OCORA

Open CCS On-board Reference Architecture

Economic Model

User Manual

Revision history

Version	Change Description	Initial	Date of change
0.1	First version	CTR	31.08.2021
0.2	Version for workstream review	CTR	02.11.2021
0.3	Version for Coreteam review	NPA	19.11.2021
2.00	Official version for OCORA Release R1	NPA	23.11.2021
2.01	Decoupled document from a specific OCORA release	NPA	18.05.2022
2.11	Correcting typos and reorganising/rewriting ideas for better clarity	VI	31.05.2023

Table of contents

Table of figures

References

Reader's note: please be aware that the numbers in square brackets, e.g. [1], as per the list of referenced documents below, is used throughout this document to indicate the references to external documents. Wherever a reference to a TSI-CCS SUBSET is used, the SUBSET is referenced directly (e.g. SUBSET-026). OCORA always reference to the latest available official version of the SUBSET, unless indicated differently.

[1]   OCORA-BWS01-010 – Release Notes

[2]   OCORA-BWS01-020 – Glossary

[3]   OCORA-BWS01-030 – Question and Answers

[4]   OCORA-BWS01-040 – Feedback Form

[5]   OCORA-BWS03-010 – Introduction to OCORA

[6]   OCORA-BWS04-010 – Problem Statements

[7]   OCORA-BWS06-010 – Economic Model – Introduction & Overview

[8]   OCORA-BWS06-020 – Economic Model

[9]   OCORA-BWS06-020 – Economic Model – Model Description

[10]   OCORA-BWS06-020 – Economic Model – User Manual

1 Introduction

1.1 Purpose of the document

This document is a guide to use the economic model simulation tool. This guide is valid for version 0 of the tool and is accompanied by a model description [9] for the technical aspect of the tool.

The document gives the needs of the tool to work. The simulation tool has been created on the delta release of the economic model, and in consequences he uses some format specifications of this model to be executed. Besides, the inputs must respect some conditions due to the language or the operation of the program.

This document is addressed to experts in the CCS domain and to any other person, interested in the OCORA concepts for on-board CCS. The reader is invited to provide feedback to the OCORA collaboration and can, therefore, engage in shaping OCORA. Feedback to this document and to any other OCORA documentation can be given by using the feedback form [4].

If you are a railway undertaking, you may find useful information to compile tenders for OCORA compliant CCS building blocks, complete on-board CCS system, or on-board CCS replacements for functional upgrades or life-cycle reasons.

If you are an organisation interested in developing on-board CCS building blocks according to the OCORA standard, information provided in this document can be used as input for your development.

1.2 Applicability of the document

The document is currently considered informative but may become a standard at a later stage for OCORA compliant on-board CCS solutions. Subsequent releases of this document will be developed based on a modular and iterative approach, evolving within the progress of the OCORA collaboration.

1.3 Context of the document

This document is published as part of the OCORA Release, together with the documents listed in the Release Notes [1]. Before reading this document, it is recommended to read them. If you are interested in the context and the motivation that drives OCORA we recommend reading the Introduction to OCORA [5] and the Problem Statements [6]. The reader should also be aware of the Glossary [2] and the Question and Answers [3].

2 Format

The are several different conditions to respect the format.

- <u>The name of products must be the same everywhere</u>. Indeed, the applied products' name appears in the name of Product Breakdown Structure (PBS), Product Breakdown Structure (PBS), costs, scenarios and parameters tables. In all these cases, the name of a product must be the **same**. Generally, the diminutive: "Pre-O." stands for "Pre-OCORA Minimum Solution".
- <u>PBS lines of roadmaps and costs tables must have the same numbering</u> as seen in **Figure 1**.
- The name of WBS must be the same in the costs assumption tables as the WBS table to match, as seen in **Figure 2**.
- <u>The colour code and the places of costs in the costs assumption tables</u>. Firstly, in the costs assumption tables the WBS and cost associated begin at column "G". Besides, the order of the WBS is the "Maintain CCS" cost in last column, the RTS costs before and the other cost in the first ones. Moreover, the RTS costs background colour is different from colour of the other costs. The colour of the background is not important, but all the RTS costs must have the same background colour and different from the other costs, as seen in **Figure 2**.
- <u>The name of the different tables must be kept as defined</u>:
  - the name of the WBS table is "Work Breakdown Structure";
  - the name of the principal PBS table is "Product Breakd. Struct.";
  - the name of the PBS tables of products is "ProductBreak.Struct. (EVC)" (or "pre-O." for pre-OCORA, …);
  - the name of the costs assumption tables is "Costs assumpt. (EVC)" (or "pre-O." for pre-OCORA, …);
  - the name of the parameter table is "Parameters";
  - the name of the scenarios table is "Scenarii (for simulation)";
  - the name of the result table is "Simulation Results".
- The limits of the roadmaps. The roadmaps in PBS tables start in 2022 in the 26'th column ("Z") and end in 2054 in the 58'th column ("BF"). In this version of the tool this columns values have been specified directly in the code.

