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Ole Burose

University of Twente, the Netherlands

The Smartness of National Support Schemes in the Context of the EU ETS: A Cross-Sectional Observation

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Proposed by: Ole Burose

Supervised by: Prof. Michiel A. Heldeweg

Co – Supervised by: Asst. Prof. Marc Harmsen

Ole Burose, Management and Governance, University of Twente

Abstract of Bachelor's Thesis, Submitted 25th of March 2014:

The Smartness of National Support Schemes: A Cross-Sectional Observation

The primary purpose of this thesis is determine the practicability of the instrument combination EU Emission Trading System (ETS) and national support schemes for the promotion of electricity from renewable energy sources to eventually be able to reject the claim that the ETS should not be complemented by any additional measure. Furthermore, it is of interest to see whether there is one best instrument for RES-E support that can be recommended.
It is assumed that under the absence of a proper functioning ETS the national support schemes as formally introduced on EU level under the Renewable Energy Directive (RED) are the main drivers in the pursuit to handle climate change. A combination of the ETS and national support schemes should be embraced as being smart if the latter perform well on average.
In the first part, a literature review identifies the concept of smartness in the policy context to be strongly related to the two indicators of effectiveness and efficiency. The two are then further conceptualized as to be represented by the deviation from national trajectory targets for the share of renewable energy from total energy consumption and the adherence to commitments made by the MS' with respect to administrational reform and provision of secure support regarding RES-E support systems.
Subsequently, the two indicators are first observed separately before a combined observation enables final observation of the performance of the national support systems. The quantitative observation is accompanied with qualitative evaluation for both indicators, adding extra perspective to the observations.
The results don't yield sufficient support for the initial main claim that an instrument mix should be embraced under current premises. Qualitative evaluations do however suggest that feed-in related instrument combinations are better able to provide for equity within tech-support, similarly fostering investment through better long-term security, which can be considered a key element for success.

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1 Introduction

"With today's vote, the European Parliament has sent a clear message: Europe needs an effective ETS and a genuinely European climate policy. I of course welcome this positive vote which also shows that the European Parliament shares the Commission's view: we must have a well-functioning European carbon market to boost innovative low-carbon technologies in Europe. The next step is now for the Council to take a decision. The sooner, the better, so that we can move on to the structural reform of the ETS as soon as possible."

(Hedegaard, 2013)

The EU Commissioner for Climate Action reacted with relief on the EP's recent decision to support the COM's proposal for so-called "backloading" which is regarded as being crucial for the EU Emission Trading Scheme (ETS) to bear any positive outcome until the end of the third trading period in 2020.

The proposal by the COM (2012) seeks to amend the ETS Directive 2003/87/EC, giving the COM the mandate to adapt the timetable for each trading period so as to ensure an orderly functioning of the market and hence making way for the proposed backloading of 900 million allowances from the years 2013-2015 until 2019-2020, when the COM expects the demand will have picked up.

The unexpectedly strong support of 344 to 311 votes in favour comes as a bit of a surprise as it was only three months earlier that the EP rejected the first proposal leading the allowance-price to fall to a depressed level of as little as 2,63€ per ton. Reason for the rejection of the proposal back then were amongst others the opinion of opposing MEPs that interfering with the supply of credits could undermine players' confidence in the carbon scheme (Keating, 2013). Additionally some stated that they believed a rise in the carbon price had the potential to erode the competitiveness of European industry (McGrath, 2013).

"I think that when people considered all the alternatives to the market-based system, they realised it was much better...," Hedegaard stated after the decision.

The apparent struggle within the EU over the necessary structural reform of the ETS sends a bad signal to the industry and all stakeholders involved. If it is not possible to address the significant shortcomings of the scheme, particularly with regard to its inflexibility to adapt to changing circumstances, the whole scheme might eventually prove useless until the end of the third trading period in 2020 (European Commission, 2013b).

This becomes obvious in the recent discussion about backloading, a measure which, according to some experts would not even considerably change the overall situation in which over-allocation of allowances poses a serious threat to the general effectiveness of the whole undertaking. Following the scientists from Sandbag, the expectations of Europe's GDP growth out to 2020 are down by a third since the climate package was agreed upon leaving the ETS caps with a shortage in demand of 2.2 billion tons (D. Morris & Campaign, 2012).

As David Hone, Royal Dutch Shell's chief climate change adviser, stressed in an interview with the Financial Times:

"Backloading sends a political signal about the importance of the ETS, but does not address the structural problems. We urge the commission to come forward as soon as possible with proposals for structural reforms."(Clark, 2013)

Nonetheless, it is about time the EU legislative body shows some real commitment as otherwise the whole scheme is likely to fall apart, as it is all about reliable information

provided, including the backing of the success of the scheme and not a weak second thought gesture.

