ORDRE DES INGÉNIEURS DU QUÉBEC

SESSION MAY 2023

Any documentation allowed
Calculators: authorized models only
Duration of the exam: 3 hours

14-EC-3 SUSTAINABILITY, ENGINEERING AND THE ENVIRONMENT

Section I - THEORETICAL KNOWLEDGE (20%)

I-1) Sustainable Engineering (10%)

Present one (1) principle or one (1) guideline or good practice in sustainable engineering.

I-2) Corporate Social Responsibility (CSR) (10%)

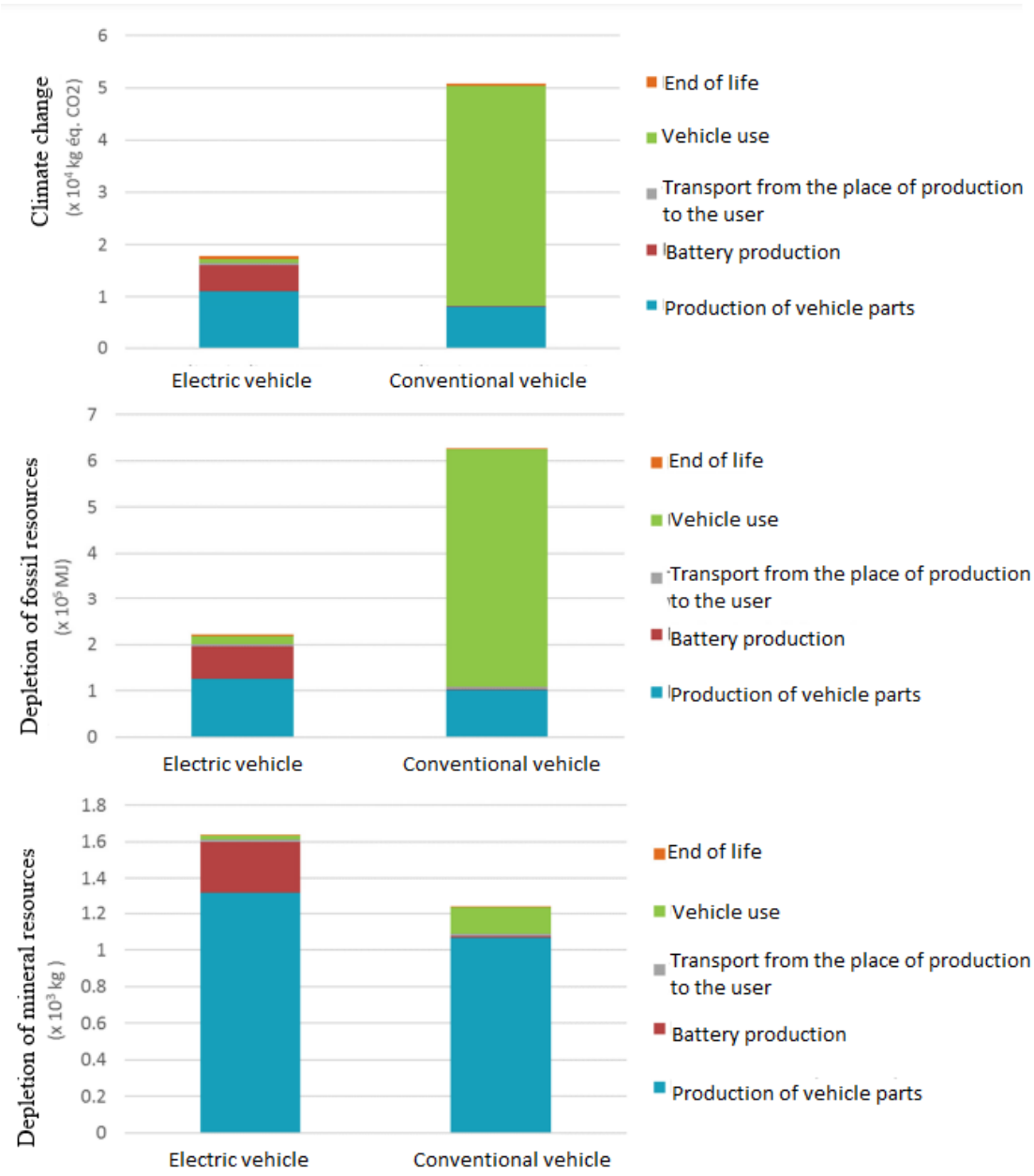
Present a certification or standard that guides and/or recognizes a company's performance in terms of CSR.

Section II - PUTTING TOOLS INTO PRACTICE FOR SUSTAINABLE ENGINEERING (60%)

II- A) Life cycle analysis (LCA) (30%)

We submit to you an extract of the very partial results taken from a life cycle analysis.

(Source: Ciraig. COMPARATIVE LCA TECHNICAL REPORT IN QUEBEC CONTEXT. 2016)



Note: The parts of the vehicle are: the engine, the transmission, the body….

II-A-1) These results come from a life cycle analysis (LCA). Briefly present what LCA is (7%).

II-A-2) Why is LCA an important tool for engineers? (5%)

II-A-3) What are the categories of impact or damage presented in the results of this LCA? (5%)

II-A-4) Based on an interpretation of the very partial results presented in this LCA, is the electrification of vehicles in Quebec an interesting choice from an environmental point of view? (13%)

<u>II-B) Climate change and adaptation (30%)</u>

Climate concerns are increasing in proportion to the materialization of the devastating effects visible in recent years: heat waves, floods, tornadoes, droughts follow one another everywhere on the planet. In this context, you want to assess the avenues to explore so that Quebec can meet its commitments in terms of reducing greenhouse gas (GHG) emissions. To do this, consult the report *GHG EMISSION REDUCTION TRAJECTORIES IN QUEBEC – HORIZONS 2030 AND 2050 prepared in 2021 by Dusnky Energie+ Climat for the MINISTRY OF THE ENVIRONMENT AND THE FIGHT AGAINST CLIMATIC CHANGE.*

II-B-1) What is the order of magnitude of annual GHG emissions (around 2018) in Quebec? (4%). You can approximate the value.

II-B-2) What is Québec's GHG emission reduction target for 2030? (4%)

II-B-3) According to this report, which sectors contribute the most to GHG emissions in Québec and which will have to reduce their GHG emissions? (5%)

II-B-4) Based on the information and recommendations of the report cited above, what are the main lines of action on which Quebec will have to act to eventually achieve its objectives? (17%)

Section III - YOUR THOUGHTS ABOUT IMPLEMENTING SUSTAINABLE ENGINEERING (20%)

Based on your knowledge of:

- Engineering,
- Sustainable development,
- Economy,
- Technology,
- Environmental Law,

and taking into account:

- The current environmental situation,
- Issues of responsibility and social acceptability,
- The need for energy and social transitions,
- Quebec's GHG report,
- Your experience,
- Your values and vision,

Propose a reflection and ideas to meet the great challenge that forces us to live within the limits of the planet. What should we change in our ways of doing, designing, manufacturing, marketing, consuming? **How to apply sustainable engineering**? Be creative and imaginative, but remain realistic and pragmatic.

End