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PUBLIC VERSION

In the published version of this decision, some information has been omitted pursuant to Article 17(2) of Council Regulation (EC) No 139/2004 concerning non-disclosure of business secrets and other confidential information. The omissions are shown thus […]. Where possible the information omitted has been replaced by ranges of figures or a general description.

'To the notifying party

Subject: **Case M.9447 – Hitachi/ABB (Power Grid Division)**
Commission decision pursuant to Article 6(1)(b) of Council Regulation No 139/2004[1] and Article 57 of the Agreement on the European Economic Area[2]

Dear Sir or Madam,

(1) On 20 April 2020, the European Commission received notification of a proposed concentration pursuant to Article 4 of the Merger Regulation by which Hitachi Ltd ("Hitachi", Japan) acquires within the meaning of Article 3(1)(b) of the Merger Regulation sole control of ABB Management Holding AG ("ABB (Power Grid Division)" or "Target", Switzerland), controlled by ABB Ltd ("ABB")[3]. Hitachi is referred to as the "Notifying Party" and Hitachi and ABB (Power Grid Division) collectively are designated hereinafter as the "Parties".

1 OJ L 24, 29.1.2004, p. 1 (the "Merger Regulation"). With effect from 1 December 2009, the Treaty on the Functioning of the European Union ("TFEU") has introduced certain changes, such as the replacement of "Community" by "Union" and "common market" by "internal market". The terminology of the TFEU will be used throughout this decision.

2 OJ L 1, 3.1.1994, p. 3 (the "EEA Agreement").

3 Publication in the Official Journal of the European Union No C 136, 27.4.2020, p. 7-8.

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1. THE PARTIES

(2) Hitachi is a global company, headquartered in Japan and active in a variety of business segments including IT Solution, Energy Solution, Industry Solution, Mobility Solution and SmartLife Solution.

(3) ABB (Power Grid Division)'s activities involve the development, engineering, manufacturing and sale of products, systems and projects relating to: (a) high voltage ("HV") products; (b) transformers; (c) power grid automation ("GA"); and (d) power grid integration ("GI").

2. THE CONCENTRATION

(4) The concentration relates to the proposed acquisition from ABB, of 80.1% of the issued share capital of ABB Management Holding AG of Switzerland, by Hitachi. It will result in the acquisition of sole control by Hitachi of the Target within the meaning of Article 3(1)(b) of the EU Merger Regulation (EUMR), following which ABB will retain 19.9% of the Target ("the Proposed Transaction").

(5) Prior to the Proposed Transaction, ABB will contribute its entire power grids business to the newly created Swiss legal entity ABB Management Holding AG, which will be the holding company for the Target Group. As such, following the SPA signed by Hitachi and ABB on 17 December 2018, Hitachi will acquire 80.1% of the issued share capital of the Target.

(6) ABB will hold a non-controlling minority shareholding in the Target post-transaction (19.9%). ABB will not acquire, or retain, any additional rights, which confer upon it the power to veto decisions which are essential for the strategic commercial venture of the Target.

(7) Accordingly, the Proposed Transaction involves the acquisition of sole control of the Target by Hitachi within the meaning of Article 3(1) (b) of the EUMR.

3. EU DIMENSION

(8) The undertakings concerned have a combined aggregate world-wide turnover of more than EUR 5 000 million[4] (Hitachi: EUR 99 647 million; ABB: [confidential details on the Target's worldwide turnover]). Each of them has an EU-wide turnover in excess of EUR 250 million (Hitachi: [confidential details on the Parties' EEA-wide turnover]; ABB: [confidential details on the Parties' EEA-wide turnover]), but they do not achieve more than two-thirds of their aggregate EU-wide turnover within one and the same Member State. The notified operation therefore has an EU dimension.

4 Turnover calculated in accordance with Article 5 of the Merger Regulation.

4. MARKET DEFINITION

(9) Hitachi and the Target are both active in the supply of electrical equipment for use in the transmission and distribution of electricity within power systems, including (i) HV products, (ii) transformers, (iii) GA products and (iv) GI products. The focus of the assessment is on these four general product groups with several segments.[5] The products are sold as part of turnkey systems or on a stand-alone basis for industries like power generation or transportation.[6]

4.1. High voltage (HV) products

(10) HV products are predominantly used in transmission networks, operating at high voltages (above 52 kV[7]) to transmit electricity over long distances.

(11) HV products are usually installed in HV substations.[8] The main components of HV substations are: (i) HV circuit breakers; (ii) HV disconnectors; (iii) HV instrument transformers; (iv) power transformers; and (v) HV or MV surge arresters. These components in an HV substation must be insulated in order to prevent short circuits. This can either be done by installing the components at a distance from each other, so they are air-insulated (air-insulated switchgear substation, or "AIS substation"). Where less space is available, the switchgear units of the substation are assembled within encapsulated enclosures infused with pressurised sulfur hexafluoride gas, so they are gas-insulated ("GIS substation").[9]

(12) HV products are also used in a variety of other power-system related applications, such as switching and protection of power transmission and distribution grids or power generation plants, integration of renewables, enhancement of energy efficiency in industrial settings, and improvement of power quality in industry and power grids.

(13) The Notifying Party has only limited activities in HV products, focusing on a few components: HV gas-insulated switchgear ("GIS"), HV circuit breakers, and LV capacitors). The Target is an important producer of most HV products as well as certain MV and LV products and related services.[10]

4.1.1. Product market

(A) The Commission's decisional practice

(14) In previous cases, the Commission has acknowledged the existence of a HV product market, subdividing electrical products and systems according to their respective voltage levels into three broad product segments:

- Low Voltage ("LV") products (<1 kV)

5 Form CO, paragraph 104.
6 Form CO, paragraph 105.
7 Case COMP/M.8678 – *ABB/General Electric Industrial Solutions*, paragraph 6.
8 Form CO, paragraph 124.
9 Form CO, paragraph 125 *et seq.*
10 Form CO, paragraph 130.

- Medium Voltage ("MV") products for distribution networks operating at voltages between 1kV and 52 kV;

- HV products for transmission networks operating at voltages between 52 kV and 800 kV.

(15) The Commission also considered whether individual HV products might constitute a separate product market. However, the Commission has to date left open whether individual HV products belong to separate markets or whether they all belong to one overall market.[11]

(16) Individual HV products previously considered by the Commission are (i) HV switchgear (both AIS and GIS); (ii) HV circuit breakers; (iii) HV instrument transformers; (iv) HV disconnectors; and (v) HV coils.[12]

(B) The Notifying Party's view

(17) The Notifying Party considers that the entire HV product area should be treated as one overall product market for all HV products and that it should not be further segmented, insofar as: (i) customers tender on a project-based basis and do not specifically look for suppliers of specific products but rather expect suppliers to offer a comprehensive product range; (ii) from a supply-side perspective, customers will often require and purchase a variety of HV products for one and the same project; (iii) in a previous decision, which concerned a similar product portfolio as the Proposed Transaction, the Notifying Party suggested an overall market for HV products on the basis of similar considerations,[13] and this approach was largely confirmed by the market investigation.[14]

(18) Taking into account the Parties' activities in the HV area, this market would include but not be limited to HV switchgear (incl. GIS and AIS), HV circuit breakers, HV instrument transformers, HV disconnectors, HV surge arresters (incl. accessories), HV circuit breaker components and other HV products, HV cable accessories and HV capacitors, harmonic filters, and other Reactive Power Compensation ("RPC")[15] products.

(19) In any case, given Hitachi's *de minimis* position on a global and EEA-wide basis, the Notifying Party submits that the exact product market definition for HV products can be left open since, even if the Commission were to examine the Proposed Transaction on the basis of the narrowest plausible HV product segments, this would not give rise to any competition concerns on a global or EEA-wide basis.

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11 Case COMP/M.8678 – *ABB/General Electric Industrial Solutions*, paragraph 6. Case COMP/M.5754 - *Alstom Holdings / Areva T&D Transmission activities*, decision of 26 March 2010, paras. 52-53.

12 Case COMP/M.7278 - *General Electric / Alstom (Thermal Power – Renewable Power & Grid Business)*, decision of 8 September 2015, para. 1798, Case COMP/M.3653 - *Siemens / VA Tech*, decision of 13 July 2005, para. 76-78.

13 Case COMP/M.3653 - *Siemens/VA Tech*, paragraph 76.

14 Case COMP/M.3653 - *Siemens /VA Tech*, paragraphs 77 to 79. Form CO, paragraph 195 et seq.

15 RPC will be explained below in Annex I.

(C) The Commission's assessment

(20) In the market investigation, a majority of customers and competitors suggested a segmentation of the market for HV products into the following:[16]

- HV Instrument Transformers
- HV Disconnectors
- HV Switchgear, either overall or GIS and AIS separately
- HV Circuit Breakers, either overall or HV disconnecting circuit breakers and generator circuit breakers separately.
- (Competitors in addition also suggest a sub-segmentation for HV live-tank circuit breakers and HV dead-tank circuit breakers separately).

(21) At the same time, the market investigation confirmed the arguments of the Notifying Party regarding supply side substitutability. In particular, the results showed that the same suppliers typically supply all or most HV products in the sub-categories, with the possible exception of smaller suppliers that are more specialised.[17] This would point to an overall market for HV products from a supply-side perspective.

(22) In any event, out of the potential markets for each HV product listed in paragraph (20), the Proposed Transaction only results in horizontally affected markets related to HV circuit breakers and HV generator circuit breakers (a potential sub-segment of this potential market) and vertically affected[18] markets

16 Replies to eQuestionnaire – Customers, question 7; Replies to eQuestionnaire – Competitors, question 9.

17 Replies to eQuestionnaire – Customers, question 11; and Question 11.2: the Parties' main competitors Siemens, GE/Alstom, Artech, Schneider Electric, Hapam, Pinggao, Hyosung, and Mitsubishi Electric supply all/most HV products.

18 An affected market consist of all relevant product and geographic markets, as well as plausible alternative relevant product and geographic markets, if in the EEA territory (a) two or more of the parties to the concentration are engaged in business activities in the same relevant market ("horizontal relationships") and where the concentration will lead to a combined market share of 20 % or more; or (b) one or more of the parties to the concentration are engaged in business activities in a relevant market, which is upstream or downstream of a relevant market in which any other party to the concentration is engaged (vertical relationships), and any of their individual or combined market shares at either level is 30 % or more, regardless of whether there is or is not any existing supplier/customer relationship between the parties to the concentration. (See Section 6.3, Annex 1, Commission Regulation (EC) No 802/2004 of 21 April 2004 implementing the Merger Regulation).
The Commission may presume that concentrations where the market share of the undertakings concerned does not exceed 25 % either in the common market or in a substantial part of it are not liable to impede effective competition and are compatible with the common market. (See recital 32 of the Merger Regulation and paragraph 18 of the Guidelines on the assessment of horizontal mergers under the Council Regulation on the control of concentrations between undertakings (OJ C 31, 5.2.2004, p. 5).
The Commission is unlikely to find concerns in non-horizontal mergers, be it of a coordinated or of a non-coordinated nature, where the market share post-merger of the new entity in each of the markets concerned is below 30 % and the post-merger HHI is below 2 000. Where a merged entity would have a market share just above the 30 % threshold on one market but substantially below on other, related, markets competition concerns will be less likely. (See paragraph 25 of the Guidelines on the assessment of non-horizontal mergers under the Council Regulation on the control of concentrations between undertakings (OJ C 265, 18.10.2008, p. 6).

related to HV AIS modules (downstream) and MV switchgear and power transformers (upstream).[19]

(23) As the other HV products do not give rise to any affected market, these will not be further discussed in this Decision.

(24) In conclusion, the Commission will analyse the Proposed Transaction on the basis of all plausible product markets, but will leave the market definition open as the Proposed Transaction does not raise concerns on any plausible market.

4.1.2. Geographic market

(A) The Commission's decisional practice

(25) In previous decisions the Commission found that the market for HV products is at least EEA-wide.[20]

(B) The Notifying Party's view

(26) Regarding the geographic market definition, the Notifying Party considers that, for all HV products, competition takes place on a global basis. As such, it agrees with the Commission's previous findings that the relevant geographic market for HV products is at least EEA-wide.[21]

(C) The Commission's assessment

(27) The results of the market investigation point towards a worldwide market for all sub-segments of HV products, as a clear majority[22] of customers[23] and of competitors[24] confirmed. According to a majority of competitors,[25] HV products sold in other world regions are generally substitutable for the HV products used in the EEA, as they are produced in line with international (IEC) standards. Nevertheless, some technical requirements are specific to the area of installation, such as special seismic conditions or minimum ambient temperatures.[26]

(28) Within the EEA, HV products do not differ across individual Member States, neither with regard to their technical specifications nor with regard to price, as

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19 The exact market definition can be left open between MV products overall or each MV product (only MV switchgear is an input for HV AIS modules), as well as between transformers overall and each type of transformer (only power transformers are inputs for HV AIS), because even if the smallest plausible product definition would be taken, no serious doubts as to the compatibility of the transaction with the common market would arise.

20 Case COMP/M.8678 - *ABB/General Electric Industrial Solutions*, paragraphs 28 et seq; Case COMP/M.6642 - *Eaton Corporation/Cooper Industries*, paragraph. 29-30; Case COMP/M.5754 - *Alstom Holdings/Areva T&D*, paragraphs 69-72.

21 Form CO, paragraph 264.

22 "Majority" in this Decision stands for at least 50% of participants in the market investigation who replied to the question (excluding those that replied "not applicable", or "I do not know").

23 Replies to eQuestionnaire – Customers, question 39.

24 Replies to eQuestionnaire – Competitors, question 41.

25 Replies to eQuestionnaire – Competitors, question 42.

26 Replies to eQuestionnaire – Customers, question 40.

confirmed by a majority of participants in the market investigation.[27] Geographical proximity to end-customers is not required to be successful in the electrical equipment industry[28] and transport costs only make up a small percentage of the purchase price of individual HV products (less than 5% according to a majority of customers).[29] National markets can thus be excluded for the purpose of the present case.

(29) In conclusion, the exact definition of the market for HV products can be left open between the EEA and worldwide, as the Proposed Transaction does not give rise to serious doubts as to its compatibility with the internal market or the functioning of the EEA Agreement on any of the two plausible geographic market definitions.

4.2. Transformers

(30) A transformer is the electromagnetic equipment that transfers electricity from one electrical circuit to another and steps the voltage up or down as required.[30] There are two main types of transformers used within a power grid: power transformers and distribution transformers. Another type of transformers, used in railway rolling stock applications, is traction transformers.

(31) Transformers come in different sizes (large, medium and small), depending on the voltage and power rating covered, but categorisation varies from supplier to supplier. Transformers always consist of two main components: the steel core, and several winding coils. Together, the steel core and the winding coils form the "active part" of a transformer.

(32) Transformers might be further sub-segmented within the three segments indicated above (power transformers, distribution transformers and traction transformers):

- **Power transformers**: generator step-up transformers; substation and system inertia transformers; HVDC converter transformers; power transformers used in industrial or special applications; and shunt reactors (and other types of reactors).

- **Distribution transformers**: liquid-filled distribution transformers; and dry-type distribution transformers.

- **Traction transformers**: used for railway rolling stock applications, and come in different designs in terms of size, weight and power ratings.

(33) The Parties' activities in transformers:

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27 Replies to eQuestionnaire – Customers, questions 41 and 42; Replies to eQuestionnaire – Competitors, questions 43 and 44.

28 Replies to eQuestionnaire – Competitors, question 47.

29 Replies to eQuestionnaire – Customers, question 43.

30 See description provided by ABB to the Commission in Case M.8678 - ABB/General Electric Industrial Solutions, Annex I, page 34 (IV). See also ABB glossary of technical terms, "Transformer" and "Distribution transformers" (https://new.abb.com/media/glossary).

- The Target is active in the design, manufacture and sale of different types of transformers (such as power transformers, distribution transformers, and traction transformers) as well as specific transformer components (including, e.g., bushings and tap-changers) and related services.[31]

- The Notifying Party has limited activities in transformers on a global basis. Although Hitachi has a transformer portfolio which is similar to that of the Target, its sales of transformers are [outside the EEA] and, in particular, it has no stand-alone sales of transformers in the EEA.[32] In addition, Hitachi does not sell any transformer components externally.

4.2.1. Product market

(A) The Commission's decisional practice

(34) In previous decisions the Commission has considered whether power and distribution transformers constituted separate relevant product markets or whether they belong to an overall market for transformers, while ultimately leaving the precise product market definition open.[33]

(B) The Notifying Party's view

(35) The Notifying Party submits that the relevant product market is the overall transformers market since, ultimately, all transformers serve the same purpose, i.e. mainly to increase or decrease the voltage levels of electrical power for its efficient transport on transmission and distribution networks. Hitachi submits that it would be inappropriate to further segment the overall transformers market from a demand or from a supply-side perspective by voltage type, technology used (e.g., dry-type or liquid filled) or end-use application (e.g. utility vs. industrial customers, subsea or railway rolling stock), and that this is in line with the market investigation in *Alstom Holdings/Areva T&D*, in which a majority of respondents supported an overall transformers market.

(36) In any event, the Notifying Party submitted information for the narrower product segments of (i) power transformers, (ii) distribution transformers overall (as well as (ii.1) oil-filled distribution transformers, and (ii.2) dry-type distribution transformers); and (iii) traction transformers.

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31 In addition, the Target provides captive after-sale services for its own transformers ([confidential]% of the transformer service revenue) and to a limited extent service transformers of other OEM suppliers ([confidential]% of the transformer service revenue). In 2018, the Target realized worldwide revenues of approximately [confidential details on the Target's worldwide revenues generated from servicing transformers] with servicing of its own and third-party transformers, of which approximately [confidential details on the Target's EEA-wide revenues generated from servicing transformers] represented sales in the EEA.

32 Hitachi's activities mostly focus [outside the EEA]. [Confidential details on Hitachi's position on the worldwide market, and Hitachi's sales strategy for traction transformers]. In addition, Hitachi provides captive after-sale services, but only for its own transformers.

33 See most recently Case COMP/M.8678 - *ABB/General Electric Industrial Solutions*, paragraphs 70 and 73; Case COMP/M.3296 - *Areva/Alstom T&D*, paragraph 11, and Case COMP/M.5755 - *Schneider Electric/Areva T&D*, paragraph 8, Case COMP/M.5754 - *Alstom Holdings/Areva T&D*, paragraphs 59-60; and Case COMP/M.3653 - *Siemens/VA Tech*, paragraph 76.

(37) In addition, with regard to components used for the manufacture of transformers, the Notifying Party provided data for each of the transformer components that the Target sells externally (bushings, tap changers, measurement and safety devices, and insulation components and materials), even though it submits that the relevant market should be the overall market for transformers (including components), and that it would not be appropriate to define separate markets for transformer components or sub-segment it by specific component products.

(C) The Commission's assessment

(38) The vast majority of the respondents to the Commission's market investigation consider that, in light of their characteristics, price and intended use, it is appropriate (both from a supply-side and demand-side substitutability point of view) to segment the market by transformer type into power transformers, distribution transformers and traction transformers, and have not signalled that a further segmentation beyond that is warranted.[34]

(39) In any event the precise product market definition can be left open since the Notifying Party provided market shares for the narrowest plausible segmentations of transformers according to the Commission's previous assessments, i.e. for power[35] and traction[36] transformers separately, and for overall distribution transformers as well as for oil-filled and dry-type distribution transformers separately,[37] (as well as for each transformer component that the Target sells externally)[38] and no competition concerns arise regardless of the ultimate product market definition.

34 Replies to eQuestionnaire – Competitors, question 14, e.g. a respondent stated that "*they are different solutions with different uses and voltages*" whilst another one stated that "*each category of transformer specified above requires specific design/manufacturing capabilities. Hence they need to be segregated*", one stated that "*each transformer type has a different purpose on the market, a different end usage and a different strength for each manufacturer. Saying this, is important to have a segmentation for each type*", and another one explained that "*different norms and regulations apply to each segment*". Only a minor fraction of respondents signaled that an overall market for transformers could be considered as the appropriate relevant product market, e.g. one stated that "*there is no clear definition between Power and Distribution Transformers and manufacturers handle this often differently. Transformers should be looked at as one single segment*". Replies to eQuestionnaire – Customers, question 13, e.g. a respondent stated that "*each type of transformer has specific constraints and characteristics (e.g: norms, standards, ….) for intended application*", whilst another stated that "*there are different markets for each type of transformers*".

35 See most recently Case COMP/M.8678 - *ABB/General Electric Industrial Solutions*, paragraph 70.

36 Case COMP/M.5754 - *Alstom Holdings/Areva T&D Transmission activities*, paragraph 68.

37 See most recently Case COMP/M.8678 - *ABB/General Electric Industrial Solutions*, paragraph 70.

38 Bushings, tap changers, measurement and safety devices and insulation materials and components.

4.2.2. Geographic market

(A) The Commission's decisional practice

(40) In previous cases the Commission considered that the relevant geographic market for transformers was at least EEA-wide in scope, possibly even worldwide, although the precise definition was left open.[39]

(B) The Notifying Party's view

(41) In relation to the geographic scope of the market for transformers (and transformer components), Hitachi argues that it is global and that it can ultimately be left open since Hitachi is not active in the EEA.

(42) In any event, the Notifying Party provided information on both an EEA-wide and global basis and for the narrowest segments within the area of transformers and for each transformer component that the Target sells externally.

(C) The Commission's assessment

(43) The market investigation is not conclusive on whether the relevant geographic market should be EEA-wide or global.[40] In any event, no horizontal concerns arise under either definition (because Hitachi is not active in the EEA). For the purpose of the assessment of the only material vertical link (that for traction transformers used for railway rolling stock), the market shares at both the EEA and globally are similar and thus the competition analysis is applicable regardless of the precise geographic market definition.

4.3. Railway rolling stock

4.3.1. Product market

(A) The Commission's decisional practice

(44) In previous decisions the Commission has considered trains reaching speeds equal to or higher than 250 km/h (high and very high-speed trains) as a separate product market, distinct from intercity trains which are incapable of achieving similar speeds. Moreover, the Commission has considered a potential further sub-segmentation between high-speed trains (top speed between 250 and 300 km/h) and very high-speed trains (top speed greater than 300 km/h), while ultimately leaving the precise product market definition open.[41]

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39 See most recently Case COMP/M.8678 - *ABB/General Electric Industrial Solutions*, paragraph 74; Case COMP/M.5754 - *Alstom Holdings/Areva T&D*, paragraphs 69-72.