This is because the whole scheme faces a crisis that might very well destroy the whole approach. What once was set out to be the single largest driver towards the reduction of emissions, now proofs to be the weakest link in the chain of instruments. After having taken a huge hit by the recession, the inflexibility to adapt to changing circumstances the ETS now finds itself in a situation where it not only isn't contributing to abatement, but cancels out progress achieved by other instruments. When recent caps were devised, the ETS was originally expected to deliver some 2.8 billion tons of emission abatement against business-as-usual emissions over and above the other EU climate targets that were supposed to deliver abatement. However, following the recession, emissions in power stations and factories covered by the scheme have fallen by as much as 3.5 billion tons until 2020 (D. Morris & Campaign, 2013). The experts from Sandbag find that today, the scheme is cancelling out around 700 million tons of abatement achieved by other European policies (D. Morris & Campaign, 2013, p. 3; Ricardo, Tamra, & Joanna, 2013).[1]

Furthermore, the price that is too low does not reflect the true damage caused by CO_2 emissions[2] (Matthes, 2010). In addition, price volatility has been significant with the ETS in recent years. This increases uncertainty for investors as it reduces profitability and hence directly affects the sector for electricity generated from renewable energy sources (RES-E) significantly (Betz & Sato, 2006; Ellerman & Joskow, 2008; Hintermann, 2010; Schäfer & Creutzig, 2008). This uncertainty is in turn is aggravated by the mere fact that emission caps are renegotiated from trading-period to trading-period. The renegotiations are subject to a political bargaining process where the outcome is unkown. Important long-term incentives are unlikely to be provided by the ETS (Lehmann et al., 2012).

Politicians find themselves in a partly inexplicable struggle to act as to overcome the situation in which heavy surpluses in allowances drown any ambition of the system and a manufacturing industry that already moans about a too heavy economic burden imposed by the ETS. However, when looking at the data available, the arguments brought forward by these companies seem rather ridiculous facing the fact that the surpluses of allowances are accumulated in some cases right out to 2020. Those bringing forward the argument of companies already suffering enough in the aftermath of the biggest economic crisis in centuries, fail to recognise the fact that the ETS actually provides the opportunity for well-run companies to make money (with selling their spare allowances) and additionally gain from the insights in and knowledge about new environmental technologies that have the potential to foster economic growth and subsequent job creation immensely (Domac, Richards, & Risovic, 2005).

Again, the ETS was meant to help Europe to cost-effectively reduce emissions to foster the ultimate goal of fighting global warming.

The obvious ingredient missing for proper working of the undertaking was the provision to ensure a minimum level of ambition by the parties involved.

One cannot, however, just make the recession the single responsible influence for the bad situation. Although this economic shock pushed other priorities up the agenda, to combat climate change remains the biggest task for all of us, as stagnation is unacceptable for every human being on the planet.

[1] See "Comparison of 2008 and 2013 'base case' emissions (BAU minus non-ETS policies)" in the appendix (p. 49) for a graph illustrating the dilemma

[2] Referring to social cost

Meanwhile, as the EU system seems to stagnate, other emission trading systems are set up and flourishing. Recently, China and California entered into talks about linking their schemes (D. Morris & Campaign, 2013, p. 5). Once the role model for systems worldwide, the EU is falling behind in the global race as Worthington states in his introductory letter for the Sandbag report (D. Morris & Campaign, 2013). European policy makers should be nervous of the indicated developing merger situation, in which the danger of the global carbon market moving its centre to the Far East or to the US is very real.

The time for action is now, as the window to avoid dangerously high levels of global warming is closing. The latest report of the UN Environment Programme finds a gap of 8 to 13 billion tons between current pledges in 2020 and the global pathway for staying under 2° of global warming (UNEP, 2012). Especially in this context, it is a concern to see Europe leaving way too much headroom to meet its current 2020 targets which, under current circumstances, can be met by just standing still. It is hard to believe that no considerable action is taken even at a moment, where with emissions staying fixed, industry still has around 877 million tons of headroom when considering the economy-wide carbon budgets apportioned between the ETS and the Effort Sharing Decision (ESD)[3]. This number increases significantly, when one adds the 1.8 billion allowances accrued surplus from phase 2 – 2.6 billion tons! Of course, the emissions are not expected to stand still but rather to decline further under the force of the Energy Efficiency Directive (EED), the Renewable Energy Directive (RED), and related national policies, increasing the surplus even further (D. Morris & Campaign, 2013, p. 16).[4]

1.1 Brief excursion: the ETS – history and functioning

For the EU as a political entity the awareness of the need for action concerning a climate-based instrument arose during the 1990s. First studies regarding the applicability of a common carbon tax were conducted but eventually rejected as a carbon tax faced strong opposition of enterprises fearing that it would undermine their international competitiveness. Eventually the carbon tax idea was scrapped as it failed to reach unanimity in the European Council in 1994. However, the 1997 Kyoto Protocol set a cap for GHG emission reduction for the EU15 of 8%. Since the carbon tax was off the table other ways had to be found to reach the set goal the EU member states (MS) committed themselves to. In 2000 the COM issued a first green paper on emission trading to start the consultation procedure involving all stakeholders concerned followed by an official COM proposal for a trading scheme in 2001. In 2003 the EU directive on emission trading was accepted with free allocation of allowances being embraced as the main allocation mechanism in the beginning to minimize harm for companies involved. The scheme was set out with having three phases. The first period from 2005 to 2007 was to function as a trial and error period. In the following second period, running from 2008 to 2012, the aim was to introduce auctioning as an allocation method and to create a non-zero price. In the first two phases, it was the EU that divided the EU-cap into a cap for MS which then further divided their cap in an ETS and non-ETS part. The currently running third period (2013 to 2020) was then meant to put greater emphasis on generally harmonized allocation rules, establishment of auctioning as the primary allocation method and the inclusion of aviation in the scheme.

