



DECISION PAPER

PROPOSED MODIFICATIONS TO THE TRANSMISSION CODE

1 DECEMBER 2022

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1 Introduction

- 1.1 The Transmission Code sets out the rights and obligations of the Transmission Licensee, together with the rights and obligations of users of the transmission system. The Transmission Code also sets out the technical requirements to be met by those who seek to connect and operate installations on the transmission system.

2 Proposed Modifications to the Transmission Code

- 2.1 Pursuant to Section 1.6 of the Transmission Code, EMA has sought representations on the proposed modifications to the Transmission Code to provide updates and clarity to the technical requirements relating to, among other things, electricity import and generating units, and to update the reference to “Wholesaler Licensees” instead of “Wholesaler (Generation) Licensee” or “Wholesaler (Demand Side Participation) Licensee”, following the Wholesaler Licence Modification Final Determination Paper issued to the relevant licensees on 29 Jun 2021.
- 2.2 Feedback was received from 5 respondents when the consultation closed on 10 February 2022. EMA had on 15 Aug 2022 issued a determination paper for the modification of clauses 1.3.1, G2.3, G2.4 and G2.5 of the Transmission Code.
- 2.3 EMA has since reviewed the remaining feedback pertaining to the other proposed modifications and our responses are detailed in [Appendix 1](#).

3 EMA’s Decision

- 3.1 Taking into consideration the feedback received, EMA has decided to modify clauses 1.2.1, 1.3.1, 6.1.6, 6.15.1, C1, C7.1, C7.2, F7.2, F8.2, F8.3, H3.3 and H9 of the Transmission Code as set out in [Appendix 2](#). The proposed modifications will come into effect on 15 Dec 2022.
- 3.2 For the remaining clauses, which relate to electricity import, EMA will further review the proposed modifications, taking into consideration the feedback received. EMA will thereafter issue a new consultation paper to seek representations on the proposed modifications.

~ End ~

EMA's Response to Written Representations

Modification Ref. No.	Clause	Public/ Industry	Comments	EMA's Response
-	-	SPPA	<p>In relation to EMA's proposed modifications, SPPA has drawn reference from the following sources when giving our views on the proposed modifications:</p> <p><u>A: Guide to Electricity Imports dated 12 Nov 21 ("the Guide"). Section 6: Electricity Imports – Framework on Build, Own, Operate and Maintain Imports Infrastructure.</u></p> <p>In giving our comments, we have taken into consideration section 6 of the Guide to Electricity Imports (dated 12 Nov 2021) ("the Guide"), where it basically provides that on new and unused land, the Transmission Licensee shall by default Design, Build, Own, Operate and Maintain (DBOOM) the imports infrastructure (comprising the subsea cable, landing points and HVDC converter sites) that are within Singapore's borders. From the Guide, EMA views such import infrastructure as common grid infrastructure that should be managed by SPPA. However, we note that the modifications to the Transmission Code at times did not make reference to the Transmission Licensee as the owner or operator of the import facility(s). As such, some of the proposed modifications and the Guide are not aligned. Where the proposed modifications and the Guide are not aligned, we had provided comments to align them.</p> <p>Where the comments provided below are due to the alignment of the proposed modifications and the Guide, we will indicate it as: "This comment seeks to align the modifications and the Guide".</p>	EMA notes the feedback pertaining to electricity import. We will issue a new consultation paper for Code modifications relating to electricity import, taking into consideration the feedback received.

Modification Ref. No.	Clause	Public/ Industry	Comments	EMA's Response
			<p><u>B: First Request For Proposal (RFP1) to Appoint Licensed Electricity Importers dated 13 Jan 22</u></p> <p>There are potential scenarios where the Importer Licensees may lease the use of import facilities from 3rd party owners and operators who will also be responsible to design and build them. It is likely that a consortium bidding for RFP 1 or RFP 2 may set up special purpose vehicles (SPVs) to own the Import Facility assets (or different portions of the Import Facility, e.g. one SPV may own the subsea cable, while another SPV may own the HVDC converter stations) and may use a different SPV to bid for the Importer Licence. In such instances, the import facilities may not be built, owned and operated by the Importer Licensee.</p> <p>Where the comments provided below are due to the possibility that the Importer Licensee may not be the owner or operator of the import facility, we will indicate it as: “This comment relates to the situation where the Importer Licensee may not be the owner or operator of the import facility”.</p>	
TC/2021/1	1.2.1	SPPA	<p>Our comments here are in response to both TC/2021/1 and TC/2021/2.</p> <p>1. This comment seeks to align the modifications and the Guide (Guide to Electricity Imports dated 12 Nov 21):</p> <p>With reference to the Guide, since SPPA is the default owner and operator of import facilities (on new and unused land) we suggest that it be made clear that where the statements “Licensee responsible for the import facility” or “Licensee responsible for each import facility” appear, that this be amended to “Transmission Licensee responsible for the import facility, unless otherwise determined</p>	<p>EMA notes the feedback pertaining to electricity import. We will issue a new consultation paper for Code modifications relating to electricity import, taking into consideration the feedback received.</p> <p>We will proceed with the proposed modification of this clause as it is a general clause to state the parties who are required to comply with the Code (see Appendix 2).</p>

Modification Ref. No.	Clause	Public/ Industry	Comments	EMA's Response
			<p>by EMA that such import facility is under the responsibility of another Licensee.”</p> <p>2. We wish to clarify if the owner or operator of the import facility has to be a Licensee / Importer Licensee (i.e. not any unlicensed entity).</p> <p>3. If the response to paragraph 2 above is in the negative, this comment relates to the situation where the Importer Licensee may not be the owner or operator of the import facility:</p> <p>The proposed modifications imply that the Transmission Code is applicable to the “Licensee” only (which includes the Importer Licensee). The proposed modifications at times state that the Licensee is “responsible for the import facility” or “responsible for each import facility”. In the Transmission Code, the term “responsible for” in relation to an installation seems to mean “maintain, operate and enable” (referring to section 6.1.1 and section 4.8.6(e)).</p> <p>Please clarify the meaning of “responsible for it”. Specifically, does “responsible for it” mean that the Licensee is the owner, maintainer, operator or enabler of the import facility? As mentioned, the Importer Licensee may not be the owner/maintainer/operator/enabler of the import facility. Alternatively, it may be clarified that in the context of import facilities, an import facility that a Licensee is “responsible for” refers to an import facility(s) which is referred to in the Import Licensee’s license conditions.</p>	

Modification Ref. No.	Clause	Public/ Industry	Comments	EMA's Response
			<p>Assuming, that the phrase “responsible for it” means to “maintain, operate and enable”, we wish to clarify if the intention of EMA is to regulate the owner/maintainer/operator/enabler of import facilities and ensure their compliance to the Transmission Code. If so, where the import facility is not owned by the Transmission Licensee, we suggest that this Code should be made applicable to the owner/maintainer/operator/enabler of the Import Facility, who may not necessarily be a “Licensee” or the “Importer Licensee”.</p> <p>Alternatively, or in addition, we suggest that in the Transmission Code, where the statements “Licensee responsible for the import facility” or “Licensee responsible for each import facility” appear to impose obligations on the Licensee (i.e. Importer Licensee), these statements be replaced with a statement to the effect that the “Licensee or Importer Licensee procures the owner/maintainer/operator/enabler of the import facility” to perform the said obligations.</p>	
TC/2021/2	1.3.1	SPPA	<ol style="list-style-type: none"> <li data-bbox="680 1002 1196 1031">1. Please refer to comments to TC/2021/1 <li data-bbox="680 1066 1391 1123">2. This comment seeks to align the modifications and the Guide: We wish to clarify if the term “Licensee” refers only to an Importer Licensee. The reason for the modification in the consultation paper indicates so. If this is the case, we suggest that the word “Licensee” be replaced with “Importer Licensee” or “the Licensee (other than the Transmission Licensee)” because “Licensee” is a broad term 	<p>EMA notes the feedback pertaining to electricity import. EMA will issue a new consultation paper for Code modifications relating to electricity import, taking into consideration the feedback received.</p> <p>Meanwhile, we will proceed with the proposed modification of this clause without incorporating the modification relating to electricity import (see Appendix 2).</p>

