by two or more parties, wherein those parties pursue:

1. Joint research and development of technology or new products and joint exploitation of those results;
2. Joint research and development of technology or new products, excluding joint exploitation of those results;
3. Paid-for research and development of technology or products pursuant a prior agreement between the parties and the joint exploitation of those results;
4. Paid-for research and development of technology or products, without joint exploitation of those results.

Article 2 of Regulation 1217/2010 exempts these activities, as well as licensing that is directly related and necessary for the implementation of these research agreements from the scope of art. 101 (1) TFEU through usage of art. 101 (3).

Article 3 Regulation 1217/2010 provides the conditions necessary for such an exemption.

- All parties must be granted the results of the research for further research, as soon as these results become available.

- All parties must furthermore be granted access to the know-how necessary for the effective exploitation of the technology or product, if that know-how is indispensable for effective exploitation.
- Compensation for such a transfer is allowed, but it must not be so high as to effectively impede access.
- Joint exploitation of the results may only pertain to the results of the agreement that are protected by IP or constitute know how essential for the manufacture or application of the researched technology.
- The distinction between merely cooperative research and cooperative research with joint exploitation is relevant, as the Commission states in its guidelines. Should a company exceed the to-be-discussed market share threshold the exemption no longer applies. But the Commission's assessment under art. 101 (1 &3) does treat mere cooperative research with more leniency.

As the Regulation makes clear, research and development agreements require parties to jointly develop relevant technology. The joint exploitation of technology that, essentially, already exists, is not covered. It is unclear when this Regulation considers something novel enough to warrant classifying it as a new technology deserving of exemption. This is one of the topics that will be amended in the new version, based on the draft proposal.

Article 4 of Regulation 1217/2010 furthermore restricts the application of the exemption via a market threshold test. Companies are only exempt from EU competition law if the combined market share of all competing parties in the agreement does not exceed 25%. This can be measured from both the relevant technology market and the relevant product market where that technology will be used. If any market share is higher than that, at any point in during the research of seven years after the first exploitation, the exemption of Regulation 1217/2010 no longer applies.

The regulation also contains a list of "hardcore" restrictions, which cannot in any event be exempt under Regulation 1217/2010. Some of these are rather obvious, such as: no splitting up of the relevant market territory for each company and, generally, no artificial restriction of output. Somewhat more difficult in the context of standardisation is the fixing of prices. While traditionally price fixing is never allowed in EU competition law, Regulation 1217/2010 does allow it when that is the result of licensing fees charged to immediate licensees, which they then in turn incorporate into their prices. It is unclear from the wording of the Regulation when such licensing fees overstep their boundaries, either due to not being immediate enough or where the licensing prices become too high. The Regulation furthermore forbids a restriction imposed on the parties to carry out R&D on fields unrelated to the original agreement, or in that field after the agreement has ended. How the Commission determines what those unrelated fields are is also not apparent from the text of the Regulation. It will in any event limit the parties' ability to restrict any other party from using any of the knowledge gained, even if a company seeks to safeguard highly sensitive know-how or trade secrets.

3.1.5 Specialisation Agreements

Regulation 1218/2010 provides an exemption from art. 101 TFEU to certain specialisation agreements. Specialisation agreements may refer to unilateral agreements, reciprocal agreements or joint production agreements. These agreements have as their purpose allowing one company to further gain specialisation, which results in better products. With unilateral agreements a company will agree to limit its production of certain products, instead purchasing those products from the other contracted party who

is active on that same product market. Reciprocal agreements refer to two or more parties, active on the same product markets, jointly agreeing to cease or limit production of certain products, which they will then procure from the other party. By limiting the production of certain products, participating companies can focus on certain production processes and achieve greater efficiency as a result. Finally, a joint production agreement refers to an agreement by two or more parties where all parties jointly produce certain products. Unlike with R&D agreements, this block exemption does not facilitate the development of entirely new technology. Rather, it aims to facilitate improved production of already existing products.

It is unclear where the threshold of improved production of existing products ends and the researching of new products begins. Production agreements may, for instance, facilitate improved joint production of existing products and the joint development of future products. The threshold is important to know, because the hardcore restrictions from the R&D agreements may then become relevant for (parts of) the joint production agreement. It is furthermore relevant to know for the maximum market share of all parties, which is not necessarily equal. Finally, the distinction is important to know for the applicability of both exemption regulations. The specialisation exemption regulation can only be applicable to two directly competing companies. Companies that merely occupy the same supply chain cannot use Regulation 1218/2010. But R&D agreements can be applicable in both contexts. Regulation 1218/2010, Regulation 1217/2010 and the Guidelines on the applicability of Article 101 provide little clarity on the possibility and consequences of overlap.

As mentioned, Regulation 1218/2010 is only applicable to agreements between competing companies, where the total share of the relevant market does not exceed 20%. Depending on the structure of the market, it can be quite easy for companies to exceed that threshold. As such, the Regulation will only have worth for smaller companies, or in markets populated by smaller companies.

Regulation 1218/2010 also contains hardcore restrictions which a company may never commit, though there are less than in Regulation 1217/2010. The only restriction that lacks clarity concerns the fixing of prices in specialisation agreements. In principle, fixing prices is an action that has as its object the restriction of competition and is therefore never allowed. The difficulty in this restriction for specialisation agreements lies in the possible exemption to that in Regulation 1218/2010. Fixing prices is allowed, if these prices are charged to immediate customers in the context of joint distribution. Neither the Regulation nor the guidelines on the applicability of Article 101 provide much clarity on what constitutes an immediate customer. Joint distribution must furthermore be necessary to jointly produce a product, which the Commission clarifies in its guidelines as: "parties would not otherwise have an incentive to enter into the production agreement in the first place". It is not clear from the wording of Regulation 1218/2010 and the Guidelines on the applicability of Article 101 when such an incentive exists or how a company should assess that incentive. As these restrictions lack clarity, it would be safest for a company to not engage in price fixing at all, as failing to meet these vague criteria will result in conduct that violates the core of EU competition law. Undertakings lack the clarity necessary to make full use of price-setting in specialisation agreements.

3.1.6 Technology Transfer Agreements

Regulation 316/2014 provides an exemption pursuant to certain technology transfer agreements.

Technology rights may refer to copyright for software or patents but does not include any definition of trade secrets or otherwise valuable know-how. Technology transfer agreements refer to agreements whereby two undertakings:

1. Enter into a technology licensing agreement for the purpose of allowing the licensee to produce products;
2. Assign technology rights between each other for the purpose of producing products, where the risk associated remains in with the assignor of the technology, at least in some respect.

These agreements may be reciprocal, whereby both undertakings grant the other the usage of technology rights which compete with one another. They may also be non-reciprocal, whereby the assigned or licensed technology rights are not competing with one another. The definition used in Regulation 316/2014 makes it clear that the Regulation only aims to grant exemptions to conduct where the licensee produces the product or the production of a product where the assigner retains some manner of risk regarding the exploitation of the technology. This may include agreements where the licensing or transfer fee is dependent on the profitability of the produced product. Strictly speaking, the Regulation only covers agreements where a product is produced, not developed. The Guidelines accompanying this Regulation do stress that some preliminary development may be accepted. That same guideline also makes clear that developing new products cannot be covered by Regulation 316/2014. Though the exact boundary between mere preliminary development and new development is unclear, it seems likely the Regulation favours a somewhat strict interpretation of preliminary development. Regulation 316/2014 therefore retains little use for development agreements. Regulations 1217/2010 and 1218/2010 are meant for such development agreements.

The regulation is furthermore limited, by only allowing agreements between two undertakings. Multilateral frameworks are not covered by this Regulation 316/2014.

The market share of the relevant undertakings is another important restriction on technology transfer agreements. Competing undertakings must not exceed a combined market share of 20%. For non-competing companies this market share threshold is 30 % for each individual company. The limited market threshold restricts competing undertakings significantly more than non-competing undertakings. Regulation 316/2014 may therefore be the most useful for non-competing undertakings. The 30% share of the market, though, could still restrict the scope of Regulation 316/2014, particularly where it concerns TSO's.

3.2 Legislative Gaps and Possible Solutions

In this section, the state of the art of legislation and regulation concerning the cooperation of undertakings, indispensable for interoperability, is laid down. Several gaps and issues have been identified. After each issue, possible lines of thoughts and – where possible – possible solutions regarding this issue are laid down.

- No ex-ante certainty that cooperation by a large group of undertakings (covering a large market share) is allowed by the EC.

Considering the market structure regarding vendors for HVDC components, not even the most favourable interpretation of the Block Exemption Regulations could result in some manner of exemption from competition law. As a result, use of the block exemption regulations is highly discouraged.

- The safe harbours (market shares for when Block Exemption Regulations are valid) are relatively low, whereas it would be best if a large percentage of the market participates in the standardisation.

The need to foster broad participation in the development of a new standard – which, as paragraph four and six specify, is necessary to create a standard unobstructed by patents – reduces the usage of the block exemption regulations yet further. As a result, use of the block exemption regulations is highly discouraged.

- The distinction between R&D and specialisation agreements is not entirely clear. The instruments do not provide clarity on consequences of overlap.

Further research has not revealed additional sources necessary to properly distinguish between R&D agreements and specialisation agreements in the context of MVMT HVDC grid development. Several interpretations remain possible, yet only the Commission can provide further clarity on whether a beneficial interpretation is likely. As a result, the different legal effects possible under R&D and specialisation agreements, considering the possibility of overlapping definitions, discourage the usage of R&D or specialisation agreements.

- Fixing of prices is possible in certain limited instances (specialisation agreements). However, the rules on the fixing of prices are not entirely clear in practice.

Price-fixing is a hardcore restriction of competition law, with only a small exception (prices charged to immediate customers in the context of joint distribution). The consequences of being suspected of fixing prices in any competitive context are severe. The burden of proof that the exemption applies lies with the suspected party. As a result, any attempted price fixing that does not match the precise wording in the block exemptions is legally risky. Its usage is therefore discouraged.

4. STANDARDISATION

Interoperability in HVDC systems and HVDC grids asks for a certain degree of standardisation. Standardisation is a process that can take different forms, and the legislation on standardisation depends on the way the process is organised. The process of standardisation requires undertakings to engage in agreements with each other, which makes the rules on competition law also relevant for this topic. Therefore, the way standardisation can take place is determined in part by the rules set by the European Commission.

4.1 Participation in Standardisation

An important topic throughout the standardisation process concerns the necessary rules to properly facilitate participation by a variety of industry actors. Standardisation can occur in, essentially, two variants. It may occur within specified bodies of EU or national law, in which case the participation process is governed by that body of law's rules and procedures. It can also occur, with several possible configurations, by private actors. As there is in principle no prohibition on standardisation by industry there are also no rules private actors must necessarily adhere to.

4.2 Open and Transparent

EU Competition Law, particularly the soft law of the EU commission, limits the freedom private actors have to standardize. Standardisation is defined as the voluntary technical or quality specifications with which current or future products, processes or services may comply. This is a broad definition capable of encompassing a variety of industry cooperation and industry agreements. While the Commission generally stresses that the efficiency improvements standards can provide are significant, it remains wary of standards and the standardisation process as covers for other, undesirable forms of cooperation. In the early stages of standardisation that may be of little concern, but the greater the market share of a particular standard becomes, the greater these concerns become. The standard setting process should therefore be as open and transparent as possible. Of particular relevance is the requirement to ensure that all relevant parties can participate in the formation and selection of the standard. This includes all entities within a given market that are competitors or are otherwise affected by the standard.

4.3 Voting Rights

The voting rights granted to each participant in the standardisation should be objective, non-discriminatory, and contain objective criteria for selecting technology or specifications. If not done appropriately, a few undertakings could gain significantly more influence than would ordinarily be justified. The criteria used by the Commission are general in nature and are not further elaborated upon. The relevant undertakings must therefore decide upon these rules themselves. The Commission only clarifies that possible exclusions could be justified, if:

1. The would-be participant demonstrates or is likely to demonstrate significant inefficiencies (i.e. technical or organisational).
2. The standardisation process already sufficiently covers the collective interest of that particular would-be participant.

Regarding the first exemption, it is relevant that such a determination is made through usage of objective criteria, with preferably an independent body making the final decision. The wording of the Commission does not allow for a clear separation between "mere" inefficiencies, and inefficiencies that are of such significance that they warrant exclusion from the standardisation process.

