

# Response from the University of Strathclyde

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Q1. Please confirm which stakeholder group you believe that you belong to; this will enable the Open Networks Project to understand the spectrum of respondents to this consultation.

This is a response from academia.

Q2. Please provide your views on Baringa's interpretation of the Future Worlds, detailed in Section 2, for the purpose of this impact assessment and the overall approach, highlighting any key strengths or weaknesses, or areas which should be explored in more detail?

Overall, the questions posed in section 2.2 are important and relevant for the Impact assessment of the Future Worlds. It is true that there may be more than one path and it is important that the report acknowledges and carries out analysis which takes that into consideration. Having different dates for when each of the Future Worlds will mature at Stage 2 is also true and important to understand, but Figure 3 does not seem to clearly reflect this, especially not the times at which each world is expected to reach maturity at Stage 2.

Assumptions made for Worlds A and B sound reasonable, and it would be useful if some further clarifications or investigations on mechanisms in World B are provided/done by ENA. This should be modelled in more details, as it can have an impact on overall performance of world B.

As we stated in previous consultations, we do not see World C as a separate world, but rather one that will be present in each of the other four Worlds, so agree with the assumptions made in the Impact Assessment report.

A question related to World D regarding the "depth" of ESO control of DERs, is an important one, but it does not seem to be fully evaluated. Assumption that the ESO could extend its coordination down to LV levels does not seem realistic, as it is not certain that tools used for system operation/optimization will be able to address such large problems. Going down to LV levels may effectively require coordination of millions and millions of nodes and devices, which does not seem practical or feasible, especially that approximations used for the transmission networks (i.e. DC approximation) cannot be applied to distribution networks. Not taking into consideration the huge scale of the highly nonlinear problem to be solved can lead to problems (although, the research is going in the direction of distributed and decentralised algorithms, which will, in our opinion, sit more naturally with the World A). Going down the route of a centralised optimisation of the complete GB network, down to LV levels (where a number of flexible DERs, such as EV, etc. will be connected) needs more significant evaluation.

Assumptions regarding limiting a number of Flexibility Co-coordinators in World E, to only four may not be realistic – at the moment there may be problems with DGs in those areas, but flexibility will not only be important for managing increased penetration of renewables, but EVs as well (and potentially some other technologies). That may have not shown up yet as a significant problem in the current operation.

## Executive summary

Q3. Do you agree with the conclusions and insights within the Executive summary? If not, please explain your rationale. Please provide reference to more detailed comments against individual sections if this is appropriate.

Table 1, objectives:

- Ease of market engagement for existing providers – it is important to allow these to participate, but it is at least equally (if not even more) important to allow new providers, typically DERs, to engage. In our opinion participation of DERs may be a key to enable better integration of renewable resources, in particular DGs.
- Lowest cost to implement – World D may require very large scale problem to be solved, and costs associated with that might have been underestimated in the Impact Assessment
- Transparent, fair, neutral markets – with good regulation this can also be done in other worlds.

## Transition paths

Q4. Do you agree with the options set out as potential transition paths?

World A appears only at a later stage, as a branch-off from World B. Although a number of projects are currently in line with World B, it is more likely due to current regulation rather than really World B. Also, option to go down to World E (Stage 1) happens faster than World A (which has only Stage 2). Why is that?

We agree that the high take-up of DERs may make World A better suited than world B, but as mentioned above, it may start earlier. Actually, relatively higher level of DERs take-up will be needed for World E, to ensure liquidity, although that is also relevant for World A. In that sense, we would not expect that conditions for World E would be fulfilled earlier than conditions for World A.

In general, we expect that some kind of local markets may be needed to enable DERs to provide services. Even if local flexibility is managed/traded via aggregators, local markets may be needed to ensure completion. Also, it seems that path 4 with a transition to a series of regional SO and path 2 may, at the end, somewhat overlap, especially that SO will need to coordinate with DSOs.

Q5. Do you believe there are any other viable transition paths? If so, please explain why.

It may not be a complete different path, but there could also be World A stage 1, starting earlier and/or replacing, at least part of, World B Stage 1. Also, there could be a merger at the end of path 2 and path 4.

