BC>AD>PC

PC - The *Post Carbon Age*

a solution

www.thepostcarbonage.com

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Section I – What are our aims?

- As we all know, global warming is here, it is progressive, its everywhere – so by definition:
- It **IS** a **WORLD problem**
- It's principal cause is excess anthropogenic CO_2 resulting from energy created by the **combustion of "*Free Burn*[1]" Hydrocarbons (HCs)**

But paradoxically, HC energy is our most concentrated source of natural energy and has been a boon to human civilization

❑*NOTE 1: Free Burn* Hydrocarbons are those which are used to produce energy with consequential uncontrolled release of CO2.

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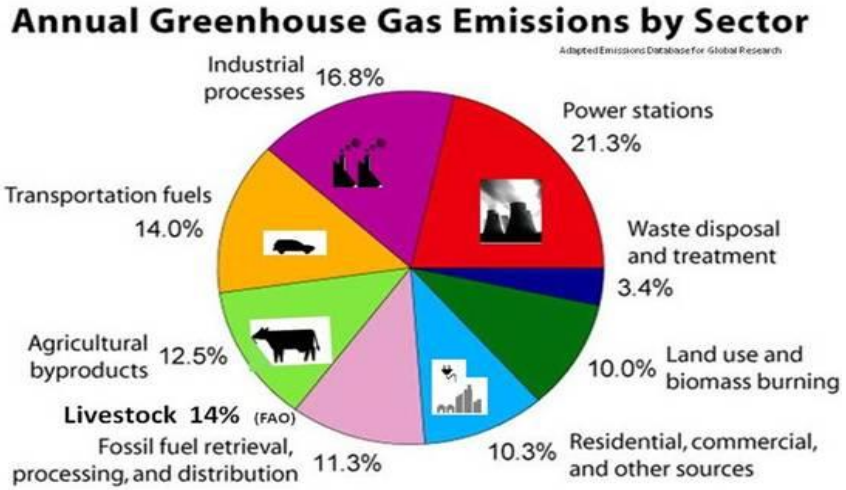
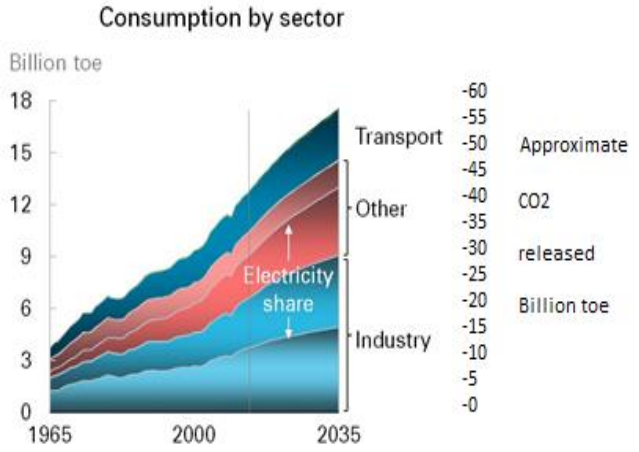
Section I – What are our aims?

We are all familiar with the WORLD EMISSIONS graph:





and …..the world's energy appetite is growing.

Hydrocarbon (HC) combustion produces the lion's share c.70% of world greenhouse emissions and they are going UP!.

To date, we have tried to control this by directly focusing on the amount of CO_2 emitted. **THIS IS NOT WORKING!**

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Section I – Critical Aims

Going back to basics, our CRITICAL AIMS are

1. To reduce WORLD CO2 emissions to a **tolerable level** [1]
2. To do so across the WORLD in an **acceptable time frame** [2]
3. To do so on a **long term & sustainable** basis that does not rely on the **public purse**
4. To do so at an **energy price** that the WORLD population can realistically meet and accept
   and…
5. To ***not*** be sustained by **competitive, discriminatory and inflationary** impositions of **taxes and/or subsidies** by world governments (i.e. real competitive prices)

