Getting there

Executive summary

Mt

New Zealand can reduce its greenhouse emissions to 40% below 1990 levels in 2020 at low cost if we act now.

The Green Party has researched opportunities to reduce emissions in all sectors of the economy and found some 36.2 million tonnes (Mt) of reductions over the next decade to 2020. There are many that cost less than nothing – we would actually save money – and others that are likely to cost much less than buying carbon credits on the international market.

The perception that reducing emissions will be very costly has been used to argue that we should adopt a low target at the international negotiations aiming to stabilise climate. This argument does not stand up to scrutiny.

The science shows that, to avoid dangerous climate change, developed countries need to reduce emissions collectively by the equivalent of 25% - 40% below their 1990 level. We don't have to do it domestically, however, countries that begin to put their economies on a low carbon track now will find it much easier to meet the much more stringent 2050 targets. **The highlights are:**

Electricity

Retire Huntly's coal burning power station and replace with new geothermal, wind, and small-scale hydro that does not damage rivers. Implement interruptible load agreements with industry. Restrict Taranaki's gas-fired station to running only in winter months. These steps are all part of the Electricity Commission's *Statement of Opportunities* and regarded as economic and save 4.25 Mt.

An aggressive programme of minimum energy performance standards (MEPS) for products like appliances will save householders money and save 1Mt.

5.25 Back to 2013 levels

Industrial and manufacturing fuels

Replace coal with wood waste fuels and some gas (excepting the steel industry), and invest in all efficiency projects that pay a return over their lifetime. Wood fuel is economic in many applications at a carbon price of $25/tonne (the current price), and energy efficiency investments pay for themselves over time. (1.9 Mt)

1.9 Back to 2010 levels

Transport

Set average fuel economy standards for light vehicles coming into NZ and progressively raise them from 2013 to 2019. Importers would be free to meet the average with any mix of vehicles they choose and could trade unders and overs among themselves. Vehicles imported in 2020 would use half the fuel per 100 km compared with current imports. (3 Mt)

Pursue the rest of the transport measures in the NZ Energy Efficiency and Conservation Strategy to encourage mode shift to public transport, walking and cycling. (1.7 Mt)

4.7 Back to 2001 levels

Agriculture

If we reduce the average dairy stocking rate from 2.83 cows/ha to 2.3 we save 2.2 Mt while farmers are more likely to enjoy medium-term profitability as well.

Research shows that high dairy stocking rates are only profitable at milk prices over $5.50/kg where the return pays for the input costs of urea, feed, off farm grazing and animal health. The 2008/9 payout is expected to be the 10 year average of $5.20 and only $4.55 in 09/10. We have counted just the savings that come from fewer cows. There are additional savings from lower emissions per kg of milk at lower intensity.

We note that if the average stocking rate reduced to 2.43 the dairy industry would pay nothing under the current version of the ETS as it would be within its free allocation. Further opportunities exist to breed from cows that produce 30% less methane on the same feed as others in the herd. We have not counted this. Meanwhile, proven management tools such as diet changes and better soil drainage can reduce nitrous oxide in sheep, beef and deer farms and save 0.5 Mt.

Mt	
2.7	Back to 2000 levels

Planting new forests

Forests planted since 1990 will capture and store enough carbon in 2012 to cover the rise in our emissions since 1990, but this will not last. New forest planting has almost ceased in the last ten years and harvesting of those 1990 forests will cause a spike in emissions from 2016 to 2030. An aggressive planting programme, which the forest industry says will occur at a carbon price of $25/tonne and policy certainty, could smooth out that spike. There are 1.8m ha of low producing steep hill country on sheep and beef farms where this could occur profitably. Planting 10,000 ha in 2010 and 30,000 ha/yr after that would store an additional 10.9 Mt tonnes of carbon in 2020. This would be a mix of pine, exotic hardwoods and softwoods as well as some new, permanent indigenous forest.

10.9	3.7% below 1990 levels

Pest control in DOC forests

If NZ signs up to article 3.4 of the Kyoto protocol we have the opportunity to control possums, goats and deer on 219,000 ha of DoC land and capture an additional 8.75 Mt. It is recognised that pests eat leaves and leaves store significant amounts of carbon; a pest-free forest is therefore another way in which we can responsibly reduce our liabilities.

We calculate a further 2 Mt is achievable on private land.

10.75	21% below 1990 levels

Subtotal	**36.2**

Offsets from the international market

The Kyoto Protocol allows for countries to purchase emissions reductions from overseas if it is cheaper than making reductions domestically. This flexibility buys countries time to achieve their reductions while transferring much needed technology and finance to developing countries. We can take responsibility for the balance of our 40% target by purchasing credits from overseas. This amount represents less than a quarter of our total reductions.