Modification Ref. No.	Clause	Public/ Industry	Comments	EMA's Response
			<p>which includes the Transmission Licensee, and where the Transmission Licensee DBOOMs the import facility, the Transmission Licensee does not need to be a connection applicant.</p> <p>3. As an observation, if the intention of EMA is to hold the Importer Licensee responsible for obligations which should be due from the owner/operator of the import facility or the external generation facility, under the Transmission Code, the current modifications are likely to achieve that. However, as mentioned, if the owner/operator/maintainer of the import facility or external generation facility refuses to perform the said obligations, it may mean that electricity cannot be safely imported from the external generation facility. It would be ideal for EMA, as a condition precedent to the award of the import license, to obtain an undertaking from the owner/operator/maintainer of the import facility and external generation facility to comply with the Transmission Code.</p>	
		Sun Cable Pte Ltd	How does this set of amendments affect battery energy storage systems (BESS), and how will the BESS be treated since there is currently no license class applicable to BESS?	<p>The Transmission Code amendments do not affect the regulatory framework in respect of BESS as set out in the Handbook for Energy Storage Systems published at the following EMA website: https://www.ema.gov.sg/Energy_Storage_Programme.aspx</p>
TC/2021/6	1.3.1	SPPA	We wish to clarify if this import facility that forms part of the generation facility is limited to "import infrastructure that is built on private land (e.g. at the sites of local gencos)" as described in the Guide. If so, would the Generation Licensee be deemed as the party "responsible" for the import facility or would the Importer Licensee be "responsible" for it?	<p>This proposed modification is being further reviewed. Therefore, it will not be included in this round of modifications to the Code.</p> <p>EMA will issue a new consultation paper for Code modifications relating to electricity import, taking into consideration the feedback received.</p>

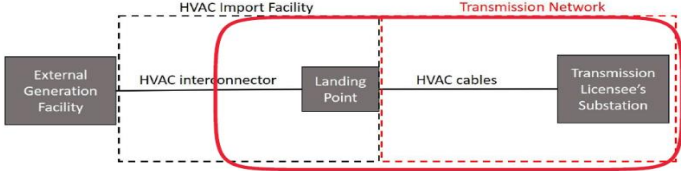
Modification Ref. No.	Clause	Public/ Industry	Comments	EMA's Response
TC/2021/7	1.3.1	SPPA	<p>We refer to the new definition for “import facility” under CI 1.3.1 and the Figures 1.3.1a-d.</p> <ol style="list-style-type: none"> 1. Please clarify if an “interconnector” is also part of the “import facility” as it is now defined as being “between the import facility and an external system...”, which appears to be different from the definition of an “import facility” which had included the “interconnector”. Please clarify the scope of the definitions as we may have further technical input based on the final definition or that there may be an impact on our current comments to the technical requirements of the “interconnector” and the “import facility” (e.g. please see comments to TC/2021/23). However, assuming that the “interconnector” is to be excluded from the definition of an “import facility”, we have proposed amendments to the definition of “import facility” below at TC/2021/9. As the definition of the “import facility” and “interconnection” is critical to the modification of the Transmission Code, we propose to have a separate discussion with EMA on this. 2. We wish to clarify if the interconnector will include the “landing point”, and whether a definition of the “landing point” is required. 3. In relation to Figure 1.3.1b, we wish to clarify the voltage of the HVAC interconnector. Should it be 230kV, 400kV or some other voltage? If the voltage is not 230kV or 400kV, it would mean that a substation (with transformers and switchgears) would have to be built at the landing point, which would also mean that there needs to be sufficient space for the substation. Given this, we propose that the HVAC interconnector be clarified to be at 230kV or 400kV. 	<p>This proposed modification is being further reviewed. Therefore, it will not be included in this round of modifications to the Code.</p> <p>EMA will issue a new consultation paper for Code modifications relating to electricity import, taking into consideration the feedback received.</p>

Modification Ref. No.	Clause	Public/ Industry	Comments	EMA's Response
TC/2021/9	1.3.1	SPPA	<p>We refer to our clarification under TC/2021/7.</p> <p>1. Taking into account that the definition of “interconnector” allows for the transmission of energy between the import facility and an external system, for clarity, we think that it may be appropriate to include a similar concept in the definition of “import facility”, and also to (if the definition of “interconnector” at TC/2021/7 is final) exclude the “interconnector” from an “import facility” as follows in red:</p> <p><u>“import facility” means an installation in Singapore wherein electricity imported from or exported to an external system or external generation facility via High Voltage Direct Current (HVDC) or High Voltage Alternating Current (HVAC) interconnector is transmitted to or from the transmission system or a Generation Licensee’s HVAC switchhouse. A HVDC import facility shall comprise of a HVDC interconnector, HVDC Facility station, a subsea cable landing point, HVDC cables, HVAC cables connecting to the transmission system or a Generation Licensee’s switchhouse, all auxiliary equipment, and an energy storage system if needed. Whilst a HVAC import facility shall comprise of a HVAC interconnector, subsea cable landing point, HVAC cables connecting to a Generation Licensee’s switchhouse (if applicable), all auxiliary equipment, and an energy storage system if needed. Refer to Figure F1.3.1.a, b, c, and d for illustration.</u></p> <p>2. This comment seeks to align the modifications and the Guide:</p>	<p>This proposed modification is being further reviewed. Therefore, it will not be included in this round of modifications to the Code.</p> <p>EMA will issue a new consultation paper for Code modifications relating to electricity import, taking into consideration the feedback received.</p>

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			<p>2.1 Import facilities will be operating above 66kV. Taking into consideration that the definition of "transmission network" means that part of the transmission system operating at 66kV and above", we would like to clarify for Figures 1.3.1b and 1.3.1d if the black dotted-lined box (i.e. import facility within Singapore waters) should be a subset of the red dotted-lined box (i.e. Transmission Network). If this is not the intention, we suggest that the definition of the "transmission network" exclude any "import facility".</p> <p>2.2 Further, and specifically with reference to section 6.7 of the Guide, it is stated that SPPA will own as much of imports infrastructure in Singapore as possible. This means that it would be an exception for an Importer Licensee (or an SPV belonging to the Importer Licensee's consortium) to DBOOM the import facility. For clarity, we suggest that it be provided in the Transmission Code and in figures 1.3.1b and 1.3.1d that the default party who DBOOMs the import facility (on new and unused land) will be SPPA, subject to the said exceptions.</p> <p>2.3 It is provided in section 6.2 of the Guide that EMA intends SPPA to build, own and operate (including but not limited to) the subsea cables within Singapore's borders. SPPA understands that the reasons for this are: (i) to facilitate open access and (ii) to ensure a responsible party is available to decommission the subsea cables when the cables reach their end-of-life. SPPA would like to seek confirmation that SPPA would be able to recover all associated costs and what would be the charging and/or cost recovery mechanism for (i) and (ii), and whether this will be stated in the</p>	

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			<p>Transmission Code, reflected in a regulated contract with the Importer Licensee, or otherwise.</p> <p>2.4 It is provided in section 6.3 of the Guide that import infrastructure (including subsea cables) that is built on private land will not be built by SPPA. SPPA would like to seek confirmation that SPPA would not be required to decommission these subsea cables when they reach their end-of-life.</p> <p>3. Referring to the Figures, we would like to clarify that the cable jointing at:</p> <ul style="list-style-type: none"> (a) the "Generation Licensee's Switchhouse" (at figure 1.3.1a and 1.3.1c); or (b) the "Landing Point" (at figure 1.3.1b where the HVAC import facility is not owned or operated by the Transmission Licensee); or (c) the "HVDC substation" (i.e. HVDC Facility) (at figure 1.3.1d where the HVDC import facility is not owned and operated by the Transmission Licensee), <p>is not under SPPA's the scope of work.</p> <p>4. Referring to the figures, please clarify where "all auxiliary equipment, and an energy storage system if needed" will be or are allowed to be located as these are not indicated in the figures.</p> <p>5. We note that section 3.4b of the Guide indicates that HVDC imports can also be used in dedicated Plant-to-Grid connections. We suggest that figures 1.3.1c and 1.3.1d be modified accordingly (or a new figure be added) as they are currently showing that HVDC Import Facilities are connected to "External Systems" only.</p>	

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			<p>6. In relation to Figures 1.3.1b and 1.3.1d, we propose that section 7.1 of the Transmission Code be amended to include that the Importer Licensee is to provide security to mitigate the risk of non-payment by the Importer Licensee for the access to SPPA's import facility.</p> <p>7. We note that the existing SPPA-TNB circuit is not represented in the figures and may require an exceptional treatment in the Transmission Code. For this to be represented, we minimally suggest that the term "External Generation Facility" in figure 1.3.1b be replaced with "External Generation Facility / External System". However, we wish to point out that in the SPPA-TNB circuit, the landing point and the HVAC interconnector (up to but not including Plentong Station) is co-owned by SPPA and TNB, and by agreement between SPPA and TNB, SPPA is responsible to operate and maintain the interconnector (up to termination of the submarine cable at Senibong) as indicated in the solid red-lined box below. Moreover, the importer licensee (e.g. YTLPS and Keppel pursuant to the 100MW trials) who uses the SPPA-TNB interconnector to import electricity do not own/operate/maintain the import facility (i.e. not "responsible for"). As such, we suggest that the Transmission Code be amended to reflect the specific setup for the SPPA-TNB circuit and that SPPA is the owner/operator/maintainer of the import facility. We also wish to highlight that the definition of the interconnector in the SPPA-TNB Interconnection Agreement is in line with the current Transmission Code (6 Aug 2021) definition of "interconnector", but once the definition of "interconnector" changes (from between transmission system and external system to between import facility and external system), there will be a disconnect between the definition of "interconnector" in the Transmission</p>	

