**Call for evidence**

**Call for evidence: response form**

We are looking for responses that are evidence-based, with data and references included where possible. Please limit your response to each question to a maximum of 400 words, plus links to supporting evidence, using the template provided. Please answer only those questions where you have particular expertise or experience.

We recommend that you refer to the Climate Change Response (Zero Carbon) Amendment Bill when considering your answers, which can be found [here](http://www.legislation.govt.nz/bill/government/2019/0136/latest/LMS183736.html).

If you have any questions about completing the call for evidence, please contact us via feedback@ICCC.mfe.govt.nz. Please include a contact number in case we need to talk to you about your query.

Please email your completed form by **12 noon, Friday 15 November 2019** to feedback@ICCC.mfe.govt.nz.We may follow up for more detail where appropriate.

**Contact details**

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| *Name and/or organisation* | Simon ArnoldNational Energy Research Institute |
| *Postal Address* |  |
| *Telephone number* |  |
| *Email address* |  |

**Submissions on similar topics**

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| *Please indicate any other submissions you have made on relevant topics, noting the particular material or information you think we should be aware of.*  |
| *Answer:* [www.neri.org.nz/submissions-and-papers-by-neri](http://www.neri.org.nz/submissions-and-papers-by-neri) has available for download all submissions mage by NERI on energy matters over the last three years. All have degrees of relevance to the ICCC’s work and the call for evidence.[www.neri.org.nz/strategy](http://www.neri.org.nz/strategy) links to the energy research strategy NERI developed to address the key issues NZ will face, including reducing GHGs. It particularly identified the areas of significance where there are high levels of uncertainty, so rather more addresses the issue of where the evidence is lacking, and where work needs to be done. NERI members have the capability to address these issues and in many cases are actively engaged in doing this. |

**Commercially sensitive information**

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| *Do you have any objection to the release of any information contained in your response, including commercially sensitive information?**If yes, which part(s) do you consider should be withheld, together with the reason(s) for withholding this information.* |
| *Answer:* No |

**Questions for consideration:**

 **Section A The first three emissions budgets**

Under the proposed Zero Carbon Bill, the proposed Commission will have to provide advice to government on the levels of emissions budgets over the coming decades.

Currently, the Zero Carbon Bill requires budgets to be set from 2022-2035 (three separate budgets covering 2022-2025, 2026-2030, and 2031-2035). When preparing this advice the proposed Commission will have to consider the implications of those budgets for meeting the 2050 target. The Commission will also need to consider the likely economic effects (positive and negative) of its advice.

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| *Question 1:**In your area of expertise or experience, what are the specific proven and emerging options to reduce emissions to 2035? What are the likely costs, benefits and wider impacts of these options? Please provide evidence and/or data to support your assessment.* |
| *Answer:* From NERI’s review of the available science as documented in the Research Strategy and its various submissions (examples referenced), the early opportunities lie in:* Encouraging demand-side reductions in dirty fuels use (including but not limited to efficiency). Behavioural changes can occur rapidly and in energy this is being facilitated by the convergence of ICT with energy use, again with ICT applications having low adoption cost (particularly where the infrastructure is being provided for other reasons eg 5G). Various roadmaps also show that efficiency in housing/commercial buildings (retrofitted on 20-year cycles), process heat, and heavy-duty transport represent the early opportunities (i.e. at lower Co2-e pricing). Under-rated is the impact of VR/AR/MR telepresence and transport as a service on personal travel, and 3-D printing, V2X comms/embedded intelligence on logistics (e.g. NERI “Comments on Draft Transport Evidence Base Strategy”).
* Electrification of low duty cycle transport. In NZ where we have significant available renewable generation available the evidence is this will be increasingly competitive, limited by fleet age at import and turnover. The latter will be accelerated by transport as a service (e.g. NERI “Submission on NZ Productivity Commission's ‘Low-emissions economy’ Draft Report”).
* As well as growing renewable generation over this timescale there will be significant opportunities to better match the electricity loads to profiles so that the electricity system changes to better suit NZ’s mix of renewable generation (e.g. electrifying milk drying), while addressing shortfalls through the use of other fuels or efficiency gains (e.g. EECA “Efficiency First”, NERI “Meeting NZ's Winter Electricity Needs: Research Priorities”). In respect of growth in renewable supply there are likely to be opportunities to improve the performance of existing geothermal generation.
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| *Question 2:* *In your areas of expertise or experience, what actions or interventions may be required by 2035 to prepare for meeting the 2050 target set out in the Bill? Please provide evidence and/or data to support your assessment.* |
| *Answer:*  The NERI Energy Research Strategy and subsequent NERI submissions start the process of identifying where we need to be investing in energy related research to better understand and reduce the uncertainty around options to achieve these targets. It is important to note that at the current state of knowledge there is limited evidence on these timescales of what will be required with any certainty. This perhaps suggests on these timescales the Commission will not find evidence, but will instead need to adopt processes that progressively reduce this uncertainty.The research community can help identify the potential options indicated by our resource base and likely needs. The key action/intervention required then is to invest in targeted RSI to reduce the uncertainty and develop the most promising options (see e.g. Productivity Commission “Low-emissions economy"). Because of the high uncertainty Real Options will need to be developed in a way that ensure that we retain adaptability i.e. not closing off options or overly committing to them prematurely. Adaptability will be the key attribute we will need, and this is likely to lead to a bias in favour of interventions/investments that avoid lock-in. Good quality RS&I is required to avoid that and is itself a relatively low-cost way to reduce these risks.  |
| *Question 3:**In your areas of expertise or experience, what potential is there for changes in consumer, individual or household behaviour to deliver emissions reductions to 2035? Please provide evidence and/or data to support your assessment.* |
| *Answer:* See earlier comments. |

