Check proposal type: Typical Concurrent Paper_✓__ Extended Presentation Paper___

Improving the meaningfulness of measurements of greenhouse gas abatement potential: a transport case study

Paul Graham, CSIRO, Ph: +61 2 4960 6061, paul.graham@csiro.au
David Cosgrove, BITRE, Ph:+61 2 6274 7111, david.cosgrove@infrastructure.gov.au
David Gargett, BITRE, Ph: +61 2 6274 6879, david.gargett@infrastructure.gov.au
Caroline Evans, ARRB Group, Ph:+61 3 9881 1610, caroline.evans@arrb.com.au

Keywords

Greenhouse gas, abatement, transport

Overview

In response to the imperative to reduce greenhouse gas emissions, researchers have developed various means of communicating information about the abatement potential of different policies, processes or technologies. These include, for example, a 'wedges' diagram which shows contributions beginning at a given point and expanding over time – hence the wedge shape. This approach was made popular by Princeton researchers Pacala and Socolow (2004).

Another approach is to show the contribution to abatement at a single point in time but also show the cost of achieving that abatement. Combining these two axis of information and ranking the items from least to highest cost provides a carbon abatement cost curve. This approach was popularised by McKinsey and Co starting with Enkvist et al. (2007).

This paper demonstrates that, while the diagrams produced via these methods are extremely useful in summarising the options available in a single diagram, greenhouse gas abatement potential calculations can be manipulated to provide radically different viewpoints depending on how the reference case is designed and how the options are ordered when combined. The paper suggests a way to address some of these issues and demonstrates the results in a case study examining greenhouse gas abatement potential in transport.

Methods

Greenhouse gas abatement potential calculations require a reference case against which the abatement must be measured. Once the reference case is established two further key assumptions are the extent and timing of the adoption of the option and its impact relative to what it is replacing (in particular its relative emission intensity).

The paper outlines how these steps require several arbitrary choices which significantly impact upon the amount of abatement potential calculated. The argument is demonstrated by examining a simple transport example which includes options to improve energy efficiency and renewable fuel. By altering reference case assumptions and the order in which the options are implemented the paper shows that the impact of the abatement options can be either zero, minor or substantial.

Results

Using a transport case study which examines a much more comprehensive set of 47 greenhouse gas options, the options are calculated in isolation, in a subjectively chosen order and when implemented first. A key outcome of this approach is that, whilst a subjective ordering can never be avoided, the amount of abatement calculated in first choice ordering indicates the degree to which the ordering has biased the calculated abatement amount, depending on your perspective of the subjectively chosen order.

Figure 1 illustrates the results when the greenhouse gas abatement potential in Australia of four selected categories of transport sector options (aggregated across the original 47) were estimated both in a subjectively chosen sequence and in isolation. It shows that demand management options appear to deliver significantly lower abatement when considered from the perspective of the study sequence which includes these options after the vehicle fuel and technology options. However, demand management options in fact offer only slightly less abatement compared to the other aggregate options if implemented in isolation.

