ACEEE
American Council for an Energy-Efficient Economy
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Comments on Low Emissions Economy Draft Report

May 2018

Dear Chairman Sherwin and other members of the Commission,

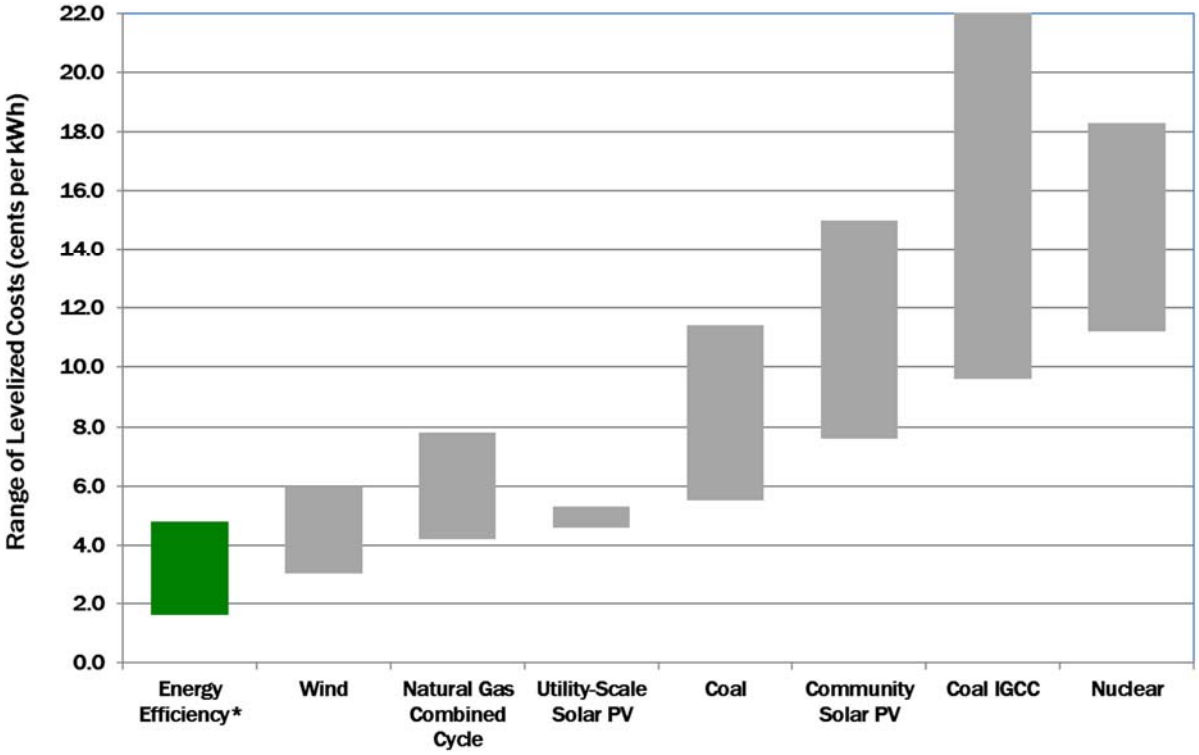
I am writing on behalf of the American Council for an Energy-Efficient Economy (ACEEE) to provide comments on the Productivity Commission's draft report on a *Low Emissions Economy*. ACEEE is the United States' leading non-profit energy efficiency research organization. Founded in 1980 by researchers from academia and national laboratories, ACEEE has published more than 300 research reports on energy technology, program and policy topics. We work primarily in the US, but also conduct joint research projects with researchers in other countries including from Europe, Australia, Canada, China, India, Brazil and Thailand. More information about our work can be found on our website – www.aceee.org .

Recently I attended and spoke at the EMANZ conference in Auckland and at that conference learned about your draft report. I have since reviewed this draft and wanted to provide a few comments. First, given some of the challenges we now face in the US, it is heartening to see New Zealand making a major commitment to reducing its emissions. We also appreciate and support your proposals to improve the existing emissions trading scheme, to electrify transportation, and to expand financing.