The last exemption can be used to avoid unnecessary organisational difficulties. Unfortunately, the Commission does not adequately explain when the collective interest is already sufficiently covered, or when mere inconvenience evolves into organisational difficulties.

4.4 Participation, Technology and IP

As previously mentioned, standardisation allows for efficiency gains within the market that is standardized. For the greatest possible efficiency gains to occur, it is necessary that the standardisation process has broad industry participation. Through this broad base of industry support the best available technology can influence the chosen specification and be integrated into the standard at an early stage. This aligns with the Commissions stance on open and transparent participation in the standard-setting process. Any rules, regulations, or organisational decisions should therefore facilitate broad participation.

The need for broad participation is counter-balanced by the related need to acquire a binding licensing commitment from participating companies. Any technology that participating companies possess that is useful for a standard nearly always has intellectual property rights (IPR) attached to them. It is therefore in the interest of the standard that these companies provide irrevocable licensing commitment under fair,

reasonable and non-discriminatory terms (also known as: FRAND terms). That way a standard can develop specifications according to the relevant technology, with the knowledge that the standard will not be hindered by companies invoking their IPR. This is also a required by the Commission: without it, a standard cannot make use of the "safe harbour" found with the Commissions Guidelines on the applicability of Article 101 of the Treaty on the Functioning of the European Union to horizontal co-operation agreements.

Such a binding licensing commitment, however, has the potential of reducing participation by companies, depending on the terms of the licensing commitment. Unclear or early binding commitments may otherwise force companies to license IPR, without them being entirely aware of the IPR that they possess and the value that this IPR could have in the future. The ECJ's case law dictates that, once a binding commitment has been made by companies to license their IP for use in a standard, competition law significantly restricts their freedom to licensing their IP. The goal of open and transparent participation and the need for binding licensing commitments therefore cause tension within the standardisation process. If the timing of the binding commitment is early, participation by companies may be hindered. If the binding commitment is required late into the standardisation process, this may delay the development of the specification. The standard-setting process should therefore find an appropriate balance between transparent participation, fostering broad industry participation, and securing relevant IP licenses.

4.5 Good Faith

An issue associated with broad industry participation concerns the obligation of participating companies to disclose which IP they possess. It is necessary for the standardisation process that all relevant IPR is disclosed ahead of time. If a specification has been set without knowledge of existing IPR, that could hinder the effective development of the standard or force other companies to pay a large licensing fee for the usage of that technology. For the benefit of a standard, companies are required to disclose what IPR they have. To that end the Commission requires companies to perform a good faith disclosure of all IP that "might be essential for the implementation of the standard under development".[4] This requirement does not require companies to compare their available technology to the standard and positively conclude that they have no related IPR. Neither do companies have to disclose exactly what type of IPR they possess regarding (a particular development stage) of a standard. All that is necessary is that the company, as the standard develops, makes a good faith effort to locate its relevant technology and associated IPR. If any relevant IPR are found, the company in question must then merely inform the other parties that they have IPR on technology of theirs that could fulfil a particular specification. This test seeks to balance two factors: a need to disclose IPR so that a "patent ambush" can be avoided, and the need to foster participation in the standardisation process. If no disclosure requirements are implemented, the Commission may consider the standardisation process as suspect. The exact manner in which the good faith requirement should be implemented, however, is left unclear by the Commissions Guidelines.

4.6 Legislative Gaps and Possible Solutions

Regarding the legal side of the process of standardisation, the main take-away is that the process should be as open and transparent as possible, but that there are several specific issues to take into account.

[4] See the next section for the issue of essentiality in standardisation.

Several gaps and issues have been identified. After each issue, possible lines of thoughts and – where possible – possible solutions regarding this issue are laid down.

- There are limited concrete ex ante rules and procedures on open and transparent participation in standardisation that industry participants can follow, necessitating – to a large extent – the development and monitoring of such rules and procedures by undertakings themselves.

The lack of legal guidelines does not mean there are no relevant guidelines a standard-setting body of companies can take inspiration from. Even if not specifically empowered under EU law, the guidelines and practice of standard-setting organisations within the EU remain authoritative. For the purposes of a MTMV HVDC grid, the authoritative standard-setting organisations are CEN and CENELEC. As long as the sighted boundaries of competition law specified in this white paper are held into account, the usages of relevant guidelines or the involvement of standard-setting organisations is to be encouraged.

- There are no concrete ex ante rules and procedures dictating when exclusion of undertakings from standardisation is justified nor how the allocation of the voting rights within the standardisation process should take place.

Competition law tends to review standard-setting in hindsight: if there are certain red flags or dubious practices in the process of standard-setting, competition authorities may review the process and start enforcement proceedings. This necessitates a careful consideration of which companies vote on the specifications within a standard and how strong their voting rights are. Within the development of standards for MTMV HVDC grids, there is the added complexity that the nature of the standard might result in an overrepresentation of vendors. As vendors are the responsible parties for creating the components that must comply with a standard, it is natural their voice is represented as one of the most knowledgeable parties. Simultaneously, an overrepresentation of vendors could potentially be seen, retroactively, as a form of unwanted commercial coordination. The inclusion of multiple types of companies with adequate representation is useful in reducing that risk, such as research institutes or TSO's. Absent any guidance from the Commission, the use of guidelines from CEN or CENELEC could prove valuable in determining what an appropriate balance of standardizing companies is.

- The law determines in general terms that FRAND licensing terms require binding commitments from participating undertakings. It largely fails to align these commitments with the need to foster broad industry participation, requiring companies to balance these tensions themselves.

The standard-setting phase should focus on broad, active participation over an early, binding licensing commitment. Instead of potentially reducing participation with binding commitments at an early stage, it is advisable that standardization efforts focus on crafting specifications that all relevant companies can fulfil. The participation of a sufficiently large group of vendors, research institutes and other IP holders can help achieve that. Throughout the process of choosing the relevant specifications companies should continue to provide information on whether certain inventions or solutions are likely to be covered by a patent of theirs. This can allow the engineers choosing the specifications to consider to what extent particular solutions might be dependent on patents from a single company and potentially steer the specifications away from solutions only one patented solution can provide. A standard setting organization should consider combining an obligation to provide relevant information to the standard setting organisation with a good faith effort policy from the participating companies to continuously

reveal relevant IP. Such a combination will allow all parties to make informed decisions during the standardization process. If the standard setting organisation does not wish to take a risk with an IP-heavy specification, it could potentially choose alternatives. IP holders could determine with each patent that might cover a specification whether or not they would be willing to license that patent. Through proper communication by both parties unexpected licensing requirements can be avoided. Of course: if a company is willing to provide a voluntary binding licensing commitment, that would be the safest option, as participation will not be threatened in that scenario.

- The regulation requires a good faith effort on the part of undertakings to disclose relevant IPR. The scope and duration of that good faith effort, however, are not specified.

The development of a standard requires input from relevant parties to set the specification in a manner that can achieve interoperability, as well as several lesser objectives. When crafting these specifications, the engineers might not be fully aware of any potential patents their company possesses that could (partially) overlap with these specifications. If specifications are chosen whilst a company is unaware of relevant patents, a binding licensing commitment could force vendors to license IP they might otherwise have kept for themselves. It is advisable that relevant experts on both the contents of company patents and the development of the standard regularly take stock on the progress of the standard. This would allow a company to be more aware of what IP it might have to license, which as a result would give the standard setting organisation information on the necessary patents for the standard.

5. THE STANDARD-ESSENTIAL PATENT

A technological standard for HVDC grid components will be based on a large amount of IP and patents. Some patents are essential to a standard: these are called 'standard-essential patents' (SEP). A SEP is defined as a patent that a standard must use, without which a particular standard cannot function. Depending on the nature of the standard and the market in question, a standard may contain thousands of such patents. It is relevant to know for standardisation what constitutes such a patent. The definition of standard-essential patents influences which patents should be prioritized, how they should be determined and ultimately the legal risk (under EU competition law and IP law) that a standard incurs when selecting or using the patent in question.

5.1 Which Patent is Selected?

A patent can be essential for a particular standard if the equipment or methods used in that standard cannot be carried out without violating that patent. This presupposes that a standard has been set independently of existing patents or cooperation from partners of industry, which often is not true. The process of selecting a patent requires the relevant standard setting organisation or partners of industry to determine what the best solution for a particular technical problem is. If only one patented solution exists that can meet the selected specifications, then there is no issue. That patented solution can be selected.

If, however, multiple solutions exist that can meet the relevant specification, it becomes more difficult to determine which of these solutions is *the* essential patent. A safe solution in that context would be to include all relevant patents into a standard, so that concerns of discrimination against particular patents cannot occur. Such an approach, however, would run contrary to the Commission's view.

In its Guidelines on the applicability of Article 101 the Commission prefers only one set of essential patents. The Commission tends to consider the interoperability efficiencies gained through standardisation and the efficiency lost through excessive licensing costs holistically. If multiple patents are unnecessarily included in the standard, the concomitant costs of licensing for those patents will also rise unnecessarily. The initially gained interoperability efficiencies could then be undermined by the extra licensing costs. Including all suitable patents into the standard is therefore no solution to multiple patents meeting the chosen specification. In order for multi-terminal multi-vendor HVDC standardisation to safely select specifications and patented technology it is necessary to gain clarity on this issue.

A possible solution for the issue of multiple patents meeting the relevant specification, with no discernible difference in performance, would be addition of a commercial context. In the Guidelines on the applicability of Article 101 the Commission makes no mention of commercial criteria, but in its Guideline on technology transfers such a mention is made in reference to technology pools. Technology pools are arrangements whereby two or more parties assemble a package of technology, which is licensed not only to contributors to the pool but also to third parties.

The comparison is not perfect, as technical standards result in interoperability, which technology pools do not necessarily provide. The licensing component of IPR, whereby multiple companies in a horizontal setting bundle their IPR and provide other parties access, can nevertheless be necessary to achieve standardisation. This justifies the comparison between technology pools and technical standards.[5] In this guideline the Commission defines technologies as essential if "no viable substitutes (both from a commercial and technical point of view) for that technology inside or outside the pool and the technology in question" exist, and it "constitutes a necessary part of the package of technologies for the purposes of producing the product(s) or carrying out the process(-es) to which the pool relates".[6] In the context of pool-based licensing, which may be related to standardisation, commercial feasibility can give a relevant patent an edge in case of multiple technically comparable technologies. It remains unclear, however, to what extent this soft law is applicable to standardisation. The Commission considers technology pools related to standards, but does not consider them "inherently linked".[7] It is therefore unclear to what extent commercial consideration can help break a deadlock between multiple, on technical grounds comparable patents.

The Guidelines on horizontal coordination of art. 101 TFEU and the Guidelines on technology transfers both describe activities which are applicable to standardisation. The possibility of overlap between these two guidelines is largely left unaddressed. The first guideline covers standardisation, the second technology pools and licensing, which is often used in standards. This makes it difficult to determine to what extent the aforementioned commercial context can help determine the essentiality of patents. It also makes it difficult to determine if other factors in the technology transfer guidelines, such as the need for independent expert panels to determine the essentiality of certain patents, is applicable to standards. Additionally, it leaves unaddressed the possible complementary nature of patents in technology pools, which is allowed in the technology transfer guidelines. As the guidelines on horizontal coordination seem

5 See the Commission's own assessment of tech pools and standards: Communication from the Commission — Guidelines on the application of Article 101 of the Treaty on the Functioning of the European Union to technology transfer agreements, para 244-249, para . 252 et seq. See also: "C. Shapiro, Navigation the patent Thicket: Cross Licenses, Patent Pools, and Standard Setting.

6 Guidelines on the application of Article 101 of the Treaty on the Functioning of the European Union to technology transfer agreements, para . 252.

7 Ibid, para. 245.

to only allow essential patents, it is difficult which interpretation should be applicable when the scope of both guidelines overlap.

5.2 Legislative Gaps and Solutions

The standard-essential patent is a key concept in standardisation. However, there are certain points of attention in the selection process:

- The Commission prefers one set of Standard Essential patents per specification. It does not address standards where multiple patented solutions exist, which can all perform the specified function equally well.