Q6. Do you agree with the assumption that all transition paths start in Stage 1 of World B?

As mentioned, above, World A could also be a good candidate as a starting point.

## Further work

Q7. Do you agree with the areas identified for further work in the 2019 workplan and the further work ideas in the impact assessment or do you feel there are other areas of work that should be prioritised to progress in this area?

The proposed further work covers important issues for better understating transition towards DSOs and system operation. Other areas of work could include potential business models that may entice participation of DERs, including business models of aggregators. Also, interactions between different energy vectors, and understanding flexibility provided by heat and hydrogen should be included.

Q8. What future work do you believe would enhance the debate and body of evidence around transitioning to the potential Future Worlds?

More detailed modelling of networks and envisioned operation of markets, including local markets. There have been a number of pilots/trials, with somewhat piecemeal approach to address particular issues. It might be useful to extend some of the trials and evaluate more complex issues, as well as use data from the trial to test/evaluate operation of different Worlds.

## Benefits assessment

Q9. Do you agree or disagree with the four categories of system operation benefits identified? Are there areas that should be excluded from the list and/or other areas that should be included?

The four categories are important to consider, and cover the main benefits. It is not clear if the (reduced) costs of Balancing Services will also include costs associated with mismatch that may happen due to uncertainty related to provision of flexibility from DERs. Also, reduction of CO<sub>2</sub> and other GHG could be another category.

As stated in Appendix B, it is not clear if avoided generation investment seems only considers impact due to flexibility or reduction of a demand, presumably due to demand shift, or it also considers that penetration of renewable generation can also expect to displace other generation overall.

Q10. Do you agree, disagree on the key benefits assumptions contained within Appendix B (eg. all Worlds, apart from World C, achieve the same benefits by 2050 etc) and used in the impact assessment? If you disagree, please explain your reasoning. Do you have any other comments?

Table B3 provides a summary of assets capable of providing flexibility to avoid investment. It is not clear why demand turn-up is not considered for generation driven investment. Even today, communities are considering providing demand side participation to enable better integration of DGs at their local levels. It can be expected that flexibility from demand can help avoid generation driven investment in the network, in general.

Q11. Do you agree or disagree on the approach used to assess the overall potential benefits of improved system operation?

This is quite a high level study which is trying to make a best use of currently (publicly) available data. However more detailed studies, using more realistic data and networks, will have to be carried out so to really understand system operation under these different Worlds, as well as what is an impact of the levels of DER take-up.

Q12. Do you agree with the assessment of the proportion of benefits which each Future World is capable of delivering in Stage 1 and Stage 2?

Q13. Do you agree or disagree on the approach taken to deal with the uncertainty/range of benefits? If you disagree please explain your reasoning.

Uncertainty is an important factor to consider, and while it is mainly considered, it is not clear why uncertainty of response is not considered important for the Avoided generation Investment.

In some of the worlds (e.g Table B10) it is stated that the response is high as contracted services should be able to deliver high certainty – this may not be the case as it depends on a number of factors. For example, if flexibility is provided by thermal loads, then weather conditions can have an influence on willingness of customers to provide that flexibility.

## Cost assessment

Q14. Do you agree or disagree with the areas identified for quantification of the implementation costs that will be faced by DSOs and ESO in Appendix C? If you disagree please explain your reasoning.

Q15. Do you agree or disagree with the approach used to assess the costs of each world? If you disagree, please explain your reasoning.

Q16. Do you agree or disagree with the approach to dealing with the uncertainty/range of costs? If you disagree please explain your reasoning.

## Qualitative assessment

Q17. Do you agree with the trade-offs of each of the Future Worlds identified against each of the level criteria in Table 1 of the Executive summary?

Q18. Do you agree or disagree with the Appendix A approach of ranking of worlds to help identify the strengths and weaknesses of each World against each criteria? If you disagree please explain your reasoning.

Q19. Do you agree or disagree with the rankings and whether they are suitably justified? If not, please comment on which ones and why?

Q20. Do you agree or disagree with the list of potential unintended consequences identified in Section 4.5, and their prioritisation and potential mitigation as charted in Figure 20? If you disagree please explain your reasoning. Should the Open Network project progress further work on unintended consequences?