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			<p>Code and the definition in the Interconnection SPPA-TNB Agreement. We propose to have a separate discussion with EMA on this.</p> <p>Figure F1.3.1 b - HVAC Import Facility Connecting Directly to Transmission Licensee's Substation</p>  <p>8. In relation to Figures 1.3.1.c and 1.3.1d, we suggest that the reference to “HVDC Substation” be replaced with “HVDC Facility” for clarity. This is because in this Transmission Code modifications, the definition of “substation” has been modified to mean the Transmission Licensee’s substation, and the term “HVDC Facility” has already been defined.</p> <p>9. In relation to Figure 1.3.1d, we wish to clarify the contingency requirement for the “HVDC cable” connection between the “Landing Point” and the “HVDC Substation” as it does not seem to be defined as an interconnector, nor is it part of the “Transmission Network”. Does this cable need to be at least single or dual contingency?</p>	
		Keppel Merlimau Cogen	EMA’s Import Guide published 12 Nov 2021 requires import infrastructure to be transferred to SPPA. As such, will the HVDC Import Facility be managed by the Transmission Licensee or the Importer Licensee? Keppel would also like to confirm if the section between the subsea sea-to-land transition joint to the converter station HVAC cable outlet is considered to be part of the Import Facility.	<p>This proposed modification is being further reviewed. Therefore, it will not be included in this round of modifications to the Code.</p> <p>EMA will issue a new consultation paper for Code modifications relating to electricity import, taking into consideration the feedback received.</p>

Modification Ref. No.	Clause	Public/ Industry	Comments	EMA's Response
		Tuas Power Generation	<p>1. We understand that "import facility" means the installation in Singapore as per the proposed new definition for "import facility" in section 1.3.1 and includes interconnector, either HVDC or HVAC. Referring to Figures F1.3.1 a, b, c, and d, HVDC interconnector and HVAC interconnector are also part of Import facility. EMA has proposed modifying the definition of "interconnector" to: "interconnector" means a set of feeder circuits for the transmission of electricity to from between the transmission system <i>import facility</i> and from or to an external system or external generation facility outside Singapore, and 'interconnection' shall be interpreted accordingly. This implies that the interconnector has parts that are outside of Singapore and not part of an import facility whereas the proposed new definition for "import facility" refers to an installation in Singapore and includes interconnector, either HVDC or HVAC.</p> <p>Given the above, could EMA clarify and elaborate the definition of "interconnector" and if need be "import facility" too in section 1.3.1?</p> <p>2. For Figures F1.3.1 a, b, c, and d, could EMA specify the composition of what is called "landing point" in the proposed modified Transmission Code. Is there necessarily an electrical substation or can this be just an electrically passive transition box from subsea to underground cables? For each case could EMA specify the physical limit (switchgear for example) between Import facility and Transmission Network?</p> <p>3. For Figures 1.3.1 a, b, c and d - Can "internal generation facility" (i.e. existing generation units connected to the "Generation Licensee's Switchhouse" and already active in Singapore's transmission system and wholesale electricity market) contribute and support the "external generation</p>	<p>This proposed modification is being further reviewed. Therefore, it will not be included in this round of modifications to the Code.</p> <p>EMA will issue a new consultation paper for Code modifications relating to electricity import, taking into consideration the feedback received.</p>

Modification Ref. No.	Clause	Public/ Industry	Comments	EMA's Response
			<p>facility" performance (e.g. to meet load factor or 30-min dispatch period non-intermittency requirements)?</p> <p>4. For figures 1.3.1 a, b, c and d - How does EMA intend to allocate the commitments/requirements/performance standards between the generation licensee's existing assets and the ones of the External Generation facility or External System if EMA has any intention to do so?</p>	
		Sun Cable Pte Ltd	<p>As per TC/2021/7, "interconnector" means a set of feeder circuits between the import facility and an external system. Our interpretation of the meaning of interconnector is that it is a connection of the import facility and is independent from the import facility. We would like to seek EMA's confirmation that an importer is considered an "external system" rather than "generation facility" (referring to Figure F1.3.1c).</p> <p>Referring to Figure F1.3.1a, there is no connection method mentioned between the indicated "Generation Licensee's Switchhouse" and "Transmission Licensee's Substation". Would both the "Generation Licensee's Switchhouse" and "Transmission Licensee's Substation" include existing buildings and new ones?</p>	<p>This proposed modification is being further reviewed. Therefore, it will not be included in this round of modifications to the Code.</p> <p>EMA will issue a new consultation paper for Code modifications relating to electricity import, taking into consideration the feedback received.</p>
TC/2021/12	1.3.1	SPPA	<p>We would like to clarify if "interconnectors" include that part of the interconnector that is outside of Singapore's boundary limits.</p> <p>We would also like to clarify if the definition of power system should include import facility(s).</p>	<p>EMA notes the feedback pertaining to electricity import. EMA will issue a new consultation paper for Code modifications relating to electricity import, taking into consideration the feedback received.</p> <p>Meanwhile, we will proceed with the proposed modification of this clause without incorporating the modification relating to electricity import (see Appendix 2).</p>

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TC/2021/15	1.3.1	SPPA	<p>This comment relates to the situation where the Importer Licensee may not be the owner or operator of the import facility:</p> <p>It is possible that the generating unit (including an import facility) that is connected to the Generation Licensee's switchhouse may not be owned and operated by such Generation Licensee but by an entity who may not be a Licensee (e.g. in respect of an import facility, it may not be owned by an Importer Licensee). As such, we suggest that this definition be modified to take into account the situation where the respective generating unit (including an import facility) is owned and operated by an entity other than the Generation Licensee.</p>	<p>This proposed modification is being further reviewed. Therefore, it will not be included in this round of modifications to the Code.</p> <p>EMA will issue a new consultation paper for Code modifications relating to electricity import, taking into consideration the feedback received.</p>
TC/2021/19	4.8.1	SPPA	<ol style="list-style-type: none"> <li data-bbox="680 735 1388 978">1. This comment relates to the situation where the Importer Licensee may not be the owner or operator of the import facility: <p>As a general comment, we propose that a statement be provided that it is the responsibility of the Importer Licensee to procure all requirements or obligations in relation to an import facility.</p> <li data-bbox="680 1011 1388 1337">2. This comment seeks to align the modifications and the Guide: <p>As SPPA will by default DBOOM the import facility (on new and unused land), certain obligations in section 4.8 of the Transmission Code are also applicable to SPPA as owner/operator of the import facility. As such, where in section 4.8 it refers to the Importer Licensee, where sensible, it should also be amended to clarify that it includes SPPA.</p> 	<p>This proposed modification is being further reviewed. Therefore, it will not be included in this round of modifications to the Code.</p> <p>EMA will issue a new consultation paper for Code modifications relating to electricity import, taking into consideration the feedback received.</p>

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TC/2021/20	4.8.2	SPPA	<p>This comment seeks to align the modifications and the Guide:</p> <p>As SPPA will by default own and operate the import facility (on new and unused land), this section may be amended to also state that SPPA, where it is the owner/operator of the import facility, to provide certain information to Power System Operator.</p>	<p>This proposed modification is being further reviewed. Therefore, it will not be included in this round of modifications to the Code.</p> <p>EMA will issue a new consultation paper for Code modifications relating to electricity import, taking into consideration the feedback received.</p>
TC/2021/21	4.8.3	Keppel Merlimau Cogen	<p>Will the 600 MW single source import limit be further reduced if generating units in the SWEM are unable to provide 600MW of reserves (e.g. during reserve shortfall scenarios)?</p> <p>Will the EMA be open to relaxing the 600 MW limit for the initial 5 years of imports? This will provide importers with some lead time to ramp up their BESS capacity after the commencement of commercial operations in order to manage the intermittent nature of renewable imports.</p>	<p>This proposed modification is being further reviewed. Therefore, it will not be included in this round of modifications to the Code.</p> <p>EMA will issue a new consultation paper for Code modifications relating to electricity import, taking into consideration the feedback received.</p>
TC/2021/22	4.8.4	SPPA	<p>1. This comment relates to the situation where the Importer Licensee may not be the owner or operator of the import facility:</p> <p style="padding-left: 40px;">In the case where the neither the Importer Licensee nor the Transmission Licensee owns and operates the import facilities, we would like to clarify who should be the parties forming the Joint Operation Committee.</p> <p style="padding-left: 40px;">If the Generation Licensee is the owner and operator of import facilities within private land, should the Generation Licensee be part of this Joint Operation Committee?</p> <p>2. We would also like to clarify if there would be a lead party for the joint operation committee, and if so, should the lead party be identified.</p>	<p>This proposed modification is being further reviewed. Therefore, it will not be included in this round of modifications to the Code.</p> <p>EMA will issue a new consultation paper for Code modifications relating to electricity import, taking into consideration the feedback received.</p>