In the event that multiple patents can perform a particular standardized function, there is arguably not an issue. If multiple patents exist for each relevant standard user, then patents for that function will not have to be licensed. If, however, one or more companies do not have access to a relevant patented solution, at least one patent should be licensed. From a competition law perspective, it is desirable that one patent is not declared as the standard essential patent without good cause. Should multiple solutions remain possible, it might be optimal that the companies possessing the patents compete for licenses. If the number of patents required becomes too large or the overview of who has what patent becomes to complex, it might become necessary to employ usage of a technology pool. The patent that gains entry into the patent pool could then compete for its position based on price. That way, interoperability will remain possible and competition for licenses can continue without SEP's getting in the way unnecessarily.

- The Commission's preference for one set of technology – and therefore one set of patents – leaves unaddressed the possibility of non-essential but complementary technology.

Complementary technology might refer to a reduction in the complexity of a particular standard or otherwise reducing the price of hat standard. Whilst the status of complementary technology is uncertain, its inclusion within a standard could be justified with proper motivation. If a standard setting organisation wishes to include complementary technology, it needs to motivate: what aspect of the standard it would aid with or how the overall price of the standard would be reduced. The onus, if a choice must be made, should be put on potential price reductions over reductions in complexity within the standard. This is advisable due to qualitative improvements of a standard being more difficult to analyse from a competition law perspective.

- The Guidelines on the applicability of Article 101 do not mention commercial factors in determining essential patents. The Guidelines on technology transfer do, and specifically mention standards. It is unclear if and to what extent commercial factors can influence the essentiality of patents.

The previous section largely dealt with commercial factors. Interoperability is the main goal of standards and should be its primary goal. If, however, clearly favourable price reduction can be achieved by favouring one set of essential patents, it is defensible that this set of patents is chosen. Such a choice should also consider which technology allows for more flexible standard development, which could result in price reductions in the future.

- The Commission's guidelines related to standardisation and essentiality are at times contradictory. This results in a lack of clarity regarding, for instance, the essential and complementary nature of the Standard Essential Patent.

The Commission could clarify the guidelines on this point and thereby provide certainty to the industry.

6. FRAND LICENSING & EXCESSIVE PRICING

An important obligation pertaining to standards is the requirement of all participating companies to license their relevant IP. This licensing needs to comply with the criteria of Fair, Reasonable, and Non-Discriminatory (FRAND) licensing, as determined by the ECJ and the Commission.

A large part of the rules pertaining to FRAND licensing refers to the determination of the price. Excessively high prices are frowned upon and should a particular licensing regime be classified as producing such prices, there will likely be a violation of competition law. However, it is difficult when exactly a licensing fee is excessive. A high licensing cost may be explained and justified by high costs of R&D, including the costs made in researching that yielded no commercially useful technology. The Commission and the ECJ furthermore lack relevant information to determine ex ante what the price for a license should be. It is therefore established practice that competition law in principle does not interfere with the prices set with licences. Intervening is more likely:

1. in a market where barriers to entry make it difficult for competitive forces to reduce licensing fees;
2. in situations where excessive fees are the result of anti-competitive behaviour, rather than a reward for expensive and risky R&D

The first situation is inherent in standards, as parts of the (technology) markets are restricted through use of the standard. The second situation may apply, though that is more difficult to determine ex ante.

6.1 Different Tests

The Commission has intervened with license fees at several instances. In doing so, it has made use of a variety of tests for whether a fee was excessive or not. The first test relates to prices that, on an absolute level, are too high. This test likely is not relevant for standardisation.

The second test attempts to establish relatively excessive prices, by comparing the license fees of comparable technologies used by other companies. The Commission might also attempt to compare the licensing fees of technology to before its integration into a standard to the license fee afterwards. If no comparable technology or companies exist, this test has little practical value. Even if there are comparisons, the Commission would have to determine those license fees are not already excessive for the test to work. A third possible methods attempt to account for the R&D costs and base the excessive pricing on those costs. However, this method requires significant investigation into those costs and does not account for the R&D costs incurred for other technology that lack commercial value. The lacking ability of the Commission to determine objective value for technology hinders its ability to determine appropriate license fees.

A relatively recent case before the ECJ shows the possibility of a fourth test to determine excessive pricing.[8] This test attempts to separate the strategic value of information in general and might be used in the future to determine excessive licensing costs in standards. The test assumes that only value borne out of innovation is worthwhile in licensing. Value originating from the strategic placement of a patent within a license – which market participants have to acquire due to the nature of a standard – ought to be excluded. This test still struggles with the issue of comparability mentioned previously. It therefore remains difficult for the Commission and the ECJ to determine what excessive prices are.

6.2 Legislative Gaps and Solutions

Excessive prices constitute an important component of the required FRAND terms related to licensing IP within standards. The methods employed by the ECJ and the Commission to determine excessive prices lack clarity in several respects.

- There are multiple methods available to determine excessive pricing. It is unclear when each method will be used and in what combination.

If relative comparisons are chosen to determine an excessive licensing price, it will be difficult for the Commission to determine if all companies involved are not already charging excessive prices. Nevertheless: properly motivated licensing policy, particularly if reference can be made to common commercial practice, will reduce the chance that the Commission will declare licensing fees as excessive. It is unlikely the research and development costs of a particular patent will be used to determine an appropriate licensing fee, as:

1. that is usually not the role of an executive or judicial entity in market capitalism, but that of commercial parties.
2. executive and judicial authorities will not have access to the necessary information to determine what the relevant costs are.

- Informational and comparability issues leave companies with a lot of freedom to determine appropriate licensing fees. The lack of clarity on when exactly licensing fees are excessive leaves unclear where that freedom ends.

The lack of clarity on when the freedom to determine licensing fee ends will likely only be a concern if common commercial practice in the relevant industry is exceeded. As long as that is avoided, the lack of clarity will likely not be an issue.

- Recent attempts to reduce strategic value from licensing fees may cause future issues, if the commercial practice of participating companies does include strategic value. It is unclear to what extent that is likely to occur.

It remains unclear if the Commission and the ECJ are likely to employ strategic value in determining the value of a patent. With no indication forthcoming, it is advised to at least not state that the value of a particular patent relies on its strategic position. If some form of patent pool is used, it might be advisable

[8] Case T-167-08 ECLI:EU:T:2012:323 27 June 2012, Microsoft Corp v Commission

to not differentiate the value of individual patents. If the value of patents for a company is determined purely on the number of patents in the patent pool, with the total licensing income of the pool portioned out based on each company's share of patents, a competition authority will be unable to claim any value derived from the patents is strategic.

7. STATIC OR DYNAMIC STANDARDS

Standardisation aims to achieve interoperability and increase general efficiency within particular markets. This requires a standard that all relevant market participants can adhere to. The greater the reach of the standard, the greater the potential interoperability and efficiency gains. A standard may evolve to such an extent that, while there is no legal obligation to use it, there will be a de facto commercial obligation to adhere to it. In static markets with little innovation this has few downsides, as the standard can generally not be greatly improved. The chosen specification does not require change over time in such contexts.

7.1 Innovative Environments

In still evolving environments, such as HVDC grids and grid components currently are, the context changes. A standard's justification for existing from a competition law point of view is the interoperability and efficiency gains it can provide. The requirement of interoperability assumes, to an extent, that certain standards will be "locked in" to allow all relevant market participants to build on those standards. In innovative environments this presumption may be challenged by continual improvement. As technology improves it is possible that the technology integrated into a standard becomes increasingly outdated. The specifications of a standard ideally allow for continual adaptation to new and improved technology.

If a standard locks in its specifications and excludes the possibility of integrating more innovative technology later on, that might be taken as a point of critique by the Commission. Relevant considerations in that context are: if the standard can be formulated in such a way as to allow the relevant specifications to be changed and whether this may be done without disrupting the work other market participants have performed in complying with these specifications. Other relevant concerns are whether the relevant market can support continual improvement of the standard or if there are other good technical reasons for excluding the technology. It seems at least plausible that the Commission prefers an approach where continuous competition regarding relevant technology occurs. Of particular interest is whether the appearance of better technology at a later date may be classified as essential in the sense of section 5. It is not immediately clear if EU competition law considers it possible for new technology – introduced at a time where the standard has already been set – to be essential for a standard. Neither the ECJ's case law nor the Commissions soft law explicitly state this possibility. This lack of clarity does not, however, suggest that new technology can never be considered as essential. Much depends on the technical possibilities within a given standard.

7.2 Consequences of the Choice

The choice between a dynamic or static standard may influence the licensing arrangements that are necessary to support the standard. In a static standard the choice of technology and IP do not undergo (significant) change. The IPR associated with that technology will not change either. But in a dynamic standard, with the (possible) inclusion of future technology, the licensing arrangements made must take

that future technology into consideration. Licensing arrangements that do not consider this will create the possibility where the improved technology is licensed at higher prices than before or does not get licensed at all. Licensing agreements regarding dynamic standards, that only cover the initial integrated technology, will likely not comply with the obligation to provide a FRAND license to all potential users of the standard. Failing to comply with FRAND licensing terms will increase the risk from a competition law perspective. To what extent the competition law risk increases may depend on a number of factors, such as the increase in licensing fees, the potential to reduce interoperability or other restrictions in competition. The issue remains largely unaddressed in EU case law or in the Commissions guidelines. It is consequently difficult to give clear pronouncements. To avoid the issue, it would be prudent to require all participating companies in dynamic standards to provide binding licensing commitments pertaining to current and future IPR. Such a commitment may cause concern for the requirement of open and transparent participation in standardisation, as explained in section 4.3.

7.3 Legislative Gaps

It may be beneficial for standards to be dynamic instead of static. The current regulation and soft law do not provide adequate clarity on several issues:

- The extent to which interoperability and general efficiency, gained by continuously integrating innovative technology into the standard, reduce competition law risk.
- The status of innovative technology as essential to an already developed or nearly completed standard.
- The grounds under which innovative technology, at a later date, may or must be integrated into a standard
- The appropriate licensing regime pertaining to dynamic standards.

The legislative gaps of sections 7-10 are not addressed individually but all in one in section 11.

8. TECHNOLOGY/IPR NEUTRAL SPECIFICATIONS

The specifications of a given standard are not the object of competition law per se. EU competition law does not in principle concern itself with considerations of a technical nature, unless these considerations have some influence or overlap with other areas. One topic that fits this description concerns technology or IPR neutral specifications. Technology or IPR neutral specifications refer to specifications that are designed in such a manner as to encompass a variety of technical solutions. These specifications are therefore not bound by a particular technology and, as a result, not bound by a particular IPR. Competition law generally has no opinion on the design of such specifications, provided that the efficiency gains of interoperability are reached and that the process of selecting these specifications complied with the requirements mentioned in section 4.

The relative neutrality of a standard does influence the potential ease with which new technologies can be integrated into a standard. The previous section explained the concept of dynamic standards. A technology neutral specification may better facilitate the creation of a dynamic standard. Technology neutral specifications do not require constant updating to integrate new technology, as these specifications were not originally bound to a particular technology. It will still be necessary to make proper licensing arrangements pertaining to future technology, as the previous section explained.

The neutrality of the licensing arrangement may also influence the licensing arrangements that participating companies are likely to use. If the specifications of a standard are highly neutral, there is less need for participating companies to cross-license with other participating companies. Companies with IPR will be more able to license their IP individually with standard users. This allows participating companies to avoid complex licensing arrangements like technology pools (see section 9). It may additionally allow companies to make better use of intellectual property that is not classified as a patent (see section 10). Finally, licensing under neutral specification may enable competition in the relevant technology markets. If multiple technologies exist to meet the demands of a given specification, a potential standard user may benefit from having more than one option to choose from, for example because competition between different options drives down prices for the relevant technology. A downside to technology-neutral specifications is that they may reduce the performance and efficiency gains a standard may provide. The potential licensing downsides coincide with the potential downsides of bilateral licensing. See section 9.

8.1. Legislative Gaps

Technology or IP neutral specifications within a standard may influence the ease with which standards can be updated and the licensing arrangements of the standard. Competition law has no rules pertaining to these specifications. If these specifications are used, the following questions are relevant:

- It is unclear to what extent competition law has relevance for IPR neutral specifications in standards, even if it may be technically desirable.
- Technology neutral specifications may allow for the utilization of trade secrets (see section 10). The regulation leaves unclear to what extent that possibility is positive or negative from a competition law perspective.

