

# **Cap and Trade: A Tangled Web of Good Intentions and Bad Policy**

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## Part 1: Cap and Trade's Ineffectiveness and is Bad News for the Climate

I favor some of the more aggressive actions to avert climate catastrophe, actions which nevertheless do not compromise the continuity of human life and well-being. The climate which enabled our evolution as a species and the societies upon which we depend has almost no price attached to it. Averting this calamity, if we can, is the moral equivalent of war. As such it deserves the investment and political priorities that are accorded the military during a war, though the necessary moral and climate-science arguments for this level of investment have not been made clearly by leaders, especially in the US. In our Great Recession, a forward-looking policy to counter climate change would have much needed economic benefits and lay the foundation of the new economy that we are supposed to be building.

Unfortunately, the mental “real estate” of climate activists and politicians has been captured by a monumentally bad idea, a misapplication of an environmental regulatory system that encourages delay and irresponsibility in climate action rather than changing the course of our society’s use of energy and land. Whatever urgency is felt popularly or by leaders, the institutions that will arise from the cap and trade policy framework have a good chance of actually blocking more effective action on climate (more straightforward system of rules, incentives, disincentives, and direct investment), which makes the work of exposing its flaws not simply the matter of my or someone else’s political or economic preferences but one of life and death for future generations and the ecosystems upon which we depend. An unquestioning herd mentality has taken over and encouraged even some of our best social scientific minds, including Nobelist Paul Krugman, to issue [statements of support](#) for a policy inspired by an outdated political and economic fashion of which Krugman is himself [one of the leading critics](#).

Somehow a connection is not being made between the monumental collapse of our financial systems over 13 months ago and the design of the twenty-year-old policy instrument to which so much unearned credence has been given. Fundamental to cap and trade is the hand-off of key responsibilities and [agency](#) (the ability to act) for cutting carbon emissions to a [carbon derivatives trading market](#), an unnecessary gift to the hyper-caffeinated and overgrown [trading sector of finance](#). Just this week, critics of the Obama Administration’s [earlier weaker financial regulatory efforts](#) are now feeling somewhat vindicated in seeing that [the Administration is now stepping up its efforts to rein in](#) financial engineering and trading-dominated finance. It is utterly baffling that people who are intelligent enough to design or just understand an over-complicated

policy instrument like cap-and-trade have not made the connection between the origins of cap and trade and the vagaries of our financial system. For them, the cap and trade instrument is still wrapped in the mystique of trading-based markets, which outside the climate community have lost much of their appeal.

It is [an open secret among people who actually work now in cutting emissions by implementing energy efficiency and renewable energy projects](#) that cap and trade is at best a holding pattern if not a monumental roadblock to pushing ahead with deployment, investment and research in emissions reductions themselves. These voices, generally excluded from the political discussion, contradict the “line” that, for instance, the upcoming legislation from the US Congress centered around cap and trade is a “[clean energy jobs bill](#)” and is the very heart of a green economy. While cap and trade is complex, these criticisms come not from a lack of economic or even political understanding but from a realistic appraisal of how actual lower-carbon technology implementation decisions get made, [an elementary business process](#) which seems to have escaped study by the policy’s designers. Cap and trade is not too stringent or too effective but not nearly effective enough.

The fundamental problem with cap and trade is that it placates government leaders and activists with manifest good intentions while undermining the effectiveness of the only instruments which could realize those good intentions. Cap and trade inserts a layer of obfuscation and indirection into governments’ ability to make rules, implement programs, build public works, and levy taxes in a fair and transparent manner. On another level, it has a faulty microeconomics, inserting uncertainty about the value of emissions reductions to the businesses that will actually cut emissions via responding to the policy. While working with ineffectual or superficially "P.C." policy instruments might be acceptable in other matters, in climate policy the massive open-air experiment that has been cap and trade over the past 15 years is an unfolding catastrophe. It is not unlike the [Trojan Horse](#), in that cap and trade appears as a gift, yet gives the vandals or just climate do-nothings command of the citadel. Tragically, the barrage of criticism and invective from [the loony political Right](#) or from [professional contrarians who have lost a sense of proportion](#), distracts well-intentioned lawmakers and their supporters from seeing the flaws of their chosen policy.

## Cap and Trade in Summary

Briefly, the [cap and trade](#) systems under discussion are permit trading systems that attempt to limit emissions of greenhouse gases by allowing polluters to emit greenhouse gases to the amount for which they possess permits. Permits are either given away or auctioned off up to the amount of a society-wide or economic sector-wide “cap” determined by regulators, which is supposed to be "tightened" (meaning reduced) over the years, leading to the decades long equivalent of a game of musical chairs.

Regulators, as is planned, will in the future remove “chairs” by reducing the number of permits available to the point where by [2050 there would only be permits for 20% of 1990 greenhouse gas emissions](#). The “trade” part happens when companies have excess permits, because of having polluted less or owning unneeded permits. They can sell these excess permits for a profit to companies that pollute more than the amount of permits that they own. There have been various attempts to re-brand cap and trade with a name that sounds somewhat less shady, like “[market-based cap](#)” etc..

Derived from the speculations of the economists Ronald Coase ([1960](#)) and Martin Weitzman ([1974](#)), cap and trade, also called emissions trading, was invented in the US in the late 1980’s and early 1990’s during the first Bush Administration as a way to avoid issuing so-called “[command-and-control](#)” environmental regulation by government (telling industry exactly what to do and monitoring it) or direct monetary penalties like [pollution taxes](#). [The original cap and trade system for acid rain pollution](#) which is still in place in the US, has been [declared responsible](#) for reducing by 40% sulfur emissions (SOx) by coal-burning power plants in the period 1990-2004. However, during the same time period, European and Japanese regulators have been [markedly more successful](#) using traditional regulations in cutting the emissions of these same pollutants (65%) from power plants, revealing the cap and trade system to be the equivalent of a regulatory stunt: “See! Look Ma...no hands!” In a [2007 review of the results of emissions trading](#), Gar Lipow has led the way in calling into question the sales pitch for cap and trade.

As an example, the highly coal-dependent, heavily industrial Czech Republic went from in 1990 emitting two times the amount of SOx per capita as the US to in 2004 emitting approximately one-half the amount of SOx per capita as the US ([UNECE report page 68](#)). While most post-Communist societies have decreased all types of emissions substantially due de-industrialization, economic hard times, or adoption of modern emissions controls, [the Czech Republic](#) had in 2006 [twice as much industry](#) as a percentage of GDP and uses as a percentage of total energy supply [twice as much coal](#) as the US, revealing the US to be far from a leader in reducing acid rain pollution. Furthermore, the cap and trade system’s success has been aided in America by [the accessibility of low-sulfur coal at an equivalent price to coal with higher sulfur content](#); Wyoming’s [Powder River Basin coal deposits](#) have been the “wind beneath the wings” of the US anti-acid rain program such as it is. From the perspective of these results, holding out the SOx regulatory system of the US as the pivotal policy to save the planet stretches credulity.

## **Cap and Trade and Greenhouse Gases**

The road to applying cap and trade to climate change had a number of twists and turns. Before implementing a climate policy, in 1993 the newly-formed Clinton Administration

had attempted to institute [a BTU energy tax](#) as a means of raising revenue but was rebuffed by Congress. The Administration considered this experience along with its frustrated [health care reform effort](#) a major early defeat that shaped later thoughts on policy and political strategy; these fateful events 16 years ago unfortunately have had inordinate effect on US and world climate policy since then.

The Clinton Administration subsequently in the negotiations surrounding the Kyoto treaty to limit greenhouse gas (GHG) emissions [favored "flexibility"](#) and helped engineer a consensus in favor of cap and trade and cross-border emissions swaps. While a "wonky" intellectual interest in emissions trading may have played a role, the Clinton Administration also thought that this policy would have domestic political benefits as a means to circumvent a policy that had the "tax" label or appeared to tell industry what exactly to do (direct regulation). Using cap and trade also was an effort to "reach across the aisle" as the first cap and trade system had been implemented under the Presidency of the first George Bush. In other areas of the economy, in tune with economic fashion of the 1980's and 90's, the Clinton Administration was [as fascinated by markets](#) as its Republican predecessors and, additionally, had [a penchant for policy complexity](#), within which the notion of using a market to regulate other markets seemed almost commonsensical.