40 However, some customers have signalled that the market could be wider than the EEA, e.g. in relation to traction transformers one customer, when asked whether it could purchase from suppliers located outside the EEA or whether that would be difficult, replied that "*Mitsubishi is an example of an Asia supplier*" (correspondence with customer of 8 May 2020).

41 Case COMP/M.8677 – *Siemens/Alstom*, paragraphs 105 and 106.

(B) The Notifying Party's view

(45) The Notifying Party submits that the relevant product markets for railway rolling stock are (i) very high-speed trains (top speed above 300 km/h), (ii) high-speed trains (top speed between 250 and 299 km/h), and (iii) mainline railway rolling stock (intercity and regional trains).

(46) In any event, the Notifying Party submitted information for the narrowest plausible product segments of (i) high-speed trains (top speed between 250 and 299 km/h), (ii) very high-speed trains (top speed equal to or above 300 km/h), (iii) intercity/regional trains (top speed between 160 and 249 km/h), and (iv) commuter trains (top speed below 160 km/h), as well as for the broader product markets of (v) all high-speed trains (including high-speed and very high-speed trains) and (vi) combined market for intercity/regional + commuter trains.

(C) The Commission's assessment

(47) For the purpose of the present case, the Commission considers that the precise product market definition can be left open since, for the purpose of the vertical assessment for traction transformers for railway rolling stock applications, the Proposed Transaction does not raise concerns even on the narrowest segments (in particular, in the segment for intercity/regional trains, where the Notifying Party is present).

4.3.2. Geographic market

(A) The Commission's decisional practice

(48) In previous decisions the Commission has defined the relevant markets for high and very high-speed rolling stock as at least EEA-wide (including Switzerland) while not excluding the possibility of these markets being worldwide (excluding China, South Korea and Japan) and leaving the precise geographic market definition open.[42]

(49) For regional trains[43] and intercity trains[44], the Commission has previously considered the market to be likely at least EEA-wide.

(B) The Notifying Party's view

(50) The Notifying Party submits that in its view, and in line with the geographic market definition in *Siemens/Alstom*, the geographic market for high and very high-speed trains is at least EEA wide, if not worldwide (excluding China, Japan and Korea).

(51) In any event, the Notifying Party also submitted information on a worldwide basis (including China, Japan and Korea) for all plausible segments.

42 Case COMP/M.8677 – *Siemens/Alstom*, paragraph 133.

43 Case COMP/M.7871 – *Bombardier/CDPQ/Bombardier Transportation UK*, paragraph 24.

44 Case COMP/M.5754 – *Alstom Holdings/Areva T&D*, paragraph 43.

(C) The Commission's assessment

(52) For the purpose of the present case, the Commission considers that the precise geographic market definition can be left open since, for the purpose of the vertical assessment for traction transformers for railway rolling stock applications, the Proposed Transaction does not raise concerns either in the EEA or globally (in particular, given that both the upstream shares of the Target for traction transformers and the downstream shares of the Notifying Party in the different railway rolling stock segments are relatively similar in the EEA and worldwide).

4.4. Grid automation

(53) GA is the digitalisation and automation of power grids and/or substations, which provide the ability to remotely control and monitor the operating conditions of primary and secondary assets of a transmission or distribution network throughout the entire network. GA solutions consist of hardware and software products, systems and services.[45]

(54) GA systems that digitalize and automatize power grid operations can be summarized under the term "Power System Management Solutions". GA solutions operating at substation level include products and systems that enable the automated monitoring, control and supervision of substation assets - these solutions are referred to as "Substation Automation Systems" (SAS). GA solutions operating at the enterprise level via the control center are used to manage the entire grid network composed of numerous substations, using SCADA software solutions to enable secure, efficient and optimized operation of the electric power system as a whole. They are therefore referred to as "Network Management Systems" (NMS).[46]

(55) GA solutions also exist for Microgrids, i.e. distributed energy resources that can also operate in "islanded" mode (so-called "Microgrid Automation Systems" (MAS)). The automation system architecture is similar to SAS and NMS, but MAS additionally includes battery energy storage solutions (BESS) and a power conversion system (PCS).[47]

(56) GA solutions can also include enterprise application software ("EAS") solutions which help businesses improve their efficiency, reliability, safety and sustainability.[48] In GA solutions, enterprise software is used in the control center to collect and manage data on the condition and availability of major plant equipment, thus enabling plant operators to plan maintenance schedules more effectively and avoid unnecessary equipment inspections and unexpected breakdowns, which can cause expensive interruptions in production time. Business analytics solutions track, analyze and manage data in support of corporate decision making processes.[49]

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45 Form CO, paragraph 327.
46 Form CO, paragraph 347.
47 Form CO, paragraph 348.
48 Form CO, paragraph 377.
49 Form CO, paragraph 382.

(57) The Target's GA business is divided into (i) GA systems and products, including SAS, NMS, microgrid automation systems and communication systems; (ii) standalone GA products, including different GA components and software sold on a standalone basis; and (iii) enterprise application software (EAS).[50] Approximately [confidential details on the Target's breakdown of GA sales]% of the Target's GA sales are generated with system solutions.[51]

(58) Hitachi has only limited activities in GA on a global basis [mainly focusing outside the EEA], and Hitachi does not offer GA products or systems in Europe. Hitachi's GA solutions are designed and developed [Confidential details on Hitachi's sales strategy for GA products]. [Confidential details on Hitachi's sales strategy for GA products].[52]

4.4.1. Product market

(A) The Commission's decisional practice

Energy Automation and Information Systems

(59) The Commission has previously considered an overall market for Energy Automation and Information Systems ('EAIS') as a potential segment within the market for Transmission and Distribution.[53]

(60) The Commission has also considered dividing the market for EAIS into two sub-segments: i) power system management and ii) protection relays.[54] Furthermore, the Commission has considered whether a market exists both in the turnkey area and at the level of individual components.[55]

(61) The Commission has also considered a potential sub-segmentation of power system management into i) Substation Automation Systems ('SAS') and ii) Network Management Systems ('NMS'), because they from a demand-side perspective perform different functions.[56]

(62) Additionally, the Commission has considered to do a further sub-segmentation of NMS into i) Energy Management Systems ('EMS'), ii) Distribution Management Systems ('DMS') and iii) Wide Area Monitoring Systems

50 Form CO, paragraph 342.

51 Form CO, paragraph 343.

52 Form CO, paragraph 344-346.

53 Case COMP/M.5755 – *Schneider Electric/Areva T&D*, paragraph 23; Case COMP/M.3296 – *Areva/Alstom T&D*, paragraphs 11-15; Case COMP/M.3653 – *Siemens/VA Tech*, paragraphs 76-78; and Case COMP/M.7278 – *General Electric/Alstom*, paragraph 1796.

54 Case COMP/M.5755 – *Schneider Electric/Areva T&D*, paragraphs 24-26; Case COMP/M.3653 – *Siemens/VA Tech*, paragraph 76; and Case COMP/M.7278 – *General Electric/Alstom*, paragraph 1797.

55 Case COMP/M.3653 – *Siemens/VA Tech*, paragraphs 77-78.

56 Case COMP/M.7278 – *General Electric/Alstom*, paragraph 1793.

('WAMS').[57] Ultimately, the Commission has left the final definition of the product market open in all its previous decisional practice.[58]

Enterprise Application Software

(63) The Commission has previously considered a market for the provision of enterprise application software ('EAS') as a segment within business software[59]. Furthermore, the Commission has considered further distinctions, ultimately leaving the market definition open. These possible further distinctions are explained in the three paragraphs below.

(64) The Commission has considered dividing EAS into the following sub-segments: i) Enterprise Resource Planning ('ERP'), ii) Customer Relationship Management ('CRM'), iii) Supplier Relationship Management ('SRM'), iv) Supply Chain Management ('SCM'), v) Product Lifecycle Management ('PLM') and vi) Business Analytics ('BA').[60]

(65) Within the ERP segment, sub-segments based on functionality have been considered, namely i) Financial Management Systems ('FMS'), ii) Human Resources ('HR') and iii) Enterprise Project Management ('EPM').[61] Furthermore, the Commission has considered whether each of these three segments should be subdivided into two sub-segments, namely i) high-function solutions and ii) mid-market solutions.[62]

(66) Within the BA segment the Commission has in past cases considered a possible distinction between i) Performance Management Tools and Applications ('PMT') and ii) Data Warehouse Platforms ('DWP').[63] PMT was itself considered as possibly divided between i) business intelligence ('BI'), ii) Financial performance strategy management ('FPSM') applications, iii) CRM analytics, iv) SCM analytics, (v) service operations management applications, vi) workforce analytics, and vii) analytic spatial information management tools.[64] BI has been considered as possibly sub-segmented into i) Query, Reporting and Analysis ('QRA') tools on the one hand and ii) Advanced Analytics on the other.[65]

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57 Case COMP/M.7278 – *GE Alstom/Alstom*, paragraph 1794.

58 Case COMP/M.5755 – *Schneider Electric/Areva T&D*, paragraph 26; Case COMP/M.3296 – *Areva/Alstom T&D*, paragraph 15; Case COMP/M.3653 – *Siemens/VA Tech*, paragraph 78; and Case COMP/M.7278 – *General Electric/Alstom*, paragraph 1799;

59 Case COMP/M.8274 – *Cinven/Permira/Allegro/Ceneopara*, paragraph 53.

60 Case COMP/M.8274 – Cinven/Permira/Allegro/Ceneopara, paragraph 54; Case COMP/M.4944 – SAP/Business Objects, paragraph 7.

61 Case COMP/M.5128 – *Nordic Capital/TietoEnator*, paragraph 15; and Case COMP/M.3216 – *Oracle/PeopleSoft*, paragraph 18.
Case COMP/M.5128 – *Nordic Capital/TietoEnator*, paragraph 15; and Case COMP/M.8274 – *Cinven/Permira/Allegro/Ceneopara*, paragraph 56.

63 Case COMP/M.4987 – *IBM/Cognos*, paragraph 10; and Case COMP/M.4944 – *SAP/Business Objects*, paragraph 9.
Case COMP/M.4987 – *IBM/Cognos*, paragraph 11; and Case COMP/M.4944 – *SAP/Business Objects*, paragraph 10.

65 Case COMP/M.4944 – *SAP/Business Objects*, paragraph 11 and 16.

(B) The Notifying Party's view

EAIS

(67) The Notifying Party submits that the relevant product market is the overall EAIS market.[66] However, the precise market definition can be left open as no concerns will arise under any plausible market definition.

(68) According to the Notifying Party, Automation customers require the set-up of a complete solution and hence issue a call for tenders for an entire EAIS rather than for individual automation products, making it necessary for suppliers to offer a comprehensive range of products in order to be able to compete successfully on the market. Where products are sold on a stand-alone basis, those sales are usually made to other system integrators for a specific project.[67]

(69) Furthermore, the Notifying Party argues that a distinction between SAS and NMS or any further sub-segmentation is not appropriate, as the underlying system remains the same and there is a high degree of supply-side substitutability in relation to the automation products required (both hardware and software).[68] Likewise, after-sale services should not be considered a separate market, as they are inherent to and constitutive of the different products and systems which the Parties offer in the area of transmission and distribution.[69]

(70) The Notifying Party submits that there is no separate market or segment for power network communication solutions, noting that the activities of the Parties in this area predominantly involve the supply of communication solutions in the context and as part of the provision of a SAS or NMS system (i.e. the Parties do not focus on the supply of stand-alone communication systems).[70]

(71) Furthermore, the Notifying Party submits that products, systems and services for energy management solutions should fall within an overall market for EAIS including both power system management and single devices that are sold stand-alone, such as e.g. protective relays, communication equipment and automation software.[71]

EAS

(72) The Notifying Party submits that the relevant product market should be the overall market for EAS.[72] While there is business software with various different functionalities, there is no clear-cut line between those functionalities as often software solutions are tailored to the needs of a respective customer and

66 Form CO, paragraph 424. The Notifying Party also submits that the narrowest plausible markets within the EAIS market are: i) Substation Automation Systems ('SAS'), ii) Network Management Systems ('NMS'), iii) Microgrid Automation Systems ('MAS'), and iv) stand-alone automation products (Form CO, paragraph 425).

67 Form CO, paragraph 394.

68 Form CO, paragraph 395.

69 Form CO, paragraph 397

70 Form CO, paragraph 403.

71 Form CO, paragraph 407.

72 Form CO, paragraph 414.

hence usually include more than just one functionality.[73] In addition, supply-side substitutability between the single functionalities is high.[74] However, given that, in its view, there is an absence of any concerns arising under all plausible market delineations, the Notifying Party submits that the market definition can ultimately be left open.[75]

(C) The Commission's assessment

EAIS

(73) The Commission considers that the EAIS market can be segmented between power management systems and stand-alone products. Within power system management systems a segmentation between SAS and NMS can be considered, the latter potentially further divided between EMS, DMS and WAMS.

(74) Furthermore, a separate segment for MAS can be considered as well as stand-alone products for communication products or systems, protective relays, automation software and remote terminal units (RTUs).

(75) The results of the market investigation were mixed but generally supported a segmentation of the EAIS product market.[76]

(76) However, in this case the Commission can leave the product market definition open as the Proposed Transaction does not raise competition concerns on any plausible market.

(77) Given the absence of any horizontally or vertically affected markets, the Commission will not further discuss this market.

EAS

(78) The results of the market investigation were mixed but generally supported a segmentation of the EAS market.[77] However, in this case the Commission can leave the product market definition open as the Proposed Transaction does not raise competition concerns on any plausible market.

(79) Given the absence of any horizontally or vertically affected markets, the Commission will not further discuss this market.

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73 Form CO, paragraph 410.

74 Form CO, paragraph 416.

75 Form CO, paragraph 416.

76 Replies to eQuestionnaire – Competitors, question 19 and Replies to eQuestionnaire – Customers, question 17.

77 Replies to eQuestionnaire – Competitors, question 19 and Replies to eQuestionnaire – Customers, question 17.

4.4.2. Geographic market

(A) The Commission's decisional practice

EAIS

(80) The Commission has previously considered the plausible EAIS markets to be EEA-wide or world-wide, but has ultimately left the precise geographic market definition open.[78]

EAS

(81) The Commission has considered the relevant geographic market for EAS to be EEA-wide or worldwide.[79] With respect to CRM and BA (including possible sub-segments), the Commission has considered the market to be at least EEA-wide and possibly worldwide.[80]

(82) Concerning high function solutions for HR and FMS, the Commission has concluded that the market is global.[81]

(B) The Notifying Party's view

EAIS

(83) The Notifying Party submits that the relevant geographic market for EAIS is global and, in any event, far larger than a geographic area including the EEA. All product markets within GA are global in scope, as there are no trade barriers through technical standards, the vast majority of customers and the major suppliers are active at a global level, and transportation costs do not limit the ability of manufacturers to compete effectively in countries where they do not have production. However, the geographic market definition can be left open in this case, as Hitachi is not active in the EEA.[82]

EAS

(84) The Notifying Party submits that the relevant geographic market for EAS (and its segments and sub-segments, if examined separately) is global and, in any event, far larger than a geographic area including the EEA. All product markets within GA are global in scope, as there are no trade barriers through technical standards, the vast majority of customers and the major suppliers are active at a global level, and transportation costs do not limit the ability of manufacturers to compete effectively in countries where they do not have production. However,

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78 Case COMP/M.5755 – *Schneider Electric/Areva*, paragraph 32; Case COMP/M.3296 – *Areva/Alstom*, paragraphs 17-18; and Case COMP/M.7278 – *General Electric/Alstom*, paragraph 1803.

79 Case COMP/M. 7334 – *Oracle/Micros*, paragraph 17; and Case COMP/M.5904 – *SAP/Sybase*, paragraphs 29-30.

80 Case COMP/M.3978 – *Oracle/Siebel*, paragraph 19; Case COMP/M.4944 – *SAP/Business Objects*, paragraph 18.

81 Case COMP/M.3216 – *Oracle/PeopleSoft*, paragraph 179.

82 Form CO, paragraph 430 and 436.

the geographic market definition can be left open in this case, as Hitachi had no sales in EAS in the past three years (2016-2018).[83]

(C) The Commission's assessment

EAIS

(85) The Commission has in the past analysed the segments of the EAIS market at EEA and worldwide level. The majority of the respondents to the market investigation considered the plausible EAIS markets worldwide in scope.[84] However, as the Proposed Transaction does not raise competition concerns on any plausible market the geographic market definition can be left open.

(86) Given the absence of any horizontally or vertically affected markets, the Commission will not further discuss this market.

EAS

(87) The Commission has in the past analysed the segments of the EAS market at EEA and worldwide level. The majority of the respondents to the market investigation considered the plausible EAS markets to be worldwide in scope.[85] However, as the Proposed Transaction does not raise competition concerns on any plausible market the geographic market definition can be left open

(88) Given the absence of any horizontally or vertically affected markets, even for the narrowest plausible combination of product and geographical market definitions, the Commission will not further discuss this market.

4.5. Grid Integration

(89) The Target's Grid Integration ("GI") business line is active in the design, manufacture and sale of HV substations, high voltage direct current (HVDC) stations, flexible alternating current transmission systems (FACTS), and (high) power semiconductors as well as related services. Each of these products could be potentially sub-segmented into several other different markets. This business line also includes charging infrastructure for buses, trams and electric vehicles, and power consulting services. Hitachi has *de minimis* activities in GI on a global basis. In this business area, Hitachi's focus is on the manufacturing and supply of power semiconductors.[86]

83 Response to RFI 6, 9 April 2020.

84 Replies to eQuestionnaire – Competitors, question 54 and Replies to eQuestionnaire – Customers, question 52.

85 Replies to eQuestionnaire – Competitors, question 54 and Replies to eQuestionnaire – Customers, question 52.

86 Form CO, paragraph 440.

4.5.1. Product market

T&D turnkey systems

(A) The Commission's decisional practice

(90) In previous decisions relating to the overall market for transmission and distribution and its various components, the Commission has considered the overall market for transmission and distribution and its various components, both when they are supplied individually or integrated into a system.[87]

(91) In one decision, while the market definitions were ultimately left open, the following potential product markets were identified: (i) HV products, (ii) MV products, (iii) power transformers, (iv) transmission systems and distribution systems, (v) energy automation and information systems and (vi) transmission and distribution services.[88]

(92) The Commission has considered in the past that the transmission and distribution systems could constitute a single market comprising the design and installation of turnkey systems, either for transmission networks or for distribution networks, but ultimately left the market definition open.[89] The Commission has previously considered identifying tentative product markets for HV turnkey projects (transmission systems), as distinguished from MV turnkey projects (distribution systems).[90] In another decision, the question whether the transmission and distribution systems together constitute a separate market, or whether the market for transmission systems should be considered as a separate market was left open.[91] Also, the Commission has previously looked into the markets for HVDC and FACTS,[92] but ultimately left the market definition open.[93]

(B) The Notifying Party's view

(93) The Notifying Party submits that the relevant product market is the overall market for T&D turnkey systems, and that the narrowest plausible segments within this market are HVDC stations/systems, FACTS and substations.

(94) The Notifying Party submits that it would also be inappropriate to further segment the overall market for T&D turnkey systems from a demand or supply-side perspective. This is because from a supply-side perspective, all major EPC companies in the T&D sector have the necessary capabilities to offer all main types of T&D projects (including HVDC, FACTS and substations) and equipment and resources will typically be sourced externally as required. Whereas from a demand-side perspective, customers will set out the required

87 Case COMP/M.7278 - *General Electric/Alstom* paragraph 1792.

88 Case COMP/M.3296 - *Areva/Alstom T&D*, paragraphs 11-15.

89 Case COMP/M.5754 - *Alstom Holdings/Areva T&D,* paragraph 62; Case COMP/M.3296 - *Areva/Alstom T&D*, paragraph 15.

90 Case COMP/M.3653 – *Siemens/VA Tech*; Case COMP/M.5754 - *Alstom Holdings/Areva T&D,* paragraph 63.

91 Case COMP/M.5754 - *Alstom Holdings/Areva T&D,* paragraph 65.

92 Case COMP/M.4892 - *Infineon/Siemens/JV*, paragraph 17.

93 Case COMP/M.4892 - *Infineon/Siemens/JV*, paragraphs 17-19.

specifications for a project in the tender documents and it is not decisive which type of provider undertakes the project, as long as the specifications are met, and all major providers can do all types of projects. In addition, large-scale T&D projects often include a combination of HVDC, FACTS and substations.

(95) As regards HVDC, the Notifying Party maintains that neither HVDC, nor the following HVDC solutions – HVDC Light and HVDC Classic solutions, belong to separate product markets, for the following reasons.

(96) HVDC Classic is the "traditional" HVDC technology, which operates with a power of more than 100 MW whereas, HVDC Light is a technology developed by ABB in the 1990s. While there are certain differences in the distance and power ranges that can be covered by each of the systems, they are now largely interchangeable and it often depends on the customer's preferences and/or budget whether to choose a "classic" or "light" HVDC solution. Furthermore, from a supply-side perspective most large vendors now offer both types of HVDC solutions.

(97) Moreover, each HVDC station is a tailored solution, depending on the requirements and characteristics of the respective project and the customer. A segmentation on the basis of these two technologies would not reflect the complexity of these systems, and the variety of HVDC station offerings. Such systems are in practice largely customized to meet the needs of customers so that the exact composition and set-up of HVDC stations based on the same technology can differ.

(98) The Notifying Party submits that it would not be appropriate to segment FACTS (into Series compensation FACTS, and the latter into a) fixed (Fixed Series Compensation or Fixed SC), and b) controlled Series compensation FACTS; and (ii) (Dynamic) Shunt compensation FACTS, and the latter into: (i) static compensators (STATCOM), and (ii) static VAR compensators (SVC)) for the reasons explained below.

(99) *First*, the main intended use of any FACTS, irrespective of the technology used, is to boost transmission capacities without having to build or use new transmission lines or power generation facilities. Both Series Compensation and (Dynamic) Shunt Compensation are used to compensate power quality issues quickly through reactive power, ensuring higher grid stability.

(100) *Second*, both technologies use similar impedance devices, like capacitors or reactors, which are used to control voltage in the network.

