Please find bellow general comments on content, and then specific comment by line:

**On the content:** I see this as an important contribution to the field, especially as groundwork for a national level MCC and BXCC. Interesting result, to think about also for XCC, is the rational efficiencies vs the resource efficiencies – as in societal exergy accounting usually we ignore the non-exergy uses’ outputs and there lies an interesting link with materials.

**On the structure:** Nothing much to comment. The article seems very well structured, easy to follow the authors narrative and thinking.

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**Detailed by line:**

**Lines 40-41:** This is a tricky example because coal also plays a "material" role in Steel production, changing iron chemically. I understand what you are saying here, may an example with a different energy carrier can avoid a "picky reviewer" on the coal role in in steel production.

\*\* I understand you used this because it is related to the process you will study bellow \*\*

**Lines 42-43:** “upgrading material quality”

Knowing the context is exergy, by "quality" here, are you making a parallel to when we say that exergy provides a metric to analyze the quality of energy to be used? So, to maintain the same context would be quality to be used for societal needs/potential to generate economic value? Maybe clarify your definition of quality.

**Lines 44-45:** The heat is used to produce cement(clinker) in the calcination process, not concrete. So, to transform limestone and aggregates into cement. To make concrete we need mechanical drive for the mixing, no additional heat, cement, aggregate (like sand, gravel and other aggregates) and water.

**Line 48:** Maybe I'm being too picky here, but the definition of quality is relevant because it is then used here again. here, I understand you mean "ability to be transformed into other types of energy"/ "ability to be used by society for its needs" - not sure it is so clear for those not used to exergy.

**Line 74:** “Is molecular structure correct?”

From what I briefly checked I found this <https://doi.org/10.1016/S0360-5442(97)00061-3>, section 3 first paragraph talks about “binding exergy” of the atoms in the material to be comminuted… is that what you mean here?

I’d say there’s 2 accounts in physical exergy (T and P) and 2 accounts in chemical exergy (concentration/mixing and binding of atoms). The binding of atoms would be the one related to the different chemical species - because is the potential work associated to each chemical bond, which changes accordingly with the chemical species we’re looking at-.

Then, when studying exergy related to minerals/mining, there is the exergy of the comminution process, which is defined in the first reference I talk about as a combination exergy input and output exergies (the paragraph I mention is descriptive of this).

Maybe adding a reference here could help the definition, or the understanding of what you mean?

**Line 151:** pig iron production where? And what is the period studied? Bellow you then specify what will be the case study, but as this is the first time referencing it, maybe give all this information already…

**Line 159:** \*beneficiation

**Lines 185-186:** Do you mean all energy inputs are treated “in mass terms” (you say “as materials”), the exception being electricity which I only measured in energy units (massless) OR that electricity will not be accounted at all in the MCC?

**Line 218:** “Material exergy is the maximum amount of work…” maybe add “is also the maximum…”

**Lines 261-265:** I understand the content, but its phrasing was a bit confusing to understand first time I read it – it is dificult to understand that the two steps are the decompostion and then “re-form” of the compound. Maybe instead of “including” in line 262 use “and” or similar.

**Figure 2 caption:** Describe briefly that the red line briefly is a redirection of flows to connect conversion cahins, so the figure with caption would “stand alone” in any situation it might be used.

**About Figure 2:** Make the cut “closer” or “right after” the red dashed line so it is visually consistent with the redirection. I did not visually understand the redirection right away because it seem the electricity flow contiued until certain point. This is simply my opinion, change only if makes sense to you, of course.

**Lines 425/432/444/488:** Include where in supplementary information this can be find (e.g., letter of appendix or title in supplementary information).

**Line 438:** Equation 5?

**Lines 434-439:** Not sure you need this detailed description, as believe the reader can make tahat connection with the equations. Leave it but if there is a word-limit to on Energies journal for manuscripts, you can cut this detailed link with the equations. The variables in the tables are clear and clearly the same as in the equations.

**Line 467 and Equation 15:** The equation is missing the variable name of “across-industry balance”, so the equation seems incomplete (what is equal to the matrix subtraction?). As you are talking about several balances with different names (mloss, Qloss and J) maybe before equation just say that “…are given by the matrix substraction” rather than “equation”.

**Line 487:** Word “indicating” repetition.

**Figure 7 caption:** Legend for the letters in the figure so the figure in understandable “on its own”.

**Line 526:** Note that “beneficial” is a new term used here, either change to something already used in the text or introduce it before (I believe by beneficial you want to say something like useful products, or demanded products, or something similar…).

**Line 527:** Delete the dot after “waste products.

**Line 533:** Word “efficiency” repetition.

**Equation 25:** Try to be consistent with the letters used in the figure and in the equation. Rather than *Xelect* use *XE*. Also, rather than should use or, for a simpler version, but explain is related to *W* outputs.

**Line 543:** Thinking about the results, and trying to help here (ignore if it doesn’t make sense)… when you extract both coal and limestone you use basically 100% of the raw material as you find it. When you extract iron, its concentration in ores is 50-70% (check references this is based on a quick websearch), so what you use is not the whole 100%. So, when you are considereing the iron ore, there’s already waste associated to it which is not accounted here... could that be the reason?

**Line 551/560:** Word “beneficial” – see comment about Line 526.

**Equation 27:** Same as equation 25, rather than *Xelect* use *XE* for a direct link to Figure 7 letters.

**Line 697:** Repetition of unit K.

**Line 718:** Missing an a in “surface area”.

**Line 739:** Missing reference.