11.8	**40% below 1990 levels**

Total	**48.0**

What would it take?

Most of these reductions will not happen by just leaving it to the ETS. A range of other measures are needed such as; energy standards, providing the funds to DoC for pest control, stable policy for the forest industry, and an expansion of the EECA programme to assist energy intensive business.

It will also take a change of attitude and perceptions where climate change is taken seriously by New Zealanders and particularly government as it is in other countries. Then New Zealanders will feel it is worth driving smaller cars, funding pest control and shifting to renewable energy in order to play our part in avoiding catastrophic climate change. It will require farmers to start measuring their success by their profitability, not by volume of production or rise in land values. The measures above are not a huge change in the way we live, but they are a change.

The important thing is NOW

Every year we delay makes a – 40% target less attainable in 2020. Many of the projects need to start right away if savings are to accumulate by 2020. We need to start work immediately on vehicle standards, forest planting and replacing coal. So it's urgent – a bit like climate change really!

This is not the end

In the course of this investigation we have noted many opportunities we have not been able to quantify but which will undoubtedly present opportunities in the future: cows producing lower methane emissions; biogas plants on farms turning waste into energy; more use of electricity in transport; tidal and wave energy. Once we turn our emissions path around and start reducing, more and more opportunities will become available to reduce further.

We have choices

We do not have to make any of these reductions ourselves to meet a 25% - 40% responsibility target. This is our international obligation. We could continue to live the way we do, drive large inefficient cars, waste energy, and let our native forests decline. Instead of these actions we could purchase emissions units on the international market and help other countries make their economies more efficient. However, there are cost effective options as outlined here which all have positive environmental, economic and employment spinoffs.

Other benefits

The co-benefits of the actions above include lower household electricity and petrol bills; a lower current account deficit from importing less oil; a more resilient economy when oil prices and farm input prices rise again; new industries and jobs; cleaner rivers and streams from changed farming practices; flourishing biodiversity in our native forests; and wood for timber or fuel in the future.

We can reduce our greenhouse emissions to 40% below 1990 levels in 2020 at low cost if we act now.

Energy

Emissions from the energy sector grew 40% from 1990 - 2008. This occurred primarily in electricity and transport. These sectors represent a catalogue of missed opportunities for increased energy efficiency, which translates directly into missed opportunities for increased productivity. We are now decades behind the OECD in managing the energy efficiency of our homes, businesses and vehicle fleets.

Electricity

Electricity is only 9-10% of total emissions but more than half of this is the old, inefficient Huntly coal fired power station. The Huntly station has been used more and more over the years to meet increased electricity demand, particularly in dry years. Retiring Huntly represents the greatest single opportunity to reduce emissions.

The Electricity Commission (EC) has built several electricity generation scenarios for their *Statement of Opportunities*, which includes a "Sustainable Path" scenario which enables us to meet the government's target of 90% renewable electricity by 2025. It proved cost effective and just as plausible as the other scenarios, and in an economy with a carbon price, it came out on top economically as well.

The Sustainable Path scenario progressively retires all four of Huntly's coal units by 2020, reducing emissions by 4 Mt per year. However, some of this will be replaced by gas fired peaking plant, which has significantly lower emissions, and will run less of the time, so we assess the savings by 2020 will be around 3.5 Mt.

The EC's Sustainable Path scenario would see the Taranaki Combined Cycle (TCC) station retired to winter only use in 2022. We propose that the date of TCC'c semi-retirement is moved forward by two years to help us achieve our 2020 emissions target. Restricting TCC to 4 months winter duty in 2020 is achievable, because of additional renewable projects announced since the EC calculated its scenarios, and gives us a further .75 Mt in emissions reductions, while retaining the plant for emergencies and dry years.

Renewable generation

Huntly (1,000 MW) and Taranaki (367 MW, reduced to running winter only) would be replaced by new geothermal and wind plant, most of which is already in the pipeline. New renewable electricity capacity listed in the Electricity Commission report which could be generating by 2020 includes:

- Over 900 MW from new geothermal baseload plant;
- 60-85 MW from new hydro with no damage to rivers;
- Over 3,000 MW from new wind already in the consenting process or approved;
- 200 MW of interruptible load which can be profitably turned off when prices spike

There will also be coal seam methane and landfill gas generation developed, which will reduce emissions by turning methane into carbon dioxide.

We have not included new hydro, such as the Mokihinui because we do not support further destruction of rivers and it is not necessary in this scenario.

The vital piece of policy if we are to reach our 90% renewable electricity goal is to prevent the building of new fossil fueled plants, except for limited gas peaking capacity. If we leave this to the market we will end up with generating plant that runs because of the sunk cost, not because it is the cheapest generation option in the long run. In particular it is essential that the proposed gas fired plant at Kaukapakapa not proceed.