The legislative gaps of sections 7-10 are not addressed individually but all in one in section 11.

9. BILATERAL LICENSING OR LICENSING POOLS

Standards require large volumes of technology to fulfil its purpose of interoperability. Any company that has offered a binding licensing commitment must offer its associated IPR to would-be standard users on FRAND terms. The terms have been clarified to an extent, but the licensing arrangements have not been. Of note for standardisation and competition law is the manner in which the required licensing is carried out. There are two main variants worthy of discussion: bilateral licensing and pool-based licensing

With bilateral licensing the IPR holder will provide FRAND licenses at the request of third-party standard users. Through bilateral licensing none of the parties holding IPR engage in any coordination pertaining to joint licensing agreements. This may be considered beneficial for competition, as coordination between direct competitors is limited to the standardisation phase. Once the standard is in place, no further coordination is necessary. This lack of coordination, which is an essential element of pool-based licensing, can more easily allow competition between IPR holders and increase competitive pressure. Bilateral licensing can synergize quite well with IPR neutral specifications, provided that multiple patented solutions exist. Bilateral licensing can, however, increase transactions costs for third-party standard users. It may also make upgrading the standard more complex, at least if IP neutral specifications cannot be effectively realized. Without one centralized "hub" for relevant patents, new patents may require new licensing arrangements to be negotiated with third-party standard users.

Pool-based licensing allows multiple standardizing companies to integrate their relevant IPR into a single "pool" of technology. The technology pool has several advantages over bilateral licensing. While initially more complex to arrange, the technology pool offers third-party standard users one single license for all necessary IPR. This can reduce the transaction costs associated with standard-related licensing. A technology pool becomes more relevant the greater the number of participants and associated IP. If the specifications of a standard cannot achieve sufficient IP neutrality, a pool-based licensing model becomes even more useful. Bilateral licensing in a large standard without IP neutral specifications requires a third-party standard user – if all relevant IP is not held by a few companies – to expend considerable effort to acquiring all relevant licenses. It may also be easier to update the standard through usage of a technology pool, as one license can be connected to one continuously updatable pool. The downsides of a pool-based system largely revolve around its difficulty to set up and the renumeration formula employed for each participant. Pool-based licensing also complicates the issue of trade secrets and other valuable know-how related to patented technology.[9] Finally, pool-based licensing may provide competing companies more means to coordinate on what can be competition sensitive information.

9.1. Legislative Gaps

Licensing will be key in facilitating the smooth development and usage of a standard. There are two main forms of licensing available, with each having distinct advantages and disadvantages. A number of gaps in the regulation or issues of clarity exist pertaining to these two forms of licensing:

- It is unclear ex ante which licensing form would be most appropriate for a particular standard.
- There is a general lack of clarity between favourability of bilateral licenses and technology pools.
- There is a general lack of clarity pertaining to issues of overlap between technology pool licensing and its usage in standardisation.
- It is not clear to what extent the possibility of increased coordination influences the legal risk pertaining to technology pools.
- It is unclear to what extent a possible reduction in transaction costs with technology pools influences the legal risk pertaining to technology pools.

The legislative gaps of sections 7-10 are not addressed individually but all in one in section 11.

10. TRADE SECRETS IN TECHNICAL STANDARDS

Patents concerns technical information publicly registered, which grants a legal monopoly on either a particular process or invention. Not all technical information can be patented, however, and not all patentable information is patented. Of particular note is the concept of trade secrets, which are defined as:

1. secret in the sense that it is not, as a body or in the precise configuration and assembly of its components, generally known among or readily accessible to persons within the circles that normally deal with the kind of information in question;

[9] See section 10 on the interplay between bilateral/pool-based licensing and trade secrets.

2. having commercial value because it is secret;
3. subject to reasonable steps under the circumstances, by the person lawfully in control of the information, to keep the information secret;

Such information can be protected from a variety of unlawful methods of acquisition. A trade secret may furthermore be commercially exploited in a variety of ways, often with a variety of safeguards in place. Think of: black box methods, whereby the use of the trade secret may be possible but all knowledge pertaining to the trade secret is kept in the hands its holder, or extensive confidentially agreement, with high sanctions in place for violations. Such information cannot be licensed in a similar manner as with patent law. Moreover, as is argued in section 10.2 below, one could argue that as soon as a trade secret is part of a standard, it is no longer a trade secret because part 2 of the three-step definition is no longer fulfilled.

This leaves a lot of commercially sensitive information that exists outside the scope of an ordinary license. From a licensing perspective this is an issue, as the value of this information relies on its relative secrecy. Depending on the nature and scope of technically important and commercially sensitive information it may become difficult to effectively standardize. If companies either have or develop technology that is only partly patented or patentable, just the usage of the patented information may not be sufficient to fully utilize it. Nor may a company be willing to share that information broadly, due to its protection relying on relative secrecy.

10.1 Interdependence with Choices for Licensing

Depending on the amount of trade secrets and their necessity to make patented solutions work (optimally), the licensing framework needs to shift. Pool-based licensing seems unfeasible, considering the requirement that the information must not generally be known by the relevant industry. Bilateral licensing could better facilitate some sharing or utilization of trade secrets or other relevant know-how. Even if relevant legal arrangements can be made, the trade secret cannot be fully integrated into the standard. The required secrecy prevents it. It can only be an attachment to a license related to patented technology that has been adopted into the standard.

10.2 Legislative Gaps

Trade secrets constitute de facto monopolies regarding information. Trade secrets and their interaction with standardisation reveals several gaps in the regulation:

- To what extent does competition allow licensing arrangements to depend on trade secrets, which are not integrated into a standard
- To what extent do the practical requirements of non-disclosure agreements coincide with the requirement of FRAND licensing terms?
- Trade secrets are not part of a standard. Does competition law allow the standardisation process and the selection of specifications to be influenced by trade secrets?
- The Commission might frown upon licensing fees which depend on strategic value. Does the secret nature of a trade secret constitute strategic value in terms of excessive licensing fees?

The legislative gaps of sections 7-10 are not addressed individually but all in one in section 11.

11. PATENTABILITY OF SOFTWARE & TRADE SECRETS

Algorithms – and more broadly: software and mathematical formula – cannot be patented directly. But an invention solving a particular technical problem can. In accordance with the article 52 of the European Patent Convention (EPC), European patents shall be granted to any inventions, in all fields of technology, provided that they are new, involve an inventive step, and are susceptible to industrial application.

Novelty, in accordance with the art. 54 EPC, requires an invention to not form part of the prior art, otherwise known as the state of the art. Art. 54 (2) EPC considers the prior art to comprise everything made available to the public by means of a written or oral description, by its use, or in any other way, before the date of filing of the European patent application. The examiner of the European patent office establishes the prior art pertaining to the technical field wherein the invention is used. If the invention cannot be found within the currently available prior art, novelty will be present.[i]

Novelty determines whether a particular invention is new. To determine the scope, i.e., power to enforce that patent against others, it is furthermore necessary that the invention is inventive. Inventiveness means nothing more than: is the way the invention reaches a technical solution non-obvious to the relevant expert, i.e., surprising to him. There are a variety of ways to determine, without the benefit of hindsight, when an invention is inventive. One method is the problem-solution approach, whereby the closest prior art is first established (usually elucidated through the prior art investigation the European patent office conducts) and compared to the technical solution the patent claims. Then, the innovation between the prior art and the new invention is compared, to see whether the technical solution of the invention was non-obvious. The greater the inventiveness of the patent, the stronger its juridical value will be. The greater the novelty is, the greater the scope of protection the patent provides.

11.1 Downside of patents

While software and algorithms can be patented to some extent, patenting a particular invention can have downsides. First, the process of filing for a patent, together with potential lawsuits from competitors challenging the validity of the patent, can consume an extensive amount of time and resources. Even after a patent has been granted, its precise scope may still be challenged later on in infringement proceedings. If good prior art research has been conducted prior to filing, substantiated with a good research report from patent offices, the risk of a challenge will be minimal. But if that has not been done or conducting that research was infeasible, a competitor may successfully challenge filed patents. In these circumstances, it can take quite a few years before the patent holder knows with certainty the extent of protection that his patent offers.

Secondly, the patented invention must be described sufficiently clearly in the patent filing and in potential subsequent proceedings to offer sufficient information to third parties on the scope of protection the patent offers. That requires publishing that information in public registers that are available to its competitors. As a result, and depending on the scope of the protection of the invention, competitors can

find alternative solutions to the patented invention that are not covered by the patent.10 The patent holder can prevent that by filing an opposition procedure during the filing such an alternative patent, thus imposing costs on the competitor or depending on the overlap between the novelty and inventiveness of the patent, deny a competitor its patent.11 Filing a great many patents in terms that are as neutral as possible can thus reduce the likelihood another company can utilize inventions that are covered under these patents or at least impose costs on the competitor if they try. But there is no way to prevent entirely the efforts of a competitor to gain a patent that achieves something similar, provided the new invention is novel and inventive enough on its own.

Finally, the ability to be novel or inventive in innovative markets is usually limited. Inventiveness implies the invention has managed to expand on the prior art. In innovative, competitive markets the room for a particular invention to expand on the prior art will usually be limited. The closer competitors are to one another in terms of innovation, the closer inventions from these competitors are likely to be to one another. The time it takes to patent an invention in innovative environments and the speed with which new inventions are created can reduce the usefulness of a patent.12

A possible solution to the issues with patents is not patenting an invention at all and instead relying on trade secrets. For MT MV HVDC components – with the applicable software being appropriately black-boxed – trade secrets can be a viable alternative to patent protection.13 The input or the output of the black box can be measured, but the technical invention within the black box cannot. For dynamic markets the usage of trade secrets, so long as it remains feasible to black-box these secrets, constitutes a valid alternative to patents.

Within the context of standardization, however, trade secrets have some distinct drawbacks. Standardization, as elaborated on previously, requires voluntary technical or quality specifications with which current or future products, processes or services comply. Standardization requires extensive deliberation by relevant experts to set the specifications in such a manner that interoperability can be reached. The specifications within a standard and the relevant IP must be provided or licensed under

[10] Ideally, if company A wishes to compete with company B, company A will file a patent with a large scope company B has difficulty avoiding. A broad scope implies the patent filing only limits its invention to certain technical features if it must, thus keeping the scope of the patent as broad and neutral as possible. Concurrently or alternatively, company A could file many patent applications covering a variety of solutions in order to protect strategic technology. A single invention could result in many patents which describe a variety of different technical features. Even if not all possible solutions can be covered, such patents can still impose costs onto company B to such an extent that it becomes more difficult for them to acquire a similar invention.

[11] Art. 94 EPC. The discussion becomes more complication when the doctrine of equivalence is factored into the discussion. Through equivalence the patent gains indirect protection, which depends to a large extent on the inventiveness and novelty of the infringed patent. The scope and juridical value of a patent can be increased

[12] It is important to mention here that the granting of the patent does not immediately allow a company to commercialize that patent. It can take additional years before a company can industrialize, utilize and then appropriately market its invention. Until then, a company canot begin to recoup its investment.

[13] Black-boxing refers to keeping relevant information technology – through a variety of technical means – contained. Such technical approaches prevent third parties from acquiring information, even if they were to attempt it.

FRAND terms, the exclusion of which constitutes a violation of competition law.14 Under the current regulation there is no impediment to firms providing the full extent of their knowledge to all third parties wishing to access a standard, but doing so would likely cause trade secrets to lose their de facto protection.15 Simultaneously, the requirement for FRAND licensing under ordinary licenses cannot allow companies to protect trade secrets in such a manner that effective competition, both within the standard and with possible competing standards, is restricted. If it were otherwise, a single vendor could monopolize a solution that is necessary to allow other third parties to gain access to the standard.16 As a result, there is currently no clearly laid out path in the regulatory framework that aligns: standardizing, providing trade secrets to third parties in a FRAND, multilateral setting (if that is required to use the standard) *and* retaining the de facto monopoly trade secrets provide. To determine if the legal risks associated with trade secrets in a standardized context prevent their usage, this white paper will explore the perceived tensions from an IP law and a competition law perspective. The focus will be on FRAND access, interoperability and the enforcement of trade secrets.