However, we are concerned that the plan relies too much on the emissions trading scheme and financing, and recommend that the energy efficiency aspects of the plan be strengthened. While we are not experts on New Zealand, from our understanding of the situation and our recent discussions there, we recommend that you consider implementing a series of "market transformation initiatives" to remove market barriers and permanently transform markets for several high priority energy efficiency technologies and practices. For example, market transformation initiatives could address electric vehicles, heat pumps, "smart buildings," zero net-energy buildings and strategic energy management for large industrial and institutional energy users. New Zealand could also label homes and buildings so that purchasers and renters can make more informed choices when they are buy or remodel a home or building or rent an apartment or office space. In addition, we recommend that building codes be strengthened and new efficiency standards be considered for motor vehicles and lightbulbs. We elaborate on each of these recommendations in the sections below.

1. Why is more energy efficiency needed?

Energy efficiency generally provides the lowest cost carbon reductions – the cheapest energy is generally energy you don't waste. By pursuing more energy efficiency, New Zealand can reduce the cost of reaching its low emissions goals. While we do not have New Zealand-specific data on this point, data from the US in the chart below are illustrative. Each bar shows the range of costs per kWh from energy efficiency and various new power sources. As can be seen, energy efficiency is generally the lowest cost, although there is a little overlap with the lowest cost wind and solar. The wind and solar costs however do not include any storage or grid integration costs (however, due to New Zealand's large hydropower resource, storage is likely to be less of an issue than in most other countries).



*Notes: Energy efficiency program portfolio data from Molina 2014; All other data from Lazard 2017. High-end range of coal includes 90% carbon capture and compression.

2. Do not rely only on the emissions trading scheme

A price on emissions, such as New Zealand's emissions trading scheme, is an important component of a low emissions strategy. Such a scheme puts an economic cost on emissions that can be factored into business decisions. The Commission suggests a gradual increase in the emissions price, sending a long-term signal that businesses can factor into their planning. ACEEE has looked at the impact of carbon taxes in actual practice (see https://aceee.org/files/proceedings/2016/data/papers/9_49.pdf). We find that putting a price on emissions does reduce energy use and emissions, but the reductions are fairly modest – a median reduction of about 1.3% per year across studies looking at impacts. While these are highly useful reductions, in order to meet long-term emissions goals, a price on emissions will likely need to be complemented with other strategies.

3. Financing is useful for some but not all customers

The draft report talks about expanding use of financing. We agree that this is an important component of emissions reduction efforts. However, in our work in the US, we find that financing is only useful for some customers. Some customers already have capital and do not need financing. Other customers are debt-adverse and do not want to borrow. In the US, some states and utilities have offered financing for energy-efficiency measures for many years. They find that it is hard to entice more than 1% of eligible customers to participate each year, resulting in maximum participation rates after 25 years of about 25% of eligible customers. Thus, like emissions fees, financing should be just one element in broader emissions reduction efforts. Additional information on best practices in financing in the US and lessons learned can be found at https://aceee.org/sector/state-policy/toolkit/financing-energy-efficiency (includes references to a selection of the most useful studies).

4. Establish several market transformation initiatives for key energy efficiency technologies and practices

The draft plan generally takes a market-approach, using a price on emissions and financing as primary vehicles, complemented with work on innovation, policy and regulations. A promising area that lies at the boundary between markets and complementary policies is what the US and UK call *market transformation initiatives*. These initiatives identify major energy-saving and emissions-reduction opportunities, seek to understand their markets and market barriers, and then develop a series of interventions to overcome the market barriers and make the efficient/low-emissions option normal practice. In the US, this approach has been successfully used to transform markets for lamps, clothes washers and new schools in some states. More information can be found in the following report: http://aceee.org/research-report/u1715 .

For New Zealand, based on our understanding of the situation, we think market transformation initiatives should be considered for the following opportunities:

a. **Electric Vehicles (EVs):** The draft report proposes a substantial effort in this area, including use of feebates and efforts to expand charging. We recommend approaching this work as part of a market transformation effort to address barriers. For example, while we agree that limited charging infrastructure is a barrier, from our work in the US, it appears that some charging locations will be particularly important such as quick chargers along major long-distance routes and chargers at multifamily buildings. Also, if New Zealand adopts fuel economy standards for passenger vehicles, as we suggest below, this would spur EV sales as vehicle importers can use the higher fuel economy of EVs to help meet the standards.