Replacing thermal plant with renewables can reduce emissions by 4.25 Mt in 2020, more than 55% of current electricity emissions.

Energy efficiency

If electricity generation in 2020 is mostly renewable, energy efficiency after that date will not save significant carbon emissions. However it can help ensure demand growth does not occur and can release renewable electricity for use in transport which is likely to become increasingly important after 2020.

The NZEECS contains a long list of initiatives to reduce energy demand at least cost. Many of these initiatives are at negative cost, meaning they put money in our pockets. They are calculated in that document to add to 26 PJ of energy savings by 2020. The largest opportunity is in Minimum Energy Efficiency Standards (MEPS) for products, which are predicted to save more than 10 PJ by 2020. (NZEECS page 13.)

It is difficult to know how much of this programme will be delivered – we are already some months behind schedule. We have counted half of the projected savings as part of our reduction programme as we do not believe they will all occur without further effort. This provides a further ~1 Mt

Manufacturing Industries

Manufacturing still uses significant amounts of coal. This produced just over 1.7 Mt of emissions in 2008. Because of coal's high emission factor, programmes that set out to provide substitutes for coal can rapidly reduce our emissions. These include upgrading coal boilers in schools, hospitals and combined heat and power at factories to burn renewables such as wood pellets or wood chips.

Assuming that half of the coal will be replaced with renewable fuel such as wood and that the latter half is replaced by natural gas, this will reduce emissions in this sector by 1.3 Mt by 2020, before we achieve any efficiency improvements.

Industrial Processes

The industrial processes area is a difficult one to quantify, but we know from the KEMA and Covec reports that there is significant economic potential for savings and efficiencies, all of which reduce emissions and improve productivity. The EECA Energy Intensive Business (EIB) programme tackles these inefficiencies and is chronically underfunded and over-subscribed.

A proactive programme such as that proposed in the Green New Deal, that fully funds the EIB and Crown Loan Fund, would invest $125m/y for three years, creating 1781 extra jobs, which become 2714 with flow on effects.

Leaving aside the metal industries of aluminium and steel, there is still scope to reduce emissions in this sector by .6 Mt by 2020 if we capture the economic potential in energy efficiency. This would have a positive cost benefit to business. A fully funded EIB programme would be a very low cost programme for the taxpayer with huge dividends to New Zealand's productivity.

One effect of these programmes, coupled with the phase out of Huntly, is that all coal use in New Zealand is eliminated except for that used by the steel industry. Rio Tinto has been experimenting with a coal free steelmaking process in Perth for several years, with mixed success. It would be ambitious to believe that this technology could evolve sufficiently or apply to New Zealand's conditions prior to 2020; however if it did, NZ could wean itself off coal use completely.

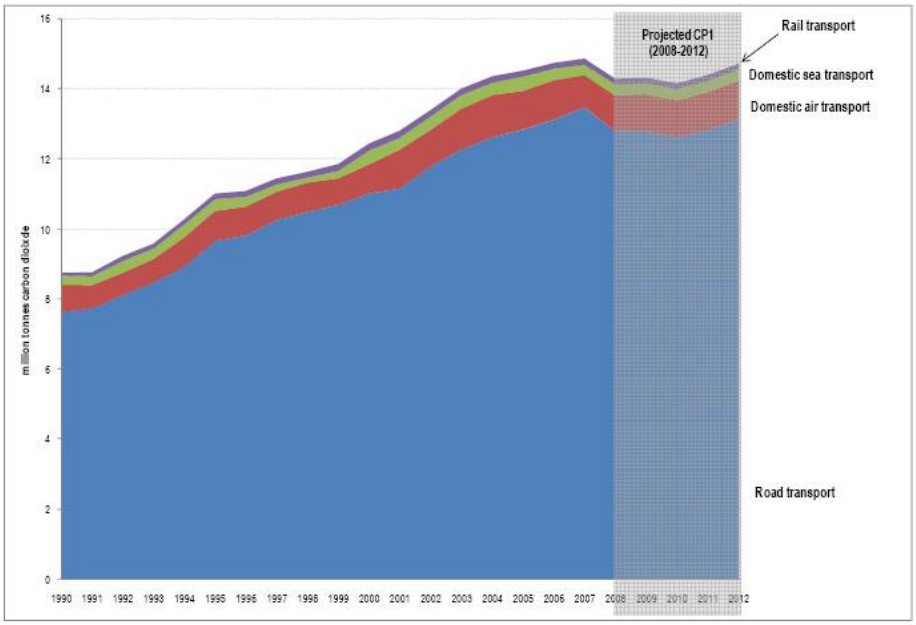
Reductions from Energy sector:

Approaching our 90% renewable target	4.25 MT
Proactive MEPS programme	1.0 MT
Manufacturing and industrial processes	1.9 MT
Total from energy sector	**7.15 MT**

Transport

Transport produces 20% of our greenhouse gas emissions and has been the fastest rising source. NZ's per capita use of transport, especially road, is very high by international standards. However oil prices are starting to have an impact which has been continued by the recession. Vehicle kilometres travelled on state highways dropped from 2006 and are still around 2005 levels. Public transport patronage has increased 8% in a year.

