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A New Climate Strategy Beyond 2012: Lessons from Monetary History

Launching a joint Lowy Institute and ANU Perspective
Written by Professor Warwick McKibbin

The Australian Senate this week is debating the passage of the Carbon Pollution Reduction scheme legislation. In a timely contribution to the broader debate about the direction Australian and global greenhouse policy is proceeding, Professor McKibbin has released a Lowy Institute Perspective which is his Shann Memorial Lecture on "A New Climate Strategy Beyond 2012: Lessons from Monetary History".

This joint publication of the ANU and Lowy Institute examines the design of carbon abatement policy using lessons from policy failures and successes over the past century in the development of monetary policy frameworks. He makes a number of key points:

- The current approach of targets and timetables and cap and trade permit systems like the CPRS are unlikely to work over time;
- Attempting to have a global market for the promises of government to reduce CO2 emissions (i.e. a global carbon market) is likely to fail just as have the attempts to create a global common currency;
- A central bank of carbon should control the short-term carbon price while a market like a long-term bond market should determine the long-term carbon price;
- Property rights over long-term carbon emission should be given to consumers and businesses so that a majority of voters lose from future governments changing policy.

As well as outlining the key lessons from monetary history in designing a national and global policy response to climate change, the lecture offers a practical alternative which has become known as the McKibbin Wilcoxen Hybrid Approach which is a strategy to implement climate policy in a similar way as monetary policy.

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The 2007 Shann memorial Lecture

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A New Climate Strategy Beyond 2012: Lessons from Monetary History*

The 2007 Shann Memorial Lecture

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A New Climate Strategy Beyond 2012: Lessons from Monetary History

Warwick J. McKibbin

Abstract

The Kyoto Protocol was the outcome of many years of multilateral negotiation and political compromise with the ultimate aim of reducing the risk of dangerous climate change. Unfortunately, most of the countries that ratified the Kyoto Protocol have not taken effective action to curb greenhouse gas emissions with many Kyoto countries not looking likely to reach their targets. There is also a lack of enthusiasm from major developing countries to take on the binding targets that form the basis of the Kyoto Protocol Approach. This has raised serious doubts about the viability of the Kyoto policy of committing countries to targets and timetables especially as a model for the current negotiations. As the science becomes more compelling that action is needed to curb greenhouse gas emissions, countries are beginning to look for more sustainable alternatives for the period beyond 2012.

This lecture outlines the key features that are needed in a new climate change framework beyond Kyoto drawing on lessons from monetary history. Using the analogy to the way modern central banks run monetary policy it outlines an alternative to the Kyoto Protocol which is a system of national climate policies coordinated around a common global price for carbon.

1. Introduction

This lecture is in honour of one of Australia's great economists and policymakers of the early twentieth century. Edward Owen Shann made many contributions to the economics profession and to policy development in Australia[1]. One of his many contributions was relating economic history to existing economic policy problems of the 1930s and using this insight to develop practical policy solutions. Although climate change was not one of the areas of debate in the 1930s (although Svante Arrhenius had raised the issue as early as 1895) it is clearly a high priority in Australia today and in need of practical policy development. In the spirit of Shann there are key lessons to be learnt from history in how to design a national and global climate policy framework. Outlining these lessons and providing a practical policy framework is the goal of this lecture.

History contains some important lessons that are relevant for climate policy. Firstly, what we have learnt from monetary history is that common currencies don't last, which suggests that for similar reasons a global carbon market won't last. Money like emission permits are merely the promises of a government – not a physical commodity. Secondly there is no gain from short run interest rate volatility in targeting longer run goals of inflation and unemployment and for the same reasons there are no gains from short run carbon price volatility when the carbon price is an instrument which is set to achieve a long run goal of stabilization of carbon concentrations. Thirdly, time consistency really matters in designing policies which require long term investment by the private sector. It is a very good idea to tie the hands of future governments to prevent them from changing policy after businesses and households have committed to an investment strategy. This constraint on policy revision can be achieved by creating balancing constituencies within an economy to prevent the government from reneging every time they think it is in their own self interest. Fourthly, it is critical to get the institutional design of the policy framework right – a key to this is to build independent institutions with clear goals to implement climate policy. I believe it is not a good idea to put climate policy in the hands of either Treasury, or the Climate Change Department. It should be put it in the hands of an independent institution like a Central Bank of Carbon. Fifth, the whole debate in the 20th century about the transfer problem

[1] See Snooks (1988).

and the Dutch disease issues caused by attempting to transfer large amounts of wealth between economies is very relevant for the climate issue. Mixing climate policy (the need to reduce global emissions at low cost) with attempts to have big income transfers from one part of the world to another part of the world or from one part of society to another part of society for political or ideological purposes undermines the climate policy regime and makes climate policy very much harder to implement. It is critical to take the transfer problem seriously into account when you are designing global policy. Attempting too many achieve goals with a limited number of policy instruments usually fails.

Finally I want to point out how I think you should design climate policy, to deal directly with each one of these issues that history has taught us in the evolution of non climate policies. What I propose is not a perfect approach but I think it is an approach that deals with some of these core issues pretty effectively and much better than recently published reports on climate policy design for Australia[2].

2. The Climate Policy Problem

What do we know? We know quite a lot but there is still much that is uncertain. We know that climate is a complex system that is always changing. We are not dealing with a situation that usually concerns most economists where we are in a steady state and we are trying to just prevent perturbations around a steady state. Climate policy is dealing with something that is continually changing and never reaches a steady state. This is a very difficult policy environment.

We observe that average temperatures have risen roughly 0.7 degrees in the past century - we are observing rising temperatures. We do see both natural variability and human induced climate change co-existing, so to unravel how much is human induced and how much is natural variability is quite a complex question. Figure 1 shows the temperature variability from the Vostok Ice Core Samples for the past 425,000 years. The past 10,000 years contains the human

[2] The Garnaut Review or the White Paper – which were both published after this lecture was given.

footprint.

We know that we are pumping enormous quantities of greenhouse gases into the atmosphere. This is clearly seen in Figure 2 where we reached more than 7 gigatonnes per year by 2002. This is not a sustainable situation unless you have a minority view about the link between human source greenhouse emissions and temperature changes. Perhaps it will one day be shown that there is no clear link between human greenhouse gas emissions and climate change but it is clear that to do nothing involves considerable risk – at a minimum an insurance policy is needed for the climate issue just in case the large body of scientific knowledge in the Intergovernmental Panel on Climate Change (IPCC)[3] is correct.

The biggest problem I see at the moment is that there is an enormous vacuum in policy, globally as well as nationally in most countries and this vacuum is causing significant economic losses. Even if you are skeptical about human induced climate change, the 'do nothing option' is actually becoming very costly because to do nothing on a policy framework means that investment in energy infrastructure is not being undertaken because of the uncertainty about climate change policy. There are investments in a whole range of different technologies that aren't being undertaken and everybody is waiting for the policy framework to be put in place. Thus even if you are a skeptical that doesn't mean do nothing, because to do nothing actually costs. You need to take out insurance.

What else do we know from the climate science? Firstly, scientists makes it clear that it is not greenhouse gas emissions in any year that matter but the accumulation of these emissions in the atmosphere over time. These accumulations are known as concentrations. Science doesn't tell us exactly what concentrations should be to avoid dangerous climate change. There are different views amongst the scientific community as to what is the level of concentrations at which dangerous climate change occurs, whether is might be 350, 450, 550 or even higher or lower parts per million. Science really doesn't tell us exactly what concentration target we should aim for but there is a pretty convincing argument out there that we need to be heading in a

[3] See IPCC (2002,2007)

direction where we are trying to avoid concentrations of 450 parts per million. I should stress that this number has changed a lot since I started working in this area 18 years ago but it is a good starting point for a system that allows this number to change over time as evidence accumulates. This lack of scientific certainty is not of comfort to those trying to design a policy regime based on targets and timetables for emissions.