In 1998, despite pressing for cap and trade as the international GHG regulating instrument, the Clinton Administration compromised [with an intransigent US Congress](#) by not ratifying the Kyoto treaty, insisting that the developing world must be included in the regulation of greenhouse gases. The elaborate political ploy in using cap and trade failed as far as US politics were concerned. Other industrialized nations, most notably Europe and Japan, and the relevant UN bureaucracies continued developing the carbon market and cap and trade concept without direct US involvement during the later Clinton and Bush years. The Protocol went into effect in most industrial countries in 2005 after a lengthy period of negotiation and set-up.

While emissions have been cut in some countries, the experience of the first four years of international carbon regulation via cap and trade have not shown the instrument to be particularly capable of effecting meaningful reductions in carbon emissions. In the European Union Emissions Trading Scheme (EU ETS), affiliated with Kyoto, the effects of the economic downturn or a future upturn are making any evaluation of the effect of cap and trade on emissions a near impossibility. The use of carbon offsets originating in developing countries will further cloud the data. In its [initial 3 year period](#) (2005-2007), GHG emissions in the EU ETS went up by 1.9% with wide nation by nation variation ranging from Sweden (-20%) to Finland (+28.5%). Multiple reasons are possible for the wide span between countries and more generally many self-issued excuses are rampant because of the acknowledged complexity of the system; this was a "run-in period" etc. In 2008 there is missing data but it appears that a combination of the economic

downturn and high energy prices (not necessarily attributable to a carbon price) led to [a fall of GHG emissions of 3% from 2007](#) in the EU, which the managers of the EU-ETS attributed to the carbon "price signal" generated by the trading scheme. In the same period (2007-2008) without a national GHG cap and trade system, [US emissions fell 2.8% for similar reasons](#), contradicting the claims of EU ETS managers that cap and trade had an effect in 2008. The net contribution of carbon trading to emissions reductions is still, 12 years after Kyoto, indistinguishable from "noise" in the data.

While it is universally agreed that "errors" were made in [giving away too many permits](#) in the initial round of Kyoto/EU-ETS, it is a strange repeat of these supposed errors that the [now proposed US cap and trade system](#) being debated in Congress will as of this writing also [give away most of its permits](#) for about the next decade. Furthermore the use of offsets, the (supposed) emissions cuts by others that are purchased on an international market because they are cheaper than internal investments, [has been controversial both in design and in implementation](#). Whatever one's view on carbon arbitrage (shopping around for the cheapest reductions around the world), it is universally agreed that offsets reduce pressure on the biggest polluters to take action now in reducing their own emissions. The notion of cap and trade being a system of indulgences for fossil fueled economies is further reinforced by this disturbing propensity of real-existing, as opposed to theoretical-ideal, GHG cap and trade systems to undermine themselves or soften their impact on the biggest sources of emissions.

In Copenhagen in December at [COP15](#), the successor to the Kyoto process (2005-2012) is to be designed and most of the climate community is moving towards a new cap and trade-based treaty that activists hope will be more vigorous than the previous one. Yet the [trenchant criticisms of cap and trade systems](#) that emerge from economists, most notably [William Nordhaus](#), and concerned economic actors on the ground are [brushed aside](#) by those congregated at these events who seem to feel that their good intentions can substitute for conscientious analysis. For instance, almost every economist, including [cap and trade supporter Sir Nicholas Stern](#), has had to agree at one point or another that carbon taxation is more efficient than the baroque emissions trading systems we have built.

Furthermore, we in the US are put in the difficult position of being a laggard in a process that is based upon our own bad idea, and upon which we really never followed through in its original form. In a way, the Obama Administration is, as it may be doing with its Afghanistan policy, put in the position of fighting the last Democratic President's war rather than designing a more future-looking policy; having defined the political choice as cap and trade or, as the Republican opposition to Obama would have it, no strong action on climate change, the Democrats and Obama should instead be looking for the way to a more effective climate policy. The cap and trade framework, a product of some tortured political logic from the Bush and Clinton years, has "captured" the discussion,

limiting thought and discourse on what are the available instruments to avert this catastrophe.

In its defense, permit trading may be appropriate as a distribution mechanism though not a magical cure-all in certain environmental arenas, most particularly [the regulation of fisheries](#). In many nations now “catch-shares” are allocated to fishers who can trade these shares with other fishers. However, the ultimate success of even this appropriate use is [achieved by the government setting limits on the fishing industry, not by yielding to some invisible hand of a fabricated market](#): the total amount of the permits allowed would need to be determined beforehand with reference to study of the fishery by biologists unaffiliated with industry and fishing limits would need to be enforced by government regulators, albeit according to the number of permits that the fisher owns. The appropriateness of permit trading as a distributional mechanism in this instance is that

1. one is trying to calibrate exploitation of a natural resource at a particular level rather than reduce it in one direction (lower is almost always going to be better with GHG emissions for the foreseeable future).
2. The permit trading is a just a new layer inside an existing historical market for fish which have an intrinsic positive economic value for people but are not arbitrarily created by people (it's "inelastic"). Pollution permits are on the other hand entirely an arbitrary creation of government(s), so the determination of a pollution price via the market is similar to playing a game of "guess what's on my mind."
3. A simple intuitive equation can be made by all fishing market participants between a permit and a tradable object of recognized economic value, i.e. the fish.

All types of permit trading, whether of emissions or other, have provoked ethical controversy with regard to the selling of ownership shares to a public or natural common good. Despite these reservations, in the case of fisheries, fishers already have a longstanding tradition of claiming ownership of what they catch so permit trading represents not much of an innovation in resource ownership in fishing.

### **Why Cap and Trade is Bad News for Our Climate's Future**

There are a number of fundamental problems with cap and trade systems that are deeply embedded within the policy or its likely implementations, which suggest that working towards alternatives, even if they too are imperfect, is preferable. Remember, we do not have as many shots as we would like to deal with this problem, perhaps only one or one and a half, so a decades-long experiment with third-best policies is a foolish game. As [Bill McKibben points out in a recent article](#), we cannot negotiate with non-human nature, unlike some other areas of policy. So we need to put in policies that are either “right” or that do not install roadblocks that would stand in the way of better solutions.

1. Cap and trade puts a newly formed [financial derivatives market](#) (the carbon permit market) with all its potential for boom and bust cycles and manipulation by powerful and unaccountable players, in a position to distort the real market for low-carbon technology and land-use changes; the stimulation of this real market is the reason for its existence in the first place. Within the fabricated permit market, the profit-seeking activities of permit traders from the financial markets and industry will be able to exert a substantial amount of unintentional control over the real technology choices and solutions implemented to curb our emission and sequester carbon. These traders, as do all traders, have a [vested interest in opacity, price variability, and information asymmetries](#) that would enable them to achieve the highest profit levels for their firms. Permit trading may offer some of the highest returns on investment in a cap and trade-dominated climate action world, so financial players will defend these profit streams with all the considerable means at their disposal. These are the most likely candidates for the “Greek raiding party” in the belly of the Trojan Horse, though climate activists and bureaucrats wedded to cap-and-trade are co-responsible for opening up the "citadel".
2. As trading looks to be one of the more profitable areas of the carbon business but in itself does not cut emissions, the incentives in the policy are misaligned: the most profitable business within a carbon policy framework should be those lines of business that cut the most emissions either through selling new technologies or processes or implementing them. An unfortunate echo of the go-go 90’s in which it was conceived, activity of trading is given a role far beyond any real value it offers. On the level of businesses with real polluting assets, cap and trade will also reward those economic actors who are better permit-buying "game-payers" rather than those companies that invest most in emissions reductions. This type of reward structure has no place in climate policy.
3. Non-cap-and-trade policies that determine a fixed price for carbon have the advantage of having as an “output” an acknowledged decision-making tool (a monetary amount) that is [already historically integrated into every economic transaction](#). In permit trading, permit prices are only applicable to large economic actors and have only a “reflected” (and variable) monetary price after the net costs of the cap and trade outcome for that economic actor have been integrated into the pricing of their goods and services.
4. A variable, uncertain carbon price that arises from market fluctuations and artifacts of the permit auctioning and trading system is not a clear, easily quantifiable incentive for firms and other real economic actors to make the long-term investments in capital equipment required to cut carbon emissions. A predictable carbon price (in the form of a tax or fee) over the long-term, albeit steeply increasing, would provide a much better incentive to make long-term

investments that pay off over years. The “[net present value](#)” calculations that are the bedrock of investment decision-making depend on the projection of costs and benefits out into the future, which is nearly impossible using the rapid fluctuations and uncertainties of a carbon market.