Figure 6: Historical emissions data and projected transport emissions 1990–2012



Source: Ministry of Economic Development (2009).

NZEECS measures

In 2007 the NZ Energy Efficiency and Conservation Strategy set out a range of measures to reduce fuel use and carbon emissions in transport. The programme included

- shifting more personal trips to public transport, cycling and walking;
- collection of better data on freight movements to develop a strategy to shift freight to more efficient modes;
- a driver training programme for heavy vehicles;
- a scheme to scrap old and very inefficient vehicles.
- a biofuels programme
- an electric vehicles programme.

This strategy, fully implemented, expected to reduce carbon emissions 1.7 Mt by 2020.

However some of these measures could go further than was proposed. Approximately one third of vehicle trips in Auckland at the morning peak are education related, particularly taking children to school. Auckland Regional Transport Authority surveys show that a third of children would much prefer to cycle, but only ten per cent do as it is considered too dangerous. We propose a systematic analysis of where cycle routes are most dangerous and building of safe options. We estimate that this could reduce morning peak trips in Auckland by 10%.

Vehicle fuel economy standards

The NZEECS also proposed a very mild vehicle fuel economy standard by 2015.

New Zealand's light motor vehicles use an average of over 10 litres of fuel to travel 100 km. This is 210 grams of carbon dioxide per km. By comparison, the EU fleet is currently at 170g/km on average and has notified a standard of 130g to be achieved by 2015.
The situation in NZ is not getting better – while technology is improving, vehicles coming into the country are getting bigger and their carbon emissions are increasing. New vehicles entering the country are more fuel consuming than second hand ones.

We propose a corporate average fuel efficiency standard for all vehicles crossing the border beginning at 170g/km by 2013 (roughly 7.4 litres/100 km for petrol cars), 150g/km by 2015, 130g/km by 2017 and 110 by 2019. This is not a limit per car, but an average standard which importers would have to meet across all vehicles they import, with trading of unders and overs between importers. People could still buy a car fit for purpose, e.g. towing a boat, but prices would favour small, efficient cars (including hybrids and electric vehicles) rather than SUVs in order to achieve the required average.

By 2020 we would still not have caught up with the EU which has set a standard of 95g by 2020 but we would be much closer, and would avoid the dumping of rejects that cannot meet the fuel economy standards of other countries. The administrative cost to government would be far outweighed by the fuel cost savings to motorists and the reduction of our current account deficit from fewer oil imports.

We calculate, using past discussion papers by the Ministry and some data about age classes in the vehicle fleet, that this would save 3 Mt of carbon dioxide by 2020.

Earlier carbon pricing

The Emissions Trading Scheme initially planned to bring transport in from January 2009, but changed this to 2011 when fuel prices spiked in 2008. With hindsight this was a major mistake as fuel prices had dropped substantially by 2009. We propose bringing transport into the ETS a year earlier than legislated, from January 2010, to deter purchase of gas guzzlers before the fuel efficiency standard comes in from 2013.

Freight

Rail uses about a quarter the fuel of road for long distance bulk freight yet we still have daily trips Auckland-Wellington with huge truck and trailer container vehicles. Sufficient investment in the rail system, from the track to the IT and freight forwarding systems will result in significant additional savings that are not calculated here.

NZEECS transport initiatives, fully implemented, (excl. fuel economy stds)	1.7 Mt
Vehicle fuel economy standards	3
Total transport reductions	**4.7 Mt**