11.2 FRAND access & Trade secrets

A hypothetical scenario: If a standard-setting organisation for MT MV HVDC systems were to agree to specifications that only include specifications covered by trade secrets, what options would remain to ensure FRAND access?[17] The available options regarding the need for FRAND access depend on technical aspects within a standard. If the specifications of a standard are sufficiently open to multiple technical solutions – and multiple firms participating in the standardization signal that they are capable of achieving these specifications – the need for FRAND access of trade secrets to direct competitors will be removed. The open specification would allow companies to compete within the standard and against other standards, which is positive from a competition law perspective. But that rests on the specifications being sufficiently open to multiple solutions and that multiple firms can adequately provide those solutions. If only one firm has the appropriate solution for a specification in the form of a trade secret, FRAND access remains necessary for that particular solution. If such a situation occurs multiple times – as in: multiple firms have the only solution for a given specification within a standard – then all relevant firms must provide FRAND access for these specific solutions.18 To do otherwise would constitute a likely violation of EU competition law.19 The safest way of employing trade secrets within a standard that still complies with EU competition law rests on the specifications being sufficiently open, in order to allow firms to each

[14] It Is only a violation of the firm holding the patent made a binding licensing commitment during the course of standardization. Third-party IP can be withheld, even if that were to ruin the standard. See paragraph 6.

[15] The requirement for open access to a standard seems incompatible with the requirements of relative secrecy necessary for the definition of trade secrets.

[16] With patents there is a mature legal system in place for multi-lateral licensing that is recognized by the Commission as in principle compatible with competition law. See paragraph 9. For trade secrets, no such recognition exists. The extent to which EU competition law allows IP holders to use trade secrets to monopolize or monetize their solutions in a standard-based setting is therefore uncertain.

[17] it is not likely that such a standard is likely to exist, but using it as an example can be useful for clarification's sake.

[18] The larger the number of specifications that can only be fulfilled by one single firm, the greater the difficulty in arranging appropriate contracts and NDAs for all relevant parties.

[19] See gap analysis paragraph six on FRAND access

create relevant solutions for the specifications. If that cannot be done, FRAND access by the participating standardizing firm will be necessary to ensure an open standard.[20]

It is unclear to what extent EU competition law allows trade secrets to be monetized when granting FRAND access. The nature of a trade secret allows bilateral licensing, which implies that monetization is a right of the trade secret holder.[21] In a standardized context, however, EU competition law leaves uncertain whether that is possible. Case-law from the European Court of Justice seems to imply that all forms of information considered as strategically valuable must be viewed with suspicion.[22] The definition of a trade secret and the definition of strategic value somewhat overlap. A future interpretation of FRAND access regarding trade secrets might therefore require a vendor to provide valuable information to third parties, potentially without (significant) compensation.

The requirement of FRAND access for trade secrets within a standardized context brings with it significant organisational difficulties. Firms will have to be aware of the trade secrets necessary to use the standard, insofar as they possess solutions to specifications others lack, and sign appropriate non-disclosure agreements (NDAs) with each firm that holds a relevant trade secret.[23] A risk of sharing (sufficiently large amounts of) information contained within a particular trade secret with direct competitors lies in the loss of commercial value of that information. Even with appropriate NDAs in place, sharing secret information with a direct competitor for use in standardized products still discloses that information. If the specifications within a standard do not require sharing information or only limited amounts of it – thus keeping the most important information within a black box – there is no issue. The secrecy is maintained and thus the value is maintained. But if enough information is shared to the point where a competitor can determine the contents of the black box, the commercial value of the trade secret may be lost.[24] Much will depend on future interpretation of commercial value within trade secrets by the ECJ.[25] Specifications

[20] Unlike with patents, there is not a clear reference to FRAND requirements under the EC guidelines to horizontal cooperation with trade secrets. But given the similarity of a firm participating in standardization not allowing other firms to use their solution in a patent context, it seems reasonable that the same requirements for FRAND access are applied to trade secrets.

[21] Both Directive 2016/943 and the art. 39 Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIP) consider licensing or sharing as an option, which in a commercial setting will usually require some form of compensation

[22] See paragraph six.

[23] If the firm sharing information wishes to be renumerated for its knowledge, the problem of valuing this information within a standardized context comes into play. In paragraph 6.2 the gap analysis mentions a recent ECJ case forbidding the renumeration within a standard for information that is strategically valuable. It is possible that applies to trade secrets, though it cannot be said with any degree of certainty.

[24] Recall that the definition of a trade secret requires that the information within the trade secret has commercial value through its secrecy (art. 2 (1b) Directive 2016/943). If the commercial value of a trade secret relies on it being kept secret from direct competitors, such value might be lost if, through standardization, direct competitors learn the trade secret.

[25] The lack of case-law makes it difficult to confirm anything. But depending on the interpretation the ECJ follows, commercial value within the directive could be interpreted negatively or positively for the trade secret holder. If (enough) direct competitors learn a trade secret, that could be interpreted as losing the trade secret.

with multiple approaches to technical problems may not be able to prevent the loss of commercial value. If MT MV HVDC systems cannot be interoperable without sufficiently large amounts of shared information between different components, FRAND access must be granted to ensure compliance with competition law. If technical reasons compel information to be shared to maintain interoperability – with trade secrets becoming known to direct competitors as a result – it may not be possible to align FRAND requirements with trade secret protection.

If the information contained within trade secrets must be shared with not directly competing actors, the legal situation changes. The status and legal protection granted to trade secrets is not lost if sharing the trade secret does little to affect its commercial value. Within innovative markets the value of trade secrets lies in direct competitors not knowing the trade secret.26 Thus: If direct competitors gain knowledge of the trade secret – even if it occurs under an NDA – the value of the trade secret may be lost. In the context of access to the trade secret for third parties, however, the value is not lost. For MT MV HVDC systems, for instance, vendors or research institutes hold trade secrets to compete with one another, not with TSO's. Sharing trade secrets with TSO's therefore does not reduce the commercial value pertaining to a firm's ability to compete.27

A complicating factor for using trade secrets to fulfil specifications within standards concerns the lack of any established way to share trade secrets in a manner similar to technology pools.28 Technology pools allow for licensing to any number of standard users through one patent pool. While potentially difficult to set up, technology pools provide easy access to the relevant IP to all potential standard users. Currently, there is no established regulation or soft law providing for pools of trade secrets, nor any law on the impact of such multilateral agreement on competition law. Existing commercial practice would require a significant shift to accommodate such sharing agreements. Should the specifications or the requirement for interoperability not allow for sufficient technical secrecy, the FRAND requirement of EU competition law would remain. The lack of a clearly defined multilateral legal arrangement for sharing trade secrets

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A different reading, one reliant on recital 14 of directive 2016/943, puts the emphasis on the unlawfulness of the trade secret use. The recital might be interpreted to mean: lawful use of the trade secret cannot damage the commercial value as defined under art. 2 (1b). With such an interpretation, knowledge of the secret may be allowed by direct competitors without fear of losing the trade secret. The recital may also be interpreted, however, to aid understanding of when unlawful disclosure of the trade secret is protected.

[26] In Recital 14 of Directive 2016/943 the directive refers to commercial value: "Such know-how or information should be considered to have a commercial value, for example, where its unlawful acquisition, use or disclosure is likely to harm the interests of the person lawfully controlling it, in that it undermines that person's *scientific and technical potential, business or financial interests, strategic positions* or *ability to compete*".

[27] Ibid. If commercial value must be read as a vendor's ability to compete on financial, technical or strategic grounds, competition would occur *for* third parties, not with them

[28] Such an agreement may be concluded by multiple firms in theory. The effort to do so would likely be difficult and time-consuming, due to the need to locate all relevant information, agree on the terms for sharing and then effectively enforce the agreement with several competitors. All the while the risk regarding the loss of the trade secret due to over-sharing would remain in place. The trade secret directive allows firms to share information without losing the trade secret (art. 4 (3) Directive 2016/943). But due to the directive containing a fair amount of references to highly contextual norms and the lack of EU case-law, it is difficult to say when the sharing of a trade secrets causes it to lose its status.

will require substantial effort from the participating firms to solve, if it can be done at all. Without such a regime, all prospective users of a standard require bilateral contracts and NDAs from each party in possession of relevant trade secrets.

- EU competition law's relation to licensing patents is well-defined, allowing companies to provide licenses in multi-lateral contexts without concern for losing their IP. EU competition law's relation to the licensing of trade secrets is not well-defined. Both the question of monetization and FRAND access within standards are unclear, resulting in a large legal grey area. If information must be shared in a FRAND manner – and a vendor has the ability to – a vendor should therefore consider changing an essential trade secret into a patent to allow for more secure licensing
- Trade secrets must only be shared if the specifications within a standard choose a specific solution that only one vendor has, which is then contained in a trade secrets. To avoid the legal uncertainty associated with FRAND access, a standard-setting organisation should choose specifications that are sufficiently open to multiple approaches. Input from vendors could allow a standard-setting organisation to know which specifications to avoid.
- If sharing trade secrets cannot be avoided, it is necessary to compel each party that requires access to a trade secret to sign appropriate non-disclosure agreements. Clauses forbidding reverse-engineering, experimenting or any other usage than what is strictly required for the usage of the standard, are highly encouraged.
- Licensing can occur in a pool-based model or through bilateral licensing. Bilateral licensing has some basis in EU intellectual property law, though none in EU competition law concerning standards. Sharing trade secrets in a standardized context through a pool-based model currently has no basis in either EU competition law or intellectual property law. If sharing trade secrets cannot be avoided, the safest option for licensing trade secrets is the more established bilateral licensing option.

11.3 Interoperability and Trade Secrets

The second difficulty regarding the use of trade secrets within a standard concerns interoperability. Interoperability mostly raises technical problems, but some issues on interoperability and sharing information might be solvable with legal methods. Without interoperability, standards would serve no purpose. Within the context of MT MV HVDC systems, all the technical components and software that was once provided by a single vendor will have to work in a system where all components (can) come from different vendors. The system, in more technical terms, must change from a point-to-point system to a multi-terminal multi-vendor system. To allow all the relevant components and software to operate within one single system, a standard must create specifications that take the interoperability within a MT MV HVDC system into account. If different components must "communicate" with other components or software, the specifications must be appropriately adjusted for that task. That is not a legal but a technical problem. The legal problem here lies in the type of information that is being shared. If the information being shared is a patent, the legal regime is well suited to facilitate interoperability.29 For trade secrets, as previously mentioned, the legal framework is less ideal. A technical solution previously used to safeguard trade secrets in a non-standardized context relied on the concept of a black box. Any systems

[29] paragraph nine

that interact with the black box cannot see what processes are at work within the black box.30 In a MT MV HVDC context, it is an ongoing process to determine to what extent it is possible to keep the relevant information in a black box, whilst still facilitating interoperability.

If assumed that all the relevant components and software can remain appropriately black-boxed, then the objective of interoperability can be aligned with the objective of protecting trade secrets. If, however, interoperability cannot be achieved with the level of secrecy vendors require to secure their trade secrets, legal measures are required. Through usage of NDAs with each party that will glean relevant information due to the requirement of interoperability, the use or disclosure of that secret can be made unlawful.31 A vendor sharing trade secrets with other third parties with appropriately constructed NDA's, may not lose that trade secrets due to the required interoperability.32 Having said that, the lack of case-law does mean there can be no certainty on this issue. NDA's do not automatically prevent a competitor or third-party from learning from the trade secret of the competitor.33 The lack of clear law at EU level necessitates considering the application of trade secret law – including unfair competition law in general – in each Member State to determine the precise protection a trade secret can offer and the usability of these secrets in commercial transactions.

- At time of writing, it is unknown to what extent future specifications will allow software processes – contained within trade secrets – to remain appropriately black-boxed within a standard. If black-boxing does not offer suitable protection within a future standard – and sharing information through the standard is required to ensure interoperability – vendors should consider to what extent the relevant trade secrets can be turned into patents.
- If appropriate black-boxing is infeasible in a future standard, NDAs with all relevant parties that can learn trade secret information are essential. Clauses forbidding reverse-engineering, experimenting or any other usage than what is strictly required for the usage of the standard, are highly encouraged.

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[30] It may also be possible to design the relevant software through a collaborative effort, with an agreement in place allowing participating firms to all use the developed software.

