Clean Energy – What is it and what are we paying for?

By Pat Swords BE CEng FIChemE CEnv MIEMA

Executive Summary

"Measure what is measurable, and make measurable what is not so".

- **Galileo Galilei, Italian physicist, mathematician, engineer, astronomer, and philosopher, 1554 - 1642**

Dogmas of 'clean energy' versus 'dirty energy' abound. So much so, that in order to 'cure' a perceived problem in the EU, by the end of 2012, over €600 billion had been invested in wind turbines and solar panels, with multiples more of that planned to come. Given that you only get to spend it once and we are funding it through soaring electricity prices; that's a hell of a belief system. So where are the figures to justify it?

"Politics is the art of looking for trouble, finding it everywhere, diagnosing it incorrectly and applying the wrong remedies".

- ***Groucho Marx, 1890 – 1977, American comedian, film and television star.***

History abounds with poor decision-making and the resulting major political, financial and environmental failures. As a result, legal systems were put in place, requiring for significant policies, plans or programmes, that Regulatory Impact Analysis with detailed cost benefit studies be completed, with a further legal requirement for the completion of Strategic Environmental Assessments. These procedures must involve participation of the public in the decision-making and be completed before such policies, plans or programmes can be adopted.

"I not only use all the brains that I have, but all that I can borrow".

- ***Woodrow Wilson, 1856 – 1924, 28th President of the United States***

However, having established such procedures, they were promptly ignored by the EU and its Member States, after all there was a planet to be saved and existing energy structures no longer sufficed and had to be made 'clean'. The EU's politicians knew best and established a 20% target for renewable energy by 2020, essentially 'pulling it out of a hat'. It was never worked out in advance; what was to be built, where it was to be built, what were the impacts, what were the costs, what were the benefits, etc. These minor details were not allowed to limit the implementation of the target. As the introduction to the relevant Directive explains, the overall 20% target for the EU was then shared out among the Member States based on their existing level of renewable energy and a factor based on GDP[1]. Hence Ireland obtained a 16% target and Austria, a country with considerable hydro reserves; essentially double that at 34%.

The democratic deficit was staggering; as bypassing these assessment procedures also bypassed the associated public participation in decision-making. To quote Animal Farm, in which the pigs decide and all the animals have to toil building windmills:

"No one believes more firmly than Comrade Napoleon that all animals are equal. He would be only too happy to let you make your decisions for

[1] See Recital (15) of Directive 2009/28/EC: http://eur-lex.europa.eu/legal-content/en/ALL/?uri=CELEX:32009L0028

yourselves. But sometimes you might make the wrong decisions, comrades, and then where should we be?"

- **George Orwell, Author of Animal Farm, 1903 - 1950**

The number 42 is, in 'The Hitchhiker's Guide to the Galaxy' by Douglas Adams, "The Answer to the Ultimate Question of Life, the Universe, and Everything", calculated by an enormous supercomputer over a period of 7.5 million years. Unfortunately no one knows what the question is. It is the same way with 'clean energy'; it was never worked out what the 20% renewable energy target was actually to deliver, a position we are still in, after five years of its implementation and hundreds of billions of Euros spent.

In the limited supporting documentation for the 20% renewable energy by 2020 programme, the wild guess used to justify the claimed for carbon dioxide savings, was generated as an output from a super computer used by the EU, which nobody else is allowed to access and evaluate. However, it was clearly fundamentally flawed, the computer programme completely failing to account for the increasing inefficiencies induced on the existing thermal power stations, as more and more highly intermittent wind and solar energy is added to the grid. As if this wasn't stupid enough, even if those claimed for savings had materialised, they would have amounted to at most 2% of global annual carbon emissions; in other words have had no effect on the planet's climatic systems. Neither was any consideration given to alternative measures to achieve the same or better results.

Bad enough as how the issue of emissions savings was dealt with, even worse is that nobody knew or continues to know, what exactly in terms of damage, carbon dioxide emissions are causing. Instead, political consensus was reached that these emissions were causing damage and a policy and target implemented to suit. Then billions of Euros, our Euros, thrown at it to achieve the target – but nobody knew what the problem was in the first place, as the data to support and quantify the decision-making was never generated. This was never seen as an obstacle by the relevant political decision-makers, after all being 'Green' was fashionable and any decisions could be justified by taking the moral high ground in that the planet needed to be saved.

"One of the primary reasons we don't seek counsel from the wise people around us is that we already know what we are going to hear - and we just don't want to hear it."

- ***Andy Stanley, 1958 -, American Christian Pastor and Author***

A striking feature which runs through the limited amount of documentation, produced by the authorities to support the renewable and climate change programmes, is its glaring incompetency. Competency by definition requires demonstration of the relevant knowledge and experience in the subject matter, but more importantly evidence of a position of responsibility in implementing that subject matter. Europe for instance is not short of senior engineers, who have delivered major projects in the energy sector. Yet absolutely none of this competency featured in the appalling poor and limited analysis completed on behalf of the public authorities. Instead deliberate preference was given incompetent University 'researchers', who as complete charlatans repeatedly produced deficient and politically motivated documentation to suit the politicians' objectives.

In contrast the manner in which since the early 1980s Europe, both Eastern and Western, addressed the challenge of air pollution could not be greater. As a result of a focused technical approach, with extensive cost benefit analysis, huge reductions

in emissions of pollutants, such as sulphur dioxide, nitrogen oxides and particulates have occurred. While there are still some remaining problems with respect to air pollution, these are now occurring primarily from traffic and domestic heating systems. Our power generation sector is no longer the significant source of these pollutants.

"Everything we hear is an opinion, not a fact. Everything we see is a perspective, not the truth".

- **Marcus Aurelius, Roman Emperor from 161 – 180**

However, these improvements in reducing the environmental impact of our power generation was no longer good enough for us, we also had to decarbonise, but why? In particular, where is the supporting information for these policies, which have such huge costs? If it is the EU's official position that:

- *"Science tells us that all developed countries would need to reduce emissions by 80-95% in order to have a fair chance of keeping global warming below 2℃".*

Then is it not reasonable to expect that if one goes searching for the supporting information, one will find it? Unfortunately, one finds that such supporting information for this position does not exist; instead the policy was based on political consensus being reached by our same leaders gifted with their superior knowledge and abilities. Yet global temperatures have not risen since 1998, when the EU was developing its renewable energy programme, despite that fact that some one third of global carbon emissions have occurred since that date, why?

Chemical engineers by profession complete heat transfer calculations, which are based on the three methods of heat transfer, namely conduction, convection and radiation. If you put your hand on a stove, heat will transfer by conduction from the molecules of the stove to the molecules of your hand. Yet the heat transfer fluxes based on conduction, which occur when the air interfaces with the surface of the land or the sea are unknown. The same stove in a room will transfer heat by generating circulating air currents, which is heat transfer by convection. The planet's circulating ocean currents and atmospheric patterns likewise transfer heat by convection, but we do not understand those mechanisms, such as to the basic level as how clouds form in these thermals.

The stove in the room will, if you are in a line of sight to it, transfer heat to you by infra-red radiation. If you place an obstacle between yourself and the stove, such as a sofa, you will not feel this radiant heat. In a similar manner, the planet radiates infra-red radiation out to space, except when it is trapped by molecules in the atmosphere, the so called greenhouse effect. Despite claims as to otherwise, the most significant greenhouse gas in the atmosphere is water vapour, whose concentration and hence effect is highly variable. Carbon dioxide is also a greenhouse gas, but the greenhouse effect associated with carbon dioxide is logarithmic, decreasing rapidly as the carbon dioxide concentration is increased. For example, the greenhouse effect which occurs when the carbon dioxide concentration is raised from 10 to 20 parts per million (ppm), is the same as an increase in concentration from 100 to 200 ppm. In simple terms, carbon dioxide's greenhouse effect is 'tailing off', as the carbon dioxide concentration in the atmosphere is increased.

So where does this the catastrophic warming arise from? Of huge concern is the blind faith we are now expected to put in the skills of a limited number of

mathematical experts and their computer models, called General Circulation Models (GCMs). The threat of global warming in those models is singularly based on the principle of a feed forward effect, i.e. that if the earth's temperature increases slightly as a result of increased carbon dioxide, then more water vapour will enter the atmosphere, this will in turn increase temperatures, leading to even more water vapour and as a result we will enter into a never ending spiral of run-away temperatures.

Yet if this feed forward mechanism were not to occur, then even the UN's Intergovernmental Panel on Climate Change (IPCC), a deeply politicised body, has to admit that a doubling of the global atmospheric carbon dioxide level would only lead to about a 1.2˚C rise in temperature. As we are only about a third of a way to that doubling of the pre-industrial age concentration, one can only conclude; so what, after all such a rise is equivalent to everybody moving 200 km closer to the equator; Belfast gets Cork's climate, etc. Indeed, if we consider the EU's policy objective of limiting the future average global surface temperature increase to two-degrees, that this would essentially happen anyhow without any requirement to reduce fossil fuels.

So does the whole debate around whether climate change, is mild warming or catastrophic warming, come down to this question of the degree of feedback? Essentially it does. While the ability to understand the complexity of the Earth's climatic systems will require many decades of careful analysis, as the Earth goes through its natural cycles of change, there are two things which are already certain.

Firstly the large degree of uncertainty in relation to how the Earth's basic heat transfer mechanisms occur, uncertainties which are documented in the IPCC reports, renders these GCM computer models as completely unfit for purpose. As such then it is not surprising that the predictions of these computer models, which are extremely alarmist, is rapidly diverting from the behaviour of Mother Earth, which has been in a temperature pause for eighteen years. Secondly, if there was strong water vapour feedback occurring, we would have seen it to date, as the pre-industrial carbon dioxide concentration has risen from 250 to 400 ppm.

We are in a position in the Western World, the EU in particular, where political leaders jumped on this populist decarbonisation agenda without ensuring that the proper due diligence and assessments were completed. This hasn't happened in other parts of the World, such as China for example, where the validity of the IPCC's predictions is called into question. As a result the EU's obsession with renewable energy is increasingly becoming a liability for the proper functioning of its society, not least in the manner in which its citizens are being deceived and defrauded.

The cost of renewables in Ireland has already resulted in a 50% rise in the domestic electricity rate, while the capital expenditure alone for the infrastructure to deliver the 40% renewable electricity target, which is almost exclusive related to wind energy, is in excess of €20 billion. As the necessary legal procedures in assessment were bypassed, it was never worked out in advance what actual reduction in greenhouse gases would occur or what the costs would be, while neither was any alternatives considered.

When applying in 2007 to the EU for State Aid for Environmental Protection in relation to Renewable Energy Feed in Tariffs (REFIT), the Irish administration claimed that 1.9 million tonnes of carbon dioxide savings would result per 1,000 MW of installed wind energy. Their latest 2014 National Renewable Energy Action Plan (NREAP) progress report claims 1.17 million tonnes of CO_2 savings per 1,000 MW of installed capacity, but this is based on a calculation method, which even the Irish

authorities admit is inaccurate, as it ignores the significant inefficiencies induced on the grid by the intermittent input of wind energy.

Stung by criticism that they were ignoring these inefficiencies, the Irish authorities produced a new analysis in which they claimed that these inefficiencies were addressed, in which savings were now estimated at 0.85 million tonnes of CO_2 per 1,000 MW of installed wind capacity. Sadly, this is actually less than half (45%) of what they claimed would occur when REFIT was initiated back in 2007 to fund the building of this infrastructure in the first place. Despite their claims, there are also huge doubts over the validity of the methodology used in the final report, but regardless, the sad conclusion is that Ireland's renewable energy programme delivered emission savings of less than 0.004% of the global total; a futile drop in the ocean.

"All of us are not always smarter than one of us; leaders need to distinguish between the wisdom of crowds and the madness of crowds."

- ***Paul Gibbons, 1960 -, writer, scientist and leadership consultant***

No matter which way you look at it, Ireland and the EU's renewable energy programme has been a massive squandering of resources. Back in the late nineties and early 2000s some efforts had been made to quantify the environmental impact of carbon dioxide. Even then it was obvious that the money being allocated, to reduce carbon dioxide emissions, was grossly disproportionate to the environmental impact of those emissions. Furthermore, those conclusions on environmental impacts were based on projections of computer models, which have since proven to be inaccurate and alarmist.

In times to come people will look back at how the EU and its Member States failed to complete any technical, economic and environmental assessments, broke its rules in relation to State Aid for Environmental Protection and subverted the democratic rights of its Citizens, all to deliver the projects of the wind energy industry. Who in turn as purveyors of a technology, which was obsolete in the 1770s when James Watt invented the steam engine, must be in a position where they cannot believe their luck.

However, right around the EU the renewable energy programme is now coming off the rails, as both the financial and environmental costs spiral out of control – the 20% by 2020 renewable target is dead, it is impractical to meet it, even for the wealthier Member States like Germany, the UK and France. Yet one cannot but wonder at the stupidity of political leaders and their infatuation with the 'Green' vote, which led them to pull this whole programme 'out of a hat'.

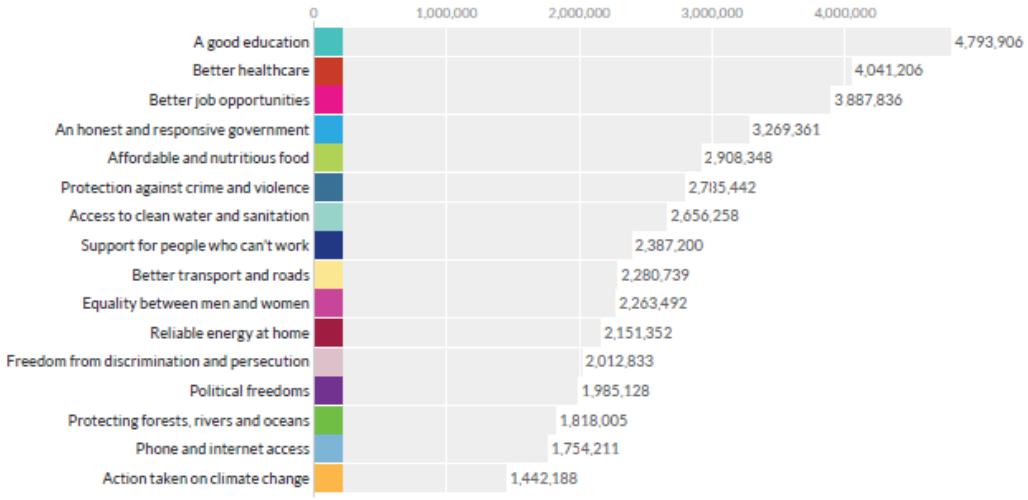
"The history of human opinion is scarcely anything more than the history of human errors".

- **Voltaire, 1694 – 1778, French Enlightenment writer, historian, and philosopher**

So was it a case of the 'grass is always greener on the other side of the fence' and we 'threw the baby out with the bathwater'. Well the figures actually show that there is actually nothing wrong with our existing conventional generation. Air pollution had been dealt with by improved emissions control. The carbon dioxide emissions are only leading to a minor warming in temperatures and an increase in plant growth, particularly in arid regions, both of which are beneficial. So what is the problem?

Europe is in decay, it is obsessed with doom. Would our forefathers, who made Europe the dominant global force for so long, recognise our behaviour now, as one dominated by cultural 'hang-ups'? Despite the fact that we have never had it so 'good', we are wallowing in negativity and not positivity. Good food is no longer good enough; it has to be designer driven, such as organic, vegetarian, gluten free, etc. Energy is no longer something you switch on and off, it has to come as renewable, nuclear free, etc. The weather is no longer something you just adapt to, it has to be designer driven by life style choices, in order to ensure in a hundred years' time it will be less stormy, etc. Behaviour, particularly by those in so called positions of leadership, is not just foolish; it is downright irresponsible, as ownership is no longer being taken of what is actually going on around us.

Yet on a global scale things are different. The United Nations Development Program (UNDP) poll[2] seeks to gauge what the people of the world are most concerned about. The poll, answered by millions, asks the world about its most vital concerns. Among the choices are "a good education," "better healthcare," "access to clean water," and "protection against crime and violence." Of the survey's 16 questions, as regards how important "action taken on climate change" is to the millions, who have answered the poll, it has come in dead last.



As Bjorn Lomberg, the Danish environmental economist has quite rightly put it: "We live in a world where one in six deaths are caused by easily curable infectious diseases; one in eight deaths stem from air pollution, mostly from cooking indoors with dung and twigs; and billions of people live in abject poverty, with no electricity and little food. We ought never to have entertained the notion that the world's greatest challenge could be to reduce temperature rises in our generation by a fraction of a degree."

What we have done to date is simply squander resources, as a result of unaccountable, illegal and irresponsible decision-making.

"The most dangerous man to any government is the man who is able to think things out for himself, without regard to the prevailing superstitions and taboos".

- **H. L. Mencken, 1880 – 1956, American journalist, satirist, social critic, cynic, and freethinker**

[2] http://data.myworld2015.org/

Contents

1. INTRODUCTION

Alexis-Charles-Henri Clérel de Tocqueville (1805 – 1859) was a French political thinker, historian and writer. He was a champion of the nineteenth-century ideals of liberty and democracy, and observed:

- ***That it is easier for the world to accept a simple lie than a complex truth.***

If you are a firm believer that renewable energy is clean energy and must replace other fossil fuel energy sources, then woe betides me to upset your firm beliefs. Read no further and go practice your beliefs and refrain from the use of fossil fuels.

However, if instead you care for a factual analysis, then continue to read further, in particular as the large scale State sponsored roll out of renewable energy, has by law to be completed in a manner, which is fully competent, fully transparent and fully legal. Therefore, the short question as to the above, as to what clean energy is and what we are paying for, has to be answered. Unfortunately, despite the fact that over €600 billion has been spent on wind turbines and solar panels in the EU to date [1], there is actually no information from official sources to answer that question.

"Look before you leap for as you sow, ye are like to reap".

- ***Samuel Butler, British poet, 1835 – 1902***

The above is just basic common sense; surely the decision making we have reached in the 21st Century is based upon a structure of assessment of cost and benefits, environmental impacts, etc.? In fact it is in theory; there is such a defined system in place. However, with regard to renewable energy and climate change policies, it wasn't complied with. As a result that is why this issue of 'clean energy' is of such great concern and requires further clarification. We simply do not know what we have spent that €600 billion on, with equally more billions to follow, other than it meets a renewable energy target. If that simple explanation suffices, then read no further.

However, for many of you, you will find it logical that if we are shutting down and restricting the use of fossil fuels to give access to new renewable generation, that we should have a defined justification related to quantifiable environmental protection, long term financial benefits, etc.?

"The road to hell is paved with good intentions"

- **Generally attributed to the English Author Samuel Johnson, 1709 - 1784**

One could take the 'moral high ground' that we must do 'something' to protect the next generations to come. But do we know what this 'something' is? Have we quantified it before we implemented it? Have we reviewed it during the course of its implementation to determine that it is effective in achieving its objectives? If we cannot logically answer those questions, how do we know we are not in a bubble of 'make-belief' sustained by 'Groupthink' in an oversimplified concept?

We have had plenty of 'bubbles' through the course of human history, the dotcom crash and the property crash being in recent memory. There have of course been some winners, but the general public were in the main significant losers. So why are things different with 'clean energy'? What is supporting it? What happens if it fails to deliver and this general realisation becomes widespread? Does the bubble bursts?

Who picks up the tab, both financially and with regard to the relics in the landscape? Given that most people can reasonably answer the last question, we then will move in the following Sections into the more complex issues of ‘Cost, Benefit Analysis’ and ‘Environmental Justification’ and the structures, which have developed around them. This will provide the detail, which in turn will lead to the answers to the previous questions and more.

2. REGULATORY IMPACT ASSESSMENT AND COST BENEFIT ANALYSIS

Many countries had a system of Regulatory Impact Assessment or Impact Assessment going back to the 1970s or 1980s. For instance, in 1993 President Clinton issued Executive Order 12866, which broadened the scope of Regulatory Impact Assessments: New regulations were to be assessed by quantitative or qualitative measures. Furthermore, options must be considered to find the most beneficial alternative with regard to potential economic, environmental, and public health and safety impacts. The assessment should also address distributive impacts and effects on equity.

"There are some remedies worse than the disease".

- **Attributed to Publilius Syrus a Roman slave and poet, 1st Century BC**

In many cases, Regulatory Impact Analysis arose from the need to address regulatory failure. For instance, in the US, analysis of costs and benefits of regulations was first introduced during the Nixon administration, after industry representatives raised the issue of the administrative burden related to environmental legislation. As has been recognised: "Effective and efficient regulation by government is important for economic development. Effective and efficient regulation promotes economic development, while vexatious regulation can cripple it[3]".

In 2003, the European Commission developed a comprehensive system for assessing the impact of policy proposals, which is broadly applied, such that Impact Assessments are carried out for programmes and policies (e.g. White Papers) and not only for regulations and guidelines. The EU Commission's latest daft updated guidance on completing an Impact Assessment clarifies[4]:

- *Impact assessment is about gathering and analysing evidence to support policy making. In this process, it verifies the existence of a problem, identifies its underlying causes, assesses whether EU action is needed, and analyses the advantages and disadvantages of available solutions.*

Many countries in the Organisation for Economic Co-operation and Development (OECD) have implemented a system of Regulatory Impact Assessment. Following Ireland's participation in an OECD regulatory reform peer review programme in 2000-2001, a Working Group developed a draft model for the Irish context, which resulted in the 2005 guidelines on "How to conduct a Regulatory Impact Analysis"[5]. An influencing factor being the fact that such analysis was increasingly being applied by other Member States to draft EU Directives, both during the negotiation and transposition phases.

The Irish Government decided in June 2005 that Regulatory Impact Analysis should be should be introduced across all Government Departments and Offices and applied to:

---

[3] Parker, Fitzpatrick: "Researching Economic Regulation in Developing Countries: Developing a Methodology for Critical Analysis"

[4] http://ec.europa.eu/smart-regulation/impact/docs/iag_pc_questionnaire_en.pdf

[5] A copy of these can be downloaded from: http://www.legislationline.org/search

- Proposals for primary legislation involving changes to the regulatory framework, significant Statutory Instruments,

- Proposals for EU Directives and significant EU Regulations when they are published by the European Commission, and

- Policy Review Groups bringing forward proposals for legislation.

The guidelines contained some important points:

- *Regulatory Impact Analysis is a tool used to assess the likely effects of a proposed new regulation or regulatory change. It involves a detailed analysis to ascertain whether or not the new regulation would have the desired impact. It helps to identify any possible side effects or hidden costs associated with regulation and to quantify the likely costs of compliance on the individual citizen or business. It also helps to clarify the costs of enforcement for the State.*

- *It is important to note that Regulatory Impact Analysis is not a substitute for decision making. Instead, Regulatory Impact Analysis is best used as a guide to improve the quality of political and administrative decision-making, while also serving the important values of openness, public involvement and accountability.*

- *Regulatory Impact Analysis should also contribute to achieving value for money and efficiency by generating more detailed information in relation to cost and allowing more extensive analysis of alternative options for achieving policy objectives.*

- *The steps of Regulatory Impact Assessment comprise:*

    1. *Statement of policy problem and objective*
    2. *Identification and description of options*
    3. *Impact analysis including costs and benefits of each option*
    4. *Consultation*
    5. *Enforcement and compliance for each option*
    6. *Review*
    7. *Summary of merits / drawbacks of each option and identification of recommended option where appropriate.*

- *Examine at least three options. Include the 'no policy change' option and at least one regulatory alternative*

- *Cost-benefit analysis: This entails identifying and evaluating expected economic, environmental and social benefits and costs of proposed public initiatives. A measure is considered justified where net benefits can be expected from the intervention.*

- *Cost Benefit Analysis must be considered where costs of €50 million over ten years are likely.*

- *Where the costs exceed the predicted benefits, the proposal should be refined or in certain circumstances abandoned.*

The introduction of these guidelines was not without some problems, such as articulated below[6]:

- *Representatives of the business sector had strong criticism of the lack of visibility of Regulatory Impact Assessments; they felt that either they were not done, or, if done, many were not published. Moreover, where Regulatory Impact Assessments had been done, there was a lack of credible consultation; risk assumptions and estimates of costs and benefits had not been consulted on, and timescales in some cases were unrealistic.*

The Irish Guidelines were updated in 2009, but fundamentals in them remained the same. Indeed it is interesting to reflect on the OECD's 2011 publication on "Integrating the Environment in Regulatory Impact Assessments", which in relation to Ireland, was very complementary, as to the manner in which the environmental dimension was integrated into Regulatory Impact Assessment processes. As the report stated:

- *In the context of Regulatory Impact Analysis, environmental impacts of proposed regulations are considered to stand equally next to the evaluation of economic and social impacts (e.g. national competitiveness, socially excluded and vulnerable groups etc.—seven impact types in total) (Department of the Taoiseach, 2009, pp. 26-30). As former Prime Minister Bertie Ahern puts it: - [Regulatory Impact Analysis] aims to promote the quantification of impacts on society [⋯] and the environmental costs and not just the compliance cost to business (Ahern, 2005).*

However, a common problem with the Irish public service, as will become clearer, is the difference between 'taking the talk' and 'walking the walk'. It worth noting the concluding remark of the section of this OECD report on Ireland:

- *Other sources, such as the OECD, find that the Irish Regulatory Impact Assessment is well suited for advanced environmental policy integration. Improvement can and should however be achieved - through rigorous implementation of Strategic Environmental Assessment and Environmental Impact Assessment procedures.*

This then leads on to the system, which had been developed in relation to those environmental assessments.

[6] Ferris Tom, 2009: "Challenges for Regulatory Impact Analysis": http://publish.ucc.ie/ijpp/2009/01/ferris/04/en

3. THE EU'S DETAILED SYSTEM FOR ENVIRONMENTAL ASSESSMENT

It had long been realised that projects, which had a significant effect on the environment, needed to go through a formal process of environmental assessment. Indeed, the EU's legislation on this, Directive 85/337/EEC, dated to the mid-eighties. It is important to point out, that while the developer prepares his Environmental Impact Statement, which is his version of the impacts, the final Environmental Impact Assessment for the purpose of decision making has to be prepared by the competent authority for the planning decision. This assessment should also reflect input from other sources, such as submissions from the public and various public authorities.

However, while the outcome of this final assessment will inform the decision-making process, the fact that there could be negative environmental impacts is not grounds for refusal. Decision-making is inherently about achieving a balance related to a number of factors, many political. However, the Principle of Proportionality is a key aspect of European Law and has to be incorporated into decision-making; as the European Court has consistently ruled in a wide variety of cases:

- *"The principle of proportionality is one of the general principles of European Union law, it requires that measures adopted by Member States do not exceed the limits of what is appropriate and necessary in order to attain the objectives legitimately pursued by the legislation in question; when there is a choice between several appropriate measures recourse must be had to the least onerous, and the disadvantages caused must not be disproportionate to the aims pursued".*

While the above legislation from the eighties ensured that environmental considerations were taken into decision-making in relation to planning decisions on significant projects, it became clear that the process needed to be integrated further back into the decision-making. If for instance a one-off wind farm was being built, then the Environmental Impact Assessment process sufficed for that project. However, if instead the wind farm was one of many such projects, as part of a National programme, then it was necessary to ensure that the impact of the programme and the alternatives to the programme, including the 'do-nothing' scenario were assessed. In addition, adequate mitigation measures in relation to the significant adverse effects needed to be established, along with the monitoring to identify at an early stage unforeseen adverse effects, to enable the appropriate remedial action to be taken.

As a result, Directive 2001/42/EC on Strategic Environmental Assessment was adopted and transposed into Irish Law as Statutory Instrument No. 435 of 2004. Such Strategic Environmental Assessment being mandatory for a range of programmes, including energy, which set the framework for future development consent of projects falling under the scope of the Directive on Environmental Impact Assessment. The latter including wind farms, high voltage lines and power stations.

It also became increasingly clear that this process could not happen in isolation of the general public, who had to be given procedural rights in this form of decision-making. In the late nineties the EU and Ireland signed the United Nations Economic Commission for Europe's (UNECE) Aarhus Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters. The EU ratified it in 2005, at which point it became part of Community Law,

while Ireland eventually ratified in 2012. This strengthen the role of the public in the decision making above, such that early public participation has to be taken, when all options are open and effective public participation can take place. Plus it has to be ensured that in the decision, due account is taken of the outcome of the public participation. While the latter does not give the public a veto right on decision-making, it does mean that the authorities have to objectively demonstrate that they considered the input from the public in the decision-making, in essence a written record of why they did or did not agree with the positions raised.

In summary by 2005 a well-defined system was in place, not only in relation to Regulatory Impact Assessment, but also comprehensive environmental assessment, both overall plans and programmes and the individual projects which followed. In all cases public participation was required. Indeed one need only go as far as the first Article in the 2009 Lisbon Treaty ("Treaty on European Union")

- *This Treaty marks a new stage in the process of creating an ever closer union among the peoples of Europe, in which decisions are taken as openly as possible and as closely as possible to the citizen.*

This was also the first Article of the previous "Treaty on European Union" signed in 2002 in Nice. So what actually happened as regards renewable energy? Before we reach that point it is worth pointing out one of the key obligations of the UNECE Aarhus Convention:

- *Recognizing the importance of fully integrating environmental considerations in governmental decision-making and the consequent need for public authorities to be in possession of accurate, comprehensive and up-to-date environmental information*

Not least through the efforts of UNECE, from the late eighties on, major efforts occurred to tackle the most significant environmental challenge in the greater European area, namely that of air pollution. As such, this went led to a greater understanding of environmental impacts, including from the Large Combustion Plants, which are the power stations responsible for generating the largest percentage of our electricity.