(101) *Third*, a segmentation by these technologies would not reflect the complexity and variety of FACTS offerings. Such systems are in practice largely customized to meet the needs of customers so that the exact composition and set-up of FACTS based on the same technology can differ. The choice between series or shunt type of compensation is the result of plan optimization based on customer requirements and network characteristics.

(102) *Fourth*, just as the Target and Hitachi offer these technologies, other players in this space, such as Siemens, also offer different technologies to customers indicating a high degree of supply-side substitutability.

(103) The Notifying Party further submits that it is not appropriate to further differentiate between different types of substations within this segment for the following reasons.

(104) Substations are used in transmission and distribution networks to convert and transfer electricity from the power generation plant to the end-customer. Depending on the terrain, specific project, amount of energy supplied, budget, customer requirements, etc., the supplier will choose a substation setup that is suitable to meet the requirements. However, the basic function of a substation is always the same, namely to convert and to transfer electricity.

(105) While substation setups can roughly be divided into AIS substations, GIS substations, and mobile substations, the additional existence of Hybrid Substations already shows that the distinction between the different types is blurred. There is no clear-cut distinction between AIS, GIS and Hybrid and there are many different setups that are possible and which use either more air-insulated or more gas-insulated equipment, depending on the respective project.

(106) In addition, substation-offerings are tender-based, and the EPC companies will source the required equipment according to the project specifications. From a supply and demand-side point of view, there is no significant difference in supplying either an AIS or GIS (or hybrid) substation.

(C) The Commission's assessment

(107) The Commission conducted its market investigation on the basis of and in respect of the plausible sub-segments mentioned above. The market investigation examined whether sub-segmentation is warranted for the following products that could be offered within HVDC stations, FACTS and substations:[94]

- segmentation of HVDC stations/systems into: (i) HVDC Classic (the "traditional" HVDC technology, operating with a power of more than 100 MW), and (ii) HVDC Light/Plus (used for undersea cable links and long underground cable links, with range from around 80 kV up to 320 kV);

- segmentation of FACTS into: (i) Series compensation FACTS, and the latter into a) fixed (Fixed Series Compensation or Fixed SC), and b) controlled Series compensation FACTS; and (ii) (Dynamic) Shunt compensation FACTS, and the latter into: (i) static compensators (STATCOM), and (ii) static VAR compensators (SVC);

- segmentation of substations into: (i) AIS substation; (ii) GIS substation; (iii) Hybrid substation; and (iv) Mobile substation.

(108) The market investigation confirmed that T&D turnkey systems could be viewed as a separate market, with the majority of customers and competitors confirming

94 For more information on these products please see Annex 1.

such an understanding.[95] The results of the market investigation on any plausible segmentations within T&D turnkey systems were mixed.

(109) As regards T&D turnkey systems, the majority of customers considered that T&D turnkey systems could be segmented between HVDC stations/systems, FACTS and substations. For example, a customer explained that these segments require different knowledge. Another customer explained that the products require different supply chains.[96] On the other hand, competitors had divergent views whether HVDC stations/systems, FACTS and substations are part of one market for T&D turnkey systems, or can be viewed as belonging to different markets. One competitor that opined that these products belong to different markets explained that there are different electronic engineering standards applicable to these products.[97]

(110) As regards a possible segmentation between HVDC Classic and HVDC Light/Plus, the market investigation also yielded mixed results. While the majority of customers considered that a segmentation between HVDC Classic and HVDC Light/Plus is warranted,[98] the majority of competitors were of the opposite view.[99]

(111) As regards FACTS sub-segmentation into Series compensation FACTS and (Dynamic) Shunt compensation FACTS, the majority of customers considered that such a segmentation is not warranted.[100] One customer explained that there is not a lot of difference between these two products, and another one that it is likely that these products will be supplied by the same manufacturers.[101] Competitors were split in their view as to whether Series compensation FACTS and (Dynamic) Shunt compensation FACTS belong to the same market or not. Those who considered that the products should not be segmented explained that these different technologies have the same basic functionality and suppliers mostly offer several technologies; and that these products are complementary to secure the grid quality.[102]

(112) As regards the possible segmentation of Series compensation FACTS into fixed (Fixed Series Compensation or Fixed SC), and controlled Series compensation FACTS, the majority of customers and competitors considered that such a segmentation is not warranted.[103]

(113) As regards the possible segmentation of (Dynamic) Shunt compensation FACTS into static compensators (STATCOM), and static VAR compensators (SVC),

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95 Replies to eQuestionnaire – Customers, questions 22 and 22.1; Replies to eQuestionnaire – Competitors, questions 24 and 24.1.

96 Replies to eQuestionnaire – Customers, questions 23 and 23.1.

97 Replies to eQuestionnaire – Competitors, questions 25 and 25.1.

98 Replies to eQuestionnaire – Customers, question 24.

99 Replies to eQuestionnaire – Competitors, question 26.

100 Replies to eQuestionnaire – Customers, question 25.

101 Replies to eQuestionnaire – Customers, question 25.

102 Replies to eQuestionnaire – Competitors, questions 27 and 27.1.

103 Replies to eQuestionnaire – Customers, questions 26 and 26.1; Replies to eQuestionnaire – Competitors, questions 28 and 28.1.

customers and competitors were split in their view as to whether these products should belong to separate markets or not.[104]

(114) Finally, as regards the possible segmentation of substations into: (i) AIS substations; (ii) GIS substations; (iii) Hybrid substations; and (iv) Mobile substations, the majority of customers considered that these products could be part of different markets. For example, customers explained that prices of the products differ; there are different supply chain operating for these products; and not all suppliers can offer the various different designs.[105]

(115) Taking into account the Notifying Party's arguments and the results of the market investigation, the Commission considers that, in any case, the precise scope of the product market definition of T&D Turnkey systems can be left open since the Proposed Transaction does not raise serious doubts on the narrowest plausible segmentation within T&D turnkey systems, which in this case is HVDC stations, FACTS and substations, and the further sub-segmentation for HVDC stations/systems between HVDC Classic and HVDC Light/Plus; for FACTS between Series compensation FACTS (fixed (Fixed Series Compensation or Fixed SC), and controlled Series compensation FACTS) and (Dynamic) Shunt compensation FACTS (static compensators (STATCOM), and static VAR compensators (SVC)); and for substations between AIS substations, GIS substations, hybrid substations, and mobile substations.

Power semiconductors

(116) Semiconductors are materials, such as silicon, which can act as an insulator, but are also capable of conducting electricity. Therefore, they are a good medium for the control of electrical current. Semiconductors are at the heart of many devices which are produced by the Parties and can be found in virtually every electronic device today. They are rarely bought as end-products by consumers. Rather, they are an input product for equipment manufacturers in virtually all sectors within the electronic equipment industry.

(117) The Proposed Transaction relates to power semiconductors (including high power semiconductors), which have a different functionality compared to general semiconductors.[106] Power semiconductors include integrated circuits (ICs), discretes, as well as many other types of power semiconductors and modules. The Proposed Transaction relates to power discretes, such as diodes, rectifiers, transistors or thyristors, and modules (the transaction relates to these products in the sense that one or both of the Parties produces them).

(118) The overlap between the Parties' global offerings mainly relates to high power standard IGBT modules, where both Parties have a limited position at a global

[104] Replies to eQuestionnaire – Customers, questions 27 and 27.1; Replies to eQuestionnaire – Competitors, questions 29 and 29.1.

[105] Replies to eQuestionnaire – Customers, questions 28 and 28.1; Replies to eQuestionnaire – Competitors, questions 30 and 30.1.

[106] While general semiconductors (operating in ranges of mW or µW) are used to control devices with millions of (low-power) switching functions, power semiconductors (operating in ranges > 1 W) and high power semiconductors (operating in ranges > 1200 V / 300 A) only provide for one switch with high power.

level and in the EEA. In addition, both Parties also had minor sales of discretes (more specifically: diodes / rectifiers) both globally and in the EEA.[107]

(A) The Commission's decisional practice

(119) In previous cases relating to semiconductors, the Commission distinguished between ICs, discretes, and sensors and actuators, respectively (and further sub-segments, as applicable).[108] The Commission also considered within discretes a distinction between the segments for RF and microwave, power transistors and thyristors, rectifiers and power diodes, and small signal and other discretes.[109]

(B) The Notifying Party's view

(120) The Notifying Party submits that these cases relating to general semiconductors can give a rough indication as to how to further segment the relevant markets based on the relevant types of semiconductors available, as they are not directly applicable to high power semiconductors which differ in functionality and in the relevant sub-types compared to general semiconductors.

(121) The Notifying Party submits that in the area of power semiconductors, a distinction can be made between discretes (including, e.g., thyristors and diodes/rectifiers) and modules. While it would also appear plausible to further segment discretes into thyristors, diodes/rectifiers, IGCTs, GTOs and GCTs as well as IGBTs, the Notifying Party maintains that it would not be appropriate to distinguish between power, high power and extra-high power semiconductors for the following reasons.

(122) First, the basic functionality remains the same regardless of the exact (high) power level. Power semiconductors provide for one switch with high power, as opposed to "general semiconductors" that provide for millions of "low power" switches.

(123) Second, the input material for all power semiconductors is the same (primarily silicon). Producing different power semiconductors therefore does not require any substantive change in the materials used, or the manufacturing facilities.

(124) Third, there is no established standard or defined term as to where to draw the line between power, high power and extra high power - notably, also established industry reports including IHS only provide sales data for power semiconductors overall rather than splitting between power and high power or power, high power, and extra high power. Suppliers such as the Target offer a wide range of product types with voltage ratings ranging (in the case of the Target) from 200 to 8500 V and current ratings from 25 to 13500 A. Whether or not a product would qualify as power, high power or even extra high power would ultimately depend (apart from the definition of these categories) on the required specifications of the customer on these two metrics. Moreover, the IHS reports

[107] Form CO, paragraph 494.
[108] Case COMP/M.7585 - *NXP Semiconductor/Freescale Semiconductor*, paragraph 14.
[109] Case COMP/M.7585 - *NXP Semiconductor / Freescale Semiconductor*, paragraph 78.

only distinguish between power levels (powers vs. high power) for two types of semiconductors, i.e., thyristors and diodes/rectifiers.

(125) Fourth, while there is a difference in suppliers for "general" semiconductors and "power semiconductors", there is no such distinction between power, high power and extra high power. While certain suppliers (such as e.g. Hitachi) may focus on semiconductors that are usually provided at the lower end of the range, in principle, all suppliers are capable of providing power and high-power semiconductors as the underlying basic technology is similar.

(126) Fifth, while there is a difference between the types of semiconductors included in the categories of "general" semiconductors and "power semiconductors", there is no such difference between the types of devices that are offered in power, high power and extra high power. Furthermore, the types of semiconductors offered by the Parties can be both power and high power (or extra high power).

(127) Lastly, in terms of downstream use, parallel and multilevel connection of lower power semiconductors are increasingly used to better harvest the economy of scale of the lower power components.

(128) In any event, the Notifying Party submits that the market definition can ultimately be left open.[110]

(C) The Commission's assessment

(129) The Commission conducted its market investigation on the basis of and in respect of the plausible sub-segments of power semiconductors mentioned above.

(130) The majority of customers and competitors considered that power semiconductors could be segmented between thyristors, diodes/rectifiers, integrated gate-commutated thyristors (IGCTs), gate turn-off thyristors (GTOs), gate-commutated thyristors (GCTs), transistors (insulated gate-bipolar transistors (IGBTs), IGBT dies, press-pack IGBTs, bipolar semiconductors, IGBT modules, diode modules, Integrated Circuits (ICs), and modules of thyristors/diodes.[111] Some customers and competitors further explained that there could be also other plausible segments of power semiconductors.[112]

(131) As regards plausible segmentation of power semiconductors as per different power levels (power, high power, extra high power), the market investigation yielded mixed results. The majority of customers considered that such segmentation is not warranted.[113] On the other hand, the majority of competitors considered that power semiconductors could be further segmented into power,

[110] The Notifying Party has provided data for various product splits of power semiconductors.

[111] Replies to eQuestionnaire – Customers, questions 30 and 30.1; Replies to eQuestionnaire – Competitors, questions 32 and 32.1.

[112] Replies to eQuestionnaire – Customers, questions 30 and 30.1; Replies to eQuestionnaire – Competitors, questions 32 and 32.1.

[113] Replies to eQuestionnaire – Customers, questions 31 and 31.1.

high power, extra high power.[114] Some competitors however did not consider such a segmentation appropriate. For example, a competitor explained that the distinction between general semiconductors and power semiconductors is sufficient to classify the use of the semiconductor, and a further distinction of power semiconductors is not needed. This competitor also explained that customers usually can choose between several options of power semiconductors depending on the topology used in the system and the design of the system in terms of building block, and this makes a segmentation into power ranges difficult.[115]

(132) As regards a plausible segmentation of IGBT modules into (i) standard IGBT modules and (ii) other (application-specific) IGBT modules, the majority of customers considered that this is not warranted.[116] Competitors' view on this question were split.[117] For example, competitors explained that the value of specific modules parameters differ per application, but they are usually not specific for one application; It is not important to segment the IGBT, as specific modules are only for specific cases; the technology for the IGBT modules is the same.[118]

(133) Taking into account the Notifying Party's arguments and the results of the market investigation, the Commission considers that, in any case, the precise scope of the product market definition for power semiconductors can be left open since the Proposed Transaction does not raise serious doubts on the narrowest plausible segmentation within power semiconductors, which in this case are power semiconductor discretes; power semiconductor modules; high-power semiconductors; power diodes/rectifiers (including all power levels); high power diodes/rectifiers; power thyristors (including all power levels); high power thyristors; standard IGBT modules (which are only high power); thyristor/diode modules (& rectifier bridges) (which are only high power); GTOs, IGCTs & GCTs (which are only high power); press-pack IGBT modules (which are only high power); discrete IGBTs (which are only high power); intelligent power modules (IGBT-IPMS) (which are only high power); power integrated modules (PIM/CIB) (which are only high power); bipolar power transistors (which are only lower to medium power, but not high power); power ICs (which are only lower to medium power, but not high power).[119]

EV charging infrastructure

(A) The Notifying Party's view

(134) The Notifying Party submits that charging infrastructure for electric vehicles could form a distinct product market within the area of Grid Integration, without further distinguishing between the different vehicle types e.g. (a) charging infrastructure for public transportation and (b) charging infrastructure for other

[114] Replies to eQuestionnaire – Competitors, questions 33 and 33.1.
[115] Replies to eQuestionnaire – Competitors, question 33.1.
[116] Replies to eQuestionnaire – Customers, questions 32 and 32.1.
[117] Replies to eQuestionnaire – Competitors, questions 34 and 34.1.
[118] Replies to eQuestionnaire – Competitors, question 34.1.
[119] None of the Parties have any activities in thyristor/diode modules (& rectifier bridges), intelligent power modules (IGBT-IPMS), power integrated modules (PIM/CIB), bipolar power transistors, and power ICs.

vehicles. Nevertheless, the Notifying Party submits that the precise market definition can be left open, as the Proposed Transaction will not raise any competitive concerns in relation to EV charging systems.

(B) The Commission's assessment

(135) The majority of customers and competitors considered that EV charging infrastructure could be viewed as a separate market within GI products.[120]

(136) Furthermore, the majority of customers considered that EV charging infrastructure could be segmented into (i) charging infrastructure for electric vehicles for the public transport (trams and buses), and (ii) charging infrastructure for other electric vehicles types.[121] Some customers explained that not all suppliers are capable of providing (yet) the whole range of charging infrastructure. However, the majority of competitors were of the opposite view, and considered that such a segmentation is not warranted.[122]

(137) Taking into account the Notifying Party's arguments and the results of the market investigation, the Commission considers that, in any case, the precise scope of the product market definition for charging infrastructure for electric vehicles can be left open since the Proposed Transaction does not raise serious doubts on the narrowest plausible segmentation within charging infrastructure for electric vehicles, which in this case is charging infrastructure for electric buses used for public transportation.

4.5.2. Geographic market

(A) The Commission's decisional practice

(138) The Commission has considered in a previous case that the scope of the geographic market for transmission & distribution (T&D) equipment is at least EEA-wide.[123] In another case, the Commission left open the question whether the geographic market for transmission and distribution products is EEA-wide or worldwide in scope.[124]

(B) The Notifying Party's view

(139) The Notifying Party submits that, in particular, HVDC stations and FACTS are tendered globally and all large suppliers are also active globally. The Notifying Party submits that the exact scope of the geographic market for T&D turnkey systems need not be defined in this case, as concerns will neither arise in case of an EEA-wide market definition (in which case there would not be an overlap between the parties, as Hitachi is not active in T&D turnkey systems within the EEA) nor in case of a global market definition.

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120 Replies to eQuestionnaire – Customers, questions 22 and 22.1; Replies to eQuestionnaire – Competitors, questions 24 and 24.1.

121 Replies to eQuestionnaire – Customers, questions 29 and 29.1.

122 Replies to eQuestionnaire – Customers, questions 31 and 31.1.

123 Case COMP/M.3296 - *Areva/ALSTOM T&D*, paragraph 17.

124 Case COMP/M.7278 - *General Electric/Alstom* paragraph 1803.

(140) As regards semiconductors, the market investigation in a recent Commission decision gave strong indications that the markets for semiconductors are worldwide in scope (although the Commission has left open the precise scope of the geographic market).[125]

(141) The Notifying Party submits that the markets for power semiconductors are indeed global in scope and that all the larger providers are also active globally.

(142) The Notifying Party submits that the market segment for charging infrastructure for electric vehicles is global in scope. First, all major suppliers of charging infrastructure for electric vehicles are active globally and sell to customers on a global basis. Second, prices for charging infrastructures for electric vehicles are quoted on a global basis, and do not vary substantially according to geographic region. Third, manufacturers of electric vehicles generally apply a worldwide purchasing policy to most of their input products, including for the charging infrastructures. In any event, the Notifying Party submits that the precise geographic market definition can ultimately be left open in this case as no concerns will arise under any plausible narrower geographic market definition.[126]

(C) The Commission's assessment

(143) The results of the market investigation point towards a worldwide market for all sub-segments of GI products, as a majority of customers[127] and of competitors[128] confirmed. According to a majority of competitors, GI systems and products sold across different world regions are substitutable (e.g., in terms of product specifications, safety and industry standards). Competitors also explained that standards are similar across the world and suppliers can comply with the diverse standards.[129] Both customers and competitors confirmed that suppliers of GI products participate in tenders across the whole of the world.[130]

(144) Within the EEA, competitors do not supply the same GI systems and/or products at materially different prices (by 5-10%) across individual Member States.[131] Transport costs for GI products across the EEA only make up a small percentage of the purchase price of individual GI products (less than 5% according to a majority of customers[132] and between 5-10% according to a majority of competitors[133]). The majority of competitors explained that they participate in tenders for GI systems and products in the whole of the EEA,[134] and this was

125 Case COMP/M.7585 - *NXP Semiconductor / Freescale Semiconductor*, paragraphs 58, 85, 99.

126 The Target is only active in Switzerland, and Hitachi is not active in the market for charging infrastructure for electric vehicles anywhere in the world.

127 Replies to eQuestionnaire – Customers, questions 59, 59.1, 67 and 67.1.

128 Replies to eQuestionnaire – Competitors, questions 63, 63.1, 71 and 71.1.

129 Replies to eQuestionnaire – Competitors, questions 63 and 63.1.

130 Replies to eQuestionnaire – Customers, questions 61 and 61.1; Replies to eQuestionnaire – Competitors, questions 65 and 65.1.

131 Replies to eQuestionnaire – Customers, question 63; Replies to eQuestionnaire – Competitors, question 67.

132 Replies to eQuestionnaire – Customers, question 66.

133 Replies to eQuestionnaire – Competitors, question 70.

134 Replies to eQuestionnaire – Competitors, question 68.

also confirmed by customers.[135] National markets can thus be excluded for the purpose of the present case.

(145) In any event, there is no need to close the geographic market definition for GI products between the EEA and worldwide, as the Proposed Transaction does not lead to serious doubts under any plausible market definition.

4.6. Internet of things (IoT) platforms

4.6.1. Product market

(146) Hitachi has an IoT platform called "Lumada" which can be used for the acceleration of digital solutions using field data from customer assets.

(147) Whilst the term “platform” is used for many sorts of platforms, the “real IoT platforms” are so-called IoT Application Enablement Platforms, i.e. IoT platforms to develop and run industrial IoT applications. In that sense, IoT platforms are comparable to operating systems, since, like an operating system, the platforms serve as a basis for the development and operation of software. In the context of industrial IoT, this software consists of industrial IoT applications that meet industrial customers’ growing needs.[136]

(148) The Commission has not yet considered the supply of IoT platforms such as the Lumada Platform in detail. However, the Commission has examined operating systems on several occasions.[137]

(149) The Notifying Party submits that the relevant product market for the purposes of assessing the Lumada Platform should be the market for the supply of IoT platforms, or, alternatively, a broader market for “infrastructure software” (Infrastructure software is typically distinguished from other (secondary) software products such as middleware, application software and office software, and operating/browser software). According to the Notifying Party, IoT platforms constitute comprehensive solutions with many functionalities, as opposed to a specific solution for a particular functionality. In any event, the Notifying Party submits that the exact product market definition can be left open since the Proposed Transaction does not substantially affect the supply of IoT platforms.

(150) The majority of customers and competitors explained that industrial IoT platforms should not be considered separately from other (non-industrial) IoT platforms.[138] Market respondents explained that a platform is rarely segment specific even though it can host apps that could be segment specific; that such

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135 Replies to eQuestionnaire – Customers, question 64.

136 Form CO, paragraph 984.

137 In terms of operating systems, the Commission has distinguished operating systems for different types of devices (PC vs. smart mobile devices (smartphones and tablets) vs. simple mobile devices such as PDAs), based on different hardware requirements and performance capacities, see Case COMP/M.6381 – *Google/Motorola Mobility*, paragraph 26, referring to Case COMP/C-3/37.792 – *Microsoft*, paragraphs 324-330.