[31] Art. 3 (1b), 4 (2-4) Directive 2016/943

[32] Per art. 2 (1c) & 3 (1b) Directive 2016/943 trade secrets that have entered the public domain or have not been subject to reasonable steps to keep them secret can be used by anyone. The precise scope of when something enters the public domain or when a firm has not expended enough effort in keeping the secret is difficult to determine in general. The text does not provide clear answers and there is a lack of case-law at the EU level that specifies it. The recital in the directive provides some interpretative aid. In recital 1-4 & 8 the need to realize innovation and usage of trade secrets is mentioned. If (certain aspects of) trade secrets are shared with other parties under strict NDA's, it seems plausible that future European Court of Justice case-law will take the need to innovate into consideration when interpreting: when something has entered the public domain and the reasonable effort required to keep something secret.

[33] Though the lack of case-law makes it difficult to determine, the protection of a trade secret may depend on what was done with the information. If the trade secret is copied, there is no room for doubt regarding the protection a trade secret holder is due. But if a competitor merely learns from a trade secret to produce new technology, it will depend on the terms of the NDA and the differences between the technology whether protection is due. Reverse engineering clauses are essential here, though it will remain difficult to determine when a competitor has used reverse engineering on a trade secret to improve its own technology.

- The lack of available case-law at the EU level leaves much uncertainty about the definition of trade secrets and the use of trade secrets in a standard. National unfair competition law may be able to fill in the gaps that EU law has. Vendors should, if feasible, inquire on the state of national unfair competition and the definition of trade secrets at the national level.

11.4 Trade Secrets and Enforcement

A favourable interpretation of trade secret protection does not necessarily result in adequate enforcement of that protection. The trade secrets directive provides for legal remedies in general terms. The enforcement of trade secrets must be fair and equitable, occur within reasonable timeframes without unnecessary complexity, and be effective and dissuasive.[34] A large body of literature describes what effective enforcement of EU law at the national level ought to look like.[35] But EU law has not harmonized national procedural law. With enforcement being a part of procedural law, the trade secrets directive limits itself to proscribing certain goals, without dictating how these goals must be met.[36] As a result, the precise enforcement of trade secrets within the EU largely depends on national procedural law, which will be different for each Member State. The ability of trade secret holders to request evidence, the burden of proof for violations and the legal remedies a trade secret holder can request will therefore vary. The legal uncertainty associated with the differences in enforcement may hamper the ability of a trade secret holder to adequately enforce its trade secrets or to investigate possible violations. Any agreements wishing to facilitate trade secret protection should be duly aware of these enforcement differences. The NDA must take into account which jurisdiction of the EU has the most favourable protection of trade secrets. The NDA must additionally ensure the trade secret holder has the right to request or gather evidence necessary to determine whether a violation of the NDA has occurred.

The enforcement of trade secrets in the EU is complicated due to the requirement of having unlawfully gained the trade secret from its holder. With patents the information behind an invention must be described in sufficient detail. The information behind the invention will therefore be public knowledge. A license for the patent does not grant that information, but simply allows its usage. It does not matter if another company used that same process previously, due to the patent granting a legal monopoly to whomever files for the relevant patent first. In enforcement proceedings a patent holder will thus only have to prove the encroaching invention is similar enough to its patent.[37]

Unlike with patents, the information behind a trade secret invention is not public knowledge. The protection of the right relies on relative secrecy, with disclosure only being safe with NDA's and other reasonable effort to maintain secrecy. In enforcement proceedings the trade secret holder will have to prove that another firm acquired relevant information from one of its trade secrets, and that this other

[34] Art. 6 Directive 2016/943.

[35] See for instance: G Bacharis & S. Osmola, "Rethinking the Instrumentality of European Private Law", *ERPL* 2022/3. P. Gliker, "European Tort Law: Five Key Questions for Debate", *ERPL* 2009/3 & H.W. Micklitz, "The Transformation of Enforcement in European Private Law: Preliminary Considerations", *ERPL* 2015/23.

[36] The relation between the trade secrets directive and the general enforcement directive of IP law (Directive 2004/48 on the enforcement of intellectual property rights) is still unclear.

[37] There is a limited right for a firm to continue to use the process described in the patent in some Member States (see art. 55 Rijksoctrooiwet for a Dutch example). The burden of proof, however, is high, and that firm can only use the process for itself. It cannot be licensed to others. The practical relevance of the right is limited.

firm was reasonably aware of the information's status as a trade secret.38 The trade secret holder must prove two things: another firm uses the same information contained within its trade secret; that other firm acquired that information from the trade secret in an unlawful manner. Extensive NDAs with precise details on the allowed use of trade secrets – with sufficient detail for the opposing firm to determine what the scope of trade secrets is – reduce some of the risks.39 Special attention should be given to clauses forbidding reverse engineering.

- The definition of trade secrets is harmonized. The procedural law that determines the enforcement of trade secrets largely is not. Aspects such as a trade secret holder's ability to request evidence, the burden of proof for violations and the legal remedies available to a trade secret holder are all dependent on national procedural law. Vendors should, if feasible, inquire on the procedural law of member states pertaining to trade secret enforcement and choose that national law for enforcing their trade secrets
- Proving a trade secret violation requires proving that another company unlawfully gained that secret from its holder. An NDA can aid in making another company reasonable aware of information's status as a trade secret, which is necessary if infringement is to be proven. Clauses forbidding reverse engineering are highly recommended.

11.5 Trade secrets & Patents in a Standard

All relevant current or future processes that can facilitate MT MV HVDC systems will likely not all fit neatly into the definition of either patents or trade secrets. A firm may be limited in filing for a patent. As explained previously, patents on software that do not provide a solution to specific technical problem cannot be patented. Should such software have a use for MT MV HVDC systems, a firm will only have the protection afforded through trade secret law. A firm may also not want to patent an invention. It may make more commercial sense to forgo a legal monopoly – and the required publication of the invention – and choose de facto protection through secrecy.40 Different commercial considerations may move a firm to file a patent. A particular invention might require active enforcement against its competitors, which trade secrets cannot facilitate if a competitor independently made its own invention. Or a firm may consider that the enforcement of trade secret protection for a particular invention it wishes to license is inadequate, thus necessitating the status of a patent for proper commercial use. Depending on the precise legal limitations or commercial considerations a firm has, the processes necessary to make MT MV HVDC systems function can be split between two forms of IP: patents and trade secrets.

Firms in innovative industries will typically have a combination of patents and trade secrets covering their commercially valuable information.[41] Through a combination of trade secrets and patents it is possible to protect valuable information beyond the period for which a patent is granted. A firm usually achieves this by either not filing a patent for all the inventive technical solutions necessary to solve a particular problem or by only claiming a limited protection scope covered by the patent. This results in a series of patents, which do not contain all the necessary information to solve a particular technical problem. The legal

[38] Art. 3 (1a), 4 (1-4) Directive 2016/943.

[39] A firm will then also have more difficulty claiming ignorance.

[40] There is some literature on what might motivates firms in a commercial context to choose either patents or trade secrets. See for an overview K. Sim, "optimal use of patents and trade secrets for complex innovations", *IJIO* 2021/79 & Belleflamme, Paul & Bloch, Francis & Bloch, "Dynamic Protection of Innovations Through Patents and Trade Secrets" Center for Operations Research and Econometrics 2013.

[41] K. Sim, "Optimal use of patents and trade secrets for complex innovations", *IJIO* 2021/79.

monopoly of a firm will prevent usage of the patented solution, which will remain useful until another firm has invented a sufficiently different solution.42 The remaining information contained within a trade secret can then be of use to extend the de facto monopoly a firm has on a particular solution. Should innovation be sufficiently rapid within a market, this combination of trade secrets and patents can potentially indefinitely safeguard the most recent – and therefore most valuable – information a firm has.

A mixture of patents and trade secrets within a standard allows for a more flexible standardization approach. Depending on either a lack of openness regarding a specification to multiple solutions or due to the inability of sharing information whilst retaining appropriate black box secrecy, it may be infeasible to rely on trade secret protection.43 If the trade secret is patentable, a firm can avoid legal uncertainty associated with trade secrets and instead rely on the more developed licensing regime patents have.[44] If, however, interoperability can be secured without sharing (sufficiently large parts of) the trade secret or if blackboxability can be maintained, a firm may instead opt for indefinite trade secret protection. Splitting inventions up into patents and trade secrets may, additionally, grant a firm higher protection than having one form of IP for one particular invention.[45]

The usage of both trade secrets and patents within a standard can require bilateral or multi-lateral agreements. For patents it is possible for a standard-setting organisation to require the use of a technology pool.46 If the specifications do not allow for vendors to create their own solutions to particular problems or if the specifications are not sufficiently IP neutral, the large-scale deployment of the standard may require the use of technology pools.[47] Trade secrets, as shown in the previous sections, may face a variety of legal risks if they are shared in a multilateral context. To avoid potential risk, it may be prudent to only use bilateral contracts when divulging trade secrets necessary for ensuring FRAND access and interoperability. The use of two different information-sharing models – bilateral or multilateral – will require additional coordination from IP holding parties. They must first determine the technology pools for patents and all relevant issues that come with it.[48] IP holders must subsequently consider the bilateral divulging of trade secrets to standard users, if that is necessary for interoperability or FRAND access. The

[42] The length of a patent in the EU is ostensibly 20 years, but in innovative markets the actual protection will be much shorter. The specific patented solution to a problem becomes outdates significantly before the 20-year period expires. That of course implies that other patents cannot block the invention. Continuously filing a large number of patents can cause an opposing firm difficulty in overcoming all of them.

[43] See the previous sections.

[44] This does of course imply that the trade secret is patentable. Only inventions that solve a particular technical problem are patentable.

[45] Note that this option must still comply with the requirement of FRAND access and interoperability mentioned above.

[46] See for greater detail: Communication from the Commission — Guidelines on the application of Article 101 of the Treaty on the Functioning of the European Union to technology transfer agreements, para. 244 et seq.

[47] With IP neutrality this white paper refers to specifications that largely avoid patented inventions. See paragraph nine from the gap analysis.

[48] Think of: profit-sharing, obligation to include new patents, determining the value of patents, determining inclusion of new participants etc. See also: A. Ishihara, N. Yanagawa, “Dark sides of patent pools with independent licensing” IJIO 2018/57.

greater the success of the standard and the greater the number of participants requesting to use the standard, the more cumbersome this arrangement may become.

- The ability of a vendor to convert a trade secret into a patent can be a useful tool to avoid the legal risks associated with relying on trade secret protection. The specifications within a standard and the perceived commercial risk play a role in determining when a vendor should consider that. The previous sections on FRAND access and interoperability show that this decision should be taken on a case-by-case basis, with the vendor being aware of: the scope of the trade secret, the need to enforce it against competitors and the specifications of the standard.
- The lack of an established pool-based licensing option for trade secrets complicates licensing arrangements, particularly if a standard becomes popular. It is possible to license patents in a pool-based system, with trade secrets being licensed on a bilateral basis. A solution covered by both patents and trade secrets may increase the difficulty of licensing under FRAND terms whilst retaining trade secrets. A standard-setting organisation should either: set specifications in such a manner that there is limited overlap between solutions covered by trade secrets or patents, or otherwise inform vendors of the risk of combining solutions between two forms of IP.

12. RISKS AND LIABILITY

The change in roles, duties and responsibilities in HVDC projects with multiple vendors and multiple owners, has a significant impact on liability and warranty in the overall system.

12.1 System Design – Impact on Liabilities

12.1.1 Independent Turn-key HVDC Projects

Today, point-to-point and a few multi-terminal HVDC transmission systems are built or under construction as single-vendor turnkey projects. The system owners (TSOs or others) specify the system as a whole. Interfaces at the AC grid connection or access points are defined in harmonised network codes for the AC grid connection for HVDC systems, providing a clear legal framework.

In such turnkey projects, as shown in Figure 1 (left), the contractor (e.g. a HVDC manufacturer) is responsible for the design and execution within the boundaries that are set by the system owner. The contracts typically include engineering, procurement and construction (EPC) and even installation (EPCI).

Consequently, the contractor is liable for defects in design as well as for installation and commissioning. If during this, or a later phase the system is not providing the guaranteed performance according to the contract, the owner can recover costs related to damages or downtimes from the contractor as dictated by the specific project contract conditions.