The bottom line is that we need science to guide us in the policy formulation, but science can't tell us exactly what we should be doing. However suppose we actually did know the precise global concentration target. Suppose scientists agreed that we cannot go past 450 parts per million, science doesn't tell us how precisely to get there – do we cut emissions or increase sequestration? How quickly should emissions be cut? The profile of emission reductions to hit a given concentration target is not a scientific question. Science doesn't tell us whether we should cut sharply now, and then do very little, or cut mostly later but then do a whole lot[4]. The issue of costs and benefits of different strategies are economic or moral questions posed in the context of risk management.

Thus the actual profile of emissions reductions is not given to us by science but science informs us.

However, suppose that we did know what the global emissions profile should be exactly, science tells us absolutely nothing about what a national emissions target should look like because the way you divide up that emissions pie globally across countries is not a scientific decision. It's partly an economic question, where an economist would propose choosing the least cost emissions abatement opportunities to hit the global target. It's partly a moral or ethical question about who should bear the burden of the cuts. The precise cuts that each country individually should undertake is not a scientific question. Any national study which starts with the idea that science tells us that as a nation we have to cut emissions by a certain percentage is actually not based on any of the science that I am aware of. Therefore the entire climate change issue at the national level becomes an issue of not just science but of economics and morality, of

[4] One qualification is if there is a critical threshold where the flow might be critical in a given year.

politics and a whole range of other issues that combine to makes it a very difficult policy debate often dominated by religious zeal. This is not a good environment to formulate a sensible long term policy framework.

What are the implications of this complexity? Many economists who initially start working on climate policy start with the idea that a "cap and trade" emission trading market would be a good approach. Cap and trade is based on the idea that we know what the annual cap should be, or we know what the cap should be over a period of time but in fact that's really an assumption rather than an implication of science. We know from science what we need to do more broadly - we need an approach that moves towards a global concentration target that is uncertain. But this target is likely to vary over time as we get more information on the entire complex climate system. Within the global concentration target one of the key issues from an economics point of view is to try and equalise the cost across countries and minimise the costs over time[5], but this doesn't look like the current approach in international negotiations. The essence of the focus should be on how to design a global system that achieves the scientific goal but at minimum global and relative cost across countries. Just to stress again that science does not give us a national emissions target and timetable framework, yet that tends to be the sort of framework that the Garnaut Review and Stern Review[6] and others are premised on.

3. What Needs to be Done?

What should climate change policy focus on? Climate change policy, in my view, should focus on managing risk and dealing with climate uncertainty. That's the essence of the climate problem. We don't know how much to cut, but we think we should be cutting significantly. We want to manage the risks to the environment, to the economy, to a whole range of issues and most importantly we have to design systems, markets in particular, that let us deal with uncertainty. Again it isn't about picking arbitrary targets and hitting the target no matter what.

[5] It is the role of economists to highlight tradeoffs. For a dollar spent on greenhouse emission reduction that is a dollar less spent on the reduction of poverty or disease. If we can achieve the same concentration outcome for a much lower price who would deem this unimportant?

[6] See Stern (2006) and Garnaut (2008)

That's a political argument, that isn't a scientific argument and it's certainly not an economic argument. The focus then should be creating a system that enables all of society to manage risk - it's not just that the government should bear all the risk in my view. We need to create markets so that individuals and corporations can make decisions using markets and other mechanisms to manage their own risk. That's important when we are trying to deal with the sort of energy system development and deployment that is needed. Fundamental to this is creating long term institutions and clear property rights over carbon emissions, globally and nationally, that steer the global economy to a low emissions future.

The institutional structures have to be thought about very, very carefully. When constructing a global system, my view is that starting from the top down and making countries undertake action is just not going to work. You have to start with countries taking action that they see is in their own self interest and then knit these national or regional policies together into a global system with an overarching framework that helps sustain the national actions. The idea that you get uniform global agreement and consensus has not worked and is unlikely to work in the future despite politician's optimism about the Copenhagen conference in December 2009. They were also optimistic in 1997 when the Kyoto Protocol was negotiated and global emissions are much higher today than almost anyone predicted.

Pricing Carbon is a Necessary but not Sufficient Condition

At the base of the climate policy issue, there's a whole range of different policies that are required. The carbon prices need to be at the core in my view, because the carbon price is a way of co-ordinating all of the decisions, of all of the agents, all over the world who are making carbon emitting and carbon abating decisions. Yet the carbon price has to be designed and implemented very carefully. There is no doubt that the short term carbon price is a cost to the economy. If we change the price of carbon tomorrow, it will be costly. On the other hand the long term carbon price is, in my view, an opportunity for the economy. People appear to get these two time dimensions mixed up either because they don't understand the key issue of investment incentives or for their own self interest. You hear a lot of people argue that there should be a carbon price today that is high because that's the only way to stimulate renewable

energy. My view is that a high initial carbon price is going to hurt the economy, and what matters for renewable energy sources is actually not the price of carbon today, it's the price of carbon that people expect over the next 20, 30 or 50 years. You've got to focus on the balance between costs and opportunities in the time dimension much more than are usually debated. In fact, everybody is focusing, in my view, too much on the short run. What we need to do is to set very clear long term carbon prices for the global economy that enable individual countries to manage their own domestic costs of carbon abatement to suit their own national and global self interest.

The importance of prices can be seen in Figure 3 which shows GDP, CO2emissions and energy use in the United States from 1960 to 1990 with each variable expressed as an index of 1 in 1960. It is clear that before the early 1970s energy use and CO2 emissions where rising faster than GDP. That is energy intensity in the US economy was rising. In the early 1970s something fundamentally changed the relationship between GDP growth and energy use. This was the first and second oil price shocks. What was important about this event was not that energy prices change but that they changed in a way that most people thought was permanent – the world was thought to be running out of oil. As it turned out this was premature but the impacts on the energy price shocks on spurring new technology was permanent as can be seen from the permanent improvement in energy intensity of GDP.

There are many ways to put a price on carbon. One way is a carbon trading market. Firstly, you create a regulation that a carbon emitter requires a permit to emit carbon. But there are very many different ways of creating a carbon trading system. Firstly, the government could limit the supply of permits and so you create a fixed amount of carbon. You let the market determine the price because carbon permits are scarce, and that's what determines the carbon price. A cap on emissions is what you call a cap and trade permit system. There are various different versions depending on whether you allow banking and borrowing of permits so that the cap is not binding in a given year. An alternative approach is to set a price at which you can buy permits from the government and let as many permits be bought from the government in a particular year. This approach is the equivalent of a tax, but you can still regard it as a permit trading system, although it's really a tax.

The advantages of the "cap and trade" approach is that once you've got the cap then you know exactly what the environmental outcome will be. The disadvantage is that you don't know what it's going to cost, and in fact, you could end up with a lot of volatility in the short term carbon market, because you have no flexibility in the supply of permits. The advantages of a tax is that you know exactly what the carbon price will be, but you don't know what the emissions outcome will be in any year. Volatility in short term carbon markets is good for financial market participants that thrive on making money out of reducing volatility at a price but does nothing for the environment or the economy.