Extract from EVC Roadmap

Extract from EVC Costs assumption
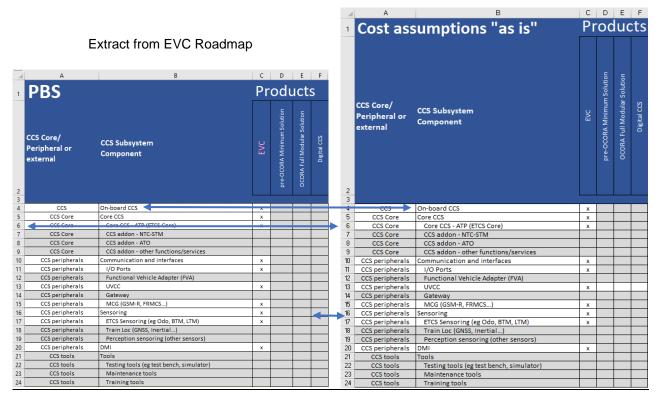
Figure 1   Correspondence between PBS roadmaps and cost assumptions tables
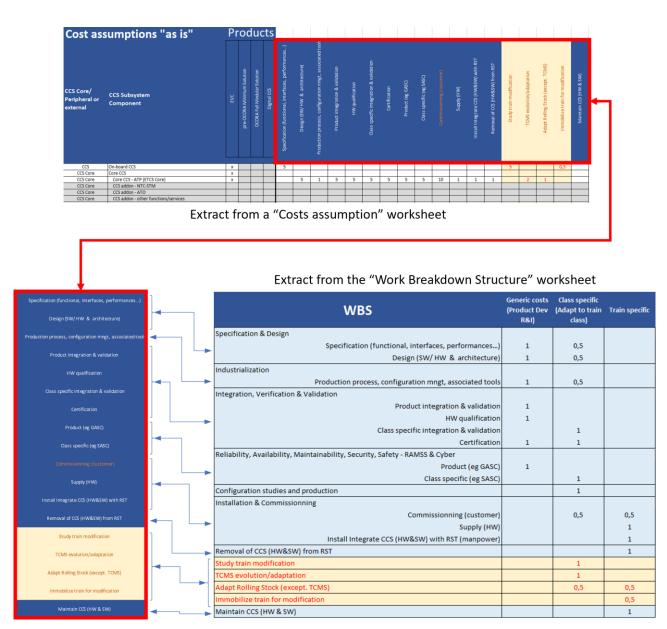
Figure 2   Correspondence between "Cost assumptions" and "Work Breakdown Structure" worksheets

3   Values

The following conditions on the form of the values are necessary:

- (WARNING!) All the decimal values must be written with a comma (,) and not with a point (e.g. 5,2)
- The cross in PBS tables and costs tables are the letter "x" written in lowercase
- In the Roadmaps, the name of the software updates must contain "SW" in capital letters (e.g. "Upgrade (SW)"), the name of the hardware updates must contain "HW" in capital letters (e.g. "Obso (HW)"). For an update on both hardware and software the name of update must contain "HW" and "SW" (e.g. "FRMCS (HW/SW)" or neither and be a non-empty string (e.g. "TSI").

4 Simulation

To run a simulation, follow the next steps:

1. Fill in the sub-systems (PBS) used in products applied in PBS tables by "x".
2. Put the updates in the products roadmaps.
3. Put in the WBS table the multiplicative coefficients of costs for each costs type. Do not put three on the same line.
4. See in column "F" if the WBS concerns the Hardware (HW), the Software (SW) or both (HW/SW).
5. Put costs in costs assumption tables.
6. Put in the parameter table the multiplicative coefficients of the acquisition cost to applied for each type of update.
7. Erase the precedent results in the result table (all the line with a number superior to 2).
8. Fill the scenario table. For each fleet fill the fleet number, the class, the type, the product equipped, and the number of trains put or withdrawn by year (use negative number for train withdrawn).
9. Click on "run simulation".
10. If you do not want to modify anything, click on "no".

The simulation is then executed, it may take a few seconds.

Think to copy your result in another table if you want to save it.

5 Launch note

<u>Before the simulations:</u>

- Download the folder "BWS06-R2".
- Open it, copy the file "Title_OCORA-BWS06-020", paste it in the folder "inputs" and replace "Title" by the name you want without using "_".
- Open your Excel file.

<u>To run a simulation:</u>

- Place updates in product roadmaps. Software updates must contain "SW" in their title, hardware updates must contain "HW" in their title. Global updates must contain "HW" and "SW" or neither and be a non-empty string.
- Fill in the WBS table with the cost multiplier coefficients entered for each type of cost. WARNING all decimal numbers must be written with commas and not dots (ex: 0,5)
- Indicate the cost at the crossroads of the WBS and the subsystems in the cost tables associated with the product.
- In the parameter table fill in the coefficients to be applied to the costs filled for an update.
- To start a new set of simulation, click on "clear" in the result table to delete all the previous result. Else, the new results will be put below the previous and tag as a new simulation.

- In the scenario table, fill in the number of each fleet, their class, their type, the product used, the number of trains put into circulation or taken out of circulation depending on the year (positive number for putting into circulation, negative for withdrawal).
- Click on run simulation.

If you want to change the roadmaps, costs or parameters (update or WBS) we advise to create a new file to keep the data who gave the result with them.

<u>After the simulations:</u>

- Once you ran all your simulation in all your files, if you want to see your results with power BI, open the file "Results Analysis" in the folder "Report"
- Click on "Refresh"
    First time you launch the report you need to indicate the path to the inputs folder. To do so, click on "Transform data", on your left in the queries you have a query name "Inputs" in a folder name "Transformer le fichier à partir de Input" click on it. On the right in "APPLIED STEPS" you have a step name "source" double click on it, then you can indicate the path until the folder "inputs" where you put your simulations files. Click on "Close & Apply".