The potential from agriculture

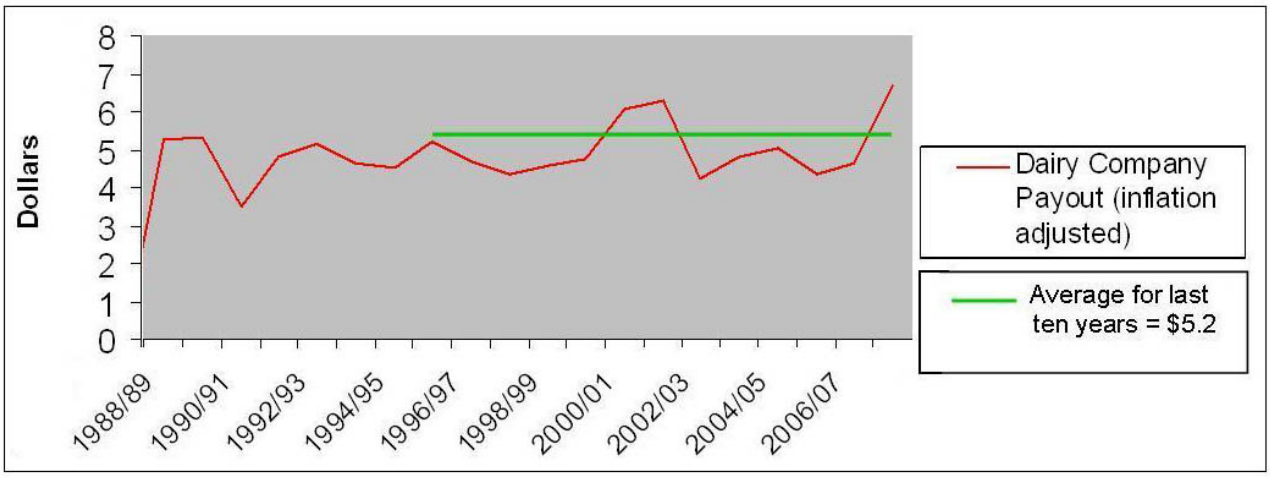
Dairy

Total agricultural emissions in 2008 were ~35Mt, up from ~32 Mt in 1990. Emissions from dairying have almost doubled, with this increase masked by the reduction in emissions from sheep and beef. Since 1990 total dairy cows have risen from 2.4 million to 4 million (not including replacement heifers who are nevertheless included in emissions numbers); farm size and herd size have grown and the average stocking rate has grown from 2.4 cows/ha to 2.83. (1) This intensification has been driven by large increases in nitrogen fertilisers and bought in feeds with animals not in milk grazed off the farm. Dairy emissions were ~13 Mt in the 2007/8 season.

Much research is going into technical fixes such as nitrification inhibitors where one chemical input is used to neutralise the effects of another. However research reports suggest that most gains at present are to be made from changes in management practices and reduced intensity.

Work at Agresearch suggests that farms with lower stocking rates, which avoid the use of nitrogen fertiliser and bought in feeds and graze replacements on farm have significantly lower total greenhouse emissions per kilo of milk. Each kg of milk from the high intensity farm, with a stocking rate of 5.2 was responsible for 18% more total greenhouse emissions than an equal kg of milk on a low intensity farm stocking 2.3 cows/ha. (2)

Rising milk prices have driven intensification and there is no doubt that at the 2007/8 payout of $7.67/kg high stocking rates are more profitable. However work done at Dairy NZ has concluded that *"At a payout of less than $5.50, increasing the stocking rate and feed supply was no advantage for operating profit"*.(3) The 2008/9 payout has been reported at $5.20 which is the average payout in inflation adjusted dollars over the last ten years. 2009/10 is predicted to be only $4.55. Capitalising farms on the assumption that the high 2007/8 payout will return would seem to be imprudent, financially as well as climatically.



The free allocation proposed for the dairy industry in the 2008 ETS legislation is 90% of 2005 emissions. Dairy farmers could keep their emissions within this limit if the average stocking rate dropped from 2.83 to 2.43 on the existing hectares of dairy land. Thus dairy farming could come into the ETS as planned with no loss of average profitability to farmers for as long as the milk payout stays around the ten year average. If the average stocking rate dropped to 2.3, the same as the low intensity farm studied by Agresearch, NZ emissions would drop by 2.21 Mt/yr, and dairy farmers would have emission units to sell.

In addition to these reductions which are based on cow numbers, there would be a further reduction per cow from less intensive management. We have no way of calculating this so have conservatively left it out.

A Dairy NZ paper confirms the feasibility of reducing emissions by changing management practices. It concludes an average, all-pasture Waikato dairy farm could decrease emissions by 30-35% while increasing profitability by 60% through higher reproductive performance, better genetic merit cows, and better pasture management. This would enable dropping stocking rate from 3.0 to 2.3 and reducing nitrogen fertiliser to less than 50 kg/ha/yr. (4)

If a farmer adopts the low input, low intensity approach, so that reductions in herd size are compensated by reductions in costs of fertiliser, feed, off site grazing (and, farmers tell us, in animal health bills) the next step to being fully organic is not very great. Further profit opportunities exist in the additional $1 a kg payout from Fonterra for organic suppliers.