There are a few other differences between these alternative ways to price carbon which are of a longer term nature. The beauty of a carbon market where you allocate the permits is that the allocation in itself creates constituencies that change the nature of the interaction between the private sector and the government. The problem with a tax is that if you are trying to generate some long term carbon price, it is not clear what the tax will be in the future if the government hasn't pre-committed to what the tax profile will be. Once you get into the difference between national markets and global markets, again there are attractions from a theoretical economic point of view to allow global permit markets to emerge. In our modeling, the Australian carbon price for any sort of plausible target that is being discussed, tends to be much higher per unit of

carbon, than say an American carbon price or Chinese carbon price. If you only have a national market in Australia, it could be very expensive to reduce carbon in the Australian economy when you could buy permits from an offshore market and therefore lower your abatement costs. The idea of using a global market is to reduce the costs in Australia if it proves difficult to hit an annual emissions target. This is the essence of the argument in the Garnaut review and the White Paper. Countries with high marginal abatement costs can buy permits from countries with low marginal abatement costs. By doing this trading you reduce the costs within your economy and a global market for carbon emerges with a common price. This is nice efficient outcome. The price of carbon in any part of the world would end up being exactly the same. Now trading is good in theory and even in our modeling work we demonstrate it can have significant impacts on reducing the costs of abatement, but it doesn't actually solve the problem of uncertainty. Even though you can pick a target for Australia, and if it turns out to be too expensive, you can actually trade offshore, it doesn't reduce the global cost of the target that is picked for the world. In other words you can shift the global costs around but you can't reduce the global costs under a standard cap and trade ("where" flexibility is possible but not "when flexibility").

There are also some serious problems associated with the allocation of permits. Trading permits across borders is transferring resources from one country to another through the trading mechanism. If an Australian buys a permit offshore they are actually transferring wealth to other markets. A third problem with trading across countries is that there is a lot of short term price volatility possible and the European trading system is a great example of how markets can trade from 36 Euros down to 2 Euros just because of some information that is revealed to the market. Shocks in one market would be transmitted instantly to all markets that are linked.

There are no gains in my view from short term permit price volatility – the gains and the price discovery is at the long end and not the short end of the time scale. It's really critical who gets the rights to emit in each trading period, and if you just create a series of national markets like the European system, or like a system in Australia, where you might have a 5 year or a 10

year horizon, you run into this re-allocation of property rights continuously and it's a waste of resources in terms of rent seeking activity.

4. Lessons from Monetary History

There are some historical lessons to be learnt about linking markets and let me draw out these lessons. In our modeling work in the mid-1990s Peter Wilcoxen and I leading a team at Brookings[7], discovered that there may be a problem with cross border emissions trading that depending on how you allocate permits. It is possible that once you start trading, if there are some big transfers from one region of the world to another region of the world, this can lead to large fluctuations in real exchange rates and large fluctuations in trade balances. This volatility can destabilise the global trading system. These effects are related to the Dutch disease and the classic transfer problem debates.

Trading emission permits is not just trading pieces of paper. Trading permits are transferring resources from one part of the world to another part of the world. Why is that a problem? Well, it's a problem if you look at the experience of the United Kingdom when they discovered North Sea oil in the 1970s. Suddenly the UK had a comparative advantage in oil. It had to shift resources from the manufacturing sector to the oil sector, so manufacturing industries in the UK had to be restructured. Because of a lot of stickiness in the real world, the UK ended up with an adjustment problem. The UK was better off in aggregate because they had increased wealth, but you had serious adjustment problems in getting the resources from the non-traded sectors to the oil industry.

There could be a serious problem if we gave China or India an enormous volume of permits, which some people want to do, and then buy back from those countries, because this changes the comparative advantage of these economies from labour intensive manufacturing economies to carbon abating economies. Within these economies the shift in comparative advantage could be a very significant economic shock. Again Keynes wrote about this after

[7] See McKibbin. Shackelton and Wilcoxen (1999) and McKibbin, Ross, Shackleton and Wilcoxen (1999).

World War 1[8], how can German reparation payments be transferred out of Germany to the rest of the world without causing a major disruption to the global trading system. This may or may not be a problem in practice in the climate change debate because it depends on how you allocate the permits. It depends on how the world economy evolves and how the carbon price changes over time. It depends on a lot of things, which we really aren't very good at predicting but none can be ruled out. Thus the system of global emissions trading is vulnerable.

The second lesson that emerges from experience relates to the observation that there is not a single world currency. Countries have tried periodically to move towards a single world currency but this attempt has failed to varying degrees at the global level although there have been some notable regional successes – so far. I believe that there is not going to be a single world permit market because emission permits are very similar to money. An emission permit is not a physical commodity like a pork belly. There is not a physical quantity of these things which are real. Permits are promises of government to hit an emissions target in the same way that a unit of money is a promise of a government to maintain purchasing power. The value of that promise depends on the government's credibility and because different governments in the world have different degrees of credibility and different incentives over time to debase their currencies, then you are going to have problems with governments reneging on these carbon trading markets and debasing the global currency. We have seen the consequences in the past. The world attempted to have a common global currency (a dollar standard) after the end of the Second World War in the Bretton Woods system. When it finally unraveled in the early 1970s due to uncertainty about the value of the anchor currency (the US Dollar) it was a significant shock to the global economy.

The third lesson from monetary history is how many countries have converged in the way they run monetary policy. Economists used to think that you could target the quantity of money and then let short term interest rates fluctuate. This would lead you to a good outcome with the quantity of money tying down the price level. Policymakers discovered very quickly that this nice theory actually didn't work very well in practice. In addition there were substantial costs

[8] Keynes (1929)

from short term interest rate (or price) volatility. The gains to policy came from tying down expectations about the policy goal. In different countries now the target for monetary policy tend to be inflation, or inflation over the cycle, or other nominal targets, but policy is implemented through manipulating the short term price of money while gradually adjusting to the long term goal. This is exactly the insight and lesson that we should learn for climate policy.

Climate policy should have a short run price goal, which is the price of carbon to the economy, and a long run quantity goal which is atmospheric carbon concentrations. The economy would then move from the short term to the long term in the same way that monetary policy works. Transparency, but flexibility in minimizing costs in transitioning from the short run to the long run is critical. We have learnt a lot about how to create a global monetary regime and you don't do it by having a big meeting every year where everyone makes a promise and then everyone goes back to their economies. You have national or regional monetary systems that are working in the national or regional self interest and you co-ordinate these across countries to internalise the global externalities. It is obviously the case that the externalities related to climate change are orders of magnitude bigger than the externalities from monetary policy but the UNFCCC framework is the right way to deal with these.

It is clear from the discussion so far that climate policy is more like monetary policy than it is like trade policy. The world and Australia needs a system where there are clear concentration targets, not necessarily annual timetables for emissions. There needs to be an independent agency at the national level charged with reaching those targets free of political interference but managing the costs of adjustment from where we are to where we want to be. There needs to be a very clear long term price for carbon, because just as it's the long term interest rate that drives investment, not the short term interest rate, it is the long term carbon price that will drive greenhouse gas reducing investment. It's the long term carbon price that will drive technologies, not the short term carbon price, but we need to control the short term carbon price in the same way that we control the interest rate to minimise the economic disruptions in the economy. Thus the entire argument that people make when they say that if Australia doesn't have a carbon market today, at $35 per tonne you might as well forget it, I think is completely

the wrong way to think about it. I care much less about what the price of carbon is today. I care much more about what the market says the price of carbon will be in 10, 20, 30 or 40 years into the future.