4. EUROPE'S SUCCESSFUL PROGRAMME TO REDUCE AIR POLLUTION

4.1 Background

The impact of pollution from the combustion of fuels has a long history. The London smog of the 19th Century was so notorious that it had its own name; the 'peasouper'. Indeed, it is estimated that sulphur dioxide levels occurring then, primarily from the domestic combustion of coal, were over a hundred times the now accepted air quality limit value. This situation continued to worsen such that the London smog of December 1952 resulted in more than 4,000 deaths over a four day period. It was the greatest officially recognised urban air pollution disaster in modern history and contributed to the increasing demands for effective environmental controls. These controls initially took the approach of restricting the combustion of domestic fuels to those, which were relatively 'smokeless', along with the use of higher stacks to achieve dilution at industrial sites, such as power stations.

However, this approach of 'dilution is the solution' was clearly not the proper solution and the late 1970s and 1980s in Central Europe, Germany in particular, was characterised by growing public concern over damage to forests, the so called 'Waldsterben' or dying forests, a circumstance which was referred to as 'acid rain' in the English speaking world. It was the central 'dogma' in Germany that an unprecedented decline in all tree species in central European forests was occurring, as a result of a complex disease of forest ecosystems triggered by air pollution.

Indeed, the public outcry at the time led Germany in 1983 to fast tracking legislation with stringent emission limit values, which meant that 70 large coal fired power stations were in a short period of time retrofitted with emissions controls for sulphur dioxide, amounting at that time to an investment of €7 billion.

It was also true that such Waldsterben or forest death was not new in Germany, but academia in the late seventies was pushing a strong link between such forests deaths and sulphur dioxide emissions, for which Large Combustion Plants were a major contributor. While scientifically conclusive proof could not be produced, the mass media and the public had been galvanised. In the end research groups for the German authorities spent about €125 million on ca. 660 different research projects between 1982 and 1988[7]. The fundamental conclusion that forest death is caused by a multitude of factors rather than by air pollution alone has remained unchanged. However, political decision making was increasingly been driven a public awareness that air pollution was unacceptable and action was required. Indeed, many European cities at that time, Dublin included[8], had unacceptable levels of air pollution and regular winter smog episodes.

Emissions from large chimneys, such as the two chimneys at the Ringsend power station in Dublin, which have characterised the skyline since 1970, are responsible for the transboundary nature of emissions. An example of such transboundary impacts being the pollution from German smoke stacks, which was at that time causing acid deposition on the forests in the Czech Republic. This transboundary impact therefore needed international solutions and it was UNECE, which led the process, with its 'Geneva Convention on Long-range Transboundary Air Pollution'.

---

[7] http://www.uni-potsdam.de/u/sprinz/doc/Sprinz_PIK_Report_42.pdf

[8] http://www.thejournal.ie/smog-dublin-764941-Jan2013/

This Convention entered into force in 1983 and has had eight Protocols dealing with various pollutants and emission reduction targets. In hindsight, this was a remarkable process of co-operation, occurring behind the backdrop of the then Cold War. Note: The countries of UNECE not only comprise Western Europe, but also Eastern Europe, Central Asia and North America.

The first of these Protocols in 1985 was in effect a political comprise, in that a 30% reduction in sulphur emissions was to be achieved by the twenty one countries ratifying the Protocol by 1993, based on a very simple calculation, completed in 1984 in which:

- Flue gas desulphurisation yielded 80 to 95% sulphur dioxide emission reduction at power plants fired by coal or by high sulphur coal oil;
- Flue gas desulphurisation applied to all new and existing power plants would decrease national sulphur emissions by 30% in most countries; and
- Continuing fuel switching, particularly to natural gas would further decrease national emissions.

In addition, an increasing body of scientific knowledge evolved from both within the EU and the further UNECE area. This supported the Convention through the development of emission inventories, control measures and model calculations, the latter concerning atmospheric concentrations, depositions and cross-border transportation of air pollutants. It was also recognised that a good understanding of the harmful effects of air pollution was a prerequisite for reaching agreement on effective pollution control. Six International Cooperative Programmes (ICPs) and the Task Force on Health continue to identify the most endangered areas, ecosystems and other receptors by considering damage to human health, terrestrial and aquatic ecosystems and materials.

Indeed, by the mid-nineties the UNECE Protocols were setting emission targets, not only based on technology standards, but also the concept of critical loads. This evolved from scientific research on the development of specific dose-response relationships between loads and adverse effects, where the critical load is defined as the highest annual deposition level, at which adverse effects on natural ecosystems are unlikely to result in the long term. Critical loads vary greatly with soil type and other local characteristics. This critical load concept has also contributed to the cost-effectiveness of European air pollution policies, since impacts (benefits) can be compared to the economic and technical consequences (costs) of policy alternatives.

In Ireland, winter smog in our cities and large towns is a thing of the past. Many older Irish citizens attribute it to the success of Mary Harney, the then Minister of Environment. In reality, the Air Pollution Act of 1987, which initiated emission controls for both industry and domestic households, was simply the transposition of EU legislation developed as part of the UNECE Protocols.

4.2 The Impacts of Air Pollutants

As UNECE pointed out in their 2004 report on "25 years of the Convention on Long-range Transboundary Air Pollution[9]":

[9] http://www.unece.org/fileadmin/DAM/env/lrtap/ExecutiveBody/BOOKscreen.pdf

- *There has long been interest from Parties in estimating the economic benefits of emission controls and to this end the Task Force on Economic Aspects of Abatement Strategies was established in 1991. It identified that the major benefits were associated with the protection of human health and building materials, and in the preparations for the Gothenburg Protocol benefits were calculated for the most prominent abatement scenarios. For practically all countries the benefits were two to five times the calculated costs.*

In their 2007 report on the "Review of the Gothenburg Protocol[10]" they conclude:

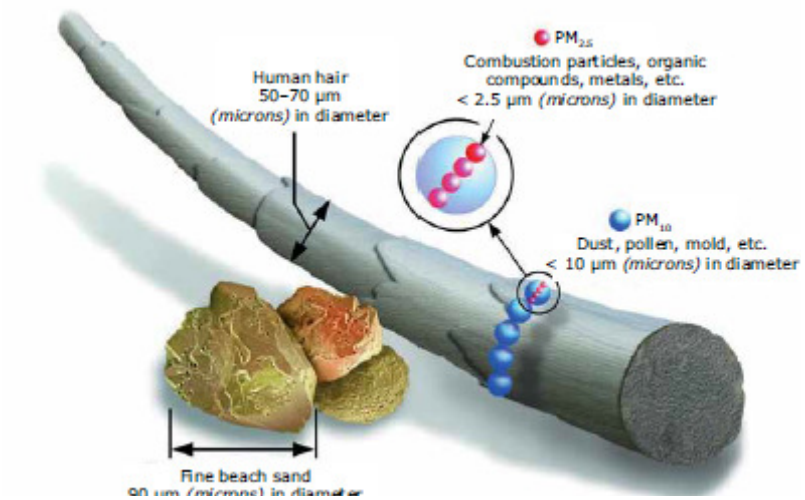
- *The benefits of current efforts under the Protocol exceed abatement costs. According to new scientific insights, however, efforts under the Protocol lead to less improvement towards the ultimate objectives of the Protocol, in terms of the protection of ecosystems and health, than originally estimated.*

First it is necessary to explain what these pollutants were, the principal ones being the by-products of combustion, namely sulphur dioxide, nitrogen oxides and Particulate Matter.

- Sulphur dioxide occurs as most fossil fuels contain a percentage of sulphur, which when combusted gives rise to sulphur dioxide. While petroleum fuels can be refined to essentially reduce sulphur level in diesel and gasoline to near zero, this clearly isn't an option for coal or indeed heavy fuel oil blends.

- Nitrogen oxides arise from the combustion of both the nitrogen fraction in the fuel, but also the high combustion temperatures causes the nitrogen in the combustion air to be converted to nitrogen oxides. The higher the combustion temperature, diesel engines for instance operate at higher temperatures than petrol engines, the higher the resulting emissions of nitrogen oxides.

- Particulate Matter refers to ultra-fine particulate matter, which is either sub 10 microns (PM_{10}) or sub 2.5 microns ($PM_{2.5}$). This is fine enough to penetrate into the respiratory tract and indeed into the air sacs (alveoli) of the lungs. To put this in perspective, a hair has a typical width of 50 to 70 microns.



[10] http://www.unece.org/fileadmin/DAM/env/lrtap/TaskForce/tfiam/TFIAM_ReportReviewGothenburgProtocol.pdf

The 2013 European Environment Agency's report on air quality in Europe[11], from which the graphic above is taken, summarises in respect of health impacts:

- *Particulate Matter (PM): Can cause or aggravate cardiovascular and lung diseases, heart attacks and arrhythmias, affect the central nervous system, the reproductive system and cause cancer. The outcome can be premature death.*

- *Sulphur oxides (SO_X): Aggravates asthma and can reduce lung function and inflame the respiratory tract. Can also cause headache, general discomfort and anxiety.*

- *Nitrogen oxides (NOx): NO_2 can affect the liver, lung, spleen and blood. Can also aggravate lung diseases leading to respiratory symptoms and increased susceptibility to respiratory infection.*

- *Ozone (O_3): Can decrease lung function; aggravate asthma and other lung diseases. Can also lead to premature mortality.*

The ozone above is not to be confused with the upper atmospheric (stratospheric) ozone layer, but rather that the ground level ozone, which is formed at low level due to the complex interplay between intense sunlight, NOx and Non-Methane Volatile Organic Compounds (NMVOCs). The latter occurring from hydrocarbon emissions, such as solvent or petroleum vapours. Ground level ozone is therefore a secondary pollutant, as it is not emitted directly by any emission source. Of direct relevance Ireland is the interplay with intense sunlight, such that as can be seen in the monitoring results in the air quality reports of the European Environment Agency, the highest ground level ozone readings are to be found in the Southern areas of Europe, characterised by intense summer sunshine. In contrast, the British Isles, at latitude of over 50^0N, are not exposed to that level of intense sunshine, and hence the chemical reactions which lead to the concentrations of ground level ozone. For instance, the European Environment Agency produces a Fact Sheet on Air Pollution each year for each Member State[12]; Ireland simply does not have exceedances of the recognised ozone limits, a circumstance which also essentially applies to the UK.

If we consider effects on ecosystems, the same 2013 European Environment Agency's report on air quality in Europe clarifies that:

- *Particulate Matter (PM): Can affect animals in the same way as humans. Affects plant growth and ecosystem processes. Can cause damage and soiling of buildings. Reduced visibility.*

- *Sulphur oxides (SOx): Contributes to the acidification of soil and surface water. Causes injury to vegetation and local species losses in aquatic and terrestrial systems. Contributes to the formation of particulate matter with associated environmental effects. Damages buildings.*

- *Nitrogen oxides (NOx): Contributes to the acidification and eutrophication of soil and water, leading to changes in species diversity. Acts as a precursor of*

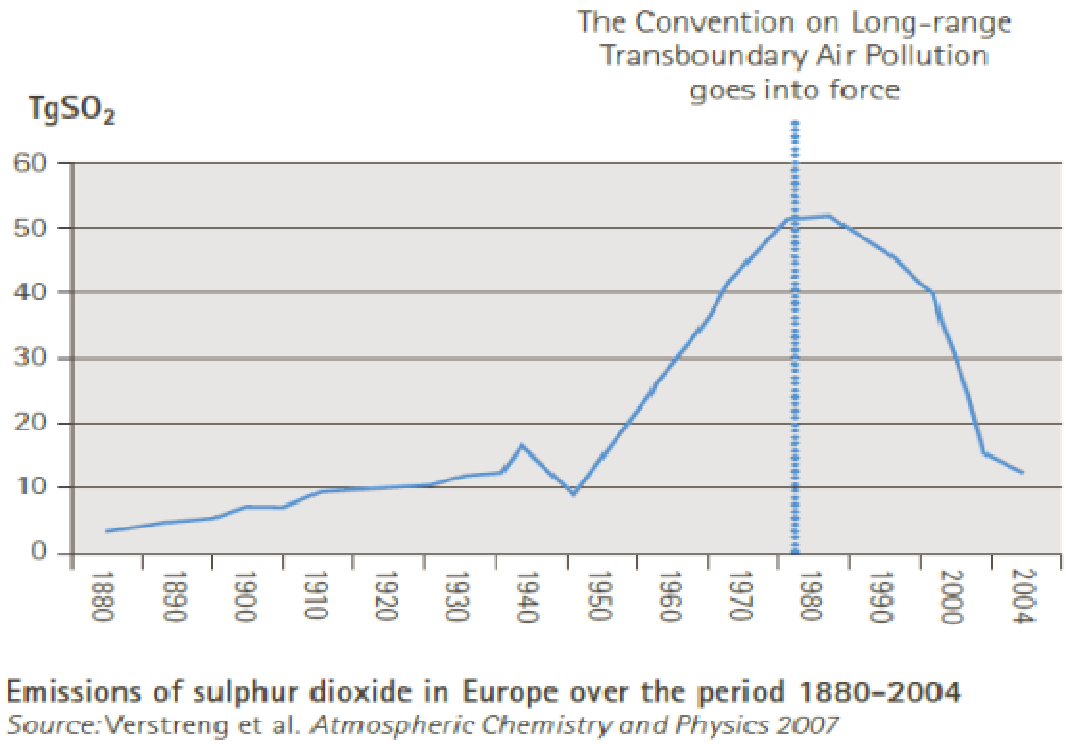
[11] http://www.eea.europa.eu//publications/air-quality-in-europe-2013

[12] http://www.eea.europa.eu/themes/air/air-pollution-country-fact-sheets-2014

ozone and particulate matter, with associated environmental effects. Can lead to damage to buildings.

- *Ozone (O_3): Damages vegetation, impairing plant reproduction and growth and decreasing crop yields. Can alter ecosystem structure, reduce biodiversity and decrease plant uptake of CO_2.*

However, it most certainly is not all doom and gloom, in particular with regard to sulphur dioxide, considerable progress has been made through UNECE's Convention on Long-range Transboundary Air Pollution and associated EU legislation in reducing emissions of sulphur dioxide in Europe:



Sulphur Dioxide Emissions in Europe – Taken from "Clearing the Air, 30th Anniversary brochure" (UNECE, 2009)[13]

4.3 The Cost of Air Pollution

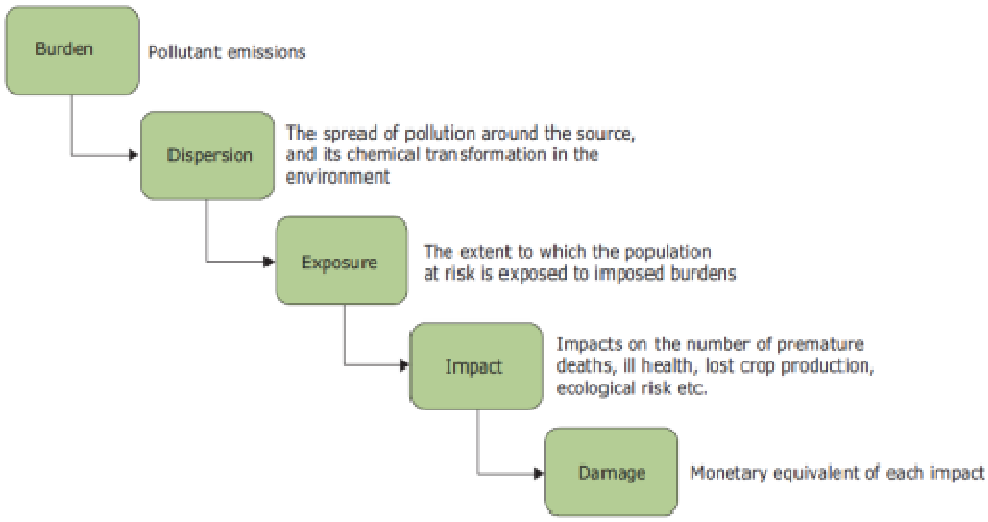
"Measurement is the first step that leads to control and eventually to improvement. If you can't measure something, you can't understand it. If you can't understand it, you can't control it. If you can't control it, you can't improve it."

- **H. James Harrington, Globally recognised quality expert, 1929 -**

In conjunction with the monitoring of air quality, it is also possible to model the dispersion of emissions from both point sources, such as industrial and power station stacks, and the more disperse emissions such as from traffic. In this way a model

[13] http://www.unece.org/index.php?id=31345

can be built up, which predicts the concentration to which the receptor will be exposed, such as the sensitive human being. The dose response relationship, such as for human health or ecosystems, can then be used to predict the adverse impacts which occur, impacts which are then monetised. In this manner an estimate of the externalities associated with the air pollution can be derived. See schematic overleaf of the 'impact pathway approach' taken from the European Environment Agency's "Cost of Air Pollution from European Industrial Facilities 2008-2012" [2].



"The Impact Pathway Approach" (EEA, 2014)

To explain, the internal costs is what we pay in our bill as a financial charge, while the external costs, also referred to as externalities, are the costs society pays in terms of health impacts, environmental degradation, etc. The true cost is therefore the sum of the internal and external costs. As the 'polluter pays principle' is a key cornerstone of EU legislation, then over time, external costs should become increasingly internalised.

Clearly, it is the monetary equivalent of the impact of each pollutant, which will allow an estimation of its external cost. While this will never be a precision figure, it is important for decision making on policy, as to the degree of investment justified. In other words, if it can be demonstrated that the benefits outweigh the costs, then clearly there is a strong justification for that investment.

However, the calculation of this external cost of a pollutant is a complex issue affected by geographical location, such as the role of sunlight highlighted before, and complex dispersion processes based on prevailing meteorological conditions. The European Environment Agency's Report on Cost of Air Pollution [2] addresses these issues in its Annex 2 based on the 2013 Impact Assessment[14] completed to support the EU Commission's Clean Air Policy Package[15], which drew on expertise built up over several decades of air quality assessments, management and review activities in both the EU and internationally through UNECE. Of interest in the Cost of Air Pollution [2] is the statement that:

[14] http://ec.europa.eu/environment/archives/air/pdf/Impact_assessment_en.pdf

[15] http://ec.europa.eu/environment/air/clean_air_policy.htm

- *Ozone effects generate only a small amount of the overall pollution damage, with effects of fine PM being far more significant. Recent analysis for the Gothenburg Protocol suggests that over 95 % of health damage from the main air pollutants is attributable to PM. It may be argued that the role of ozone is being underestimated, perhaps through the omission of some types of effect, but ozone-related damage would need to increase very markedly for this to be a problem.*

The report then presents in tabular form the estimates for pollution damage, expressed as Euros per tonne of emissions, for the primary pollutants ammonia (NH_3), nitrogen oxides (NOx), Particulate Matter sub 2.5 micron ($PM_{2.5}$), Particulate Matter sub 10 micron (PM_{10}), sulphur dioxide (SO_2) and Non-Methane Volatile Organic Compounds (NMVOCs). Note: These costs are reported individually for each of the Member States with large differences to be seen between the various Member States.

As to why these large differences occur, it is necessary to understand some of the complex economics used. As the "Cost-benefit Analysis of Final Policy Scenarios for the EU Clean Air Package: Version 2" [3] explains:

The general form of the equation for the calculation of impacts is:

- *Impact = Pollution level x Stock at risk x Response function*

Pollution may be expressed in terms of:

- *Concentration, for example in the case of impacts to human health where exposure to the pollutants of interest to this study occurs through inhalation, or;*

- *Deposition, for example in the case of damage to building materials where damage is related to the amount of pollutant deposited on the surface.*

The term 'stock at risk' relates to the amount of sensitive material (people, ecosystems, materials, etc.) present in the modelled domain. For the health impact assessment, account is taken of the distribution of population and of effects on demographics within the population, such as children, the elderly, or those of working age. Incidence and prevalence rates are used to modify the stock at risk for each type of impact quantified. Improved data availability has enabled this report to use country-specific rate data to a much greater degree than before.

If we take a country like Ireland, which is not densely populated and on the edge of the Western seaboard, then clearly both the 'pollution level' and 'stock at risk' will be lower than a densely populated country in Central Europe. Indeed, further research of this form of economics shows that it is health benefits, in the form of reduced premature mortality and reduced morbidity, which 'drive' the positive benefit-cost results to justify investments in air pollution control.

As to how exactly these health-benefits are to be monetised, has led to some different approaches, but no one simple figure, which is applicable. In the nineties and early 2000s, there was a joint EU and US project over a period of fifteen years, called ExternE[16], which through socio-economic research in the field of energy, set

[16] http://www.externe.info/externe_d7/

out to quantify the external costs associated with energy. In its "ExternE, Externalities of Energy Methodology 2005 Update" [4] it clarified:

- *The goal of the monetary valuation of damages is to account for all costs, market and non-market. For example, the valuation of an asthma attack should include not only the cost of the medical treatment but also the Willingness-To-Pay (WTP) to avoid the residual suffering. It turns out that damage costs of air pollution are dominated by nonmarket goods, especially mortality. If the WTP for a non-market good has been determined correctly, it is like a price, consistent with prices paid for market goods. Economists have developed several tools for determining non-market costs.*

The OECD in their report "Valuing lives saved from Environmental, Transport and Health Policies: A meta-analysis of stated preference studies"[17] clarify in relation to a WTP for a risk reduction that will extend that life:

- *WTP is defined as the maximum amount that can be subtracted from an individual's income to keep his or her expected utility unchanged. Individuals are assumed to derive well-being, or utility, from the consumption of goods.*

However, as regards setting a non-market price, air pollution is somewhat unique in that it is more likely to affect older people and, perhaps because of correlation, persons who are already ill. In many respects it can be considered to be a cause of "accelerated ageing". Therefore, the concentration of risks, such as those associated with air pollution, among the older-aged groups in society, might appear to suggest that the relevant aggregate social value should in turn be very low, due to the short periods of life that are saved by reducing those risks. Typically, such as for socio-economic studies related to accident injuries and mortality, an age profile of 40 years of age is assumed. However, for air pollution there has to be some legitimacy, to adjust downwards the Willingness to Pay (WTP), typically estimated for a 40 year old, for those over 70 years of age. These are some of the complex and to a certain extent unresolved issues with assessing the monetised impact of air pollution.

As a result the EU Commission and others use two approaches in monetising heath impacts based on the 'Value of Statistical Life' (VSL) and 'Value of a Life Year' (VOLY). This "Value of Statistical Life" (VSL), also called the 'Value of a Prevented Fatality' (VPF), is an unfortunate term that often evokes hostile reactions among non-economists. However, while this approach is relevant for accidental deaths, it is not directly appropriate for air pollution mortality, as the 2005 ExternE Report [4] clarifies:

- *But whereas Value of a Prevented Fatality (VPF) is relevant for accidental deaths, it is not appropriate for air pollution mortality; the latter is primarily cardio-pulmonary and the associated loss of life expectancy per premature death is much shorter than for accidents. Furthermore, one can show (Rabl, 2003) that the total number of premature deaths due to air pollution cannot even be determined. One of the reasons is that air pollution cannot be identified as cause of any individual death; it is only a contributory, not a primary cause of death. Epidemiological studies of total (as opposed to acute) air pollution mortality cannot distinguish whether the observed result is due to a few people suffering a large loss of life expectancy or many suffering a small loss. It is quite plausible that everybody's life is shortened to some extent by pollution, in which case every death would be a premature death*

[17] http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?doclanguage=en&cote=env/epoc/wpnep%282008%2910/final

due to pollution. Number of deaths is therefore not a meaningful indicator of the total air pollution mortality (even though several authors who do not understand this point have published numbers). Rather one has to use loss of life expectancy which is indeed a meaningful indicator.

For the valuation of life expectancy one also needs to use the Value of a Life Year (VOLY). However, it wasn't until the 2000s, that VOLY started to receive attention, while a considerable number of studies had existed previously in relation to VSL / VPF. Often economists estimate VOLY as the constant annual sum which, taken over a remaining life span, has a discounted value equal to the estimated VSL.

In their 'Cost of Air Pollution' report [2], the European Environment Agency used Median VOLY and mean VSL values. Therefore for Ireland we get the following damage costs for the primary pollutants, which are to be found as emissions from power stations:

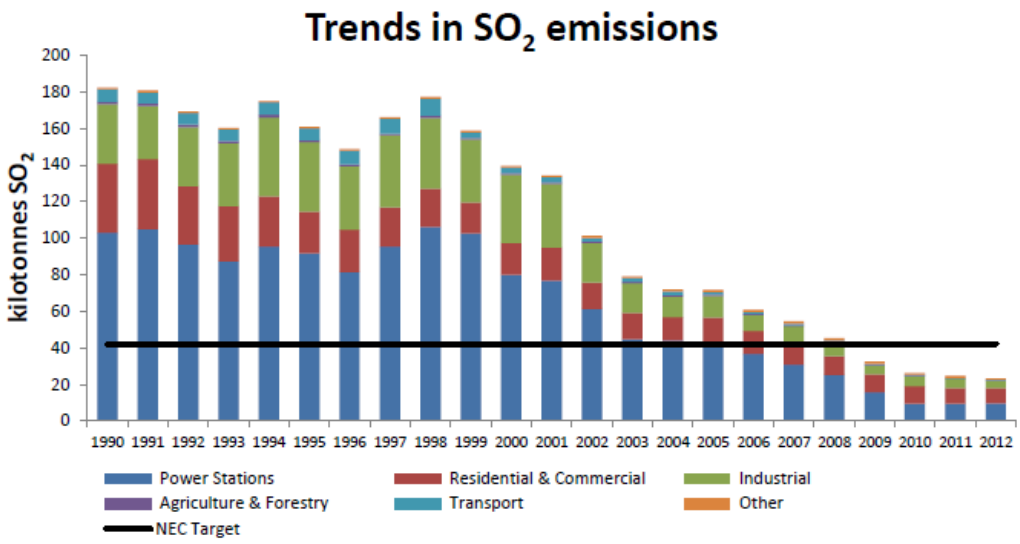
Pollutant	**Damage € per tonne emission estimates (2005 prices) for Ireland**	
	Low VOLY	**High VSL**
$PM_{2.5}$	13,461	40,315
PM_{10}	8,741	26,178
NOx	3,736	9,785
Sulphur Dioxide	11,011	32,378

As can be seen above, there is quite a variation depending on what method of calculation one uses, but in reality the more meaningful figure is that based on VOLY.

4.4 The Impact of Air Pollution from Irish Power Generation

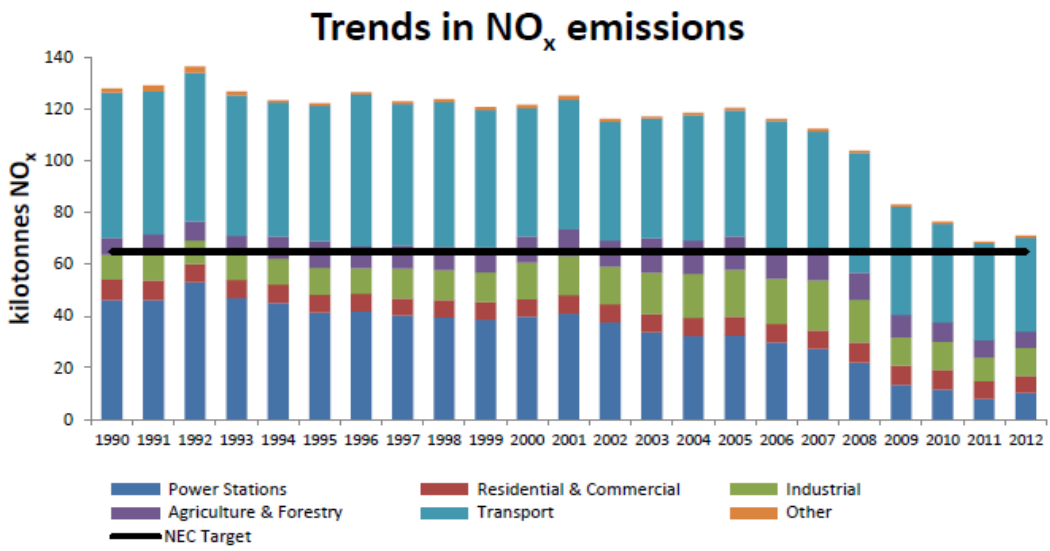
So what is the significance of these emissions with respect to power generation? The Irish Environmental Protection Agency (EPA) has published its 2014 report on transboundary air emissions[18], which reviews the emissions data from 2012. The data for sulphur dioxide overleaf, showing the trends from 1990 to 2012, are quite remarkable, demonstrating massive reductions. Indeed the European Environment Agency estimates that 17% of Europe's sulphur dioxide emissions are now coming from shipping. Energy production in Ireland is no longer significant emitter of sulphur dioxide and Ireland is well below the emission quantities for sulphur dioxide specified as the target in International Agreements with UNECE.