Work on the role of cow genetics in methane emissions shows that cows of the same breed on the same diet can vary by 30% in the amount of methane they emit. (5) Those emitting less methane convert more of their feed to meat and milk so there is every incentive to pursue this line of investigation. While there is considerably more work to do on this a concentrated research effort should enable selective breeding to have started to benefit the national herd by 2020. However, to be on the conservative side we have not counted this in our potential reductions.

Sheep and Beef

We have no numbers for the overall potential for reductions from sheep and beef farming, but note they are not growing in the way dairying is.

There is however work done for Ministry of Agriculture and Forestry (MAF) which shows that a mix of diet changes, high sugar grasses, stand off pads and improving drainage of wet soils can reduce nitrous oxide emissions from sheep by 16%, dairy by 28%, and beef by 25%. (6) We have not counted any of this in our dairy total as there will be some overlap with the 2.2 Mt already noted, but we note some of that 28% could be additional reductions in the dairy industry. We assume a conservative 10% reduction in nitrous oxide emissions from sheep and beef farming (and presumably also deer) which would give us a reduction in total emissions of 0.5 Mt.

So: total potential farming emissions reduction by 2020 are:

Reduce average dairy stocking rate from 2.83 to 2.3	2.2 Mt
This lower intensity reduces emissions per kg milk	not computed
Genetic improvements to breed from low methane cows	not computed
10% nitrous oxide reductions from sheep, beef , deer	0.5 Mt
Total from Agriculture	**2.7 Mt**

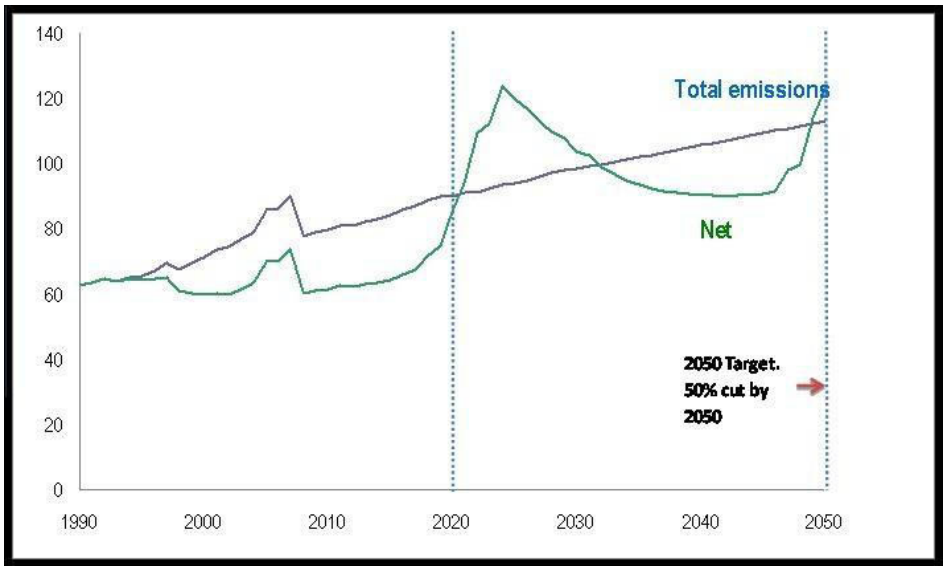
Value of reductions at $25/tonne is $67.5m/yr

References

1. NZ Dairy stats 2007-8
2. Basset-Mens, Ledgard & Boyes, Eco-efficiency of intensification scenarios for milk production in New Zealand, *Ecological Economics*, 2009
3. Glassey, C and Clark, D, Milksolids Production per ha vs Profit per ha Dairy NZ July 2008
4. Beukes, Gregorini, Romera and Waghorn, Modelling the efficacy and profitability of mitigation strategies for greenhouse gas emissions on pastoral dairy farms in New Zealand, Dairy NZ for PGGRC, Dec 2008
5. O'Hara, Freney, and Ulyatt, Abatement of Non-Carbon Dioxide Greenhouse Gas Emissions MAF, 2003
6. Waghorn and Dewhurst Feed efficiency in cattle – the contribution of rumen function Dexcel and Lincoln university, 2007