Modification Ref. No.	Clause	Public/ Industry	Comments	EMA's Response
			<p>3. We suggest that the decision-making process of the Joint Operation Committee be outlined, e.g. whether it is by majority vote or unanimous agreement.</p>	
TC/2021/23	4.8.5	SPPA	<p>1. In relation to 4.8.5(a), it would not be appropriate for SPPA to determine the design of the import facility or technology if the definition of "import facility" includes the interconnector, and in practice, the interconnector may comprise not just the subsea cables but also overhead land cables in a foreign country. We note that the definition of "import facility" means "an installation in Singapore", but the figures in 1.3.1 do not reflect this. We suggest that the definition of import facility be made clear that it is limited to only that part of the interconnector that is located within Singapore borders, and that the figures in 1.3.1 be amended to reflect this.</p> <p>2. In relation to 4.8.5(b), if circuit breakers are required at both ends of the interconnection (i.e. interconnector), this would mean that circuit breakers are required to be located, at the Singapore end, at the landing point. However, the landing point is usually just a jointing between the subsea cable and the onshore cable. For figure 1.3.1a, the circuit breaker in Singapore can be located at the Generation Licensee's switchhouse. For figure 1.3.1b, the circuit breaker in Singapore can be located at the Transmission Licensee's substation, if the importer does not build its own installation to house the circuit breaker. For figures 1.3.1c, as there is no viable solution for HVDC circuit breakers at present, we suggest that the circuit breaker be located at the HVDC Facility (where it connects to the HVAC cables) and/or at the Generation Licensee's switchhouse (where it connects to the Transmission Licensee's substation). For figure 1.3.1d, we suggest that the circuit breaker be</p>	<p>This proposed modification is being further reviewed. Therefore, it will not be included in this round of modifications to the Code.</p> <p>EMA will issue a new consultation paper for Code modifications relating to electricity import, taking into consideration the feedback received.</p>

Modification Ref. No.	Clause	Public/ Industry	Comments	EMA's Response
			<p>located at the HVDC Facility (where it connects to the Transmission Licensee's substation).</p> <p>3. In relation to 4.8.5(g), if synchronizing facilities are required at both ends of the interconnection (i.e. interconnector), this would mean that synchronizing facilities are required to be located, at the Singapore end, at the landing point. However, the landing point is usually just a jointing between the subsea cable and the onshore cable. For the figures 1.3.1a to d, the synchronizing facility can be located at the HVDC Facility (if available), Generation Licensee's switchhouse (if applicable) or the Transmission Licensee's substation; in these cases we suggest that the person obliged to install and maintain the synchronizing facilities be the owner or operator of the import facility. As such, where the Transmission Licensee is the owner and operator of the import facility, the Transmission Licensee has the option to place the synchronizing facility in the HVDC Facility or Transmission Licensee's substation. However, we wish to highlight that for figure 1.3.1b, as the only available place to install the synchronising facility is the Transmission Licensee's substation, we suggest that it be installed, owned and operated by the Transmission Licensee, regardless of who owns the HVAC import facility, if the importer does not build its own installation to house the synchronizing facility.</p> <p>4. This comment relates to the situation where the Importer Licensee may not be the owner or operator of the import facility:</p> <p style="padding-left: 40px;">In relation to 4.8.5(g), we would like to clarify that the "Licensee" should also refer to Importer Licensee or</p>	

Modification Ref. No.	Clause	Public/ Industry	Comments	EMA's Response
			<p>Generation Licensee (for import facilities on private land within a genco).</p> <p>We further suggest that EMA may wish to include the owner/operator of the import facility or require that the relevant Importer/Generation Licensee procures the synchronizing facilities for the import facility related to its licence conditions.</p>	
		Keppel Merlimau Cogen	<p>Does the single contingency criterion in 4.8.5(c) also refer to the "N-1" redundancy as described in EMA's Import Guide?</p> <p>Can the PSO take into consideration the nature of variability and availability of renewable energy and cater the frequency sensitivity requirement in 4.8.5(d) for renewable imports?</p>	<p>This proposed modification is being further reviewed. Therefore, it will not be included in this round of modifications to the Code.</p> <p>EMA will issue a new consultation paper for Code modifications relating to electricity import, taking into consideration the feedback received.</p>
		Tuas Power Generation	<p>4.8.5(a) - In the interests of transparency and a level playing field, can the expected allowable short circuit current contribution of each possible connection point to the transmission network for import facilities be provided?</p>	<p>This proposed modification is being further reviewed. Therefore, it will not be included in this round of modifications to the Code.</p> <p>EMA will issue a new consultation paper for Code modifications relating to electricity import, taking into consideration the feedback received.</p>
		Sun Cable Pte Ltd	<p>Referring to item (c) in the modified text, the location of measured power should be clarified as at the sending end OR the receiving end of the HVDC facility? The power loss between sending and receiving ends varies in different operating conditions. For example, in a 2-pole metallic return HVDC system design, when there is single-pole outage, the receiving end power will be reduced to less than 50%. Hence, we seek that the EMA considers the location of</p>	<p>This proposed modification is being further reviewed. Therefore, it will not be included in this round of modifications to the Code.</p> <p>EMA will issue a new consultation paper for Code modifications relating to electricity import, taking into consideration the feedback received.</p>

Modification Ref. No.	Clause	Public/ Industry	Comments	EMA's Response
			<p>measured power to be at the sending end of the HVDC connector of the generation facility.</p> <p>Referring to item (d) in the modified text, we would like to request EMA to clearly define how much capacity for import facility is considered sufficient to meet the frequency sensitivity requirement. This will allow Importers to accordingly include such requirements into the system design considerations</p>	
TC/2021/24	4.8.6	SPPA	<p>This comment relates to the situation where the Importer Licensee may not be the owner or operator of the import facility:</p> <p>The Importer Licensee is likely not the owner or operator of external generating facilities. We suggest that it may be more accurate to state that the Importer Licensee is obliged to procure all the external generating facilities to comply with the technical requirements in 4.8.6.</p>	<p>This proposed modification is being further reviewed. Therefore, it will not be included in this round of modifications to the Code.</p> <p>EMA will issue a new consultation paper for Code modifications relating to electricity import, taking into consideration the feedback received.</p>
		Keppel Merlimau Cogen	<p>Are there any conditions whereby renewable imports which meet only part of the Minimum Capability Requirements described in Appendix C4 will still be permitted to be connected to the transmission system?</p>	<p>This proposed modification is being further reviewed. Therefore, it will not be included in this round of modifications to the Code.</p> <p>EMA will issue a new consultation paper for Code modifications relating to electricity import, taking into consideration the feedback received.</p>
		Sun Cable Pte Ltd	<p>We would like to seek EMA's confirmation that an importer is considered an "external system" rather than "generation facility" (referring to Figure F1.3.1c).</p> <p>Referring to item (e) in the modified text, a clearer definition of "real-time signal" is needed. We would like to seek EMA's</p>	<p>This proposed modification is being further reviewed. Therefore, it will not be included in this round of modifications to the Code.</p>