NOTES 1 & 2 WORLD Science has to be the arbiter

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Section I – To meet the **Critical Aims**

 # 1 – Projects must be **INVESTABLE** (i.e., able to attract ***commercial investment***) without recourse to gov't aid.

In which case the overall ***scheme*** must also:

- be ***Free market*** driven,
- have minimum **bureaucratic/government** involvement,
- be **Transparent & Auditable**,
- have the **Smallest *scheme* structure**, with fewest entities needing to be controlled,
- be the **Least costly** to administer and therefore have very **Low overheads**

Any chosen ***scheme*** must be evaluated by its ability to accomplish them:

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Section I – The story so far

Directly controlling/reducing the amount of ***CO_2 emitted*** by countless industries in every county in the world is inherently:

- Loss making (there is no commercial benefit per-se from reducing CO_2)
- Cumbersome and expensive.
- Divisive in its application to each ***consumer***, each ***industry*** and each ***country***

So controlling CO_2 does not address our ***critical aims*** *nor* the means for their accomplishment.

NOTE: Electricity generation has been the main target to date but it creates only 21% of anthropogenic CO_2 so it is not the only emitter – even if it was totally successful, there is still a long way to go.

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Section I – The story so far

Over the past >10 years, two fundamentally different methods have been attempted to directly control CO_2 emissions:

A. **Subsidising Cfree energy:** by use of (divisive and publically provided) direct subsidies to **decrease** energy costs/prices for specific projects.
B. **Taxing or Charging HC energy producers** These, such as Carbon tax or ETS, aim to **increase** the cost/price of HC energy to allow Cfree energy to compete.

- **Cat. A** methods have sometimes achieved some investment
- **Cat. B** methods have yet to promoted a single Cfree investment. These are doomed to continuing failure.

There must be a better way……

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Section I – The story so far

What we have tried so far – **Cat. A**:

Direct subsidies *have been the only methods so far that have achieved any investment – but at a large public cost.*

For political/consumer acceptance reasons, the baseline adopted for **subsidised energy price** competition has been as close as possible to the current cost of **"free burn" HC** but **"free burn" HC** at any appreciable scale is doomed to eventual extinction (see later).

So, if we continue on this basis, we will be left with the frightful result of low energy cost/price across the board ----- all **subsidised by comparison with a non-existent historic competitor**!

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Section I – The story so far

What we have tried so far – **Cat. B**:

- **Carbon taxes & ETS schemes BOTH** impose, ***at the whim of governments,*** huge costs upon participating economies.
- This economic "hit" occurs **many years (c.10) before** the very first reduction in CO_2 would be achieved from ***any*** resulting investment into ***Cfree*** competition.
- **EU ETS in addition** is logically flawed and can't work for a number of other fundamental reasons (its market is flawed & its market is flooded).

Carbon taxes & ETS schemes interfere with the normal working of the energy markets:

They deter the vital ingredient - - - -

***- - - - investor* engagement [INVESTABILITY]**

So far, neither Carbon taxes nor ETS has single handedly promoted a single Cfree investment.

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Section II - Problems with the status quo

What we have tried so far – **Cat. B**:

1: Carbon tax & ETS

Carbon tax or ETS applied to **HC energy** is able to remove the competitive imbalance with *Cfree* energy and **provoke investment**.

BUT only if:

A. If the post-tax (or ETS permit levied) selling price of HC energy rises to the price of *Cfree* energy - the ***price tipping point*** and
B. And if this ***tipping point*** price is somehow ***guaranteed*** to be maintained at that level until the investment has matured,
C. It wasn't based on gov't printed tokens.

Otherwise, this is not an investable proposition

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Section II - Problems with the status quo:

What we have tried so far – **Cat. B**:

1: Carbon tax & ETS

The WORLD would also be paying the price in energy bills well before any environmental benefit:

- **Some 10 years** before the **first emission reduction** is achieved and
- **Up to 35 years** before it received **all of the environmental benefit** for which it has paid.