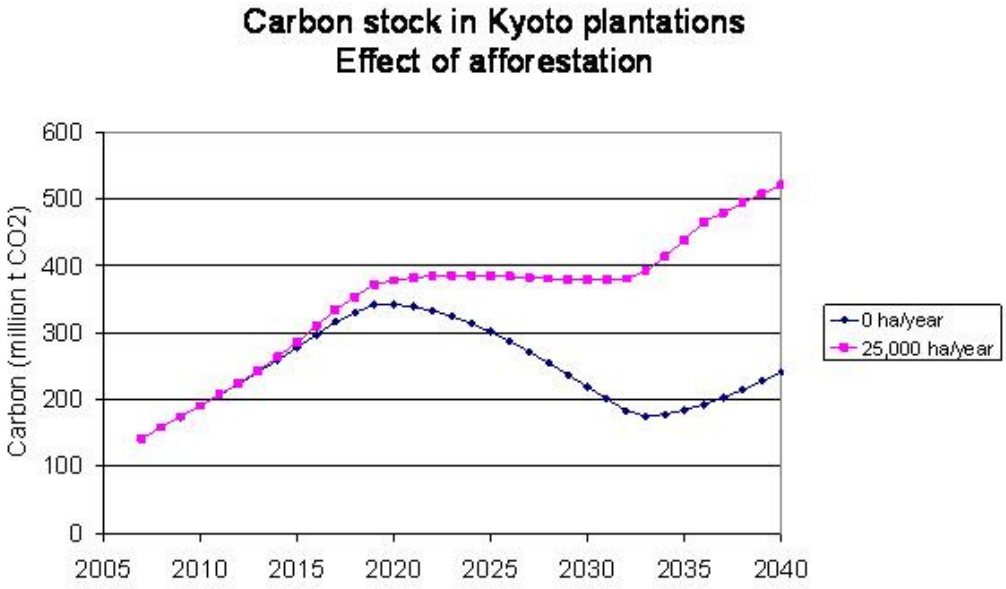
New Forest Plantings

In 2012, at the end of the first Kyoto period, forest plantings since 1989 are projected to more than cover the increase in our gross emissions leaving us meeting our Kyoto target with a little to spare. However this does not last as the post-1989 forests are harvested from 2014 and the lack of planting over the last decade means there is much less young forest coming on to replace them.



Source MfE 2009

Analysis by the forestry industry (1) shows that this looming shortfall in forestry removals between 2020 and 2030 could be compensated by an aggressive planting regime over the period from now to 2020.



Source Manley, McLaren 2009

Forestry is not a long term way of compensating for increasing emissions, as to do that requires ever increasing areas of land which must be maintained in forest in perpetuity. It is essential that our emissions peak very soon and begin to track downwards. However while we are achieving that forestry can help us meet targets.

In particular, we need to accelerate planting now to make up for the lack of planting over the last ten years, and to smooth out the removals from forestry year on year during the next two decades.

New plantings capture very little carbon in their first four years, and then grow very fast so every year we delay planting has a significant cost.

Planting has stopped because of policy uncertainty for years in relation to carbon prices and who would get them, plus the high price of land and low prices for logs. Land prices have risen because of competition with agriculture which has not had to pay for its full costs in carbon emissions and water use. Once agriculture is in the ETS land prices will stabilise and marginal hill country pasture will be more profitable in forestry.

We have adopted industry estimates that 25,000 ha/y of planting would be incentivised by a carbon price of $25/tonne, (1) provided there is policy certainty, and that this would be sufficient to balance the losses from harvesting the existing forest estate. It is too late for the 2009 planting season and trees destined to plant 7,000 ha this year have been ploughed in because of policy uncertainty.

That requires 300,000 ha of land by 2020 which is available from the 1.8m ha of low productivity pasture on steep hill country. This may well be the cheapest way for sheep farmers to meet their ETS requirements in partnerships with forestry companies.

It would be preferable for wider sustainability and economic benefits if this forest included some diversity of species and was not all pine. In particular, eucalyptus and redwood are fast growers and will eventually store more carbon than pine. Ideally the steepest most inaccessible land would be reverted or planted in natives for long term permanent forests. This will not contribute a great deal to meeting a 2020 target but will help with our 2050 target which will be even harder to meet and could still be capturing carbon for several hundred years.

Orders would need to be placed immediately for seedlings for 2010 planting and land acquisition might not be achievable for 25,000 ha next year.

We have modelled an aggressive planting programme out to 2020, comprising a modest plant in 2010 followed by 25,000 ha/y of pine, Douglas fir and other exotics. We have also modelled 5,000 ha/yr of new indigenous forest, either planted or simply set aside, which could occur on either DoC or private land. These would total 10.9 Mt in 2020.

Additional benefits from increased forest plantings on poor quality pasture land include reduced soil erosion (which may have a carbon benefit in the future as we move to full carbon accounting) and reduced flooding on farmland below, which is costly now and likely to become more so as climate change brings more severe and frequent storm events. Water quality downstream would improve and even pine forests provide some habitat for native species.

