

Exhibit A05-2: Life Cycle Costs

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1 Statement of work - LCC Requirements

Id	Requirement	Referring to
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A05-2:1.a

I Life Cycle Costs (LCC) is an integral part in the development of Trainsets and has long time effects as the information provided will affect the operational costs of the Trainsets during the Lifetime.

Life Cycle Costs (LCC) are evaluated in the following areas;

- Maintenance costs, divided into;
 - o Corrective maintenance, including fault finding;
 - o Preventive maintenance, including overhauls.
 - o The above divided into;
 - Four levels of maintenance;
 - Man-hour costs for the Operator and the Contractor;
 - Costs for Spare Parts and Materials.
- Operational costs, divided into;
 - o Consequential costs for Significant Faults;
 - o Consequential costs for Major Faults;
 - o Consequential costs for Trainset Availability;
 - o Consequential costs for Fleet Availability;
 - o Energy consumption.

Furthermore, the requirements cover the following;

- A description of LCC obligations as an aid for the Contractor to achieve the LCC commitments throughout the Trainset's technical lifetime;
- A description of the information contained in the Contractor's LCC model.

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2 LCC Plan

Id	Requirement	Referring to
A05-2:2.a	<p>K The Tenderer shall use the terminology provided in Exhibit P and the standard EN13306:2017, where any additional terminology shall be contained in the LCC Plan.</p> <p><i>Additional terminology shall be contained in the preliminary LCC Plan.</i></p>	Exhibit P, EN13306:2017
A05-2:2.b	<p>E The LCC plan shall cover at least the following areas;</p> <ul style="list-style-type: none"> • A description of the resources working with LCC and their interaction with the RAM resources and integration in the ILS organization; • The methods and tools used in work with LCC; • A description of the Contractor's process aiming to achieve the lowest possible LCC and the highest possible RAM performance with minimum risk for Norske tog. The description shall be aligned with the RAM plan in Exhibit A05-1. • Quantifiable substantiations of commitments by the Tenderer through references from other projects using the same or similar design as the offered product. The descriptions provided shall show the advantages for Norske tog and the Operators; • A description of how optimization of the LCC commitments will be undertaken by the Contractor throughout the Lifetime. <p><i>The preliminary LCC plan shall be submitted as part of the Tender.</i></p>	Exhibit A05-1
A05-2:2.c	<p>K The Contractor shall provide the final LCC plan based on the preliminary LCC plan submitted as part of the Tender no later than Milestone 1.4.</p>	A05-2:2.b, Appendix C-1

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3 LCC commitments

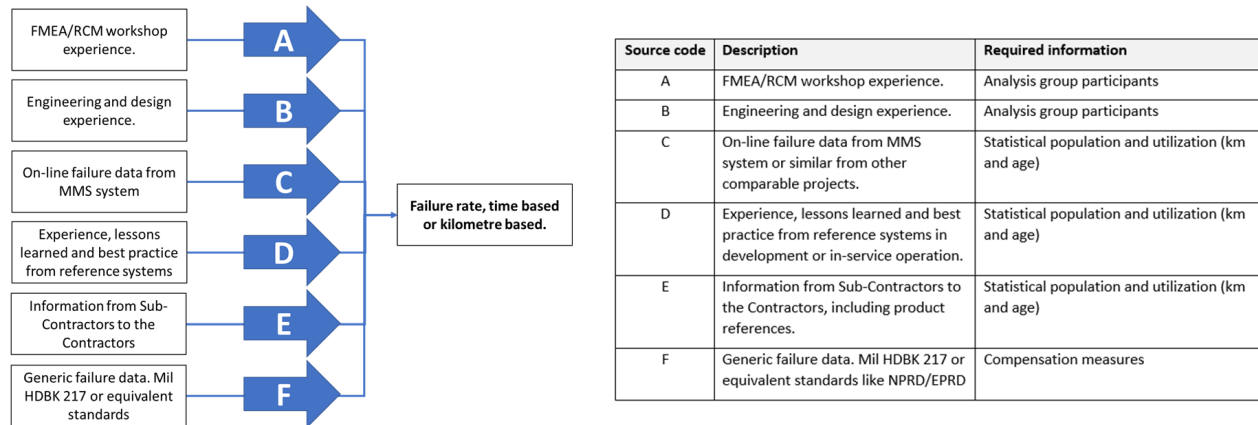
Id	Requirement	Referring to
A05-2:3.a	I Information about the verification and validation of the LCC commitments are provided in Exhibit D.	Exhibit D, section 6.4
A05-2:3.a	I The Contractor's LCC model provides the details and substantiation for the information provided in Appendix B-1.	Appendix B-1
A05-2:3.b	K The Tenderer shall perform necessary analyses and calculations regarding LCC and provide LCC commitments in Appendix B-1 according to instructions provided in Appendix B-1, the Contract Conditions and Exhibit A04 (SoW Mission Profile).	Appendix B-1, Contract Conditions, Exhibit A04

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4 The Contractor's LCC model

Id	Requirement	Referring to
A05-2:4.b	I The information provided in the figure and table serves as an aid to the Tenderer to provide information in the Contractor's LCC Model.	