138 Replies to eQuestionnaire – Customers, questions 36 and 36.1; Replies to eQuestionnaire – Competitors, questions 38 and 38.1.

platforms can be employed for both industrial and non-industrial use; and that IoT platforms can span across different commercial segments.[139]

(151) The majority of customers and competitors confirmed that IoT platforms are part of a broader market for "infrastructure software" (infrastructure software being the foundation and thus the infrastructure for the development and operation of secondary software).[140]

(152) Finally, majority of customers and competitors considered that IoT platforms are rather a comprehensive solution with many different functionalities, as opposed to a specific solution for a particular functionality.[141]

(153) Taking into account the Notifying Party's arguments and the results of the market investigation, the Commission considers that, in any case, the precise scope of the product market definition can be left open since the Proposed Transaction does not raise serious doubts on the narrowest plausible segmentation, which in this case is IoT platforms.

4.6.2. Geographic market

(154) The Notifying Party submits that the geographic scope of both the market for IoT platforms or the broader market for infrastructure software is global in scope. According to the Notifying Party, licensing agreements for IoT platforms such as the Lumada platform are generally concluded on a global basis and the objective conditions for competition are essentially the same across the world. Neither import restrictions, transport costs nor technical requirements constitute significant limitations. Certain country-specific limitations due to regulations may exist, but, as far as the supply-side is concerned, they do not constitute an obstacle for swift supply on a global basis.

(155) The Commission market investigation gave strong indications that the market for IoT platforms is worldwide in scope, with the vast majority of competitors and customers confirming such scope.[142] Competitors and customers explained that the market conditions are the same worldwide, and that IoT platforms suppliers are active and offer the same platforms on a worldwide basis.

(156) In any event, there is no need to close the geographic market definition for IoT platforms, as the Proposed Transaction does not lead to serious doubts under any plausible market definition (EEA-wide or worldwide).

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139 Replies to eQuestionnaire – Customers, questions 36 and 36.1; Replies to eQuestionnaire – Competitors, questions 38 and 38.1.

140 Replies to eQuestionnaire – Customers, questions 37 and 37.1; Replies to eQuestionnaire – Competitors, questions 39 and 39.1.

141 Replies to eQuestionnaire – Customers, questions 38 and 38.1; Replies to eQuestionnaire – Competitors, questions 40 and 40.1.

142 Replies to eQuestionnaire – Customers, questions 68 and 68.1; Replies to eQuestionnaire – Competitors, questions 72 and 72.1.

5. COMPETITIVE ASSESSMENT

(157) In the EEA and/or globally, the activities of the Parties give rise to a number of affected markets in relation to HV products, transformers, and GI products. Specifically, the affected markets relate to: (i) three HV product categories (including a number of plausible sub-segments thereof)[143], (ii) two transformer categories (including a number of plausible sub-segments thereof)[144], and (iii) two GI product categories – HVDC and FACTS (including a number of plausible sub-segments thereof).

(158) The competitive assessment below addresses the potential horizontal, vertical and conglomerate effects derived from the Proposed Transaction in the affected markets.

5.1. The Notifying Party's view

(159) The Notifying Party argues that the Proposed Transaction will not give rise to any Significant Impediment to Effective Competition ("SIEC") on any market, for the following reasons:

(i) The activities of the Parties are complementary, both as far as the scope of products are concerned, and in relation to their geographic presence (with Hitachi being active mainly [outside the EEA], where the Target has minor activities at best).[145] In the EEA, overlaps resulting from the activities of the Parties are limited.[146] Even in these markets, the Proposed Transaction will only lead to small market share increments and not give rise to any substantive foreclosure effects.[147]

(ii) Even on a global level, the Parties do not consider each other close competitors and face competitive constraints from major suppliers such as Siemens, GE and Schneider. On the markets for transmission and distribution products as well as turnkey solutions and related services, new Chinese and Korean suppliers are increasingly present.[148]

(iii) On the newer markets for automation software and solutions, the companies face competition both from a large number of established IT companies and

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143 Horizontally, in a global market for HV circuit breakers and HV generator circuit breakers. Vertically, both globally and in the EEA, in the market for HV AIS modules (downstream) and, in the EEA, the overall categories MV products (MV switchgear in particular) and transformers (power transformers in particular)(upstream).

144 Horizontally, in a global market for traction transformers. Vertically, both globally and in the EEA, in the overall category of transformers and for the segment of power transformers (with HVDC, FACTS and HV AIS (Multifunctional) Modules), as well as for the segment of traction transformers (with railway rolling stock (downstream), and bushings, tap changers, measurement and safety devices, and insulation materials and components (upstream).

145 Form CO, paragraph 1085.

146 Form CO, paragraph 1086.

147 Form CO, paragraph 1090.

148 Form CO, paragraph 1087.

their competitors in the "traditional" fields, as well as additional pressure from several new entrants in these markets with low entry barriers. This pressure is exacerbated by the competitive nature of the sector and strong downward pricing pressure from customers.

5.2. Horizontal non-coordinated effects

(160) The Proposed Transaction would, based on the 2018 market share data, give rise to two horizontally affected markets, one in relation to HV circuit breakers, and the other in relation to traction transformers, both in a global market.

(161) Market share data for these affected markets are available in Annex II to this Decision ("Annex II").

5.2.1. HV products

(162) In the group of HV products, based on 2018 figures an affected market only arises on a global[149] market for HV circuit breakers and, in case of a further sub-segmentation, HV generator circuit breakers.

5.2.1.1. HV circuit breakers and HV generator circuit breakers

(A) The Notifying Party's view

(163) The Notifying Party argues that one overall market should be defined for HV products, as outlined in paragraph (17). This market would not be affected either at EEA or at worldwide level. The Parties' combined market shares in an worldwide market for HV products would remain below 20% in the past years ([10-20]% in 2016, [10-20]% […]* and [10-20]% in 2018). In an EEA market for HV products, there would be no overlap as Hitachi is not present.

(164) A further segmentation leads to an affected market for HV circuit breakers and HV generator circuit breakers at worldwide level. However, on an EEA-wide market, there would not be a horizontal overlap between the Parties as Hitachi is not present in the market for HV circuit breakers within the EEA.

(165) The Notifying Party also points out that the market is highly competitive, given the presence of strong global suppliers for HV circuit breakers (and relevant sub-segments), notably GE/Alstom and Siemens, which both have market shares of more than 20%, as well as Meclo and Schneider Electric.

(B) The Commission's assessment

(166) In a global market for HV circuit breakers, the Parties' combined share was approximately [20-30]% in 2016-2018. Hitachi's worldwide market share was below [0-5]% in 2016, 2017 and 2018, and the increment would be *de minimis*. The five year average (2014-2018) was higher, with a combined market share of the Parties of [30-40]% at global level. Given Hitachi's share of [0-5]% (over

[149] On an EEA-wide market, there would be no overlap as Hitachi had no sales in the EEA in 2016-2018.

* Should read: '2017'

the period 2014-18), the increment in market share resulting from the Proposed Transaction would be small even when looking at a longer time frame.

(167) The pre-merger HHI for HV circuit breakers on a worldwide sales basis in 2018 was [2000 – 2500] and the post-merger HHI will be [2000 – 2500] resulting in a delta of [50-60]. As such, the Parties' activities in HV circuit breakers meet the requirements of the filter contained at paragraph 20 of the Horizontal Merger Guidelines.

(168) A further horizontally affected markets would arise in the potential sub-segment of the market of HV generator circuit breakers. These markets are only horizontally affected in a potential worldwide market, as Hitachi is not present in circuit breakers in the EEA. The Parties' combined share in a worldwide market for HV generator circuit breakers was [40-50]% in 2018. Hitachi's worldwide market share was below [0-5]% in 2016, 2017 and 2018, and the increment would be *de minimis* ([0-5]%) in 2018.

(169) The pre-merger HHI for generator circuit breakers on a worldwide sales basis in 2018 was [4000 – 4500] whereas the post-merger HHI will be [4000 – 4500] resulting in a delta of just [60-70]. As such, the Parties' activities in generator circuit breakers meet the requirements of the filter contained at paragraph 20 Horizontal Merger Guidelines.

(170) In addition, the arguments of the Parties that Hitachi and the Target do not compete in the EEA and that on a global level strong competitors are present (see paragraph (159)) were confirmed in the market investigation for HV products in general, without exceptions, and are thus also valid for HV circuit breakers and HV generator circuit breakers.

(171) *First*, the market investigation confirmed the argument of the Notifying Party that it and the Target do not compete in HV products in the EEA. Hitachi is not considered an important supplier of HV products in the EEA, as confirmed by a majority of participants in the market investigation.[150] In particular, Hitachi is not perceived as a key supplier of HV circuit breakers and HV generator circuit breakers by a majority of both customers and competitors,[151] neither in the EEA overall nor in a part of it.[152] Therefore the Proposed Transaction does not materially change the competitive structure of the market for HV circuit breakers and HV generator circuit breakers.

(172) *Second*, the Target's main competitors mentioned by most market participants are Siemens, GE/Alstom, Schneider Electric,[153] with no major differences between countries in the EEA.[154] As a customer explained, "[t]here is a

[150] Replies to eQuestionnaire – Customers, question 73; Replies to eQuestionnaire – Competitors, question 74.

[151] Replies to eQuestionnaire – Customers, question 75; Replies to eQuestionnaire – Competitors, question 74.2.

[152] Replies to eQuestionnaire – Customers, question 76; Replies to eQuestionnaire – Competitors, question 74.3.

[153] Replies to eQuestionnaire – Customers, question 72.

[154] Replies to eQuestionnaire – Customers, question 73; Replies to eQuestionnaire – Competitors, question 73.4.1.

sufficiently large number of companies that manufacture HV products so that a selection is possible at any time." The market investigation also showed that specialised or local suppliers of HV products are generally able to compete with large-scale suppliers such as the Target and Hitachi.[155] There are thus sufficient credible producers of HV circuit breakers and HV generator circuit breakers available throughout the EEA.

(173) *Third*, switching from one supplier of HV products to another is easy. A very large majority of customers reported that they had switched supplier in the past.[156] A clear majority of customers consider that they would retain sufficient alternative sources of supply and could switch to another supplier than the Target or Hitachi if the merged entity were to supply at worse conditions after the Proposed Transaction is implemented.[157] This would be the case for any subsegment of a HV product market, in any part of the EEA.[158] The possibility to switch suppliers of any HV products, including HV circuit breakers and HV generator circuit breakers, thus constitutes additional competitive constraints.

(174) *Finally*, none of the customers who participated in the market investigation expect the Proposed Transaction to have a negative impact on the markets for any HV products, including circuit breakers and generator circuit breakers.[159]

(175) Therefore, taking into account the Notifying Party's arguments and the results to the market investigation, the Commission concludes that the Proposed Transaction does not raise serious doubts as to its compatibility with the internal market as a result of horizontal non-coordinated effects with respect to the affected HV product categories HV circuit breakers and its sub-segment, HV generator circuit breakers.

5.2.2. Transformers

(A) The Notifying Party's view

(176) The Notifying Party submits that the appropriate data with which to assess traction transformers is the order basis, which allows for a more accurate comparison with the order-based railway rolling stock share data. However, if reviewed on a sales basis, the Proposed Transaction would only give rise to one horizontally affected segment in 2018 in the market for traction transformers on a worldwide basis.

(177) The combined share of the Parties would be [40-50]% in 2018 with a *de minimis* increment from Hitachi of [0-5]%. Hitachi had no sales of traction transformers in the EEA in 2018 and, globally, [Confidential details on Hitachi's position on the worldwide market for traction transformers].

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155 Replies to eQuestionnaire – Customers, question 89; Replies to eQuestionnaire – Competitors, question 81.

156 Replies to eQuestionnaire – Customers, question 93.

157 Replies to eQuestionnaire – Customers, question 79.

158 Replies to eQuestionnaire – Customers, questions 80 and 81.

159 Replies to eQuestionnaire – Customers, question 169.

(178) There are no other horizontally affected markets or segments in 2018 within transformers. On this basis, Hitachi submits that the Proposed Transaction will not give rise to any competition concerns.

(B) The Commission's assessment

(179) The Commission considers that, taking into account the Notifying Party's arguments and in particular the fact that Hitachi had sales of traction transformers [outside the EEA], and the minimal increment of market shares worldwide (below [0-5]%, and with an HHI delta brought by the Proposed Transaction below 150[160]). As such, the Parties' activities in traction transformers meet the requirements of the filter contained at paragraph 20 of the Horizontal Merger Guidelines.

(180) Also no respondent to the Commission's market investigation raised any horizontal concerns with respect to the Parties' combined activities in traction transformers. The Commission therefore concludes that the Proposed Transaction does not raise serious doubts as to its compatibility with the internal market with regard to horizontal non-coordinated effects in relation to transformer products.

5.3. Vertical non-coordinated effects

(181) The Proposed Transaction gives rise or strengthens various vertical relationships at EEA-wide or worldwide level. Hitachi has a limited presence in most products and, out of these, the relationships in the table below lead to affected markets. All materially vertically affected markets result from one of the Parties' relatively strong presence in five product markets: HV AIS modules, traction transformers, HVDC and FACTS. Therefore the analysis of vertical non-coordinated affects will focus on the analysis of these product groups.[161]

160 On a worldwide order intake basis both for 2018 and for the period 2013-2018.

161 No vertical link arises in relation to inputs for semiconductors (such as for example electronic adhesives and map molding support tape) as an upstream market and semiconductors as a downstream market. Hitachi Chemical which produces a number of input materials for semiconductors is no longer a subsidiary of and is no longer controlled by Hitachi as of 28 April 2020. Hitachi Chemical is now a consolidated subsidiary of Showa Denko. There is no information suggesting that that divestiture of Hitachi Chemical was caused by the Proposed Transaction (Source: Form CO, Parties' response of 18 May 2020 to Commission's Request for information 11, Parties' response of 19 May 2020 to Commission's Request for information 13).

LIST OF VERTICALLY AFFECTED MARKETS - 2018		
Upstream market (market shares above 30% in bold)	**Downstream market (market shares above 30% in bold)**	**Market shares above 30% (one or both Parties) in either up-or downstream market**
Overall HV products	**HVDC**	EEA, worldwide
Overall HV products	**FACTS**	EEA
Overall HV products	**FACTS – Series Compensation**	worldwide
Overall HV products	**FACTS – (Dynamic) Shunt Compensation**	EEA
Overall MV products	**HVDC**	EEA, worldwide
Overall MV products	**FACTS**	EEA
Overall MV products	**FACTS – Series Compensation**	worldwide
Overall MV products	**FACTS – (Dynamic) Shunt Compensation**	EEA
Overall MV products	**HV AIS Modules**	EEA, worldwide
HV switchgear	**HVDC**	EEA, worldwide
HV switchgear	**FACTS**	EEA
HV switchgear	**FACTS – Series Compensation**	worldwide
HV switchgear	**FACTS – (Dynamic) Shunt Compensation**	EEA
MV switchgear	**FACTS**	EEA
MV switchgear	**FACTS – Series Compensation**	worldwide
MV switchgear	**FACTS – (Dynamic) Shunt Compensation**	EEA
MV switchgear	**HV AIS Modules**	EEA, worldwide
HV GIS	**HVDC**	EEA, worldwide
HV GIS	**FACTS**	EEA
HV GIS	**FACTS – Series Compensation**	worldwide
HV GIS	**FACTS – (Dynamic) Shunt Compensation**	EEA
overall Transformers	**HVDC**	EEA, worldwide
overall Transformers	**FACTS**	EEA
overall Transformers	**FACTS – Series Compensation**	worldwide
overall Transformers	**FACTS – (Dynamic) Shunt Compensation**	EEA
overall Transformers	**HV AIS Modules**	EEA, worldwide
Power Transformers	**HVDC**	EEA, worldwide
Power Transformers	**HV AIS Modules**	EEA, worldwide
Power Transformers	**FACTS**	EEA, worldwide
Power Transformers	**FACTS – Series Compensation**	worldwide
Power Transformers	**FACTS – (Dynamic) Shunt Compensation**	EEA
Traction Transformers	overall Railway Rolling Stock	EEA, worldwide
Traction Transformers	segment for intercity and regional trains	EEA, worldwide
Traction Transformers	segment for intercity and commuter trains	EEA, worldwide
Bushings	**Traction Transformers**	EEA, worldwide
Tap changers	**Traction Transformers**	EEA, worldwide
Measurement and safety devices	**Traction Transformers**	EEA, worldwide
Insulation Materials & Components	**Traction Transformers**	EEA, worldwide

5.3.1. HV products: vertical links in relation to HV AIS modules

(182) Both in the EEA and at worldwide level, two vertically affected markets arise because of the activities of the Target in HV AIS modules, a market which is downstream of the market for MV products (MV switchgear in particular) and transformers (power transformers in particular) where Hitachi also has some very limited activities.

(183) In the EEA, the Target's market share in HV AIS modules was [30-40]% in 2018 ([70-80]% in 2016 and [40-50]% in 2017). In a worldwide market, the Target's market share in HV AIS was [60-70]% in 2018 ([80-90]% in 2016 and [70-80]% in 2017).

(184) As for the upstream markets, only Hitachi is present in the global market for MV switchgear, but its market shares in 2018 remained de minimis below [0-5]%. In the EEA, none of the Parties is active in MV switchgear. In a broader market encompassing all MV products, the Parties' combined market shares in a worldwide market and in the EEA remain below 5%.[162]

(185) In the global market for power transformers, both Parties are active, with a combined market share of [10-20]%. Hitachi's market share is *de minimis* with [0-5]% in 2018. In a broader worldwide market encompassing all transformers, the Parties' combined market share was [10-20]%. In the EEA, only the Target is active in transformers.

5.3.1.1. No foreclosure in relation to HV AIS modules

(186) The Notifying Party argues that the Proposed Transaction does not lead to a foreclosure risk given Hitachi's very limited activities in all plausible upstream markets and a decreasing position of the Target in the downstream market for HV AIS modules. Its market shares have been steadily decreasing in the last three years. A number of other large suppliers of HV AIS Modules, such as GE/Alstom, Pinggao or Siemens, make the global industry increasingly competitive. Pinggao and Siemens gained shares in 2018. Moreover, the Notifying Party argues that the market for HV AIS modules is a niche market with very limited global total market sizes.[163]

(187) In the upstream markets, following the completion of the Proposed Transaction, various credible competitors will pose additional competitive constraints. In the market for MV switchgear, highly competitive alternative suppliers who can equally offer MV switchgear, such as Schneider Electric, Siemens, Eaton, Melco and Toshiba T&D.[164] In the market for power transformers, these include GE/Alstom, Getra, Koncar Siemens, SGB, Tamini-Tes, Xian XD, and TBEA. These will continue to offer MV switchgear and power transformers to competing suppliers of HV AIS modules and hence no input foreclosure will arise.[165]

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[162] Form CO, paragraph 637.
[163] Form CO, paragraph 1114.
[164] Form CO, paragraph 638a.
[165] Form CO, paragraph 636.

(188) In addition, the Notifying Party notes that both MV switchgear and power transformers are inputs to several other downstream applications beyond HV AIS Modules.[166] For instance, power transformers are also an input for substations with customers such as Siemens, GE, Ocean Industry, Hyosung or Eico and hence no customer foreclosure can arise.[167]

(189) The Commission considers that the Proposed Transaction would not lead to a foreclosure risk, as Hitachi will neither have the actual nor potential ability, nor incentive to either hamper or eliminate rivals' access to supplies or markets as a result of the Proposed Transaction.

(190) *First*, the Target's strong position in the downstream market for HV AIS is pre-existing and the Proposed Transaction only leads to affected markets as a result of Hitachi's presence on global markets, outside the EEA. Given that Hitachi's shares even on these global markets are *de minimis* in all plausible upstream markets (as outlined in paragraphs (184)-(185))), the Proposed Transaction would not materially alter the current market structure and the Parties' competitive incentives.

(191) *Second*, the presence of credible competitors in both upstream and downstream markets was confirmed in the market investigation for all HV products, hence also HV AIS, as described in paragraph (172). As outlined in paragraph (173), there are no barriers to switching in any category of HV products. This would pose an additional competitive constraint eliminating the Parties' abilities and incentives to foreclose rivals' access to supplies or markets.

(192) Finally, none of the customers who participated in the market investigation expect the Proposed Transaction to have an impact on competition, input or customer foreclosure, on the markets for any HV products (see also paragraph (174)(174).[168]

(193) The Commission therefore considers that the Proposed Transaction does not raise serious doubts about its compatibility with the internal market in relation to the market for HV AIS modules as the Parties will have neither the ability nor the incentive for input or customer foreclosure.

5.3.2. Transformers: Vertical links in relation to traction transformers

(194) Railway rolling stock manufacturers (including Hitachi) purchase traction transformers (including from the Target) for use in their railway rolling stock.

(195) The Target supplies its traction transformers either directly to railway rolling stock manufacturers ("OEMs") or to system integrators which incorporate the traction transformer into the wider propulsion chain package which is then sold to OEMs. ABB itself has a division, ABB Motion (not part of the Proposed Transaction), which acts as a system integrator, i.e. as an intermediary between the Target's manufacture of traction transformers and the OEM customers, which it offers as part of its propulsion systems.

166 Form CO, paragraph 638b (MV switchgear) and paragraph 636 (power transformers).

167 Form CO, paragraph 636.

168 Replies to eQuestionnaire – Customers, question 169.

(196) Although Hitachi's share in any of the plausible relevant markets in relation to railway rolling stock is below 30% worldwide and in the EEA, the Target's shares in the segment for traction transformers are above 30% both on a global and EEA-wide basis. Therefore, a vertically affected market arises (both globally and in the EEA) because of the activities of ABB in traction transformers.

(197) In the upstream market for traction transformers, the Target's market share was [50-60]% on average from 2013 to 2018 in the EEA; and [40-50]% on average from 2013 to 2018 globally. Hitachi is not active in traction transformers in the EEA, and has a *de minimis* share in traction transformers globally ([0-5]% on average from 2013 to 2018, [with sales outside the EEA]). Moreover, sales are limited since Hitachi does not supply its traction transformers to third parties, except when the railway rolling stock operators ask the contract award winner to use Hitachi traction transformers.

(198) At the downstream level of railway rolling stock, Hitachi's market share was below 10% regardless of the precise market segmentation, both in the EEA and globally. Hitachi's presence is in fact minimal in most railway rolling stock segments both globally and in the EEA, and only in the segment of intercity/regional trains its market shares were higher, but still below 10%, both globally and in the EEA.