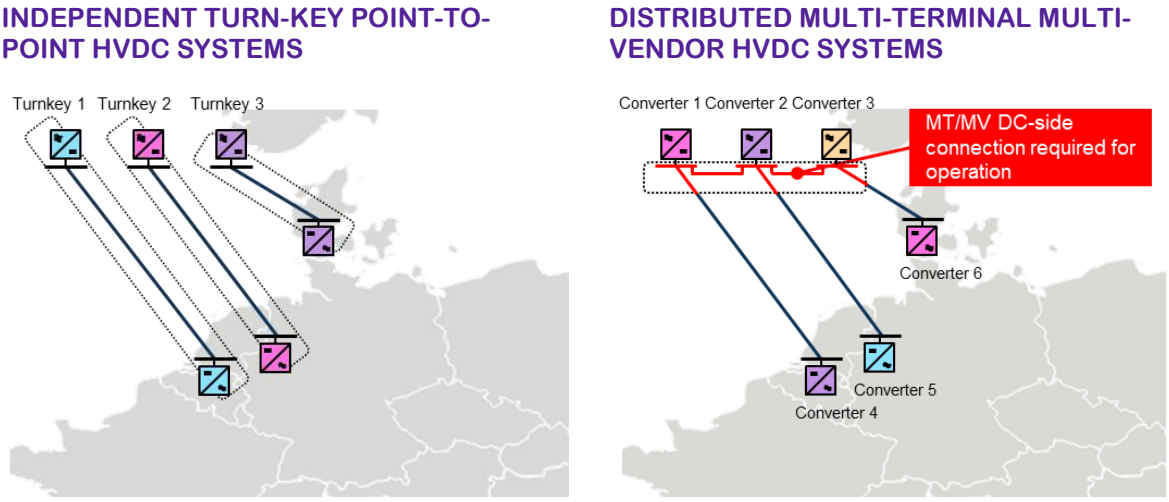

Figure 1 From independent turn-key point-to-point (left) to distributed (right) multi-terminal multi-vendor HVDC systems

12.1.2 Distributed Multi-Terminal HVDC Systems

Moving from single-vendor turnkey HVDC systems to multi-terminal multi-vendor systems will shift part of the design and execution responsibly from the manufacturer to the owner and operator of the DC grid. Owners and operators will need to specify each module (e.g. converter stations) individually, as indicated in Figure 1 (right), while being liable for the performance and the security of the overall system. In case of design errors – in particular related to the interoperability of different modules – the entire system might not be able to operate.

To derive liabilities, the roles and responsibilities of all involved parties need to be clearly assigned and mutually respected. Procurement process and contracts that adequately allocate liability and warranty risks within this new context need to be formulated. Therefore, TSOs and manufacturers are needed to derive the risks – especially liability risks – arising from multi-terminal multi-vendor connection for all phases of a project. This includes:

- Design and procurement
- Engineering and commissioning
- Operation and Maintenance
- Refurbishment and decommissioning

12.1.3 DC-side Connection of Turn-key P2P HVDC Systems

As the roles and responsibilities of the different parties and accordingly risks and liabilities in fully distributed multi-vendor systems are not defined yet, owners might be locked in realising single-vendor systems, regardless of the benefits of multi-vendor systems.

Moreover, despite the benefits of multi-terminal HVDC system, their development must not endanger other core tasks related to the energy transition:

- Offshore HVDC systems must reliably transmit wind energy to shore
- Onshore HVDC corridors and interconnectors must transmit bulk power between new (renewable) generation and load centres
- HVDC projects need to be realised in time and the execution times shall not be extended

A feasible way to reduce the risk associated with multi-terminal multi-vendor HVDC systems is to interconnect turnkey systems, as shown in Figure 2. In case problems should occur with the connection of systems from different vendors, the system can be separated and fall back into turnkey subsystems. Thus, the risk of outages of the entire system can be reduced and possible interoperability issues can be solved with diligence required.

Such a setup might result in the allocation of roles and liability risks, which needs to be taken into consideration in the overall legal framework.

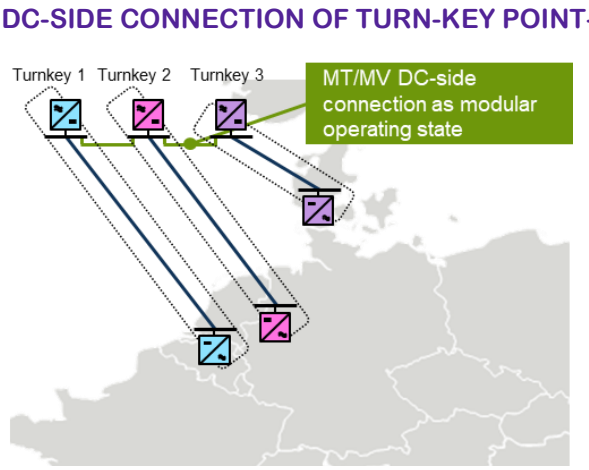

Figure 2 Step in between: DC-side connection of turn-key point-to-point HVDC systems

12.2 Risk allocation and Shift of Liability

In Deliverable 2.1 of Ready4DC several gaps were identified to being addressed in order to pave the path from turnkey to distributed multi-terminal multi-vendor system. Within this document, the following steps are discussed in more detail:

- To define and allocate liabilities and warranties, risk allocation and system responsibilities need to be defined for the different scenarios outlined in the deliverable for all relevant project phases.
- Principles determining liability and warranty assignment in the event of malfunctioning and interoperability issues must be derived.

12.2.1 Project Preparation

12.2.1.1 System Design

In multi-terminal multi-vendor HVDC systems, the responsibility for design may shift from the manufacturer to the owner and operator of the DC grid, increasing the design risk for the latter. In turnkey HVDC systems, the manufacturer has full control over technical aspects, such as the converter control systems, and has design freedom over the HVDC system, while considering standards, regulatory aspects, customer specifications, and patents. However, the shift from turnkey to multi-vendor systems fundamentally changes the design principles of the HVDC system.

The system developer(s), i.e. the TSOs, will be responsible for the high-level design of the system. Thus, the TSOs and other developers will take on the role of the system designer. Until the interfaces at the DC grid connection or access points are defined in harmonized network codes that provide a clear legal framework, and there is sufficient experience with the operation of HVDC converter stations from different vendors within one HVDC system, designers of multi-vendor systems have a new design and interface risk to bear. This includes the definition of functional and specific requirements at the DC point of connection to ensure harmonious operation of the system's components. A major challenge for the owner is limited insight into the control system of individual sub-systems, which adds risks. If the requirements at the interfaces are not correctly designed, but all HVDCs still meet the specified requirements, the system owner will be liable for the malfunction and potential consequential power losses. This must be taken into consideration in the assignment of liabilities in future contracts for multi-vendor projects.

The design of components, such as converter stations, will remain the responsibility of the HVDC vendors. They will have to design individual stations without full knowledge of the system and other sub-systems, such as converter stations or fault separation devices from other vendors, as well as grid controllers. As a result, vendors will have to rely on the functional and specific requirements of the system designer and will be liable for malfunctions against these requirements. Nonetheless, HVDC vendors may have to meet new requirements to ensure stable, secure, and robust operation of the multi-vendor HVDC system. Therefore, vendors may need to agree to comply with requirements that they have never tested before in a commercial context.

An intermediate step in allocating risks and corresponding liabilities is to connect turn-key systems. In this case, the TSO or developer is responsible for the interface between the turn-key systems. In case of design mistakes, the system can be split into turn-key subsystems that function similarly to today's HVDC system.

For offshore HVDC systems used to transmit wind energy to shore, the risk of significant financial losses due to the inability to generate electricity (since it cannot be transmitted) or penalties for not fulfilling transmission obligations can be reduced.

12.2.1.2 Procurement

The change from turn-key to distributed multi-vendor HVDC system will fundamentally change the procurement phase of HVDC projects. In today's HVDC systems, the core part of the system is purchased within one lot. Even systems that are extended in a second phase, e.g. the extension of the Ultranet Project with corridor A north[49] or the Caithness-Moray link[50] extended by the Shetland link[51] [Reference], are procured as a fully working turn-key systems for the first phase.

Warranty Risks (Components and system behaviour): Warranty risks can arise if the warranties provided by different vendors do not align or cover the entire system, leaving some components unprotected. The owner is responsible for the entire system behaviour and to specify sub-systems correctly. Since the mal-function of a single subsystem, i.e. a converter station, might cause that a significant part or even the enter

[49] Ultranet and A-Nord project: https://www.amprion.net/Grid-expansion/Our-Projects/A-North/

[50] Caithness-Moray project: https://www.ssen-transmission.co.uk/projects/project-map/caithness---moray/

[51] Shetland project: Shetland HVDC Link - SSEN Transmission (ssen-transmission.co.uk)

system might not be able to fulfil is core functions, i.e. to transport offshore wind energy to shore, the warranties of the sub-systems might need to be higher than the price of the sub-system itself.

Contracts must also include warranties for the extension of an HVDC system.

Liability Assignment Risks: The allocation of liability risks in multi-terminal multi-vendor HVDC systems may not be clear and may need to be established during the procurement phase. This can create uncertainty, especially when procuring multiple subsystems from different vendors at the same time. Moreover, an unclear assignment of liabilities due to the lack of experience with the project execution and operation of multi-vendor systems may increase the risk of disputes and legal action.

Closing all required contracts: Closing all required contracts to fulfil the core functions (i.e. bringing wind to shore). If the core contracts cannot be closed and the core parts of the grid (i.e. connection from offshore to shore) cannot be realized, it could result in significant financial losses and project delays for the owner (and involved parties). If not all contracts can be closed, alternative solutions would need to be found or the project might need to be cancelled or postponed. Even though this risk already exists in today system, i.e. when converter stations and cables are procured via separate EPC contracts, the risk increases this an increasing number of lots and interfaces.

Inadequate specifications: If the functional specifications provided by the owner are not clear or sufficient, it could lead to misunderstandings between the owner and the contractor(s), leading to a mismatch between the actual requirements and the offer submitted.

12.2.2 Project Execution

12.2.2.1 Engineering and Construction

During the engineering phase of a multi-vendor HVDC system, there are specific risks that need to be addressed, including:

- The system owner bears the risk of new testing and interface challenges, such as interoperability tests between different vendors. The experience and knowledge about these tests, specific procedures, and mitigation methods are limited, and problems with the tests may delay the overall project. Thus, the system owner might be liable for such delays.
- Delays in completing a subsystem, such as the control of a converter station, could impact the overall integration and interoperability test, causing delays and additional efforts that affect the schedules of other subsystems from different manufacturers. In such cases, it must be clarified who is liable for the costs resulting from such delays or additional efforts. To reduce such risks, it is important to develop test methods that allow subsystems to be developed and tested independently of each other. Whether common interoperability tests, which have effort and time implications for all parties in a network project, are necessary, needs to be investigated in R&D projects like InterOPERA and early multi-vendor HVDC projects.
- Reliable methods are needed to determine which party is responsible for malfunctions of the overall system. If this cannot be clearly assigned, it can lead to complex and expensive legal disputes.
- In the first multi-vendor projects, the owner's requirements may not be precise enough to ensure interoperability. In such cases, the cause must first be clarified, and then adaptation of subsystems from individual manufacturers may be necessary, leading to additional efforts and delays. It is important to have a clear assignment of responsibilities so that there is no ambiguity as to who is liable

in such a case. Additionally, it should be clarified in advance which party is liable for any resulting damages in specific cases.

As already introduced in the system design section, the risks and financial implications concerning these risks might be reduced by starting with the connection of turn-key projects before moving to a fully distributed multi-vendor system.

12.2.2.2 Commissioning

Interdependency of different projects: While in turn-key HVDC system on contractor is responsible that the requirements for commissioning are fulfilled for the entire system, in distributed multi-vendor systems, the owner or developer of the system bares these responsibilities.

Due to the split of the grid in separate lots, there may be interdependencies during the commissioning phase of the individual projects. For example, the commissioning of an offshore converter station may depend on the commissioning of the onshore station. Since delays in commissioning can lead to considerable costs, it must be clearly regulated in such cases which party is responsible for the costs incurred.