Modification Ref. No.	Clause	Public/ Industry	Comments	EMA's Response
			clarification on, what is the sampling rate of signals to be sent by Power System Operator and the expected time for the Importer Licensee and its external system to start responding to the command and time to complete the command?	EMA will issue a new consultation paper for Code modifications relating to electricity import, taking into consideration the feedback received.
TC/2021/25	4.8.7	SPPA	As the Transmission Code is likely not to have any legally binding effect on an external party, we suggest that Importer Licensee procure the obligations in 4.8.7 to be performed by the external party instead.	<p>This proposed modification is being further reviewed. Therefore, it will not be included in this round of modifications to the Code.</p> <p>EMA will issue a new consultation paper for Code modifications relating to electricity import, taking into consideration the feedback received.</p>
		Sun Cable Pte Ltd	Referring to item (f) in the modified text, and clause 6.6 in the Transmission Code, we would like to seek EMA's confirmation that this requirement is not applicable to HVDC interconnectors. For HVDC interconnectors, we would like EMA to clarify that the required power factor is 0.95 lagging to 0.95 leading, in line with the technology limitation for such HVDC systems.	<p>This proposed modification is being further reviewed. Therefore, it will not be included in this round of modifications to the Code.</p> <p>EMA will issue a new consultation paper for Code modifications relating to electricity import, taking into consideration the feedback received.</p>
TC/2021/26	4.8.8	SPPA	<p>This comment relates to the situation where the Importer Licensee may not be the owner or operator of the import facility:</p> <p>The Importer Licensee is likely not the owner or operator of external generating facilities. The Transmission Code could be clarified to reflect this.</p> <p>As the Transmission Code is likely not to have any legally binding effect on an external party, we suggest that Importer Licensee procure the</p>	<p>This proposed modification is being further reviewed. Therefore, it will not be included in this round of modifications to the Code.</p> <p>EMA will issue a new consultation paper for Code modifications relating to electricity import, taking into consideration the feedback received.</p>

Modification Ref. No.	Clause	Public/ Industry	Comments	EMA's Response
			<p>obligations in 4.8.8 to be performed by the external party instead.</p>	
TC/2021/27	4.8.9	SPPA	<p>This comment relates to the situation where the Importer Licensee may not be the owner or operator of the import facility:</p> <p>The Importer Licensee is likely not the owner or operator of external generating facilities. The Transmission Code could be clarified to reflect this.</p> <p>As the Transmission Code is likely not to have any legally binding effect on an external party, we suggest that Importer Licensee procure the obligations in 4.8.9 to be performed by the external party instead.</p>	<p>This proposed modification is being further reviewed. Therefore, it will not be included in this round of modifications to the Code.</p> <p>EMA will issue a new consultation paper for Code modifications relating to electricity import, taking into consideration the feedback received.</p>
TC/2021/29	6.1.6	SPPA	<ol style="list-style-type: none"> 1. There may be a situation where the Generation Licensee or Importer Licensee becomes insolvent and it would not be practical to seek EMA's approval to retire the generating units or import facilities. We suggest that the security or performance bond provided by these licensees be expanded in scope to allow EMA to utilize such security or performance bond to compensate for losses and expenses in the event of their exit. 2. We wish to clarify whether section 6.1.3 should include that the "Importer Licensee" shall maintain and operate its installations to ensure there is no adverse impact to the power system. 3. We further wish to clarify whether section 6.1.5 should include that the Importer Licensee shall procure sufficiently trained and qualified personnel to maintain 	<ol style="list-style-type: none"> 1. EMA currently has no intent to require any Generation Licensee to provide a performance bond for or in relation to insolvency. 2. EMA notes the feedback pertaining to electricity import. EMA will issue a new consultation paper for Code modifications relating to electricity import, taking into consideration the feedback received. <p>Meanwhile, we will proceed with the proposed modification of this clause without incorporating the modification relating to electricity import (see Appendix 2).</p> <ol style="list-style-type: none"> 3. EMA notes the feedback pertaining to electricity import. EMA will issue a new consultation paper for Code modifications relating to electricity import, taking into consideration the feedback received.

Modification Ref. No.	Clause	Public/ Industry	Comments	EMA's Response
			and operate the import facilities, similar to the obligation of the Transmission Licensee and Generation Licensee.	Meanwhile, we will proceed with the proposed modification of this clause without incorporating the modification relating to electricity import (see Appendix 2).
		Senoko Energy	<p>A 60-month (I.E., 5 years) lead time for the written application for import generation assets could be too long, especially if there are any technical and/or commercial reasons which do not support the continuation of operating these assets.</p> <p>Therefore, we are proposing for the lead time to be shortened to 2-3 years instead.</p>	The requirement for a 60-months' (i.e. 5 years) notice period is to facilitate efficient and timely planning for the entry and exit of generation capacity, which is necessary to ensure security of electricity supply to consumers. Shortening the lead-time from 5 years to 2 - 3 years would not provide adequate time for planting of new generation capacity to replace existing capacity that is to be decommissioned.
		Tuas Power Generation	The requirement to submit written request not later than 60 months before is rather long and onerous. 60 months is longer than the 4 years mentioned in the 29 July 2016 EMA Final Determination Paper "PREPARING FOR FUTURE POWER GENERATION INVESTMENTS IN SINGAPORE" with generation licensees already having concerns with the shorter 4 years. Such an onerous requirement would deter investments.	The requirement for a 60-months' (i.e. 5 years) notice period is to facilitate efficient and timely planning for the entry and exit of generation capacity, which is necessary to ensure security of electricity supply to consumers. Shortening the lead-time from 5 years to 2 - 3 years would not provide adequate time for planting of new generation capacity to replace existing capacity that is to be decommissioned.
TC/2021/30	6.6.3	SPPA	<p>1. This comment seeks to align the modifications and the Guide:</p> <p>As SPPA is the default owner and operator of import facility (on new and unused land), we suggest that this section be amended in red to:</p> <p><u>"Where the Transmission Licensee is the owner or operator of the HVDC import facility connected to the transmission system, the Transmission Licensee shall ensure that the steady state tolerance on</u></p>	<p>This proposed modification is being further reviewed. Therefore, it will not be included in this round of modifications to the Code.</p> <p>EMA will issue a new consultation paper for Code modifications relating to electricity import, taking into consideration the feedback received.</p>

Modification Ref. No.	Clause	Public/ Industry	Comments	EMA's Response
			<p><u>reactive power exchange with the transmission system expressed in MVar shall be no greater than +/-5% of the rated MW of the HVDC import facility.</u></p> <p><u>Where the HVDC import facility is not owned or operated by the Transmission Licensee, the Transmission Licensee and the Importer Licensee or Generation Licensee (as the case may be) responsible for the HVDC import facility connected person responsible for each HVDC facility connected to the transmission system shall ensure that the steady state tolerance on reactive power exchange with the transmission system expressed in MVar shall be no greater than +/-5% of the rated MW of the HVDC <u>import facility.</u>"</u></p> <p>2. Where both the Importer Licensee and Generation Licensee are not the owner or operator of such import facility but an external party is, the Transmission Code is likely not to have any legally binding effect on an external party, we suggest that these Licensees procure the obligations in 6.6.3 to be performed by the external party instead.</p>	
		Tuas Power Generation	This refers to HVDC import facility but we would like to know if there is any reactive power requirement for external generation facility and HVAC import facility.	<p>This proposed modification is being further reviewed. Therefore, it will not be included in this round of modifications to the Code.</p> <p>EMA will issue a new consultation paper for Code modifications relating to electricity import, taking into consideration the feedback received.</p>

Modification Ref. No.	Clause	Public/ Industry	Comments	EMA's Response
TC/2021/31	6.6.4	Tuas Power Generation	Would this requirement be applicable to just steady state operations or also during commissioning and transition to steady state operations? Will the power system model be available for the importer to check compliance with this requirement prior to building the import facility?	<p>This proposed modification is being further reviewed. Therefore, it will not be included in this round of modifications to the Code.</p> <p>EMA will issue a new consultation paper for Code modifications relating to electricity import, taking into consideration the feedback received.</p>
		Sun Cable Pte Ltd	Voltage change at the connection point of more than 5% of nominal is technically possible for the HVDC/VSC import facility to be in the voltage control mode, but it may require us to exceed the +/-5% reactive power requirement as stipulated in TC/2021/30.	<p>This proposed modification is being further reviewed. Therefore, it will not be included in this round of modifications to the Code.</p> <p>EMA will issue a new consultation paper for Code modifications relating to electricity import, taking into consideration the feedback received.</p>
TC/2021/33	6.12.2	SPPA	<p>1. This comment relates to the situation where the Importer Licensee may not be the owner or operator of the import facility:</p> <p style="padding-left: 40px;">This is similar to our comments provided previously. The Importer Licensee may not own or operate the external generation facility or the import facility.</p> <p>2. Where SPPA is the owner/operator of the HVDC import facility, is SPPA expected to install a separate RTU at the HVDC Facility (i.e. HVDC converter station), given that the existing RTU in the Transmission Licensee substation can be used to monitor the HVDC Facility?</p>	<p>This proposed modification is being further reviewed. Therefore, it will not be included in this round of modifications to the Code.</p> <p>EMA will issue a new consultation paper for Code modifications relating to electricity import, taking into consideration the feedback received.</p>