[18] http://www.epa.ie/pubs/reports/air/airemissions/NECD_Summary_Rpt_%202014.pdf



Irish EPA National Emissions Ceilings Data for 2012

If we consider NOx the following data is presented by the EPA's report:



Irish EPA National Emissions Ceilings Data for 2012

The transport sector is responsible for 51% of NOx emissions, while power generation is only 15% of these emissions. Indeed, in January 2016 even lower emission standards for emissions of NOx from power stations will apply, so further reductions from this sector will occur. Indeed, since 1990 there has been a major reduction of 78% in NOx emissions from power generation even though electricity consumption has increased 104% in the same period. As regards there being a significant problem with NOx emissions in Ireland, it is already clear that we are near to our UNECE target and that power stations are a decreasing contributor to this. Furthermore, given the geographical location of Ireland, the previous analysis has shown that the damage cost of NOx in Ireland is lower than that of other pollutants.

In this respect, as has been highlighted previously, health impacts are primarily driven by the impacts of Particulate Matter. This is a point also recognised by the WHO in their publication: "Health effects of particulate matter: Policy implications for countries in eastern Europe, Caucasus and central Asia"[19]. This was developed in conjunction with UNECE's Convention on Long Range Transboundary Air Pollution. As the document explains as to where Particulate Matter (PM) comes from:

- *Particles can either be directly emitted into the air (primary PM) or be formed in the atmosphere from gaseous precursors such as sulfur dioxide, oxides of nitrogen, ammonia and non-methane volatile organic compounds (secondary particles).*

- *Primary PM and the precursor gases can have both man-made (anthropogenic) and natural (non-anthropogenic) sources.*

- *Anthropogenic sources include combustion engines (both diesel and petrol), solid-fuel (coal, lignite, heavy oil and biomass) combustion for energy production in households and industry, other industrial activities (building, mining, manufacture of cement, ceramic and bricks, and smelting), and erosion of the pavement by road traffic and abrasion of brakes and tyres. Agriculture is the main source of ammonium.*

- *Secondary particles are formed in the air through chemical reactions of gaseous pollutants. They are products of atmospheric transformation of nitrogen oxides (mainly emitted by traffic and some industrial processes) and sulfur dioxide resulting from the combustion of sulfur-containing fuels. Secondary particles are mostly found in fine PM.*

- *Soil and dust re-suspension is also a contributing source of PM, particularly in arid areas or during episodes of long-range transport of dust, for example from the Sahara to southern Europe.*

Thermal power stations are therefore not the only significant anthropogenic (man-made) source, but they are a contributing factor. Furthermore, the epidemiological evidence in relation to Particulate Matter is very conclusive, as the example below demonstrates which is taken directly from the WHO guidance document.

- *A copper smelter strike in 1967–1968 in four states, and the closure and reopening of a steel mill in Utah Valley in 1986–1987, are two examples of unplanned events which had a positive impact on health by decreasing air pollution concentrations in specific areas.*

- *The copper smelter strike led to a 60% drop in regional sulfur dioxide concentrations over eight months and was associated with a 2.5% decrease in mortality. In the Utah Valley, the closure of the steel mill, which was the primary source of PM10 in the area, lasted for 13 months and led to a decrease in PM_{10} levels of approximately 50% during the closure in winter compared to the previous winter when the mill was operating. Hospital admissions for children were approximately three times lower and bronchitis and asthma admissions were halved when the mill was closed. Furthermore, the reported 3.2% drop in daily numbers of deaths was associated with a*

[19] http://www.unece.org/fileadmin/DAM/env/documents/2013/air/Health-effects-of-particulate-matter-final-Eng.pdf

simultaneous fall in PM_{10} levels of approximately 15 µg/m^3 while the steel mill was closed, the strongest association being with respiratory deaths.

If we consider the EPA's State of the Environment Report for 2012 this clarifies[20]:

- *PM_{10} concentrations show a decreasing trend in cities and large urban areas since 2003. This is mainly due to the decreases in particulate emissions from traffic arising from improvements in vehicle engine emissions. However, this decrease is not seen in smaller towns, where domestic solid fuel emissions are more significant than traffic emissions. Many towns do not benefit from the ban on smoky coal, and often do not have access to cleaner fuel alternatives such as natural gas.*

A similar position can be found in the European Environment Agency's 2014 report on air quality in Europe[21]:

- *Household fuel combustion dominates the emissions of primary PM_{10} and $PM_{2.5}$, and has increased its emissions by 13 % and 11 %, respectively, since 2003.*

- *The use of household wood and other biomass combustion for heating is growing in some countries, due to government incentives/subsidies, rising costs of other energy sources, or an increased public perception that it is a 'green' option.*

- *Some households have reverted to heating with solid fuels in response to economic hardship. This has happened recently in Greece and Ireland, for instance.*

If we consider power generation in Ireland, then half of this is from gas turbines, which to all extents and purposes are free of particulate emissions. As regards coal and peat burning, improved emissions controls have reduced particulate emissions very significantly, from a concentration limit of 150 mg/Nm^3 under previous standards in the early 2000s to the range of 10 to 20 mg/Nm^3, which will be applied from 2020, depending on the age of the facility, as a result of the new legal limits in the 2010/75/EC Directive on Industrial Emissions.

The conclusion from this is that in terms of air pollution, there is nothing remotely 'dirty' about the power generation sector in Ireland. While in general Ireland doesn't have an air pollution problem, if further improvements were to be made, then the place to do so is related to other sources than power generation.

[20] https://www.epa.ie/pubs/reports/indicators/00061_EPA_SoE_2012.pdf

[21] http://www.eea.europa.eu/publications/air-quality-in-europe-2014

5. THE COST AND BENEFITS OF REDUCING CARBON EMISSIONS

5.1 Eighteen Years later do we actually have a clue as to the damage cost of Carbon Emissions?

UNECE's Kiev Protocol on Pollutant Release and Transfer Registers[22], became binding in International Law in 2009, as part of the Aarhus Convention on Access for Information, Public-Participation in Decision-Making and Access to Justice in Environmental Matters[23]. The objective of the Protocol is "to enhance public access to information through the establishment of coherent, nationwide pollutant release and transfer registers (PRTRs)." PRTRs are inventories of pollution from industrial sites and other sources. The net result is that right around Europe pollutant releases from larger industrial sites are annually quantified, verified and published on a dedicated website[24]. If one wants to find what your local power station emitted in terms of sulphur dioxide or carbon dioxide; it is all there.

The processing of this data formed the basis for the European Environment Agency's 2014 report on the Costs of Air pollution from European Industrial Facilities 2008–2012 [2], referred to earlier, which concluded:

- *The report lists the top 30 individual facilities identified as causing the highest damage across the five-year period 2008–2012. Of these, 26 are power-generating facilities, mainly fuelled by coal / lignite and located predominantly in Germany and Eastern Europe. Not surprisingly, most of the facilities with high emission damage costs are among the largest facilities in Europe, releasing the greatest amount of pollutants.*

So how did this arise, after all the previous section has shown the emissions of the common air pollutants from the power generation sector is decreasing significantly? However, such thermal plants function by the combustion of carbonaceous fuels and as a result give rise to very large discharges of carbon dioxide. This carbon dioxide is not a pollutant in the 'ordinary sense'; it does not lead to health impacts, but is instead a key life giving compound, critical not only for plant growth, but also for proper regulation of our respiratory functions. It is therefore radically different from Particulate Matter, for which as the World Health Organisation (WHO) in their reports on air pollution for the European Union[25] concluded:

- *There is no evidence of a safe level of exposure or a threshold below which no adverse health effects occur.*

It is also noteworthy that both WHO reports; *"identified road transport as the major air pollution source affecting health in Europe"*. Notwithstanding that there is a somewhat shrill populist and political agenda behind the climate change impacts of

[22] http://www.unece.org/env/pp/prtr.html

[23] http://www.unece.org/environmental-policy/treaties/public-participation/aarhus-convention.html

[24] http://www.prtr.net/

[25] http://www.euro.who.int/__data/assets/pdf_file/0004/193108/REVIHAAP-Final-technical-report-final-version.pdf?ua=1 and http://www.euro.who.int/__data/assets/pdf_file/0017/234026/e96933.pdf?ua=1

carbon dioxide, it is a gas, which has been with us in the atmosphere since time immemorial. So it is the dose which counts, as has been known for a long time:

"Nothing is more useful than wine for strengthening the body and also more detrimental to our pleasures if moderation be lacking"

- **Pliny the elder, Roman author, naturalist, and natural philosopher, AD 23 – 79.**

Therefore wine in moderation is beneficial, but not so in excess. A point the WHO in the modern world would agree with, as their list of 114 high risk carcinogens includes alcoholic beverages[26].

So when does carbon dioxide reach a 'dosage level' that it is harmful? The previous section has provided a brief insight into the huge amount of work, which has gone into estimating the dose response functions of common air pollutants, the assessment of critical loads and monetisation of these impacts. So given that the EU initiated its renewable programme in 1997, which lead to its Directive on the use of renewable sources in electricity in 2001[27], which was then followed by the later 2009/28/EC Directive establishing an overall 20% renewable energy by 2020 target, then where are we now eighteen years later, with regard to understanding the damage impact of carbon dioxide emissions?

Sad to say that if one examines the European Environment Agency's report on the cost of air pollution [2], it's a bit embarrassing – nobody has a clue. Instead a low value of €9.5 per tonne of carbon dioxide to a high value of €38.1 per tonne of carbon dioxide, both on a 2005 basis, are used in the reports as the damage related costs. As the report explains:

- *The selected values used in the present report are based upon carbon price values for the EU Emissions Trading System (ETS) used in policy modelling by the European Commission. This approach provides a reflection of the costs associated with decreasing CO_2 emissions over time in line with the required reduction necessary to meet the current policy objective of limiting the future average global surface temperature increase to two-degrees.*

Is this science or politics? Well this requires a somewhat deeper analysis of the above. First of all, under the Emissions Trading Scheme carbon credits are issued to industry to cover some, but not all, of their carbon emissions. When carbon reduction projects are implemented, such as related to energy efficiency, carbon credits become available, which can be traded. However, the controlling factor in the scheme, which is the biggest determinate of price, is the extent of the free allocations. This allocation is a political decision not one of environmental science. Since 2014 the whole scheme has been a mess and the carbon price has collapsed to €5 or less. So in essence, these so called 'damage related costs' above are complete political figures, which have got absolutely nothing to do with the assessment of the environmental impact of carbon dioxide on our natural environment.

So where did the two-degrees above come from? The planet goes through natural warming and cooling phases; the Roman period was characterised by a warm phase,

[26] http://monographs.iarc.fr/ENG/Classification/

[27] 2001/77/EC

as was the medieval period. Indeed, both were characterised by rather flourishing periods in comparison to the intervening cold cycles of the 'Dark Ages' and the later 'Maunder minimum' of about 1645 - 1715. It is accepted based on past human history, that the planet could have been two degrees warmer, such that if we go past this two degree rise we are into 'unknown territory'[28]. This does not imply that warming is dangerous. Indeed, there are many benefits to warming which outweigh the negatives, such that it is only when we go somewhat beyond the two degrees that we actually get an overall negative impact. As to how far beyond, well that is a subject of much debate, but no clear answer[29] – it is after all, as is much with this climate change subject, politics. Politics which were agreed before the actual evaluations were done and the evaluations completed since then, have not been anyway robust in relation to providing any further clarifications.

The early part of 2015 found Ireland going through the process of adopting a Climate Change Bill in its parliament. However, prior to this is in early 2012, a public participation exercise was completed on a very limited aspect of this legislation. Under the UNECE Aarhus Convention, obligations are placed on public authorities in relation to information on the environment. In particular to possess and update information on the environment, which is relevant to their function and to ensure it is transparent and effectively accessible. Rights are also provided to the public in relation to requesting environmental information.

On this basis a formal legal request was made by this author and others in relation to this climate change public participation of 2012. The first two elements of the request had to do with the public participation procedures which were being used, the third was in relation to the cost benefit analysis on the climate change programme being proposed and the final element of the request related to a reference to the EU Commission's webpage on Climate Action and a roadmap to a low carbon economy by 2050, which stated on the webpage:

- *"Science tells us that all developed countries would need to reduce emissions by 80-95% in order to have a fair chance of keeping global warming below 2℃".*

This was in fact the only information, which was justifying the whole climate change programme proposed, so how was it derived? As the final part of the request for information also clarified in relation to 'transparency':

- *The Aarhus Convention Implementation Guide defines this as: "Transparency means that the public can clearly follow the path of environmental information, understanding its origin, the criteria that govern its collection, holding and dissemination, and how it can be obtained". As the relevant EU legislation states, Directive 2003/4/EC as implemented by S.I. No. 133 of 2007, Member States have to ensure that information on the environment is up to date, accurate and comparable[30].*

There is no legal obligation on us, as members of the public, to be 'automatic believers'. However, there are legal obligations on the authorities under the Aarhus

[28] http://cowles.econ.yale.edu/P/cd/d04a/d0443.pdf

[29] http://pubs.aeaweb.org/doi/pdfplus/10.1257/jep.29.1.217

[30] For Institutions and Bodies of the EU Regulation 1367/2006 applies.

Convention, which is part of Community legal order since its ratification by the EU in 2005, with regard to:

- *Recognizing the importance of fully integrating environmental considerations in governmental decision-making and the consequent need for public authorities to be in possession of accurate, comprehensive and up-to-date environmental information.*

Unfortunately, there was an outright refusal by the Department of the Environment to answer all parts of the request. The matter went to appeal to the Commissioner for Environmental Information. Despite the legal obligation that this be an expeditious appeal procedure, it took over seventeen months for the decision on appeal CEI/12/0005[31]. This decision was quite remarkable in that it was legally decided that the request was 'manifestly unreasonable', i.e. the request was made in "bad faith". As the Commissioner in the decision stated that it was sought through the request to challenge the validity of the national climate policy review process. This made a mockery of the whole fundamental rights of the Aarhus Convention; namely to access information, participate in the decision-making and if necessary by means of access to justice, to challenge acts and omissions of the authorities through the courts. Note: This decision on appeal CEI/12/005 is now part of a Communication to the Aarhus Convention Compliance Committee in relation to Ireland's obligations under the Convention and the implementation of the renewable programme there.

However, as a year had passed and the appeal had not been processed, it was decided in March 2013 to send the same request to the European Commission's Directorate General on Climate Action (DG Clima). They replied reasonably promptly; quite clearly nothing was found to be in bad faith. However, the reply was very short, not only in length at just over a page, but also on what one could describe as details:

- *On the basis of the science collected and summarised by the IPCC, EU policies strive to limit the global temperature increases to less than 20ºC within this century. Current research suggests that potential damages to human and natural systems beyond that threshold could be both dangerous and irreversible. This broad objective was endorsed in Copenhagen and Cancun by world leaders of countries representing more than 80% of global anthropogenic GHG emissions.*

- *On this basis, in February 2011 the European Council endorsed the 20ºC objective and reconfirmed the EU's commitment to reduce greenhouse gas emissions by 80-95% by 2050 compared to 1990, in the context of necessary reductions according to the Intergovernmental Panel on Climate Change by developed countries as a group.*

So in a nutshell, it's based on a series of political decisions – not to mention lots of 'woolly' words like; 'policies strive to limit', 'could be both dangerous and irreversible', 'broad objective was endorsed', 'reconfirmed the EU's commitment', 'in the context of necessary reductions'.

Are there any hard figures out there at all? If we go back to the European Environment Agency's Cost of Air Pollution Report [2]:

[31] http://www.ocei.gov.ie/en/Decisions/Decisions-of-the-Commissioner/Mr-Pat-Swords-and-the-Department-of-Environment-Community-and-Local-Government-.html

- *Given the difficulty on deciding an appropriate value for the present day damage costs per tonne of emitted CO_2, other approaches have been developed based on the cost to society of avoiding dangerous levels of climate change. The so-called target-consistent approach, starts from a GHG reduction target, to be achieved in order to be consistent with a long term climate target. An associated carbon value that would result in the necessary emission reductions is subsequently derived. This type of approach has for example been used since 2009 for carbon valuation by the United Kingdom's Department of Energy and Climate.*

In layman's terms; we decided we are going to do it, without having a notion of the costs and benefits, primarily as we don't have a clue about the 'dose response' relationship, which is the key to the whole scientific analysis. Then we invent an economic value, which is related to the target we have politically chosen and then claim it's linked to a direct economic benefit in terms of climate change. Not only is the cart being put in front of the horse, but there are a lot of wild assumptions being made; it doesn't take a cynic to be cynical of the ability of such a procedure to get it right.

"The power of accurate observation is called cynicism by those, who do not have it"

- **George Bernard Shaw, Irish author and playwright, 1856 - 1950**

The same report from the European Environment Agency then clarifies:

- *There is a variety of approaches used to estimate the economic costs associated with CO_2 emissions, and the benefits of mitigating emissions for policy assessment purposes. Such approaches are however recognised as being very uncertain. The Intergovernmental Panel on Climate Change (IPCC) has highlighted the significant difficulties and high uncertainties associated with approaches used for the economic assessment of climate change risks, noting that there is a very wide range of values available in the literature, ranging between a few dollars and several hundreds of dollars per tonne of carbon in 2000 to 2015.*

In layman's terms; we haven't a clue and all we have is guesses, which the cynic would just point out from the orders of magnitude in the range above, are clearly wild guesses. In fact the report goes on to document, that even though the US has Federal requirements in relation to cost benefit studies, their estimates of what they call the 'social cost of carbon' are "subject to well-documented limitations". In layman's terms – they don't know either.

So political decisions have been made in the past, resulting in the allocations of hundreds of billions of Euros on the basis that the science was settled. However, clearly when one examines the issue, there is some really key information, which was necessary to justify those decisions and quantify the progress we have made over the last eighteen years, which simply doesn't remotely exist. So how did we get to this situation?

5.2 How Renewable Energy was originally justified financially?

As described in Sections 2 and 3, there are in theory robust procedures in place, as to how a structured form of decision making should occur, requiring various assessments and public participation. So what happened? To recap, in the late

1990s and early 2000s, the EU Commission funded a project assessing the external costs of energy technologies - named ExternE, the project singularly failed when it came to assessing the 'damage' cost of greenhouse gas emissions. ExternE finally recommended[32] the use of a 'central estimate' (2.4 €/t CO_2, with a 'minimum' value of 0.1 €/t CO_2, and a 'maximum' value of 16.4 €/t CO_2; Tol and Downing, 2000). To put this external cost in context, it has already been calculated in Ireland that it is costing over €135 to reduce a tonne of CO_2 by replacing fossil fuel generated electricity with wind energy[33].

Unfortunately EU and Member State decision makers got bored with this whole structure of assessing costs and benefits. As a result, it was the repeat of the whole 'Waldsterben' form of decision making, where, as highlighted previously, the Germans rushed into upgrading their whole coal power plant sector without understanding the science first and the dominant natural processes, which were occurring. Further insight as to what happened is to be found in the 2007 EU Commission's "Renewable Energy Road Map: Renewable energies in the 21st century; building a more sustainable future"[34], with regard to the EU working since 1997 towards a target of a 12% share of renewable energy in gross inland energy consumption by 2010:

- *"The target of a 12% share for renewable energy was based on the expectation that 68% of the increase in renewable electricity would come from biomass and 24% from wind power. With the successful development of wind power, this technology will instead account for at least 50% of the increase in renewables".*

As every engineer would point out, biomass combustion gives a steady high quality power input to the grid, i.e. it is dispatchable as it is available on demand, while wind is a highly variable intermittent non-dispatchable source, which has to be full backed up by other thermal plants. Clearly, the ball was set rolling without any proper analysis or control of the programme and as a result something completely different evolved.

It is also relevant to point out that the late nineties were a period of major transition for Eastern European countries; they were coming out of near economic collapse and adopting EU environmental standards, as part of the accession process. Unlike Western Europe, Eastern Europe is not densely populated and is characterised by under-utilised farm land and forestry. Many power generation plants and heating systems were dilapidated and reliant on high sulphur heavy fuel oil (mazut), which had previously been supplied under the communist system at low cost from Russia. Not only were there environmental issues, but there were also foreign currency issues in sourcing fuels which were now expensive imports. Biomass was a 'win – win' approach in terms of local employment, natural resources and the modernisation programme for these heat and power plants, which would anyhow have to occur. So

[32] http://www.dlr.de/Portaldata/41/Resources/dokumente/institut/system/publications/Do_the_answers_match_the_questions.pdf

[33] See Section 9.4: http://www.iae.ie/site_media/pressroom/documents/2011/Apr/06/IAE_Energy_Report_Web2_05.04.2011.pdf

[34] http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52006SC1719

the initial assumption was very valid; but instead they just ignored it and did something totally different.

There was also an input from the ExternE approach at that initial period when the renewable energy programme was first conceived, both in relation to Directive 2001/77/EC, which set an indicative target for 12% of the Community's electricity to come from renewable sources by 2010, and the 2001 Community Guidelines for State Aid for Environmental Protection[35]. In the latter it was established that:

- *Member States may grant operating aid to new plants producing renewable energy that will be calculated on the basis of the external costs avoided. These are the environmental costs that society would have to bear if the same quantity of energy were produced by a production plant operating with conventional forms of energy. They will be calculated on the basis of the difference between, on the one hand, the external costs produced and not paid by renewable energy producers and, on the other hand, the external costs produced and not paid by non-renewable energy producers. To carry out these calculations, the Member State will have to use a method of calculation that is internationally recognised and has been communicated to the Commission. It will have to provide among other things a reasoned and quantified comparative cost analysis, together with an assessment of competing energy producers' external costs, so as to demonstrate that the aid does genuinely compensate for external costs not covered.*

- *At any event, the amount of the aid thus granted to the renewable energy producer must not exceed EUR 0.05 per kWh.*

Nobody could argue that this wasn't fair and transparent and as regards the 5 cents per kWh, as one of the principal authors on the ExternE project later clarified in his paper "External Costs of Energy – do the Answers Match the Questions?" published in 2002[36]:

- *Based on the current 'best estimates' from ExternE, the maximum allowance of 5 €-cent/kWh for the renewable energy sources seems to be quite generous.*

So what happened? In Germany, Jurgen Trittin, the Green Party Minister for the Environment, was the driving force behind a guaranteed price for solar photovoltaic electricity of 46 cent per kWh[37] over a period of twenty years, when the same electricity could be generated from a conventional power plant for 5 cent per kW. As a result Germany now has a bill of hundreds of billions of Euros, but little to show for it in terms of any quantifiable environmental benefit[38].

---

[35] http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32001Y0203(02)&from=EN

[36] Energy Policy Volume 30, Issue 10, August 2002, Pages 839–848: See page 11: http://www.dlr.de/Portaldata/41/Resources/dokumente/institut/system/publications/Do_the_answers_match_the_questions.pdf

[37] http://www.sfgate.com/news/article/Germany-shines-a-beam-on-the-future-of-energy-2628485.php

[38] "Former German Minister of the Environment Peter Altmaier recently estimated that the program costs would reach $884 billion (€680 billion) by 2022": http://www.finadvice.ch/files/germany_lessonslearned_final_071014.pdf

In Ireland a 'Renewable Energy Feed in Tariff' (REFIT) was approved by the EU as State Aid for Environmental Protection. The first phase approved in 2007 for 1,450 MW had no such analysis of external impacts avoided completed, but a claim that 1.9 million tonnes of CO_2 would be saved per 1,000 MWs of installed capacity[39]. Even worse in February 2012, when the EU approved under REFIT II, a further 4,000 MW of wind energy representing a capital investment of some €8 billion, they did so on the back of a 'one pager' from the Irish authorities. This simply stated that by 2009 14.4% of Ireland's electricity was from renewable sources and this new State Aid would contribute to achieving the target of 40% of electricity from renewable sources[40].

So the financial model was now all about achieving a renewable target and nothing to do with quantifiable environmental protection. Indeed, one can add that the guaranteed price Irish wind energy operators get under REFIT is 7 cent per kWh. To this has to be added the 'balancing costs', for which the electricity companies under REFIT obtain a further cent per kWh, to compensate for the intermittent and volatile supply they have now to accept from the wind farms, i.e. they have to run their power stations in a variable stop start inefficient manner to balance this fluctuating wind energy input to the grid. As a result, the Irish electricity market price has become increasingly volatile, due to the extent and variability of the wind energy input. However, an examination of the website of the Single Electricity Market Operator[41], shows that most of the electricity is sold by conventional generators for less than 5 cent per kWh.

So clearly the direct subsidy under REFIT, without considering hidden costs, such as grid expansions or the true cost of balancing, is over 3 cent per kWh. To go back to the position of the ExternE authors, this appears generous with regard to their damage costs for carbon dioxide. Note: This isn't difficult to demonstrate; 3 cent per kWh is €30 per MWh. The carbon intensity of for generation of MWh in Ireland is 0.47 tonnes[42]. Therefore 2.13 MWh of electricity will be generated for each tonne of carbon emissions. REFIT then is equivalent to a direct subsidy of €64 to avoid a tonne of carbon emissions, well above their estimates of the damage cost for carbon dioxide, see for instance Figure 5 overleaf taken from previously referenced article on ExternE.

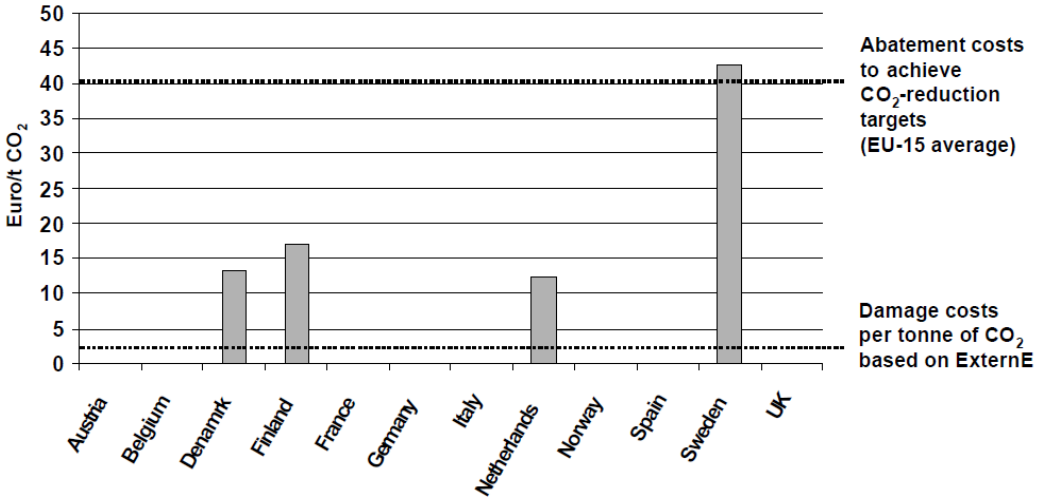
---

[39] Part III Supplementary Information Sheet on environmental protection: http://www.dcenr.gov.ie/Energy/Sustainable+and+Renewable+Energy+Division/REFIT.htm

[40] See documents of 13.03.2012: http://www.unece.org/env/pp/compliance/Compliancecommittee/54TableEU.html

[41] http://www.sem-o.com/Pages/default.aspx

[42] http://www.seai.ie/News_Events/Press_Releases/2014/Energy-in-Ireland-2014-release.pdf



External Costs of Energy – do the Answers Match the Questions?
Figure 5: Comparison of ExternE based damage costs for CO_2-emissions, abatement costs for achieving European CO_2-emission targets, and CO_2-taxes in European countries

It is also necessary with regard to external costs to look at Article 8 of Directive 2001/77/EC itself, which required that the Commission should present to the European Parliament and the Council, no later than 31 December 2005 and thereafter every five years, a summary report on the implementation of this Directive.

- *This report shall - consider the progress made in reflecting the external costs of electricity produced from non-renewable energy sources and the impact of public support granted to electricity production.*

Clearly this was an important report, what was the damage cost from existing generation, which was justifying the financial transfer at considerable cost to renewable forms of generation. However, as the report could not be found, it was formally requested from the EU. The resulting reply was that it did not exist. This was one of a number of issues that the European Platform Against Windfarms (EPAW) complained to the EU Commission about and which then lead to a formal complaint to the EU Ombudsman in September 2012[43]. The formal position of Hans Van Steen of DG Energy[44] was that this report wasn't completed as required by Directive 2001/77/EC as;

(a) The Member States did not provide the information on externalities (Note; they weren't required to) and;

(b) This information on externalities was available from other EU documentation.

[43] http://www.epaw.org/legal.php?lang=en&article=c4

[44] http://www.epaw.org/documents/Attachment%202%20-%20Reply%20from%20EU%20Commission%2012-08-31_16-29.pdf

The latter was completely untrue; there was no information prepared on the externalities associated with carbon dioxide, the greenhouse gas, which was the justification for this Directive and its targets.

6. THE BASIS FOR THE EU'S 20% RENEWABLE ENERGY PROGRAMME

6.1 The EU's Impact Assessment for the Programme

As increasingly becoming clear, as the EU moved to a larger 20% overall renewable energy target for 2020, cost and benefits related to any tangible assessment of damage costs were becoming completely and absolutely irrelevant to the decision making process. Indeed, in the development of this 20% renewable energy Directive, the EU Commission's official position in their "*Renewable Energy Road Map Renewable Energies in the 21st Century: building a more sustainable future COM (2006) 848 final*[45]*"* was that:

- *"The additional renewable energy deployment needed to achieve the 20% target will reduce annual CO_2 emissions in a range of 600-900 Mt in 2020. Considering a CO_2 - price of €25 per tonne, the additional total CO_2 benefit can be calculated at a range of €150 - €200 billion. Actual CO_2 prices will depend on the future international climate regime".*

So where did this cost, benefit analysis come from? It has to made clear that this is not a cost, benefit analysis, it is a political statement; the €25 per tonne was based on the expected trading price for carbon dioxide.