In case of a distrusted MT/MV system, individual HVDC stations (and contractors) may impact if another HVDC can be commissioned and taken into operation on time. In such case, the owner of the grid will be liable towards the sub-systems that are delayed in commissioning, while the delayed project is liable towards the owner. Thus, the corresponding warranties and penalties must be aligned to ensure that the party causing the delay is liable for the resulting costs.

To reduce the risks associated with interdependencies, starting with a moderate increase of interface in multi-vendor projects, i.e. the interconnection of turnkey projects, might be a feasible solution.

Integration Risks: Integration risks can arise if different modules from different vendors do not seamlessly integrate into the overall system, leading to potential system failure and increased downtime.

12.2.3 Operation

12.2.3.1 Malfunction / Performance related

Interoperability risk: If separate HVDC stations are not interoperable, it could lead to the failure of the entire HVDC transmission system. This, in turn, could result in power outages, reduced energy transmission and distribution, and other operational problems. This may cause significant financial losses and delays in the project, as well as damage to the reputation of the involved parties. Moreover, identifying and fixing the root cause of the interoperability issue may require redesigning and recommissioning the HVDC stations. If the issue remains unresolved, it could affect the feasibility and overall success of the project, as well as the energy market as a whole.

Moving from single-vendor turnkey HVDC systems to multi-vendor systems shifts the risk of interoperability from the vendor to the owner of the system. With a single vendor, the contractor is responsible for the design and execution of the entire system, and is liable for any design, installation, or commissioning defects. However, with a multi-vendor system, the owner and operator of the DC grid must specify each module individually and are liable for the performance and security of the entire system.

This increases the risk of design errors and interoperability issues, as each vendor's equipment may not be compatible with the equipment provided by other vendors.

To mitigate this risk, the responsibilities and liabilities of all parties involved should be clearly defined and mutually respected. Procurement processes and contracts also need to be formulated to allocate liability and warranty risks. This can ensure that all parties are aware of their responsibilities and can take the necessary steps to prevent interoperability issues from arising.

Performance Risks: Performance risks may arise if the performance of the different modules does not meet the required specifications. This can lead to reduced system efficiency and increased costs. Moreover, hidden features or control methods might not be exchanged between the vendor and the owner or operator of the system. Thus, performance reduction and also damages according from inadequate knowledge transfer to the operator, can a risk in multi-vendor projects for which the vendor might be liable.

12.2.3.2 Faults causing damages

Liability for damages to system components resulting from faults can vary depending on the specific procurement contract and the roles and responsibilities assigned to each party involved. Generally, the party responsible for designing, installing, and commissioning the components may be liable for any resulting damages. This is often the contractor or manufacturer, but in a multi-vendor, multi-terminal HVDC system, liability could be shared among multiple parties and might shift from the manufacturer to the owner.

An essential part to reduce this risk of damage or faults resulting from incompatible components or control systems is thorough Interoperability testing during the execution phases to ensure that all components and systems are compatible with each other. Nonetheless, interoperability testing based on real-time simulation cannot mitigate all interoperability risks.

To minimise the risk of disputes over liability, it is important to have a clear allocation of roles and responsibilities in the procurement contract, as well as clear procedures for investigating and allocating liability in the event of a fault or damage to the system components. Moreover, it must be clearly defined how is responsible for the investigation, i.e. the owner or operator of the system or a third-party investigator. The investigation should include a review of the system design, installation, and commissioning processes, as well as any relevant maintenance or operation procedures. The investigation should also include a detailed analysis of the data collected from the system.

> Therefore, adequate sensors, control systems, and other monitoring equipment must be foreseen. Once the root cause of the fault has been identified, the liability can be allocated based on the roles and responsibilities outlined in the procurement contract. If the fault was caused by a failure in the design or installation of the sub-system, i.e. the converter station, the contractor or manufacturer may be liable for any resulting damages. If the fault was caused by improper design, operation or maintenance, the owner or operator of the system may be liable.

12.2.4 Maintenance

The shift from turnkey to multi-vendor systems can also have an impact on liabilities during the maintenance of HVDC systems. In turnkey systems, the contractor is often also responsible for the maintenance of the entire system – often for the first years of operation – including any components

supplied by third-party vendors. Therefore, in case of any fault or damage during maintenance, the turnkey contractor would be liable.

In a multi-vendor system, the responsibility for maintenance might be divided between different vendors, with each vendor being responsible for maintaining their own components. This can make it more challenging to identify the root cause of a fault and allocate liability.

To mitigate this risk, it is important to have clear maintenance contracts in place with each vendor clearly defining their roles and responsibilities. The contracts should also include provisions for determining the root cause of any faults and allocating liability accordingly.

12.2.5 End of Lifetime

12.2.5.1 Refurbishment

No additional risks that cause a shift of liabilities are identified.

12.2.5.2 Decommissioning

No additional risks that cause a shift of liabilities are identified.

12.2.6 Summary

The shift from turnkey HVDC systems to distributed multi-terminal multi-vendor HVDC systems can impact risks and associated liabilities in several ways.

- In turnkey systems, a single vendor assumes responsibility for the entire project, including design, installation, and commissioning.
- Therefore, the liability for faults or damages or malfunction resulting from the system falls on the turnkey vendor.
- In contrast, in multi-vendor systems, responsibility is divided among several vendors, potentially increasing the risk of interoperability issues and making it difficult to allocate liability in the event of faults or damages.

The connection of turn-key point-to-point systems from different vendors for early multi-terminal multi-vendor HVDC systems can limit risks by allowing for easier management and operation of the system. If interoperability issues occur, the system can be separated and operated as individual turnkey systems. Thus, such systems can be an adequate intermedia step to multi-vendor interoperability with less drastic change of risk allocation and liabilities.

To minimize risks and associated liabilities in multi-vendor HVDC systems, it is important to clearly define roles and responsibilities in procurement contracts and establish clear guidelines for system integration and testing. Additionally, thorough testing of interoperability can help identify and address potential faults or damages before they become major issues.

Finally, having a clear plan for allocating liability in the event of a fault or damage can is essential to minimize disputes and ensure that the responsible party is held accountable.

13. EU NETWORK CODES

Although their content is highly technical, network codes are in essence legal documents, which is why they are also included in this Deliverable. The current EU Network Codes aim for a smooth operation of the European electricity network. The network codes were drafted with the existing AC network in mind. The network code dedicated to HVDC systems, Commission Regulation (EU) 2016/1447 establishing a network code on requirements for grid connection of high voltage direct current systems and direct current-connected power park modules, is aimed at point-to-point systems and specific applications, but not at a multi-vendor, multi-terminal HVDC network. This is a gap in the existing legal framework. Therefore, at some point, after the functional requirements have been specified and tested, and roles and responsibilities have been clearly assigned, the network codes need to be adapted to the needs of such a multi-vendor, multi-terminal HVDC network. In this process, it needs to be foreseen that the first large-scale HVDC demonstrator project(s) will probably lead to several insights and fine-tuning, so the learnings from this phase need to be taken into account at some point as well.

It goes beyond the scope of this Work Package to identify all issues and gaps in the existing Network Codes regarding the implementation of a multi-terminal HVDC network, but it is important that the Network Codes are ready for multi-terminal HVDC systems when the technology is ready to be implemented. This requires the relevant actors to start in time with the drafting process.

14. CONCLUSION

This deliverable analysed legal and regulatory issues that play a role in the development of a multi-vendor, multi-terminal HVDC grid: the cooperation required between different actors, standardisation, patents and licenses; the division of risks and liability between different companies. The gaps are presented alongside possible directions for addressing the barriers. The most important conclusions are:

First, the governance of a MV MT HVDC grid is best served by a clear legal and regulatory framework. The current framework is based on AC networks and, when HVDC technology is used, on point-to-point connections. The future legal framework for HVDC should be based on two legs: first, in public law (European Directives, Regulations and Network Codes), the principles and division of roles and responsibilities between different actors should be made clear. Moreover, specific standards that are agreed upon should be reflected in the European Network Codes. Secondly, next to public law, there is also need for certainty in the form of agreements under private law. This can be done in the form of an umbrella agreement between all involved parties on the aim and general rules of the cooperation towards the development of a HVDC grid, and a standardized bilateral agreement that developers and vendors can use as addition to the procurement contract each time the HVDC grid is extended. The contents of such agreements are discussed further in another Horizon Europe project: InterOPERA.

One of the topics to be adopted in the legal framework is the division of roles and responsibilities. It is sometimes said that the ownership and other roles regarding a HVDC grid should be decided before the development starts. However, the conclusion of WG2 is that the ownership of the grid can very well vary between different parts, as long as these parts are interoperable. Moreover, it is important that the grid planning and operation are coherent. However, these aspects can be decoupled from ownership. Furthermore, over the lifetime of the grid (multiple decades), the ideas on ownership, development, roles and responsibilities will probably change several times. We should therefore not aim to clarify everything prior to starting development, but we must instead ensure that the MT MV HVDC grid works regardless of the exact ownership division. Nonetheless, it is important to know how the roles and responsibilities are divided in the next phase. This deliverable includes a list of roles per (type of) entity.

Another important topic in the legal framework for HVDC grids is how to reach standardization in a situation with multiple vendors who have different IP and trade secrets. This deliverable highlights different options, such as for example bilateral or multilateral information sharing and the (dis)advantages of the usage of technology pools. Depending on the precise options that are chosen in standardization, the risk of respectively violating competition law or ill-suited use of intellectual property rights will increase or decrease. This is of particular concern for trade secrets usage, which due to the lack of a clearly defined legal framework carries with it distinct risks. No matter which option is chosen, it is always important that there is access on 'FRAND' terms (fair, reasonable and non-discriminatory) and that competition law is respected. In this regard, a standard-setting organization can help to create the standard, but here again it is important that the specifications are based on open and reasonable criteria. An important question in this regard is to what extent interoperability can be reached without sharing IP (or how the amount of IP to be shared can be limited as far as possible). This presupposes that IP needs to be shared in the first place. Depending on the ability of all relevant stakeholders to reach a shared philosophy for MTMV grid operations and the precise specifications required for interoperability, it may not be necessary to share (large amounts of) IP. This depends on the clearness of the interface regarding the roles and responsibilities of all relevant parties. An important question in MTMV HVDC

standardization is therefore: to what extent is it feasible to expect stakeholders to reach a shared design philosophy and to what extent can the specifications accommodate that?

Finally, the division (and shift) of liability is an important theme in this Deliverable. The shift from turnkey HVDC systems to MV MT HVDC systems can impact risks and associated liabilities in several ways. In turnkey systems, a single vendor assumes responsibility for the entire project, including design, installation, and commissioning. In these systems, the liability for faults or damages or malfunction resulting from the system falls on the turnkey vendor. In contrast, in multi-vendor systems, responsibility is divided among several vendors and the party that determines how they interoperate, potentially increasing the risk of interoperability issues and making it difficult to allocate liability in the event of faults or damages.

In an early development phase of MV MT HVDC systems, risks can potentially be limited by connecting several turn-key systems to each other. If interoperability issues occur, the system can be separated and operated as individual turnkey systems. Thus, such systems can be an adequate intermediate step to multi-vendor interoperability with less drastic change of risk allocation and liabilities. To minimize risks and associated liabilities in multi-vendor HVDC systems, it is important to clearly define roles and responsibilities in procurement contracts (as mentioned above) and establish clear guidelines for system integration and testing. Additionally, thorough testing of interoperability can help identify and address potential faults or damages before they become major issues. Finally, having a clear plan for allocating liability in the event of a fault or damage can is essential to minimize disputes and ensure that the responsible party is held accountable.

ABBREVIATIONS AND ACRONYMS

AC	Alternating Current
EC	European Commission
ENTSO-E	European Network of Transmission System Operators for Electricity
EPC	engineering, procurement and construction
EPCI	engineering, procurement, construction and installation
ECJ	European Court of Justice
FRAND	Fair, Reasonable and Non-Discriminatory
HVDC	High Voltage Direct Current
IP	Intellectual Property
IPR	Intellectual Property Rights
MVMT	Multi-Vendor Multi-Terminal
RCC	Regional Coordination Centre
R&D	Research and Development
TFEU	Treaty on the Function of the European Union
TSO	Transmission System Operator
TYNDP	Ten Year Network Development Plan

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[i] Per art. 92 of the EPC the European patent office (EPO) shall establish a European Search Report, where the EPO will determine the novelty of the invention in question.