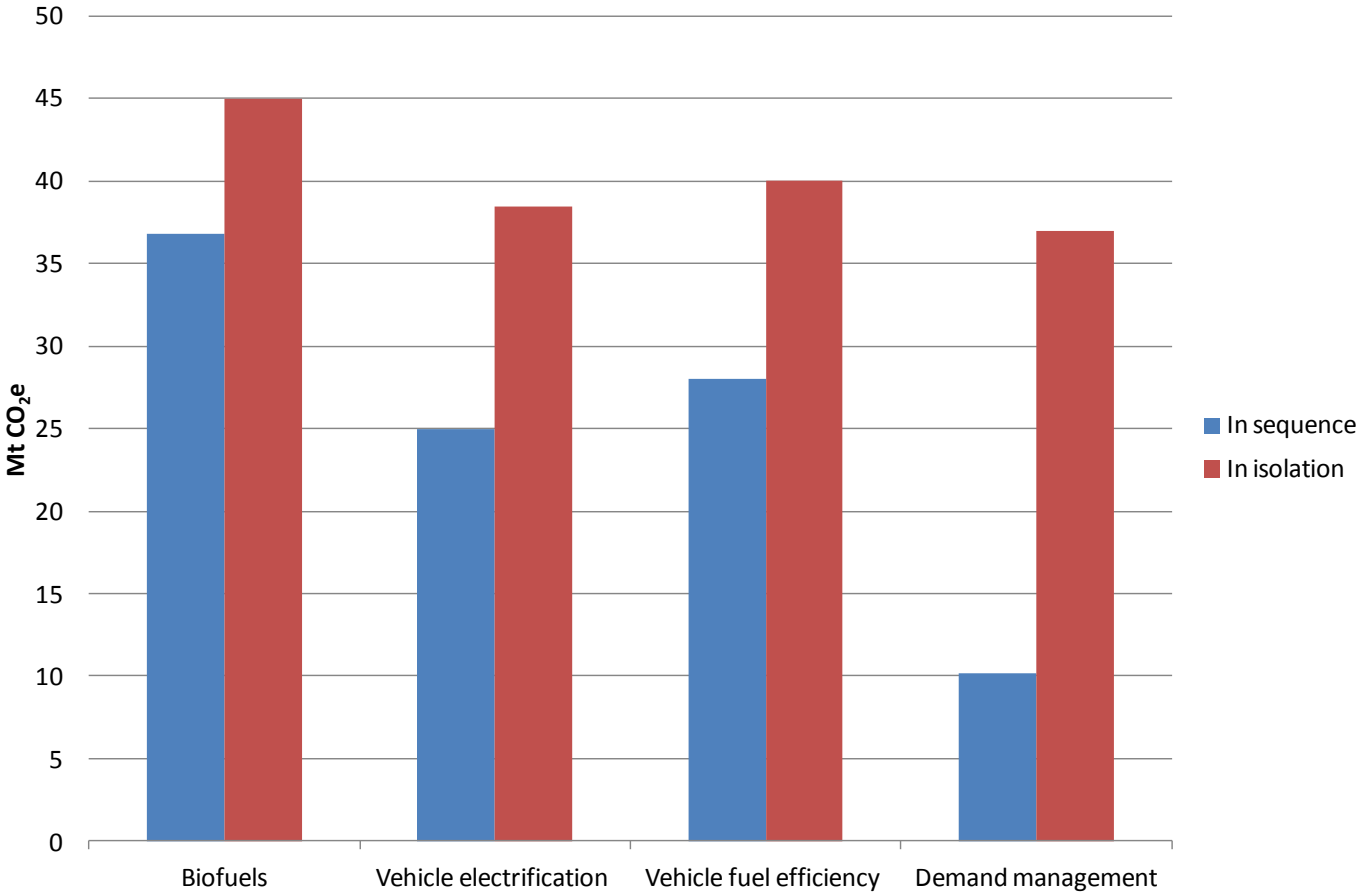

Figure 1: Abatement potential in Australia of four transport sector options estimated in a sequence selected by the authors and in isolation

Conclusions

The calculated greenhouse gas abatement potential of a set of given options can be misleading due to the arbitrary or subjective choices associated with the design of the reference case and the order in which the options are implemented. If decision makers are not aware of this underlying methodological issue and make policy and investment choices based on such information then there is the potential that options will be implemented that do not achieve their desired outcome – either in terms of greenhouse gas abatement or program cost.

The paper provides a partial solution in the sense that not all subjectivity can be removed from the process of summarising the greenhouse gas abatement potential of a set of options. The paper recommends that when presenting the level of abatement that it should be described in three ways – in isolation, in a subjective sequence with other abatement options and finally in first sequence

with other abatement options. In the transport case study that is applied, by using this approach we can say with greater confidence that vehicle technology options emerge as having the greatest abatement potential in that sector.

References

Enkvist, P., Naucler, T and Rosander, J., 2007, A cost curve for greenhouse gas reduction: A global study of the size and cost of measures to reduce greenhouse gas emissions yields important insights for business and policy makers, *The McKinsey Quarterly*, no. 1,

Pacala, S. and Socolow, R., 2004, Stabilization Wedges: Solving the Climate Problem for the Next 50 Years with Current Technologies, *Science*, Vol. 305, no. 5686 pp. 968-972.