We also need to critically evaluate the other claim above, that the additional renewable energy deployment needed to achieve the 20% target would reduce annual CO_2 emissions in a range of 600-900 million tonnes (Mt) in 2020. The source of this claim was the PRIMES computer model used by the Commission, a computer model which has caused a lot of controversy, as it remains the private property of the National Technical University of Athens. While assumptions are published, independent parties cannot replicate the results. In the EU Commission's consultation on the "Energy Roadmap for 2050"[46], it is reported that a few organisations from diverse sectors criticised the PRIMES model regarding its transparency. Note: Only a few organisations would have the technical skills to evaluate the function of such a model.

Furthermore, careful examination of the Commission Staff Working Document SEC(2006) 1719[47], which was the official EU Impact Assessment for the Renewable Energy Roadmap, provides an insight into the key assumption of the PRIMES model in relation to assessing greenhouse gas emissions, namely "*the assumption that CO_2 savings per percentage point increase of renewable energy's share is constant*". In other words there is no allowance being made for the significantly increased power station inefficiencies, which are occurring on the grid, with resulting higher fuel consumption and emissions, as more and more intermittent renewable energy is placed on the grid. In other words the balancing costs, which the EU Commission recognised had to be financially funded under the REFIT and similar schemes. The PRIMES computer model is therefore fundamentally flawed and over predicts any emission savings which could arise.

---

[45] http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52006DC0848&from=EN

[46] SEC(2011) 1569 Part 3/3: http://ec.europa.eu/energy/energy2020/roadmap/doc/sec_2011_1569_3.pdf

[47] http://www.europarl.europa.eu/RegData/docs_autres_institutions/commission_europeenne/sec/2006/1719/COM_SEC%282006%291719_EN.pdf

One also has to seriously question SEC(2006) 1719, the sixty two page document, which was the official Impact Assessment for this massive roll out of the 20% renewable energy programme. First off, how on earth can one properly assess the impact of such an enormous programme, which for the island of Ireland alone is to result in the plastering of the countryside with over three thousand wind turbines and over a thousand kilometres of new high voltage lines, in just sixty two pages? In reality, this can be partly explained by the fact that the 20% target was just 'pulled out of a hat' by the politicians, without working out first in advance, as to what was actually achievable, not to mention its costs, benefits and impacts:

- *In 2004, the European Parliament called for a target of a 20% share of renewable energy in 2020. Also in 2004, the Commission agreed to "thoroughly assess the impacts of RES resources, notably with regard to their global economic effects before deciding on adopting targets beyond 2010 and before taking a position on a 20% target for the share of renewable energy in 2020"15. And in 2006, the spring European Council asked the Commission to look into a 15% target for renewable energy in 2015.*

Did that assessment of the impacts of Renewable Energy Sources (RES) actually happen? The Impact Assessment report states, i.e. claims, that the following impacts were examined:

• Feasibility and achievability risks (Section 5.1.1);

• Costs (Section 5.1.2);

• Benefits (Section 5.1.3):
- Greenhouse gas (GHG) emissions
- Security of supply
- Employment, GDP and export opportunities
- Biodiversity impacts
- Regional development and rural economy.

In essence the analysis in the report, for what it amounted to, was based primarily on outputs from two computer models: PRIMES[48] (designed to analyse developments across the whole energy sector) and Green-X[49] (giving more detail on renewable energy).

If we consider feasibility, the Impact Assessment had a few words in relation to the 'suggestion':

- *"That the limited ability of the electricity system to absorb wind power and other forms of variable power is a constraint on ambitious renewable energy scenarios".*

However, it was decided the renewable target was technically feasible:

- *"Greater use of variable energy is therefore a question of economics and regulatory rules rather than of technical constraints".*

[48] http://www.energyplan.eu/primes/

[49] http://www.green-x.at/

In reality this was an example of incompetence. We are in early 2015 only half way to achieving the 2020 renewable target. In Germany, the grid has already become completely unstable, due to the rapid growth in intermittent wind and solar power. Prior to 2006 grid operators rarely had to take action to keep the grid stable. The number of interventions started to soar in 2008 and have now reached 3,500 per year. Indeed not only is this affecting the safe operation of industrial facilities in Germany, but surges of solar and wind generated electricity are causing major problems in surrounding grids. Poland for instance having had to install phase shifters to "lock out" unplanned power surges from Germany[50]. The massive roll out of new high voltage lines throughout Europe, which is now being progressed to 'cure' this problem, is quite rightly being strongly resisted by citizens, who do not want to see their countryside blighted with thousands of new huge pylons.

Equally as incompetent were the estimates in the Impact Assessment of the capital costs required for investment in renewable electricity:

- *Under PRIMES, which works in detail with the electricity sector, investment needs in this sector are calculated to be about €160bn in the business-as-usual case (renewable share across all sectors: 10.4%) and some €280bn to reach 20% by 2020 in the PRIMES high renewables and efficiency scenario. In comparison, the Green-X model projects, for the power generation sector, an investment cost of €232bn for renewable energy in the business-as-usual scenario and a range of €285–414bn in the 20% scenarios.*

As has been pointed out already, the capital investment in solar panels and wind turbines in the EU by the end of 2012 was €600 billion and that's only a fraction of the investment required to be installed by 2020. So we are not even half way there and have completely blown the budget.

Then to justify the Impact Assessment, the results from the PRIMES and Green-X models were fed into another model. This ASTRA model was used to assess the employment and GDP impact of the achievement of a 20% renewable energy share. It also was completely incompetent, predicting that:

- *GDP would be a little more than 0.5% higher than under business-as-usual conditions and that employment would grow by around 0.3%, which amounts to about 650 000 additional jobs.*

In reality by the beginning of 2014, natural gas prices in the EU were some three times higher than the US, while industrial electricity prices were twice that of the US and rising rapidly. In was therefore not surprising to see reported in February 2014[51]:

- *EU leaders must address rising energy prices and climate policies which are crippling the bloc's manufacturing sector, according to a manifesto signed by more than 100 industry bosses.*

- *One hundred and thirty seven chief executives, including the heads of Tata Steel, Arcelor Mittal, and Rio Tinto, signed up to a paper published by the International Federation of Industrial Energy Consumers (IFIEC) Europe on Thursday (27 February).*

[50] https://www.bcgperspectives.com/content/articles/sustainability_energy_environment_germany_energiewende_end_power_market_liberalization/?chapter=2

[51] https://euobserver.com/news/123305

- *"EU economic recovery and reversing trends in employment will not happen without industry," the paper states.*

- *EU leaders will gather in Brussels on 21 and 22 March for a summit focused on the EU's industrial competitiveness and how to reinvigorate the bloc's rapidly eroding manufacturing base.*

- *The EU's manufacturing sector has been in steady decline for the past 20 years and now accounts for just 15 percent of economic output. Meanwhile, 4 million manufacturing jobs across Europe have been lost since 2008, according to the European Commission's latest figures.*

Another incompetent claim of the Impact Assessment was that:

- *The European Union is already the global leader in renewable technologies, which account for a turnover of €20 billion and employ 300,000 people. Further opportunities to create employment will arise from the export of renewable energy technology.*

In reality cheaper Chinese solar panels flooded the European market, the EU becoming the largest importer of Chinese solar PV products; having imported panels worth nearly €21 billion in 2011 (nearly 7% of China's total exports to EU)[52], this naturally wiped out European solar manufacturers. This was despite billions in German government subsidies granted each year to their solar industry[53]. Similarly in the wind turbine manufacturing sector, despite the billions poured into wind energy, European wind turbine manufacturers are going bust[54].

Yet another incompetent claim was in relation to biodiversity, where it was stated:

- *Careful study of two prominent forms of renewable energy – wind power and biofuels – shows that in general, the biodiversity effects of their production processes, while present, are minor. In both cases it is possible to avoid production processes which have a negative biodiversity impact: for example, avoiding siting wind turbines in locations through which migrating birds are obliged to pass, or avoiding felling rain forest to permit the production of palm oil to make biodiesel.*

The 20% renewable energy by 2020 Directive contained a target of at least 10 % of the final consumption of energy in transport in a Member State to come from renewable sources. This resulted in a massive roll out of biofuels, which was such a disaster, that we have reached the situation, where in summer 2014 the EU Energy Ministers have had to agree it should now be capped[55]. As Oxfam are quite rightly putting it, such biofuels are a:

---

[52] http://www.wsj.com/news/articles/SB10001424127887324010704578414673612252346

[53] http://www.spiegel.de/international/business/q-cells-bankruptcy-heralds-end-of-german-solar-cell-industry-a-825490.html

[54] http://www.economist.com/news/business/21597920-europes-wind-turbine-makers-are-pleading-more-political-support-still-short-puff

[55] http://www.reuters.com/article/2014/06/13/us-eu-biofuels-idUSKBN0EO14L20140613

- "*Brazen assault on common sense. In a starving world, phasing out the use of food for fuel is the only sensible thing to do*".

The European Environment Agency has also had to call a 'spade a spade'[56]:

- *"The overambitious 10 % biofuel target is an experiment, whose unintended effects are difficult to predict and difficult to control. Therefore the Scientific Committee recommends suspending the 10 % goal; carrying out a new, comprehensive scientific study on the environmental risks and benefits of biofuels; and setting a new and more moderate long-term target, if sustainability cannot be guaranteed".*

There is also the cold fact that wind turbines are posing an increasing threat to both birds and bats[57], while the extent of the problem may be disputed, there is no doubt that there has been an abject failure by the relevant authorities to assess it, which was keeping in good company with the skills and integrity of those, who prepared the original EU Impact Assessment.

Finally if we come to the claim in the document that the impacts on "regional development and rural economy" were addressed, then there is zero indication that this happened, as outside the 'contents list', it was never actually mentioned again. To reiterate this point, at no stage in the documentation or the associated models PRIMES and Green-X was it ever worked out what exactly was to be built, where it was to be built, what were its proper costs, what were the impacts and real benefits? For instance, there is not a scrap of information on what was to be built in Ireland, where it was to be built, etc.

Neither were any alternatives to renewable energies assessed. After all, it's not unknown that there are a multitude ways of reducing carbon emissions. For instance, it is indisputable that electricity in Denmark costs twice as much as France and has some ten times the amount of carbon emissions in its generation. Furthermore, the carbon price on the EU's emissions trading scheme has effectively collapsed to €5 per tonne, as there were so many low cost options available, such as in efficiency improvements, to reduce carbon.

None of this was looked at, as the whole Impact Assessment document was solely about a percentage target of renewables and nothing in relation to assessing what this actually 'would do for you' or alternatives to achieve that goal. In this regard, there are 35 billion tonnes of anthropogenic (man-made) carbon emissions each year[58], which are only 17% of what the UN IPCC defines as the natural annual fluxes between the terrestrial biosphere and the atmosphere and between the oceans and the atmosphere[59]. Given the PRIMES claim that the 20% target would reduce annual CO_2 emissions in a range of 600-900 million tonnes (Mt) in 2020 and this was a clear over-prediction, even if the EU's renewable energy programme had been reasonably

[56] http://www.eea.europa.eu/highlights/suspend-10-percent-biofuels-target-says-eeas-scientific-advisory-body

[57] http://www.nature.com/news/the-trouble-with-turbines-an-ill-wind-1.10849

[58] http://edgar.jrc.ec.europa.eu/news_docs/pbl-2013-trends-in-global-co2-emissions-2013-report-1148.pdf

[59] http://www.ipcc.ch/publications_and_data/ar4/wg1/en/ch7s7-3.html

effective, we are still only looking at less than a 2% reduction in anthropogenic emissions and 0.25% of the total fluxes which are occurring. In other words, it simply was never capable of having any impact on the climate cycles.

The question might well be asked; how did they get so much wrong? The answer to this is really; were they actually capable of getting it right? The Oxford Dictionary defines competent as: "Having the necessary ability, knowledge, or skill to do something successfully"". In this there is an inherent understanding that the relevant person has an established track record in the subject matter and recognition of the same by the established peers in that subject. Indeed, with regard to Health and Safety the issue of a 'competent person', while not precisely defined in law, has a very significant legal requirement in relation to the duties of ensuring a safe place of work. It is fundamentally understood that in these circumstances a "competent person" is different from a person solely having "adequate knowledge, training, and experience". Competence means the ability to undertake responsibilities and to perform activities to a recognised standard on a regular basis[60].

Performing an Impact Assessment, such as completing financial estimates running into hundreds of billions of Euros, is a task with enormous responsibilities, not least in relation to the impacts it has on the citizens on Europe. Instead we got a document that was completely incompetent. In this regard one could point out that the Impact Assessment was grossly inadequate not only in scope, but also with regards to financial estimates. For instance, as highlighted before the PRIMES model predicted for the 20% renewable energy target a cost of 'some €280 billion', while the Green-X model predicted for the same target €285 to €414 billion. That's a huge discrepancy; were they ever in a position to get it right? In the professional engineering world, getting project designs and project cost estimates right is absolutely and utterly crucial. You don't stay in business if you don't get it consistently right. Yet the whole climate change and renewable energy agenda is characterised by a 'gravy train' of consultancy projects, completed by individuals, who have never actually been responsible for designing and delivering major engineering projects, such as related to electricity generation and distribution infrastructure[61].

Is this right? Of course not, in particular as such professional expertise actually exists in Europe, after all how did we end up with an ultra-reliable and cost effective electricity network for decades before all this renewable hype was inflicted on us. However, such expertise is being deliberately ignored, in favour of what can only being described as dubious research institutes, with no actual competency in delivering the large scale projects, which are actually core to the whole policy objectives that they are 'advising' on. While one can and should criticise the 'professional' integrity of those working in such institutes and the appalling quality of their output, one also has to criticise the moral and legal position of the political decision makers. Political decision makers, who pull critical decisions 'out of the hat' without proper analysis, and then have it pushed through the legal 'assessment' procedures, by assigning it to these professionally incompetent and politically motivated research institutions. However, if we come back to the legal requirement of the Aarhus Convention that public authorities shall ensure that environmental

[60] http://www.hse.gov.uk/humanfactors/topics/02competency.pdf

[61] See Technical University of Athens (PRIMES) model and relevant staff : http://www.e3mlab.ntua.gr/e3mlab/index.php?option=com_content&view=article&id=62&Itemid=63&lang=en

information is transparent and effectively accessible, the 'Aarhus Convention: An Implementation Guide'[62] defines this as:

- *"Transparency means that the public can clearly follow the path of environmental information, understanding its origin, the criteria that govern its collection, holding and dissemination, and how it can be obtained"*

As has been highlighted already, despite the use of the PRIMES model to justify the EU's 20% renewable programme; the manner in which the model was actually programmed is completely inaccessible for others to investigate and replicate. This dreadful position alone calls into question the whole validity of the European Union's energy agenda[63].

6.2 How the Member States then went about implementing the Renewable Energy Programme

As the previous section documents, nobody had a clue about the practical realities of this renewable energy programme, not to mention alternatives in relation to achieving its so called objectives. It was a nice round number, 20% by 2020. As the EU had failed to evaluate, what exactly was to be built in each Member State, where it was to be built, what its costs and benefits would be, what were the alternatives to the programme, etc., it therefore reached the position that this 20% renewable energy target had to be implemented in the following manner, as described in Recital 15 of the 2009/28/EC Directive[64]:

- *The starting point, the renewable energy potential and the energy mix of each Member State vary. It is therefore necessary to translate the Community 20 % target into individual targets for each Member State, with due regard to a fair and adequate allocation taking account of Member States' different starting points and potentials, including the existing level of energy from renewable sources and the energy mix. It is appropriate to do this by sharing the required total increase in the use of energy from renewable sources between Member States on the basis of an equal increase in each Member State's share weighted by their GDP, modulated to reflect their starting points, and by accounting in terms of gross final consumption of energy, with account being taken of Member States' past efforts with regard to the use of energy from renewable sources.*

In other words, the 20% renewable energy target was 'dished out' to the Member States based on what level of renewable energy resources they already had and a 'fudge factor' based on GDP. The Irish Republic got a 16% target and the UK 15%, while Austria with considerable hydro resources got double that at 34%.

One might question where were the individual Regulatory Impact Assessment completed by Member States prior to the adoption of this Directive and the targets which applied to them. After all as we have established, such procedures were binding in Ireland since 2005. In reality, the Irish authorities just couldn't be bothered to comply with their own procedures. In the UK the same happened, there was no

[62] http://www.unece.org/env/pp/implementation_guide.html

[63] http://www.ft.com/intl/cms/s/0/9cf8f93e-0865-11e1-bc4d-00144feabdc0.html#axzz3RfJLGVTi

[64] http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:32009L0028

Regulatory Impact Assessment and associated robust cost benefit analysis completed. Indeed, the parliamentarians were left to evaluate the fundamentals themselves:

The report by the House of Lords Select Committee on Economic Affairs, published on 25 November 2008 and entitled, "The Economics of Renewable Energy[65]", is, some seven years later, well worth the read; you most certainly could not fault them in their conclusions in the report, which were introduced with:

- *The British economy will increasingly feel the impact of the Government's commitment to reducing carbon emissions, including targets for greater use of energy from renewable sources. The Government describes its targets for renewables as challenging; others have suggested they are unachievable. In any event, the effort to meet them will come at a cost and, if not properly managed, risks distracting attention from other means of reducing emissions.*

- *It seems timely, therefore, to examine the economics of renewable energy. We take as a given the Government's wish to reduce carbon emissions; we do not address how far such reductions are justified as a contribution to a world-wide effort. We note the following main points:*

    - *EU targets have focussed the spotlight on renewables rather than other means of reducing emissions such as energy efficiency or greater use of nuclear power.*

    - *The EU is committed to a binding target that 20% of its energy consumption should be from renewable sources by 2020. Individual states' contributions to the overall target are still only proposals and some remain a matter of dispute. The Government seems ready to accept the Commission's proposal that the UK target should be 15% of energy from renewables by 2020.*

    - *The expected UK target implies a dash from 1.8% renewable energy now to a near-tenfold increase in 12 years.*

They then went on to clarified:

- *It must be doubtful whether a 15% EU target can be met under current policies. If it were met, it would mark a step change in the use of renewable energy but take Britain into a degree of dependence on intermittent renewables unprecedented elsewhere in Europe, with the attendant risks. Determination to meet the target may lead to over-emphasis on short term options, simply because they are available, rather than because they offer the most effective and economical means of reducing carbon dioxide emissions over the longer term.*

Indeed, as regards their concerns about the intermittency and reliability of wind power, these were further elaborated within the report, with the suggestion that more "reliable" means of generation should be focussed to meet the target:

- *We have a particular concern over the prospective role of wind generated and other intermittent sources of electricity in the UK, in the absence of a break-*

[65] http://www.publications.parliament.uk/pa/ld200708/ldselect/ldeconaf/195/195i.pdf

through in electricity storage technology or the integration of the UK grid with that of continental Europe. Wind generation offers the most readily available short-term enhancement in renewable electricity and its base cost is relatively cheap. Yet the evidence presented to us implies that the full costs of wind generation (allowing for intermittency, back-up conventional plant and grid connection), although declining over time, remain significantly higher than those of conventional or nuclear generation (even before allowing for support costs and the environmental impacts of wind farms). Furthermore, the evidence suggests that the capacity credit of wind power (its probable power output at the time of need) is very low; so it cannot be relied upon to meet peak demand. Thus wind generation needs to be viewed largely as additional capacity to that which will need to be provided, in any event, by more reliable means.

- *[…]So far as reliability is concerned, the best options among renewable sources of generation are tidal barrage and biomass, which are problematic for other reasons, and hydro-power, which is not, but is already near the limit of its potential in the UK.*

However, they were ignored by the decision makers. The 2009/28/EC Directive on 20% renewable energy was adopted on the 23rd April 2009[66], by the 30th June 2009 the Commission had to adopt a template for the National Renewable Energy Action Plans (NREAPs) and these in turn had to be completed, adopted by the Member States and notified to the Commission by the 30th June 2010. In terms of European Directives, the timescales were simply unprecedented. A Directive in essence is a European legal act, which as the EU's website clarifies[67]:

- *A "directive" is a legislative act that sets out a goal that all EU countries must achieve. However, it is up to the individual countries to decide how. This was the case with the working time directive, which stipulates that too much overtime work is illegal. The directive sets out minimum rest periods and a maximum number of working hours, but it is up to each country to devise its own laws on how to implement this.*

In the normal course there is a two or three year period for a Member State to transpose the Directives and its requirements into National Law – but clearly this didn't apply with the 20% renewable energy Directive. One could also point out that the manner in which it had to be implemented through this NREAP process was highly rigid – like a planned economy of old style Eastern Europe. However, the Member States were free to choose, as a means of meeting their individual target, whatever combination of the eleven sources of renewable energy defined in Directive, which suited them. These sources comprised:

- *'Energy from renewable sources' means energy from renewable non-fossil sources, namely wind, solar, aerothermal, geothermal, hydrothermal and ocean energy, hydropower, biomass, landfill gas, sewage treatment plant gas and biogases.*

Which goes back to the previous point, that before this whole programme was set in motion, nobody had any clear idea of what was to be built, why it was to be built and where it was to be built? Literally anything could have happened when it came to

[66] http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:32009L0028

[67] http://europa.eu/eu-law/decision-making/legal-acts/index_en.htm

implementing it. Even more damming, in the development and adoption of these targets, both at EU level and at Member State level, the public concerned were not contacted and provided with an opportunity to participate in this decision-making. In particular, as the Aarhus Convention clarifies:

- *"The public concerned" means the public affected or likely to be affected by, or having an interest in, the environmental decision-making.*

Let's not beat around the bush here, this programme was effectively conceived and implemented by an 'elite' behind closed doors. Despite the massive impact it was to have, not just financially, but also on the whole character of rural Europe, there was no effort made to identify the public concerned and "*make appropriate practical and / or other provisions for the public to participate during the preparation of plans and programmes relating to the environment, within a transparent and fair framework, having provided the necessary information to the public*". The latter being a fundamental requirement of Article 7 of the Aarhus Convention, where the necessary information is seen within the context of effective public participation. Indeed, given the enormous impacts of this programme, there naturally should have been in-depth information on its costs, benefits and environmental impacts.

Indeed, the EU legislation which implements Article 7 of the Aarhus Convention[68] requires that such plans or programmes related to Energy, which lead to future development consent[69] of projects regulated by the Environmental Impact Assessment Directive, must undergo a Strategic Environmental Assessment with comprehensive public participation before adoption. Note: Wind farms and high voltage lines, among others, are projects regulated by the Directive on Environmental Impact Assessment. However, none of this was completed, as was legally required, not only in the UK and Ireland, but also in the other Member States. The NREAPs were adopted by by-passing the Strategic Environmental Assessment and associated public participation. As a result the assessment of the objectives of the plan, the alternatives to reach those objectives, the likely state of the environment without implementation of the plan, the significant environmental impacts of the plan, the necessary mitigation measures, the monitoring for unforeseen adverse environmental impacts, all of this was bypassed and ignored.

However, the Aarhus Convention is part of Community and National legal order and the UNECE Meeting of the Parties on the Aarhus Convention is the Treaty Convention, which takes place every three years. Under the Vienna Convention on the Law of Treaties[70], an agreement reached by the Parties becomes part of the legal interpretation of the Treaty. On the 30th June 2014, the 47 Countries (Parties), which had ratified the Convention met in Maastricht, the decisions formally adopted by the Meeting of the Parties by consensus included[71]:

---

[68] See Section on Article 7 in EU Implementation Report to UNECE: http://www.unece.org/fileadmin/DAM/env/documents/2008/pp/mop3/ece_mp_pp_ir_2008_EC_e.pdf

[69] A considerable amount of legal definition as to the important term 'set the framework for future development consent' is to be found at: https://www.supremecourt.uk/decided-cases/docs/UKSC_2013_0172_Judgment.pdf

[70] Article 31: https://treaties.un.org/doc/Publication/UNTS/Volume%201155/volume-1155-I-18232-English.pdf

[71] http://www.unece.org/fileadmin/DAM/env/pp/mop5/Documents/Post_session_docs/ECE.MP.PP.2014.2.Add.1_aec.pdf

- *Decision V/9(g) on compliance by European Union (ECE/MP.PP/2014/L.16)*

An examination of this decision on compliance by the European Union shows[72]:

1. Endorses the following findings of the Committee with regard to communication ACCC/C/2010/54:

(a) That the Party concerned, by not having in place a proper regulatory framework and/or clear instructions to implement article 7 of the Convention with respect to the adoption of National Renewable Energy Action Plans (NREAPs) by its member States on the basis of Directive 2009/28/EC, has failed to comply with article 7 of the Convention;

(b) That the Party concerned, by not having properly monitored the implementation by Ireland of article 7 of the Convention in the adoption of Ireland's NREAP, has also failed to comply with article 7 of the Convention;

(c) That the Party concerned, by not having in place a proper regulatory framework and/or clear instructions to implement and proper measures to enforce article 7 of the Convention with respect to the adoption of NREAPs by its member States on the basis of Directive 2009/28/EC, has failed to comply also with article 3, paragraph 1, of the Convention;

So we now have the above declaration in International Law, which is automatically a breach of Community and National Law. It all comes back to the requirement of the Convention and associated EU law for the public to have the option to participate in the NREAP when all options are open, as Decision V/9(g) requires:

- *This would entail that the Party concerned ensure that the arrangements for public participation in its member States are transparent and fair and that within those arrangements* ***the necessary information is provided to the public****. In addition, such a regulatory framework and/or clear instructions must ensure that the requirements of article 6, paragraphs 3, 4 and 8, of the Convention are met,* ***including reasonable time frames, allowing sufficient time for informing the public and for the public to prepare and participate effectively, allowing for early public participation when all options are open, and ensuring that due account is taken of the outcome of the public participation.*** *Moreover, the Party concerned must adapt the manner in which it evaluates NREAPs accordingly;*

The EU in its first Aarhus Convention National Implementation Report clarified[73]:

---

[72] http://www.unece.org/environmental-policy/conventions/public-participation/aarhus-convention/tfwg/envppcc/envppccimplementation/fifth-meeting-of-the-parties-2014/environmental-policytreatiespublic-participationaarhus-conventionenvpptfwgenvppccenvppccimplementationfifth-meeting-of-the-parties-2014european-union-decision-v9g.html

[73]http://www.unece.org/fileadmin/DAM/env/documents/2008/pp/mop3/ece_mp_pp_ir_2008_EC_e.pdf

- *2. According to Article 300(7) of the Treaty establishing the European Community ("EC Treaty"), international agreements concluded by the European Community are binding on the institutions of the Community and on Member States. In accordance with the European Court of Justice's case-law, those agreements prevail over provisions of secondary Community legislation. The primacy of international agreements concluded by the Community over provisions of secondary Community legislation also means that such provisions must, so far as is possible, be interpreted and applied in a manner that is consistent with those agreements.*

Furthermore, a part of Communication ACCC/C/2006/17 (European Community) at the Aarhus Convention Compliance Committee, the European Community drafted a note setting down in writing certain explanations given verbally. The explanations related on the one hand to the adjustment by the European Community of Community law to make it compatible with the Aarhus Convention and to the legal certainty, which had to be created by the legal acts adopted, so as to guarantee full application of the Convention, and on the other to the applicability of the Convention to the sole Member State which had yet to ratify it, as a result of its approval by the Community[74]. This document reaffirmed with reference to established case law, the impact on the European Community of approval of the Aarhus Convention, in that an agreement concluded by the Council is binding on the Community's institutions and Member States, the Aarhus Convention having being ratified by the Council in Decision 2005/370[75].

If we consider Point 2 above in the EU's first National Implementation Report plus the additional clarification given below during Communication ACCC/C/2006/17:

- **Such agreements take precedence over legal acts adopted under the EC Treaty (secondary Community law).** So if there was a conflict between a Directive and a Convention, such as the Aarhus Convention, all Community or Member State administrative or judicial bodies would have to apply the provision of the Convention and derogate from the secondary law provision.[76] This precedence also has the effect of requiring Community law texts to be interpreted in accordance with such agreements.

Not only do we have as a result of Decision V/9g a serious compliance failure in relation to the EU's International Treaty obligations[77], but from the perspective of Community law, we have a secondary law provision, namely Directive 2009/28/EC, the EU's 20% by 2020 renewable energy programme, which is in direct conflict with primary legal order, i.e. the Aarhus Convention. Given that this secondary legislation, in which the NREAPs were adopted on the 30th June 2010, will run through to the end of 2020, we are therefore not yet even at the mid-point of the implementation of

[74] http://www.unece.org/env/pp/compliance/C2006-17/Response/ECresponseAddl2007.11.21e.doc

[75] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2005:124:0001:0003:EN:PDF

[76] Judgment of 10.9.1996 in Case C-61/94, Commission v Germany, paragraph 52; judgment of 1.4.2004 in Case C-286/02, Bellio F.lli, paragraph 33; judgment of 10.1.2006 in Case C-344/04, IATA e.a., paragraph 35, and judgment of 12.1.2006 in Case C-311/04, Algemene Scheeps Agentuur Dordrecht, paragraph 25.

[77] See in particular Article 31 of the Vienna Convention on the Law of Treaties: https://treaties.un.org/doc/Publication/UNTS/Volume%201155/volume-1155-I-18232-English.pdf

the NREAPs. Yet the European Union is insisting on driving forward this renewable programme, even though it is in blatant non-compliance with its primary legislation, not to mention an abuse of its citizens' rights,

As regards what was actually in the NREAPs and they are an awful disjointed and rambling document to read, the core issue was to be found right at the end of the NREAP template[78].