Both of these would be very inefficient economic undertakings.
Their economic cost is c. 20 times (NPV_{10}) the cost of subsidising individual investments as they happen.

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Section II - Problems with the status quo

What we have tried so far – **Cat. B**:

2: Emissions Trading Schemes (ETS)

As well as sharing some of the problems of carbon taxes, Emissions Trading Schemes (ETS) are ***actually worse than carbon taxes.***

Over the last ten years:

- ETS schemes, (such as the much-vaunted EU ETS) have never incentivized a single *Cfree* energy investment.
- They are racking up government receipts and increasing energy costs wherever they exist and the EUA market is illogical and cannot work.

We have an elephant – and it's still in our room!

[Discussed in detail at the end >slide 37]

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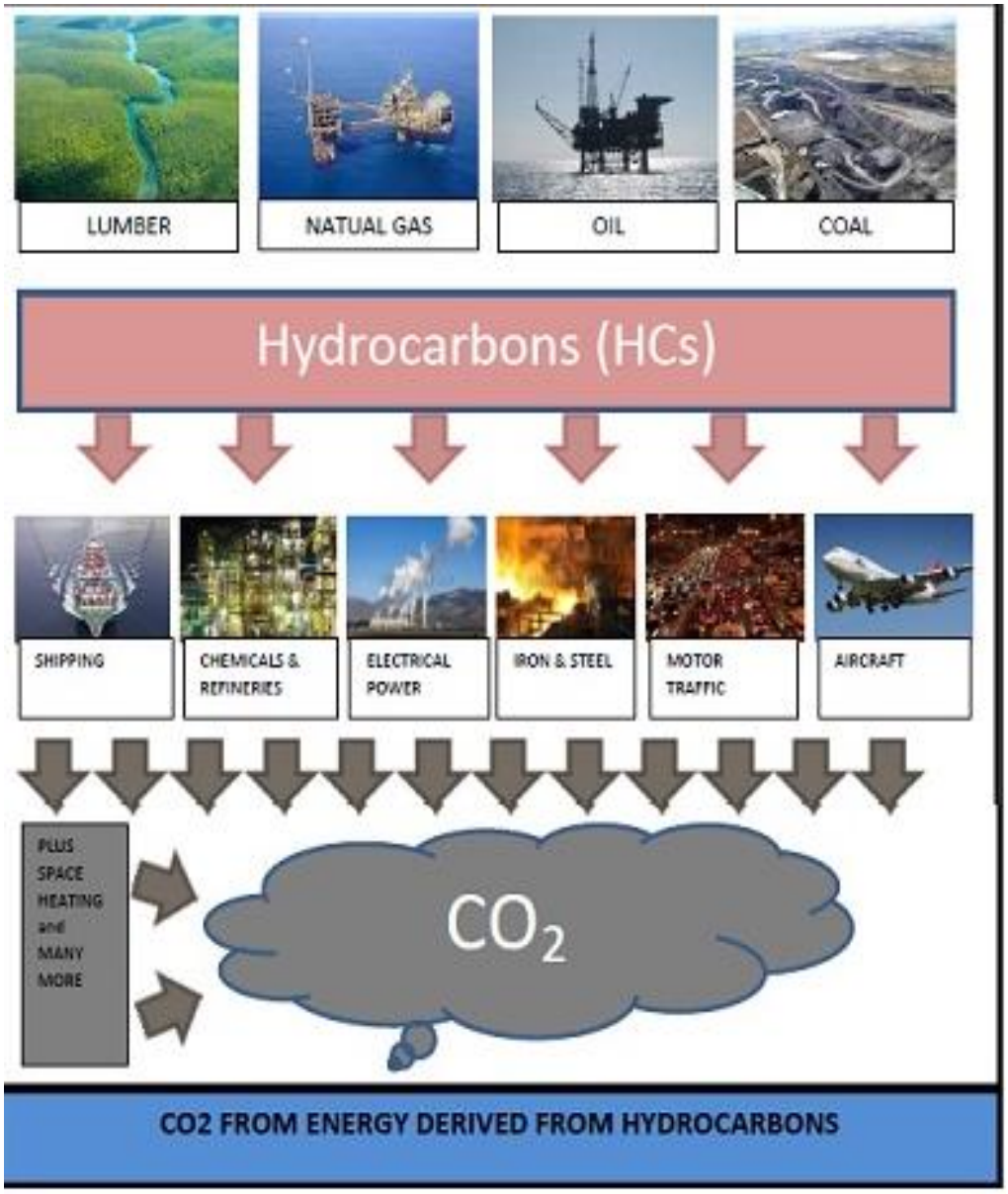
Section II - Problems with the status quo