(199) More precisely, Hitachi's market share in the EEA and Switzerland was, on average between 2014 and 2018: [0-5]% for very high speed trains, [0-5]% for high speed trains, [5-10]% for intercity/regional trains, and [0-5]% for commuter trains; whereas Hitachi's market share globally (except in China, Japan and South Korea) was, on average between 2014 and 2018: [0-5]% for very high speed trains, [0-5]% for high speed trains, [5-10]% for intercity/regional trains, and [0-5]% for commuter trains.[169]

(200) The Notifying Party submits that the Proposed Transaction will not give rise to any significant impediment to effective competition as a result of this vertical relationship, since there is no risk of input or customer foreclosure.[170]

(A) No upstream input foreclosure for traction transformers

(201) With regard to input foreclosure, the Notifying Party claims that Hitachi will not have the ability or incentive to foreclose railway rolling stock competitors, since:

169 Note that Hitachi is mostly active in the segment of intercity/regional trains, and has a minor/no presence in the segments for (very) high speed trains, which typically require the more sophisticated traction transformers.

170 For all other technically affected markets in the area of transformers (i.e. upstream: bushings, tap changers, measurement and safety devices, and insulation materials and components; and downstream: traction transformers), the Commission does not consider further these links on the basis that Hitachi's individual shares in the respective markets are very limited (if not *de minimis*) and the Target is already integrated, i.e. there would not be any merger-specific foreclosure effects or otherwise a negative impact on competition resulting from the transaction.

- Railway rolling stock manufacturers are typically large vertically integrated companies (e.g. Siemens, Alstom) or have sufficient alternatives to the Target (e.g. Bombardier, Stadler).

- Traction transformers represent a very small share of the total value of AC railway rolling stock, typically less than [0-5]%.

- Railway rolling stock manufacturers and final customers (railway operators) have sufficient countervailing buyer power.

- Most customers of the Target's traction transformers purchase and use them for railway rolling stock contracts for which Hitachi is not a competitor.

- Competing railway rolling stock manufacturers generally bid in tenders without having finalised the contract and terms for the supply of traction transformers so if they have won the project already, Hitachi would have no incentive to not supply the traction transformer for the project with a view to win the business itself.

(202) Moreover, the Notifying Party argues that even if Hitachi had the ability and incentive to foreclose rivals, there would be no significant effect on competition since such a strategy would relate to a limited portion of the downstream market where Hitachi is active.

(203) The market investigation confirms that the Proposed Transaction is unlikely to lead to input foreclosure in the market for traction transformers, either in the EEA or globally. One customer expressed concerns about possible input foreclosure as the merged entity, post-Transaction, would have a strong position in traction transformers and be present in the market for railway rolling stock (particularly intercity and regional trains). However, for the reasons explained below, the Commission finds that this concern is not substantiated and concludes that foreclosure is unlikely.

(204) The Parties are unlikely to have post-Transaction the *ability* to foreclose customers from sourcing traction transformers.

(205) *First*, the Target has a strong position in the upstream market,[171] but below 60% in both in the EEA and globally. In other words, the Target is not an unavoidable trading partner, and even if Hitachi refused to supply the Target's traction transformers to certain customers post-Transaction, these would have sufficient alternatives to source their requirements from. Given the strong presence of vertically integrated companies in these markets and the possible entry of new players, the market share data on the merchant market is not necessarily an indication of market power as discussed below.

(206) There are multiple suppliers of traction transformers for railway rolling stock applications which represent credible alternatives to the Target for traction transformers used across all segments of railway rolling stock. Major traction transformers suppliers are global vertically integrated companies that also sell

[171] Some respondents indicated that ABB is a key supplier of traction transformers, Replies to eQuestionnaire – Competitors, questions 18.3 and 85.1.

railway rolling stocks downstream (e.g. Siemens, Alstom, CRRC Zhuzhou, who use traction transformers captively but also sell them to third parties and represent a large portion of the merchant market demand),[172] and long-established and experienced non-vertically integrated companies such as JST, BNP, ETD, Fuji Electric, Mitsubishi Electric, Končar, and Toshiba.

(207) There are sufficient and credible alternatives, both globally and in the EEA. In the EEA Siemens was the largest competitor with a market share on average between 2013 and 2018 of [10-20]%, Alstom followed with a market share of [5-10]% and JST had a market share of [0-5]%. Globally Zhuzhou was the largest competitor with a market share on average between 2013 and 2018 of [10-20]%, followed by Siemens and Alstom with a market share of [5-10]% and [0-5]% respectively. The market investigation also showed that these companies are credible alternatives to the Target, with equivalent after-sale/support capabilities and technical qualifications.[173]

(208) Customers have largely confirmed during the market investigation that there are credible alternative suppliers to the Target, with a vast majority considering that they will retain sufficient alternative sources of supply and could switch to another supplier if the Parties were to supply at worse conditions after the Proposed Transaction.[174]

(209) *Second*, traction transformers suppliers and vertically integrated OEM competitors have the possibility to expand their (in-house) production of traction transformers, and there are recent examples of such expansion. Vertically integrated players can expand their in-house production. For instance Siemens decided to expand its traction transformers' production [confidential details on the Target's position as a supplier to Siemens]; and Alstom moved to in-house production and [confidential details on the Target's position as a supplier to

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172 "*Alstom's growth has been so significant that Alstom advertises that it has the capacity to produce more than 400 traction transformer units per year, which is more than double Alstom's average internal needs in the period 2016-2018. As such, Alstom has expanded its in-house production not only for Alstom's own internal use, but also as an increasingly active player on the market selling traction transformers to railway rolling stock companies*", Notifying Party's Reply to RFI 8.

173 For instance a customer currently sourcing traction transformers from the Target stated that it "*has already explored other alternatives in the past, among others Mitsubishi, JST as good examples, so we believe other options are available*" (correspondence with traction transformers' customer of 14 May 2020).

174 Replies to eQuestionnaire – Customers, questions 103, 103.1 and 104. Some customers explained that "*competition is present in the transformer business*", and that "*there are other suppliers in the market*". Some other customers expressed doubts but overall were positive about the existence of alternatives, e.g. a customer stated that "*for traction applications that is something we are not fully sure but we believe we should find an additional partner/supplier in Europe*". Another customer stated that "*there are few other alternatives on these solutions as JST and Mitsubishi as relevant independent companies. Also Siemens is another potential supplier …*" and, when asked whether other suppliers had a similar offering to that of the Target, that e.g. "*Mitsubishi have references in all types of rolling stocks platforms actually running (…) with different technologies of materials and requirements for different application (…). In the case of JST they have solutions for all type of platforms (…)*", and that alternative suppliers "*have the capacity to supply transformers for the different types of rolling stock platforms*" (i.e. for all railway rolling stock segments) (correspondence with customer of 7 and 8 May 2020).

Alstom] reduced its demand of traction transformers from the Target as a consequence.[175]

(210) *Third*, non-vertically integrated OEM competitors may start the in-house production of traction transformers, since there are no material barriers to entry in terms of access to raw materials, capacity constraints, intellectual property or regulatory aspects. In fact the barriers to entry would be lower for a railway rolling stock firm, as it would be able to more easily validate its own in-house design, and would face less risk as it has a guaranteed purchaser.[176]

(211) New companies could also enter the traction transformers' market. The Notifying Party estimates that it would take a maximum of two years, if not less, for a non-established player to enter the market.[177] Traction transformers are technically mature products and there are no significant scale economies. As explained above, there are no significant barriers to entry; and while a traction transformer needs to be tested as part of a railway rolling stock comprehensive certification process, this is the case for all traction transformer brands due to testing and certification requirements for each project. In addition, there are examples of recent entry and expansions in the EEA, e.g. Mitsubishi Electric, or companies which are currently developing traction transformers, e.g. Turkish company Sönmez Transformer or Indian manufacturers such as HVEPL or JST Stesalit Transformers.

(212) *Fourth*, customers (either OEMs or system integrators) can switch their traction transformer supplier in a relatively short time. Years often pass between the announcement of a railway rolling stock tender, the contract award and the first delivery of the railway rolling stock; therefore, customers of traction transformers can switch their supplier in the timeframe of one project.[178] Moreover, in the railway rolling stock where Hitachi is mostly active (intercity/regional trains) the traction transformers required are typically less sophisticated than those for (high) speed trains, and therefore switching is easier in such a segment, as confirmed by the market investigation.[179]

(213) The market investigation confirmed that the vast majority of customers can and do switch their transformers suppliers.[180]

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[175] [Confidential details on the Target's position as a supplier to Alstom].

[176] There are examples of this, such as collaborations between railway rolling stock manufacturers in order to supply traction transformers (e.g. Bombardier's joint venture BNP, or Alstom's joint venture EKZ, see https://www.bombardier.com/en/media/newsList/details.bt-20170807-bombardiers-chinese-joint-venture-to-provide-propulsion-and-control-equipment-for-nanchang-metro-01.bombardiercom.html; and https://www.alstom.com/alstom-kazakhstan).

[177] Notifying Party's Response to RFI 8.

[178] Notifying Party's Response to RFI 8.

[179] One customer explained with regard to their ability to switch supplier for traction transformers that "*complexity of the product differs from Commuter and Regional applications to HST or VHST, so for certain tenders and/or platforms the decision could be harder or simpler to take*" (correspondence with customer of 14 May 2020).

[180] Replies to eQuestionnaire – Customers, question 116: 77% of respondents indicated that they have in the past switched to a different supplier and some customers explained that "*varying on projects, we have used other suppliers for traction transformers*".

(214) The Parties are also unlikely to have post-Transaction the *incentive* to foreclose customers from sourcing traction transformers.

(215) *First*, as explained above, traction transformers represent a small share of the total value of railway rolling stock, and are not generally purchased before the award of a contract for a certain railway rolling stock project. The market investigation confirmed that most suppliers have the ability to design the transformer according to the required functionality or specific requirements from the customer,[181] and confirmed the Parties' proposition that railway rolling stock manufacturers are first awarded a contract and afterwards negotiate and even co-design with the selected traction transformer supplier.[182]

(216) In other words, Hitachi will not have an incentive to stop supplying ABB's traction transformers to its competitors downstream. Once the latter are awarded a project, a refusal to supply traction transformers to them would entail a loss of the upstream profit without any gain at the downstream level.

(217) *Second*, even if the sales of traction transformers were executed before the award of a railway rolling stock project, and Hitachi decided to not supply traction transformers to OEM customers also bidding for that project, this would (i) in principle not materialise in non-vertically integrated OEMs being excluded from the bid (since they have alternative suppliers they can turn to, or produce in-house, see paragraphs (205)-(211) above), and (ii) even if non-vertically integrated companies were excluded from the bidding process, this would also increase the options of vertically integrated competitors to win the project. Since the diversion ratio from non-vertically integrated players is not 100% towards Hitachi, it is unlikely that Hitachi would have the incentive to sacrifice profits upstream (the sale of traction transformers) as this loss would not automatically and in all cases be compensated by profits obtained downstream (as a result of Hitachi winning the railway rolling stock project).

(218) *Third*, the Notifying Party has indicated that it will continue supplying traction transformers to ABB Motion post-Transaction [Confidential details on future contractual arrangements between the Parties]. As noted above, ABB Motion (not part of the Proposed Transaction) acts as a system integrator, i.e. as an intermediary between the Target's manufacture of traction transformers and the OEM customers, which it offers as part of its propulsion systems. [Confidential details on future contractual arrangements between the Parties]. Therefore, as a result of the Proposed Transaction, Hitachi will not acquire the relationships with ABB Motion's customers, which will continue to be served by ABB Motion. [Confidential details on future contractual arrangements between the Parties]. Finally, [Confidential details on future contractual arrangements between the Parties], the other two reasons given above for not finding a SIEC would still apply, and the reasoning below would still apply.

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181 Replies to eQuestionnaire – Competitors, question 17.

182 Customers have confirmed this, e.g. a customer indicated that "*the usual process starts with the request for an offer for rolling stock vehicles of a customer, on which basis the manufacturer works out a concept and simultaneously requests an offer from a traction transformer supplier. The manufacturer then submits the offer, gets awarded and finally is able to award the traction transformer supplier. In summary, the rolling stock award is done prior to the purchase of the traction transformer*" (correspondence with customer of 8 May 2020).

(219) Moreover, even if the Parties had the *ability* and *incentive* to foreclose rival railway rolling stock manufacturers from sourcing the Target's traction transformers by raising its prices, such strategy would not have a significant effect on the market. Even if customers could not or decided not to switch to alternative suppliers, a hypothetical price increase of the Target's traction transformers post-Transaction would in principle not translate into OEMs being foreclosed downstream to the benefit of Hitachi. In other words, increasing the Target's traction transformers prices would not mean that OEMs cannot be awarded a railway rolling stock project (which Hitachi could therefore win). This is because traction transformers represent a small fraction of the railway rolling stock project's total cost ([typically less than [0-5]%] according to the Notifying Party and in any event below 8%, as confirmed by the market investigation).[183]

(B) No downstream customer foreclosure for railway rolling stock applications

(220) The Parties submit that there is also no risk of customer foreclosure in relation to traction transformers, since the Target is not active downstream in the manufacturing of railway rolling stock, and Hitachi does not currently source traction transformers from any supplier in Europe other than the Target, i.e. the purchases of traction transformers by Hitachi are effectively already internalised and the market structure will therefore remain unaffected as the demand of Hitachi is already internalised.

(221) Moreover, even if Hitachi sourced from third party traction transformers suppliers, its market share in the downstream market for railway rolling stock, regardless of its precise segmentation, is not substantial (its highest market share is that for intercity/regional trains, which was in any event below 10% on average between 2014 and 2018, both in the EEA and globally). A foreclosure strategy is therefore not plausible even if the Parties had the incentive to do so, since traction transformers suppliers would always be able to address a substantial proportion of the demand.

(222) The predominant view among the respondents of the market investigation confirms that the Proposed Transaction would not have a substantial impact on the market, and the Commission did not receive any substantiated complaint.[184]

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183 Notifying Party's Response to RFI 8. A customer stated that, in their experience, "*the value of the traction transformer lies between 4-8%*" (correspondence with customer of 8 May 2020).

184 Amongst customers who responded to the Commission's market investigation, the vast majority considered that the Proposed Transaction would have a neutral effect, including on the supply of transformers (Replies to eQuestionnaire – Customers, question 187). For completeness, only one customer expressed that Hitachi could have, post-Transaction, the incentive to weaken its competitors [Confidential details on the issues raised by the customer] (correspondence with customer of 6 and 8 May 2020). However, the Commission asked subsequent questions to this and other respondents and excluded that the Proposed Transaction will likely enable or incentivise the merged entity to foreclose rival railway rolling stock manufacturers. [Confidential details on the issues raised by the customer]. Moreover, the same customer confirmed the Notifying Party's argument that the rolling stock award is done prior to the purchase of the traction transformer (see paragraph (215)), and that the value of the traction transformer within the total value of a railway rolling stock project is below 8% (see paragraph (219)). As explained above, other customers confirmed that there are sufficient suppliers of traction transformers as an alternative to the Target's offering (see paragraph (208)).

(223) The Commission therefore considers that the Proposed Transaction does not raise serious doubts about its compatibility with the internal market as the Parties will have neither the ability nor the incentive to input or customer foreclose their competitors in relation to the market for traction transformers used for railway rolling stock.

5.3.3. Grid integration

Vertical links in relation to HVDC

Vertical link Overall HV products – HVDC

(224) Under a narrower market definition looking at HVDC, affected markets could arise as a result of the combination of Hitachi's activities in overall HV products at worldwide level and the Target's activities in HVDC. The Target's worldwide market share in HVDC was [30-40]% on the basis of average projects won in 2008-2018, whereas its market share in the EEA was [40-50]% on the basis of that same parameter.[185] The Target's projects-based market share within the segment for HVDC Light in 2008-2018 was [50-60]% at worldwide level and [50-60]% at EEA-wide level. In HVDC Classic, the Target's projects-based market share in 2008-2018 was [20-30]% at worldwide level and [30-40]% at EEA-wide level.

(225) The Commission considers that the Proposed Transaction will not lead to a foreclosure risk, since the merged entity will neither have the ability nor the incentive to foreclose.

(226) Hitachi's presence in overall HV products is limited (with a market share of only [0-5]% in 2016-2018 worldwide and [0-5]% in the EEA). In particular, there are no indications of merger-specific foreclosure concerns, as the Target is already active both upstream and downstream pre-merger, and the addition of Hitachi's market position in overall HV products will not appreciably reinforce this position (the post-merger share of the merged entity in overall HV products will be only [10-20]%, with an increment of only [0-5]% under a narrow product market definition at worldwide level).

(227) Hitachi will have neither the ability nor the incentive to either hamper or eliminate rivals' access to supplies or markets as a result of the Proposed Transaction. There are many alternative suppliers for overall HV products upstream (such as e.g. Siemens, GE/Alstom, Pinggao, Hyosung, and others) and at the downstream level, there are other customers (such as e.g. HVDC suppliers Siemens and GE/Alstom).

Vertical link overall MV products – HVDC

(228) Given the limited activities of both Hitachi and the Target in MV products (the Parties' combined market share in 2018 was less than 5% both at worldwide and at EEA-wide level), the fact that Hitachi is not active in MV products within the

[185] Source: Form CO, Table 7.71a Worldwide projects and shares (excluding China and Japan) within the segment for HVDC systems; Table 7.72a EEA-wide projects and shares within the segment for HVDC systems.

EEA, and that the Target is already active both upstream and downstream pre-merger, the Commission considers that the Proposed Transaction will not lead to a foreclosure risk, since the merged entity will neither have the ability nor the incentive to engage in input or customer foreclosure.

Vertical link HV switchgear – HVDC

(229) Under a narrower market definition looking at HVDC, affected markets could arise (at worldwide level) as a result of the combination of Hitachi's activities in HV switchgear and the Target's activities in HVDC. The Target's worldwide market share in HVDC was [30-40]% on the basis of average projects won in 2008-2018, whereas its market share in the EEA was [40-50]% on the basis of that same parameter. The Target's projects-based market share within the segment for HVDC Light in 2008-2018 was [50-60]% at worldwide level and [50-60]% at EEA-wide level. In HVDC Classic, the Target's projects-based market share in 2008-2018 was [20-30]% at worldwide level and [30-40]% at EEA-wide level.

(230) The Commission considers that the Proposed Transaction will not lead to a foreclosure risk, since the merged entity will neither have the ability nor the incentive to foreclose.

(231) Hitachi's presence in HV switchgear is limited (with a market share of only [5-10]% in 2016-2018 at worldwide level and [0-5]% at EEA-wide level). In particular, there are no indications of merger-specific foreclosure concerns, as the Target is already active both upstream and downstream pre-merger, and the addition of Hitachi's market position in HV switchgear will not appreciably reinforce this position (noting that the post-merger market share of the merged entity in HV switchgear will be [10-20]%, with an increment of just [5-10]%).

(232) Hitachi will neither have the actual nor potential ability, nor incentive to either hamper or eliminate rivals' access to supplies or markets as a result of the Proposed Transaction. There are many alternative suppliers for HV switchgear upstream (such as e.g. Siemens, GE/Alstom, Pinggao, and Hyosung) and at the downstream level, there are other HV switchgear customers (such as e.g. HVDC suppliers Siemens and GE/Alstom).

Vertical link HV GIS – HVDC

(233) Under a narrower market definition looking at HVDC, affected markets could arise as a result of the combination of Hitachi's activities in HV GIS and the Target's activities in HVDC (both under a worldwide and EEA-wide market definition). The Target's worldwide market share in HVDC was [30-40]% on the basis of average projects won in 2008-2018, whereas its market share in the EEA was [40-50]% on the basis of that same parameter. The Target's projects-based market share within the segment for HVDC Light in 2008-2018 was [50-60]% at worldwide level and [50-60]% at EEA-wide level. In HVDC Classic, the Target's projects-based market share in 2008-2018 was [20-30]% at worldwide level and [30-40]% at EEA-wide level.

(234) The Commission considers however that the Proposed Transaction will not lead to a foreclosure risk, since the merged entity will neither have the ability nor the incentive to foreclose.

(235) Hitachi's presence in HV GIS is limited (in 2018 market share of [5-10]% at worldwide level and [0-5]% at EEA-wide level), whereas the Target had a market share of [10-20]% at worldwide level and [10-20]% at EEA-wide level in 2018. There are no indications of merger-specific foreclosure concerns, as the Target is already active both upstream and downstream pre-merger, and the addition of Hitachi's market position in HV GIS will not appreciably reinforce this position. (The Commission also notes that the post-merger share of the merged entity in HV GIS will still remain clearly below 30%, with an increment of about [5-10]% under a narrow product market definition and wide geographic market definition).

(236) Hitachi will neither have the actual nor potential ability, nor incentive to either hamper or eliminate rivals' access to supplies or markets as a result of the Proposed Transaction. There are alternatives in the EEA and global suppliers for HV GIS upstream (such as e.g. Siemens, GE/Alstom, Pinggao, and others) and at the downstream level, there are other HV GIS customers (such as e.g. HVDC suppliers Siemens and GE/Alstom, and Chinese companies).

Vertical link Transformers – HVDC

(237) In a broader worldwide market encompassing all transformers, the Parties' combined market share in 2018 was [10-20]% (the Target – [10-20]%, Hitachi – [0-5]%). In the EEA, only the Target is active in transformers with a market share of [10-20]% in 2018.

(238) In a narrower market for power transformers, both Parties are active, with a combined market share in 2018 of [10-20]% at worldwide level (the Target – [10-20]%, Hitachi – [0-5]%). In the EEA, only the Target is active in power transformers with a market share of [20-30]% in 2018.

(239) The Target's worldwide market share in HVDC was [30-40]% on the basis of average projects won in 2008-2018, whereas its market share in the EEA was [40-50]% on the basis of that same parameter. The Target's projects-based market share within the segment for HVDC Light in 2008-2018 was [50-60]% at worldwide level and [50-60]% at EEA-wide level. In HVDC Classic, the Target's projects-based market share in 2008-2018 was [20-30]% at worldwide level and [30-40]% at EEA-wide level.

(240) The Commission considers that the Proposed Transaction will not lead to a foreclosure risk, since the merged entity will neither have the ability nor the incentive to foreclose.