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| *Question 4:* *When advising on the first three emissions budgets and how to achieve the 2050 target, what do you think the proposed Commission should take into account when considering the balance between reducing greenhouse gas emissions and removing carbon dioxide from the atmosphere (including via forestry)?* |
| *Answer:* There is a significant area that is under-explored here and that is the trade-off between using land and crops as a sink versus its use for energy production to displace difficult fossil fuel use (e.g. energy crops to replace high duty cycle transport fuels). It can be argued that long rotation forests are a poor investment in mitigation if discount rates are used that reflect the high uncertainty (e.g. technological change, demand etc), particularly since there contribution tends to take time to get going. Shorter rotation energy crops will be more adaptable (see Question 2) and are likely once in place give higher levels of mitigation per hectare running up to 2050. The trade-offs will be around land use, particularly harvesting. |

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| *Question 5:* *What circumstances and/or reasons do you think would justify permitting the use of offshore mitigation for meeting each of the first three emissions budgets? And if so, how could the proposed Commission determine an appropriate limit on their use?*  |
| *Answer:*  n/a |

**Section B Emissions reduction policies and interventions**

The proposed Commission will also need to consider the types of policies required to achieve the budgets it proposes. This consideration should include:

* sector-specific policies (for example in transport or industrial heat) to reduce emissions and increase removals, and
* the interactions between sectors and the capability of those sectors to adapt to the effects of climate change.

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| *Question 6:*  As noted we consider investment in directed medium-term RS&I is required, and that considering the interactions between sectors and various supply options is essential. We have circulated to ICCC a discussion document on improving modelling in this area that specifically addresses the latter issue.*What sector-specific policies do you think the proposed Commission should consider to help meet the first emissions budgets from 2022-35? What evidence is there to suggest they would be effective?* |
| *Answer:* In Question 1 we identify the areas where the greatest payoffs appear to lie. There are a range of policy interventions that have been tried internationally, but unfortunately these don’t transfer easily into the NZ context. Individual research groups will be able to help address this question. NERI can assist here. |

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| *Question 7:* *What cross-sector policies do you think the proposed Commission should consider to help meet the first emissions budgets from 2022-35? What evidence is there to suggest they would be effective?*  |
| *Answer:* The fuel supply issues are critical and just looking at any in isolation will be suboptimal (as the ICCC found in its work on electricity – see earlier references). In this regard the domestic supply of fuels for international transport needs to be in scope because of its significance to the supply side, and some of these applications could be early opportunities with positive impact for NZ (i.e. marine biofuels).Energy is a critical input into the rest of the economy so it needs to be considered in that context, and being a low priced commodity it is often only viable as a co-product with other more valuable products (e.g. chemicals from the petrochemicals industry). Thus, interventions to encourage a biorefining industry will be essential to achieve high values of biofuels. This can be seen with bioenergy and the pulp and paper industry.These are matters where the evidence will need to be developed on a case-by-case basis. |

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| *Question 8:* *What policies (sector-specific or cross-sector) do you think are needed now to prepare for meeting budgets beyond 2035? What evidence supports your answer?* |
| *Answer:* As noted, investment in targeted RSI in order to improve NZ’s options. NERI can assist here. |

**Section C Impacts of emissions budgets**

The proposed Commission will need to consider the potential social, cultural, economic and environmental impacts of emission budgets on New Zealanders, including how any impacts may fall across regions and communities, and from generation to generation. Potential impacts may be either positive or negative.

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| *Question 9:* *What evidence do you think the proposed Commission should draw upon to assess the impacts of emissions budgets?*  |
| *Answer:* There is considerable experience being built up in the research community on impacts and this should be used. NERI can assist. |
| *Question 10:* *What policies do you think the proposed Commission should consider to manage any impacts of meeting emissions budgets? Please provide evidence and/or data to support your assessment.* |
| *Answer:* Again, this is an area where research is being done including evaluation. NERI can assist. |

**Section D Other considerations, evidence or experience**

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| *Question 11:* *Do you have any further evidence which you believe would support the future Commission’s work on emissions budgets and emissions reduction policies and interventions?*  |
| *Answer:* There is considerable expertise in the NZ research community on all aspects of the Commission’s likely work programme over the next year, and NERI has good links into this and would be pleased to help identify those as priorities emerge. By way of example NERI keeps closely in touch with where government funding is going in energy research and we maintain a database of NZ authored research papers that includes not just technologies but also social and policy research (www.neri.org.nz/search-papers). Through this we track areas of expertise. Again as the Commission identifies priority areas NERI can assist contact this. |

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