The ETS works as follows: a limit (or cap) is put on the total amount of agreed upon greenhouse gases that are emitted by power plants, factories, and other installations part of the

[3] Which covers reduction targets for sectors not included in the ETS

[4] Take a look at the appendix (pp. 49+50) to find some more in depth information in the sections “History and the Need for Change” and “Main Threats the EU ETS faces”.

system. This limit is then reduced over time so that total allowed emissions are falling. Plan is for emissions covered by the system[5] to be 21% lower in 2020 than in 2005.
Within the system, emitters receive or buy emission allowances (EA)[6] which are then open for trade. The limited total number of allowances in the system is supposed to secure that EAs actually have some value. Every year, emitters covered by the scheme must surrender enough allowances to cover respective emissions as otherwise they face heavy penalties (100€ per ton). Spare allowances can be kept and sold to other emitters or stored for later usage. The rationale behind this is to secure that emissions are cut where it is most cost-efficient to do so (Clark, 2013; European Commission, 2014).
Despite all the pitfalls mentioned already, the ETS very well remains a significant policy instrument, not the least for being a multinational system.

It did put a price-tag on emissions which is a good start. However, widely believed to be too low, hard evidence about the price signal actually having reduced emissions in Europe is lacking (Ellerman, Marcantonini, & Zaklan, 2014).

Furthermore, the ETS has been subject to substantive changes in structure: increased centralization of functions, steady phase-out of free allocation of allowances in favour of auctioning, and reduction of the use of offsets.

With a price too low the debate is now tuning to regulate allowance supply, long-term ambition of the ETS, and, not least, the coordination with other EU climate policies (Ellerman et al., 2014, pp. 19+20).

1.2 The ETS and the 20-20-20 targets

The ETS is the most important measure out of the four of which together comprise the EU climate and energy package, which is supposed to deliver on the 20-20-20 targets. Together they represent the EU's approach of combating climate change. Also, they are the headlines of the Europe 2020 strategy for a smart, sustainable, and inclusive growth. Besides the necessary reform on the ETS there is national targets for non-ETS emissions, national renewable energy targets, and a strategy on carbon capture and storage (European Commission, 2010).

1.2.1 The three key objectives of the 20-20-20 targets:

1. a 20% reduction in EU greenhouse gas emissions from 1990 levels
2. raising the share of EU energy consumption produced from renewable energy sources to 20%
3. a 20% improvement in the EU's energy efficiency

The ETS, is accompanied by national support schemes, once more emphasized under the renewed RED (Directive, 2009) that is to further safeguard MS' efforts to commit on fostering the expansion of renewable energy share of the total energy consumption (second 20-20-20 target).

MS were required to set up national support schemes fostering amongst others, electricity RES-E. The RED, repealing Directives 2001/77/EC and 2003/30/EC, allows for different schemes to be applied[7]. All of them have good and bad attributes. Because performance of instruments is strongly context dependent and with some the share positive attributes might be

[5] Altogether the ETS covers around 45% of total greenhouse gas emissions from the 28 EU countries
[6] One per ton of emissions
[7] Find the definition of support schemes and different variations in Art. 2 (k) and the requirement of MS to introduce support schemes in Art. 3 RED

bigger than with others, the COM supports the idea of invoking the cooperative instrument of "best practices" for the MS to harmonize the respective systems in a way that society benefits. With respect to best practices however, opinions divide strongly as to which instrument should be utilised under which circumstances (Bergek & Jacobsson, 2010; Ringel, 2006; Sijm, 2002).

While the climate and energy package does not address the energy efficiency targets in a direct manner this is done through the Energy Efficiency Plan and the Energy Efficiency Directive. However, the approaches towards the 3rd 20-20-20 target remain rather weak, as the measures only include indicative targets for energy efficiency improvement and only enter into force by 5th of June 2014.

To briefly sum up: The ETS was set out to expose emitters to a benchmark that was eventually meant to provide a strong incentive for them to reduce emissions and subsequently also opt for improving their facilities as prices for certificates or the threat of heavy fines would exceed the cost of investing in a more sustainable operation. With giving an incentive for investing the scheme was also meant to foster innovation in the field of renewables. As that didn't work out as planned for various reasons named above there is little prospect for the ETS to have a recognizable positive impact on climate change until 2020. This was also acknowledged by the COM in their report on the progress of renewable energies (European Commission, 2013b, p. 11). At this point, the alert reader might already legitimately ask himself, whether or not the whole idea of climate protection and emission abatement through a certificate based system is smart or not. Is EU environmental policy able to have any considerable impact on emission abatement at all? Is all hope gone until at least until 2020?