Modification Ref. No.	Clause	Public/ Industry	Comments	EMA's Response
		Keppel Merlimau Cogen	What is the expected ramp rate (MW/min) that the Import Facility must achieve to provide AGC?	<p>This proposed modification is being further reviewed. Therefore, it will not be included in this round of modifications to the Code.</p> <p>EMA will issue a new consultation paper for Code modifications relating to electricity import, taking into consideration the feedback received.</p>
		Senoko Energy	<p>RTU for automatic control of generating unit's output This requirement for all upstream export assets is infeasible as they would be subjected to their respective transmission code obligations.</p> <p>To quote an example, should an upstream export asset be connected to the TNB's grid, it will require RTU connection to GSO/NLDC for metering and AGC purposes. I.E., The Malaysian grid operator will have automatic control of the asset's output.</p> <p>This requirement would only work if the upstream asset is connected to a dedicated transmission line connected to Singapore.</p> <p>RTU for remote monitoring We agree that this requirement is necessary and practicable.</p>	<p>This proposed modification is being further reviewed. Therefore, it will not be included in this round of modifications to the Code.</p> <p>EMA will issue a new consultation paper for Code modifications relating to electricity import, taking into consideration the feedback received.</p>
TC/2021/34	6.12.3	SPPA	<p>This comment seeks to align the modifications and the Guide:</p> <p>We suggest this clause be amended to reflect that SPPA will, in some situations, own and operate import facility(s).</p>	<p>This proposed modification is being further reviewed. Therefore, it will not be included in this round of modifications to the Code.</p> <p>EMA will issue a new consultation paper for Code modifications relating to electricity import, taking into consideration the feedback received.</p>

Modification Ref. No.	Clause	Public/ Industry	Comments	EMA's Response
TC/2021/35	6.12.4	SPPA	<p>This comment seeks to align the modifications and the Guide:</p> <p>We suggest this clause be amended to reflect that SPPA will own and operate import facility(s).</p>	<p>This proposed modification is being further reviewed. Therefore, it will not be included in this round of modifications to the Code.</p> <p>EMA will issue a new consultation paper for Code modifications relating to electricity import, taking into consideration the feedback received.</p>
TC/2021/36	6.12.5	SPPA	<p>This comment seeks to align the modifications and the Guide:</p> <p>We suggest this clause be amended to reflect that SPPA will own and operate import facility(s).</p>	<p>This proposed modification is being further reviewed. Therefore, it will not be included in this round of modifications to the Code.</p> <p>EMA will issue a new consultation paper for Code modifications relating to electricity import, taking into consideration the feedback received.</p>
TC/2021/37	6.15.1	SPPA	<p>This comment seeks to align the modifications and the Guide:</p> <p>We suggest this clause be amended to align with the Guide to Electricity Imports that SPPA will own and operate import facility(s).</p>	<p>EMA notes the feedback pertaining to electricity import. EMA will issue a new consultation paper for Code modifications relating to electricity import, taking into consideration the feedback received.</p> <p>Meanwhile, we will proceed with the proposed modification of this clause without incorporating the modification relating to electricity import (see Appendix 2).</p>
TC/2021/40	9.2.7	SPPA	<p>1. This comment relates to the situation where the Importer Licensee may not be the owner or operator of the import facility:</p> <p>Please refer to comments to TC/2021/2</p>	<p>This proposed modification is being further reviewed. Therefore, it will not be included in this round of modifications to the Code.</p> <p>EMA will issue a new consultation paper for Code modifications relating to electricity import, taking into consideration the feedback received.</p>

Modification Ref. No.	Clause	Public/ Industry	Comments	EMA's Response
			2. We suggest that Importer Licensee also have the necessary obligations in sections 9.3 and 10 of the Transmission Code	
		Tuas Power Generation	Is there any document we can refer to understand the detailed requirements of the technical audits? What would be the scopes of the different technical audits? And how frequently would the audits need to be conducted? Would EMA consider funding audit costs in excess of a specified amount or provide co-funding? Audits should only be triggered by clearly defined events such as non-compliance/failure. For audits not triggered by clearly defined events, then EMA should bear the costs and to avoid excessive regulatory burden such audits should be minimised given that licensees would still have to commit time and resources for such audits even if costs are borne by EMA.	<p>This proposed modification is being further reviewed. Therefore, it will not be included in this round of modifications to the Code.</p> <p>EMA will issue a new consultation paper for Code modifications relating to electricity import, taking into consideration the feedback received.</p>
TC/2021/41	9.4.1	SPPA	<p>This comment relates to the situation where the Importer Licensee may not be the owner or operator of the import facility:</p> <p style="text-align: center;">Please refer to comments to TC/2021/2.</p>	<p>This proposed modification is being further reviewed. Therefore, it will not be included in this round of modifications to the Code.</p> <p>EMA will issue a new consultation paper for Code modifications relating to electricity import, taking into consideration the feedback received.</p>
TC/2021/43	C7.1	Tuas Power Generation	Where would the ancillary services performance measurement be taken? At the connection point of the generation facility? At the connection between the import facility and the transmission network?	<p>EMA notes the feedback pertaining to electricity import. EMA will issue a new consultation paper for Code modifications relating to electricity import, taking into consideration the feedback received.</p> <p>Meanwhile, we will proceed with the proposed modification of this clause without incorporating the modification relating to electricity import (see Appendix 2).</p>

Modification Ref. No.	Clause	Public/ Industry	Comments	EMA's Response
TC/2021/44	C7.2	Tuas Power Generation	We would like to know if dynamic simulation model would be required for the external generation facility with solar photovoltaic generating units. Note that there is no mention of Importer Licensee.	The dynamic simulation model of the external generation facility (regardless of the type of generating facility, e.g. solar PV) is required.
TC/2021/45	C7.3	Tuas Power Generation	What would be the limits of the ramp rates?	<p>This proposed modification is being further reviewed. Therefore, it will not be included in this round of modifications to the Code.</p> <p>EMA will issue a new consultation paper for Code modifications relating to electricity import, taking into consideration the feedback received.</p>
TC/2021/47	Appendix E	Tuas Power Generation	We understand that the Import facility does not include external generation facility but we would like to know if the test requirements in Appendix E would be applicable to external generation facilities.	<p>This proposed modification is being further reviewed. Therefore, it will not be included in this round of modifications to the Code.</p> <p>EMA will issue a new consultation paper for Code modifications relating to electricity import, taking into consideration the feedback received.</p>
TC/2021/50	F7.1	SPPA	Please clarify if this applies to renewable energy, such as a solar farm.	<p>This proposed modification is being further reviewed. Therefore, it will not be included in this round of modifications to the Code.</p> <p>EMA will issue a new consultation paper for Code modifications relating to electricity import, taking into consideration the feedback received.</p>
		Sun Cable Pte Ltd	<p>Can we remove the "spinning" and just refer to "reserve" which is adopted several times in the document?</p> <p>If "spinning reserve" definition is used, we would like to seek clarity on whether this also includes synthetic i.e. pseudo spinning reserve.</p>	This proposed modification is being further reviewed. Therefore, it will not be included in this round of modifications to the Code.

Modification Ref. No.	Clause	Public/ Industry	Comments	EMA's Response
				EMA will issue a new consultation paper for Code modifications relating to electricity import, taking into consideration the feedback received.
TC/2021/55	F8	SPPA	Suggest to change the term "Spinning Reserve" to "Primary Reserve" as the former may not be applicable to an Import Facility.	<p>This proposed modification is being further reviewed. Therefore, it will not be included in this round of modifications to the Code.</p> <p>EMA will issue a new consultation paper for Code modifications relating to electricity import, taking into consideration the feedback received.</p>
TC/2021/60	F9.1	SPPA	We wish to clarify that SPPA would not normally have access to the recorder's information from the external generation facility.	<p>This proposed modification is being further reviewed. Therefore, it will not be included in this round of modifications to the Code.</p> <p>EMA will issue a new consultation paper for Code modifications relating to electricity import, taking into consideration the feedback received.</p>
TC/2021/65	H2.1	SPPA	Please clarify if the RTU is required only for HVDC Facility (i.e. HVDC converter station).	<p>This proposed modification is being further reviewed. Therefore, it will not be included in this round of modifications to the Code.</p> <p>EMA will issue a new consultation paper for Code modifications relating to electricity import, taking into consideration the feedback received.</p>
TC/2021/71	J2.10	Tuas Power Generation	For HVDC facilities, what are the expected limits of reactive power supply of the converter? Will such depend on the operation situation?	This proposed modification is being further reviewed. Therefore, it will not be included in this round of modifications to the Code.