Management and organization

To **meet our Critical Aims** by regulating WORLD CO_2 emissions directly is therefore a highly complex and unique management challenge for mankind.

We need another way! – let the market take the strain


LUMBER
NATUAL GAS
OIL
COAL
Hydrocarbons (HCs)
SHIPPING
CHEMICALS & REFINERIES
ELECTRICAL POWER
IRON & STEEL
MOTOR TRAFFIC
AIRCRAFT
PLUS SPACE HEATING and MANY MORE
CO_2
CO2 FROM ENERGY DERIVED FROM HYDROCARBONS

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Section III - What do we need to do?

There is a better way…..

- It is beyond doubt that our ***Critical Aims*** can only be accomplished by ***phasing out*** of ***"Free Burn"*** HC energy and triggering truly competitive ***investment*** in "*Cfree*"

CO_2 emissions will reduce in strict proportion to **"Free Burn" HC** extraction/production– they are the same carbon atoms.

HC + Oxygen = *Energy* + Water + Carbon Dioxide

- ***HC production industries*** can only continue and prosper through HC *combustion* processes becoming *Cfree* through decarbonisation (e.g. CO_2 removal/ re-sequestration).

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Section III - What do we need to do?

There is a better way…..

It is therefore in the interests of the world and specifically in the interests of the HC industry(s) that:

In the same way that the water industry also takes responsibility for sewage,

HC industry takes responsibility for the decarbonisation of HC processes through investment by the HC industry throughout the world.

How is this to be achieved?

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Section III - What do we need to do?

There is a better way…..

HC extraction and usage management can be achieved simply :

1. Apply an ***Annual Global Maximum Allowance (AGMA)*** for anthropogenic CO2 and hence for HC**.**
2. Calculate its **carbon atom content** and therefore the maximum allowable HC burn,
3. Apply market principles of supply and demand to the source of the carbon i.e. **"Free Burn" HC production.**

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Section III - What do we need to do?

There is a better way…..

A number of options can be explored but just **one** way to do this is to divide the ***HC market*** into two:

- ***Black HC*** - HC destined for "free burn" which emits CO_2
- ***Red HC*** – HC destined for "Cfree" purposes which do not emit CO_2. These include those which remove their combustion CO_2 from the environment, including CO_2 re-sequestration.

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Section III - What do we need to do?

There is a better way…..

- The *extraction for sale of* ***Red HC*** continues at unrestricted rates to accredited[1] customers for approved purposes (e.g. involving zero[2] CO_2 emission including CO_2 re-sequestration).
- The *extraction for sale of* ***Black HC*** will be controlled on a progressively reducing trajectory based on the tolerable carbon content **for each YEAR**.

1. The accreditation of use can be handled on a commercial basis by existing certification agencies.
2. Or near zero in which case the excess CO_2 will have to be assessed for consideration of Black HC fuel %

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Section III - What do we need to do?

There is a better way…..