5.3. Assessment of the impacts (Optional)

Table 13

Estimated costs and benefits of the renewable energy policy support measures

Measure	***Expected renewable energy use (ktoe)***	***Expected cost (in EUR) — indicate time frame***	***Expected GHG reduction by gas (t/year)***	***Expected job creation***

An access to information on the environment request was sent in to the Irish Department of Communications. Energy and Natural Resources in July 2011 in relation to the failure to complete the above section of the NREAP template and the basis for emission savings claims made in the State Aid for Environmental Protection application in 2006 for the REFIT scheme. As the reply documents[79], not filling in the above Section of the NREAP was justified on the basis that 19 Member States did likewise and a verbal decision had been reached by the Department and Sustainable Energy Authority of Ireland (SEAI) not to so. Indeed, what the remaining Member States provided for Section 5.3 can be best described as having 'fudged it'.

In the decision on the complaint by EPAW to the EU Ombudsman on case 1892/2012/VL[80], which was referred to earlier, the absence of data in Section 5.3 of the NREAP template was raised. However, the EU ombudsman simply concluding that this assessment was optional, as it was not documented as being otherwise in Directive 2009/28/EC, despite there being a general obligation under the Aarhus

[78] http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:32009D0548

[79] http://www.unece.org/fileadmin/DAM/env/pp/compliance/C2010-54/Correspondence%20with%20communicant/frCommC54Annex_Reply_from_DCENR_5Sept2011.pdf

[80] http://www.ombudsman.europa.eu/de/cases/decision.faces/de/51946/html.bookmark

Convention to fully integrate "*environmental considerations in governmental decision-making*".

As highlighted before, the whole programme was 'pulled out of a hat' by politicians:

- *In 2004, the European Parliament called for a target of a 20% share of renewable energy in 2020*.

It then went through a whole implementation phase, both at the EU and Member State levels, without anybody having a clue as to what it was supposed to do and cost, which remains the current situation in early 2015, where we are nearly half way through the programme. Indeed as a number of 'Access to Information on the Environment' requests to the Irish Department of Communications, Energy and Natural Resources have shown[81]:

- *No ranking system was ever prepared in relation to the different renewable technologies and their ability to meet the objectives of the renewable Directive. In other words the relative abilities to achieve greenhouse gas savings and the resulting cost basis was never assessed;*

- *No verification of emission savings with the wind energy installed to date has been completed;*

- *No estimation of greenhouse gas savings has been completed with regard to Ireland's National Renewable Energy Action Plan, which is to implement the EU's 2009/28/EC Directive on achieving an EU 20% renewable energy target by 2020;*

- *The funding mechanisms for the renewable energy programme (REFIT) are to ensure delivery of an EU obligation in relation to renewable energy and not part of a commitment to contribute to any quantifiable environmental target related to quantified carbon dioxide savings.*

[81] http://www.ocei.gov.ie/en/DecisionsoftheCommissioner/Name,12832,en.htm and http://www.unece.org/fileadmin/DAM/env/pp/compliance/C2010-54/Correspondence%20with%20communicant/frCommC54Annex_Reply_from_DCENR_5Sept2011.pdf

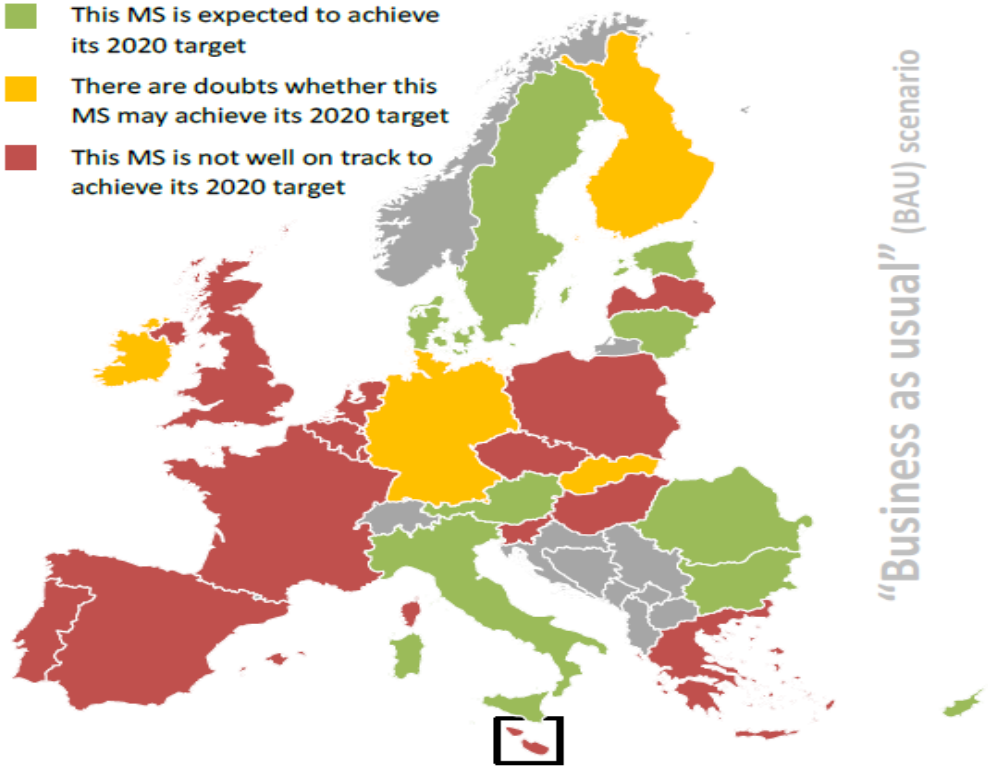
7. SO AFTER 18 YEARS WHAT WAS ACTUALLY ACHIEVED?

7.1 The National Renewable Energy Action Plans come off the rails

There is a website funded by the EU's Intelligent Energy Europe Programme 'Keep on Track[82]', whose function is to track the progress towards the EU's 20% renewable energy by 2020 target, namely the implementation of Directive 2009/28/EC. Indeed, the website's press release of 6th October 2014 couldn't be clearer: "*14 EU Member States will fail to meet their 20% renewables target by 2020, as progress stands today*[83]".

- *According to the 2020 RES (Renewable Energy Sources) Scenarios for Europe Report, as it stands today, 14 Member States will fail to meet their 2020 RES targets and there are doubts about 4 other Member States reaching their target.*

Consideration of this report[84] provides the results below of the quantitative analysis of a Member State's ability to meet its 2020 target given the current 'business as usual' scenario:



Note: The traffic light colours of the figure on the left hand-side show an achievement or shortfall of 2020 RES targets by Member State after possible adjustments through RES cooperation.

[82] http://www.keepontrack.eu/

[83] http://www.keepontrack.eu/contents/mediapressreleases/scenario-2020-press-release.pdf

[84] http://www.keepontrack.eu/contents/publicationsscenarioreport/kot--2020-res-scenarios-for-europe.pdf

While the same report 'dishes out' new projections from the Green-X model, as to how the Member States can get back on track, this Green-X model was delusional from the outset. Indeed, the House of Lords' Committee was correct back in 2008, as to the whole practicality of the UK's target. We now have the situation, right around Europe, where the renewable programme is 'coming off the rails'. Costs have soared out of control and as a result, renewable energy subsidies have had to be slashed in Member State after Member State. This is not a position just limited to the weaker economies of Eastern Europe, but also to the strongest, such as Germany. Then there is also the considerable environmental impact associated with plastering the countryside with wind turbines and pylons. Naturally communities are rising up in opposition to all of these developments; objections are not just being voiced, but also taken into the courts.

It's not as if these issues weren't known already prior to the above report of late 2014. Indeed the EU Commissions had also published a "Renewable energy progress report COM(2013) 175 final" in March 2013[85]. In addition, the Commission published a Staff Working Document accompanying this progress report, entitled SWD(2013) 102 final[86]. As the latter pointed out:

- *These findings are based on data from the period 2008-2010. Since then, as set out in the Report mentioned above, the economic climate has changed significantly and, as a result, the overall prospects of Member States meeting their targets for 2020 are less evident.*

It then further pointed out:

- *In the **electricity sector**, 12 Member States (Belgium, Bulgaria, the Czech Republic, Estonia, Finland, Germany, Hungary, Italy, the Netherlands, Romania, Spain and Sweden) exceeded their planned targets for renewable energy electricity in 2010, whilst the remaining 15 missed their targets. The "planned" targets for 2010 were also the indicative targets for the share of renewable energy in the electricity mix as submitted by Member States under Directive 2001/77/EC. **Thus 15 Member States failed to meet their legally agreed indicative 2010 targets.***

- *The Commission has also undertaken a qualitative assessment of Member States' policies and measures described in their progress reports of 2011 and made a comparison with the commitments contained in the national renewable energy action plans ("Plans"). This assessment indicates that few Member States have vigorously implemented their planned short term measures and many have not honoured their commitments.*

- *In addition, modelling-based analysis was undertaken for the Commission, considering the current and planned policy initiatives of Member States, their current implementation rates and the various barriers to renewable energy development. This conservative analysis points to the possibility of an even less optimistic outlook for 2020.*

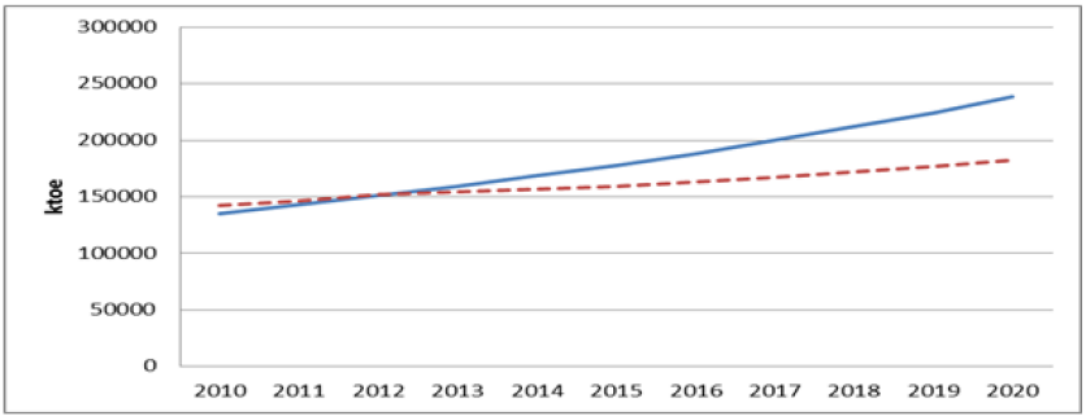
- *In the majority of countries, currently implemented renewable energy policies appear insufficient to trigger the required renewable energy deployment, at least under such conservative assumption. Generally this reflects the*

[85] http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52013DC0175&from=EN

[86] http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52013SC0102&from=EN

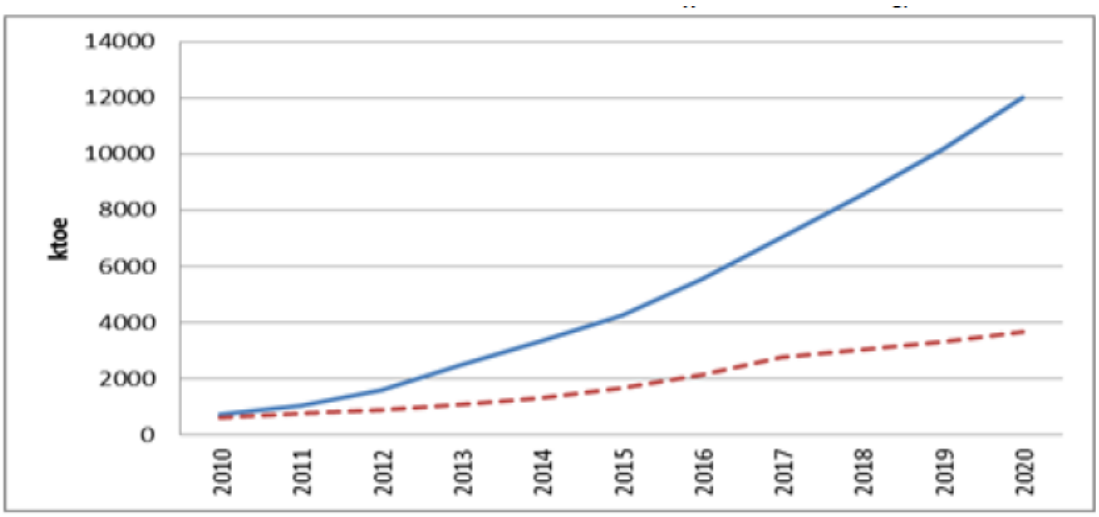
inadequacy of both the current, existing measures necessary to mitigate the non-economic barriers that hinder renewable energy growth and support. The financial crisis also affects these developments more than was anticipated by Member States in their national renewable energy action plans; EU countries face a different financial risk rating today and that has had a further negative impact on investments in renewable energy.

If we consider the main "Renewable energy progress report" itself, the same issues are to be seen. Indeed as presented in the following graphs



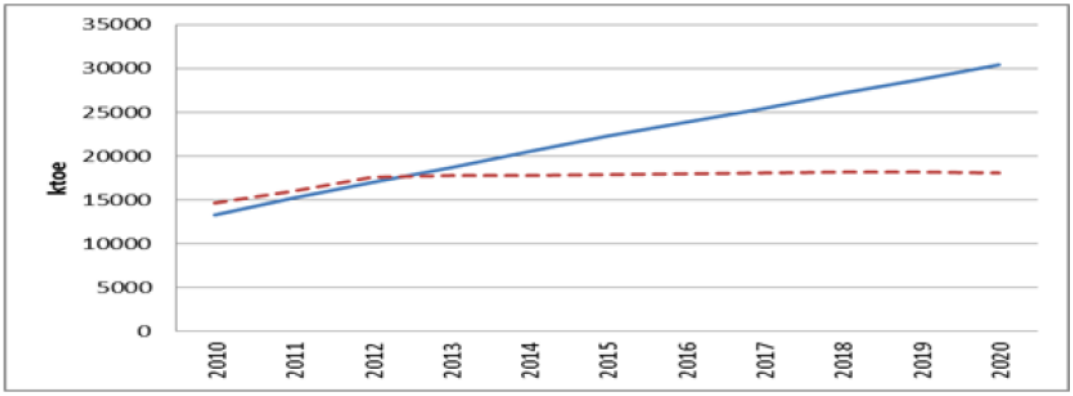
Planned (blue) versus estimated (red/dotted) trend in EU renewable energy

- *The failure to comply with national plans is most evident in the **wind sector**. According to Member State plans, wind capacity is expected to reach 213 GW in 2020 (169 GW onshore and 44 GW offshore). Electricity generation from offshore capacity is planned to reach 140 TWh (roughly 12 Mtoe). However, according to the Commission's analysis, it may only reach 43 TWh (3.7 Mtoe) due to reduced national efforts and infrastructure difficulties.*



Planned (blue) versus estimated (red/dotted) trend in EU offshore wind energy

- *Despite the recent strong growth in the onshore wind industry of recent years, Member States' plans for onshore wind production 354 TWh may fall short. Further efforts will be needed to reinforce measures and improve infrastructure, or only an estimated 210 TWh might be achieved.*



Planned (blue) versus estimated (red/dotted) trend in EU onshore wind energy

- *Total wind generation may therefore fall short of expectations. Whereas Member State plans foresee wind generation of almost 500 TWh, current trends point to the risk of achieving only half of it, i.e. 253 TWh.*

This dysfunctional renewable programme energy was impractical from the outset, so is it now surprising it has come off the rails? Furthermore, no matter how many incompetent reports are produced by the Green-X model, the programme is not going to 'get back on the rails'. It simply takes enormous sums of money and time to develop this amount of infrastructure, both of which are increasingly running out, as we approach 2020.

Yet the 'bogey man under the bed' is constantly wheeled out, i.e. as to how Ireland and other Member States will be exposed to billions of Euros in fines, if they don't meet these targets. In reality this is a pure lie. If we take the manner in which the EU Commission takes legal proceedings against a Member State, then this process requires more than five years to progress and indeed the number of times fines have actually been levied by the European Court are extremely limited, such as less than twenty times. So are we really going to reach the situation where the majority of Member States end up in the European Court, in relation to non-compliance with a Directive, which was not only fundamentally flawed and impractical, but also legally non-compliant with Community law and Democratic Rights? There is enough resentment around Europe already with respect to the lack of Democratic accountability of the EU, as was evident in the election results of the 2014 vote on the European Parliament. To even contemplate such draconian fines ignores the reality of the complete backlash that it would generate around Europe, in particular with a population, which is becoming increasing sceptical and disillusioned with the whole programme.

7.2 Mother Nature did her own thing

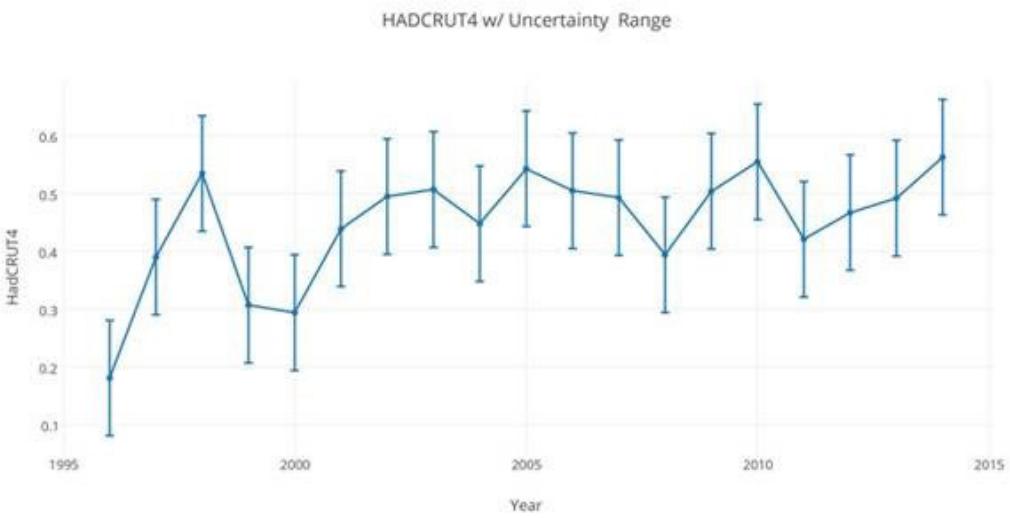
The Extern-E analysis on climate change, previously referred to, quoted extensively the work of Professor Richard Tol, who in a more recent 2009 publication on the "Economic Effects of Climate Change[87]", when he was working for the Irish Economic Science and Research Institute, stated:

[87]Journal of Economic Perspectives – Volume 23, Number 2, Spring 2009, Pages 29-51 https://www.aeaweb.org/articles.php?doi=10.1257/jep.23.2.29

- *"Projections of future emissions and future climate change have become less severe over time—even though the public discourse has become shriller".*
- *"The quantity and intensity of the research effort on the economic effects of climate change seems incommensurate with the perceived size of the climate problem, the expected costs of the solution, and the size of the existing research gaps. Politicians are proposing to spend hundreds of billions of dollars on greenhouse gas emission reduction, and at present, economists cannot say with confidence whether this investment is too much or too little".*

In essence we simply don't know what environmental damage greenhouse gases are doing. While Professor Tol focused quite rightly on his area of expertise, namely economics and the expenditure which was warranted, the problem is actually broader, in that the dose response relationship has first to be understood. In layman's terms, like Pliny the Elder and wine, how much carbon dioxide does it take in the atmosphere, before we see a significant rise in global temperatures, which will lead to adverse effects?

In reality, the physical phenomena of climate and weather are amongst the most complex in nature, and science can say very little about what they will do in the future. Yet a large international policy framework has been built around the assumption that we know precisely what is happening and how to control it. It is also a sobering fact that since 1998, when the EU was in the initial phases of developing its renewable energy programme, there has been no increase in global temperatures. All we know for sure is that we are being forced to fund a hugely disproportionate amount of money for an 'alleged environmental benefit', which has never been quantified.



HadCRUT4 is a gridded dataset of global historical surface temperature anomalies relative to a 1961-1990 reference period. Data are available for each month since January 1850, on a 5 degree grid. The dataset is a collaborative product of the Met Office Hadley Centre and the Climatic Research Unit at the University of East Anglia[88].

So what do we know? The global warming debate all comes down to what chemical engineers understand as 'heat transfer'. In an industrial design the transfer of heat is

[88] http://www.metoffice.gov.uk/hadobs/hadcrut4/

calculated, such as from the combustion flame in the boiler, to the steam generation, to the heating of the production process by the steam, etc. Heat transfer takes places by three mechanisms; namely conduction, convection and radiation. In simple terms if you had a stove in the room combusting fuel and you placed your hands on it, you would very quickly feel the heat; this is thermal conduction, which is essentially direct transfer by molecule to molecule. Yet the heat from the stove also manages to raise the temperature of the whole room, this is partly because of thermal convection in which circulating air currents are generated, namely the hot air rises and circulates. The final mechanism is the heat transfer by thermal radiation, which is by electromagnetic radiation primarily in the infrared range. For instance, if one sits directly on a sofa near the stove, one will feel the 'radiant heat'. However, if one hops over the back of the sofa and crouches behind it, there is no longer a pathway for the thermal radiation and the heating effect one receives from the stove is reduced.

On a larger scale, the greenhouse effect in the atmosphere is based on a similar 'blocking mechanism' as the sofa. Solar radiation penetrates the earth's atmosphere and heats up its surface, particular in the tropical regions where the sun is directly overhead, but far less so at the polar regions, where the sun is penetrating at an angle. The planet also radiates out heat in the infra-red range to space, which is why it cools down during night. Some of this infrared radiation is trapped by the greenhouse gases in the atmosphere, while the rest simply continues to radiate out to space. It is the temperature imbalance caused by increasing the quantity of greenhouse gases in the atmosphere, thereby reducing the amount of this radiant heat to space, which is the basis for the claims made in relation to Catastrophic Anthropogenic Global Warming.

However, what do we really know? If we go back to the European Environment Agency's Cost of Air Pollution Report [2], then this stated:

- *CO_2 is the most significant greenhouse gas influencing climate change, thereby posing a threat to public health and the environment.*

This is not even remotely correct. As we know only too well, the atmosphere contains a lot of water vapour, enough on occasions to flood us out of it. Water vapour is also the largest contributor to the Earth's greenhouse effect. The exact quantity is disputed, but it is generally accepted to be more than 60% of the warming effect. Like many things with climate change science, nobody has a precise figure. Therefore, on the one hand we have atmospheric water vapour and clouds themselves being far more important to the greenhouse effect than carbon dioxide, while the fact that the quantity of water vapour and clouds is highly variable, only adds further to the problem. As Prof Richard Lindzen, the American atmospheric physicist from M.I.T. has clarified[89]:

- *Small percentage changes in either water vapour or clouds are fully capable of changing the infrared flux more than the changes induced by increased CO_2.*

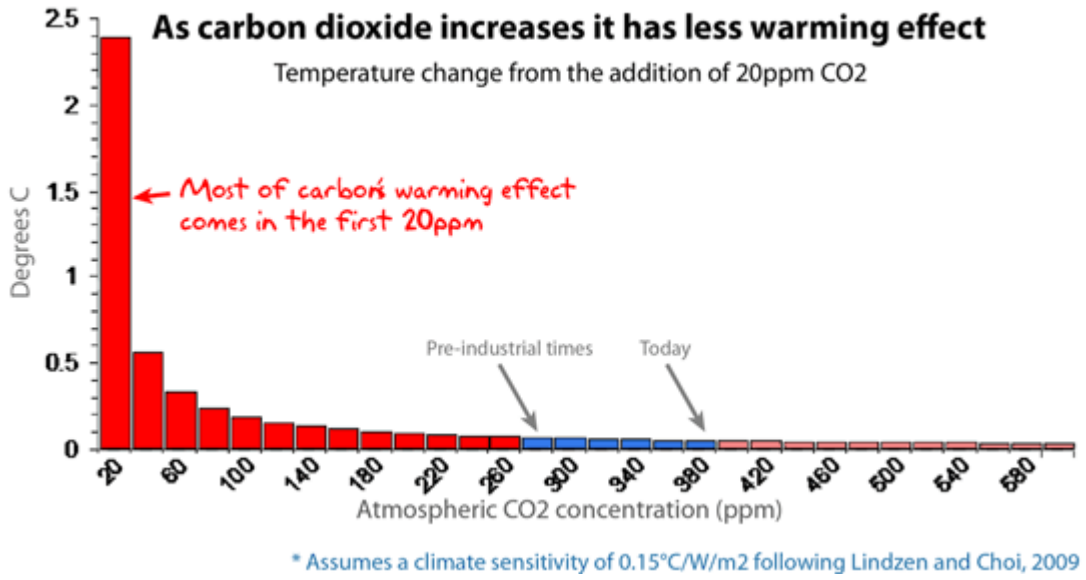
Furthermore, the greenhouse gas relationship for carbon dioxide is logarithmic not linear, as carbon dioxide concentration increases, the warming effect starts to rapidly decrease. The radiative (greenhouse) effect of going from 10 to 20 parts per million (ppm) CO_2 is about the same as going from 100 to 200 ppm or 1,000 to 2,000 ppm. The pre-industrial age was characterised by a CO_2 concentration of about 280 ppm, while currently in 2015 we are essentially at 400 ppm. Note: Not all of this increase is

[89] http://eaps.mit.edu/faculty/lindzen/139rmg~1.pdf

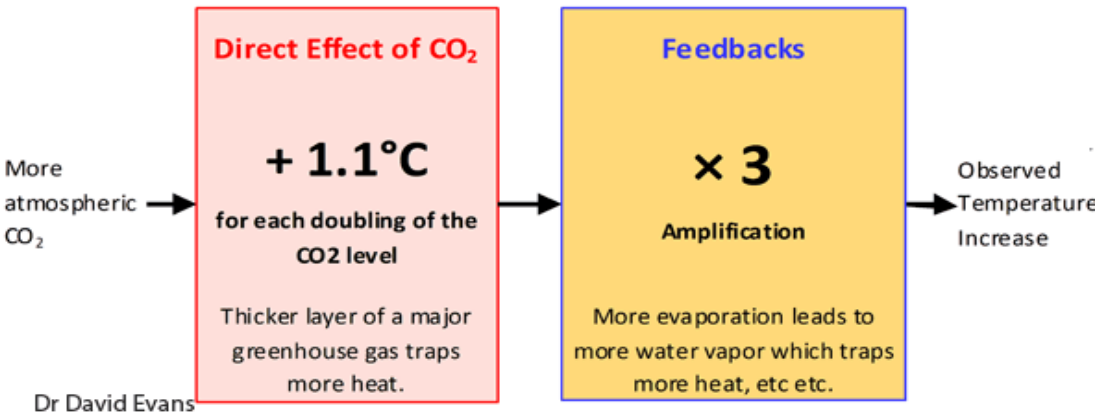
anthropogenic, as natural warming cycles also contribute to higher CO_2 levels. The metric that is used in climate change analysis is the doubling of CO_2 from pre-industrial levels, i.e. to 600 ppm, which would take an awful lot of time and fossil fuel reserves. However, this is where the logarithmic effect starts to kick in, as Prof Lindzen points out:

- *The effect of the 25% increase of CO_2 over the last century is expected to be proportionally greater than the effect of doubling CO_2 in the next several decades.*

Graphically this can be represented below; in simple terms the greenhouse effect is 'tailing off' as the carbon dioxide quantity in the atmosphere is increased.



So where does the catastrophic warming come from? Of huge concern is the blind faith we are now expected to put in the skills of a limited number of mathematical experts and their computer models, called General Circulation Models (GCMs). The threat of global warming in those models is singularly based on the principle of a feed forward effect, i.e. that if the earth's temperature increases slightly, then more water vapour will enter the atmosphere and as a result we will enter into a never ending spiral of run-away temperatures, see simple representation below.



Yet if this feed forward mechanism were not to occur, then even the UN's Intergovernmental Panel on Climate Change (IPCC), a deeply politicised body, has to admit that a doubling of the global atmospheric carbon dioxide level would only lead to about a 1.2˚C rise in temperature[90]. Note: As previously, we are only about a third of a way to that doubling of the pre-industrial age concentration. Given that humans live in a temperature range of -50˚C to +50˚C, sometimes within the same year, one can only conclude; so what, after all such a rise is equivalent to everybody moving 200 km closer to the equator; Belfast gets Cork's climate, etc. Sadly it also doesn't take a cynic to realise, that when we refer back to the EU's policy objective of limiting the future average global surface temperature increase to two-degrees, that this would essentially happen anyhow without any requirement to reduce fossil fuels.