5. The [salespeople of cap-and-trade](#) claim falsely that the system gives policymakers "certainty" in terms of the amount emitted as compared to a price instrument like a tax/fee. As the study of existing cap and trade systems shows this certainty is illusory and gives leaders a false sense of security. To get this type of certainty in a cap and trade system, regulators would have to engage in some very harsh and disruptive administrative actions, like shutting down a power plant during the last 3 months of a year if its owners ran out of permits. Alternatively, the owners of the power plant could "borrow" permits from the next year's allotment, only to create a direr threat for the next year, but the cap for the current year would have been broken. Again this is punishing players for not playing the permit "game" as smartly as others though not necessarily being the gravest offenders in terms of carbon-inefficiency or overall emissions.
6. Buying permits from other firms at a higher cost will impose an undue burden on companies or organizations that need to scale up their operations and increase their emissions in the middle of a year in response to an increased demand for their products. A carbon tax will have no such punitive effects for unplanned growth as its cost will remain constant throughout the year and per unit produced.
7. The carbon market does not differentiate between upstream and downstream emissions mitigation. “Upstream” means at the source of emissions, while “downstream” means either increasing efficiency of carbon-emitting energy use or absorbing emissions via land use changes. The efforts to make carbon emissions reductions appear as cheap as possible have tended to emphasize downstream solutions or projects in developing countries. However ultimately the main solution to slowing global warming is to eliminate emissions upstream which is currently more expensive, though downstream mitigation is always going to be necessary as well. A carbon policy that addresses upstream emissions immediately is preferable to one that waves a hand of resignation at business as usual in power generation and transport fuels because of initial cost issues.
8. Cap and trade, because of its complexity, indirection and somewhat mystical faith in markets, has become the lingua franca of the climate action community and in so doing has shut down that community’s ability to critically examine the instrument itself or alternative, more effective instruments. The collective mental bandwidth that this instrument occupies has helped it to “suck in” many of the good intentions and attentions of politicians and activists, drawing their efforts away from other measures.

9. Cap and trade obscures the vital role of government leadership, responsibility, regulation and direct investment from the public, the climate action community, and the leaders of government themselves. The successes of cap and trade systems such as they are, depend on either external factors independent of policy (economic downturns, low-sulfur coal deposits) or governmental actors setting stringent targets, operating the permit auction and trading system, and enforcing emissions goals. Yet, cap and trade's sponsors and advocates continue to promote the fallacy that government is only playing an indirect role in its workings, as if this were a strength of the program. According to most of the expectations that have developed about government over the past millennium or so, there's nothing wrong with governments taking a leading role in averting one of the greatest calamities we have ever faced. Government is the only institution that can represent and press for the realization of our society's intention to save itself and the climate via implementation of low-carbon technologies and abstaining as a society from using up fossil fuels all at once. Attempts to hide the role of government paradoxically reinforce the position of advocates of a smaller government who can then point to the attempt soft-pedal as supporting evidence for their claims that government, especially "Big Government", is "bad". An honest assumption of responsibility by government would enable clearer, more transparent and more decisive policy moves and educational efforts about the dangers and opportunities for taking a sustainable path to economic development associated with climate change
10. Instituting a cap and trade system because we, pro forma, must put a policy called a climate policy in place now or by December's Copenhagen climate conference is worse than delaying a few months or a year to put in a better policy once our leaders have examined the alternatives with a more complete understanding of where they are going. The cap and trade systems now and soon to be developed already create considerable institutional and bureaucratic inertia and their own set of interest groups which are not so much incentivized to cut carbon emissions but to manage and justify the cumbersome system.

Any policy will have its strengths and weaknesses but cap and trade creates an economic, social scientific and political lattice-work at a distance from or interfering with the actual climate tasks ahead of us while blocking the way to better climate policy.

*[In part 2 I will highlight what I think is the "fundamental challenge" of climate and energy politics and policy, look at the generic tasks that climate and energy policy is supposed to accomplish and suggest alternate route(s) that are more practical and will be infinitely more effective than cap and trade]*

## 2. Cap and Trade: A Tangled Web of Good Intentions and Bad Policy

*In [the first part of this post](#) I identified 10 features of cap and trade, the favored climate policy of many policy elites at this point in time, that make the policy ineffectual. I outlined how cap and trade was sold to America and the world based on faulty assumptions as well as its superficial political appeal to the then Clinton Administration. Contrary to the story told in climate activist and sympathetic policy circles, cap and trade has been comparatively ineffective as a means to reduce emissions of either SOx or GHGs. I argue that this is a structural problem with cap and trade, not a mistake in implementation.*

### The Gulf Between Gutlessness and “All the Guts in the World”



A permit system requires its enforcement arm, like these fish and game wardens. The actions of whatever "enforcers" are instituted via a cap and trade system would tend to seem arbitrary given the way the auction and trading system works. These enforcers would have to compound the misery of actors that will already have "lost" on the permit markets (Photo: Debra Hamilton)

Cap and trade is a hybrid policy, the mixture of a price mechanism and permit regulation. In theory, the three “motors” of cap and trade are the economic pain caused by having to buy permits (or the anticipation thereof), the profit gained by market participants in exploiting the permit and pollution troubles of others, or the prospect of running out of permits and being subject to some penalty inclusive of actual “police action” on the part of regulators. As with any permitting system, permits are meaningless without the threat of, potentially, monetary and criminal penalties. For instance, fish and game wardens need to be able to stop hunters and fishermen from taking animals for which they do not have permits.

However, cap and trade systems hide and, it appears infinitely, postpone the moment where regulators would have to essentially shut down the operations of various industrial or power generation facilities because they no longer possess permits to

pollute (which they would have to do to operate using their current technology). For instance if a financially troubled power utility or plant operator ran out of permits on November 5, to meet the cap regulators would have to shut down one or more power plants until January 1. This might mean blackouts and brownouts to homes, businesses and, of course, hospitals. It would therefore take “all the guts in the world” for a regulator or government to enforce the cap, standing down the cries of people who will have to live with no or extremely unreliable electricity. Yes the notions of “banking and borrowing” permits are meant to reassure system users that this day of reckoning will never come. Yet this process undermines the power of the permits and the firmness of the cap.

Furthermore, at the point when this theoretical moment of enforcement might occur, the net effect would actually show the regulators/government in a very negative light because punishment might come as a consequence of a lack of “clever” permit-market behavior on the part of the power plant operators. Their power plants may be no more carbon intensive than the next but they may simply have been outfoxed by other permit buyers or various manipulators of the permit market. In this case, the punishment will seem arbitrary.

So we can now understand the design and behavior of the designers of real existing cap and trade systems a little better by recognizing this disjuncture between the lax disbursement of permits (Kyoto/[EU-ETS](#) and current [Congressional bills](#)), the various softening and smoothing mechanisms ([banking and borrowing](#)) and the need for some kind of real enforcement of the cap. It would subvert the politics of the policy to actually meet the cap through the harsh regulation that would almost certainly never happen or would be largely meaningless within the cap and trade framework.

While regulatory and political guts will be required to meet the climate change challenge, the imposition of harsh measures should be seen far in advance to allow adequate time for polluters to take action to cut emissions. Cap and trade's framework does not allow for this type of lead-time before administrative measures are taken.

### **True Belief in Markets vs. a Baroque Policy Mess**

As you might glean from how I write about these matters, I am no market absolutist nor believer in [the efficient market hypothesis](#) (EMH) which assumes exclusively rational information processing by market participants in aggregate. I think it is more reasonable to assume that people can be both economically rational and economically irrational or can alternate between the two at different times or in different contexts. Economists are also coming around to realizing how central irrationality is in our economic behavior: there has now been about a decade of [behavioral economic research](#) as well as the

coming to grips with the fact that our recent crash was [in part caused by a belief](#) in the almost total predominance of rational, utility-maximizing economic behavior.