The ***Black HC*** tolerable carbon content will reduce along a trajectory (based on CO_2 estimates from world science):

- ***Black HC*** will probably have to fall to **an annual rate** of 10-20% of current HC production within (say) c.35 years and
- ***Black HC*** will have to fall to a level such that the atmosphere of the planet can tolerate the resulting CO_2 on a sustainable basis or to zero[1] by the end of the century.

1 - If ZERO carbon content is insufficient then, perhaps only Direct Air Capture can solve the problem.

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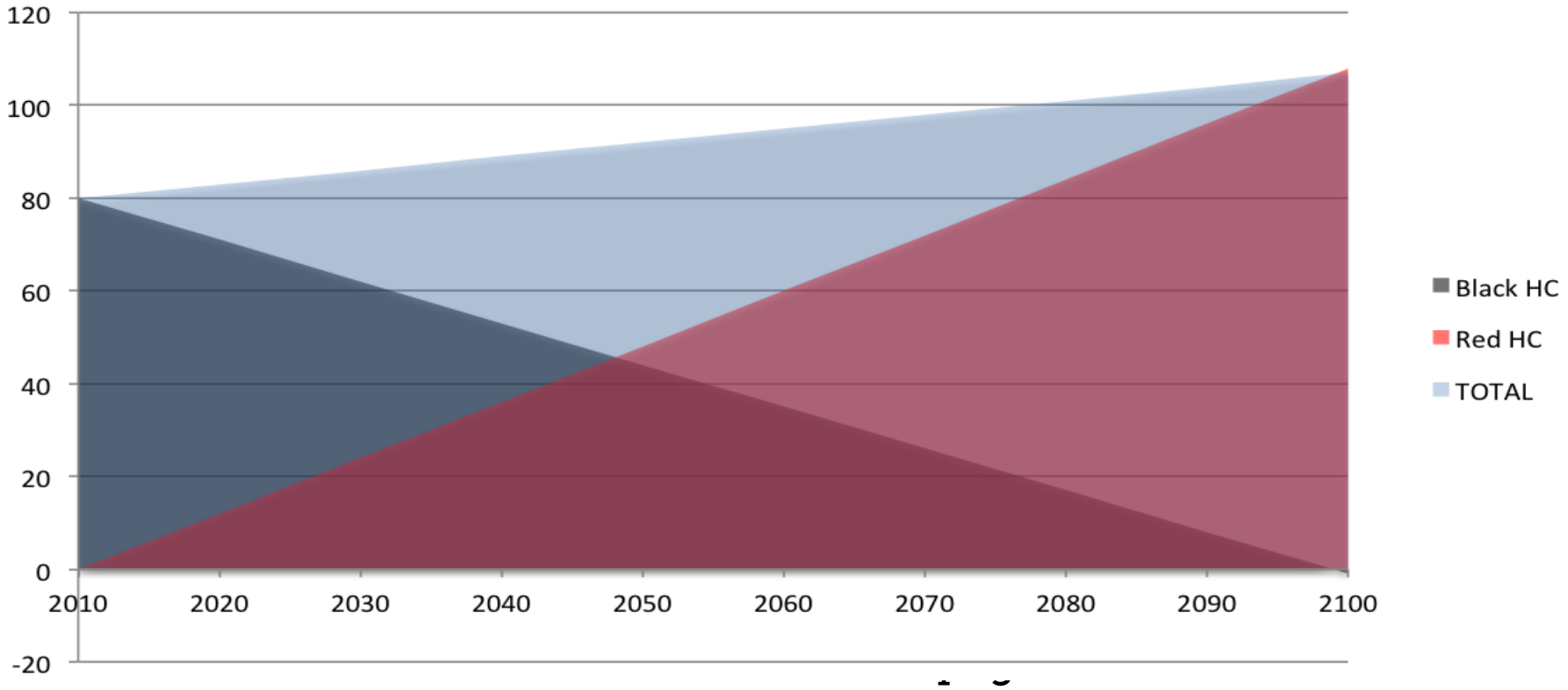
Section III - What do we need to do?