(241) There are no indications of merger-specific foreclosure concerns, as the Target is already active both upstream and downstream pre-merger, and the addition of Hitachi's *de minimis* market position in transformers and power transformers will not appreciably reinforce this position. Furthermore, Hitachi is not active in transformers (and power transformers) in the EEA. Also, in the market for

(power) transformers there are other suppliers such as GE/Alstom, Koncar, SGB, Tamini-Tes, Xian XD, and others.

Vertical links in relation to FACTS

Vertical link Overall HV products – FACTS

(242) Under a narrower market definition looking at FACTS (and sub-segments of FACTS), affected markets could arise as a result of the combination of Hitachi's activities in overall HV products at worldwide level and the Target's activities in FACTS. The Target's worldwide market share in 2018 in FACTS was [5-10]%, and [30-40]% at EEA-wide level. On the segment for FACTS – Series Compensation, the Target's market share in 2018 was [50-60]% at worldwide level, and on the segment for FACTS – (Dynamic) Shunt Compensation, the Target's market share in 2018 was [10-20]% at worldwide level and [30-40]% at EEA-wide level.

(243) The Commission considers that the Proposed Transaction will not lead to a foreclosure risk, since the merged entity will neither have the ability nor the incentive to foreclose.

(244) Hitachi's presence in overall HV products is limited (with a market share of only [0-5]% in 2016-2018 at worldwide level and [0-5]% at EEA-wide level). In particular, there are no indications of merger-specific foreclosure concerns, as the Target is already active both upstream and downstream pre-merger, and the addition of Hitachi's *de minimis* market position in overall HV products will not appreciably reinforce this position.

(245) Hitachi will have neither the ability nor the incentive to either hamper or eliminate rivals' access to supplies or markets as a result of the Proposed Transaction. There are many alternative suppliers for overall HV products upstream (such as e.g. Siemens, GE/Alstom, Pinggao, Hyosung, and others) and at the downstream level, there are other customers (such as e.g. FACTS suppliers Siemens, GE/Alstom, and others).

Vertical link MV products – FACTS

(246) Given the limited activities of both Hitachi and the Target in MV products (the Parties' combined market share was less than 5% both at worldwide level and at EEA-wide level in 2018), the fact that Hitachi is not active in MV products within the EEA, and that the Target is already active both upstream and downstream in MV products and FACTS pre-merger, the Commission considers that the Proposed Transaction will not lead to a foreclosure risk, since the merged entity will neither have the ability nor the incentive to engage in input or customer foreclosure.

Vertical link HV switchgear – FACTS

(247) Under a narrower market definition looking at FACTS, affected markets could arise (at worldwide level) as a result of the combination of Hitachi's activities in

HV switchgear and […]* activities in FACTS. […]* worldwide market share in 2018 in FACTS was [5-10]%, and [30-40]% at EEA-wide level. On the segment for FACTS – Series Compensation, the Target's market share in 2018 was [50-60]% at worldwide level, and on the segment for FACTS – (Dynamic) Shunt Compensation, the Target's market share in 2018 was [10-20]% at worldwide level and [30-40]% at EEA-wide level.

(248) The Commission considers that the Proposed Transaction will not lead to a foreclosure risk, since the merged entity will neither have the ability nor the incentive to foreclose.

(249) Hitachi's presence in HV switchgear is limited (with a market share of only [5-10]% in 2016-2018 at worldwide level and [0-5]% at EEA-wide level). In particular, there are no indications of merger-specific foreclosure concerns, as […]* is already active both upstream and downstream pre-merger, and the addition of Hitachi's market position in HV switchgear will not appreciably reinforce this position.

(250) Hitachi will neither have the actual nor potential ability, nor incentive to either hamper or eliminate rivals' access to supplies or markets as a result of the Proposed Transaction. There are many alternative suppliers for HV switchgear upstream (such as e.g. Siemens, GE/Alstom, Pinggao, Hyosung) and at the downstream level, there are other HV switchgear customers (such as e.g. FACTS suppliers Siemens, GE/Alstom, and others).

Vertical link MV switchgear - FACTS

(251) Given the limited activity of Hitachi in MV switchgear (worldwide market share of less than [0-5]% in 2016-2018), and that Hitachi is not active in MV switchgear in the EEA, the Commission considers that the Proposed Transaction will not lead to a foreclosure risk, since the merged entity will neither have the ability nor the incentive to engage in input or customer foreclosure.

Vertical link HV GIS – FACTS

(252) Under a narrower market definition looking at FACTS, affected markets could arise as a result of the combination of Hitachi's activities in HV GIS and the Target's activities in FACTS. […]* worldwide market share in 2018 in FACTS was [5-10]%, and [30-40]% at EEA-wide level. On the segment for FACTS – Series Compensation, the Target's market share in 2018 was [50-60]% at worldwide level, and on the segment for FACTS – (Dynamic) Shunt Compensation, the Target's market share in 2018 was [10-20]% at worldwide level and [30-40]% at EEA-wide level.

* Should read: 'the Target'.
* Should read: 'the Target'.
* Should read: 'the Target'.
* Should read: 'the Target'.

(253) The Commission considers that the Proposed Transaction will not lead to a foreclosure risk, since the Parties will neither have the ability nor the incentive to foreclose.

(254) Hitachi's presence in HV GIS is limited (in 2018 market share of [5-10]% at worldwide level and [0-5]% at EEA-wide level), whereas the Target had a market share of [10-20]% at worldwide level and [10-20]% at EEA-wide level in 2018. In particular, there are no indications of merger-specific foreclosure concerns, as the Target is already active both upstream and downstream pre-merger, and the addition of Hitachi's market position in HV GIS will not appreciably reinforce this position (noting that the post-merger share of the merged entity in HV GIS will still remain clearly below 30%, with an increment of about [5-10]% under a narrow product market definition and wide geographic market definition).

(255) Hitachi will neither have ability, nor incentive to either hamper or eliminate rivals' access to supplies or markets as a result of the Proposed Transaction. There are alternative suppliers for HV GIS upstream (such as e.g. Siemens, GE/Alstom, Pinggao, others), and at the downstream level, there are other HV GIS customers (such as FACTS suppliers Siemens, GE/Alstom and others).

Vertical link Transformers – FACTS

(256) In a broader worldwide market encompassing all transformers, the Parties' combined market share in 2018 was [10-20]% ([…][*] – [10-20]%, Hitachi – [0-5]%). In the EEA, only the Target is active in transformers with a market share of [10-20]% in 2018. In a narrower market for power transformers, both Parties are active, with a combined market share in 2018 of [10-20]% at worldwide level ([…][*]– [10-20]%, Hitachi – [0-5]%). In the EEA, only […][*] is active in power transformers with a market share of [20-30]% in 2018.

(257) The Target's worldwide market share in 2018 in FACTS was [5-10]%, and [30-40]% at EEA-wide level. On the segment for FACTS – Series Compensation, the Target's market share in 2018 was [50-60]% at worldwide level, and on the segment for FACTS – (Dynamic) Shunt Compensation, the Target's market share in 2018 was [10-20]% at worldwide level and [30-40]% at EEA-wide level.

(258) The Commission considers that the Proposed Transaction will not lead to a foreclosure risk, since the merged entity will neither have the ability nor the incentive to foreclose.

(259) There are no indications of merger-specific foreclosure concerns, as the Target is already active both upstream and downstream pre-merger, and the addition of Hitachi's *de minimis* market position in transformers will not appreciably reinforce this position. Furthermore, Hitachi is not active in transformers (and power transformers) in the EEA. Also, in the market for (power) transformers

[*] Should read: 'the Target'.

[*] Should read: 'the Target'.

[*] Should read: 'the Target'.

there are other suppliers such as GE/Alstom, Koncar, SGB, Tamini-Tes, Xian XD, and others, and there are other FACTS suppliers such as Siemens, GE/Alstom and others.

Conclusion on vertical non-coordinated effects in relation to GI products

(260) With view of the above, the Commission concludes that the Proposed Transaction does not raise serious doubts as to its compatibility with the internal market with regard to vertical non-coordinated effects in relation to any Grid Integration products including HVDC and FACTS, and any plausible sub-segments of these products (see Section 4.5 above).

5.4. Conglomerate effects

(261) The Proposed Transaction involves a large number of products and applications across the area of Power Transmission and Distribution ("T&D"), in which both Parties are active.

(A) The Notifying Party's view

(262) The Notifying Party submits that the Proposed Transaction will not give rise to conglomerate concerns in the area of T&D for the following reasons:

(i) In the area of T&D, closely related markets as a result of the Proposed Transaction would only arise in case of a worldwide geographic market definition, as the Parties' activities have a different geographic focus (as Hitachi is essentially not active in Europe or the EEA as far as T&D is concerned);

(ii) Hitachi's worldwide market share in relation to all plausible relevant product markets in the area of T&D in which it is active[186] is low (if not *de minimis*) and will only insignificantly add to the Target's market position before the Proposed Transaction;

(iii) In the few plausible product markets, in which - only under a narrow market definition - the merged entity's combined share could be considered "significant" in the sense of the Non-Horizontal Merger Guidelines, this share is either not increased a result of the Proposed Transaction (as there is no overlap), or the increment is minimal;

(iv) At a worldwide level, the combination of the Target's portfolio with Hitachi's concentrated activities does not give rise to any new combinations of products, that could be tied or bundled across the merged entity's portfolio, regardless of market shares;

(v) To the extent it exists at all, the possibility to offer bundled or tied products would already exist for the Target pre-merger; also, the fact that the Target has so far not offered any bundles of T&D products pre-merger, despite already now having a comprehensive portfolio of

[186] Certain HV, MV and LV Products, Transformers, Grid Automation and Grid Integration including Power Semiconductors.

products, suggests that such offerings are generally not likely to be attractive in the area of T&D;

(vi) The main competitors of the merged entity in the area of T&D have comparable portfolios and could deploy effective and timely counter-strategy in the event the Parties were able to bundle or tie their products;

(vii) As customers can pick and combine equipment based on relevant specifications for projects, a bundled offer may be risky and unprofitable, if it does not meet customers' requirements.

(263) The Notifying Party also submits that the Proposed Transaction will not give rise to conglomerate concerns from the combination of Hitachi's IoT solutions with the Target's business activity such as for example Grid Integration, HVDC stations, FACTS systems or substations offered by the Target, for the following reasons:

(i) Customers are not interested in simultaneously buying GI products and an IoT platform, and may have developed their own IoT platform and solutions;

(ii) Technical bundling is not currently possible, and contractual tying would also not be a commercially realistic strategy;

(iii) Competitors could offer equally attractive bundles;

(iv) Hitachi would have no incentive to bundle, as it may incur significant losses;

(v) IT solutions represent a very small proportion of the Grid Integration system;

(vi) Hitachi is not a leader on the market for IoT platforms (there are other large undertakings, such as Dell EMC, Hewlett Packard Enterprise, IBM, and Lenovo, who are specialized IT companies);

(vii) Bundling or tying would have no effect on prices and choice for products.

(264) The Notifying Party also submits that the Proposed Transaction will not give rise to conglomerate concerns as regards also the Parties' semiconductors' portfolio for the following reasons.

(265) The Target offers a comprehensive portfolio of power and high power semiconductors prior to the Proposed Transaction.[187] The Proposed Transaction

[187] This includes also power semiconductors for MV power converters and drives. However, MV power converters and drives currently offered by ABB are not part of the Target business and are outside of the scope of the Proposed Transaction. Almost all of ABB's MV (and LV) equipment business, with the exception of those products expressly mentioned in the Form CO (i.e., MV Surge Arresters, MV and LV Cable Accessories, and MV and LV Capacitors, Harmonic filters and Other RPC Products), will remain

will not significantly alter or expand this offering and therefore not alter any incentive to engage in a foreclosure strategy on prices and choice for products. Hitachi submits that such a strategy would not make sense from either a technical or economic point of view for the following reasons:[188]

(i) While there are hundreds of different semiconductor devices, customers usually use either one particular type of semiconductor device, or a project-based combination of different devices, in their equipment. High power semiconductor applications are complex and, to reduce prototyping, require evaluations and analyses to find the best possible semiconductor for customized settings and conditions. Finding the right device, or tailored combination of devices, is the key element of a successful project-based procurement process for the customer and normally requires a case-by-case assessment. Therefore, bundling or tying of certain devices does not make sense from a technical point of view. Rather on the contrary, tying or bundling products that do not perfectly match the customers' specifications for a particular project bears the risk of losing those customers if they are unable to source the precise product (or combination of products) suitable for their needs;

(ii) The market for power semiconductors (including all power levels), as well as any plausible segment thereof, is highly fragmented with many established suppliers that can all supply the different types of power and high power semiconductors. The industry is competitive and changes rapidly, allowing companies to enter or expand their share by bringing new products to the market. Any tying or bundling strategy would therefore not force a customer to buy the tied product, as they could switch to competing suppliers offering the same products without a tie or outside of a bundle;

(iii) For standard (non-integrated) IGBT modules in particular, the Parties' combined worldwide market share in 2016-2018 was in the range of [0-5]%-[5-10]% and they face competition from larger players such as Infineon Technologies, Mitsubishi, Fuji Electric, and Semikron, who equally supply other types of power and high power semiconductors.[189] It is therefore possible for customers to switch suppliers for any given device;

(iv) Customers for power and high power semiconductors are large established players in both traditional and innovative industries, who enjoy a significant degree of countervailing purchasing power vis-à-vis the semiconductor manufacturers;

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with ABB's Electrification ("EL") business post-transaction (Parties' response of 8 May 2020 to Commission's Request for information 9).

188 Parties' response of 8 May 2020 to Commission's Request for information 9.

189 Per Table 7.84j at paragraph 1286 of the Form CO, the same applies with regard to the EEA, where the Parties' combined share in 2016-2018 was similarly low (between [5-10]%-[5-10]% in 2016-2018) and large players are also active (e.g., Infineon Technologies, Semikron, Mitsubishi, Bosch, Vincotech).

(v) Even if the merged entity were to tie or bundle its semiconductor devices as a result of the Proposed Transaction, it is therefore unlikely that such strategy would be successful or result in any anti-competitive foreclosure effects.

(B) The Commission's assessment

(266) The Commission has investigated whether the Proposed Transaction could give rise to conglomerate effects in relation to the combination of the Parties' activities and has reached the conclusion that it does not raise serious doubts in this regards for the following reasons.

(267) As far as the area of T&D is concerned, the Target is already offering a comprehensive portfolio of products for various applications worldwide. As the Parties' portfolios are largely complementary the Proposed Transaction will not result in new opportunities to bundle products.[190]

(268) Customers confirmed that, generally speaking, neither ABB nor Hitachi currently ties or bundles its products.[191] In the few cases where ABB does, bundling is a result of the negotiations with the customer.[192] The tendency to sell products in a bundle thus "varies from customer to customer and even within customer, from project to project".[193] Many customers explained that there is a widespread "preference to mix and match to avoid dependency towards suppliers".[194] The merged entity will thus not be able to exercise any leverage from the breadth of its portfolio.

(269) Customers also indicated that products supplied by ABB and /or Hitachi will not be more attractive even if a wider choice of those products were to be available from the merged entity post-Transaction.[195] This again confirms that, therefore, the enlarged portfolio is unlikely to give leverage to the merged entity.

(270) Customers also indicated that even if post-transaction Hitachi were to tie or bundle some of its products, they would have sufficient suppliers to purchase the products separately at competitive conditions.[196] Customers explained that they have a multitude of other suppliers to choose from, such as for example Siemens, Schneider, GE, Mitsubishi, and others. Competitors also indicated that enough competition would remain in the market even in a hypothetical tying/bundling strategy of the merged entity, and that competitors would be able to compete with a combined offer of the merged entity,[197] as well as that customers will have sufficient suppliers to purchase the products from

[190] Form CO, paragraph 945.
[191] Replies to eQuestionnaire – Customers, questions 170 and 171.
[192] Replies to eQuestionnaire – Customers, question 170.2.
[193] Replies to eQuestionnaire – Competitors, question 156.
[194] Replies to eQuestionnaire – Customers, question 184.
[195] Replies to eQuestionnaire – Customers, question 177.
[196] Replies to eQuestionnaire – Customers, question 176.
[197] Replies to eQuestionnaire – Competitors, question 147.

separately at competitive conditions.[198] As a result, the merged entity will still face competition post-Transaction.

(271) IT solutions represent (such as Hitachi's Lumada Platform) a (very small) proportion of the value of an HVDC system (or any other Grid Integration system).[199] Hitachi is not a leader on the market for IoT platforms and other large undertakings, such as Dell EMC, Hewlett Packard Enterprise, IBM, and Lenovo, who are specialized IT companies with significant buying power and leverage are equally present in this sector.[200]

(272) The majority of the participants in the market investigation did not have any conglomerate concerns in particular as regards the combination of Hitachi's IT solution portfolio and/or Hitachi's IoT platform solutions (Lumada Platform) with the ABB product offerings.[201] A customers for example clarified that it is unlikely that ABB products would be offered exclusively together with Hitachi's IoT Platform solutions, and even in such a scenario, there are other supply resources comparable to ABB products.[202]

(273) The Target already offers a comprehensive portfolio of power and high power semiconductors prior to the Proposed Transaction,[203] and this will not be significantly changed post-merger.[204] A competitor for example explained that "Hitachi already has Power semiconductor, therefore the addition of the ABB portfolio does not give an over proportional benefit."[205]

(274) Customers and competitors explained that the Parties have a number of competitors for the supply of power semiconductors, such as for example Infineon, Melco, Mitsubishi, ON Semi, and STM.[206]

(275) Customers also explained that they are not obliged to procure certain GI systems and products together, in bundle (GI systems/products include power semiconductors),[207] which confirms that bundling of GI systems/products (including power semiconductors) are not attractive for customers. In this regard, a competitor explained "We offer a range of products which are needed within the system our customers are manufacturing, e.g. for an industrial drive we offer the power switches, the gate drivers, sensor and so forth. Nonetheless, these are interchangeable with the corresponding products from other players."[208]

198 Replies to eQuestionnaire – Competitors, question 148.
199 Form CO, paragraph 1032.
200 Form CO, paragraph 1034.
201 Replies to eQuestionnaire – Customers, questions 180, 181 and 182; Replies to eQuestionnaire – Competitors, question 152, 153, 154.
202 Replies to eQuestionnaire – Customers, question 180.1.
203 Form CO, paragraphs 495 to 499.
204 Parties' response of 8 May 2020 to Commission's Request for information 9.
205 Competitor's reply to eQuestionnaire – Competitors, question 152.1.
206 Replies to eQuestionnaire – Customers, question 146, 146.1. Replies to eQuestionnaire – Competitors, question 119.
207 Replies to eQuestionnaire – Customers, question 155.
208 Competitor's reply to eQuestionnaire – Competitors, question 128.1.

(276) Customers also considered that they have some degree of buyer power in GI systems/products (including power semiconductors), which could be qualified as medium buyer power.[209]

(277) Taking into account the Notifying Party's arguments and the results of the market investigation, the Commission takes the view that, with respect of any of the Parties' product categories and considered plausible sub-segments thereof, the Proposed Transaction is unlikely to raise serious doubts as to its compatibility with the internal market as a result of conglomerate effects.

6. CONCLUSION

(278) For the above reasons, the European Commission has decided not to oppose the notified operation and to declare it compatible with the internal market and with the EEA Agreement. This decision is adopted in application of Article 6(1)(b) of the Merger Regulation and Article 57 of the EEA Agreement.

For the Commission

(Signed)
Margrethe VESTAGER
Executive Vice-President

[209] Replies to eQuestionnaire – Customers, question 164.

ANNEX I

Relevant product categories[210]

I. MV Product categories and considered sub-segments

- **MV Switchgears** are electrical equipment used to control, protect, and regulate the flow of electrical power in a transmission or distribution network. MV Switchgears are available for both AC environments and DC environments. MV AC Switchgears are used in Transmission and Distribution networks or industrial settings. MV DC Switchgears are used in fixed Substations which feed power to railway power lines (so-called Traction Substations) or in industrial settings which operate on DC power (e.g., mines or cranes).

II. HV Product categories and considered sub-segments

- **HV Switchgear** is a combination of pieces of electrical equipment (i.e. HV circuit breakers, HV instrument transformers, HV disconnectors, and control & protection equipment) which controls and regulates the flow of electricity in a transmission network to protect it from short circuits or overload currents.

- **HV GIS** (HV gas-insulated switchgear): refers to a compact metal encapsulated switchgear unit consisting of high voltage components which can be safely operated in confined spaces.

- **HV AIS** (HV air-insulated switchgear) **modules** refers to the primary components used in an AIS substation.

- **HV circuit breakers** are used in substations to interrupt the flow of electricity where necessary to isolate the affected part of the network.

- **Live-tank circuit breakers (LTBs):** the switching unit is located in an insulator bushing which is live at line voltage (or some voltage above ground)

- **Dead-tank circuit breakers (DTBs)**: the switching unit is located within a metallic container which is kept at earth potential (grounded). Insulated bushings allow the current transformers to be placed on the incoming/outgoing conductors.

- **Generator circuit breakers (GCBs)** are used in power generation plants to protect electric generators and power transformers.

- **Disconnecting circuit breakers (DCBs)** provide the functionality of a circuit breaker and a **disconnector** in one single unit and are commonly considered a sub-type of an LTB.

- **HV Instrument Transformers** are devices that step down the voltage or current to reduced secondary voltage or current so that it can be measured in order to protect primary equipment (especially the circuit breaker or power transformer).

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210 Source: Form CO.

- **HV Disconnectors** are mechanical safety switch devices which provide, in an open position, an insulating distance. They are mainly used to protect personnel and ensure that an electrical circuit is completely de-energised and isolated for service or maintenance purposes, after the circuit has been interrupted by a HV circuit breaker.

- **Surge arresters** are used to protect installations (transmission lines, substations, etc.) and other primary equipment, such as power transformers, from atmospheric and switching over voltages resulting from lightning strikes to transmission lines, manoeuvres in the electrical system or internal faults in the system by limiting the maximum overvoltage to a level safe for the equipment to be protected.

- **Cable accessories** include joints, connectors, and terminations used to link various pieces of equipment in different voltage settings.

- **Capacitors** (also referred to as a "condenser") are multi-purpose devices that can store electrical charge in the form of an electric field. Capacitors are used to improve the power quality of HV, MV and LV electrical networks by eliminating disturbances and improving the power factor in line with grid requirements (RPC). A single capacitor is called a "capacitor unit"; a number of capacitor units connected in parallel are called a "capacitor bank".