5. The McKibbin Wilcoxen Hybrid for National and Global Action

So far I have drawn an analogy between climate policy and monetary policy but how can this be implemented? The answer is contained in a book and many articles published jointly with Professor Peter Wilcoxen. Although not usually described using a monetary analogy it is actually close to the way you would implement this idea in practice. The McKibbin Wilcoxen Hybrid is the monetary approach to climate change although it is usually described as a hybrid of emissions trading and carbon taxes. It is a cooperative approach you can implement as a series of national systems that are plugged together. It can also be implemented as a global system if you can get all the countries in the world to agree to take coordinate action.

How does the McKibbin-Wilcoxen hybrid work? Firstly, the aim is to impose a long term concentrations goal - we don't discard targets for concentrations, we only discard timetables. We argue that a particular concentrations target is where we are trying to get, but we are not quite sure when we are going to get there. We also propose a way to distribute this target across countries (where flexibility) and across time (when flexibility). Secondly, we use this emissions commitment to price in a market a long term carbon target within each national jurisdiction and that's what we want to drive energy investment decisions. At the same time we control short-term costs. The whole problem of trading off the costs with the environmental benefits is at the core. We also want to create markets, which currently don't exist, where you can enable corporations and households to manage their own climate risks. If a company wants to go and build a gas fired power station in the LaTrobe Valley, putting in some fairly interesting new technology, they can have a way of hedging that investment so they can proceed despite the risks. If the carbon price rises dramatically in the future because we need to cut emission more quickly than expected, there is no blockage to closing that investment down and cashing in the long term carbon rights and moving to a different technology platform.

Components of the McKibbin Wilcoxen Hybrid

What are the components of the policy? We first create what we call long term permits. These long term permits are a bundle of annual permits with different dates for each annual permit. The annual permits embodied in the long term permits get smaller and smaller over time, so effectively the permits eventually disappear. The rights you are creating are a diminishing right to a resource and the supply of these is fixed at the national long term target. These long term permit reflects this target. An example of a long term permit is given in figure 4. The right to emit in the first year in 90% of current emissions with the annual permit each subsequent smaller than the pervious year. The long term permits are allocated freely to households and to industry. The government gets no revenue from this allocation process whatsoever, these rights are like real estate contracts, they are out there in the community owned by vested interests throughout the society and they are traded in a long term market. They are owned by consumers and firms who can sell them to generate the revenue needed to reduce their emissions. Why is that important? It's important because you want to create a constituency throughout society who own the rights to the carbon, who want to object any of the governments backsliding on future policy commitment. You also want those who reduce emissions to gain financially from doing so.

Think of these long term permits as similar to a government bond. They are like a government bond which gives you an annual coupon that gets smaller every year. As a company owning these emission rights, if you do nothing to change your emissions then you are eventually going to run into a problem because the long term permits you have been given for free (and less than current emissions) effectively disappear over time. The total initial emission for an economy in 2010 would be set 10% below current emissions so you already face a shortage. There is scarcity designed into the market. Each one of the annual coupons embodied in the long term permit can only be used in the year in which it is stamped and then it disappears. This gives you the long term pre-committed ex-ante target of the Australian government. By 2100 these long term permits are gone.

The second component of the policy, which is critical, and this is where the central bank of carbon has a key role, is that you also allow the central bank of carbon, to print annual permits in order to maintain a pre-announced price of carbon. This is the annual price that will apply five years at a time. Every five years the price is reset given the observed emission reductions or as part of a global agreement on the carbon price. If an emitter cannot get enough emissions from their long term allocation they can go to the central bank of carbon and get an annual permit for a fixed price.

What this means is that you have a permanent elastic supply of these annual permits at a fixed price. This acts like a safety valve. In the US debate it is called a "safety valve". In the Australian debate, this is what I presume the government and the White Paper and the Garnaut Review mean by holding the price fixed at a low rate initially, because I don't know how you have a quantity target and a price target in a system unless you do it in the way proposed n the Hybrid by providing additional permits if needed. This means that in any given year a company can reach their legal emissions requirement, either by using an annual coupon from the long term permit or buying an annual permit from the central bank. That's why the policy is called a hybrid, because it is permit trading of the long term permits but with a carbon tax effectively implemented in the form of an annual permit. The payment to the central bank of carbon is a tax, and thus you can satisfy your emissions from either source. Since we have scarcity in the long term permits from the very beginning, the annual price of permits will most likely be the fixed pre-announced price of annual permits, unless there is a miraculous innovation that drives the price down below that annual price – which would be very good news given the deep cuts proposed in the target path.

An example for Australia is shown in Figure 5 where the line of diamonds is the diminishing target path for the economy as a whole. The red triangles are the years in which annual prices are reset - this occurs every five years. The line of pink square boxes are an example of what actual emissions might look like in a world where the cost of reducing emissions to reach the target are greater than the initial permit prices shown in Figure 7. The sale of annual permits which is the difference between the long term target and the actual emissions

are contained in Figure 6. Over time the annual price of permits is raised until the emissions path is reached. The price of annual permits is shown in Figure 7. The value of a long term permit over time is shown in figure 8. Note that even starting at $10 per ton of CO2 reducing emissions with a permanent change in behavior frees up a long term carbon right worth $1100 per ton. Consider the impact on an innovator. Suppose you are making investment decisions about some technology that may be worthwhile to invest in now, but you really need a threshold of $50 per tonne of carbon to make the investment worthwhile. If you can look out along the yield curve of carbon prices generated in the long term market and the associated derivative markets you might see that by 2020 or by 2040 the price of carbon is expected to be $80 per tonne. At this price the new technology would be viable. If it turns out when you get to the future date, that the price is much lower than expected you can take a short position in this market to bankroll the technology, and if the price ends up collapsing you can close down the technology and trade in your assets and still make money out of the venture. Therefore this approach would encourage a lot of investment in alternative technologies to reduce emissions because you are managing the risk of investing in these technologies.

Importantly the value of long term permits are the present value of the bundle of short term permits contained in the long term permit. Suppose that the annual permit price starts at $10 per tonne. A lot of people argue that at $10 per tonne nobody is going to do anything. However because these permits have been given out to all of society, if you have some sort of industrial process, where you can reduce one tonne of carbon, in a standard carbon market you would save $10. In a McKibbin Wilcoxen market you have that carbon right for 100 years, you don't save $10 you save possibly $1100 because the saving is the present value of something that's been saved forever. The hurdle rates of return by using these long time frames in this way are transformational. This approach totally changes the cost/benefit analysis for all sorts of different technologies, significantly changing the incentives people have to reduce their abatement, because usually if you reduce a unit of carbon today, it's a permanent reduction in carbon and should be rewarded that way.

At a national level, the Hybrid approach controls the short term cost of carbon abatement policy because we don't know what the rest of the world is doing, and if the rest of the world has

done nothing, we can keep the price low until they undertake serious action. But if there was a global agreement and countries implemented policies to reach that agreement there would be an international agreement to step up the short term price over time, based on where global concentrations were heading. Thus you can implement this price stepping approach either through national action or through a global agreement.

The way I see the global system evolving is that each country will inevitably have its own system. It might be a carbon tax in a Scandinavian country. It could be a McKibbin-Wilcoxen in the US and EU but the commonness of the system is that you have a uniform price at the short end. Now why is that an efficient outcome? Well, because there are no gains from trade and an American company has no gains by buying from a European company because they can go and buy the permits from their own government. Therefore you end up with an efficient market without cross-border transactions, and therefore you can partition policy in the US, you can partition the EU, you can partition Japan. Partitioning or building firewalls between these permit market are important because if there is a shock, i.e. Japan pulls out of the system, it doesn't change the price of permits in the other systems. Under a global carbon market you would destroy the market and thus a global permit market is much more vulnerable to collapse from the actions of individual countries[9].