In economic theory, people are thought to use price as the key decision criterion for making purchases. From these price tags for vodka, consumers probably will be using the differences in prices as a guide to the quality or social status value of the vodka or its ability to be wet and alcoholic at little sacrifice to them, or some compromise between price and product attributes. (Photo: Jayd Tags)

Whatever the balance of rationality and irrationality in human economic behavior, cap and trade (or carbon taxation/fees) with good justification attempts to mobilize the economic rationality of individual market actors in the service of climate protection by introducing a carbon price that will influence procurement and operations decisions. [Rational economic man](#) (or woman), according to the theory, only needs the information of price to make rational, optimal decisions. In cap and trade, the carbon price and market is supposed to be the link between merely pro-forma climate action in the form of permit giveaways/postponement of action by regulators and the theoretical, never-to-be-activated harsh punishments for exceeding the cap. Polluters are supposed to know that they are in trouble when they start paying more and more for polluting, sending to them a signal, [the price signal](#) that they need to change their operations. Rather than the impingement of some set of rules upon the company's operations, the price is going to tell that economic actor "how much" it will be worth it for them to do something, so they can make an rational choice among a range of options.

The most productive use of a price signal will be if firms anticipate the economic pain caused by the signal before it gets expensive for them; once they are in trouble and overpaying for permits they will have less of an ability to make expensive long-term investments, especially if they are an emission-intensive business like power generation or cement making. With cap and trade, there may be sudden surprises in the carbon markets which will put firms into trouble even with adequate planning.



The Baroque visual style emphasized curves and flourishes, like this side table. In the area of climate policy, too many curves and flourishes in policy leave hiding places for footdragging, corruption, and unearned profits, weighing down policy when it needs to be fleet and effective. Our stylistic preferences are secondary to getting the job done.

I've already outlined how flawed cap and trade is in generating the price signal due to the [variability of the carbon price](#) that results both via auctioning and via permit trading. In both cases there will be a lot of market "noise" related to how much people think something is worth rather than what it is worth fundamentally in terms of the climate. The "how much" will be almost impossible to calculate accurately under cap and trade as conceived and as urged by climate action groups that believe in cap and trade with [all permits auctioned off](#) as the gold standard of climate regulation. This will make investment decision making tools like net present value difficult to use as you cannot calculate the negative cash flows into the future that are attributable to the carbon price. This is not because net present value (NPV) is more environmentally insensitive than any other investment tool: it's just sloppy policy-making to defeat the purpose for which you are instituting a policy! Cap and trade would have to invent its own more baroque micro-economics and corporate finance tools that will always be more inefficient and fault-prone than using a simple price signal and NPV.

So if true belief in markets and economic rationality of individual market actors is fundamental, then a [carbon tax](#) or fee that is correlated directly with the amount of carbon or global warming potential (dealing with more powerful greenhouse gases than carbon dioxide) emitted is the clearest, most predictable price signal. Cap and trade's baroque double decker market structure is like a climate policy that has been thought up by an overeager 5-year-old who gleefully stacks markets on top of markets because it seems more "market-like". Having one "meta-market" emit the carbon price to the real market for carbon emissions reduction solutions is a bad idea. An excess of markets in this case does not encourage rational economic behavior on the part of individual market actors.

## **“It’s All that We Have”: Making Do is not Good Enough**

A number of [commentators](#), [bloggers](#), and politicians critical of the state of climate policy nevertheless hang on to cap and trade. Some agree with some of my criticisms while others might find my foregoing criticisms gratuitous or simply giving aid and comfort to climate deniers. Or, even if they are frightened of the monumental hand-off of responsibility that is contained within the cap and trade system, they might feel that so much political capital has been spent on cap and trade that it must be defended as the embodiment of climate policy itself.

Below, I will suggest that in fact we have a wealth of choice in the area of climate policy, almost all of which will be more effective and efficient than cap and trade. For one, governments around the world including the Obama Administration are [taking action in other areas](#) that do not deal with carbon pricing or trading of permits or credits/offsets. You could say that governments that openly advocate a cap and trade system might be seen as also hedging their bets. Secondly, it will be fairly easy to replace cap and trade with an ensemble of different measures or a carbon tax with any number of features. If history is any guide, other countries have implemented [a carbon tax within months](#) rather than the years long efforts to install cap and trade systems.

It pains me that so many people many of them good-hearted and well-intentioned have expended political capital and reputations on such a faulty instrument. In their own defense, depending on their social scientific or business backgrounds, they could not necessarily have known differently. However, that is no reason to stay with an instrument that has a high probability of gumming up the wheels on climate action rather than speeding it up.

Before describing alternatives to cap and trade, I want to first outline what I think the tasks are that the policy needs to address. Without a common vocabulary for these tasks, stripped of bias towards a particular policy instrument, you, the reader, won’t be able to evaluate whether these are substantially better than what we have already. In most cases I am not reinventing the wheel, but simply observing and compiling what I see is out there already.

### **The Fundamental Challenge of Climate Policy**

The fundamental challenge facing governments, climate activists, green-oriented businesses, and concerned citizens is a neat intersection between a massive policy challenge and a massive political challenge of the early 21st Century. [Policy and politics](#) are not always so closely intermingled but in this case they run for historical reasons very closely together.

Instituting cap and trade rather than more effective policies is a bad idea spawned of an era in which government was [supposed to become more “market-like”](#) in all matters. We

have discovered in so many areas of life that this philosophy of government is flawed, despite continuing political disagreements around this issue in governments around the world. Our current generation of politicians got elected by taking one stance or another (but mostly one stance) on the either/or proposition of whether government or markets were “better”. Markets unregulated, as it turns out, encourage short term thinking and satisfaction of immediate appetites. Fortunately or unfortunately, to face the future threat of climate change, a revision of government’s distinctive place vis-à-vis regulation of markets and our own appetites is required.

Climate policy has the unenviable task of

1. saying “stop” to our impulses to overuse fossil fuels and overexploit the world’s forests and soils,
2. directing, under constant political attack, substantial streams of public and private investment to building a new energy and energy-use system and
3. changing our patterns of land use to fix more carbon in plants and soil.

This places government, and government is the only instrument up to the task, at loggerheads with citizens’ and businesses’ impulses to use more and more energy (and non-renewable natural resources), as cheaply as possible with a disregard for the negative consequences. While ideally such policies would enact a form of "[aikido](#)" on our wishes, using the momentum of our wants for more and better stuff to instead be used to transform society for good, there still needs to be a firm boundary and governmental “center of gravity” that is clear to all (otherwise it cannot perform aikido on anything). In the end, what is required is the return of government’s legitimate role and moral authority to set this type of reasonable limit and redirect energies that would otherwise go elsewhere.



Police are not generally appreciated for catching speeders; to get caught speeding almost always feels like an injustice to an individual driver. Still, the net effect of fairly enforced speeding laws makes driving a safer experience for all drivers. Government needs to be accorded the same legitimacy with regard to curbing GHG emissions in order for there to be an effective climate policy of any description. (Photo: Sgt. Lek Mateo)

The analogy of speeding on the highway can bring this closer to our personal experience. Without traffic cops, many of us, including myself, would drive too fast, increasing the possibility of fatal accidents; furthermore automakers have tended to put whatever mechanical efficiency gains that come from among other devices, turbochargers, into making cars more powerful and “fun to drive” than into gains in mileage. Yes, there are those of us with a conscience or without the interest in driving fast but we cannot count on these forces alone to curb fast driving, especially given the powerful automobiles to which we now have access. The police who catch speeders are not very popular but, if they avoid corruption and are not subject to absurd ideological attack, they maintain moral authority and can do their job.

Fossil fuel use (or wanton [deforestation](#)) is similar to the propensity to speed in that it offers us and our economy an easy way to satisfy our wants without regard for the long-term consequences. Fossil fuels are notably [energy dense](#) and we in most developed or in oil-rich countries do not pay nearly enough for them given their social and environmental costs. In an uncharacteristic moment of clarity within his Presidency, George W. Bush put his finger on it when he said that “[America is addicted to oil](#)”. As in addiction, only firm limits and sometimes harsh measures are able to stop the addict from re-using the drug he or she desires. The authority of government to intervene (double entendre!) in the domestic economy has been over the past 30 year undermined by [an ongoing political barrage](#) that suggests that government has [less legitimacy and moral authority than the market](#). Cap and trade is an effort to wrap government in the faux moral authority of the market, as promoted by the market fundamentalist creed of the last 3 decades. The market unregulated, as it turns out, is [amoral](#), not caring that much about long term consequences. Markets are not “bad” or essentially immoral, they just are tools that lately have been called on to do tasks to which they are ill-suited. As even [Alan Greenspan now attests](#), they have been fundamentally misunderstood most notably by him and by many others.