So does the whole debate around whether climate change, is mild warming or catastrophic warming, come down to this question of the degree of feedback? Actually it is one of the major issues, so how much do we actually know about these feedback mechanisms? As the American Chemical Society explains[91]

- *The addition of the non-condensable gases causes the temperature to increase and this leads to an increase in water vapor that further increases the temperature. This is an example of a positive feedback effect. The warming due to increasing non-condensable gases causes more water vapor to enter the atmosphere, which adds to the effect of the non-condensables.*

- *There is also a possibility that adding more water vapor to the atmosphere could produce a negative feedback effect. This could happen if more water vapor leads to more cloud formation. Clouds reflect sunlight and reduce the amount of energy that reaches the Earth's surface to warm it. If the amount of solar warming decreases, then the temperature of the Earth would decrease. In that case, the effect of adding more water vapor would be cooling rather than warming. But cloud cover does mean more condensed water in the atmosphere, making for a stronger greenhouse effect than non-condensed water vapor alone – it is warmer on a cloudy winter day than on a clear one. Thus the possible positive and negative feedbacks associated with increased water vapor and cloud formation can cancel one another out and complicate matters. The actual balance between them is an active area of climate science research.*

In other words, the science most certainly is not settled, there is an awful lot not known about these mechanisms. However, this is a recurring theme; one can for instance delve into the Working Group I (WGI) contribution to the UN's Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (AR5), which in 2015 is one of the latest and key summary documents of the IPCC. Section 1.4 of this Report deals with the whole area of uncertainties, the following are only a few extracts, which are worthy of some clarifications:

---

[90] *"In the idealised situation that the climate response to a doubling of atmospheric CO_2 consisted of a uniform temperature change only, with no feedbacks operating (but allowing for the enhanced radiative cooling resulting from the temperature increase), the global warming from GCMs would be around 1.2℃":*
http://www.ipcc.ch/publications_and_data/ar4/wg1/en/ch8s8-6-2-3.html

[91] http://www.acs.org/content/acs/en/climatescience/climatesciencenarratives/its-water-vapor-not-the-co2.html

- *The models used to calculate the IPCC's temperature projections agree on the direction of future global change, but the projected size of those changes cannot be precisely predicted. Future greenhouse gas (GHG) emission rates could take any one of many possible trajectories, and some underlying physical processes are not yet completely understood, making them difficult to model. Those uncertainties, combined with natural year-to-year climate variability, produce an 'uncertainty range' in temperature projections.*

So from the horse's mouth; "our models can't predict the degree of climate change". Nobody disputes that the effect of increasing carbon dioxide concentrations results in a warming 'direction', but let's get serious here, if the size of those changes can't be predicted, why have the public been repeatedly bombarded with grossly alarmist predictions?

- *There are fundamental limits to just how precisely annual temperatures can be projected, because of the chaotic nature of the climate system. Furthermore, decadal-scale projections are sensitive to prevailing conditions—such as the temperature of the deep ocean—that are less well known. Some natural variability over decades arises from interactions between the ocean, atmosphere, land, biosphere and cryosphere, and is also linked to phenomena such as the El Niño-Southern Oscillation (ENSO) and the North Atlantic Oscillation.*

El Nino, an abnormal warming of surface ocean waters in the eastern tropical Pacific, is one part of what's called the Southern Oscillation. The Southern Oscillation is the see-saw pattern of reversing surface air pressure between the eastern and western tropical Pacific; when the surface pressure is high in the eastern tropical Pacific it is low in the western tropical Pacific, and vice-versa. Because the ocean warming and pressure reversals are, for the most part, simultaneous, scientists call this phenomenon the El Nino / Southern Oscillation or ENSO for short.

Under normal conditions, warm seawater accumulates in the western Pacific under the influence of Easterly trade winds, while the eastern Pacific coast of South America experiences an upwelling of cold seawater from deeper levels, which results in a seawater temperature there of some 8ºC lower. El Niño conditions are characterised by unusually warm ocean temperatures in the Equatorial Pacific, as the warm seawater in western 'pool' spreads east, due to the trade winds reducing, as the surface pressure reverses. When a super El Nino occurs, such as in 1997 - 1998, one can see that a steep rise in global temperatures occurs, see the HadCRUT4 global temperature profile shown on page 55. An El Nino is then followed by La Nino, in which the pattern is reversed and cold seawater spreads into the western Pacific.

ENSO events are the largest single impact on global climate; their influence is not just felt in the Equatorial Pacific. For instance, in the continental US, during El Niño years, temperatures in the winter are warmer than normal in the North Central States, and cooler than normal in the Southeast and the Southwest. During a La Niña year, winter temperatures are warmer than normal in the Southeast and cooler than normal in the Northwest. If we go back to the HadCrut4 graph, 2010 – 2011 was characterised by a strong La Nina (cooling), while the end of 2014 saw the development of a weak El Nino (warming).

Furthermore, until 1997, the 1982-1983 El Niño, was the largest El Niño of the twentieth century. Yet scientists can't predict ENSO events or how strong they will be. Then there is the Pacific Decadal Oscillation (PDO) and the North Atlantic Multi-

decadal Oscillation (AMO), where the northern Pacific and north Atlantic go through alternating warm and cold phases, each phase lasting 20 to 40 years at a time. These phases have a significant impact on the climate of the northern hemisphere. Yet it can't be predicted, as to when they will switch.

"The Arctic seems to be warming up. Reports from fishermen, seal hunters, and explorers who sail the seas about Spitzbergen and the eastern Arctic, all point to a radical change in climatic conditions, and hitherto unheard-of high temperatures in that part of the earth's surface."

- **The Washington Post: "Arctic Ocean Getting Warm; Seals Vanish and Icebergs Melt." 2 Nov 1922[92].**

That a warm phase happened in the 1930s is without doubt, the dust bowls of the central United States, etc. are a testament to it. Equally so that a colder period occurred in from the 1940s on, with increased sea ice, etc. This was then followed by a warm phase in the 1980s and 1990s, but by 2010, the phases reversed, such that an increase in sea ice coverage is once more being seen.

These are just some of the significant natural phenomena that climate models cannot replicate; as the IPCC report goes on to clarify:

- *The final contribution to the uncertainty range comes from our imperfect knowledge of how the climate will respond to future anthropogenic emissions and land use change. Scientists principally use computer-based global climate models to estimate this response. A few dozen global climate models have been developed by different groups of scientists around the world. All models are built on the same physical principles, but some approximations are needed because the climate system is so complex. Different groups choose slightly different approximations to represent specific processes in the atmosphere, such as clouds. These choices produce differences in climate projections from different models. This contribution to the uncertainty range is described as 'response uncertainty' or 'model uncertainty'.*

So those who prepare the climate models do not have a proper understanding of really important climatic parameters, in particular how clouds form. However, it is considered acceptable for them to use 'an approximation' for these parameters, which is basically an opinion or a guess. Yet actual observations show that cloud cover is also a variable, which is directly linked to temperature trends[93]. For example, total cloud cover decreased during the period from 1987 to 1997 and, for most of the remainder of the period from 1984 to 2009. A decrease in cloud coverage results in an increase in incoming solar radiation. Therefore, it is not surprising that this period was characterised by warming.

Then there is the fact that the sun goes through cycles, with active phases characterised by high magnetic fields and sunspot activity, such as the latter period of the 20th Century, as opposed to the period we are now entering in 2015, which is a considerably less active phase. We know that these alternating solar phases correspond to impacts on global climate, most likely by changing the frequency and

[92] http://www.washingtontimes.com/news/2007/aug/14/inside-the-beltway-81073443/?page=all

[93] http://www.scirp.org/journal/PaperInformation.aspx?PaperID=50837#.VOOpP_msXmp

magnitude of ENSO events, variations in the Jetstream, cloud coverage, etc. However, we don't know by how much and for how long; we have to observe and first collect the data, as the planet goes through these various cycles.

After all, as regards warming phases, we have been there before in the pre-industrial age, which was prior to 1850, as our own Irish temperature records from Armagh Castle show, which is one of the longest temperature records worldwide, stretching back to 1796[94]:

- *Prior to 1820 we note that autumns and winters were cooler by ~1 °C. Later, we note a significant warming in the mid-19th century, which started in the late 1820s and continued till c. 1870. A cool interval at the end of the 19th century was followed by a period of rising mean temperatures that lasted till the mid-20th century. Finally, a slight cooling from 1960 to 1980 was followed by a gradual warming over the past two decades. In spite of the current warmer conditions, annual mean temperatures still remain within the range seen in the previous two centuries.*

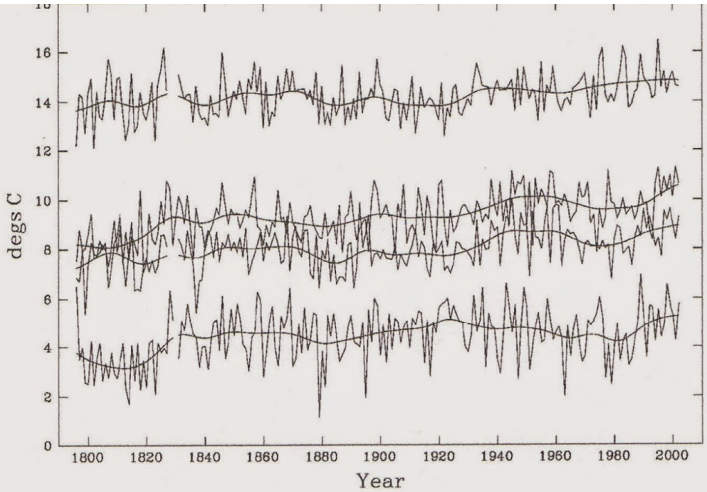


Figure 7. Mean seasonal temperatures at Armagh Observatory from the mean of Series I, II, III and the Dunsink patch. In ascending order from the bottom: winter, spring, autumn, summer

 Int. J. Climatol. **25**: 1055–1079 (2005)

Temperature records from Armagh Observatory

As Hans Von Storch, the prominent German climate scientist, reported in the June 2013 edition of Der Spiegel[95]:

- *"At my institute, we analyzed how often such a 15-year stagnation in global warming occurred in the simulations. The answer was: in under 2 percent of all the times we ran the simulation. In other words, over 98 percent of forecasts show CO_2 emissions as high as we have had in recent years leading to a greater temperature increase".*

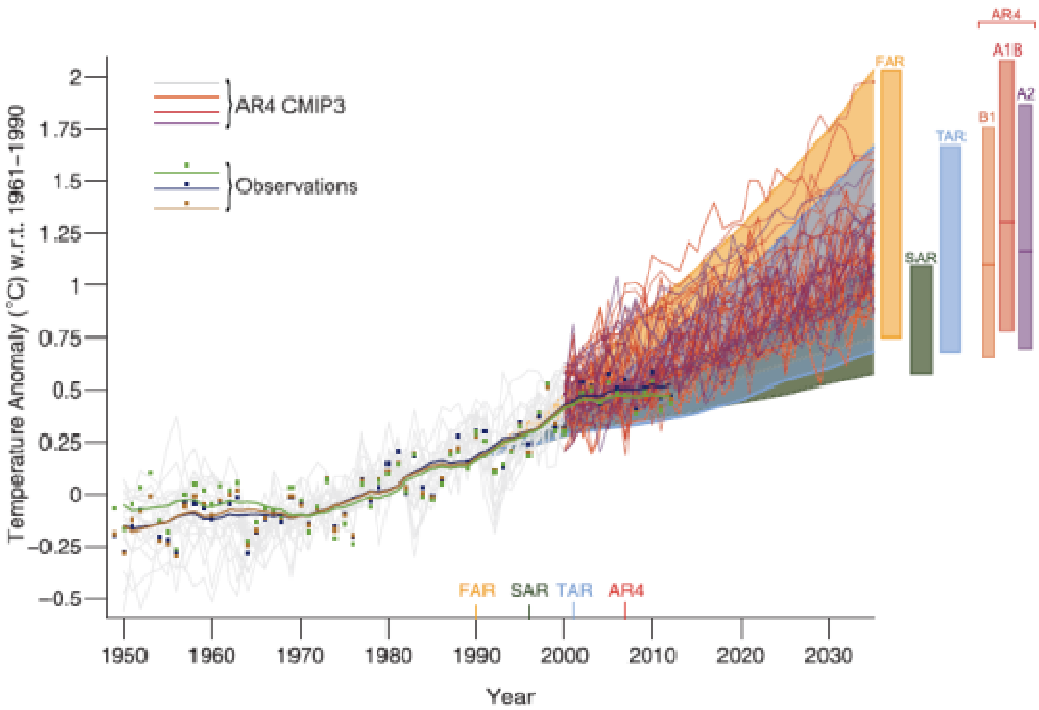
[94] http://onlinelibrary.wiley.com/doi/10.1002/joc.1148/pdf

[95] http://www.spiegel.de/international/world/interview-hans-von-storch-on-problems-with-climate-change-models-a-906721.html

Engineers don't use design models, which 98% of the time don't support the real world – it's too dangerous. As to why they don't support the real world? One only has to think in terms of heat transfer; the climate modellers don't understand how conduction works, such as how the air, warmed by the greenhouse effect, etc. interfaces with the surface of the oceans and land it is in contact with. As the IPCC point out[96]:

- *Research into surface fluxes has continued to be directed at improving the accuracy of the mean air-sea exchange fields (particularly of heat) with less work on long-term trends. Significant uncertainties remain in global fields of the net heat exchange, stemming from problems in obtaining accurate estimates of the different heat flux components.*

Neither do the climate modellers understand convection; how the ocean currents and air currents (thermals) behave, not least as the latter are a key dynamic in cloud formation. Finally when it comes to radiation and as to what is the greenhouse gas effect itself, a combination of not just carbon dioxide, but also of water vapour, the modellers don't understand the on-going complex dynamics there either. In fact it would only be by sheer luck based on picking the right combination of key assumptions, that the model output would be in any agreement with the observed natural conditions, and this clearly didn't happen.



The IPCC computer models gap with reality, temperatures are no longer rising – Figure 1.4 of their WG1 AR5 Chapter 1 Report

We need to clearly understand the natural variability in our climate plus have a track-record of twenty years of successful prediction of climate change, before we use model data as a guide for investing in the global future. However, politicians don't behave in such a rational manner; they believed the output of these models, hook,

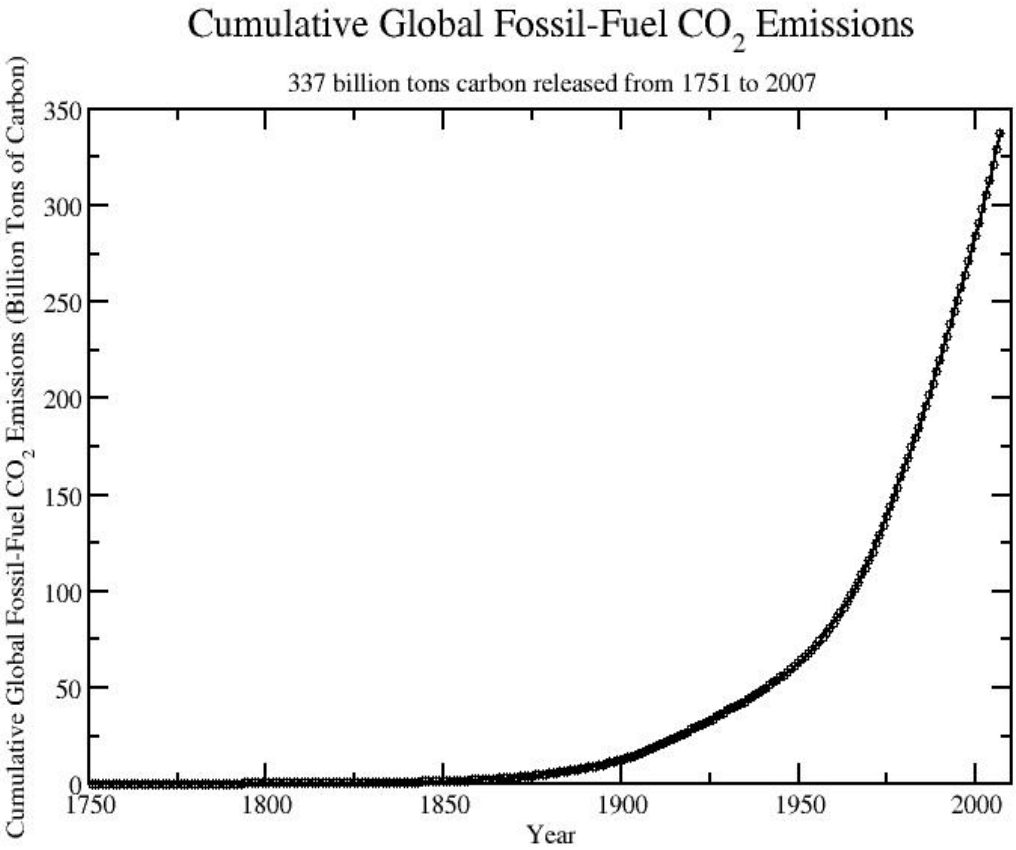
[96] http://www.ipcc.ch/publications_and_data/ar4/wg1/en/ch3s3-5-6.html

line and sinker. So €600 billion plus of our money got spent. Mother Nature couldn't have cared less, she did her own thing, and it had nothing to do with the output of the IPCC's computer models.

"There are known knowns. These are things we know that we know. There are known unknowns. That is to say, there are things that we know we don't know. But there are also unknown unknowns. There are things we don't know we don't know".

- **Donald Rumsfeld, US Secretary of Defence, 1932 -**

As to the 'know knows'; carbon dioxide does have a warming effect, but the planetary systems are not unstable with a huge feed forward mechanism. If that was the case, we would have seen it already. The IPCC summary report in 2013 estimated that cumulative fossil fuel and cement production CO_2 emission from 1750 to 2011 was about 365 GtC[97], with another 180 GtC from deforestation and land use change. Indeed, some one third of carbon emissions have occurred since 1998. If this feed forward mechanism we were occurring, we would not have had a pause in temperatures since 1998.



Cumulative global emissions of carbon from fossil fuels[98]

To go back to Prof Richard Tol, as previously quoted at the start of this section:

[97] Giga tonnes of carbon, which is a billion tonnes of carbon; Carbon dioxide is 3.66 (44 / 12) times heavier than carbon.

[98] http://cdiac.ornl.gov/trends/emis/tre_glob.html

- *"Projections of future emissions and future climate change have become less severe over time—even though the public discourse has become shriller".*

It seems ideology and dogma are the driving forces and we have forgotten how Paul Samuelson, the Nobel laureate and economist from the Massachusetts Institute of Technology, recalled that John Maynard Keynes once was challenged for altering his position on some economic issue. "When my information changes," he remembered that Keynes had said, "I change my mind. What do you do?" Maybe our society no longer cares about information and evaluating it as part of decision making, even when such decisions involve frightening sums of money and other impacts.

7.3 Billions of Euro for a 'Drop in the Ocean'

So given the huge figures for cumulative carbon dioxide above and the fact that the planet is doing just fine, what has been achieved to date? For example, what has been achieved in terms of costs and benefits with the implementation of Ireland's renewable energy programme? If we consider Ireland's first application for State Aid to establish the first phase of the REFIT scheme for supporting 1,450 MW of almost exclusively wind energy, then the 2007 clarification documentation with the EU Commission, in respect of what environmental results were anticipated and over what period, stated[99]:

Wind technology will be the dominant technology. The overall environmental improvement, based on wind technology data, will deliver emissions savings as indicated in the following table.

Table A

Emissions	***Annual** savings per 100 MWs installed* *Tonnes of oxide*
Carbon Dioxide	*0.19 ml*
Sulphur Dioxide	*4k*
Nitrogen Oxides	*1.3k*
	Ml = millions *k = thousands*

It was therefore claimed back in 2007, as basis for the 'environmental protection' to justify the State Aid funding that for each 1,000 MWs of installed wind energy capacity, 1.9 million tonnes of CO_2 savings would result. So what did we actually get for our money?

If we go to the National Renewable Energy Action Plan (NREAP) progress reports to the EU[100], we can see that the Irish report dated February 2014 claims 1,763 MW of wind energy were installed by 2012 and 2,738,072 tonnes of CO_2 savings occurred

[99] Part III.10 Supplementary Information Sheet on environmental protection aid http://www.dcenr.gov.ie/Energy/Sustainable+and+Renewable+Energy+Division/REFIT.htm

[100] http://ec.europa.eu/energy/en/topics/renewable-energy/progress-reports

that year. If we look at Table 1 b of the same progress report, then wind energy was responsible for (4,247 / 5,659) or 75% of the renewable electricity, therefore 2.05 million tonnes of CO_2 savings.

This is equivalent to 2.05 / 1.763 = 1.17 million tonnes of CO_2 savings per 1,000 MW of installed capacity – certainly not what was claimed for in the REFIT documentation.

However, we do know this 'saving' documented in the NREAP progress report is also completely inaccurate, as the calculation method is false. Namely, the calculation method does not allow for the considerable inefficiencies induced on the grid, by this intermittent input of wind energy, which requires the power stations to operate in a stop start variable manner, i.e. increased balancing. As page 29 of the Irish NREAP progress report clarifies:

- *The limitations and caveats associated with this methodology include that it ignores any plant used to meet the associated reserve requirements of renewables. These open cycle plants will typically have lower efficiency and generate increased CO_2 and NOx emissions compared with CCGT and these emissions should be incorporated into the analysis. The purpose of presenting a simplified analysis here is to provide initial insights into the amount of fossil fuels that are displaced by renewables and the amount of emissions thereby avoided.*

Note: Open cycle gas turbines are at best 40% efficient as compared to Combined Cycle Gas Turbines (CCGT), which are 55% efficient.

As the Sustainable Energy Authority of Ireland (SEAI) has been criticised for inaccurate claims, they produced another report quantifying fuel and emissions savings[101], this time where they claimed their modelling output allows for inefficiencies on the grid. The conclusion of this revised report was that for 2012, wind energy saved 1.5 million tonnes of CO_2.

Therefore with this more in-depth assessment methodology the claimed savings are now at 1.5 / 1.783 = 0.85 million tonnes of CO_2 savings per 1,000 MW of installed wind capacity. Sadly, this is actually less than half (45%) of what they claimed would occur when REFIT was initiated back in 2007 to fund the building of this infrastructure in the first place.

Furthermore, it has to be said that the SEAI report above is highly suspect, in that it is based on computer models, which concluded that increased ramping up and down of gas plants occurred, for the situation where there was no wind installed on the grid. Yet it is well known that power plant operators are complaining that the degree of ramping is now greater to compensate for the increased wind energy input. Indeed, the whole grid is being redesigned, not with the goal of fuel efficient generation, but instead to prioritise fast response, as recent documentation from the Irish grid regulator on this subject demonstrates[102]:

---

[101] http://www.seai.ie/Publications/Statistics_Publications/Energy_Modelling_Group_Publications/Quantifying-Ireland%E2%80%99s-Fuel-and-CO2-Emissions-Savings-from-Renewable-Electricity-in-2012.pdf

[102] http://www.allislandproject.org/en/transmission_current_consultations.aspx?article=c75082a0-d1d9-48d6-9b03-f240a1c9504c

- *The management of variability and uncertainty is critical to a power system with high levels of wind penetration. Detailed analysis by the Transmission System Operators (TSOs) has shown that portfolios that are capacity adequate are unlikely to be adequate in terms of ramping over all the necessary timeframes to efficiently and effectively manage the variable renewable sources and changes in interconnector flows while maintaining system security.*

So the SEAI report, which claims 0.85 million tonnes of CO_2 savings per 1,000 MW of installed wind capacity, is not truthful. Another way of expressing the 1.5 million tonnes of CO_2 savings attributed to 2012 is that it is only 0.004% of the global emissions of 35 billion tonnes per annum. It truly is a 'drop in the ocean', even more so that when one considers it with respect to any potential impact on climate change, as global temperatures haven't increased since 1998. So what are the financial implications of this wonderful investment?

Ireland's Renewable Energy Action Plan (NREAP) was prepared in 2010[103] without any proper assessment of costs and impacts. Table 10 of the NREAP provides us with the bottom line on electricity generation, namely by 2020 the installation of 4,094 MW of onshore wind and 555 MW of offshore wind. For wind energy installed in Ireland, where project costs are higher than elsewhere, approximately €2 million per MW is the installed cost for onshore installations [1] and at least €3 million per MW for offshore installations. This then gives a total cost for installed wind energy of almost €10 billion.

Additional electricity infrastructure is required in transmission to facilitate wind energy, already we have had the investment in the East West Interconnector to Wales at €0.6 billion, with more and even longer interconnectors to come to the UK and France – as described on page 79 of the NREAP. As a result the total cost of such interconnectors will conservatively come to another €3 billion.

In the Republic of Ireland there is the roll out of Grid 25 to expand the high voltage grid, for which an accurate cost is not known, but it is reported as some €4 billion and will undoubtedly rise, as the Energy White Paper of 2007 stated[104]:

- *We will ensure completion of the ongoing capital investment programme in transmission and distribution networks by 2010 and oversee further extensive investment in a programme expected to total €4.9bn up to 2013.*

Not only is there over 800 km of new high voltage lines to be constructed in Grid 25, but as the All Island Grid Study demonstrated[105], there is an additional 5,000 km of medium voltage grid connections required to connect all these wind farms to the high voltage grid. For instance, in November 2011, the European Investment Bank, i.e. the EU's bank, lent the ESB some €235 million for network expansions to facilitate

[103] http://www.dcenr.gov.ie/NR/rdonlyres/C71495BB-DB3C-4FE9-A725-0C094FE19BCA/0/2010NREAP.pdf

[104] See Page 21 of: http://www.dcenr.gov.ie/NR/rdonlyres/B0D3D168-3DCD-43E9-8D87-F4666239049F/0/EnergyWhitePaper12March2007.pdf

[105] http://www.dcenr.gov.ie/Energy/North-South+Co-operation+in+the+Energy+Sector/All+Island+Electricity+Grid+Study.htm

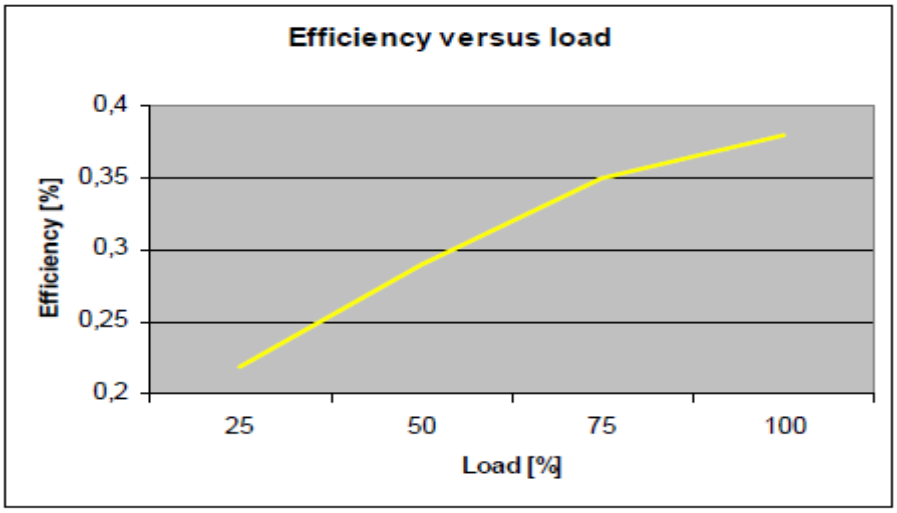
increased deployment of wind energy[106]. Further similar loans totalling €300 million followed in 2013 and 2014[107]. Their total loans to the ESB to facilitate network expansions for wind farms in Ireland have by the end of 2014 totalled €1 billion.

So between high voltage and medium voltage grid expansions, plus interconnectors, there is a bill of some €8 billion, for which if we add the turbines, the total now reaches €18 billion. However, we are not done yet, as the electricity grid is now, with all this wind energy, in an unstable state. As a result it is necessary to roll out so called 'smart meters' to regulate consumers and their demand habits. These smart meters are described on page 77 of the NREAP and for their funding, we can throw in another billion or two into the financial pot.

However, this won't 'cure' the fundamental problem the grid will experience, as more and more highly intermittent wind energy is installed and given priority access over conventional thermal power generation. As the former Green Party leader and Minister for Environment John Gormley's stated in his 'Carbon Budget' of October 2008[108]:

- *The target is underpinned by analysis conducted in the recent All Island Grid Study which found that a 40% penetration is technically feasible, subject to upgrading our electricity grid and ensuring the development of flexible generating plant on the electricity system.*

In essence we will have to mothball our current base load Combined Cycle Gas Turbines (CCGTs), which although they cannot rapidly respond to changing loads, have efficiencies over 55% and greater. New open cycle fast response gas turbines, which are at best only 40% efficient, will have to be built to replace these CCGTs:



Efficiency curve for an aero-derived gas turbine, LM2500+, which is typical of the technology, which is used for open cycle gas turbines[109]

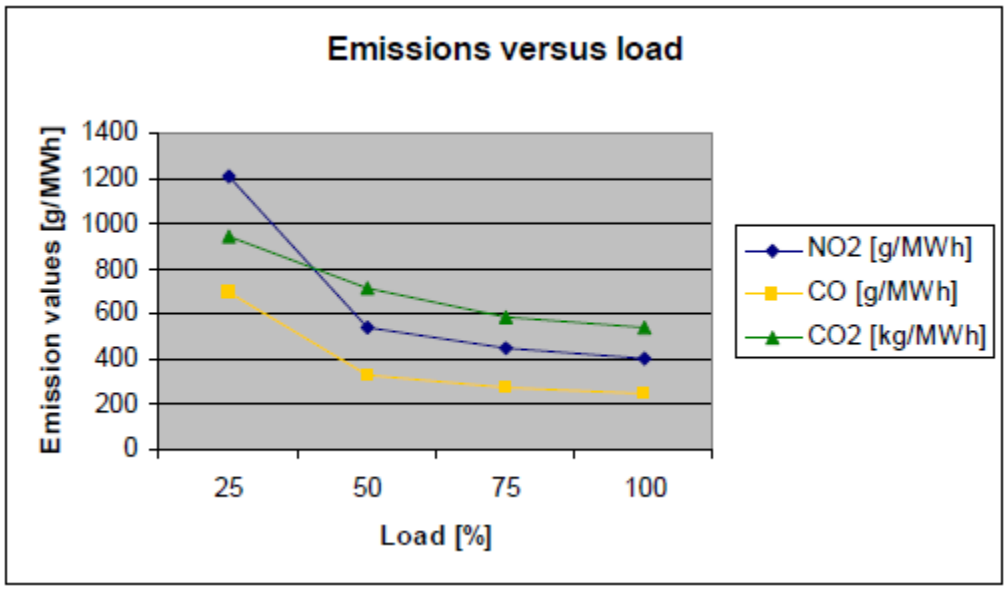
[106] http://www.esb.ie/main/press/pressreleaseWS.jsp?id=1294

[107] http://www.eib.org/infocentre/press/releases/all/2014/2014-238-esb-and-eib-sign-loan-facility-for-eur100-million.htm

[108] http://www.eirgrid.com/media/Carbon%20Budget.pdf

[109] http://www.diva-portal.org/smash/get/diva2:536427/FULLTEXT01.pdf

Equally as bad as the poor efficiency obtained with these open cycle gas turbine, is how their emissions start to rise significantly at lower loads:



Emissions profile for a LMº500+ gas turbine

So given that a the UK authorities report that the installed cost of a CCGT is £0.9 million per MW and the installed cost of an open cycle plant (OCGT) about £0.6 million per MW[110], and we will require at least 1,000 MW of fast response power to balance the grid fluctuations, there is going to be no change out of another billion Euro in terms of investment in new plant and premature write offs of CCGTs.