   While the focus for EV efforts is on passenger vehicles, there are also significant opportunities for electric trucks. Electric trucks can be good local delivery vehicles. In addition, work is proceeding by several manufacturers to develop heavy duty tractor-trailers. Current efforts are targeting vehicles with about a 1000 km range, which would cover many long-distance freight routes in New Zealand. The draft report seems to dismiss EVs for these applications. While these vehicles are not commercialized yet, we believe they could be viable and suggest that the final report recommend further investigation.

b. **Heat pumps:** Another important electrification opportunity is increased use of heat pumps. Data from Stats NZ indicate that about 25% of New Zealand homes are heated with mains or bottled gas.[1] Switching many of these homes to heat pumps will reduce emissions and save energy. And increased use of heat pumps in homes with electric resistance heat will save consumers money and reduce electricity use, freeing generation for serving newly electrified loads. The Commission should recommend further study on heat pump market barriers and opportunities. ACEEE has conducted such analyses for the US (see http://aceee.org/comparative-energy-use-residential-furnaces-and and http://aceee.org/opportunities-energy-and-economic-savings ; similar studies should be prepared for New Zealand.

c. **Smart buildings:** Building energy use data and information from sensors placed in buildings can be used to optimize building operation and reduce energy use 20% or more on average. Smart building systems typically make use of data from smart meters and from building energy management systems. Demonstration projects can be conducted to identify savings in the New Zealand context and the results used to convince building managers to adopt similar practices. Good systems for smaller buildings are being developed in Germany and the US; such systems could potentially be included in the Commission's innovation agenda. Further information on smart buildings can be found in two recent

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[1] http://archive.stats.govt.nz/Census/2013-census/profile-and-summary-reports/quickstats-about-housing/heating-fuels.aspx .

ACEEE reports: http://aceee.org/research-report/a1701 and https://aceee.org/research-report/a1703

d. **Zero net-energy buildings:** It will be much less expensive to build energy efficiency and low emissions into new homes and buildings at the time of construction, than to build inefficiently and have to retrofit these homes and buildings later. The ultimate in low-emission buildings are buildings with zero emissions over the course of a year, commonly called zero net-energy (ZNE) buildings. These buildings combine high levels of energy efficiency with on-site or nearby renewable energy systems . The "net" refers to the fact that they use zero grid energy averaged out over the course of a year, although at times during the year they either produce extra energy or need grid energy. The outlines of a market transformation strategy for the US can be found at https://aceee.org/research-report/a1403; some of these ideas may apply in New Zealand.