1.3 National support schemes – a silver lining?

Luckily, EU climate policy may hold a trump with the RED. Various national approaches towards supporting RES-E enhancement have been made over the last two decades, with varying success. The COM states that it might also be time for a harmonized European framework on Renewable Energies support. In 2009 with the introduction of the RED, a further approach has been made towards a more unified system, introducing measures of cooperation related to the various national support schemes allowing for joint projects amongst MS and with 3rd countries.

However, considerable doubts remain about the feasibility of combinations between the EU ETS and national support schemes. It is mainly economic theorists that claim that a market based economic instrument like the ETS is only to function effectively when working alone (Fankhauser, Hepburn, & Park, 2010; Frondel, Ritter, & Schmidt, 2008; Frondel, Ritter, Schmidt, & Vance, 2010; H.-W. Sinn, 2011; H. Sinn, 2012; Weimann, 2008). This is said to be true due to every additional (in this case national) measure being likely to hamper the proper working of the scheme as it potentially influences the price of the certificates and hence unnecessarily drives up the overall costs for society. Proponents of this way of reasoning reject the notion of an instrument mix mostly due to reasons mentioned above based on theoretical models of economic theory (Gawel, Strunz, & Lehmann, 2014; Lehmann & Gawel, 2013; Reyes & Gilbertson, 2010).

Other than the economists claiming that one should not combine the ETS with additional measures, I advocate the opposite. Based on the findings published in the latest Sandbag report, I claim that rather than to be negligent towards a policy mix, policy makers should embrace it. Having the 20-20-20 targets in mind, with the ETS under-performing (definite claims about the performance of the ETS are difficult, as the COM fails to deliver reports on emission abatement caused by setting up the ETS) and the energy efficiency directive only

providing indicative targets from mid-2014 onwards, the RED and the national support scheme framework that comes with it seems to be the only working climate policy. Although not specifically aiming towards emission abatement, the renewables share target implies the former, making the national support schemes *the* instrument for tackling climate change with the ETS presumably being in a deadlock until possible reforms can be implemented in the new trading period.

1.4 Research questions

It is the aim of this work to investigate upon the performance of the national support schemes towards more sustainability in the energy sector with subsequently being able to evaluate the combination of the two policies (renewable energy support and the ETS) as being smart or not respectively. I expect to be able to reject the claim of economic theorists and make a point for the use of national support schemes alongside the ETS.

I claim that when a successfully working system of national support schemes is observed in this paper, no doubts should hamper the embracement of a policy mix (especially the ETS-RED-mix).

27 MS are the units of analysis - all of which opted for different support schemes regarding RES-E. This cross-sectional study uses 2010 data examining the performance of different instrument combinations. As the question of the feasibility of combinations is the crucial topic of this work the overall explorative research question of this paper is stated accordingly:

"Is it smart to accompany the EU ETS with national RES-E support schemes?"

As smartness as such is a highly normative concept relating to a certain standard or ideal, I conduct a literature review to be able to subsequently assess the success of national support schemes and thus related smartness of the policy combination at hand. In typical social sciences research terms, the key relationship is the relation between the independent variable of existing RES-E support schemes, and the dependent variable of ETS. Although the causal relation between the two is relevant, this research is especially about the performance of the RES-E support schemes and the linked relation of a smart mix with the ETS.

"How can one measure smartness of a policy?"

The concept of Gunningham, Grabosky, and Sinclair (1998) is then applied in a slightly altered fashion to evaluate the performance of the national support schemes, asking:

"Are national support schemes working successfully?"

To answer this general question, two sub-questions are utilized relating to both efficiency and effectiveness.

"To what extend are national support schemes working effectively?"

"To what extend are national support schemes working efficiently?"

Along with the qualitative analysis of efficiency, an assessment of whether or not the choice of instrument with respect to national support schemes matters will be looked for.

"Does the choice of instrument affect the success of the support scheme?"

> **H1**: I hypothesize that especially in absence of a functioning first best policy (ETS) any supporting instrument must be welcomed and is thus a smart match.
>
> Besides the frequent claims of economic theorists that this might not hold true, reality, along with various theorists from different departments suggests otherwise.

H2: Claiming that the ETS as such will have little to no positive influence on emission abatement, a constructive – smart – combination of the current first best policy alternative with national support schemes heavily relies on the successful working of the latter.

The following theory part introduces concepts on how to evaluate and measure smartness of environmental regulation. Moreover, the discussion about whether or not the ETS should be complemented by additional measures is picked up along with theoretical insights on environmental instrument combinations and regulation as such. A short theoretical excursion will be given about advantages and disadvantages of the predominant national support instruments.