Especially in the US but also abroad, governments, in order to do their work, must re-establish moral legitimacy in many areas of domestic policy which have been thrown into question by our decades-long experiment in [market fundamentalism](#). The substance of the politics surrounding cap and trade is largely about the moral authority of government to restructure our energy system and secondarily about [the legitimacy of natural science](#). The content of this moral legitimacy is that government can when functioning well, represent the general or common interest in making and enforcing rules, collecting taxes, and spending that revenue for the purpose of maintaining and improving the future viability of the nation. Even more so in the area of climate change, which will mean over a period of a decade or two, dramatic changes in at least three sectors of our economy, governments’ moral legitimacy needs to be well established to effect whatever policy is chosen.

Cap and trade's "prospectus" (a.k.a. political sales pitch) suggests that government can after declaring a "cap" essentially recede into the background, while the "hand" of the permit trading market does its work. Its superficial political attraction is that it reinforces the pre-existing "rap" that government is "bad" or ineffective and the market is "good" and effective. However, to work in any shape or form, climate regulation and policy, including cap and trade systems such as they are, is going to need government action in spades. So, cap and trade sets up its advocates for a long-term political defeat: even if a weakened form of it passes, people will ultimately start to wonder why there is so much government involved in cap and trade (and so ineffectually at that). Maybe its advocates believe that "people know" that cap and trade is really just another government regulatory program and won't feel betrayed; given [the state of civic understanding of government's role](#), I believe they are sorely misinformed.

Ultimately the leaders of government(s) are going to need to take responsibility for protecting their people and the environment from substantial degradation via curbing our own emissions of greenhouse gases. The language and parallel institutions of cap and trade interfere directly with the process of by which government leaders would take responsibility, suggesting that automatic processes will "take care of themselves" via the invisible hand of the carbon permit market. I have demonstrated that such an invisible hand will play tricks with the policy itself compromising its effectiveness. Both the policy in its pure form and even more so efforts to curb its tendencies will create a baroque structure that does not work directly and efficiently on the basic tasks that are required to reduce carbon emissions rapidly within a decade.

### **The Basic Elements of Climate and Energy Policy**

To open up the field of alternatives to cap and trade, as well as understand cap and trade better in context, we need to understand what the generic tasks of any climate and energy policy would be. A comprehensive climate and energy policy has most of these elements independent of policy instrument choice:

1. Disincentives for (or rules against) the use of fossil fuels, leading either immediately to switching to virtually carbon neutral fuels/energy sources or vastly more efficient use of fossil fuels prior to switching to carbon neutral energy.
2. Incentives for private investors to build carbon neutral electric generation and carbon-neutral energy storage as replacements for fossil electric generation.
3. Incentives for vastly more efficient energy use of all types in transportation, buildings and industrial processes (or conversely disincentives to "waste energy").
4. Provision of or facilitating the financing of site- and regionally-specific public goods that lead to carbon neutral energy use (electric transmission, electrification of railways, build out of railways, electric vehicle recharging networks).

5. Revenue sources for financing public goods and incentive programs that enable a society to cut emissions.
6. Incentives for maintaining and increasing carbon sequestration in land use in agriculture, silviculture and in forest preserves.
7. Disincentives for (or rules against) the release of sequestered carbon in land, vegetation, and sea.
8. Reduce black carbon emissions via introducing emissions controls or alternatives to biomass combustion or other black carbon sources.
9. Develop, identify and institute standards for lower- and zero-emissions technologies and processes.
10. Generate regional and national plans based on better and best practices to curb emissions
11. Fund basic climate and energy research

There is no single policy that does all of these tasks well nor will some policy package address all of them. We see that cap and trade is an attempt to address a number of them with a single instrument, most particularly numbers 1, 3, 5, and 6. As we have indicated cap and trade's inherent laxness and unclear carbon price signal interfere with 1 and 3 (energy efficiency, fuel switching, and restriction of fossil fuel use). It does offer to join these efforts with 6, which has spurred interest in the developing world. Again there have been [difficulties](#) in establishing whether funded carbon sinks/offsets needed the funding and also run into problems with 7, the release of carbon once sequestered. Would development projects need to pay the money back if the forest they are leaving to grow is cut down by them or someone else?

The temptation of policy makers, in their first take on a climate policy to lump a number of concerns together is understandable, especially if climate policy, in relative terms, has been a low priority. However cap and trade has been extremely cumbersome to set up and ineffective or marginally effective in each of these areas with a high probability of continued problems given its long list of inherent flaws. Moving to or at least seriously considering any one of a number of alternatives is advisable given cap and trade's ability to block other policies and clog governmental channels. Furthermore translating our thinking about climate into its terms limits our ability to imagine other scenarios that will work much better. In every one of these categories there is a more effective instrument than cap and trade, meaning that we of necessity must move to a multiple instrument platform because of cap and trade's lack of effectiveness as well its (and any instrument's) lack of comprehensiveness.

I will offer here (in the next part) two main directions, one mainstream and the other "heterodox", that both will achieve more quickly and easily emissions reductions than cap and trade.

### **Part 3: A More Effective Alternative – A Comprehensive Carbon Policy Based on Carbon Tax**

*In [Part 1](#), I offered a critique of cap and trade in its existing implementations and located key flaws which make it highly unlikely that it will achieve its emissions reduction goals, even if somehow it is strengthened. [In part 2](#), I highlighted two problematic aspects of cap and trade and then went on to examine what are the fundamental challenges of climate policy. Then I offered a list of the general features of any effective climate policy.*

Turning to positive solutions rather than criticisms, I will offer here two main options, the first one mainstream and the second heterodox and project-based; both of which are easily configured for quicker and more certain emissions reductions than via cap and trade.

#### **Comprehensive Climate and Energy Policy Package with Carbon Tax/Fee**

Climate policy has emerged with a focus on markets and changing market behavior (ignoring infrastructure development to a large degree), so the “mainstream” approach below would also transparently give responsible parties control over the process. While the “one-stop shop” aspect of cap and trade overextends this already misapplied policy, a package of interacting measures that are, with fairly straightforward calibrations, guaranteed to cut emissions quickly can easily be put together. The below policy package avoids handing off climate and energy policy to an unaccountable carbon market and invite undue influence by financial traders. It also has the potential to be much more effective than a cap and trade centered policies. On the other hand it is "market-based" in that it relies on the more accurate carbon tax/fee price signal to shape market behavior rather than cap and trade's muddy signal.

1) **Emissions-Reduction Path with Targets:** Set an emissions-reduction path with target goal posts (2015, 2020, 2025, etc.): Not the reassuring “cap” metaphor but an analog to the cap without the false reassurances that it contains. The target or path could be expressed in terms of an average carbon-intensity for economic activity that yields the same path. Using a carbon-intensity target allows adjustments to be made so efforts to cut emissions do not shut down industries before they are able to transition to lower carbon alternatives. I would recommend [the "emergency pathway"](#) as defined by Greenhouse Development Rights that uses the 350 parts per million carbon dioxide target, though others may object to its ambitious goals.

2) **Carbon Fee or Tax:** Set a carbon price in the form of a [carbon fee or tax](#) fixed but rising year by year that will, according to at first estimates and then experience, reduce emissions along the path. If the tax does not yield the necessary cuts, increases in the

tax/fee levels will be accelerated. A tax or fee enables companies to calculate the value of carbon emissions and make the actual investments that will cut emissions rather than deal with a broad range of expected carbon permit values, as would result from cap and trade.

