How should Scotland manage its scrap steel? The environmental assessment

Peer review summary and response

An independent peer review was conducted of the Zero Waste Scotland study entitled "How should Scotland manage its scrap steel? The environmental assessment". The review was conducted in July 2021 by Dr Ruth Saint, Director of Building Research Solutions, an LCA expert with specialist knowledge of construction materials. It covered:

- An assessment of whether the data used was appropriate;
- A complete review of all the calculations in the model; and
- A review of the technical report, particularly how the results were used and communicated.

The following table summarises the main findings of the review and the responses taken. The full peer review is available on the Zero Waste Scotland website.

Table A-1 Summary of peer review comments and responses

Peer Review comment	Response
Functional unit and system boundaries Whilst the functional unit and study boundaries are clear in the model, there is a lack of clear definition of these parameters in the report.	Added statements on functional unit and boundaries to the report.
Transmission and distribution losses Given that the EAF process uses high voltage electricity, the T&D losses may not be as high as quoted and this should be reviewed.	T&D losses in relation to EAF production were reviewed and continue to be excluded from the main analysis. T&D losses are equal to 7% of the GHG emissions of the UK grid factor.
Electricity grid carbon intensities It is recommended that the electricity grid carbon intensity figures used in the report be investigated as far as reasonably practicable, and the sensitivity analysis reported.	The sensitivity analysis was extended to include the carbon intensities reported in Table 1 of the peer review report. The results are shown in Figure 1 below. There is no significant impact on the results. A statement in the report was added to this effect.
Material input values Inconsistencies between Liang paper and Zero Waste Scotland model for some material input values.	The Zero Waste Scotland model was updated to reflect the Liang et al. (2020) paper values.
Discrepancies in model values compared to data sources Figures in tables 1 and 6 differ from source material. Material input boundaries do not appear to cover all production stages. Continuous casting (CC) and hot rolling (HR) stages are equal for BF-BOF and EAF.	Corrected model figures in Tables 1 and 6 to match data sources. Wording around "material input" changed to reflect meaning more accurately in report. Model on CC and HR stages corrected.
Embodied impacts No consideration has been made for developing the infrastructure required to bring steel reprocessing to Scotland.	An estimate of embodied impacts of EAF plant construction are difficult to estimate accurately without site specific data. However, a high-level estimate based on Ecoinvent V3 data suggested that

	the carbon cost of the plant construction would be paid back in less than a year. It is acknowledged that more detailed assessment of these impacts is required in the future.
Forecasting Forecasting would be highly beneficial, i.e., determining the long-term viability of domestic processing when considering decarbonisation of electricity grid in the export countries.	This was beyond the bounds of this study. The current rate of decarbonisation of the Turkish grid is slow (3% over the last 5 years). If the Turkish grid reduced the level of the 2018 UK grid, and all steel production switched to EAF, emissions from exporting scrap steel to Turkey would be 7% higher than a UK based plant.
Electricity demand Can the current electricity grid support these EAF plants or will their inclusion in the national infrastructure require the use of more carbon intensive energy sources; could the current renewable supply meet the added demand?	An estimate of the electricity demand of an EAF was made and compared to existing supply. Given the scale of the demand and supply, it is unlikely an EAF plant electricity consumption would significantly affect overall supply. However, a more detailed assessment of this issue is required, which should include consideration of the intermittent demand on the grid created by an EAF plant.

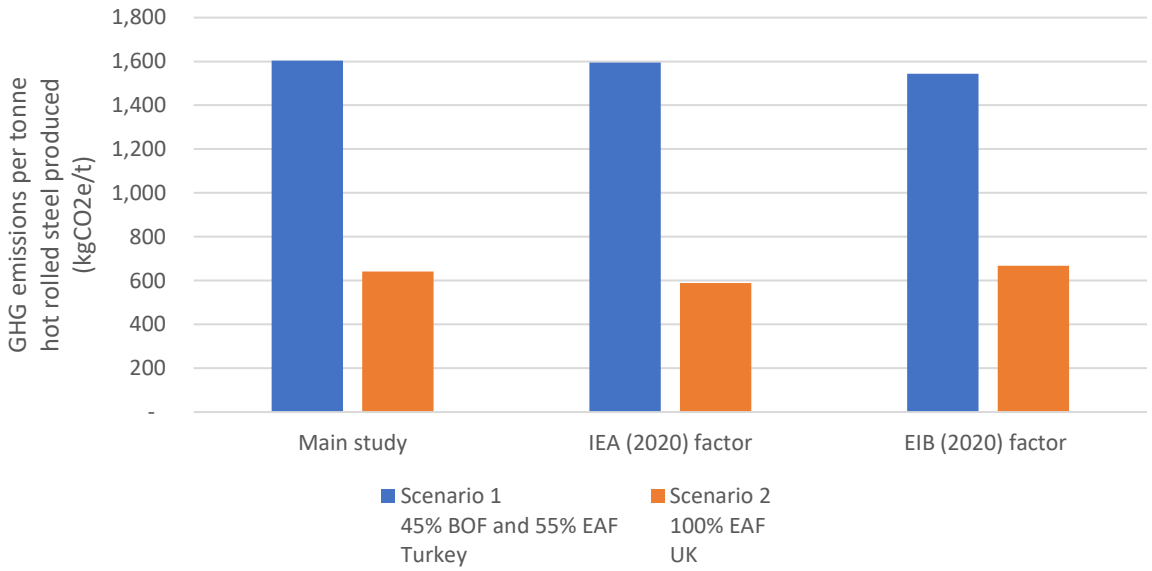

Figure 1. Effect of changing electricity grid carbon intensity factors on GHG emissions per tonne of hot rolled steel produced

Conclusion

An independent peer review of Zero Waste Scotland's study of the environmental benefits of processing scrap steel in Scotland has been completed. The review raised concerns around a number of issues which have been addressed to the satisfaction of the peer reviewer and summarised above.