- **Harmonic filters** are used to reduce the issue of harmonics (oscillations in the base power frequency, typically 50 or 60 Hz), which is a disturbance ("pollution" or "noise") of the voltage or current in electrical lines that disrupts the flow of electricity. Such electrical noise can result in fires/equipment burnout, intermittent or mal-operation of sensitive electronic equipment, failure of capacitors and other problems.

III. Transformers

- A **transformer** is the electromagnetic piece of equipment that transfers the electricity (characterised by a certain voltage and electric current level) from one electrical circuit to another (often, but not necessarily, of another voltage and electric current level) through the coupling of a magnetic core. Transformers therefore are used to transfer energy from one AC power circuit to another and to increase ("step-up") or reduce ("step-down") voltage as required.

- **Power transformers** are components in power networks. They are used in substations and, alongside the switchgear units, are considered a primary piece of the system of the substation, ensuring the integrity of the power system and availability of power to the end-user. They are also usually the biggest cost factor in a substation.

- **Distribution transformers** provide the final voltage transformation in the electricity distribution system, stepping down the voltage used in the distribution lines to the level used by residential premises, factories and similar.

- **Liquid-filled distribution transformers** contain a liquid (usually oil), which is used to insulate the windings (copper or aluminium conductors) of the transformer and to keep the transformer temperature at a specific operating level.

- **Dry-type distribution transformers** do not require a liquid, such as oil, to cool down the electrical steel core and winding coils; the winding coils of dry-type distribution

transformers are simply cooled by normal air ventilation and use resin as insulation (they thus do not contain dangerous fluids and require no special fire proof vaults or venting of toxic gases).

- **Traction transformers** are a component of a rail locomotive's traction chain, i.e., they are used in railway rolling stock applications including high-speed, commuter and regional trains, locomotives, tram-trains and AC metros.

- **Bushings** are cylindrical insulating components (usually made from porcelain) that house a conductor. This enables a conductor to pass through a grounded enclosure, such as a transformer tank (the physical shell of a transformer), a wall or other physical barrier, to connect electrical installations. In the case of a transformer, bushings protect the conductors that connect a transformer's steel core to the power system it serves through channels in the transformer's housing.

- **Tap changers** are used to adjust the performance of transformers by changing the turn ratio between the windings in a transformer. Adjusting the tap changes the voltage level of the transformer's input or output. This is essential for stabilization of the network voltage under variable load conditions. Tap changers may be paired with motor drive mechanisms to drive the connected on-load tap changer or large de-energized tap changer to a higher or lower tap of a transformer.

- **Measurement and safety devices** monitor a transformer's health and improve safe, reliable and efficient operation of the transformer. Measurement and safety devices address various types of variables, including humidity, liquid levels, temperature, pressure and flow as well as monitor systems and related metal accessories (such as connectors and fuses). The Target's measurement and safety devices also include mechanical components, valves, and eDevices.

- **Insulation materials and components** are a vital part of transformers, as they must withstand the operating temperatures that occur during the transformer's operating life. Insulation materials and components include composite insulators, insulation and winding kits (i.e., insulation of a transformer's active part), and other insulation components made from pressboard and other materials such as paper, composites, or flexible and rigid laminates. Insulation materials and components are also used in other (non-transformer) applications.

IV. Grid Integration

- **T&D Turnkey Systems.** The turnkey project-related GI business vertically integrates HV products, transformers and GA solutions, depending on the specific needs of a project.

- **HVDC stations**. HVDC is a technology used for transmitting electricity (flowing in DC) between two grid systems, and is considered to be the most advanced solution for the transmission of energy over long distances by overhead transmission lines or (underground or submarine) power cables. The HVDC system converts electricity generated as AC to DC through a HVDC station, to be able to transmit electrical power in the latter format. At the other end of the system, DC is converted back to AC by another HVDC station so that the electricity can be fed back into the AC transmission or distribution network.

- **HVDC Classic**. HVDC Classic is the "traditional" HVDC technology, operating with a power of more than 100 MW. HVDC Classic is used for: (i) long undersea cable links (> 50 km); (ii) long overhead lines (> 600 km); (iii) interconnection of different grids of networks; (iv) where control of transmitted power is of importance; and (v) combinations of the above.

- **HVDC Light/Plus.** HVDC Light is a technology developed by ABB in the 1990s. It is used for: (i) undersea cable links and (ii) long underground cable links, and is not adapted for overhead lines. It is often used in off-shore installations or wind farms, due to the smaller size of the stations and its ability to stabilize the AC voltage at the terminals. HVDC Light also allows for a connection of isolated loads, and has a relatively short delivery. HVDC Light systems range from around 80 kV up to 320 kV.

- **FACTS**. FACTS (Flexible Alternating Current Transmission Systems) refers to technologies that can be installed in new or existing power transmission and distribution lines to enhance the security, controllability and flexibility of an AC power system and to increase its capacity.

- **Series compensation FACTS**. Series compensation uses capacitors and reactors to introduce voltage in series with the line. Their major task is to reduce the inductivity of the transmission line. They supply or consume variable reactive power. Series compensation can be either fixed (Fixed Series Compensation or Fixed SC) or controlled.

- **Fixed (Fixed Series Compensation or Fixed SC) FACTS**. These FACTS are useful for optimizing performance in very large bulk transmission corridors (typically longer than 200 km).

- **Controlled Series compensation FACTS**. These FACTS, usually called Thyristor Controlled Series Capacitor (TCSC), are especially useful for damping power oscillation over interconnections between transmission grids.

- **(Dynamic) Shunt compensation FACTS** also uses variable impedance devices like capacitors or reactors, here to introduce current in shunt with the line, which is in phase with the line voltage. The technologies can also be combined to either create a series-shunt-compensation or a series-series compensation. Examples for such systems include static compensators (STATCOM) or static VAR compensators (SVC).

- **Static compensators (STATCOM**). Installing a STATCOM at one or more suitable points in a grid will increase power transfer capability by enhancing voltage stability and maintaining a smooth voltage profile under different network conditions. Its ability to perform active filtering is also very useful for improvements in power quality.

- **Static VAR compensators (SVC).** SVC will typically regulate and control the voltage to the required set point under normal steady state and contingency conditions and thereby provide dynamic, fast response reactive power following system contingencies (e.g., network short circuits, line and generator disconnections). In addition, SVC can also increase transfer capability, reduce losses, mitigate active power oscillations and prevent over voltages at loss of load.

- **Substations**. Substations are key installations in the power grid that facilitate the efficient flow of electricity within the grid as well as the connection of power plants to the grid. They also interconnect transmission lines (including those with different voltage levels, such as transmission and distribution networks), link end-consumers to these networks and protect the grid from risks (e.g., short circuit).

- **AIS substation.** Substation which contains air-insulated switchgear.

- **GIS substation.** Substation which contains gas-insulated switchgear.

- **Hybrid Substation.** Substation which contain both gas- and air-insulated switchgear.

- **Mobile Substation.** Mounted on skids, trailers or in containers for rail, road or air transportation, these substations come in the form of ready-to-connect, complete assemblies and are designed for grid code compliance and easy mobility. The solutions are available for voltage levels up to 420 kV and all power ratings, and ensure reliable and high-quality energy supplies.[211]

- **Power semiconductors**. Semiconductors are materials, such as silicon, which can act as an insulator, but are also capable of conducting electricity. The Proposed Transaction relates to power semiconductors (including high power semiconductors). While general semiconductors (operating in ranges of mW or µW) are used in integrated circuits, memories and other to control devices such as computers or washing machines with millions of (low-power) switching functions, power semiconductors (> 1 W) and high power semiconductors (> 1200 V / 300 A) only provide for one switch with high power.

- **EV charging infrastructure**. Charging infrastructure for electric vehicles. The Target offering relates to offering relates to EV charging stations (TOSA), which are fast charging stations with a mechanical arm that can be used to fast-charge buses or trams by driving them under it.

[211] See https://new.abb.com/substations/mobile-substations.

ANNEX II

Market Share Tables

Horizontally affected markets on the basis of 2018 market shares

Source: Form CO

HV circuit breakers - worldwide					
2018		***2017***		***2016***	
Company	**Share (%)**	***Company***	***Share (%)***	***Company***	***Share (%)***
Hitachi	[0-5]	*Hitachi*	*[0-5]*	*Hitachi*	*[0-5]*
Target	[20-30]	*Target*	***[20-30]***	*Target*	***[20-30]***
Combined	**[20-30]**	***Combined***	***[20-30]***	***Combined***	***[20-30]***
Siemens	[10-20]	*Siemens*	***[10-20]***	*Siemens*	*[10-20]*
GE/Alstom	**[10-20]**	*GE/Alstom*	***[10-20]***	*GE/Alstom*	***[10-20]***
Mitsubishi Electric	**[5-10]**	*Mitsubishi Electric*	***[5-10]***	*Mitsubishi Electric*	***[5-10]***
Pinggao	**[0-5]**	*Pinggao*	***[0-5]***	*Pinggao*	***[0-5]***

Source: Form CO, Table 7.9

HV generator circuit breakers - worldwide					
2018		**2017**		**2016**	
Company	**Share (%)**	**Company**	**Share (%)**	**Company**	**Share (%)**
Hitachi	[0-5]	Hitachi	[0-5]	Hitachi	[0-5]
Target	[40-50]	Target	[50-60]	Target	[50-60]
Combined	[40-50]	**Combined**	[50-60]	**Combined**	[50-60]
GE/Alstom	[40-50]	GE/Alstom	[30-40]	GE/Alstom	[40-50]
Siemens	[0-5]	Siemens	[0-5]	Siemens	[0-5]
Schneider Electric	[0-5]	Schneider Electric	[0-5]	Schneider Electric	[0-5]
Melco	[0-5]	Melco	[0-5]	Melco	[0-5]

Source: Form CO, Table 7.9c

Traction transformers - worldwide					
2018		**2017**		**2016**	
Company	**Share (%)**	**Company**	**Share (%)**	**Company**	**Share (%)**
Hitachi	[0-5]	Hitachi	[0-5]	Hitachi	[0-5]
Target	[40-50]	Target	[30-40]	Target	[50-60]
Combined	**[40-50]**	**Combined**	**[30-40]**	**Combined**	**[50-60]**
Zhuzhou	[10-20]	Zhuzhou	[20-30]	Zhuzhou	[10-20]
Siemens	[10-20]	Siemens	[5-10]	Siemens	[10-20]
Alstom	[0-5]	Alstom	[0-5]	Alstom	[10-20]
CG	[0-5]	CG	[5-10]	CG	[0-5]
BHEL	[0-5]	BHEL	[0-5]	BHEL	[0-5]
Dalian	[0-5]	Dalian	[5-10]	Dalian	[0-5]
Aichi	[0-5]	Aichi	[0-5]	Aichi	[0-5]
JST	[0-5]	JST	[0-5]	JST	[0-5]
BNP	[0-5]	BNP	[0-5]	BNP	[0-5]
Others	[10-20]	Others	[10-20]	Others	[5-10]

Source: Form CO, Table 7.87

Vertically affected markets on the basis of 2018 market shares

Worldwide: Overall transformers (Upstream) – HV AIS Modules (Downstream) - 2018			
Overall transformers (Upstream)		**HV AIS Modules (Downstream)**	
Company	**Share (%)**	**Company**	**Share (%)**
Hitachi	[0-5]	Hitachi	[0-5]
Target	[10-20]	Target	[60-70]
Combined	[10-20]	**Combined**	[60-70]
Siemens	[5-10]	GE/Alstom	[10-20]
GE/Alstom	[0-5]	Pinggao	[5-10]
TBEA	[0-5]	Siemens	[5-10]
Howard	[0-5]		
SGB	[0-5]		

Source: Form CO, Table 7.29 and Table 7.7

EEA: Overall transformers (Upstream) – HV AIS Modules (Downstream) - 2018			
Overall transformers (Upstream)		**HV AIS Modules (Downstream)**	
Company	**Share (%)**	**Company**	**Share (%)**
Hitachi	[0-5]	Hitachi	[0-5]
Target	[10-20]	Target	[30-40]
Combined	[10-20]	**Combined**	[30-40]
Siemens	[10-20]	GE/Alstom	[40-50]
SGB	[10-20]	Pinggao	[20-30]
Schneider	[5-10]	Siemens	[0-5]
MR	[0-5]	Other	[0-5]
Tamini-TES	[0-5]		

Source: Form CO, Table 7.30 and Table 7.8

EEA: Power transformers (Upstream) – HV AIS Modules (Downstream) - 2018			
Power transformers (Upstream)		**HV AIS Modules (Downstream)**	
Company	**Share (%)**	**Company**	**Share (%)**
Hitachi	[0-5]	Hitachi	[0-5]
Target	[20-30]	Target	[30-40]
Combined	[20-30]	**Combined**	[30-40]
Siemens	[20-30]	GE/Alstom	[40-50]
SGB	[10-20]	Pinggao	[20-30]
Tamini-TES	[5-10]	Siemens	[0-5]
Koncar	[0-5]	Other	[0-5]
Getra	[0-5]		

Source: Form CO, Table 7.32 and Table 7.8

Worldwide: Power transformers (Upstream) – HV AIS Modules (Downstream) - 2018			
Power transformers (Upstream)		**HV AIS Modules (Downstream)**	
Company	**Share (%)**	**Company**	**Share (%)**
Hitachi	[0-5]	Hitachi	[0-5]
Target	[10-20]	Target	[60-70]
Combined	[10-20]	**Combined**	[60-70]
Siemens	[10-20]	GE/Alstom	[10-20]
TBEA	[5-10]	Pinggao	[5-10]
GE/Alstom	[5-10]	Siemens	[5-10]
SGB	[0-5]		
Xian XD	[0-5]		

Source: Form CO, Table 7.31 and Table 7.7

Worldwide: Overall MV products (Upstream) – HV AIS Modules (Downstream) - 2018			
Overall MV products (Upstream)		**HV AIS Modules (Downstream)**	
Company	**Share (%)**	**Company**	**Share (%)**
Hitachi	N/A	Hitachi	[0-5]
Target	N/A	Target	[60-70]
Combined	**[0-5]**	**Combined**	[60-70]
		GE/Alstom	[10-20]
		Pinggao	[5-10]
		Siemens	[5-10]

Source: Form CO, Annex 6

EEA: Overall MV products (Upstream) – HV AIS Modules (Downstream) - 2018			
Overall MV products (Upstream)		**HV AIS Modules (Downstream)**	
Company	**Share (%)**	**Company**	**Share (%)**
Hitachi	N/A	Hitachi	[0-5]
Target	N/A	Target	[30-40]
Combined	**[0-5]**	**Combined**	[30-40]
		GE/Alstom	[40-50]
		Pinggao	[20-30]
		Siemens	[0-5]

Source: Form CO, Annex 6

Worldwide: MV switchgear (Upstream) – HV AIS Modules (Downstream) - 2018			
MV switchgear (Upstream)		**HV AIS Modules (Downstream)**	
Company	**Share (%)**	**Company**	**Share (%)**
Hitachi	[0-5]	Hitachi	[0-5]
Target	[0-5]	Target	[60-70]
Combined	**[0-5]**	**Combined**	**[60-70]**
		GE/Alstom	[10-20]
		Pinggao	[5-10]
		Siemens	[5-10]

Source: Form CO, Annex 6

EEA: Overall HV products (Upstream) – HVDC (Downstream) - 2018			
Overall HV products (Upstream)		**HVDC (2008 -2018) (Downstream)**	
Company	**Share (%)**	**Company**	**Share (%)**
Hitachi	[0-5]	Hitachi	[0-5]
Target	[10-20]	Target	[40-50]
Combined	**[10-20]**	**Combined**	**[40-50]**
GE/Alstom	[10-20]	Siemens	[40-50]
Siemens	[10-20]	GE/Alstom	[5-10]
Artech	[0-5]	Toshiba	[0-5]
Schneider Electric	[0-5]		
Hapam	[0-5]		

Source: Form CO, Table 7.2 and Table 7.72a

Worldwide: Overall HV products (Upstream) – HVDC (Downstream) - 2018			
Overall HV products (Upstream)		**HVDC (Downstream)**	
Company	**Share (%)**	**Company**	**Share (%)**
Hitachi	[0-5]	Hitachi	
Target	[10-20]	Target	[60-70]
Combined	**[10-20]**	**Combined**	**[60-70]**
Siemens	[10-20]	Other	[30-40]
GE/Alstom	[5-10]		
Pinggao	[0-5]		
Hyosung	[0-5]		
Mitsubishi Electric	[0-5]		

Source: Form CO, Table 7.1 and Table 7.71b

EEA: Overall HV products (Upstream) – FACTS (Downstream) - 2018			
Overall HV products (Upstream)		**FACTS (Downstream)**	
Company	**Share (%)**	**Company**	**Share (%)**
Hitachi	[0-5]	Hitachi	[0-5]
Target	[10-20]	Target	[30-40]
Combined	**[10-20]**	**Combined**	**[30-40]**
GE/Alstom	[10-20]	Siemens	[20-30]
Siemens	[10-20]	GE/Alstom	[5-10]
Artech	[0-5]	AMSC	[0-5]
Schneider Electric	[0-5]	Gamesa Electric	[0-5]
Hapam	[0-5]	Nari	[0-5]
Other	[40-50]	Cegelec	[0-5]

Source: Form CO, Table 7.2 and Table 7.74a

Worldwide: Overall HV products (Upstream) – FACTS – Series Compensation (Downstream) - 2018			
Overall HV products (Upstream)		**FACTS – Series Compensation (Downstream)**	
Company	**Share (%)**	**Company**	**Share (%)**
Hitachi	[0-5]	Hitachi	[0-5]
Target	[10-20]	Target	[50-60]
Combined	**[10-20]**	**Combined**	[50-60]
Siemens	[10-20]	Others	[40-50]
GE/Alstom	[5-10]		
Pinggao	[0-5]		
Hyosung	[0-5]		
Mitsubishi Electric	[0-5]		

Source: Form CO, Table 7.1, Table 7.74d

EEA: Overall HV products (Upstream) – FACTS – Dynamic Shunt Compensation (Downstream) - 2018			
Overall HV products (Upstream)		**FACTS – Dynamic Shunt Compensation Compensation (Downstream)**	
Company	**Share (%)**	**Company**	**Share (%)**
Hitachi	[0-5]	Hitachi	[0-5]
Target	[10-20]	Target	[30-40]
Combined	**[10-20]**	**Combined**	**[30-40]**
GE/Alstom	[10-20]	Others	[60-70]
Siemens	[10-20]		
Artech	[0-5]		
Schneider Electric	[0-5]		
Hapam	[0-5]		

Source: Form CO, Table 7.2 and Table 7.74c

EEA: Overall MV products (Upstream) – HVDC (Downstream) - 2018			
Overall MV products (Upstream)		**HVDC (2008 -2018) (Downstream)**	
Company	**Share (%)**	**Company**	**Share (%)**
Hitachi	[0-5]	Hitachi	[0-5]
Target	[0-5]	Target	[40-50]
Combined	**[0-5]**	**Combined**	[40-50]
		Siemens	[40-50]
		GE/Alstom	[5-10]
		Toshiba	[0-5]

Source: Form CO, Table 7.72a

Worldwide: Overall MV products (Upstream) – HVDC (Downstream) - 2018			
Overall MV products (Upstream)		**HVDC (2008 -2018) (Downstream)**	
Company	**Share (%)**	**Company**	**Share (%)**
Hitachi	[0-5]	Hitachi	[0-5]
Target	[0-5]	Target	[30-40]
Combined	**[0-5]**	**Combined**	**[30-40]**
		Siemens	[40-50]
		GE/Alstom	[10-20]
		Chinese Companies	[0-5]
		Toshiba	[0-5]

Source: Form CO, Table 7.71a

EEA: Overall MV products (Upstream) – FACTS (Downstream) - 2018			
Overall MV products (Upstream)		**FACTS (Downstream)**	
Company	**Share (%)**	**Company**	**Share (%)**
Hitachi	[0-5]	Hitachi	[0-5]
Target	[0-5]	Target	[30-40]
Combined	[0-5]	**Combined**	**[30-40]**
		Siemens	[20-30]
		GE/Alstom	[5-10]
		AMSC	[0-5]
		Gamesa Electric	[0-5]

Source: Form CO, Table 7.74a

Worldwide: Overall MV products (Upstream) – FACTS - Series Compensation(Downstream) - 2018			
Overall MV products (Upstream)		**FACTS – Series Compensation (Downstream)**	
Company	**Share (%)**	**Company**	**Share (%)**
Hitachi	[0-5]	Hitachi	[0-5]
Target	[0-5]	Target	[50-60]
Combined	**[0-5]**	**Combined**	**[50-60]**

Source: Form CO, Table 7.74d

EEA: Overall MV products (Upstream) – FACTS - (Dynamic) Shunt Compensation (Downstream) - 2018			
Overall MV products (Upstream)		**FACTS – (Dynamic) Shunt Compensation (Downstream)**	
Company	**Share (%)**	**Company**	**Share (%)**
Hitachi	[0-5]	Hitachi	[0-5]
Target	[0-5]	Target	[30-40]
Combined	[0-5]	**Combined**	**[30-40]**

Source: Form CO, Table 7.74c

EEA: HV switchgear (Upstream) – HVDC (Downstream) - 2018			
HV switchgear (Upstream)		**HVDC (2008 -2018) (Downstream)**	
Company	**Share (%)**	**Company**	**Share (%)**
Hitachi	[0-5]	Hitachi	[0-5]
Target	[10-20]	Target	[40-50]
Combined	**[10-20]**	**Combined**	**[40-50]**
GE/Alstom	[20-30]	Siemens	[40-50]
Siemens	[10-20]	GE/Alstom	[5-10]
Schneider Electric	[0-5]	Toshiba	[0-5]

Source: Form CO, Table 7.4 and Table 7.72a

Worldwide: HV switchgear (Upstream) – HVDC (Downstream) – 2018			
HV switchgear (Upstream)		**HVDC (2008 -2018) (Downstream)**	
Company	**Share (%)**	**Company**	**Share (%)**
Hitachi	[5-10]	Hitachi	[0-5]
Target	[10-20]	Target	[30-40]
Combined	**[10-20]**	**Combined**	**[30-40]**
Siemens	[5-10]	Siemens	[40-50]
GE/Alstom	[5-10]	GE/Alstom	[10-20]
Pinggao	[0-5]	Chinese Companies	[0-5]
Hyosung	[0-5]	Toshiba	[0-5]
Hyundai	[0-5]		