This will be followed by a methodology part that is to clarify how I intend to pursue my research. My choice fell on a combined analysis to assess both effectiveness and efficiency as they were recognized to be the main indicators for smart regulation by Gunningham et al.. This approach will be complemented by an assessment of the situation drawing on existing evaluation data provided by the COM and external advisors as well as scientific journal articles. While for effectiveness the qualitative data observation is of a more general nature taking into account recent developments for all 27 MS subject to this study, for the efficiency indicator, I opted for a two-case selection that enables to provide an assessment about the current state of efficiency in two of the countries that represent different approaches with respect to choice of main instrument which also helps me to address the last research question.

The section is then finalised by a combined observation and subsequent analysis.

After having done that I will be able to conclude with providing recommendations based on my findings, reflect on the hypotheses, and also give some advice on further research to be conducted. The paper will be completed with a discussion about the ongoing change in EU energy policy.

2 Theory

2.1 Smart regulation

If one wonders if something is the right thing to do or not, one often asks oneself: “Is it a smart thing to do a) or b)?” While the inherently normative discussion about smartness and related smart decision making has almost unlimited dimensions, a pragmatic approach towards the smartness of energy policy is key to this work. When looking for answers to the question whether or not and if so, how EU climate policy may combine the ETS and the RED in a smart way, the work of Gunningham, Sinclair, and Grabosky presented a fitting approach.

These researchers have put a lot of effort towards inquiring into environmental regulation. According to them, regulation might not be the only means to of addressing environmental problems and challenges we face today, but it sure plays a crucial role.

In the landmark work, “Designing Smart Regulation”, most existing approaches to regulation are labelled as being sub-optimal the least especially criticising the efficiency with regard to cost-optimization, political acceptability, political goal orientation, and justness of existing approaches (Gunningham, Grabosky, & Sinclair, 1998).

After having provided an overview of the political and ideological debate about the future of regulation that is currently going on, the work continues with discussing more fruitful approaches towards environmental policy designs. Besides giving valuable insides about

climate related policies and the concurrent history and development over the last 30 years, the book concludes with a section introducing and counselling on smart regulation.

The central argument is that in the majority of circumstances, the use of multiple rather than single policy instruments is recommendable, including a wide range of regulatory actors, as this will produce better outcomes and thus better regulation. In their approach to demonstrate how smart regulation could be designed, they further argue, that the former argument supports the idea that the implementation of complementary combinations of instruments and participants suited to meet the challenges posed by specific environmental issues. Here, they point towards "a far more imaginative, flexible, and pluralistic approach to environmental regulation than has so far been adopted in most jurisdictions" (Gunningham & Sinclair, 1998, p. 1).

Although their work accounts for the variety of different environmental problems and the subsequent need for issue related solutions, which necessarily differ in content, the authors still find it suitable to establish a basic general principle based framework for designing environmental regulation that is applicable under any given circumstances. This is to help policymakers in enabling them to assess respective decisions against a given set of design principles forming the basis for reaching the preferred outcome.

Two elements are stressed as being crucial. First, they outline five regulatory design principles[8]. Second, the importance of instrument combinations is stressed.

In the following, I will briefly outline the main points made by the authors to provide the reader with the possibility to grasp the basic ideas behind the theory of smart regulation.

For the authors, the debate about whether to stick to de-regulation or regulation explicitly asks for thinking about solutions that contain the best of both (Gunningham et al., 1998, p. 9).

The implied challenge herein is to find ways to overcome the inefficiencies of traditional regulation and the pitfalls of deregulation. They argue that, given the political and fiscal limits under which regulators have to work today, it is crucial to harness resources outside the public sector to foster government policy. This was exactly the line of reasoning the EU followed when deciding for economic instruments to be used in order maximise efficiency of environmental policy applied (Gunningham & Sinclair, 1998).

The purpose of the authors work is to demonstrate ways that make it possible to achieve the goals mentioned above, including highlighting "opportunities for environmental innovation, regulatory flexibility, and improved environmental performance, but without the use of greater government resources (**that is, "smart" regulation**)" (Gunningham et al., 1998, p.10).

Among those opportunities there are some flowing from naturally occurring market phenomena and from commercial influences (p. 10).

Gunningham et al. argue that it is inherently smart to use the strengths of individual instruments whilst compensating for respective weaknesses with using additional and complimentary instruments. With respect to that, they argue that in the majority of cases a mix of instruments is required, tailored to fit specific goals. Also, they add that instruments work more efficiently if a broader range of participants are capable of implementing them. With that they refer to the direct involvement not only of government (first parties) but also of

[8] See appendix (pp. 51-56) "Regulatory design principles" and "Instrument combinations" for an in-depth summary of the five principles and evaluation of instrument combinations

business and other actors targeted by regulation (second parties) and of other interested actors (third parties) (p. 15).

He does however explicitly highlight the fact that he and his colleagues don't advocate a "smorgasbord" approach, meaning, the greater the number of different instruments and actors involved isn't necessarily the better. Also, limits to what administrational burden can be put on the regulatees support that claim as it diverts internal firm resources away from productive pollution prevention activities.

It is stated, that in some cases a single instrument approach might well be the most effective, outperforming a combination of different instruments[9] (p. 16).