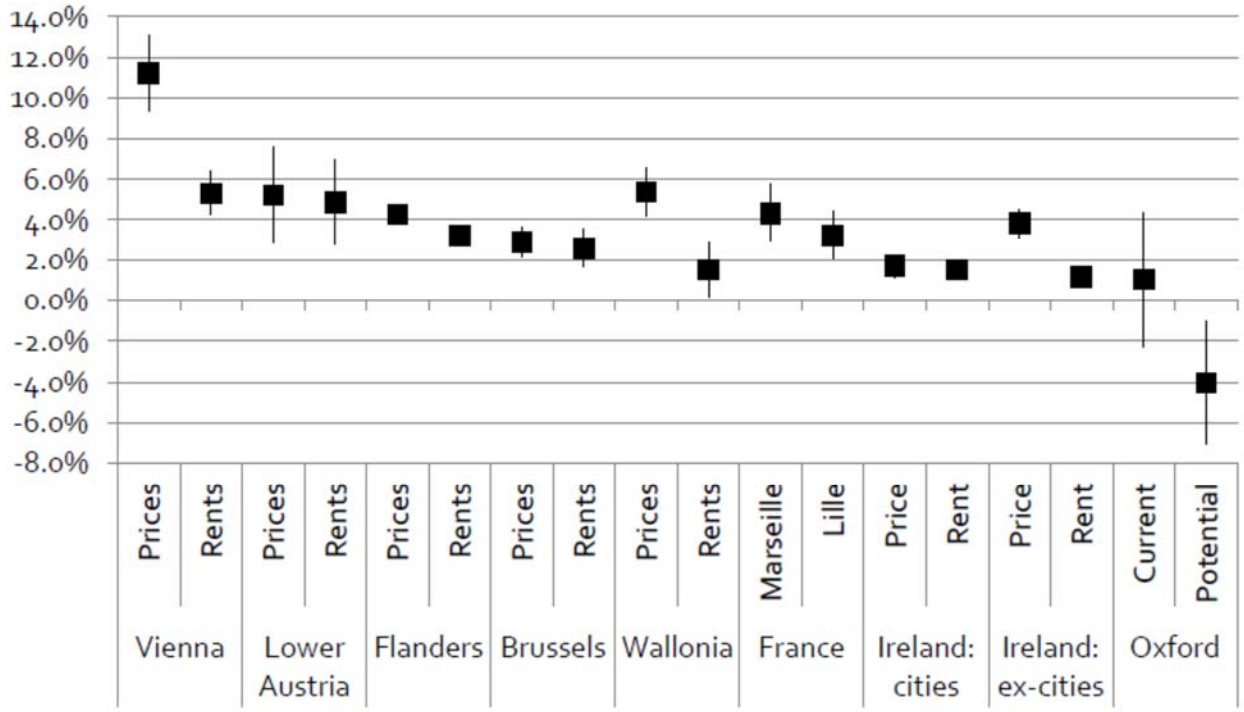
   New Zealand currently has several homes and buildings that are zero net energy (e.g. https://zeroenergyhouse.co.nz/zero-energy/). New Zealand should develop a strategy to promote these practices more widely, ultimately leading to a ZNE-based building code (we discuss this further below).

e. **Strategic energy management (SEM):** SEM can be used by large energy users (typically manufacturers and institutions) to develop a long-term energy management strategy based on continuous improvement. The International Standards Organization (ISO) has a standard for SEM: ISO 50001. Simpler approaches have been developed by the US Department of Energy (see https://www.energy.gov/eere/amo/50001-ready-program). In the initial years of a SEM effort, operations improvements are generally emphasized, with typical energy savings on the order of about 8%. Over the longer-term, more significant changes can be integrated into capital investment plans. The Commission should investigate applicability to New Zealand industry and institutions. Chapter 15 of the following report provides more information on SEM: https://aceee.org/research-report/u1507 .

f. **Labeling of commercial buildings and homes:** Rating and labeling of building energy performance allows would-be building purchasers and renters to assess the relative energy performance of homes and buildings before they purchase or rent. Such a system also allows owners of buildings and homes to assess the relative performance of their buildings, identifying buildings most in need of improvement. In New Zealand there is a voluntary NABERS label for office buildings. At the recent EMANZ conference there was some discussion about making this rating mandatory. Ideally this would happen not just for offices but also for other common commercial building types (e.g. the Austrailian NABERS also includes shopping centers, hotels and data centers). Australia has had a very successful mandatory NABERS program that, for offices, has reduced energy use by an average 36% and carbon dioxide emissions by 41% for buildings with 11 ratings (see https://nabers.gov.au/AnnualReport/2016-2017/index.html).

   Likewise, labeling of residential buildings can also encourage energy efficiency upgrades, sometimes by the seller before a home is sold, and sometimes by a new purchaser (improvements are common in the years immediately after purchase). The chart at the top of the next page shows the results from a variety of residential labeling programs in Europe – higher label values (in this case an increase of one grade on Europe's A-G label scale), increases the sales price of homes by an average of about 3%, a powerful incentive for owners to improve the efficiency of their homes.

   Rating systems are also in place in Portland, Oregon and Berkeley, California, requiring buildings to be rated on a ten point scale when homes are placed on the market (Portland) or ownership is transferred (Berkeley). In addition, there are options for rental units. For example, Boulder, Colorado requires units to earn a specified number of energy efficiency points using a scoring system they developed (see https://bouldercolorado.gov/plan-develop/smartregs).