Source: Form CO, Table 7.3 and Table 7.71a

EEA: HV switchgear (Upstream) – FACTS (Downstream) – 2018			
HV switchgear (Upstream)		**FACTS (Downstream)**	
Company	**Share (%)**	**Company**	**Share (%)**
Hitachi	[0-5]	Hitachi	[0-5]
Target	[10-20]	Target	[30-40]
Combined	**[10-20]**	**Combined**	**[30-40]**
GE/Alstom	[20-30]	Siemens	[20-30]
Siemens	[10-20]	GE/Alstom	[5-10]
Schneider Electric	[0-5]	Gamesa Electric	[0-5]
		AMSC	[0-5]

Source: Form CO, Table 7.4 and Table 7.74a

Worldwide: HV switchgear (Upstream) – FACTS – Series Compensation (Downstream) – 2018			
HV switchgear (Upstream)		**FACTS – Series Compensation (Downstream)**	
Company	**Share (%)**	**Company**	**Share (%)**
Hitachi	[0-5]	Hitachi	[0-5]
Target	[10-20]	Target	[50-60]
Combined	**[10-20]**	**Combined**	**[50-60]**
Siemens	[5-10]		
GE/Alstom	[5-10]		
Pinggao	[5-10]		
Hyosung	[0-5]		
Hyundai	[0-5]		

Source: Form CO, Table 7.3 and Table 7.74d

EEA: HV switchgear (Upstream) – FACTS – (Dynamic) Shunt Compensation (Downstream) – 2018			
HV switchgear (Upstream)		**FACTS (Dynamic) Shunt Compensation (Downstream)**	
Company	**Share (%)**	**Company**	**Share (%)**
Hitachi	[0-5]	Hitachi	[0-5]
Target	[10-20]	Target	[30-40]
Combined	**[10-20]**	**Combined**	**[30-40]**
GE/Alstom	[20-30]		
Siemens	[10-20]		
Schneider Electric	[0-5]		

Source: Form CO, Table 7.4 and Table 7.74c

EEA: MV switchgear (Upstream) – FACTS (Downstream) – 2018			
MV switchgear (Upstream)		**FACTS (Downstream)**	
Company	**Share (%)**	**Company**	**Share (%)**
Hitachi	[0-5]	Hitachi	[0-5]
Target	N/A	Target	[30-40]
Combined	N/A	**Combined**	**[30-40]**
		Siemens	[20-30]
		GE/Alstom	[5-10]
		AMSC	[0-5]
		Gamesa Electric	[0-5]

Source: Form CO, Table 7.74a

Worldwide: MV switchgear (Upstream) – FACTS – Series Compensation (Downstream) – 2018			
MV switchgear (Upstream)		**FACTS – Series Compensation (Downstream)**	
Company	**Share (%)**	**Company**	**Share (%)**
Hitachi	[0-5]	Hitachi	[0-5]
Target	[0-5]	Target	[50-60]
Combined	[0-5]	**Combined**	**[50-60]**

Source: Form CO, Table 7.74d

EEA: MV switchgear (Upstream) – FACTS – (Dynamic) Shunt Compensation (Downstream) – 2018			
MV switchgear (Upstream)		**FACTS - (Dynamic) Shunt Compensation (Downstream)**	
Company	**Share (%)**	**Company**	**Share (%)**
Hitachi	[0-5]	Hitachi	[0-5]
Target	N/A	Target	[30-40]
Combined	N/A	**Combined**	**[30-40]**

Source: Form CO, Table 7.74c

EEA: HV GIS (Upstream) – HVDC (Downstream) – 2018			
HV GIS (Upstream)		**HVDC (2008 -2018) (Downstream)**	
Company	**Share (%)**	**Company**	**Share (%)**
Hitachi	[0-5]	Hitachi	[0-5]
Target	[10-20]	Target	[40-50]
Combined	**[10-20]**	**Combined**	**[40-50]**
GE/Alstom	[20-30]	Siemens	[40-50]
Siemens	[10-20]	GE/Alstom	[5-10]
Schneider Electric	[0-5]	Toshiba	[0-5]
Elektrobudo	[0-5]		

Source: Form CO, Table 7.6 and Table 7.72a

Worldwide: HV GIS (Upstream) – HVDC (Downstream) – 2018			
HV GIS (Upstream)		**HVDC (2008 -2018) (Downstream)**	
Company	**Share (%)**	**Company**	**Share (%)**
Hitachi	[0-5]	Hitachi	[0-5]
Target	[10-20]	Target	[30-40]
Combined	**[10-20]**	**Combined**	**[30-40]**
Siemens	[5-10]	Siemens	[40-50]
GE/Alstom	[5-10]	GE/Alstom	[10-20]
Pinggao	[5-10]	Chinese Companies	[0-5]
Hyosung	[0-5]	Toshiba	[0-5]
Hyundai	[0-5]		

Source: Form CO, Table 7.5 and Table 7.71a

EEA: HV GIS (Upstream) – FACTS (Downstream) – 2018			
HV GIS (Upstream)		**FACTS (Downstream)**	
Company	**Share (%)**	**Company**	**Share (%)**
Hitachi	[0-5]	Hitachi	[0-5]
Target	[10-20]	Target	[30-40]
Combined	[10-20]	**Combined**	[30-40]
GE/Alstom	[20-30]	Siemens	[20-30]
Siemens	[10-20]	GE/Alstom	[5-10]
Schneider Electric	[0-5]	Gamesa Electric	[0-5]
Elektrobudo	[0-5]	AMSC	[0-5]

Source: Form CO, Table 7.6 and Table 7.74a

Worldwide: HV GIS (Upstream) – FACTS – Series Compensation (Downstream) – 2018			
HV GIS (Upstream)		**FACTS - Series Compensation (Downstream)**	
Company	**Share (%)**	**Company**	**Share (%)**
Hitachi	[0-5]	Hitachi	[0-5]
Target	[10-20]	Target	[50-60]
Combined	[10-20]	**Combined**	[50-60]
Siemens	[5-10]		
GE/Alstom	[5-10]		
Pinggao	[5-10]		
Hyosung	[0-5]		
Hyundai	[0-5]		

Source: Form CO, Table 7.5 and Table 7.74d

EEA: HV GIS (Upstream) – FACTS – (Dynamic) Shunt Compensation (Downstream) – 2018			
HV GIS (Upstream)		**FACTS - (Dynamic) Shunt Compensation (Downstream)**	
Company	**Share (%)**	**Company**	**Share (%)**
Hitachi	[0-5]	Hitachi	[0-5]
Target	[10-20]	Target	[30-40]
Combined	**[10-20]**	**Combined**	**[30-40]**
GE/Alstom	[20-30]		
Siemens	[10-20]		
Schneider Electric	[0-5]		
Elektrobudo	[0-5]		

Source: Form CO, Table 7.6 and Table 7.74c

EEA: Overall transformers (Upstream) – HVDC (Downstream) - 2018			
Overall transformers (Upstream)		**HVDC (2008 -2018) (Downstream)**	
Company	**Share (%)**	**Company**	**Share (%)**
Hitachi	[0-5]	Hitachi	[0-5]
Target	[10-20]	Target	[40-50]
Combined	[10-20]	**Combined**	[40-50]
Siemens	[10-20]	Siemens	[40-50]
SGB	[10-20]	GE/Alstom	[10-20]
Schneider	[5-10]	Toshiba	[0-5]
MR	[0-5]		
Tamini-TES	[0-5]		

Source: Form CO, Table 7.30 and Table 7.72a

Worldwide: Overall transformers (Upstream) – HVDC (Downstream) - 2018			
Overall transformers (Upstream)		**HVDC (2008 -2018) (Downstream)**	
Company	**Share (%)**	**Company**	**Share (%)**
Hitachi	[0-5]	Hitachi	[0-5]
Target	[10-20]	Target	[30-40]
Combined	[10-20]	**Combined**	[30-40]
Siemens	[5-10]	Siemens	[40-50]
GE/Alstom	[0-5]	GE/Alstom	[10-20]
TBEA	[0-5]	Chinese Companies	[0-5]
Howard	[0-5]	Toshiba	[0-5]
SGB	[0-5]		

Source: Form CO, Table 7.29 and Table 7.71a

EEA: Overall transformers (Upstream) – FACTS (Downstream) - 2018			
Overall transformers (Upstream)		**FACTS (Downstream)**	
Company	**Share (%)**	**Company**	**Share (%)**
Hitachi	[0-5]	Hitachi	[0-5]
Target	[10-20]	Target	[30-40]
Combined	[10-20]	**Combined**	[30-40]
Siemens	[10-20]	Siemens	[20-30]
SGB	[10-20]	GE/Alstom	[5-10]
Schneider	[0-5]	Gamesa Electric	[0-5]
MR	[0-5]	AMSC	[0-5]
Tamini-TES	[0-5]		

Source: Form CO, Table 7.30 and Table 7.74a

Worldwide: Overall transformers (Upstream) – FACTS – Series Compensation (Downstream) - 2018			
Overall transformers (Upstream)		**FACTS – Series Compensation (Downstream)**	
Company	**Share (%)**	**Company**	**Share (%)**
Hitachi	[0-5]	Hitachi	[0-5]
Target	[10-20]	Target	[50-60]
Combined	[10-20]	**Combined**	[50-60]
Siemens	[5-10]		
GE/Alstom	[0-5]		
TBEA	[0-5]		
Howard	[0-5]		
SGB	[0-5]		

Source: Form CO, Table 7.29 and Table 7.74d

EEA: Overall transformers (Upstream) – FACTS – (Dynamic) Shunt Compensation (Downstream) - 2018			
Overall transformers (Upstream)		**FACTS – (Dynamic) Shunt Compensation (Downstream)**	
Company	**Share (%)**	**Company**	**Share (%)**
Hitachi	[0-5]	Hitachi	[0-5]
Target	[10-20]	Target	[30-40]
Combined	[10-20]	**Combined**	[30-40]
Siemens	[10-20]		
SGB	[10-20]		
Schneider	[5-10]		
MR	[0-5]		
Tamini-TES	[0-5]		

Source: Form CO, Table 7.30 and Table 7.74c

Worldwide: Power transformers (Upstream) – HVDC (Downstream) - 2018			
Power transformers (Upstream)		**HVDC (2008 -2018) (Downstream)**	
Company	**Share (%)**	**Company**	**Share (%)**
Hitachi	[0-5]	Hitachi	[0-5]
Target	[10-20]	Target	[30-40]
Combined	[10-20]	**Combined**	[30-40]
Siemens	[10-20]	Siemens	[40-50]
TBEA	[5-10]	GE/Alstom	[10-20]
GE/Alstom	[5-10]	Chinese Companies	[0-5]
SGB	[0-5]	Toshiba	[0-5]
Xian XD	[0-5]		

Source: Form CO, Table 7.31 and Table 7.71a

EEA: Power transformers (Upstream) – HVDC (Downstream) - 2018			
Power transformers (Upstream)		**HVDC (2008 -2018) (Downstream)**	
Company	**Share (%)**	**Company**	**Share (%)**
Hitachi	[0-5]	Hitachi	[0-5]
Target	[20-30]	Target	[40-50]
Combined	[20-30]	**Combined**	[40-50]
Siemens	[20-30]	Siemens	[40-50]
SGB	[10-20]	GE/Alstom	[5-10]
Tamini-TES	[5-10]	Toshiba	[0-5]
Koncar	[0-5]		
Getra	[0-5]		

Source: Form CO, Table 7.32 and Table 7.72a

EEA: Power transformers (Upstream) – FACTS (Downstream) - 2018			
Power transformers (Upstream)		**FACTS (Downstream)**	
Company	**Share (%)**	**Company**	**Share (%)**
Hitachi	[0-5]	Hitachi	[0-5]
Target	[20-30]	Target	[30-40]
Combined	[20-30]	**Combined**	[30-40]
Siemens	[20-30]	Siemens	[20-30]
SGB	[10-20]	GE/Alstom	[5-10]
Tamini-TES	[5-10]	Gamesa Electric	[0-5]
Koncar	[0-5]	AMSC	[0-5]
Getra	[0-5]		

Source: Form CO, Table 7.32 and Table 7.74a

Worldwide: Power transformers (Upstream) – FACTS – Series Compensation (Downstream) - 2018			
Power transformers (Upstream)		**FACTS – Series Compensation (Downstream)**	
Company	**Share (%)**	**Company**	**Share (%)**
Hitachi	[0-5]	Hitachi	[0-5]
Target	[10-20]	Target	[50-60]
Combined	[10-20]	**Combined**	[50-60]
Siemens	[10-20]		
TBEA	[5-10]		
GE/Alstom	[5-10]		
SGB	[0-5]		
Xian XD	[0-5]		

Source: Form CO, Table 7.31 and Table 7.74d

EEA: Power transformers (Upstream) – FACTS – (Dynamic) Shunt Compensation (Downstream)- 2018			
Power transformers (Upstream)		**FACTS – (Dynamic) Shunt Compensation (Downstream)**	
Company	**Share (%)**	**Company**	**Share (%)**
Hitachi	[0-5]	Hitachi	[0-5]
Target	[20-30]	Target	[30-40]
Combined	[20-30]	**Combined**	[30-40]
Siemens	[20-30]		
SGB	[10-20]		
Tamini-TES	[5-10]		
Koncar	[0-5]		
Getra	[0-5]		

Source: Form CO, Table 7.32 and Table 7.74c

EEA: Traction transformers (Upstream) – Overall railway rolling stock (Downstream) - 2018			
Traction transformers (Upstream)		**Overall railway rolling stock (Downstream)**	
Company	**Share (%)**	**Company**	**Share (%)**
Hitachi	[0-5]	Hitachi	[0-5]
Target	[60-70]	Target	[0-5]
Combined	[60-70]	**Combined**	[0-5]
Siemens	[20-30]		
Alstom	[5-10]		
JST	[0-5]		
BNP	[0-5]		

Source: Form CO, Table 7.88 and Annex 6.1

Worldwide: Traction transformers (Upstream) – Overall railway rolling stock (Downstream) - 2018			
Traction transformers (Upstream)		**Overall railway rolling stock (Downstream)**	
Company	**Share (%)**	**Company**	**Share (%)**
Hitachi	[0-5]	Hitachi	[0-5]
Target	[40-50]	Target	[0-5]
Combined	[40-50]	**Combined**	[0-5]
Zhuzhou	[10-20]		
Siemens	[10-20]		
Alstom	[0-5]		

Source: Form CO, Table 7.87 and Annex 6.1

EEA: Traction transformers (Upstream) – Segment for intercity and regional trains (Downstream) - 2018			
Traction transformers (Upstream)		**Segment for intercity and regional trains (Downstream)**	
Company	**Share (%)**	**Company**	**Share (%)**
Hitachi	[0-5]	Hitachi	[5-10]
Target	[60-70]	Target	[0-5]
Combined	[60-70]	**Combined**	[5-10]
Siemens	[20-30]		
Alstom	[5-10]		
JST	[0-5]		
BNP	[0-5]		

Source: Form CO, Table 7.88 and Annex 6.1

Worldwide: Traction transformers (Upstream) – Segment for intercity and regional trains (Downstream) - 2018			
Traction transformers (Upstream)		**Segment for intercity and regional trains (Downstream)**	
Company	**Share (%)**	**Company**	**Share (%)**
Hitachi	[0-5]	Hitachi	[5-10]
Target	[40-50]	Target	[0-5]
Combined	[40-50]	**Combined**	[5-10]
Zhuzhou	[10-20]		
Siemens	[10-20]		
Alstom	[0-5]		
Hitachi	[0-5]		

Source: Form CO, Table 7.87 and Annex 6.1

EEA: Traction transformers (Upstream) – Segment for intercity and commuter trains (Downstream) - 2018			
Traction transformers (Upstream)		**Segment for intercity and commuter trains (Downstream)**	
Company	**Share (%)**	**Company**	**Share (%)**
Hitachi	[0-5]	Hitachi	[5-10]
Target	[60-70]	Target	[0-5]
Combined	[60-70]	**Combined**	[5-10]
Siemens	[20-30]		
Alstom	[5-10]		
JST	[0-5]		
BNP	[0-5]		

Source: Form CO, Table 7.88 and Annex 6.1

Worldwide: Traction transformers (Upstream) – Segment for intercity and commuter trains (Downstream) - 2018			
Traction transformers (Upstream)		**Segment for intercity and commuter trains (Downstream)**	
Company	**Share (%)**	**Company**	**Share (%)**
Hitachi	[0-5]	Hitachi	[5-10]
Target	[40-50]	Target	[0-5]
Combined	[40-50]	**Combined**	[5-10]
Zhuzhou	[10-20]		
Siemens	[10-20]		
Alstom	[0-5]		
Hitachi	[0-5]		

Source: Form CO, Table 7.87 and Annex 6.1

EEA: Bushings (Upstream) – Traction transformers (Downstream) - 2018			
Bushings (Upstream)		**Traction transformers (Downstream)**	
Company	**Share (%)**	**Company**	**Share (%)**
Hitachi	[0-5]	Hitachi	[0-5]
Target	[20-30]	Target	[60-70]
Combined	[20-30]	**Combined**	[60-70]
HSP / Trench	[30-40]	Siemens	[20-30]
GE/Alstom	[5-10]	Alstom	[5-10]
Moser-Glaser	[0-5]	JST	[0-5]
Pfisterer	[0-5]	BNP	[0-5]
Mosizolyator	[0-5]		

Source: Form CO, Table 7.40 and Table 7.88

Worldwide: Bushings (Upstream) – Traction transformers (Downstream) - 2018			
Bushings (Upstream)		**Traction transformers (Downstream)**	
Company	**Share (%)**	**Company**	**Share (%)**
Hitachi		Hitachi	[0-5]
Target		Target	[40-50]
Combined	[10-20]	**Combined**	[40-50]
HSP & Trench	[20-30]	Zhuzhou	[10-20]
GE/Alstom	[5-10]	Siemens	[10-20]
Hubbel	[0-5]	Alstom	[0-5]
Pfisterer	[0-5]	Hitachi	[0-5]
Mosizolyator	[0-5]		

Source: Form CO, Table 7.39 and Table 7.87

EEA: Tap changers (Upstream) – Traction transformers (Downstream) - 2018			
Tap changers (Upstream)		**Traction transformers (Downstream)**	
Company	**Share (%)**	**Company**	**Share (%)**
Hitachi	[0-5]	Hitachi	[0-5]
Target	[0-5]	Target	[60-70]
Combined	[0-5]	**Combined**	[60-70]
MR	[70-80]	Siemens	[20-30]
Huaming	[0-5]	Alstom	[5-10]
C.A.P.T.	[0-5]	JST	[0-5]
ATL (Brush)	[0-5]	BNP	[0-5]
Hyundai	[0-5]		

Source: Form CO, Table 7.42 and Table 7.88

Worldwide: Tap changers (Upstream) – Traction transformers (Downstream) - 2018			
Tap changers (Upstream)		**Traction transformers (Downstream)**	
Company	**Share (%)**	**Company**	**Share (%)**
Hitachi	[0-5]	Hitachi	[0-5]
Target	[5-10]	Target	[40-50]
Combined	[5-10]	**Combined**	[40-50]
MR	[50-60]	Zhuzhou	[10-20]
Huaming	[10-20]	Siemens	[10-20]
Chang Zheng	[0-5]	Alstom	[0-5]
C.A.P.T	[0-5]	Hitachi	[0-5]
CTR	[0-5]		

Source: Form CO, Table 7.41 and Table 7.87

EEA: Measurement and safety devices (Upstream) – Traction transformers (Downstream) - 2018			
Measurement and safety devices (Upstream)		**Traction transformers (Downstream)**	
Company	**Share (%)**	**Company**	**Share (%)**
Hitachi		Hitachi	[0-5]
Target		Target	[60-70]
Combined	[5-10]	**Combined**	[60-70]
Messko	[30-40]	Siemens	[20-30]
Qualitrol	[20-30]	Alstom	[5-10]
Cedaspe	[10-20]	JST	[0-5]
		BNP	[0-5]

Source: Form CO, Table 7.44 and Table 7.88

Worldwide: Measurement and safety devices (Upstream) – Traction transformers (Downstream) - 2018			
Measurement and safety devices (Upstream)		**Traction transformers (Downstream)**	
Company	**Share (%)**	**Company**	**Share (%)**
Hitachi	[0-5]	Hitachi	[0-5]
Target	[0-5]	Target	[40-50]
Combined	[0-5]	**Combined**	[40-50]
Qualitrol	[30-40]	Zhuzhou	[10-20]
Messko	[10-20]	Siemens	[10-20]
Cedaspe	[0-5]	Alstom	[0-5]
HJ	[0-5]	Hitachi	[0-5]
Eaton	[0-5]		

Source: Form CO, Table 7.43 and Table 7.87

EEA: Insulation Materials & Components (Upstream) – Traction transformers (Downstream) - 2018			
Insulation Materials & Components (Upstream)		**Traction transformers (Downstream)**	
Company	**Share (%)**	**Company**	**Share (%)**
Hitachi	[0-5]	Hitachi	[0-5]
Target	[10-20]	Target	[60-70]
Combined	[10-20]	**Combined**	[60-70]
Weidmann	[30-40]	Siemens	[20-30]
Krempel	[10-20]	Alstom	[5-10]
Enpay	[5-10]	JST	[0-5]
		BNP	[0-5]

Source: Form CO, Table 7.46 and Table 7.88

Worldwide: Insulation Materials & Components (Upstream) – Traction transformers (Downstream) - 2018			
Insulation Materials & Components (Upstream)		**Traction transformers (Downstream)**	
Company	**Share (%)**	**Company**	**Share (%)**
Hitachi	[0-5]	Hitachi	[0-5]
Target	[5-10]	Target	[40-50]
Combined	[5-10]	**Combined**	[40-50]
Weidmann	[30-40]	Zhuzhou	[10-20]
Taizhou Xinyuan	[10-20]	Siemens	[10-20]
Krempel	[5-10]	Alstom	[0-5]
Enpay	[5-10]	Hitachi	[0-5]
OJI	[5-10]		

Source: Form CO, Table 7.45 and Table 7.87