So all in all over €20 billion plus was committed in capital investment alone as a consequences of the NREAP and we have by early 2015 spent quite a number of billions already. To that you have to add the operating costs, profit for the wind investors and the costs of inefficient operation of the grid. So it is not surprising that in their 2014 submission to the Irish Green Energy Paper[111], the Irish Academy of Engineering pointed out:

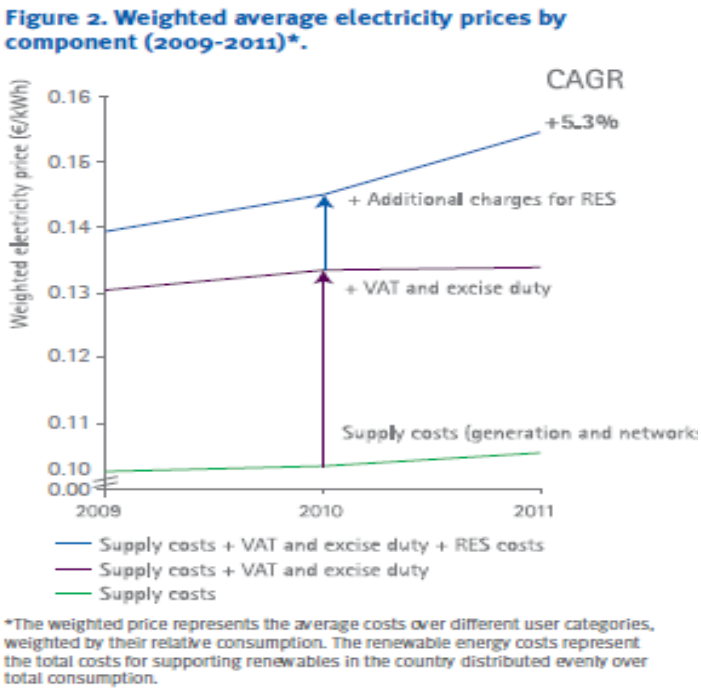
- *Without wind generation, Ireland's electricity generation costs in the period 2005 to 2013 would have increased by 1.2 cents per kWh due to the increased cost of imported fossil fuels. But over the same period, Ireland's business electricity prices actually increased by 4.0 cents per kWh and household electricity prices increased by 8.85 cents per kWh. This clearly shows that increased fossil fuel import costs were not the cause of electricity price increases in Ireland but rather government policies which did not place appropriate emphasis on price competitiveness.*

Considering that the Irish domestic electricity rate is between 19 and 20 cents per kWh, to which additional levies are applied, clearly without wind energy, the rate would be a third less, around 12.5 cent per kWh. This is not an isolated issue; the Union of the Electricity Industry – Eurelectric had a report produced by Accenture in

[110] Pages 16 and 26: https://www.pbworld.com/pdfs/regional/uk_europe/decc_2153-electricity-generation-cost-model-2011.pdf

[111] http://www.iae.ie/publications/publication/iae-response-to-green-paper-on-energy/

2014[112], which provides the rather sobering graphic of how costs to the consumer are soaring, in particular due to Renewable Energy Sources (RES):



Graphic from Eurelectric report

It is also worthwhile reflecting some more as to the so called reason? Not only are the 1.5 million tonnes of CO_2 savings for 2012 somewhat exaggerated, but these savings are not going to get a whole lot better as the NREAP is progressed. In 2004 Eirgrid produced a report on the "Impact of Wind Power Generation in Ireland on the Operation of Conventional Plant and the Economic Implications", which clarified[113]:

- *The adverse effect of wind on thermal plant increases as the wind energy penetration rises. Plant operates less efficiently and with increasing volatility*.

In other words, it is a case of diminishing returns as more wind energy is installed to comply with the trajectory of the NREAP. For Ireland total greenhouse gas emissions in 2013 were 58 million tonnes[114], while electricity generation amounted to less than 11 million tonnes. So these savings on a national basis are extremely poor when compared with the reckless enthusiasm by decision-makers for renewable energy and their disregard for both the resulting financial and environmental costs. Plus, as already pointed out, the alleged savings are only 0.004% of global annual emissions of carbon dioxide, which given that there has been no increase in global temperatures since 1998, is the classic case in terms of effectiveness of 'a drop in the ocean'.

---

[112] http://www.eurelectric.org/media/132600/eurelectric-accenture_brochure-2014-030-0355-01-e.pdf

[113] http://www.eirgrid.com/media/2004%20wind%20impact%20report%20%28for%20updated%202007%20report,%20see%20above%29.pdf

[114] http://www.epa.ie/pubs/reports/air/airemissions/GHGprov.pdf

8. THE GRASS IS ALWAYS GREENER ON THE OTHER SIDE OF THE FENCE

8.1 Throwing the baby out with the bathwater

One has to ask some fundamental questions as to what was wrong with our previous electricity generation system, which in Ireland was predominately fossil fuels, but in other countries nuclear also contributed to the mix? As Section 4 demonstrated previously, major investments in pollution control had contributed to very significant reductions in emissions from this sector, such that air pollution from electricity generation was no longer causing significant adverse impacts.

The German's have always suffered from a collective 'Angst', in which doom and dread is predominant. Instead of sitting back and accepting simply that what will be, will be, not to mention getting on and enjoying it, they agonise. As a result there is a collective fear of the unknown. Waldsterben (acid rain), mad cow disease, swine fever, bird flu, nuclear plants, global warming - who on the planet is most alarmed? That's an easy question to answer isn't it?

After the 2011 giant earthquake in Japan and the resulting nuclear problems at Fukushima, the hysteria in Germany was sadly reflected by irresponsible and illegal measures taken by its Government. Under paragraph 11 of their Nuclear Act (Atomgesetz) emergency measures can be taken in event of unacceptable risk to shut down nuclear installations. Germany's nuclear regulator pointed out that no such measures were warranted, as Germany's nuclear plants were completely safe, but there was a provincial election to be won. As a result Angela Merkel's Government convened an 'ethics commission', with no technical input but two bishops, and ordered the immediate closure of eight nuclear plants and the premature closure of others. It is not surprising, that their operating companies have taken legal action in both the International Court and the German High Court, such that compensation claims of between €4.7 and €20 billion are now at stake[115].

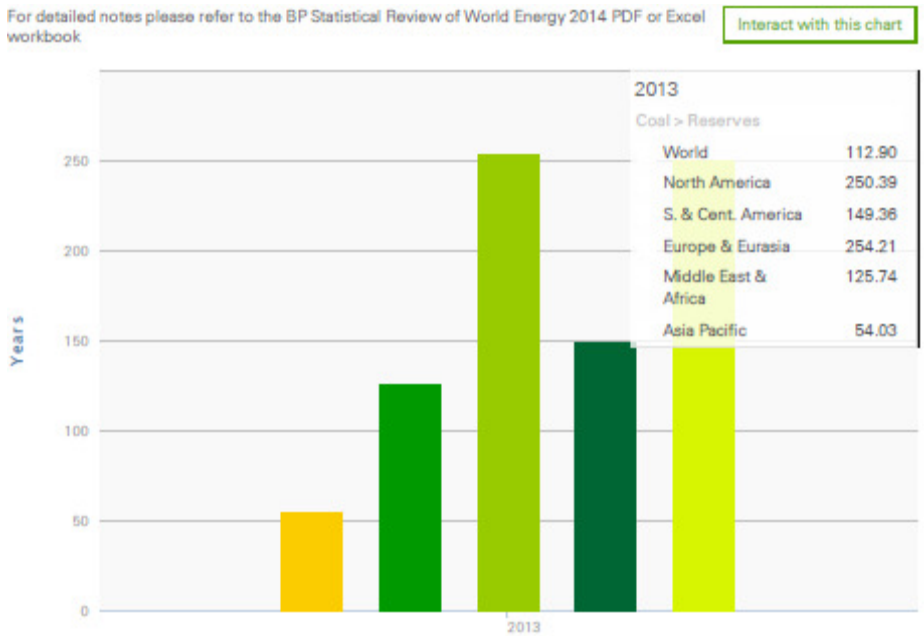
In Section 5.2 it was documented, as to how one of the principal authors on the ExternE project published in 2002 a paper "External Costs of Energy – do the Answers Match the Questions?" This clarified:

- *After the publication of the first series of ExternE results in 1995, the fact that the external costs from a badly sited wind turbine (located close to a population centre, thus high externalities due to noise impacts) were similar to those from the nuclear fuel chain attracted a great deal of attention and was controversially discussed.*

There is no doubt that large sections of the landscape in Germany and other parts of Europe are now scarred with massively intrusive wind turbines, at both a high financial and environmental cost. While there is no doubt that nuclear technology will improve over the next decades, wind and solar energy are inherently flawed for two reasons. Firstly, they are highly intermittent and cannot provide the reliable electricity supplies our modern lifestyle requires. Secondly, wind and solar are by nature highly diffuse, such that huge numbers of wind turbines and solar panels are required to deliver any significant quantity of energy. Then there are fossil fuels, which were due to 'run out'. In fact proven coal reserves in 2013 were sufficient to meet 113 years of

[115] http://americastradepolicy.com/the-future-of-isdsttip-will-be-decided-in-karlsruhe-germany/#.VOiB6vmsXmo

global production, which is not to mention those additional resources we would probably find if we went looking for them.



The bottom line – number of years by which the known coal reserves exceed the production rate

Global natural gas production is also soaring – even global oil production rates continue to rise significantly. Despite current geo-political unrest in early 2015, oil prices have crashed to a low of less than €60 per barrel. There are plenty of fossil fuels available over the coming decades, while the thousands of expensive wind turbines will be 'shot' in a lifetime of fifteen years. We never 'needed' to complete this mad rush into renewables, it was solely a political decision based on a complete lack of proper analysis.

This analysis has to be completed, if we are to get decisions right in future and the analysis has to be based on sound fundamentals, in particular a proper 'dose response relationship' for the impact of carbon dioxide. If we go back to 2003 and the EU Commission's report on External Costs "Research results on socio-environmental damages due to electricity and transport", we can see the following Table on External costs related to electricity production. However, these are based on assigning a value of €18 – 46 per tonne of carbon dioxide, based on implementing chosen policy decisions, and bear no relationship to actual environmental impacts occurring. In particular, as there has been a pause in global temperatures since this renewable energy programme was conceived.

Furthermore, technology has also improved in relation to pollution control for thermal power stations, which has been implemented through associated regulatory requirements, such that major reductions in the health impacts from power stations have occurred. Those 2003 external costs are simply not an accurate reflection of current impacts. The external costs assigned to thermal power stations are actually a lot higher than what is the true situation. On the other hand with wind energy, additional external costs have to be allowed for noise impacts, where the low frequency profile is causing higher levels of disturbance than previously estimated, while the visual impacts are becoming more pronounced with increasing turbine size.

External cost figures for electricity production in the EU for existing technologies[1] (in € cent per kWh*)									
Country	Coal & lignite	Peat	Oil	Gas	Nuclear	Biomass	Hydro	PV	Wind
AT				1-3		2-3	0.1		
BE	4-15			1-2	0.5				
DE	3-6		5-8	1-2	0.2	3		0.6	0.05
DK	4-7			2-3		1			0.1
ES	5-8			1-2		3-5**			0.2
FI	2-4	2-5				1			
FR	7-10		8-11	2-4	0.3	1	1		
GR	5-8		3-5	1		0-0.8	1		0.25
IE	6-8	3-4							
IT			3-6	2-3			0.3		
NL	3-4			1-2	0.7	0.5			
NO				1-2		0.2	0.2		0-0.25
PT	4-7			1-2		1-2	0.03		
SE	2-4					0.3	0-0.7		
UK	4-7		3-5	1-2	0.25	1			0.15

* *sub-total of quantifiable externalities (such as global warming, public health, occupational health, material damage)*
** *biomass co-fired with lignites*

1 Global warming is valued with a range of damage cost estimates from € 18-46 per ton of CO_2

External costs from EU Commission's Report of 2003

8.2 The Era of the 'Dream Salesman'

"I always say we don't sell a car, we sell a dream,"

- ***Ferrari Chairman Luca Cordero di Montezemolo, 1947 -***

Coming to the end of nearly five hours with the Joint Oireachtas (Irish Parliamentary) Committee on Environment's session of Electricity Generation and Export on the 18th February 204, the situation was reaching absurdity in that the latest infatuation of the Committee members was 'blue energy', i.e. from the ocean. The discussion turned to me as to my views – they got something unexpected[116]:

- *Speaking from my perspective as an engineer with 25 years' experience of major projects ranging in value from €50 million to €500 million, those projects have to be delivered on time, on budget and safely round the globe. If I do not deliver on those criteria I am out of a job - or prosecuted. One of the issues with the engineering profession is a tendency to deep conservatism. We assess things. When a dream salesman comes in we know it is a dream salesman. Our energy policy in Ireland is dysfunctional and it is all over the place. Whatever sort of dream comes along, everybody jumps on board. At the same time, 50% of the money, if not more, that is being paid in electricity bills comes from industry or commercial entities. They cannot carry this charge and be competitive - they are going to walk out.*

Bought the dream: Irish Minister for Jobs, Enterprise & Innovation Richard Bruton in December, 2013[117]:

- *"At the same time, Ireland is exploiting **its great natural resource – renewable energy** – and thus dramatically reducing its imports of fossil fuels.*

[116] http://oireachtasdebates.oireachtas.ie/Debates%20Authoring/DebatesWebPack.nsf/committeetakes/ENJ2014021800028?opendocument

[117] http://www.naturalcapitalnews.com/emerald-isles-green-growth/

What has been achieved today shows what is possible, but it is only the start".

Factually none of this is remotely true, which an increasing amount of sane people, who might otherwise have money to invest in the country, only know too well. However, it speaks volumes about how key decision makers actually behave – they don't do factual analysis, it is what has 'impressed them' and the less factual analysis occurs; the easier the job of the 'dream salesman'.

A man always has two reasons for doing anything: a good reason and the real reason.

- **J. P. Morgan, American Financier and Banker, 1837-1913**

If we consider the Eurelectric report referred to previously in Section 7.3, then this also reports that for 2012, European expenditure on electricity was €389 billion, while that on gas was €143 billion, a total of €532 billion, to which must be added the even larger expenditure on petroleum fluids for transport and heating purposes. Note: in 2013 the EU imported some $375 billion of oil. Furthermore, these figures are rising sharply. A slice of this action is a lucrative slice, which while previously had to be hard won in the competitive market place, is now subject to a new game on the block, namely that 20% of the market place is now deemed to be 'renewable' and is distributed by political decisions. So long as the general public are in awe of the 'good reason' that somehow or other the planet is being saved from doom and damnation, the real reason will prevail – it's a lucrative money spinner, a classic 'pork barrel' for both the politicians and their preferred companies.

"Irish renewable energy policy imposes no significant cost on consumers as we have abundant wind resources that generate power at an economic rate. When one puts the reduction in spending on imports of gas, oil and coal into the balance, our renewable energy policy is a no-brainer".

- ***Minister for Energy Pat Rabbitte – Irish Times 17th January 2014***

Nobody disputes that Ireland may well import €6.3 billion in imported fuels, but refined petrol and diesel are always going to be expensive, natural gas less so and coal and peat even less so. Since when do we use refined petroleum or indeed any significant amount of petroleum in electrical power generation? In fact when one knows how to do one's own sums, it is easy[118]:

- We can run our thermal power plants for a year supplying the country's full electrical needs on €1 billion of fuel without needing a single wind turbine.

- Nobody knows how much the Irish renewable programme for 40% electricity from renewables, nearly all wind generated, is going to cost. But in summary, the capital investment is in excess of €20 billion.

- Then there is the undisputable fact that the wind energy, when it is there, has to be paid a premium price, because it is more expensive than the existing electricity from the thermal plants. Even the electricity price from the existing plants, which as they are now operating less efficiently, has also to go up in price or else their operators will pack up and leave, as they are not in the charity business.

[118] http://www.turn180.ie/2014/06/16/deconstructing-seais-claims-that-wind-energy-provides-savings-for-the-taxpayer/

- In summary, when wind energy reaches 40% of our total electricity, and all the induced inefficiencies on the grid are accounted for, we would be lucky to save 20% of the existing fuel bill, i.e. about €200 million of our annual bill for fossil fuels.

- Indeed it is a 'no brainer' and 'dramatic'. You don't force the public to spend more than €20 billion, in which the turbines at half that capital cost will have fallen apart in 15 years, to save €200 million a year, unless you are a complete lunatic or 'on the make'. For those of you don't leap to quick sums, it is a more than a one hundred year simple payback, which is longer than your lifespan.

However, not all countries pander to 'dream salesmen', Asians are for instance highly analytical; they like to do sums and demonstrate more technocratic decision making. They haven't jumped on this Crusade to save the planet. After all it is not surprising that China, where technology is valued, was calling at the 2011 Durban climate summit for a complete review of climate change science by 2015, as a precondition for entering any possible negotiated agreement post 2020. As the Chinese Academy of Science has accurately put it[119]:

- *In recent decades, there have been a number of debates on climate warming and its driving forces. Based on an extensive literature review, we suggest that (1) climate warming occurs with great uncertainty in the magnitude of the temperature increase; (2) both human activities and natural forces contribute to climate change, but their relative contributions are difficult to quantify; and (3) the dominant role of the increase in the atmospheric concentration of greenhouse gases (including CO_2) in the global warming claimed by the Intergovernmental Panel on Climate Change (IPCC) is questioned by the scientific communities because of large uncertainties in the mechanisms of natural factors and anthropogenic activities and in the sources of the increased atmospheric CO_2 concentration. More efforts should be made in order to clarify these uncertainties.*

8.3 Have we lost the 'run of ourselves'?

In stark contrast to any form of analytical decision-making is the recent history in Ireland and its associated decision-making:

"I'm afraid we lost the run of ourselves." So says former Irish Taoiseach (prime minister) Garrett Fitzgerald[120].

"We needed houses," he said, referring to the housing boom which has buckled the country, "but we didn't need that many." During the property bubble Ireland was building about six times as many houses as Britain, and many of them now sit empty.

Fitzgerald compared the crisis facing Ireland as similar to that which faced the country in the 1970s when Ireland went heavily in debt, albeit for different reasons. He said Ireland should have reduced spending during the boom but instead everyone collectively lost the run of themselves.

---

[119] http://www.springerlink.com/content/w342k240350n4564/fulltext.pdf and http://scienceandpublicpolicy.org/images/stories/papers/reprint/human_induced.pdf

[120] http://www.irishcentral.com/news/we-lost-the-run-of-ourselves-says-former-irish-prime-minister-45254517-237642731.html

He criticised the media and the opposition for failing to challenge the government on decisions made during the heady boom years. Actually, people were raising questions – particularly in the Irish Voice – about the dark side of the boom. But the problem, as Fitzgerald identified, was that few voices were being heard in Ireland where the noise from the construction boom was drowning out everything else.

That Ireland is acutely prone to 'Groupthink' is now well known, the Finnish economist Peter Nyberg, who was commissioned in 2011 to write the official Irish Government report on the banking sector in Ireland[121], made it very clear, in that 'Groupthink' was the main contributing factor to the resulting financial crises, as his executive summary put it:

- *Widespread lack of critical discussion within many banks and authorities indicates a tendency to "groupthink"; serious consideration of alternatives appears to be modest or absent. A tendency to favour silo organisation and submissiveness to superiors strengthened this effect, particularly among the public authorities.*

As the report went on further to clarify:

- *Groupthink occurs when people adapt to the beliefs and views of others without real intellectual conviction. A consensus forms without serious consideration of consequences or alternatives, often under overt or imaginary social pressure. Recent studies indicate that tendencies to groupthink may be both stronger and more common than previously thought.*

Personally I find it increasing embarrassing and not a little disconcerting how respected public figures in Ireland and elsewhere, not just in politics, but also in economics, will stand up in front of an audience and commence to lecture them on the evils of global warming and how billions of public money has to be spent, major changes in lifestyles implemented, etc. It doesn't even seem to enter these people's head that none of them are the slightest bit competent in the actual subject matter or have taken the responsibility, which is a key aspect of competency, to investigate the subject matter and ensure that they have a reasonable depth of knowledge in it, before they start pontificating.

In the meeting of the Joint Oireachtas Committee on the Environment in February 2014, referred to earlier, my introductory remarks focused on the technical, environmental and legal failings of the renewable programme and how we needed to turn around, go back and evaluate it from scratch, not least as there was no rise in global temperatures since 1998. However, I later got a lecture from the politicians there, on how they were preparing new climate change legislation with major impacts on the public, agricultural practices, etc., which concluded with a question, as to where did I come up with the fact that there was no rise in temperature since 1998? As I pointed out such plans related to the environment were required by law to go through a detailed environmental assessment, followed by public participation in decision making, and the pause in global temperatures since 1998 could be seen in all the official reports on climate change.

It is a well-known adage that 'a little knowledge is a dangerous thing'. However, when this is coupled to arrogance, that such a little knowledge is an automatic entitlement

[121] http://www.bankinginquiry.gov.ie/Documents/Misjuding%20Risk%20-%20Causes%20of%20the%20Systemic%20Banking%20Crisis%20in%20Ireland.pdf

to make decisions with huge implications on others around you, then we have a very serious problem. The classic example in Ireland being an overnight decision in 2008, taken by a limited number of cabinet members, without consultation with the Oireachtas (parliament) or the public itself, which provided an unlimited bank guarantee and thereby effectively doubled the National debt. In essence, they transferred the cost of massive financial failures of a limited number of private banks onto the public purse.

The increasing contempt the general public in the Western world have, of their public administration and political decision-makers, is not without considerable justification. After all, the 'proof is in the pudding', the financial crises of 2008 was not the only case where the public administration and such decision-makers were exposed, as being completely irresponsible and incompetent. It doesn't take a cynic to point out that in the aftermath of the banking crises, it was not necessary to revise the whole legal framework for banking regulation, but just to ensure that it was implemented properly.

"Systemic processes tend to reward people for making decisions that turn out to be right—creating great resentment among the anointed, who feel themselves entitled to rewards for being articulate, politically active, and morally fervent."

- **Thomas Sowell, American economist, social commentator, and author**

It does not take a genius to work out that while decision-makers cannot be expected to get it right all of the time, yet in order to justify their decisions and support them, there must be a transparent rational to that decision-making. Not least, as otherwise, the whole system of decision making and its inherent balancing of different interests are subject to abuse. Instead at the moment we are in a giant political experiment, with huge sums of money being spent with no accountability, people being impoverished, and the benefits of development retarded. We should have a reason and justification for this, not just collective groupthink and beliefs, and this reason and justification has to be made available to the public on request.

"Democracy's worst fault is that its leaders are likely to reflect the faults and virtues of their constituents — a depressingly low level, but what else can you expect?"

- **Robert Anson Heinlein, 1907 – 1988, popular American Science Fiction writer**

Europe grew from relative decay in 1500 to a period of global militarily, politically, scientific and culturally domination, which stretched right through to the mid-twentieth century. It is now again in major decay. What made Europe so successful in the past? Clearly a rapid pace of development, based on positivity and fuelled by a thirst for knowledge, coupled to a willingness to both challenge current circumstances and strive to make them better. This is in stark contrast to current circumstances, in which there is an overwhelming tendency towards doom and negativity. Take for example Hans Rosling, who is a retired Swedish Medical Professor of Public Health and in his earlier years was responsible for implementing the programmes of the World Health Organisation in the developing world. Hans has set up the 'Gapminder[122] Foundation', which by the use of highly visual tools is seeking to educate the Western World on the truth behind global issues, namely that trends are overwhelmingly positive. For example, global life expectancy is now 70 years of age, 80% of the world's population is literate, etc. As he puts it:

[122] http://www.gapminder.org/

- *Why is there so much ignorance? Statistical facts don't come to people naturally. Quite the opposite. Most people understand the world by generalizing personal experiences which are very biased. In the media the "news-worthy" events exaggerate the unusual and put the focus on swift changes. Slow and steady changes in major trends don't get much attention. Unintentionally, people end-up carrying around a sack of outdated facts that you got in school (including knowledge that often was outdated when acquired in school).*

For instance, an 'ignorance survey' completed by 'Gapminder' in Germany in 2014[123] found in relation to the question below, that only 6% answered correctly, namely that the yearly number of deaths had actually decreased to less than a half.

- *How do you think the yearly number of deaths due to natural disasters changed in the world since 1970?*

In contrast 54% answered that it had more than doubled. Clearly, we have not only a major cultural problem, but one in relation to where we source our information, which is not only of very poor quality, but prone to repeated sensationalism.

"The data collected by experts from the (Bangor) university suggests that a white Christmas on Snowdon – the tallest mountain in England and Wales – may one day become no more than a memory. The figures indicated that this winter Snowdon is on track to have less snow than any of the last 10 years. The results appear to back the growing body of evidence to support climate change".

- **BBC News 20 Dec 2004**

"Snowdon Mountain Railway will be shut over the Easter weekend after it was hit by 30ft (9.1m) snow drifts. Alan Kendall, general manager of Snowdon Mountain Railway, said: "It's the worst I've experienced in the 11 years I've been here."

- **BBC News North West Wales, 28 Mar 2013**

One may well ask what our forefathers, who made Europe great, might well think of our behaviour now. The sheer availability and variety of foods available to us in our modern Western world would undoubtedly simply astound them. However, what would they think of what can now be considered, as the increasing Western 'cultural hang-ups', associated with the consumption of food? In the West, food is rapidly becoming a designer issue; good food is no longer good enough, many now require additional 'special factors', such as organic or vegetarian or gluten free, etc. With regard to the latter, while less that 1% of the population have serious and chronic gluten intolerance, the rest don't. Yet some 9% of the German population is now on a gluten free diet. Why, is it because it is perceived as trendy? Alternatively, it may be an indicator of a new religion; after all unnecessary dietary restrictions play a huge role in the ritualised compliance associated with long established religions? Maybe even because the food is 'gluten free', it is now perceived to be without 'something somehow not acceptable' and therefore purer?

There is no shortage of emerging products to pander to and cater for these 'cultural hang-ups'. After all one can fly on a British Airways jet burning circa a tonne of fossil fuel an hour, while munching on certified organic shortbread biscuits supplied by the

[123] http://www.gapminder.org/GapminderMedia/wp-uploads/German-Ignorance-2014.pdf

airline from a seemingly quaint bakery in the Isle of Mull, which is powered by local renewable energy – wind and water for electricity, and wood for heating the ovens. This may just be a commercial reaction to ensuring that 'the people are getting what they want'.

"The fewer the facts, the stronger the opinion"

- ***Arnold H. Glasow, An American businessman and humourist, 1905 - 1988***

However, if it was just a question of trendy biscuits, I wouldn't be writing this. Neither is it about a right to hold opinions and in the personal sphere to practice such issues as 'carbon piety'. What is at stake is a perceived entitlement to force those opinions and belief systems on others through the State apparatus. Personally I think a dose of absolute cutting satire is needed to bring the Western World to its senses. An abundant source for that satire being as to how scientific and technical resources, which have developed perfectly beneficial GM crops and nuclear plants, are now seen as the devil's incarnation, while other scientific and technical resources, producing grossly deficient climate change models, are now essentially the high priests of a new Green religion. So rather than a rational assessment of relative merits, dogma now rules.

"Intelligent men do not decide any subject until they have carefully examined both or all sides of it. Fools, cowards, and those too lazy to think, accept blindly, without examination, dogmas and doctrines imposed upon them in childhood by their parents, priests, and teachers, when their minds were immature and they could not reason."

- ***James Hervey Johnson, 1901 -1988, American atheist freethinker and writer***

Neither is this Green ideology a tolerant religion, those established religions with a culture of evangelism, such as the Mormons or the Jehovah's Witnesses, when informed of others' beliefs will respect them and turn their attention elsewhere. No so the 'Green' religion or ideology; theirs is only way people can and will conduct their spending habits, energy use, travelling patterns, etc. As a result, this has regretfully already led to incidences, of not only anti-democratic behaviour and confrontation, but also of violence.