Questions of regulatory strategy are of the kinds of:

- In what circumstances and to what extent can regulation safely be left to industries themselves?
- When government intervention is necessary, what forms should it take?
- What are appropriate roles for third parties?
- How can we achieve smarter regulation?

The authors' intention when establishing the five principles was to suggest ways in which policymakers that act in good faith and with the intent of designing successful environmental regulation, can best approach the task.

Herein, the authors acknowledge the arguments of public choice theorists that claim that the process of establishing and implementing regulation is subject to corruption. In the eyes of these theorists, free market environmentalism and a property-rights approach are favoured (p. 23).

The authors refer to the necessity of government to stand its ground and not leave environmental protection completely to market forces. Quoting Yeager (1991): "*The primary institutional goal is to produce rules that have a reasonable chance of surviving the inevitable political and legal attacks and that are capable to a tolerable degree of effective implementation in the real world.*"

Referring to Yeager, Gunningham et al. follow a pragmatic approach to policy design where government is relatively unencumbered by the whole debate about de-regulation versus regulation and in turn just concentrates on harnessing the resources of a range of potential participants. This would, according to the authors, also have the positive effect of avoiding errors in policy-making that are so deeply despised by public choice theorists (pp. 24+25).

In other words, just try to do the best possible job for society. Here, they also refer to the fact that when enough room is left to design policy without being limited by outside pressures, politicians along with creative experts, are best able to come up with most regulatory worth-wile regulatory measures. Again, by including a variety of actors into the process the policy maker decreases the chance of decisions made contradictory to the public agenda. Gunningham et al. aim towards identifying opportunities for win-win solutions subsequently being able to design policy mixes that maximize the former.

[9] Possible effects from combinations range from synergy (where two instruments enhance each other's effects) to neutralization (where one instrument negates or dilutes the effects of another)

2.1.1 What is meant by "optimal": Evaluation criteria and the decision-maker perspective

It is not always immediately obvious how one is to judge whether or not and if, to which extent a particular policy has been performing "successful" or "optimal" (like economists generally favour to call it).

As different groups have different ideas about how a successful outcome might look like, it doesn't come as a surprise, that of the many lists of indices for success of a policy that were established over time by academic think-tanks, policy-making bodies, and individual writers, none coincide. Among the factors prominently named are those of flexibility, efficiency, and cost-effectiveness (p. 25).

Due to the given circumstance (the absence of precisely what criteria should be used for policy evaluation), the authors come up with their own core criteria.

First they acknowledge the importance of three relatively uncontroversial ones:

- *Effectiveness* (contributing to improving the environment)
- *Efficiency* (improving the environment at minimum cost within which they include administrative simplicity)
- *Equity* (showing fairness in the burden sharing among players)

They add another one important for their purposes:

- *Political acceptability* (which includes factors such as liberty, transparency, and accountability)

As the purpose of their work is to advise policy makers, the authors name effectiveness and efficiency to be their pre-eminent criteria as they believe that "effectiveness of regulatory policy in reaching an environmental target, and its efficiency in doing so at least cost, will be the primary concerns of policy makers" (pp. 26+27).

Those two criteria are what Gunningham et al. call the essence of the term "optimality"[10], which determines whether instruments will perform according to the desired tasks and doing so at an acceptable performance level. Also, the two are in similar forms used by various scholars intending to evaluate environmental policy, which assigns a high degree of validity to them (cf. Konidari & Mavrakis, 2007; Mickwitz, 2003; Mundaca & Neij, 2009).

Three meta-principles guiding the discussion about effectiveness and efficiency in Gunningham et al.:

- Inter-generational equity
- Precautionary principle
- Polluter pays principle[11]

[10] Optimality: By efficiency is meant the static aspects (i.e., what levels of administrative costs are associated with the instruments) and the dynamic ones (e.g., to what extent will the various instruments induce technological innovation or diffusion). By effectiveness is meant the degree to which the determined environmental objectives are achieved through the use of certain instruments (Opschoor & Turner, 1994, p. 11).

[11] The concept of inter-generational equity is bound to up in the concept of sustainability, defined by the World Commission on Environment and Development (the Brundtland Commission) as: "development which meets the needs of the present without compromising the ability of future generations to meet their own needs." The attraction of this definition is its vision of integrating environmental and economic goals. The precautionary principle states that a lack of scientific certainty about the level of environmental harm is not sufficient reason to avoid taking policy action to prevent that harm. The polluter pays principle requires the generator of pollutants to pay fully for the prevention of environmental damage from these pollutants (Gilpin, 1990).

When using any kind of criterion one has to understand and take into account that in many cases there will be a tension between the used criteria. The authors call these tensions a normative dilemma and state that one has to invoke value-judgments, weighing criteria used differently with regards to the respective different environmental problems a policy is to tackle.