- a. **Calibration** - A carbon tax would be calibrated to achieve the emissions targets along the path in bullet "1" though overachieving will be encouraged. If tax levels inflict damage on economic well-being or capacity, tax levels may be reduced, though it is to be expected that there will be periods in which some economic pain will be inflicted by the tax to encourage better economic decision-making and innovation. Expectations need to be set from the outset that some pain is involved in transitioning to a more sustainable economy, though excessive pain is to be avoided.
- b. **Revenue stream** – There are [arguments among tax/fee advocates](#) (as well as [cap and trade advocates](#) for the revenues from permit auctions) about where the revenues should go. Here are my recommendations:
  1. One third of the carbon tax revenues should be used to dampen the effects of the costs of rising energy prices on the poorest, preferably via energy efficiency upgrades to housing (modeled on weatherization programs).
  2. One third should be used to help fund infrastructure that enables a zero carbon future (electric trains, electric transmission)
  3. One third will go into a international carbon trust which will fund development products, changed agricultural practices, forest maintenance and growth efforts with strict performance standards and baseline assumptions.
- c. **Exemptions and Credits** – Some argue against any exemptions and credits, seeing a flat tax as simpler. However, I, as an example, believe taxing certain activities that cut carbon is counterproductive. Additionally I want to show that it is possible to develop and regulate cross-border certified emissions reduction credits in a tax system if such a credit sub-system ends up being desirable. I believe however that these necessary accommodations to the complexity of the situation are much more transparent and can lead to more productive dispute resolution than via the arcana of the trading system.
  1. It makes no sense to levy the full carbon tax level on the very infrastructure projects that lead to carbon neutrality. If a construction project embeds fossil emissions in a zero-emission technology (electrification of a train system, renewable energy infrastructure), then the emissions from construction equipment or concrete making for that project should be at least partially exempt. Alternatively there could be a percentage exemption depending on the level of carbon reduction achieved (coal to natural gas conversions).

2. Just as with the current offset market it might be made possible to sell certified emissions-reduction credits that represent emissions reductions in other areas or other countries. These credits would need to be rigorously certified and limited to only a certain fraction of carbon tax liability.

3) **International Agreements** - Utilizing existing international institutions, nations around the world can come to agreements on both monetary fees for carbon emissions and overall emissions reduction targets. The addition of a monetary amount will force action by governments and businesses more rapidly than the abstractions of the carbon market. Agreements will focus on:

**a. Worldwide Emissions Targets and Path**

b. **International Carbon Price(s)** - Calibrated to achieving emissions targets, the international carbon price will be closer to actual microeconomic decision-making than permit pricing system of cap and trade. Choices are either a unitary price or a development-adjusted price depending on level of development. Some countries may be more “entitled” to pollute given their lesser historical contribution to total atmospheric concentrations of carbon. On the other hand, despite an “entitlement” to pollute more, some developing countries may want to go “cold turkey” and use the higher carbon tariff of the developed countries to spur sustainable development at home.

c. **Carbon tariff regime** – with differential taxation in different countries, countries would [levy tariffs](#) upon importation either up to the amount of the unitary international carbon price or up to the amount of the development-adjusted carbon price. While this contradicts “free trade” orthodoxy, under an international agreement there should be no problem in levying this type of tariff. The WTO can be outfitted to handle disputes and generating agreements carbon tariffs and integrating climate policy with trade.

d. **International Standards and Best Practices** - Agreement on standards, certifications, and grading systems for energy efficiency and low emissions technologies (see below)

4) **Zero-Carbon Infrastructure Development**– While the Obama Administration has embarked on pieces of this, a full-scale climate policy would front-load spending, including deficit spending, on building zero-carbon infrastructure and energy generation. The main source of funding would come from tax revenues and use fees. This area is largely neglected by the cap and trade instrument.

a. **Renewable Energy Supergrids and regional grids** - Link high renewable energy areas with demand centers via development of a HVDC and where appropriate high voltage AC transmission.

- b. Renewable Energy Zones - Expedite environmental impact studies for high value renewable energy zones with strong sun, wind, geothermal resources.
- c. Feed-in-Tariffs - Funding of private, community and household investment in renewable energy generators via clean energy surcharges to electric bills.
- d. Electric Freight Transport System
  - 1. Grade-separate and improve existing freight railbeds
  - 2. Add additional tracks to high traffic railbeds to allow more rail freight
  - 3. Electrify all high and moderate traffic rail routes
- e. Electric Passenger Transport System
  - 1. Build high speed rail backbone
  - 2. Enable improved track-sharing between freight and passenger traffic for lower-traffic routes.
  - 3. Build electrified bus and tram routes in high density/high-traffic city environments.
- f. Electric Vehicle Recharge Infrastructure
  - 1. Trickle charge (220V and lower) public charge network
  - 2. [Battery-swap](#) infrastructure
  - 3. Fast-charge (480V and higher) public charge network

5) **Best Practices, Certifications, Standards and Rulemaking**- Develop for most economic sectors, a set of best practices and standards that are based on cutting emissions as well as other elements of sustainable development (conservation of the earth's natural wealth). Standards would be either voluntary or mandatory depending on the level of imposed costs of meeting these standards by market participants and the existence of alternatives to meet the overall goals of the standards. Rigorous standards like the passive house standard should be encouraged as well as graded standards that represent a "path" to carbon neutral solutions. In certain vital areas, standards may become laws to rule out certain practices that are simply unacceptable. An example of the latter could be a [moratorium on new coal power plants](#).

6) **International Afforestation Program** - Using revenue streams from carbon fees and tariffs, generate local solutions to maintaining living biomass. Carbon taxes or other disincentives may be levied on activities that release excess carbon into the atmosphere.

7) **International Agricultural Carbon Sequestration Program** - Using revenue streams from carbon fees, incentivize low-emission, high sequestration variants of agriculture and food practices. In the future, once a baseline for carbon sequestration may be achieved, carbon taxes may be levied on high emission forms of agriculture.

8) **Black Carbon Reduction Program** - One of the more tractable climate problems though still a challenge is to introduce existing emissions control technology or [develop alternatives to combustion](#) of hydrocarbons and biomass that produce soot or black

carbon. We already have most of the technology to limit soot emissions from internal combustion engines and factories. More challenging is coming up with culturally-acceptable solutions for cooking with wood in less developed countries.

9) **International Technical and Scientific Cooperation** - Create the equivalent of an international energy and climate research fund that supplements the work being done on national levels towards specific technical solutions to emissions. Could develop in conjunction with IPCC WG III. One area of research should be emergency measures like [geo-engineering](#).

If adopted as a package, the above measures address all 11 generic elements of carbon policy and have none of the 10 drawbacks of cap and trade. This approach transparently identifies governments as the responsible parties for reducing carbon emissions. This comprehensive climate and energy policy does not interfere with their ability to respond to changing climate circumstances and removes unaccountable financial markets from the core of climate policy.

## Part 4: A (Heterodox) Project-Based Alternative to Cap and Trade

*In the first two parts ([part 1](#) and [part 2](#)) of this post, I discussed cap and trade as well-intentioned but a fundamental misapplication of the permit trading policy framework. I also went on to identify 11 basic elements of any climate policy regardless of instrument. In [the third part](#), I describe a package of mostly familiar policies that integrated together will have a far more profound effect on emissions than the cap and trade system. In this, the last part, I offer a second alternative to cap and trade which I believe is the most aggressive and secure approach to cutting emissions, though does not exclude elements of the package in part 3.*

### **Project-Based Carbon Mitigation Policy (PCMP): A Heterodox Climate Policy Framework**

I've redesigned an approach that is not entirely new but has been sidelined in current high-level climate and energy policy discussions. I'm calling it Project-Based Carbon Mitigation Policy– PCMP. Instead of or in addition to starting with an abstraction like a carbon price, PCMP starts [with specific large-scale regional, national or global projects that with greater than 95% probability](#) will cut emissions substantially within the next few years; these projects implement technologies and processes that are known to directly replace fossil fuel use, directly reduce demand for fossil fuel or, with some agreed-upon degree of certainty, sequester carbon emissions. A goal and timeline are set for the reductions based on the implementation of that technology or process then PCMP reverse-engineers the economic and social policies that will enable the project to take place in a timely manner. PCMP does not exclude nor discourage the use of abstractions like price mechanisms and society-wide or global targets but it starts with the security and relative certainty of projects that are technology- and process-based, supervised by some responsible party or regulator, and funded. PCMP may end up being a route to a set of policies very much like the Comprehensive policy discussed in Part 3. A PCMP policy approach also openly acknowledges the role of government leadership in achieving carbon emissions reduction goals, an attitude which has been shunned in recent history in the US and elsewhere.