There is a better way…..



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Section III - What do we need to do?

There is a better way…..

- ***Black HC*** energy will during this, time become a boutique industry catering for special priority needs where no realistic Cfree competition yet exists.
- ***Red HC*** energy will ***compete freely*** with all other ***Cfree*** energy[1], without subsidy or special taxation applied to any of them.

1. Including all renewables and nuclear (fission and fusion)

As **Black HC** production declines over time, the size of the **overall HC industry** will depend on it supporting the development of ***Red HC*** energy (through investing in CO_2 re-sequestration or other *Cfree* mechanisms)

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Section III - What do we need to do?

The markets for ***Black HC*** and ***Red HC*** will operate in totally different ways

They will be influenced by different drivers and constraints.

- Each will operate according to normal free market principles.
- Whilst being distinct, they will influence one another.

- Energy Price will be a function of these MARKETS.
- Free competition will exist between technologies, suppliers and customers.
- Each of these markets will naturally deliver a different market price for its HC products.

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Section III - What do we need to do?

A vitally important aspect of this strategy is that:

- **governments are not setting energy prices.**
- **governments are not imposing special taxation**
- **governments are not providing subsidies** to preferred **technologies**.

So, governments are off the political hook…..

….and in the process:
Cfree energy has become apolitical and
INVESTABLE!

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Section III - What do we need to do?

- These new free market solutions also ***deliver*** the real market cost/value for each ***Black & Red*** **HC**.
- The mechanism provides a huge incentive for the HC industry to ***invest*** in ***Red HC*** either by CO_2 re-sequestration or other means.
- And in this process **be in control of its own destiny to grow and prosper.**

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Section III - What do we need to do?

…and the physical reality is that **via either strategy the outcome** will be identical in terms of both:

- **Anthropogenic CO_2 emitted** and
- ***Free burn* HC (*Black HC*) produced,**

….because the ***Black HC*** and **the CO_2 emitted** from **"free burn",** both contain exactly the same number of carbon atoms.

HC + Oxygen = *Energy* + Water + Carbon Dioxide

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Section III - What do we need to do?

INVESTMENT potential:
Presently, the HC industry remains (amongst) the most powerful in the world.

It has huge capital investment resources and huge cash flows, banking and government support

The HC industry is probably the only industry that could accomplish the de-carbonization of the world in a realistic time frame.

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Section III - What do we need to do?

It can do this within a ***Black/Red HC energy*** mechanism and a normal competitive market framework which preserved its market penetration, its business model and its profitability

The *Black/Red mechanism could save the HC industry!*
and
The HC industry could save the world!

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Section III - What do we need to do?

So far so good but how do we Manage the Black HC production decline and so the CO_2 decline?

- The ***Red HC*** market is free except that it can only be sold to certified ***Cfree*** users.
- The key to success is the design of the ***Black HC*** market.
- Total ***Black HC*** production must fall to essentially zero by (say) 2100

A very important aspect, is the way in which that downward trajectory is controlled