"E.g. certainty and effectiveness will be more important when in cases where irreversibility is at stake; transparency and consultation will be highlighted when local communities are put at risk; and efficiency and flexibility will be relatively more important when there are large differences in the capacities of firms to reduce pollution."(Gunningham et al., 1998, p. 29)

To escape in some way from the normative dilemmas[12] induced through the inherent trade-off the authors suggest an easy fix, a remedy to the problem. If one is to advise the policy-maker, it is most important to weigh the criteria accordingly, meaning, to design them for optimal results as defined by the decision-maker (p. 29).

After having studied Gunningham and colleagues extensively, one might be inclined to just embrace the ideas provided and take them as given. Although the authors also preach caution with applications of their theoretical approaches and real-world applications, it is tempting.

Despite the convincing and widely acknowledged theory just laid out, especially with regard to the ETS, quite some theorists (especially those having a background in economics) are more than reluctant towards any notation of a policy mix. In the following I briefly outline the debate about the ETS and instrument combinations.

2.2 The ETS – a standalone instrument?

In the economic literature, it is often stated that the ETS constitutes a sufficient public instrument for a macro-economically optimal climate policy. In this line of reasoning it is further claimed that any additional domestic measures, for example those initiated by the RED, pose a contra-productive and inefficient threat to the proper functioning of the primary instrument – the ETS (Frondel et al., 2008; Frondel et al., 2010; H.-W. Sinn, 2011; H. Sinn, 2012; Weimann, 2008).

Following Gawel, Strunz, and Lehmann (2013a), these claims are generally based on three central assumptions:

First of all, proponents of the theory mentioned above assume that there is but one relevant externality with regard to energy consumption, which is the uncontrolled emission of CO2. *Second of all*, besides the number one goal of securing an efficient and safe supply of energy there is just one additional political goal accepted in this line of reasoning: internalisation of climate related externalities. Every additional measure is seen to be an inefficiency-creating stumbling block.

Third of all, theorists of this specific shade refuse to even consider a policy mix being a feasible option as the inherent opinion here suggests, as mentioned earlier, that the optimally designed economic instrument is flawless and manages, via the internalisation of climate related externalities, the most efficient goal achievement (Gawel et al., 2013a).

Gawel et al. subsequently reject all the points made by the economists. According to them, CO2-externalities for example, by far do not constitute the only possible market-failure on the energy market[13]. The biggest point they tend to score with criticising the second point made.

[12] Largest tension of all: environmental protection versus economic growth (Gunningham et al., 1998, p. 29)
[13] See e.g. knowledge spill-over

In their opinion it is close to utopist to assume something so heavily relying on theoretical assumptions could ever be applicable in a real-world scenario. Climate policy has broad public support and is divided into many different goals and hence works with a plural goal-system sometimes acting abstract from market failure. Of course, the authors don't fail to reject the third point made as well. Whilst the model-theory bases its calculations on an optimum CO2 cap, the real life system has to cope with a range of different actors and complex processes of political decision-making with powerful outside influences coming from the aforementioned variety of actors involved. The textbook example is hence never to be applied to reality (Gawel et al., 2013a).

However, besides the critiques by economists based on efficiency and how it is seemingly hampered by RES-support, there is another strand of critics, complaining about the feasibility of the policy mix. As Helm (2010, p. 195) suggests that "capture has, indeed, been the norm rather than the exception." In a similar manner it is Spash who claims that emission trading is creating a distraction from the actual need for human behaviour to change (Spash, 2010).

Whatever these extreme assumptions and opinions suggest, they put the current system in a bad light and represent rather counterproductive points of view (Gawel, Strunz, & Lehmann, 2013b).

Steven Sorrell and Jos Sijm (2003) make a point on the usefulness of national support schemes in addition to carbon trading. They claim that, especially when the first-best policy alternative is failing to provide sufficient incentive to emission abatement due to over-allocation of permits or other flaws in the framework, second-best alternatives can make up for these, at least partially. They do so in that they (1) ensure that at least a small portion of the inframarginal[14] emissions are priced; (2) increase incentives for technological innovation[15]; and (3) provides some means to cover up the windfall profits that might be created by inefficient allocation of permits (Johnstone, 2002; Sorrell & Sijm, 2003). Their remarks support my first hypothesis and foster my confidence to follow the chosen path towards my research.

2.3 Feed-in tariffs or quota based schemes?

MS were required to set up national support schemes fostering RES-E. The RED, repealing Directives 2001/77/EC and 2003/30/EC, allows for different schemes to be applied[16]. Whilst targets have been indicative since 2001, the RED in 2009 made MS to commit to binding targets.

Art. 2 (k) RED defines a support scheme as any measure applied by a MS or a group of MS that promotes the use of energy from renewable sources by reducing the costs of that energy, increasing the price at which it can be sold, or increasing, by means of a renewable energy obligation or otherwise, the volume of such energy purchased. This includes, but is not restricted to investment aid, tax exemptions or reductions, tax refunds, and, most importantly for this paper, renewable energy obligation support schemes including those using green certificates, and direct price support schemes including feed-in tariffs and premium payments.