Viewing projects as the fundamental element of policy also allows necessary supporting infrastructure that facilitate many types of emissions reduction to become the object and focus of high-level climate policy. Build out of the electric grid and electrification of transport are key to a zero emissions industrial/post-industrial society though, due to the variable carbon intensity of electricity production their exact contribution as separate individual projects cannot be quantified. A combined approach linking low- or zero-

carbon electrical generation with electrification of transport would qualify as PCMP projects.

Carbon mitigation projects based on tested technologies and processes are the only assured means of cutting emissions, along with their supporting infrastructure. Carbon pricing may influence projects to be initiated but the projects themselves are the primary building blocks of policy. The focus on what might be called “secondary” or tertiary levels of climate policy has, in my observation, interfered with or at least obscured the importance of these primary on-the-ground projects.

The most directive end of the PCMP project spectrum would be a government program, funded by tax revenue, that uses "command-and-control" to push through a project that is vital to our ultimate survival as a society implemented either by government contractors or via government employees. On the other end of the spectrum in terms of directiveness are rulings, changes in tax law, and the institution of technology and process standards that will tweak existing market behavior. A PCMP project will have a target emissions reduction by a certain date; optimistic goals should be shunned in favor of “worst case” scenarios to ensure that goals are met or exceeded. Incentives should be aligned for the project leaders, whether they be public or private employees, if they achieve or, better, exceed emissions targets.

Many existing government programs in the area of environmental protection already are project-based policies in that an existing technology, set of technologies or process is chosen for implementation but, to date, not taking the next step to target specific carbon emissions reductions. In the US, we have a number of [house weatherization programs](#) including a grant program for low-income homeowners and rebate programs for other homeowners. To convert these into PCMP programs, one would need to make specific greenhouse gas mitigation goals and a timeline, tuning the policy instruments to achieve these reductions along the stated time line. However, the notion behind the PCMP concept is that policies that support one or another project may be generalized to a sector-wide or economy-wide policy or have knock-on effects. National policies or international agreements would be “reverse-engineered” to support key projects as priorities.

### **Project-based Policy, Infrastructure and Synergies between Technologies**

The building of new infrastructure or its supervision, key to carbon mitigation, [almost always falls to government](#), which undertakes the building of infrastructure on a project by project basis. The emphasis on market solutions to climate change, which focuses on influencing the decision-making of individual market actors ignores the fact that most infrastructure is built by government planning and programs that anticipate rather than respond to economic demand. One way to understand the sequence of events in building

infrastructure is perhaps best summarized by the line: “[build it and they will come](#)”. Within this Hollywood formulation, what is captured is the ability of physical infrastructure to create or support markets as well as influence behavior beyond the influence of prices and goods for sale.

The carbon price signal, either the clear carbon tax version or the muddled cap and trade variety, will not by itself initiate the building of new infrastructure in a timely manner, especially if we consider the politically likely (low) level of the carbon price in the next few years. Even if we look to the history of infrastructure for market behavior shaping infrastructure (“[Go West, young man](#)” and the US railroads), in the face of catastrophic climate change we are looking at an accelerated implementation of new infrastructure as replacements for serviceable but polluting infrastructure, requiring a pro-active government role that anticipates rather than responds to trends and price signals.

In addition, basing policy on or limiting policy discussion to carbon pricing alone has been a way to say: “[we don’t know what the solutions will be](#)”. However, besides ignoring the key role of infrastructure, this is, at this point in history, disingenuous and more importantly time-wasting. As I have pointed out in [two posts](#) I wrote over a year ago, we now have about 24 technologies or processes that together could cut carbon emissions by at least 90%. These technologies and processes ranged from [CSP with storage, internetworked wind power with hydroelectric storage, transport electrification, afforestation](#), to even [voluntary \(partial\) veganism](#). Eventually much celebrated technologies like [building-integrated photovoltaics](#) will also play a major role. Other, more “traditional” climate policies that may be established more generally like a carbon price may aid the implementation of a PCMP policy but the combination of a carbon price and PCMP projects will achieve emissions reductions most rapidly. The project-based approach starts with a core of concrete intended outcomes in the way of realized projects but then welcomes and expects follow-on effects both from the realization of these projects and from the facilitating generalized policies like a carbon tax or fee.

Many of the gains associated with the most powerful of the 24 technologies, with a couple exceptions, are based on synergies between different technologies, not the solo implementation of those technologies. The impact of electric vehicles on total emissions varies a great deal depending on the type of generation that is used in a particular area of the globe. A carbon price will help urge this process on but will not of itself incentivize the creation of these synergies.

In renewable electricity generation there are some synergies between technologies, for instance between hydroelectric storage and wind power, which would need to be integrated in a planned manner across numbers of jurisdictions. These synergies between technologies can only be realized rapidly via integrated resource planning with adequate

financing. Grid operators have already engaged in [integrated resource planning](#) anyway throughout the over 100 year history of the electric grid. Linking this planning with carbon mitigation is a step towards the PCMP policy framework.

## **Prospective PCMP Projects (US)**

### ***PCMP Example #1: CSP with Storage***

One of the few standalone, scalable renewable energy technologies that can directly replace fossil electricity generation one-for-one is [Concentrating Solar Thermal Electric Power](#) (CSP) with thermal energy storage (TES). With sufficient transmission and judicious siting, [CSP with storage could supply almost all the world's energy](#) using a small percentage of the area of the world's deserts. [DESERTEC](#) which is a large CSP investment and policy project for Africa, the Middle East, and Europe, could be configured as a PCMP with specific targets for replacing fossil generation.

The example PCMP project below applying CSP with thermal storage provides close to certainty in emissions reductions and can be accelerated with increased funding. This contrasts dramatically with the lack of control over emissions under carbon pricing alone inclusive of cap and trade with its false “certainty”. Effective carbon pricing would catalyze this type of development but would not “cause” it as would a targeted program focused on implementation of the technology.

#### ***CSP with TES - American Southwest/West of Mississippi***

**Region:** 6 US States (California, Arizona, Nevada, Utah, New Mexico, Texas) – Replace Energy Production in 19 Western US States.

**Emissions Reductions Source:** Replace fossil electricity production by specified gas and coal power plants by 241 million MWh/annum by 2020 in the WECC, SPP, MRO and ERCOT grids (50% natural gas/50% coal) without addition of new fossil generation. By 2030 replace 1200 million MWh/annum fossil generation in NERC.

**Technology:** Concentrating Solar Thermal Electric Power with Storage (Capacity factors from 35% to 70%) - 50GW installed by 2020, 250 GW installed by 2030 – mean capacity factor >50%. Formation of CSP industrial base to replace fossil generation.

**Target CO2 Emissions reductions from 2007 baseline:** 181 million metric tonnes CO2/annum by 2020, 905 million metric tonnes CO2/annum by 2030.

**Finance mechanisms:** guaranteed \$.10/kWh rates (inflation adjusted) for 20 years for electricity sales plus  $\$(2 + \text{capacity factor}/.25)/W$  (2010-2013),  $\$(0.5 + \text{capacity factor}/.25)/W$  (2014-2017),  $\$(\text{capacity factor}/.50)/W$  (2018-2020) innovation grant funded through carbon tax/fee (adjusted for the effect of the [30% Investment Tax](#)

Credit). Favorable tax treatment for mothballing and early retirement of fossil generation.

**Project Team:** US DOE responsible leading industry stakeholder committee (US EPA, Fish and Wildlife, plant developers, utilities, grid operators, state and local political leaders, environmental advocates).

**Supporting national and international policies:**

1. Carbon tax/fee facilitates implementation.
2. Infrastructure: Renewable energy “smart”/supergrid
3. Guaranteed Rates for Renewable Energy
4. Contracting with Stakeholders for Greenhouse Gas Reduction Targets
5. Special Master to Determine Compensation for Retired or Semi-retired Fossil Power Plants

**PCMP Example #2: Combined Renewable Energy Power Plants**

A combined renewable power plant connects a diverse set of renewable generators that together produce electricity according to the demands of grid operators and ultimately grid users. More complex than CSP with storage, this technology is still emerging though simply a matter of organizing existing technologies via smart, renewable-energy oriented transmission network.