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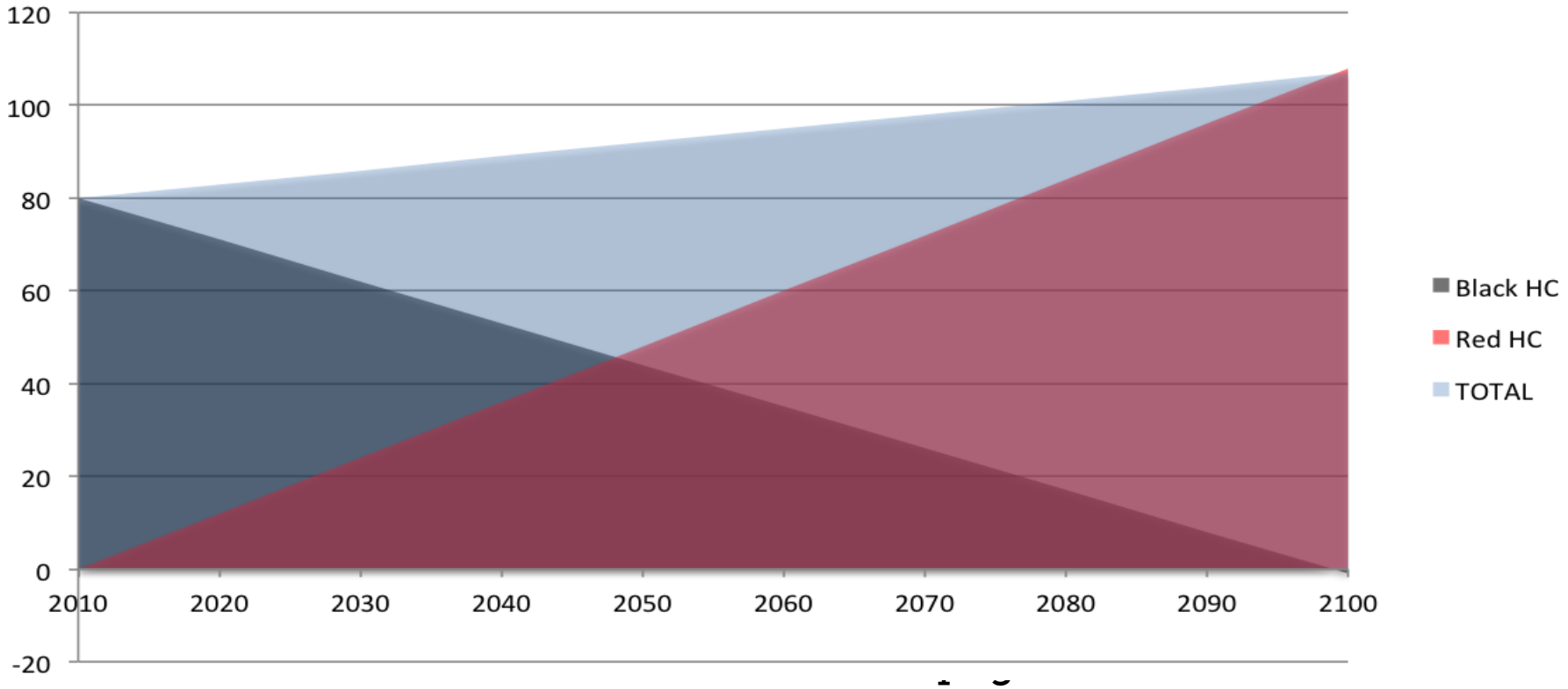
Section III - What do we need to do?

There is a better way…..



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Section III - What do we need to do?

The ***Black HC*** market

HC markets comprises all forms of HC:

gas/oil/coal

The ***Black HC*** markets deal only in HC for accredited "***free burn***" purposes within a declining ***Annual Global Maximum Allowance (AGMA)***.

This will be done by ***Black HC*** being allowed to fulfil its role in meeting ***AGMA*** through overall **annual** quotas for defined purposes, determined by the perceived absence of viable alternatives still existing at intermediate dates along the overall downward trajectory (the tolerable level) until its extinction.

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Section III - What do we need to do?

The ***Black HC*** market

Some priority structuring will be necessary:

- Some ***uses*** of HC are more amenable to substitution than others
- Some ***types*** of HC are more amenable to substitution than others

A commercial competition for the ***AGMA*** availability can then take place and be managed through secondary markets which would develop.

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Section III - What do we need to do?

So, market competition for ***Black HC*** between now and its probable extinction (in c. 2100?) has to be managed

HC (potential) accredited users can competitively bid **annually** for segments of this ***AGMA*** for any specific year (up to 20 years ahead?)