Bringing in Developing Countries

One of the big problems in international climate negotiations is how to bring in developing countries? Particularly when developing countries are legitimately arguing that they don't want to bear the same costs as industrial countries. What you can do within the Hybrid framework is to offer to negotiate in the international forum a much bigger allocation of long term rights than a developing country currently emits. What that means is that the short term price of carbon in a developing country would initially be zero because they are not facing a constraint today and the firewall between markets is binding. However the developing would be facing a transparent constraint in the future. Thus the long term carbon price in a developing economy will be non-zero. Eventually short term price would rise over time until they are equal

[9] See McKibbin Morris and Wilcoxen (2008) for a detailed analysis of this point.

to the price of carbon in developed economies. This is differentiation based on the level of development, but the actual catch up in price is based on capacity to pay which is determined by the allocation.

6. Summary of difference between standard approaches and the Hybrid

There are a couple of critical differences between the hybrid approach and the standard cap and trade approach or a carbon tax. Firstly, the hybrid creates long term returns to short term actions. If you own the rights for carbon for 100 years and you change something you do today, the benefit is the present value of a 100 year return. That totally changes the hurdle rates of return for different technologies. It also enables finance of innovations because you can negotiate with a bank or a venture capitalist with a technology where the investment in this technology can be hedged in the long term permit market (or a derivative market). Secondly the Hybrid creates constituencies within the domestic economy who own the long term rights to carbon in the economy. It isn't owned by the Treasury, it's owned by a lot of corporations and individuals in superannuation funds. Thus any government that tries to tinker with the future of carbon policy is going to face the wrath of the voters. For example you don't get too many Australian political parties running on the proposition that they are going to take all real estate contracts and cancel them and reallocate the real estate. Under a Hybrid with clear property rights there is a constituent balance which you don't achieve in a taxed based system and you don't achieve it from an allocation system of short term rights.

Summing up - climate change policy is a serious issue that all countries have to deal with. It is dealing with the climate change uncertainty that matters. Any effective policy will be a major change to the Australian economy. Missing markets need to be created. These are not short term carbon markets nor a new tax. The key is a long term market in trading climate uncertainty. It is also important to understand that there is still a great deal of uncertainty about where world policy is actually heading. If you did take a Garnaut or CPRS type approach where you commit to a precise target or a range of targets on the off-chance that you would be able to

trade your way out of the target by buying cheap permits offshore if it is too expensive, but the permit market doesn't develop offshore, what do you do? You may have locked yourself into an international agreement with no safety valve. Relying on the development of a global trading system without a safety valve domestically is a very risky policy.

The final point to stress is that it is critical to get away from this idea that we know exactly where we want to go and that there are no trade offs in getting there. That's called religion. But we have to deal with trade off between the environmental benefit of taking action and the economic costs of getting there. If we don't acknowledge that, we will not get an international agreement because it's the cost part of the negotiations where the international agreements are failing. Developing countries have bigger problems to deal with, from their own perception, than climate change, but they are willing to be part of the international process if it constructed in the right way.

7. Conclusion

Economic history has a lot to teach policymakers on how to design effective climate policy at the national level within a global cooperative agreement. It is time to move in this direction of building a transparent, credible, national or regional focused policy framework, with flexibility to adjust in a clear way over time towards a global concentration goal. The almost religious focus on targets and timetables no matter what it costs is the biggest hurdle to overcome in the climate change policy debate. There are better ways to generate carbon prices than what is currently being proposed. One such approach – the McKibbin Wilcoxen Hybrid has been the focus of this Lecture.

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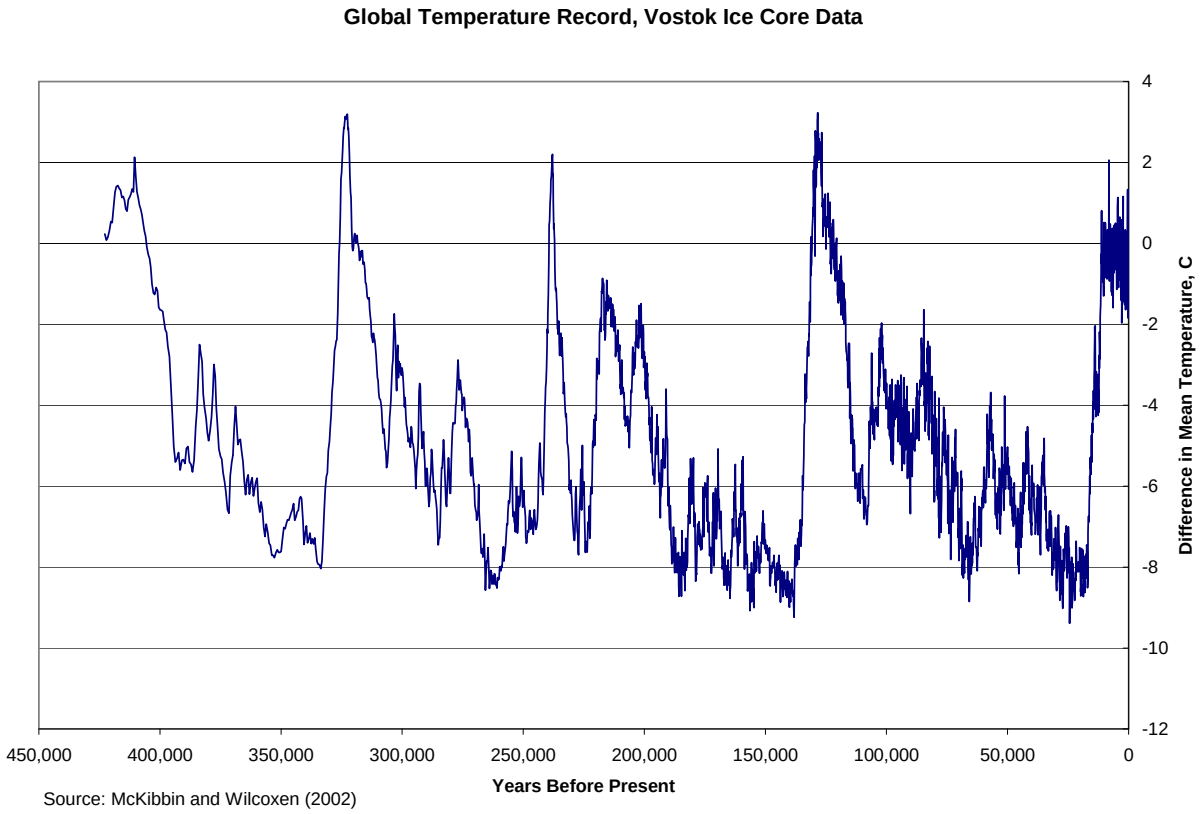
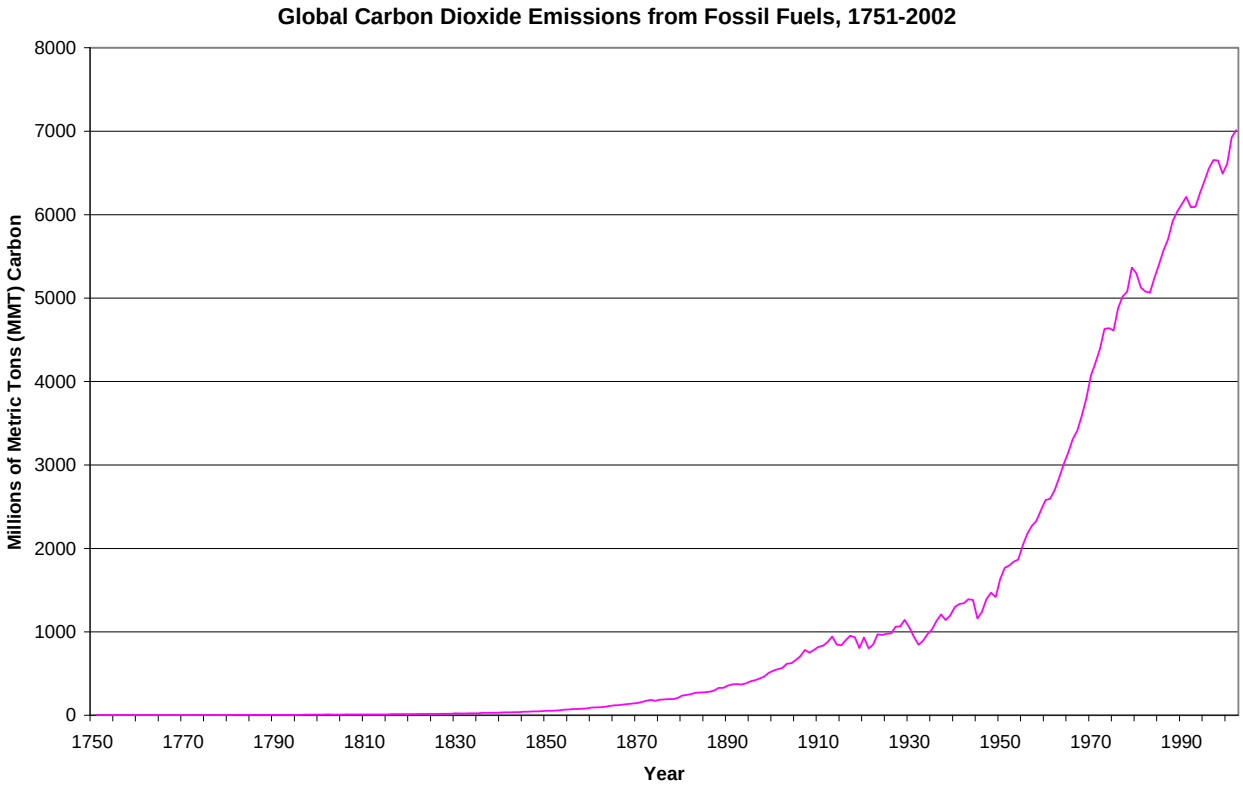
Figure 1