Effect of a one-letter or equivalent improvement in home rating across European property markets, showing average effect and 95% confidence interval.[2]

Role of EECA: For each of these market transformation initiatives, a lead organization will be needed. EECA is already involved in many activities similar to the ones we discuss and they may be an excellent lead for these initiatives, adding market transformation to their program strategies.

Regarding EECA, we note that one of the recommendations in the draft report is to change EECA's primary mandate to greenhouse gas emissions reductions. While we agree that emissions reductions are very important and should be a primary consideration, we worry that without also retaining a mandate to also promote energy efficiency, there will be no organization in New Zealand leading energy efficiency efforts, with the result that energy efficiency can get lost, increasing costs as discussed earlier in these comments. Therefore we suggest that the Commission modify this recommendation to include a primary focus on *both* emission reductions and energy efficiency. A joint focus will reduce the chances that energy efficiency is lost in discussions. Since energy efficiency almost always results in emissions reductions, these two priorities will be complementary.

5. Building codes, vehicle efficiency standards and lamp standards

The draft report includes a section on supporting regulations and policies. We recommend that it be expanded to include three additional areas.

First, we understand from colleagues at the New Zealand Green Building Council that New Zealand's building code is relatively weak compared to other developed countries. We suggest that the Commission recommend that the New Zealand code be revised to reflect the country's interest in reducing emissions. In

[2] From *Energy Performance Certificates in Buildings and Their Impact on Transaction Prices and Rents in Selected EU countries*. https://ec.europa.eu/energy/en/studies/energy-performance-certificates-buildings-and-their-impact-transaction-prices-and-rents .

particular, we recommend that New Zealand have a goal to move new construction to zero net energy performance by 2030. California and Canada are both working to develop such codes, starting with current codes and then progressively tightening them about every three years. The Canadian province of British Columbia also has their own effort (see: https://www.toolkit.bc.ca/Resource/Path-%E2%80%9CNet-Zero-Energy%E2%80%9D-Buildings-BC). New Zealand should study what these other jurisdictions are doing and adapt for the New Zealand situation.

Second, New Zealand should consider fuel economy regulations for passenger vehicles and trucks. Most of the world's leading countries have passenger vehicle standards and a growing number (China, Canada, US, Japan, soon Europe) have truck standards. While we understand that Australia and New Zealand often work together on such standards, Australia has not wanted to proceed due to concerns about impacts on a domestic car producer (who recently closed their last manufacturing plant) and to the anti-regulatory views of the current government. New Zealand may have to proceed on its own, drawing on experiences and regulations from other countries. Such an effort will both reduce fuel use and can spur adoption of EVs.

Third, New Zealand should consider efficiency standards on lamps that will phase-out inefficient incandescent screw-in lightbulbs, in favor of LED, CFL or other more efficient types. Such standards are big energy savers and are now phasing in in Europe, China, the US and other countries (see https://en.wikipedia.org/wiki/Phase-out_of_incandescent_light_bulbs). New Zealand should study these standards and consider if similar standards make sense for New Zealand.

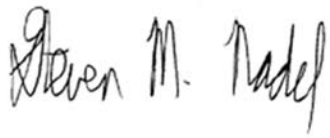
Conclusion

Overall, we find the draft report an excellent and comprehensive overview of pathways for New Zealand to pursue. However, we recommend that the Commission strengthen the energy efficiency recommendations to include:

- Implementing a series of "market transformation initiatives" to remove market barriers and permanently transform markets for several high priority energy efficiency measures such as:
    - Electric vehicles;
    - Heat pumps;
    - Smart buildings;
    - Zero net-energy buildings;
    - Strategic energy management for industry and institutions; and
    - Labeling of homes and buildings so that purchasers and renters can make more informed choices and there is a strong incentive to retrofit existing homes and buildings.
- Updating building codes and establishing new efficiency standards for motor vehicles and lightbulbs.

In these comments we have provided many links for more information on these ideas. We would also be happy to answer any questions you have about these ideas or to assist your staff in assessing the applicability of these ideas to New Zealand.

Sincerely,



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