Regional Hydrogen Transition

Submission by Climate Karanga Marlborough

Introduction

Climate Karanga Marlborough is a citizen's organisation of about 130 members with the purpose of educating the public and our decision-makers as to the dangers of climate breakdown, and to support local and national decision-makers to take action.

Concerns

We have serious concerns with this program and request a change in direction. We support a subsidy for green hydrogen used in industrial processes and aviation & ship fuel but we do not support the use of green hydrogen for heavy transport. Our reasons are below:

1. The program appears to be tailored just to the use of hydrogen in heavy transport. Companies with stationary uses for hydrogen, such as in steel and chemical manufacturing, would likely prefer to produce their own green hydrogen on-site rather than purchase it from a supplier, the condition whereby the subsidy would apply. On-site generation of hydrogen would have the benefit of being closely coordinated with other industrial processes and would require only limited storage. On the other hand, purchases of hydrogen from a supplier would like require road transport and significant on-site storage, with commensurate insecurity of supply.

   For these companies, a cost-shared subsidy for the purchase of electrolysers and associated equipment, such as through the GIDI fund, would make more sense. Still, we do not oppose a subsidy for green hydrogen for industrial application.

2. Electrical energy used to make green hydrogen will be energy not available to other consumers. Although hydrogen consumers are expected to help with generation, they can also just contract electricity from 3rd party generators. A subsidy for hydrogen users, then, will help hydrogen producers pay for their electricity, in essence subsidising what they pay for electricity. In the open market for electricity, we would expect average electricity prices to rise due to the added demand from hydrogen producers.

   This does not meet with the expectation of a "just transition". Residents and businesses in New Zealand should not have to pay more for their electricity due to the added electricity demand created by subsidised hydrogen fuel.

3. A green hydrogen rebate unfairly disadvantages other green energy technologies in transport. For example, battery powered trucks are an alternative to hydrogen-powered but will receive no similar price support. This will distort the market for the uptake of low emissions trucks. Similarly, the market for sustainable aviation fuel (SAF) and sustainable shipping fuel will be similarly distorted to favour fuels made with green hydrogen as opposed to other, potentially cheaper and more efficient fuels. We appreciate, however, that there are few options for producing SAF and ship

fuel at this time and hydrogen will likely be an important component in the manufacture of both, so we are not opposed to a subsidy for SAF and ship fuel containing green hydrogen.

4. Heavy transport is not a “hard to decarbonise” enterprise. Battery EV trucks with similar performance to hydrogen fuel cell trucks are already available. A comparison of the recently imported Hyundai XCIENT fuel cell trucks to the Volvo Electric VNR series trucks shows similar gross vehicle weight and range. The major difference is in refuelling time; the Hyundai can be refilled in 8 to 20 minutes, the Volvo takes 60 minutes to recharge to 80% state of charge. This is hardly enough difference to require a subsidy for hydrogen fuel. And besides, truck drivers would likely benefit from an hour’s rest after driving 400 km.

   It is also important to consider the charging infrastructure needed for both types of vehicles. The battery electric vehicle needs only a power line and transformer. The hydrogen vehicle will require hydrogen storage tanks and either regular visits by hydrogen fuel trucks or an on-site electrolyser.

   Considering the fact that hydrogen storage tanks have been known to explode, hydrogen filling stations will likely need to be sited well away from homes and communities, in areas where there are few other services.

5. Green hydrogen used for combustion or fuel cell energy in transport is very inefficient compared to the direct use of electricity through batteries or overhead electrification, as with electric trains. Battery electric vehicles are approximately 3 times more efficient in the use of electricity than fuel cells or internal combustion engines fuelled by green hydrogen.

   New Zealand is depending upon an ample supply of renewable electricity to replace fossil fuels, yet renewable energy supply will only grow at a pace that the wholesale price of electricity allows. In our current electricity market, increasing electricity prices will be needed to promote growth in renewable generation. With an expectation of a long term increase in electricity prices, it makes no sense to invest in low efficiency uses of that energy. A ten year subsidy for green hydrogen as a transport fuel will lock in this inefficient use of our renewable electricity.

6. There is no mention of program support for the safe transport of hydrogen. It is presumed that the network of hydrogen fuelling stations around the country will be serviced by local electrolysers or by tanker trucks carrying compressed hydrogen. As with any form of road transport, there will be accidents and local fire & emergency personnel will be needed to respond to these accidents. Compressed hydrogen presents serious safety risks to these personnel. For example:

   - Hydrogen has no smell and when prepared for fuel cells, cannot be perfumed. Local firefighters will need special sensors to detect leaking hydrogen at an accident site.
   - Hydrogen burns with a flame that is invisible in daylight. Firefighters will need special equipment to detect burning hydrogen at an accident site.

- Hydrogen has very low ignition energy and can spontaneously explode when decompressed. Compressed hydrogen presents a serious explosion hazard to rescue personnel.

  If hydrogen is to be transported around the country in tanker trucks, the skills and equipment of local emergency personnel nationwide will need to be upgraded. This should also be part of this transition program.

7. When considered alongside national support for other low emissions technologies, hydrogen for heavy transport appears to be getting "corporate welfare" through this subsidy program. In industries which are truly hard to decarbonise, such as steel & fertiliser production and aviation and ship fuels, it makes sense to subsidise green hydrogen in order to reduce the nation's greenhouse gas emissions. It is also important, from a strategic viewpoint, that New Zealand have a domestic source of aviation and ship fuel.

   The inclusion of heavy transport in the subsidy program appears to benefit only a few companies, which are easily named.

8. Finally, one of the unavoidable realities of hydrogen is that it leaks through most materials, including the carbon composite fuel tanks of fuel cell vehicles. It is estimated that 2.7% of hydrogen produced leaked to the atmosphere in 2020. The International Energy Agency estimates that with increasing hydrogen demand could lead to as much as 5.6% leakage by 2050. Leakage from transportation applications (trucking & storage) is considerably larger than that from fixed industrial applications. Transportation leakage has been calculated to be 2.3% while that for industrial processes is assumed to be around 0.5%.

   While the main focus on leakage has been to prevent hydrogen from reaching explosive concentrations in air (above 4%), there has been little attention given, until recently, to its climate impact. Recent studies have shown that hydrogen has a global warming potential of 11.6 times that of CO2 over 100 years (GWP_{100}), but an estimated GWP of over 100 times that of CO2 over ten years due to its short lifetime (~2.4 years). It is not itself a greenhouse gas; its warming effect is due to its rapid reaction with atmospheric hydroxyl ions, which results in prolonging the life of other greenhouse gases, such as methane, tropospheric ozone and stratospheric water vapour.

   Do we solve the global warming crisis by subsidising the production and widespread use of another gas which is leaky and causes intense warming?

Considering its low efficiency, ready alternatives, lack of infrastructure, explosivity, limited industrial benefit and climate impact of leakage, green hydrogen for transport should not be given preferential price support.