Modification Ref. No.	Clause	Public/ Industry	Comments	EMA's Response
		Sun Cable Pte Ltd	If the HVDC/VSC facility is set in constant voltage control mode, it might violate the +/-5% reactive power limit required. We would like to seek EMA's clarification on what requirements take precedent.	<p>EMA will issue a new consultation paper for Code modifications relating to electricity import, taking into consideration the feedback received.</p> <p>This proposed modification is being further reviewed. Therefore, it will not be included in this round of modifications to the Code.</p> <p>EMA will issue a new consultation paper for Code modifications relating to electricity import, taking into consideration the feedback received.</p>
TC/2021/72	J2.11	Sun Cable Pte Ltd	We would like to seek clarity technically on why this is stipulated.	<p>This proposed modification is being further reviewed. Therefore, it will not be included in this round of modifications to the Code.</p> <p>EMA will issue a new consultation paper for Code modifications relating to electricity import, taking into consideration the feedback received.</p>

Appendix 2

Modifications to the Transmission Code

Modification Ref. No.	Clause	Original Text	Modified Text	Reasons
TC/2021/1	1.2.1	<p>This <i>Code</i> is applicable to:</p> <p>(a) The Transmission Licensee, who is subject to and required to comply with this <i>Code</i> by a condition of its electricity licence;</p> <p>(b) Generation Licensees who are subject to and required to comply with this <i>Code</i> by a condition of their electricity licence;</p> <p>(c) Wholesaler (Generation) Licensees who are subject to and required to comply with this <i>Code</i> by a condition of their electricity licence;</p> <p>(d) Wholesaler (Demand Response Programme) Licensees who are subject to and required to comply with this <i>Code</i> by a condition of their electricity licence;</p> <p>(e) Market Company Licensee who is subject to and required to comply with this <i>Code</i> by a condition of their electricity licence;</p> <p>(f) A <i>connected person</i> who is required to comply with this <i>Code</i> or certain provisions of this <i>Code</i> under the terms of a <i>Connection Agreement</i> or <i>Retailer Use of System Agreement</i> with the Transmission</p>	<p>This <i>Code</i> is applicable to:</p> <p>(a) The Transmission Licensee, who is subject to and required to comply with this <i>Code</i> by a condition of its electricity licence;</p> <p>(b) Generation Licensees who are subject to and required to comply with this <i>Code</i> by a condition of their electricity licence;</p> <p>(c) Wholesaler (Generation) Licensees who are subject to and required to comply with this <i>Code</i> by a condition of their electricity licence;</p> <p>(d) Wholesaler (Demand Response Programme) Licensees who are subject to and required to comply with this <i>Code</i> by a condition of their electricity licence;</p> <p>(e) Market Company Licensee who is subject to and required to comply with this <i>Code</i> by a condition of their electricity licence;</p> <p>(a) <u>A Licensee who is subject to this <i>Code</i> as a condition of its <i>electricity licence</i> and a Licensee defined in section 1.3.1 of this <i>Code</i>;</u></p> <p>⊕ (b) A <i>connected person</i> who is required to comply with this <i>Code</i> or certain provisions</p>	<p>To provide clarity on the respective Licensees who are required to comply with this <i>Code</i> as a condition of its electricity licence.</p>

Modification Ref. No.	Clause	Original Text	Modified Text	Reasons
		<p>Licensee or by a condition of its electrical installation licence; and</p> <p>(g) The <i>Power System Operator</i>, either under the provisions of this <i>Code</i> or under the terms of the <i>Operating Agreement</i>.</p>	<p>of this <i>Code</i> under the terms of a <i>Connection Agreement</i> or <i>Retailer Use of System Agreement</i> with the <i>Transmission Licensee</i> or by a condition of its electrical installation licence; and</p> <p>(g) (c) The <i>Power System Operator</i>, either under the provisions of this <i>Code</i> or under the terms of the <i>Operating Agreement</i>.</p>	
TC/2021/2	1.3.1	<p>“connection applicant” means, in respect of a <i>generation facility</i>, a Generation Licensee or Wholesaler (Generation) Licensee and, in respect of a consumer <i>installation</i>, a person acting through an <i>authorised person</i> but (for the avoidance of doubt) shall exclude a <i>sub-metered consumer</i></p>	<p>“connection applicant” means, (1) in respect of a <i>generation facility</i>, a <i>Generation Licensee</i> or <i>Wholesaler (Generation) Licensee</i>, and, (2) in respect of a consumer <i>installation</i>, a person acting through an <i>authorised person</i> but (for the avoidance of doubt) shall exclude a <i>sub-metered consumer</i></p>	<p>To update the reference to Wholesaler Licensees (following the Wholesaler Licence Modification Final Determination Paper issued on 29 Jun 2021).</p>

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TC/2021/12	1.3.1	“power system” means a system comprising the <i>transmission and distribution networks</i> , generation and consumer <i>installations</i> , and <i>external systems</i> connected to the <i>transmission system</i> ;	“power system” means a system comprising the <i>transmission and distribution networks</i> , generation <i>generation facilities</i> , energy storage systems , and consumer <i>installations</i> , and <i>external systems</i> connected to the <i>transmission system</i> ;	Energy storage and generation facilities shall be included as part of the power system.
TC/2021/14	1.3.1	New definition	“substation” means an <i>installation</i> used by <i>Transmission Licensee</i> for the purpose of conveying electricity;	To include new definition for substation.
TC/2021/29	6.1.6	New Clause	<p>(a) <u>Any <i>Generation Licensee</i> that intends to retire any of its <i>generating units</i>, shall submit a written request to the <i>Authority</i> for approval not later than 60 months prior to the date of the intended retirement of the <i>generating unit</i>, and shall provide such information that the <i>Authority</i> requires to facilitate the <i>Authority’s</i> decision in relation to whether to approve the retirement of the <i>generating unit</i> (including whether to approve the same subject to conditions), taking into consideration the protection of the interests of consumers with regard to the security, reliability, availability and continuity of supply of electricity. The <i>Authority</i> may, if it considers necessary or appropriate, approve the retirement of the <i>generating unit</i> subject to conditions.</u></p> <p>(b) <u>No <i>Generation Licensee</i> shall retire any of its <i>generating units</i>, unless it has obtained the written approval of the <i>Authority</i> and complied with all conditions of approval of the <i>Authority</i> under section 6.1.6(a). For the avoidance of doubt, a <i>Generation Licensee</i> is deemed not to have obtained the <i>Authority’s</i> approval under section 6.1.6(a) if the <i>Generation Licensee</i> fails</u></p>	To improve informational certainty to facilitate efficient and timely planning for the entry and exit of generation capacity, which is necessary to ensure security of electricity supply to consumers.

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			<u>to comply with any condition of approval of the Authority under section 6.1.6(a).</u>	
TC/2021/37	6.15.1	The Transmission Licensee, Generation Licensees, Wholesaler (Generation) Licensees, Wholesaler (Demand Response Programme) Licensees, Market Company Licensee and connected person responsible for each HVDC facility shall put in place adequate cyber security measures to ensure that designated Critical Information Infrastructures (CIIs) are properly maintained, operated and secured, so as not to compromise, or cause any adverse impact, to the security, reliability and stability of the power system including interruption of electricity supply or electricity generation due to inadvertent system or equipment failure, human error or through malicious actions of other parties.	The <u>Transmission Licensee, Generation Licensees, Wholesaler (Generation) Licensees, Wholesaler (Demand Response Programme) Licensee, Market Company Licensee</u> and connected person responsible for each HVDC facility shall put in place adequate cyber security measures to ensure that designated Critical Information Infrastructures (CIIs) are properly maintained, operated and secured, so as not to compromise, or cause any adverse impact, to the security, reliability and stability of the power system including interruption of electricity supply or electricity generation due to inadvertent system or equipment failure, human error or through malicious actions of other parties.	To update the reference to Wholesaler Licensees (following the Wholesaler Licence Modification Final Determination Paper issued on 29 Jun 2021).
TC/2021/42	C1	Each Generation Licensee or Wholesaler (Generation) Licensee responsible for the generation facility, with the exception of solar photovoltaic systems, and seeking connection to the <i>transmission system</i> shall provide the information required in accordance with the format set forth in C.1.1 to C.1.3 of this Appendix for both primary and <i>alternate fuel</i> (for <i>generating units</i> that are capable of operating and required to operate on <i>alternate fuel</i>). For solar photovoltaic <i>generating unit</i> , the Generation Licensee or Wholesaler (Generation) Licensee shall provide the information required in accordance with the format set forth in C7 of this Appendix.	Each <u>Generation Licensee</u> or <u>Wholesaler (Generation) Licensee</u> responsible for the generation facility, with the exception of solar photovoltaic systems, and seeking connection to the <i>transmission system</i> shall provide the information required in accordance with the format set forth in C.1.1 to C.1.3 of this Appendix for both primary and <i>alternate fuel</i> (for <i>generating units</i> that are capable of operating and required to operate on <i>alternate fuel</i>). For solar photovoltaic <i>generating unit</i> , the <u>Generation Licensee</u> or <u>Wholesaler (Generation) Licensee</u> shall provide the information required in accordance with the format set forth in C7 of this Appendix.	To update the reference to Wholesaler Licensees (following the Wholesaler Licence Modification Final Determination Paper issued on 29 Jun 2021).
TC/2021/43	C7.1	Each Generation Licensee or Wholesaler (Generation) Licensee or connected person	Each <u>Generation Licensee</u> or <u>Wholesaler (Generation) Licensee</u> or connected person	To update the reference to Wholesaler Licensees (following the