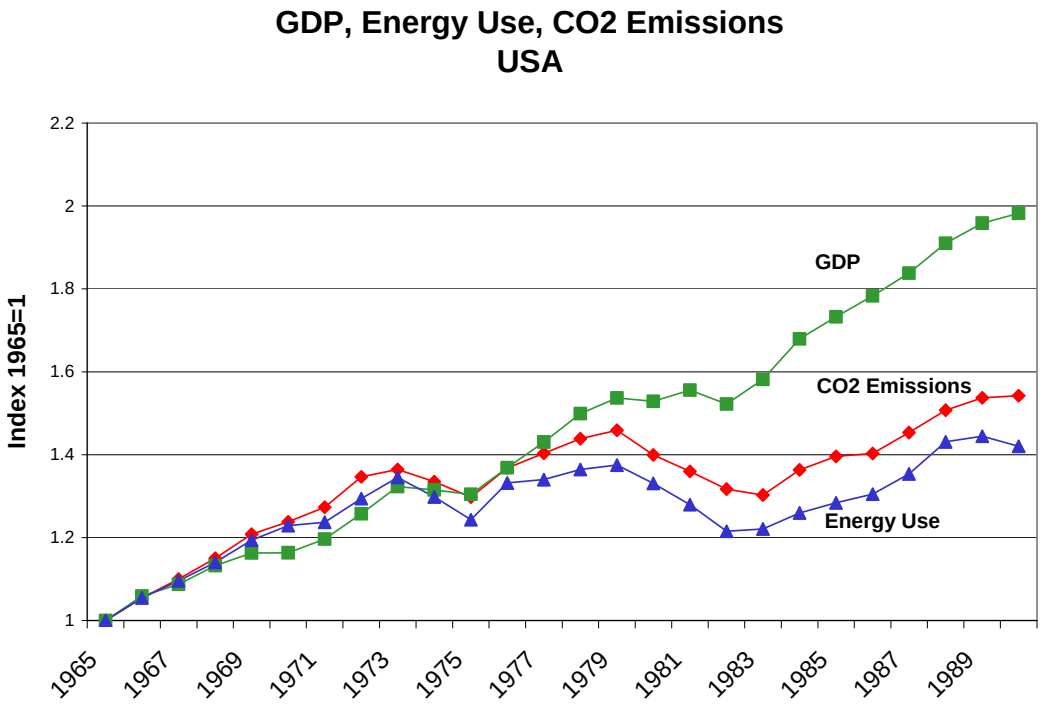
Source: McKibbin and Wilcoxen (2002)

Figure 2



Source: McKibbin and Wilcoxen (2002)

Figure 3



Source: Bagnoli, McKibbin and Wilcoxen (1996)