The typical failure data sources are further detailed in the table below



A05-2:4.c	K The Contractor shall, during the Lifetime, analyze, follow-up and verify the related information provided in Appendix B-1 in its own model for LCC ("Contractor's LCC model").	Appendix B-1
A05-2:4.d	K The Tenderer shall provide the Contractor's LCC model fulfilling requirement A05-2:4.e, applied analyses, detailed basic calculations, and documentation concerning the presented LCC result as part of the tender submission.	A05-2:4.e

The Contractor's LCC model shall be submitted as part of the Tender.

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Id	Requirement	Referring to
A05-2:4.e	<p>K Contractor's LCC model must describe the expected maintenance costs during the Trainset's technical lifetime (FLP1), based on the following:</p> <ul style="list-style-type: none"> • The model shall compile the detailed evidence that the maintenance information in sheets 3.4 (Preventive Maintenance) and 3.5 (Corrective Maintenance) in Appendix B-1 is aligned, accurate and reliable and shall be included in the continuous reporting of LCC; • There shall be a defined and traceable link between the maintenance cost data presented for each sub-system in Appendix B-1 and the more detailed maintenance cost data presented in Contractor's LCC model; • In case of extended scope of work as described in Exhibit A05-3, The Contractor's model shall clearly state responsibility split between the Contractor and the Operator; • Each item entered shall minimum contain the following information, irrespective of being a corrective or preventive maintenance activity: <ul style="list-style-type: none"> o NT Task No o 15380-2 code o Description (of system) o Description (of item) o Quantity of item o Description (of activity) o Level of maintenance • In addition, Corrective Maintenance related costs shall for each activity at least be based on the points listed below: <ul style="list-style-type: none"> o Reliability (FPMK) <ul style="list-style-type: none"> - Provided for all LRU's identified by the requirements in Exhibit A05-1; - Reference to the source of reliability information using the A – F classification; - As applicable, include a compensation factor for the adjusting to Norwegian conditions. Default values is one (1) and any value larger than one (1) indicates that the Norwegian conditions are worse than for the reference project. o The resources needed to conduct the corrective task using, as applicable, the following fields; <ul style="list-style-type: none"> - On first level of maintenance; • Duration and average number of technicians needed to conduct the fault finding; • Duration and average number of technicians to change the item, including time for possible test activities; • Spare part and Consumables to change the item; • The calculation of MTTR based on the information provided. <ul style="list-style-type: none"> o On second level of maintenance; 	Appendix B-1, EN 15380-2, Exhibit A01, Exhibit A05-1

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Id	Requirement	Referring to
	<ul style="list-style-type: none"> • Duration and average number of technicians needed to conduct the fault finding; • Duration and average number of technicians needed to restore the item, including time for possible test activities; • Spare part and Consumables to restore the item. <ul style="list-style-type: none"> o On third level of maintenance; • The guaranteed total cost, including any resources, Spare Parts and consumables to restore the item. <ul style="list-style-type: none"> o Information provided in Exhibit A05-4 (SoW Documentation); • In addition, Preventive Maintenance related costs shall for each activity at least be based on the points listed below: <ul style="list-style-type: none"> o The defined intervals with stated units, either time based on distance based; o Duration and average number of technicians needed to conduct the activity, including time for possible test activities; o The calculation of MTTM for all activities conducted on maintenance level 1. o Spare Parts and consumables required to perform the activities; o Information provided in Exhibit A01; • The Contractor's LCC model shall for the first and second level of maintenance and for each maintenance activity calculate the number of man-hours and the cost for Spare Parts and Components per one million kilometers; • The Contractor's LCC model shall for the third level of maintenance and for each maintenance activity calculated the cost per one million kilometers to restore the item; • The calculations in the Contractor's LCC model shall further be based on the fixed LCC parameters defined in Appendix B-1 (Price Schedule), sheet 3.1; • Contractor's LCC model shall be an integrated part of the RAM and LCC information system described in Exhibit A05-1. 	