There would be no possibility of any of this new planting occurring for as long as an artificial cap is placed on the carbon price as is proposed in Australia. This is just one of the ways that linking with Australia at this stage would raise the cost to NZ of meeting whatever target we choose. Even with a full carbon price it may be necessary for government to kick-start the project before it becomes self-supporting. This is the price of many years of government delay in getting certainty for the forest industry.

Planting 25,000 ha/y in pine and other exotics till 2020	10.1 Mt
Planting or reverting 5,000 ha/y indigenous till 2020	0.8 Mt
Removals from new forest planting in 2020	**10.9 Mt**

References

1. Bruce Manley and Piers Maclaren, NZ School of Forestry, Modelling the impact of carbon trading legislation on New Zealand's plantation estate, *Nature* 2009

Indigenous forest enhancement

New Zealand's old growth indigenous forests are not included in our Kyoto agreement because we did not sign up to Article 3.4. However the world is moving towards full carbon accounting and at some stage we will need to include them.

These forests in the DoC estate alone store a huge 8,785 Mt of carbon dioxide equivalent and managing it well is our greatest opportunity to contribute to a stable climate. They are currently degraded by introduced pests such as possums, goats and deer which consume large quantities of forest biomass. New research shows that if pests were eliminated or controlled there is the potential for them to store an additional 8% or 705 Mt.(1)

Our current native forests have a carbon value of $220 billion, but DOC is allocated just 0.03% of this amount to slow the rate of degradation of this asset and nothing to enhance it.

The greatest potential in the time horizon to 2020 is in active management of shrublands that are failing to succeed into forest due to invasive pests.

The most cost effective gains can likely be made through enabling succession from existing shrubland-forest vegetation to tall forest (through controlling browsing animals and preventing fire) and from grassland sites in areas of moderate rainfall and fertility with abundant nearby seed sources. "New [herbivore] control in transitional shrublands, including exotic dominated shrublands, may result in modest increased live above ground biomass carbon during 2008-2012 and significant increased biomass C by 2013-2020. The area is estimated at c. 0.219 Mha on Conservation land." (2)

It is clear from this research that new active management within the DoC estate can significantly reduce our emissions liability during the 2013-2020 period, if we start now. Burrows et. al. conservatively estimate that the potential carbon sequestration for CP1 is 5.475 Mt CO2e and 8.76 Mt CO2e for CP2, resulting from enhanced reversion of shrublands alone. This is independent of the potential to plant new forest on the DoC estate, which will not bear significant fruit until after the 2020 time horizon.

Work within the DoC estate could begin immediately. Parallel with this, the government could alter existing forestry incentive programmes to encourage the same succession enhancement on private lands. Once there is a value to NZ in enhancing carbon storage in indigenous forests it could be a source of income for many owners of Maori land who cannot clear it and want to retain ownership.

Allowing for delays in identifying appropriate sites, programme development and private sector implementation, a conservative estimate is that an additional 2 Mt CO2e could be sequestered during the 2013-2020 period from forests on private land.

Pest control on 219,000 ha DOC land by 2020	8.75 MT
Pest control on 54,000 ha private indigenous forest land by 2020	2 MT
Total from pest control	**10.75 MT**

References

1. Carswell et al, Synthesis of carbon stock information regarding conservation land. Landcare Research 2008
2. Burrows et al, Effects of the control of wild animal herbivores on carbon stocks. Landcare Research, 2008

Conclusions

Government has been relying on broad brush macro-economic studies to conclude that a 40% target would be hugely expensive and impossible to achieve. The assumption beneath the economic studies is that the economy is running at optimum efficiency and there are no gains to be made without cost. We have shown that is wrong.

Government has also confused the target for which we take responsibility internationally with the extent to which we reduce emissions in NZ.

The measures described here, which are not comprehensive, add up to 36.2 million tonnes of carbon dioxide equivalent reduced in the year 2020. We have assumed no new technology other than what is already available. We have taken a snapshot approach because we have no modelling facilities other than an Excel spreadsheet. The numbers are not all precise but their significance is clear. The opportunities for New Zealand to reduce its emissions and at the same time reduce power and fuel bills and the current account deficit; increase our resilience to rising oil prices, rising farm input prices and recession; create jobs and improve water and air quality are too good to miss.

The 36.2 Mt represents much more than 40% of today's net emissions of 75.6 Mt, but we have assumed that population growth projected by Dept of Statistics will raise baseline emissions in 2020 to 85.1 Mt. To get back to 40% of 1990 emissions in 2020 would require us to purchase another 11.8 Mt on the international market, or to develop further emissions reductions here, which might well be possible with improved technology.

New Zealanders, or rather our government, might choose not to take up any of the opportunities described here and to rely instead on purchasing credits. What is clear is that the argument that we can do nothing and so should not have to take a responsible target is not credible.