***Combined Renewable Power Plants – US***

**Region:** All US States (can be generalized to almost any region of the world)

**Emissions Reductions Source:** Replace fossil electricity production by specified gas and coal power plants by 241 million MWh/annum by 2025 in NERC grids (50% natural gas/50% coal) without addition of new fossil generation. By 2035 replacing 1200 million MWh/annum in NERC.

**Technologies:** Wind, Solar (CSP, PV), Hydroelectric/Geothermal, Marine/Wave Energy, Biomass, internetworked generators to load centers, "smart" grid management technologies.

**Target CO2 Emissions reductions from 2007 baseline:** 181 million metric tonnes CO2 by 2025, 905 million metric tonnes CO2 by 2035.

**Finance Mechanisms:** Bundled wholesale feed-in-tariffs with performance bonuses based on load-responsiveness of combined renewable power plants. Amount of tariffs as yet undetermined and would vary with renewable resource intensity.

**Project Team:** US DOE responsible leading industry stakeholder committee (US EPA, Fish and Wildlife, plant developers, utilities, grid operators, state and local political leaders, environmental advocates).

### **Supporting National and International Policies:**

1. Carbon tax/fee facilitates implementation.
2. Infrastructure: Renewable energy “smart”/supergrid
3. Guaranteed rates for renewable energy/[feed-in tariffs](#)
4. Contracting with stakeholders for GHG reduction targets
5. [Special master](#) to determine compensation for retired or semi-retired fossil power plants

### **PCMP Example #3: Home Weatherization**

The US Department of Energy has a goal of weatherizing over 1 million homes as part of the 2009 American Recovery and Reinvestment Act, a.k.a. the 2009 stimulus package. [This investment of \\$8 billion dollars](#) is divided between \$5 billion for grants via the states to weatherize homes of low-income homeowners and \$3 billion dollars for rebates to other homeowners for weatherization upgrades to homes. The low-income grant program will limit grants to \$6500 worth of work per home.

[A review of the standard weatherization packages in 2002](#), indicates that the full package that would cost in the area of \$5000-\$6500 could cut from up to 7.5 metric tonnes of carbon emissions per year per house in high emissions/high heating demand areas like the Midwest, in particularly inefficient houses. In areas with lesser heating and cooling demands, like the Western US, the savings would be maximally 2 tonnes for an inefficient older, small single-family dwelling but the price tag would only be in the order of \$2500/home.

However looking at the components of these packages there are certain measures that have much higher carbon reduction return on investment than others, most notably air sealing, programmable thermostat installation, water heater resets, low flow shower heads, and compact fluorescent lighting. An additional reduced package of these high impact measures would cost from \$1000 to \$1500 per home leading to emissions reductions of about 2 metric tonnes on average, to as many as 3.4 metric tonnes. It is possible to design then a “rapid” first-pass program of reducing emissions that would triple or quadruple the number of homes visited per unit expenditure. Later, a second program could revisit these homes to address the remaining issues like inefficient refrigerators, furnaces, insulation and water heaters that have substantial returns in reducing carbon but are more expensive.

In a few years time, we may have better measures based on among other things [passive house technology](#), which may enable "deep energy retrofits" of existing houses that

enable greater energy and emissions cuts with similar or lesser investment. In these cases, PCMP projects such as this one can revise their targets upwards.

### ***Accelerated Home Weatherization Program with Carbon Targets***

**Region:** All US States (start with high heating/high cooling areas)

**Emissions Reductions Source:** Reduce domestic combustion of fuel oil, natural gas, reduce domestic demand for electricity, especially at baseload.

**Technologies:** Building envelope air sealing technologies, insulation, high efficiency fluorescent lamps, refrigerators, water heaters, furnaces, programmable thermostats.

**Target CO2 Emissions reductions from 2007 baseline:** 60 million metric tonnes by 2020 from 30 million homes, 120 million metric tonnes by 2030 from 60 million homes.

**Finance Mechanisms:** Tax revenues fund low-income homeowner/renter grants (up to \$6500 per home) and consumer rebates for energy efficiency upgrades.

**Project Team:** US DOE and state weatherization programs, utility officials.

### **Supporting National and International Policies:**

1. Carbon tax/fee funds and facilitates implementation.
2. Contracting with stakeholders for greenhouse gas reduction targets
3. [Decoupling investor-owned utility income](#) from energy sales
4. National and [state mandates](#) for energy efficiency
5. [Green building](#) and energy efficiency certifications/[standards](#)

A PCMP project once it is approved, organized and financed can move immediately to the generation of detailed design, operational plans and the begin of construction or implementation. The reverse engineering portion comes in figuring out how to get to the point where the technologies or processes can be implemented. The key difference between a PCMP (aided perhaps by other policies) and a policy that essentially remains entirely agnostic about solutions is that a PCMP adds a stated intention and tasks a skilled project team to achieve a concrete material change in the processes that generate greenhouse gases. Then policy is built partially around that intention and the project team that is tasked with realizing that intention.

The PCMP approach is I believe the most aggressive and gives those who will be ultimately held responsible for protecting the climate, the world's governments, maximal ability to accelerate efforts if needed. To achieve the very ambitious 350 ppm goal and [follow the "Emergency Pathway"](#), the PCMP approach would have the best chance.

## **Good Intentions Alone No Longer Suffice**

Cap and trade has been a convenient mechanism for politicians to avoid fundamental but necessary conflicts while giving themselves and others the impression that they are “doing something” about climate change. As the first international climate policy, it has attracted a community of people that have seen it as the sole alternative to inaction, therefore undeservedly has become a magnet for the good intentions of both the uninformed and the somewhat-better informed. The “cap” is a reassuring physical metaphor that suggests a level of control over emissions which, as I have demonstrated, the policy itself undermines. As cap and trade appears to address 5 of the 11 domains of climate policy, it is seductive for politicians to try to set up a “one stop shop” as a means to address the climate and energy problem.

However, there are much better policy frameworks out there of which I have shown two examples. Cap and trade’s fatal ability to insulate the ultimate decision-makers from the process of pushing for emissions cuts on the ground can be avoided in a number of ways. Above, I demonstrated a project-based policy framework that I called PCMP, which builds policy from the ground up and puts at the center the key role of developing zero-carbon infrastructure in addition to price-based instruments that influence investment and behavior. Or, in part 3, I showed how it is possible to implement a nine-part composite of simpler but synergistic policies that is more flexible, will be more effective, and ultimately more comprehensible to the public at large than cap and trade. Crucially this set of policies does not give away or obfuscate governments’ responsibility to protect society and the environment.

The cap and trade policy is a twisted remnant of a political era in which government was supposed to pretend that it wasn’t really government. It has fooled no one except some of its supporters. Government must be decisively and centrally involved in the implementation of carbon policy and there must be a rapid re-discovery of the value of good government in leading society through difficult times. Furthermore cap and trade as an instrument contains within it an open invitation for corruption and “capture” by powerful financial interests with few incentives to make concrete investments in the energy or land-use future. Any effective climate policy must establish clear guidelines and openly acknowledge government’s supervisory role in the transition to a new energy economy. I wish there were more shades of grey in this regard, but there aren’t.

No set of policies is, however, a magic bullet if there is not strong popular support for decisive action on climate and popular acknowledgement of the necessity for government’s leadership role. As it currently stands in the United States, the public still is woefully misinformed about climate, with for instance, a prominent pair of columnists for the New York Times perpetuating “global cooling” myths in their latest book. Against this background, climate policy appears to be a partisan affair rather than

actions of the human community as broadly defined as possible that are based on our best science. If cap and trade is presented as the only alternative, this further undermines the cause of climate action and government responsibility because of the fundamental flaws in the policy. The equation of cap and trade with good intentions on climate action must be irrevocably broken.

Ultimately, political leaders must campaign with passion for the future of our planet and our societies, with empathy for the economically downtrodden and dispirited, informing the public about the alternatives available to minimize the impact of our two century fossil fuel bacchanal. Within the context of a better informed citizenry, only then can an effective climate and energy policy truly take effect, though the time to start on both campaigns is now.