RESPONSIBLE USE OF RESOURCES AND END-OF-LIFE STRATEGY

1. BACKGROUND

As background to the requirements given below for final year projects, consider the following taken from the Systems Engineering Body of Knowledge [SEBoK, 2021[1]]

> *Product or service disposal and retirement is an important part of system life management. At some point, any deployed system will become one of the following: uneconomical to maintain; obsolete; or unrepairable. A comprehensive systems engineering process includes an anticipated equipment phase-out period and takes disposal into account in the design and life cycle cost assessment. ... A public focus on sustaining a clean environment encourages contemporary systems engineering (SE) design to consider recycling, reuse, and responsible disposal techniques.*

> *Disposal is the least efficient and least desirable alternative for the processing of waste material.*

Further, in South Africa in 2021, the following regulations came into effect under the National Environmental Management: Waste Act, 2008 (Act No.59 Of 2008): Regulations Regarding Extended Producer Responsibility:

Extended producer responsibility measures to be implemented by producers

5. (1) The producer of a product or class of products, as identified by the Minister in terms of section

18(1) of the Act, must-

...

(o) keep record of quantity of identified products put on the market, waste generation, collection, sorting, recycling and recovery of waste arising from the identified products;

...

(s) develop and establish secondary markets for recycled content;

...

(y) implement mandatory take-back of all their products at the end of life;

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[1] SEBoK Editorial Board, 2021 The Guide to the Systems Engineering Body of Knowledge (SEBoK), v. 2.4, R.J. Cloutier (Editor in Chief). Hoboken, NJ: The Trustees of the Stevens Institute of Technology. Accessed 13 July 2021. www.sebokwiki.org

2. REQUIREMENTS FOR FINAL YEAR PROJECTS

In the light of the above background, it is expected of every final year project student in Mechanical and Mech-atronic Engineering to give due consideration to the end-of-life strategy for any hardware or services (which invariably require hardware to be able to provide the service) and to provide a short write-up regarding the responsible use of resources and the decommissioning (disassembly, reuse, recycling and/or responsible disposal) of their project. The process of responsible use of resources and the proper decommissioning of the project is something that should be considered right from the start of the project. As such, it is expected that each student should already address this point in the project proposal. It should also be included in the project progress report, as well as the final report. In most cases it will be included in the final report as an appendix (similar to the Gantt Chart and the Techno-Economic Analysis).

The following is required in each of the aforementioned reports:

1) PROPOSAL

A short section indicating awareness of likely resource requirements and a basic strategy for the decom-missioning of the project should be included. At this point the student need not give details of the im-plementation of the exact strategy, but must indicate an awareness of possible approaches and best practices. Some important areas to consider include:

- Looking for opportunities, particularly during the design and construction phase of the project, to re-use previously used materials or use recycled material

- Responsible use of resources throughout the project design

- Disassembly of the project upon the completion of the project to enhance reuse and recycling, and reduce the cost of disposal

- First preference is to reuse project resources in future

- Recycling of project materials is preferred to disposal

- Proper disposal of material that cannot otherwise be reused or recycled. Special attention should be paid to proper disposal of hazardous materials (eg batteries, chemicals and/or biological material)

- Where a project involves no physical product (e.g. a pure simulation study) the student must address the impact of the resources used for their work, such as computing and network resources, storage of data and results, etc.

2) PROGRESS REPORT

A section in the report, or an appendix that is referred to in the main report, of typically less than one page is expected. The section or appendix will typically be in the form of a refined and somewhat more detailed version of the corresponding section in the proposal, and should address

- The expected resource requirements

- The strategy that will be followed to minimise resource consumption and environmental impact

- The strategy that will be followed to minimise the project impact when decommissioning.

3) FINAL REPORT

A section in the report, or an appendix that is referred to in the main report, of typically one page (maximum two pages) is expected. The section should refine the corresponding section in the progress report and give account of what was done in the project to implement the strategy.