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		<p>responsible for the solar photovoltaic <i>generating unit</i> at each site/facility, shall provide the information set forth in this Appendix.</p> <p>(a) Name of Generation Facility (b) Maximum Generation Capacity (Aggregated capacity of all solar photovoltaic modules' AC inverters at the point of connection to the grid) (kWac) (c) Total PV modules' capacity (kWp) (d) Voltage Level of <i>connection</i> point (e) <i>Generation Facility's</i> site address/Postal Code (f) Rated Power Factor</p> <ul style="list-style-type: none"> • Over-excited (lagging) • Under-excited (leading) <p>(g) Solar photovoltaic module (for solar photovoltaic generating unit \geq 1MWac)</p> <ul style="list-style-type: none"> • Type of photovoltaic module: (Monocrystalline / Polycrystalline / Amorphous / CdTe / CIGS/CIS and Others, please specify) • Module Tilt Angle • Module Azimuth Angle <p>(h) Frequency and voltage protection settings (i) Reactive Power Control Capabilities (as per the inverters' settings) (j) Voltage reference point</p>	<p>responsible for the solar photovoltaic <i>generating unit</i> at each site/facility, shall provide the information set forth in this Appendix.</p> <p>(a) Name of Generation Facility (b) Maximum Generation Capacity (Aggregated capacity of all solar photovoltaic modules' AC inverters at the point of connection to the grid) (kWac) (c) Total PV modules' capacity (kWp) (d) Voltage Level of <i>connection</i> point (e) <i>Generation Facility's</i> site address/Postal Code (f) Rated Power Factor</p> <ul style="list-style-type: none"> • Over-excited (lagging) • Under-excited (leading) <p>(g) Solar photovoltaic module (for solar photovoltaic generating unit \geq 1MWac)</p> <ul style="list-style-type: none"> • Type of photovoltaic module: (Monocrystalline / Polycrystalline / Amorphous / CdTe / CIGS/CIS and Others, please specify) • Module Tilt Angle • Module Azimuth Angle <p>(h) Frequency and voltage protection settings (i) Reactive Power Control Capabilities (as per the inverters' settings) (j) Voltage reference point</p>	<p>Wholesaler Licence Modification Final Determination Paper issued on 29 Jun 2021).</p>
TC/2021/44	C7.2	<p>Each Generation Licensee or Wholesaler (Generation) Licensee responsible for solar photovoltaic <i>generating unit(s)</i> with an aggregated installed capacity of 10MWac or above at each site/facility, and seeking connection to the <i>transmission system</i> shall</p>	<p>Each <u>Generation Licensee</u> or <u>Wholesaler</u> (Generation) <u>Licensee</u> responsible for solar photovoltaic <i>generating unit(s)</i> with an aggregated installed capacity of 10MWac or above at each site/facility, and seeking connection to the <i>transmission system</i> shall provide to the</p>	<p>To update the reference to Wholesaler Licensees (following the Wholesaler Licence Modification Final Determination Paper issued on 29 Jun 2021).</p>

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		provide to the Transmission Licensee and the Power System Operator (where applicable) a dynamic simulation model that fulfils the requirements set forth in the System Operation Manual.	<u>Transmission Licensee</u> and the <u>Power System Operator</u> (where applicable) a dynamic simulation model that fulfils the requirements set forth in the System Operation Manual.	
TC/2021/51	F7.2	For each <i>generating unit</i> which has a Completion Date before 1 January 2000 must endeavour to meet the minimum spinning <i>reserve</i> requirement subject to and in accordance with the provisions of section F.8, otherwise Generation Licensee shall submit the achievable spinning <i>reserve</i> capability to <i>PSO</i> for consideration.	For each <i>generating unit</i> which has a Completion Date before 1 January 2000 must endeavour to meet the minimum spinning <i>reserve</i> requirement subject to and in accordance with the provisions of section F.8 <u>while using primary or alternate fuel</u> , otherwise <u>Generation Licensee</u> shall submit the achievable spinning <i>reserve</i> capability to <i>PSO</i> for consideration.	To provide clarity that generation unit must be capable of providing minimum spinning reserve for both primary and alternate fuel.
TC/2021/57	F8.2	The primary <i>reserve</i> requirements for each <i>generating unit</i> MW output between Minimum Stable Load and 75%, 75% and 90%, and 90% and 100% of its rated MW Capacity shall be linearly interpolated from the requirements for the <i>generating unit</i> MW outputs between Minimum Stable Load and 75%, 75% and 90%, and 90% and 100% of its rated MW Capacity ² respectively. Additional details are provided in the System Operation Manual.	The primary <i>reserve</i> requirements for each <i>generating unit</i> MW output between Minimum Stable Load and 75%, 75% and 90%, and 90% and 100% of its rated MW Capacity shall be linearly interpolated from the requirements for the <i>generating unit</i> MW outputs between Minimum Stable Load and 75%, 75% and 90%, and 90% and 100% of its rated MW Capacity ² respectively. Additional details are provided in the System Operation Manual.	To remove duplication of footnote [2] within the Section. Footnote [2] is in Appendix F8.1 of the same section.
TC/2021/58	F8.3	Each <i>generating unit</i> must be capable of providing minimum contingency reserve of 10% of its Rated MW Capacity ² within 10 minutes and shall be verified through test stipulated in the System Operation Manual.	Each <i>generating unit</i> must be capable of providing minimum contingency reserve of 10% of its Rated MW Capacity ² within 10 minutes and shall be verified through test stipulated in the System Operation Manual.	To remove duplication of footnote [2] within the Section. Footnote [2] is in Appendix F8.1 of the same Section.
TC/2021/66	H3.3	It is the responsibility of the Transmission Licensee, Generation Licensee, Wholesaler	It is the responsibility of the <u>Transmission Licensee</u> , <u>Generation Licensee</u> , <u>Wholesaler</u>	To update the reference to Wholesaler Licensees (following the

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		(Generation) Licensee and <i>connected person</i> responsible for each <i>HVDC facility</i> to provide all the equipment at the remote site. The communication equipment shall include encryption devices to ensure secure communication on the communication lines. These encryption devices shall be of the same make and model as the devices installed at the PSO control centres.	(Generation) <i>Licensee</i> and <i>connected person</i> responsible for each <i>HVDC facility</i> to provide all the equipment at the remote their respective site. The communication equipment shall include encryption devices to ensure secure communication on the communication lines. These encryption devices shall be of the same make and model as the devices installed at the PSO control centres.	Wholesaler Licence Modification Final Determination Paper issued on 29 Jun 2021).
TC/2021/69	H9	<p>Testing and Commissioning</p> <p>The following requirements are needed for testing and commissioning:</p> <ul style="list-style-type: none"> (a) To facilitate AGC testing, a mechanism (software or hardware) is needed to isolate the AGC signals from the turbine control. (b) Copies of all commissioning tests are to be submitted. (c) The Transmission Licensee, Generation Licensee, Wholesaler (Generation) Licensee or <i>connected person</i> responsible for each <i>HVDC facility</i> shall have qualified personnel on site during commissioning to confirm and verify all data sent to the <i>EMS</i>. <p>Copies of all final as-built drawings, parameters and data are to be submitted</p>	<p>Testing and Commissioning</p> <p>The following requirements are needed for testing and commissioning :</p> <ul style="list-style-type: none"> (a) To facilitate AGC testing, a mechanism (software or hardware) is needed to isolate the AGC signals from the turbine control. (b) Copies of all commissioning tests are to be submitted. (c) The <u>Transmission Licensee</u>, <u>Generation Licensee</u>, <u>Wholesaler</u> (Generation) <u>Licensee</u> or <i>connected person</i> responsible for each <i>HVDC facility</i> shall have qualified personnel on site during commissioning to confirm and verify all data sent to the <i>EMS</i>. <p>Copies of all final as-built drawings, parameters and data are to be submitted</p>	To update the reference to Wholesaler Licensees (following the Wholesaler Licence Modification Final Determination Paper issued on 29 Jun 2021).