Figure 4: A Long term permit

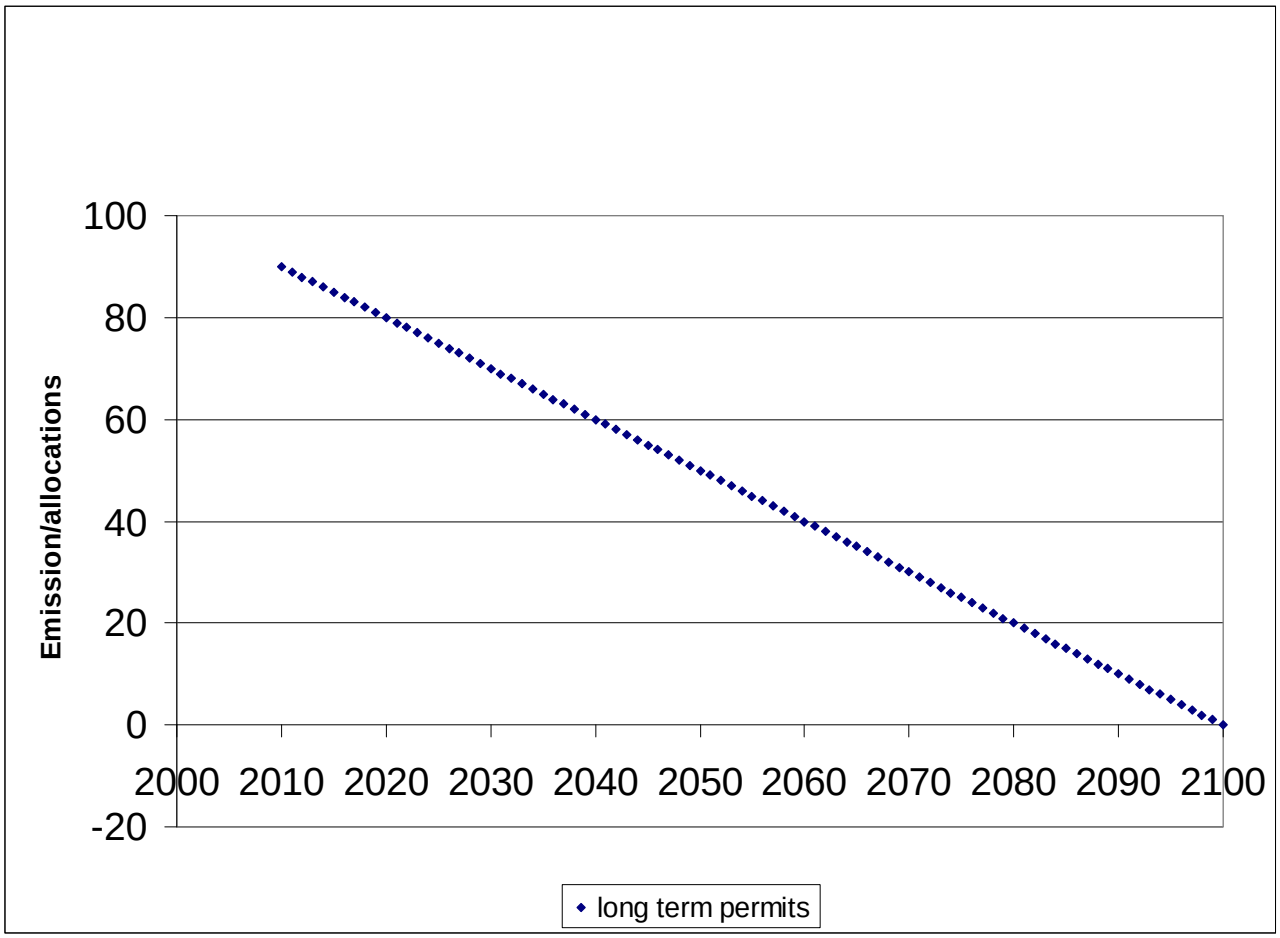


Figure 5: Emissions and long term permits in Australia

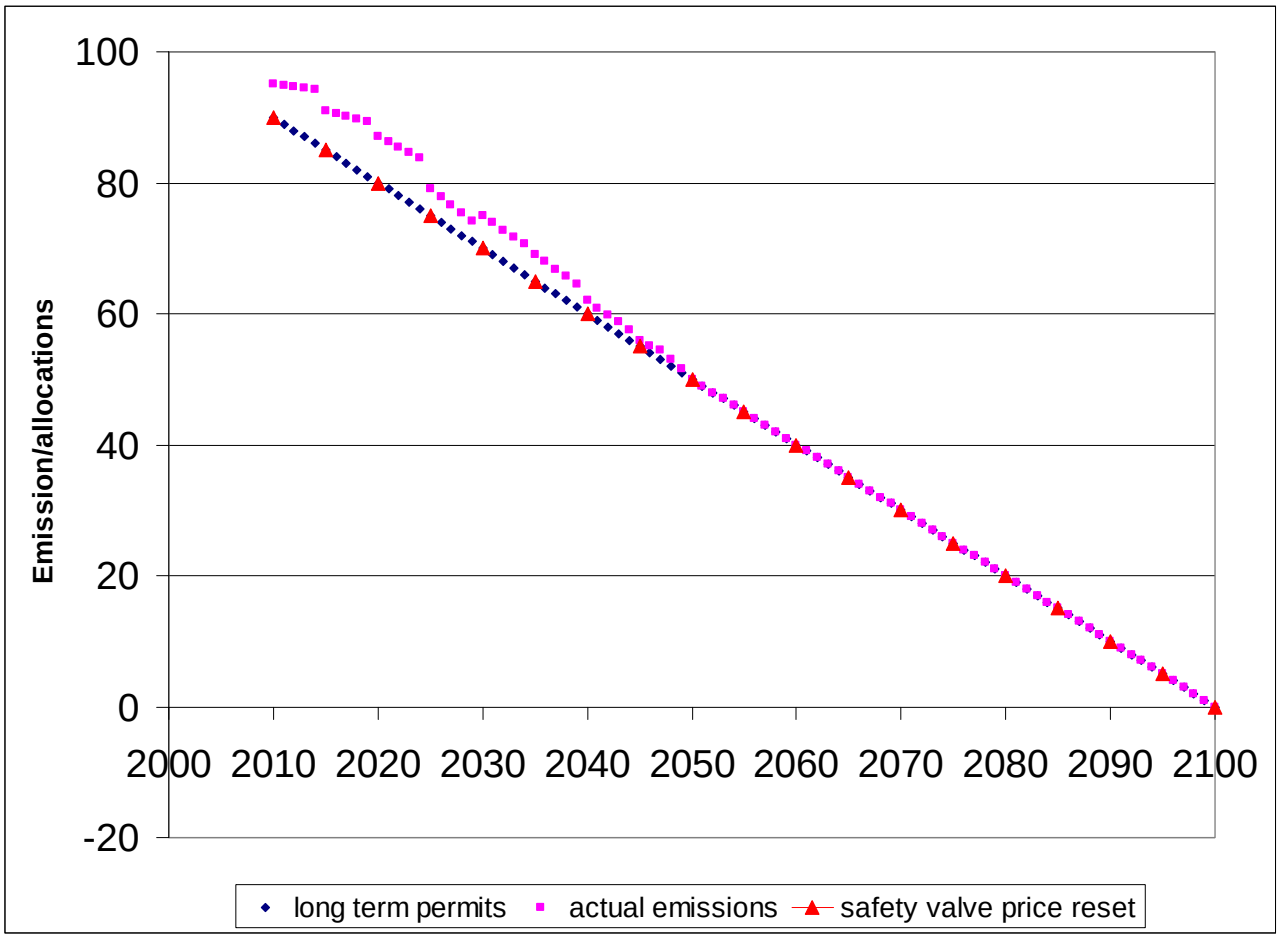


Figure 6: Annual permit sales

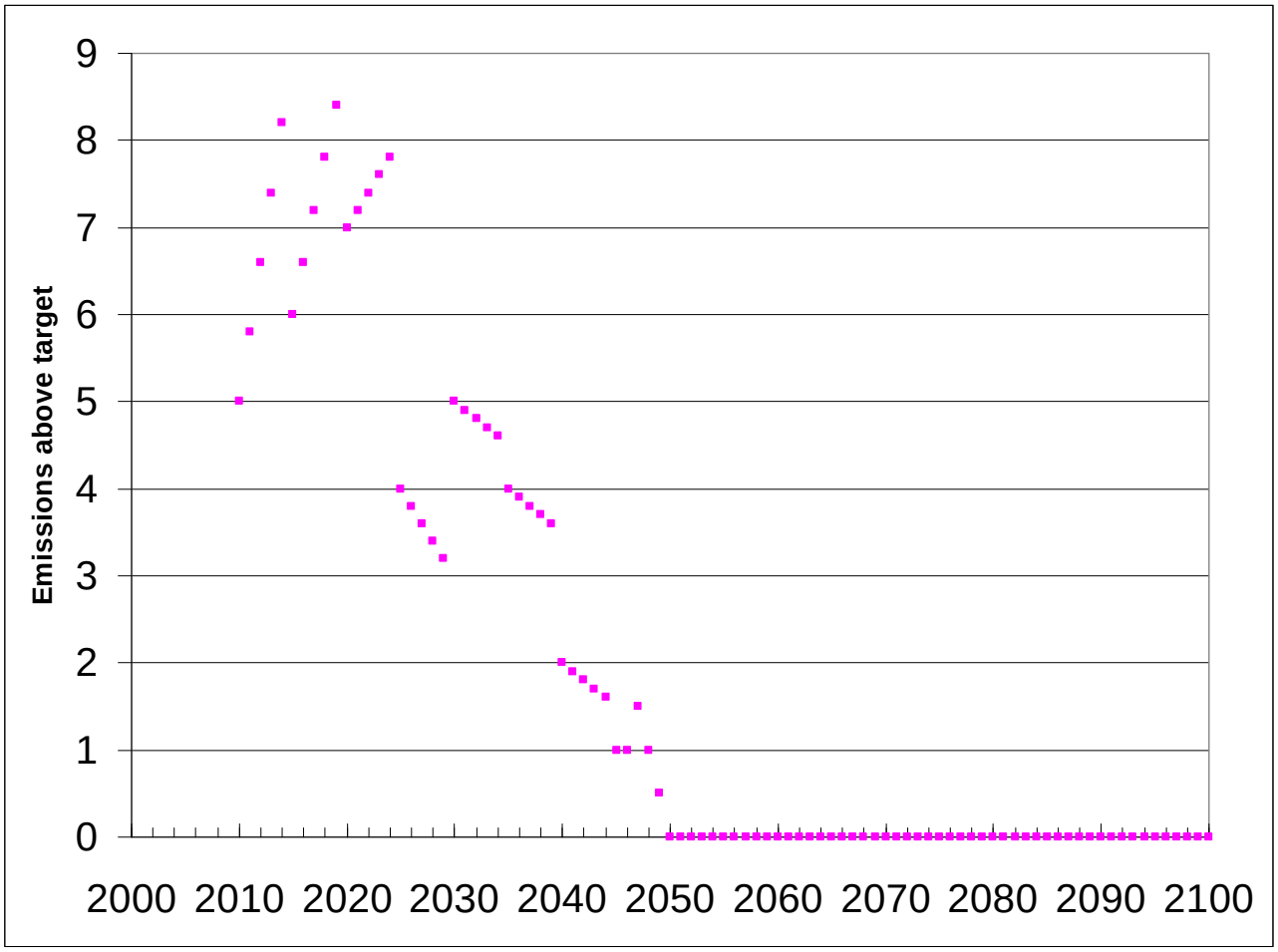