- Many ways can be designed to achieve this market competition (which in some ways could be similar to the EUA process).
- The money raised could even go into and HC industry fund to subsidise overall energy prices across the world.

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Section III - What do we need to do?

- Successful bidders in possession of ***AGMA*** allocations could then purchase HC on world markets HC markets for ***Black HC up to the*** quota they sought/acquired and use it to fuel their business intentions.

- The actual purposes would be accredited as such and be within the defined purpose of the quota they sought/acquired.

There would be no carry over into following years and at the end of each year it would be:
"use it or loose it" *so the actual downward trajectory would* ***always be maintained or bettered.***

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Section III - What do we need to do?

This **Black/Red HC** scheme is just one way to to meet ***our critical aims***. ---- Others will no doubt emerge.

In the end - we have to meet our ***critical aims***

The question is, **how** do we get there?

Do we persevere with the present poorly performing CO_2 emission control schemes? or:

Do we go to a structured Free market scheme focused on the real cause: "free burn" HC?

END

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Section II - Problems with the status quo:

What we have tried so far – **Cat. B**:

2: Emissions Trading Schemes (ETS)

There are two reasons for this:

1. ETS schemes suffer all the same problems as carbon tax.
2. More fundamentally, they operate in a ***false*** market.

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Section II - Problems with the status quo:

What we have tried so far – **Cat. B**:

2: Emissions Trading Schemes (ETS)

- In a ***proper*** market (e.g. potatoes or grain) the market price is determined by tension between supply and demand.
- So if potatoes are in short supply the market price goes up and this moderates demand so that the price falls again until there is equilibrium.

Simple!

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Section II - Problems with the status quo:

What we have tried so far – **Cat. B**:

2: Emissions Trading Schemes (ETS)

This is <u>not so</u> in the so-called "carbon market"

or even when called the "carbon emissions market".

This is because:

- it isn't a ***<u>carbon market</u>,***
- it isn't a ***<u>carbon emissions market</u>***,
- it is a ***<u>carbon emissions permissions</u> market (CEP)***.

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Section II - Problems with the status quo

What we have tried so far – **Cat. B**:

2: Emissions Trading Schemes (ETS)

Looking at the supply side:

- In a ***carbon emissions permissions (CEP) market***, the CEPs are printed by government agencies. (e.g. EUAs)
- CEPs are in effect just tokens or currencies (and share some of the characteristics of currencies such as speculation and inflation/deflation).
- The number of CEPs available for sale is a result of government's policies.

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Section II - Problems with the status quo

What we have tried so far – **Cat. B**:

2: Emissions Trading Schemes (ETS)

Looking at the <u>demand</u> side:

Demand is only marginally affected by energy market conditions. e.g. when a new HC energy provider comes into the market or an existing HC energy provider leaves the market.

So the demand for CEP will be relatively static:

- It will take a long time to replace the world's installed **HC energy.** (In electric power alone, it constitutes >5000GW or approx. 9000 major (>600MW) power plants).

So for many years the CEP price would be determined almost completely by the the <u>supply</u> side – the printing press.

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Section II - Problems with the status quo

What we have tried so far – **Cat. B**:

2: Emissions Trading Schemes (ETS)

The supply side:

- If governments allow the supply of CEPs to be generous, their price will be low and there is ***no incentive*** for Cfree investment.

- If governments restrict the availability of CEPs then the price will rise to the level, **the tipping point,** which incentivizes investment in ***Cfree* energy**.

Success!

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Section II - Problems with the status quo

What we have tried so far – **Cat. B**:

2: Emissions Trading Schemes (ETS)

Not really!!

Look at the **demand** side again.

Each successful investment in replacement *Cfree* energy *reduces* demand for CEPs.

This propels the price **lower**.

This is in the wrong direction!
The incentive declines with each success.
So, Cfree investment potential dies with every success
In other words, this is a false market.