Response to Anonymous Referee #3

*Throughout the document, the original comments of the anonymous referee are presented sequentially in **black** and italic font.*

The authors' responses are provided in **blue** font to ensure clear distinction.

Comment*: The manuscript presents the development and application of piamValidation, an open-source R package aimed at enhancing the transparency and credibility of integrated assessment models (IAMs). This tool enables structured comparisons of scenario data against historical trends, feasibility bounds, and across models, thereby addressing well-known criticisms related to transparency and technological realism. The application to the REMIND model demonstrates its practical relevance and potential to strengthen confidence in IAM-based analyses. Given the importance of IAMs in shaping climate policy, systematic validation tools are highly valuable.*

3. Response: We thank the anonymous reviewer for the assessment of our manuscript and for the constructive recommendations on how it can be further improved.

The manuscript would benefit from addressing the following points to strengthen its suitability for publication:

1)The current implementation of piamValidation is applied primarily to a limited set of technologies within the REMIND model. This narrow focus restricts the demonstration of the tool's broader applicability. To enhance generalizability and robustness, the validation scope could be expanded to include a wider array of sectors, variables, and IAMs;

3.1 Response: We thank the reviewer for highlighting this limitation. We agree that the presentation of the piamValidation tool would benefit from additional application cases illustrating its use with other models and contexts. Accordingly, we will include an additional section in the revised manuscript applying the tool to open-source NGFS scenarios. This section demonstrates how the tool can be employed for multi-model overviews, and for the intercomparison of models, scenarios, or periods. Further details are provided in the response letter to Referee 1, Response 1.1.

2)The discussion of the tool's limitations is somewhat superficial. A deeper analysis of possible uncertainties, and the difficulties of applying piamValidation to various IAMs would enhance the strength of the manuscript.

3.2 Response: We thank the reviewer for pointing this out. We restructure the section on limitation in the revised manuscript by providing a clearer distinction into the following three aspects:

1. Limitations indirectly related to the piamValidation tool,
2. tools limitation,
3. limitations regarding data management.

Thereby we seek to clearly highlight the limits of the tool's functionality and indicate where user responsibility begins. Further details are provided in the response letter to Referee 1, Response 1.5.