Figure 7: Annual permit price

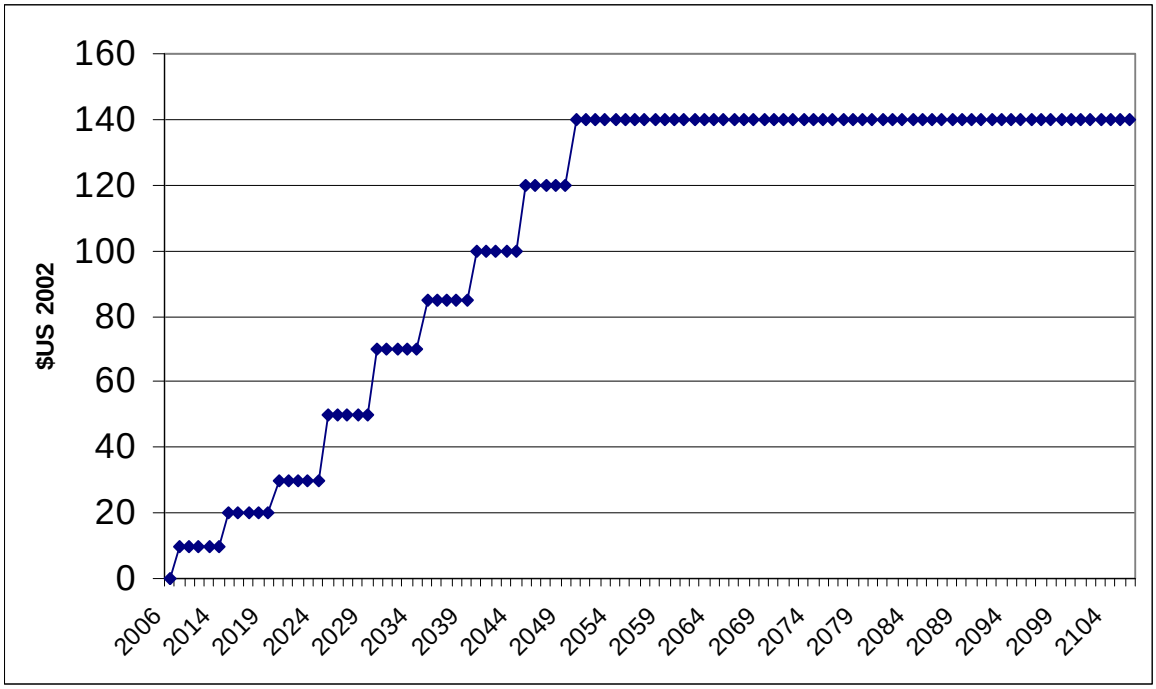
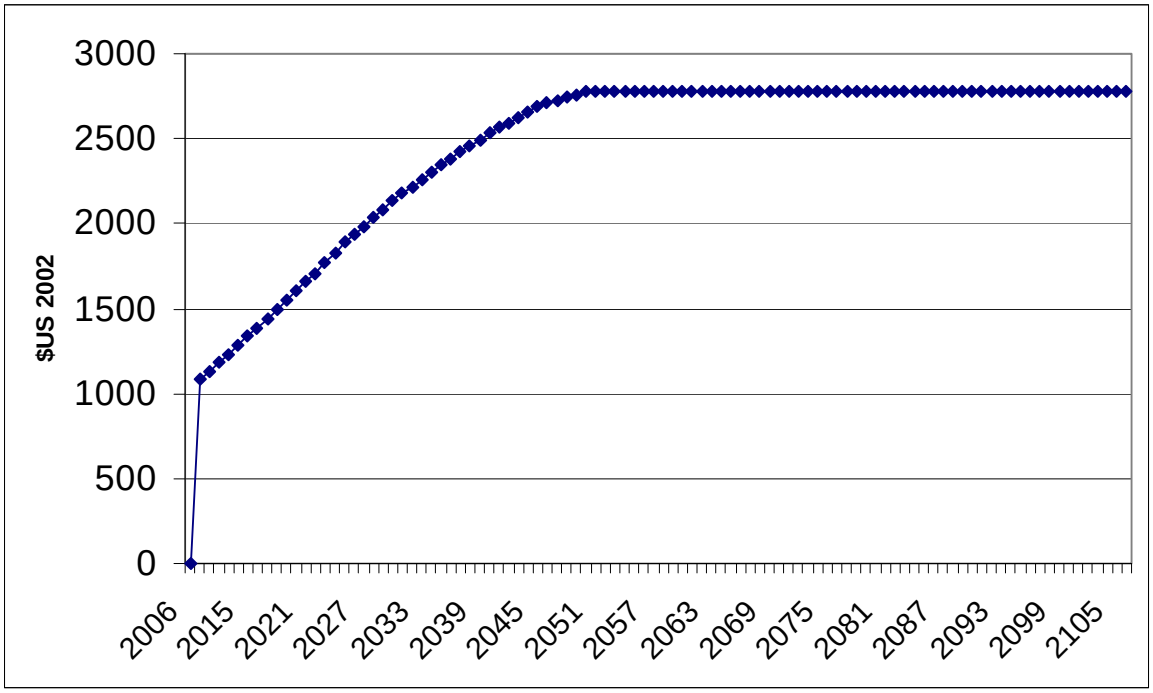


Figure 8: Stylized value of long term permits (assuming r=5%)



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