"The urge to save humanity is almost always a false front for the urge to rule."

- ***H. L. Mencken, 1880 – 1956, American journalist, satirist, social critic, cynic, and freethinker***

As always there are problems in the world, but they are being solved; the planet is managing fine, even if it needed some form of immediate attention, this ideological and intolerant approach of strident Green politics was never in the position to have a beneficial effect. As the wonderful Van Morrison song articulated "no guru, no method, no teacher", which as he explained himself; "I don't have a guru. I don't have any teacher and there's no method that I subscribe to". It's time to ditch the hang-ups, before the dumb lead the blind to further policy chaos.

"The man who reads nothing at all is better educated than the man who reads nothing but newspapers."

- ***Thomas Jefferson: American Founding Father, expert in arts, sciences, and politics, 1743 to 1826***

"It is the first responsibility of every citizen to question authority."

- ***Benjamin Franklin: American Founding Father, author, scientist and politician, 1705 - 1790***

8.4 So what is Sustainable Energy?

Is 'sustainable energy' some new 'designer fad' or ideological compliant 'necessity' for the modern Western world? With regard to the latter, considering how much is articulated about 'sustainable energy' being so important to our future well-being and welfare here in the Western world, then what is it actually, such as how is it actually defined? One can for instance go into the website of the Sustainable Energy Authority of Ireland (SEAI)[124] and guess what? One can't find a definition of sustainable or sustainable energy. So why did we end up with this public authority so 'essential' to providing our energy needs. Clearly, it was a political decision in 2002, which established the Sustainable Energy Authority of Ireland by means of the Sustainable Energy Act[125], in which:

The functions of the Authority shall be —

> *(a) To promote and assist environmentally and economically sustainable production, supply and use of energy,*
>
> *(b) To promote and assist energy efficiency and renewable sources of energy,*
>
> *(c) To promote and assist the reduction of greenhouse gas emissions and transboundary air pollutants associated with the production, supply and use of energy,*
>
> *(d) To promote and assist the minimising of the impact on the environment of the production, supply and use of energy,*
>
> *(e) To promote and assist research, development and demonstration of technologies connected with the foregoing paragraphs of this subsection,*
>
> *(f) To provide advice, information and guidance —*
>
> > *(i) To the Minister and such other Ministers or bodies as the Minister may direct, and*
> >
> > *(ii) To energy suppliers and users,*
>
> *relating to the matters specified in the foregoing paragraphs of this subsection.*

Rather strangely it doesn't define in this legislation, what exactly 'sustainable energy' or 'sustainable' actually is. Clearly it is based on some form of belief system and one shouldn't ask too many questions. However, not subscribing to such beliefs, it is

[124] http://www.seai.ie/

[125] http://www.irishstatutebook.ie/2002/en/act/pub/0002/sec0006.html#sec6

worth actually delving deeper into the outputs of this authority, such as their Biomass Fact Sheet[126]

- *What is Biomass? Biomass is the oldest fuel used by mankind. Wood has been used as a fuel for cooking and heating for over 500,000 years, but has suffered a decline in the last century as the use of fossil fuels increased. However, the environmentally harmful effects of burning fossil fuels coupled with the need to secure indigenous renewable sources of energy has resulted in a return to using natural and clean sources of energy such as biomass.*

"If you're not careful, the newspapers will have you hating the people who are being oppressed, and loving the people who are doing the oppressing."

- **Malcolm X, 1925 – 1965), American Muslim minister and human rights activist**

So let's start with the 'environmentally harmful effects of burning fossil fuels'. As has been documented previously, outside of reference to them in slogans and political decisions, these harmful effects have never been established and quantified. Indeed, the effect of increasing concentrations of carbon dioxide in the atmosphere is only leading to a mild warming, which on balance is beneficial, while additional benefits occur from increased growth rates of plant life, particular in marginal desert areas, where water resources are limited[127]. As to wood being a 'natural and clean' source of energy, in Section 4 the very significant health hazards associated with fine Particulate Matter (PM) were already extensively documented and as to how the European Environment Agency's 2014 report on air quality in Europe[128] stated:

- *Household fuel combustion dominates the emissions of primary PM_{10} and $PM_{2.5}$, and has increased its emissions by 13 % and 11 %, respectively, since 2003.*

- *The use of household wood and other biomass combustion for heating is growing in some countries, due to government incentives/subsidies, rising costs of other energy sources, or an increased public perception that it is a 'green' option.*

- *Some households have reverted to heating with solid fuels in response to economic hardship. This has happened recently in Greece and Ireland, for instance.*

These factors have been well established for a long time, for example, the US Environmental Protection Agency's Report on wood stoves[129]

- *"In localities where wood is the predominant house heating fuel, wood stoves have been shown to contribute as much as 80% of the ambient PM_{10} (fine*

---

[126] http://www.seai.ie/uploadedfiles/RenewableEnergy/REIOBiomassFactsheet.pdf

[127] http://www.nature.com/scitable/knowledge/library/effects-of-rising-atmospheric-concentrations-of-carbon-13254108

[128] http://www.eea.europa.eu/publications/air-quality-in-europe-2014

[129] In-House Performance of New Technology Wood stoves, EPA/600/D-90/026, Robert C. McCrillis, EPA/600/D-90/026

particle) concentrations during winter months. This study shows that the new technology stoves do not achieve the emission reduction expected. Some models were experiencing degraded emission control performance after only a few months use. "the relatively poor showing of the control technologies was very disappointing."

One can only conclude that the Sustainable Energy Authority of Ireland are highly suspect when it comes to part (d) of their function, with respect to 'minimising the impact on the environment of energy supply and use'. In addition, it would not be unreasonable to also conclude that their form of 'sustainable energy' is some form of 'designer energy' based on dogma. So where did this word 'sustainable' evolve from? If we consider the relevant section of the UNECE website on 'sustainable development':

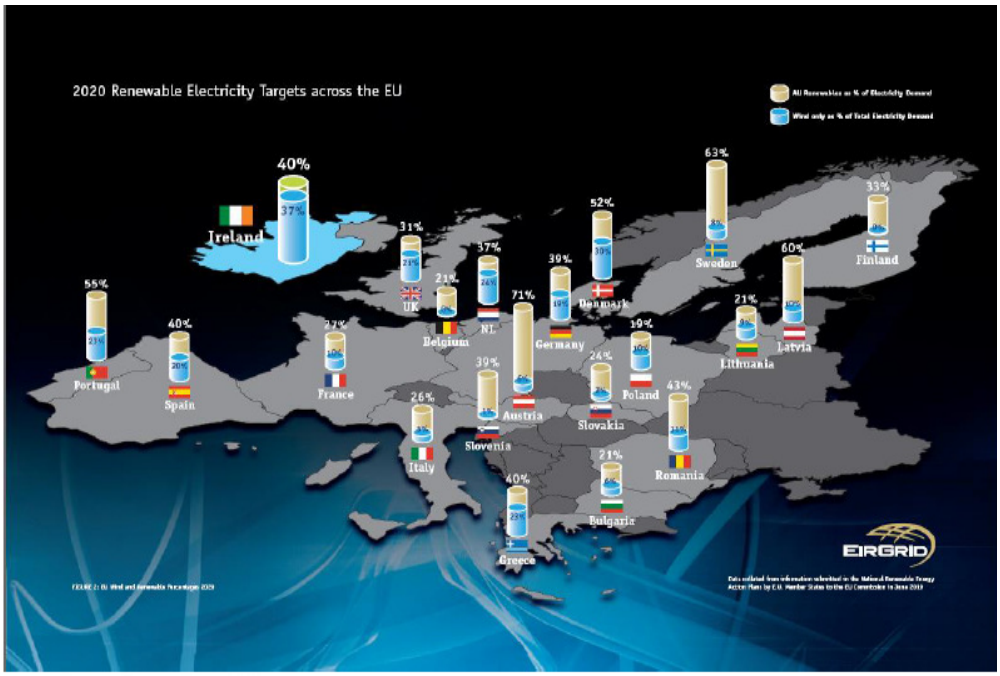
- *When the World Commission on Environment and Development (Brundtland Commission) published its report in 1987, it presented a new concept - sustainable development. The concept became one of the most successful approaches to be introduced in many years. In fact, it helped to shape the international agenda and the international community's attitude towards economic, social and environmental development.*

- *The Brundtland Commission's report* ***defined sustainable development as "development which meets the needs of current generations without compromising the ability of future generations to meet their own needs"****. The concept supports strong economic and social development, in particular for people with a low standard of living. At the same time it underlines the importance of protecting the natural resource base and the environment. Economic and social well-being cannot be improved with measures that destroy the environment. Intergenerational solidarity is also crucial: all development has to take into account its impact on the opportunities for future generations.*

So if we come back to (b) and (c) of the functions defined in the Sustainable Energy Act, even if there was an quantified environmental justification established for reducing greenhouse gases, which there isn't, then renewable energy is clearly incapable of achieving this. As any honest power engineer will point out, that unless your country is blessed with a large number of unpopulated mountains and sufficient precipitation for development of hydro-electricity, then the eleven sources of renewable energy, as defined in Directive 2009/28/EC, are at best niche energy resources. In Ireland's case the current National Renewable Energy Action Plan (NREAP) to generate 40% of our electricity from essentially wind power, has already pushed up domestic electricity prices by 50% and will require a capital investment of over €20 billion in wind turbines, pylons, etc. This is a sobering financial figure, given that it only costs €1 billion per year in fuel to generate all our electricity in existing thermal plants, while the wind turbines, at some €10 billion in capital cost, will be life expired and requiring replacement in fifteen years[130].

So is Ireland's renewable energy programme sustainable? Does it meet our present needs? Can one supply a nation's electricity using thousands of turbines, despite the fact that they can only generate significant power, when the wind speed is double the annual average?

[130] http://www.ref.org.uk/press-releases/281-wearnandntearnhitsnwindnfarmnoutputnandneconomicnlifetime



The target of 37% of Ireland's electricity to be generated by wind, which is grossly disproportionate in comparison with other Member States' NREAPs

In reality we are where we are, as a political decision was reached to provide nearly 40% of Ireland's electricity by wind energy. This was then justified by an incompetent technical report called the 'All Island Grid Study[131]. As the Irish Academy of Engineering has clarified several times[132]:

- *In previous publications the Academy has commented on the obvious inadequacies of the so called "All Island Grid Study". These inadequacies were identified in the report by the report authors themselves and the Academy is strongly of the view that the shortcomings identified by the authors render it unsuitable for use as a basis for national policy.*

The selection of the generation portfolios for the Irish renewable programme was particularly incompetent, in which a report forming part of the above study was prepared by the Electricity Research Centre of University College Dublin, who then had the audacity to put a disclaimer on it. For wind turbines their report assumed a 'high cost scenario' of €1.3 million per installed MW with a 'low cost scenario' of €1 million per installed MW. As reference [1] shows, the actual installed cost of wind energy in Ireland, are double what they assumed as the 'low cost scenario'. Furthermore, their lifespan of 20 years assumed for wind turbines was also false; as previously highlighted, 15 years is what is actually being obtained.

Unfortunately, we have now reached the situation, where years of responsible behaviour and quality technical design is being 'thrown out' to accommodate what

[131] http://www.dcenr.gov.ie/Energy/North-South+Co-operation+in+the+Energy+Sector/All+Island+Electricity+Grid+Study.htm

[132] http://www.iae.ie/publications/publication/energy-policy-and-economic-recovery-2010-2015/

can only be described as a shower of charlatans and their scams. Those, who have for many decades invested responsibly in the energy sector, such as the owners of the existing thermal plants, find themselves on the basis of 'political whims' having to hand over their market share to the politicians' friends. For example, throttling back their generation to facilitate subsidised wind turbines whenever the wind blows.

These companies are simply not in the charity business. They are not going to stick around operating and investing in conventional generation plants, which are no longer obtaining the run times and efficiencies they were designed for. There are naturally better opportunities in respect of investment decisions elsewhere. As a result of these policies, the gird will become unstable due to the highly intermittent nature of the renewable input and there will be a lack of new conventional generation to replace ageing power plants. The lights will go out, which is a position N. Ireland[133] and the UK are facing very shortly.

In conclusion, if we consider the first part of the definition of 'sustainable development', the implementation of these renewable energy programmes does not 'meet the needs of current generations'. If instead the 'do nothing' option had been progressed with, for which there was a legal obligation to assess as part of Regulatory Impact Assessment and Strategic Environmental Assessment procedures, then the EU's electricity market would have continued to develop with conventional generation. Would this have compromised the 'ability of future generations to meet their own needs'?

There are many decades of fossil fuels available at a cost which is affordable. Philosophically one can rightly point out, that the use of these fuels will render them unavailable for later generations. However, are renewables the solution to this? As previously pointed out, electricity in Denmark costs twice as much as France and has some ten times the amount of carbon emissions in its generation. So the use of intermittent renewables, primarily wind and solar, does not lead to a significant reduction in the use of fossil fuels. Not least as there are increasingly diminishing returns, as more intermittent generation is added to the grid and the existing thermal plants operate more inefficiently. Then there is the sheer number of such wind turbines and solar panels, which will need to be built to harness such a diffuse sources of energy. This requires further energy input, material input and other resources to deliver this infrastructure, all of which are not renewable.

The Energy Return on Investment (EROI) describes the overall life-cycle efficiency of a power supply technique, independent from temporary economical fluctuations or politically motivated influence distorting the perception of the real proportions. The EROI answers the simple question: "How much useful energy do we obtain for a certain effort to make this energy available". This has been answered in a German study from 2013[134], in which the buffering relates to the fact that with intermittent renewables, in order to provide a comparable steady output, have to be assessed in conjunction with a storage technology, such as wind energy with pumped hydro.

[133] http://irishenergyblog.blogspot.ie/2015/02/the-future-of-power-generation-in.htmlv

[134] http://festkoerper-kernphysik.de/Weissbach_EROI_preprint.pdf published in: Energy Volume 52, 1 April 2013, Pages 210–221

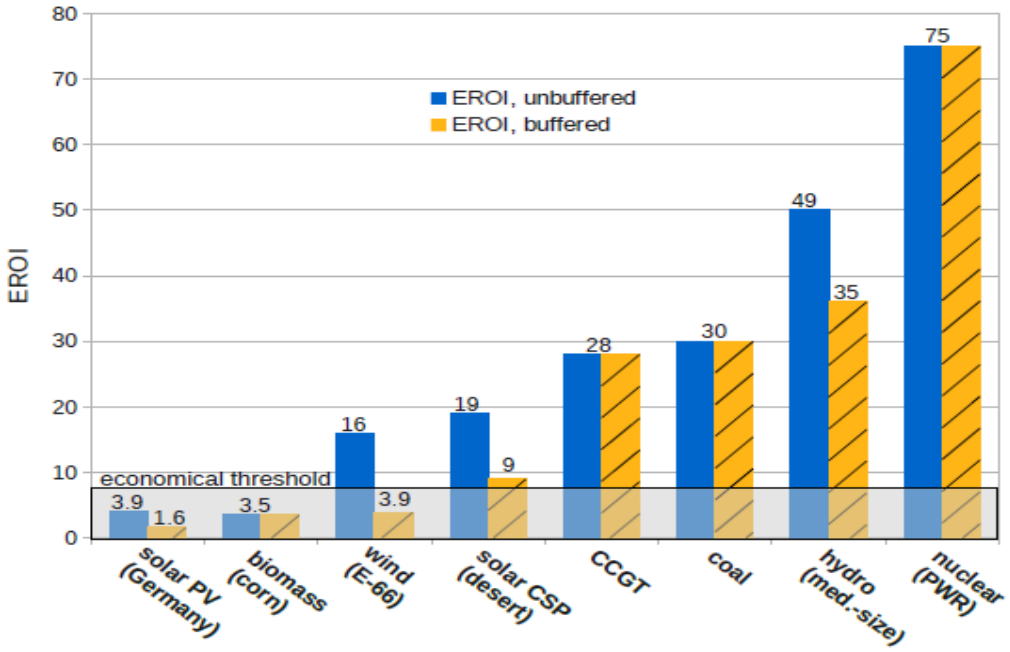


Figure 3: (Color online.) EROIs of all energy techniques with economic "threshold". *Biomass:* Maize, 55 t/ha per year harvested (wet). *Wind:* Location is Northern Schleswig Holstein (2,000 full-load hours). *Coal:* Transportation not included. *Nuclear:* Enrichment 83 % centrifuge, 17 % diffusion. *PV:* Roof installation. *Solar CSP:* Grid connection to Europe not included.

Figure from German Study: "Energy intensities, EROIs, and energy payback times of electricity generating power plants"

The results speak for themselves; intermittent renewables will never be an effective solution and demonstrate a very poor return on the resources invested in them. So what is the solution? To answer that one has to first define what the problem is. The EU Commission's bank, the European Investment Bank has already allocated some €2 billion to funding renewable energy infrastructure in Ireland, ignoring its own structures to ensure that the relevant programme was in compliance with the legal procedures on environmental assessment and public participation in decision-making. If we consider the European Investment Bank's own 2007 document on: "An efficient, sustainable and secure supply of energy for Europe"[135], then this states:

- *In general, when designing environmental policies in the presence of uncertainty about the costs of environmental damages, one cannot reason simply in terms of cost-benefit analyses or second-best optimal tax policies. Rather, it is more appropriate to conceive policies that achieve a targeted reduction in pollution in a cost-effective manner.* ***This is also true when it comes to designing policies in support of renewable electricity, mainly because of the enormous difficulty of reliably estimating the benefits of such policies, i.e., the economic value of emissions avoided and other benefits of using renewables for electricity generation.***

In layman's language; the politicians came up with a target, for which we in the bank threw lots of public money at, in order to help achieve it. "Please define the problem, before you throw lots of our money at it", should be a simple concept they should follow; but it doesn't seem to be the logic they understand.

[135] http://www.eib.org/attachments/efs/eibpapers/eibpapers_2007_v12_n02_en.pdf

We could for instance, as it grows older, simply rebuild sections of our Moneypoint coal fired power station and keep that power station running for many decades to come. Lots of coal out there and Moneypoint alone does a good job in supplying 25% of the Republic of Ireland's electricity. So what's the problem, that the coal or similar fuel is imported? Aren't all our cars, wind turbines, solar panels, steel for pylons, etc. imported as well? Isn't it worth noting that Irish exports were €89 billion in 2014, with imports of €53.6 billion? Does it really matter that we would need to import some €1 billion in coal and gas to fuel our power stations? Remember, some €22.2 billion of exports were medical and pharmaceutical products, while those of organic chemicals were another €18.1 billion. These companies are not going to stick around if electricity prices continue to soar – it's not sustainable for them.

On a much longer timeframe do we need to look at other options than fossil fuels? France for instance in 2000 was generating nearly 80% of its electricity from nuclear, a technology nobody had heard off a hundred years previously. So where did this come from? Human ingenuity is after all an enormous resource:

"We have this history of impossible solutions to insoluble problems."

- ***Will Eisner, 1917 - 2005, American cartoonist, writer, and entrepreneur***

However, it is a resource which needs to be properly looked after. If it is suppressed, it will go elsewhere and society will not receive the benefits of it. This is not sustainable, as we need to be inventive to find improved solutions to the challenges, which will always face.

If we consider the legal cases in Germany, highlighted previously in relation to the forced closure of their nuclear power stations, then the power companies involved, Vattenfall, E-On and RWE, for decades supplied reliable and affordable electricity. They paid good wages to their employees and dividends to their shareholders, they successfully delivered complex and expensive infrastructure requiring timescales of forty year; they were steady and stable companies and in the main owned by pension funds. Yet, their value and worth has now been essentially wiped out by populist political decisions. Even worse, what their infrastructure delivered was replaced by what can only be described as expensive, unreliable, wasteful junk, which is blighting the German countryside like beacons to the Nation's collective stupidity.

"To 'choose' dogma and faith over doubt and experience is to throw out the ripening vintage and to reach greedily for the Kool-Aid."

- ***Christopher Hitchens, 1949 – 201, British-American author, polemicist, debater, and journalist***

Do you not think that experienced engineers and technical managers in Europe are fed up with the stupidity which is going on? Repeatedly senior European business leaders are pointing out to European and Member State politicians that this can no longer continue, they simply cannot afford the stupidity and have to go elsewhere – it is not sustainable. For example, as was reported in the New York Times in October 2014[136].

- *Over the next five years, BASF plans to pump a quarter of its planned €20 billion in investments into North America. For the first time, the company plans to trim its spending in Germany from its traditional level of at least a third of investment to only a quarter.*

[136] http://www.nytimes.com/2014/10/25/business/international/basf-an-industrial-pillar-in-germany-leans-abroad.html?_r=0

Other countries in the world are not infatuated with Western ‘hang-ups’ related to designer foods, designer energy and designer weather, the latter which will undoubtedly be delivered in fifty to a hundred years’ time, as a result of Europe’s investments in ‘clean energy’. Furthermore, free from the shackles of our ‘hang-up’s and dogmas, these countries will innovate and develop new energy solutions, which will leave Europe, as it was pre-1500; backward and decayed.

“The evidence never seemed to matter to those in power, who had already made up their minds and did what people typically do when their worldview is threatened by new data: they attacked the messenger.”
— Sol Luckman, 1967 - , American painter and author

9. REFERENCES

[1] The 2013 Edition of the State of Renewable Energies in Europe[137]:

- 106,757 MW of total wind energy in EU 28 by end of 2012
- 5,022 MW of offshore wind energy installed by end of 2012
- 68,906 MW of installed photovoltaic cells by end of 2012

- The cost of onshore wind has been assessed internationally by a report completed for the German renewable industry[138], the main detail of which in relation to total investment costs (GIK -Gesamtinvestionkosten), can be found in the Table below:

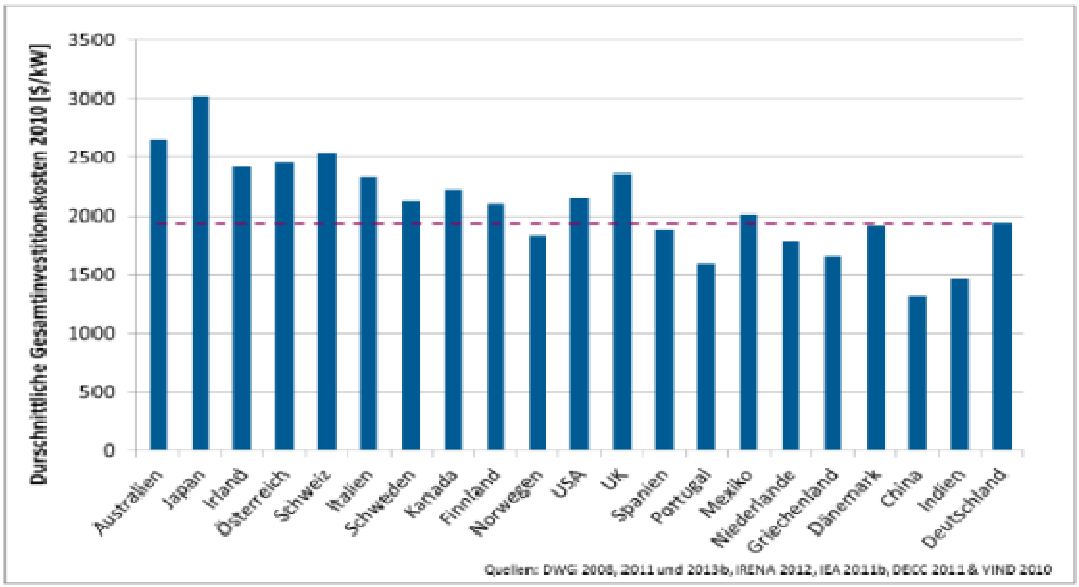


Abbildung 4-14: Vergleich der durchschnittlichen GIK für das Jahr 2010.

- Assuming a conservative value of $2 million per MW as representative of the EU, this equates to €1.7 million per MW for the installed cost. Note: Ireland's installed cost per MW is considerably higher at nearly $2.5 million.

- Cost of offshore wind is recognised at between €3 to €4 million per MW[139]

- Cost of solar PV[140]:

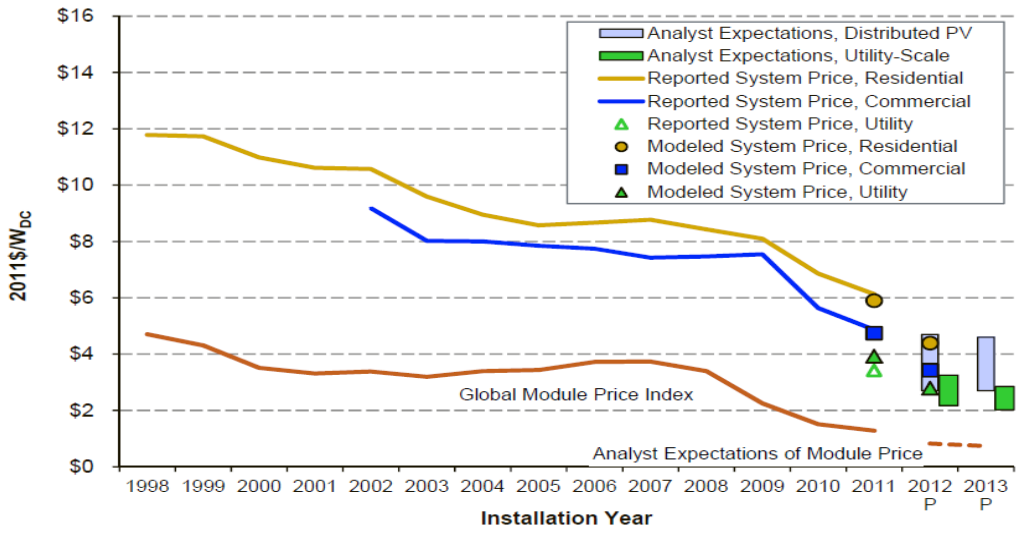
---

[137] http://www.energies-renouvelables.org/observ-er/stat_baro/barobilan/barobilan13-gb.pdf

[138] http://www.wind-energie.de/sites/default/files/download/publication/kostensituation-der-windenergie-land-deutschland-internationaler-vergleich/20140403_kostensituation_windenergie_land_int_vergleich.pdf

[139] 1,567 MW worth between €4.6 billion and €6.4 billion, were fully grid connected between 1 January and 31 December 2013: http://www.ewea.org/fileadmin/files/library/publications/statistics/European_offshore_statistics_2013.pdf

[140] http://www.nrel.gov/docs/fy13osti/56776.pdf



- Assume an average of $7.5 per W, €6.25 per W. €6.25 million per MW.
- Total: (68,906 x 6.25) + (101,735 x 1.7) + (5,022 x 3.5) = €621,189 million

Clearly this is in excess of €600 billion, to which grid connections and upgrades have not been added.

[2] "Cost of Air Pollution from European Industrial Facilities 2008-2012" (EEA, 2014)[141]

[3] EU Clean Air Package: Version 2 (Holland, 2014)[142]

[4] "ExternE, Externalities of Energy Methodology 2005 Update" (EU Commission, 2005)[143]

[141] http://www.eea.europa.eu/publications/costs-of-air-pollution-2008-2012

[142] http://www.iiasa.ac.at/web/home/research/researchPrograms/MitigationofAirPollutionandGreenhousegases/TSAP_CBA_corresponding_to_IIASA11_v2.pdf

[143] http://www.externe.info/externe_d7/sites/default/files/methup05a.pdf

10. BIOGRAPHY

Pat Swords is a Fellow of the Institution of Chemical Engineers and a Chartered Environmentalist, who graduated from University College Dublin in 1986. Pat has been active in the design and development of industrial projects in the chemical, pharmaceutical, food and energy sectors both in Ireland and abroad. For over a decade he helped implement the EU's environmental legislation concerning environmental assessment, industrial pollution control and major accident hazards into the then accession states of Central and Eastern Europe. As such he was responsible for training regulators, industry and, in later years, members of the public and NGOs in the implementation of the Environmental Acquis, the EU legislative framework in the environmental sector.

It was these skills he applied to the EU's and Ireland's renewable programme to fund and install several thousand wind turbines and thousands of kilometres of new high voltage lines into the Irish rural landscape. This lead to a legal case with the legal tribunal at the United Nations Economic Commission for Europe's (UNECE) Aarhus Convention in Geneva, the Compliance Committee ruling that the implementation of the EU's National Renewable Energy Action Plans (NREAPs), particularly in Ireland, was in non-compliance with the requirements of the Convention. The NREAPs having by-passed the mandatory steps in relation to assessment and public participation in decision-making. These findings and recommendations have since been endorsed by the UNECE Meeting of the Parties in July 2014, which is the formal Governing Body of the 47 Parties (countries) to the Convention, and are as such a declaration in International Law and binding on Community Law. UNECE are now engaged in formal compliance proceedings with the EU in relation to their recommendation that the NREAPs should be completed in a compliant manner with the active public participation before their adoption[144], while the matter is also subject to on-going proceedings in the High Court[145].

[144] http://www.unece.org/environmental-policy/conventions/public-participation/aarhus-convention/envpptfwg/envppcc/envppccimplementation/fifth-meeting-of-the-parties-2014/european-union-decision-v9g.html

[145] http://irishplanningnews.ie/high-court-challenge-to-national-renewable-energy-action-plan/ Proceedings to recommence on the 11th November 2014