At the moment, from the 27 MS under study, all operate 27 different national support schemes. When observing the evolution of the main support schemes in the electricity sector,

[14] Inframarginal pricing refers to a specific amount of emissions being priced that fulfil certain criteria. As such this statement refers to additional measures that put a price on emissions (like a carbon tax). In this context, that does not particularly relate to national support schemes.
[15] Although slightly balancing the certificate price
[16] Find the definition of support schemes and different variations in Art. 2 (k) and the requirement of MS to introduce support schemes in Art. 3

feed-in-tariffs, feed-in premiums and quota obligations[17] using systems and respective combinations of these, dominate the applied support schemes[18] (Herczeg, 2012, p. 2).

The most frequently implemented support instrument in the EU-27 however, is feed-in systems. These systems have proven to be effective and efficient in supporting renewable electricity generation in many European countries. Two options are available: the feed-in tariff (FIT), which guarantees a fixed price per kWh electricity, or the feed-in premium, which is paid on top of the market price for electricity. Over the last years, a trend towards feed-in premiums can be observed (Ragwitz, Winkler, Klessmann, Gephart, & Resch, 2012, p. 3).

Some countries opt for a quota-related system (using tradable green certificates (TGCs)). Here, TGCs provide additional revenue, above that received from power sales, to renewable electricity generators through accumulation and sale of certificates to entities required to comply with annual renewable electricity quotas.

Additional policy measures, such as production tax incentives and investment grants, represent the dominant policy measures in some countries whilst in others there are just used as supplementary support measures (see e.g. tax incentives in the Netherlands) (Herczeg, 2012, pp. 2+3).

Research shows, that there are some general types of systems in use of which each proved to be best at different stages of the market development (Herczeg, 2012, p. 1).

2.3.1 FIT or TGC – discussion

When considering the two major schemes applied throughout the Union, a controversial discussion is going on about whether quantity driven (TGCs based on quotas) or price driven FIT-related instruments lead to preferable solutions for society. A study conducted by leading scholar in the field Mario Ragwitz, accompanied by well-recognized scholars (Haas et al., 2011), introduced the following key-points with respect to the comparison of the two leading schemes:

- Success stories for growth in RES-E within the EU 27 has been triggered by FIT implemented in a tech-specific manner at modest costs for citizens
- TGC systems applied most of the times show low effectiveness with respect to RES-E deployment of less mature technologies
- Compared to short term trading in TGC markets, long-term security provided by FIT-schemes appear to be the key element of success
- Well-designed FIT systems provide for a certain deployment of RES-E in the shortest time and at the lowest costs for society

While choice of main instrument remains to be heavily dependent on the respective national context, Ragwitz (2007) based on COM evaluations provide a list with attributes of the two main instruments, providing further insight into why most MS might have opted for feed-in systems.

[17] Using tradable green certificates (TGC)

[18] See appendix (p. 57) "Summary of RES-E support in MS" for a map displaying the respective choices for the main instrument and "Overview of Selected Incentive Mechanisms" for a more in-depth definition of the main instruments applied

Attributes of the main instruments

	Increase in installed power	Administrative efforts	Economic efficiency	Enhance competition
Feed-in systems	high	low	medium	no
Green certificates	low/medium	medium/high	high	yes

Source: Ragwitz (2007)

2.3.2 Instrument of choice of the COM

The COM, in early stages already, acknowledged the benefits of a harmonised system of Member States efforts in order to "(a) be compatible with the EU treaty rules, (b) provide a considerable level of security (depending on design) and (c) ensure static efficiency, i.e., that electricity is generated and sold at minimum cost" (European Commission, 1999, p. 15). Subsequently, the COM advocated a competitive, quota-based approach (cf. European Commission, 1999).

When regarding the cost-efficiency, not only did the responsible authors refer to social, but also to consumer costs as they believed that an inappropriately high price for consumer might render RES-E too expensive and hence erode public support for the cause (European Parliament and Council, 2001, p. 34). In addition, this way of thinking is quite logical as it is one of the main goals of EU environmental policy to keep energy prices for consumers at a low level (Sáenz de Miera, del Río González, & Vizcaíno, 2008).

It might hence come as a bit of a surprise that the COM didn't suggest a harmonised quota based system. This was mainly due to the fact that by the end of 1990s some Member States, among them big players like Germany, had already introduced FITs. The officials argued, that "although a harmonised European-level support scheme would be beneficial, the experiences of different support schemes were too limited to conclude which model" (Bergek & Jacobsson, 2010, p. 1256).

2.4 Policy mixes

As highlighted by Gunningham et al. (1998) and also picked up by various other theorists (Johnstone, 2002; Sorrell & Sijm, 2003), policy mixes are the preferred option when it comes to environmental regulation. Although that might be the case, especially when one of the two policies seems to fail on a larger scale, it is not that easy to just match fitting policies by their labels.

In their work, Gunningham and colleagues introduce 6 different kinds of regulatory instruments namely (1) command and control regulation; (2) self-regulation; (3) Voluntarism; (4) education and information instruments (with various sub-categories); (5) economic instruments (with various sub-categories); and (6) free market environmentalism[19].

2.4.1 Instrument combinations

Made clear from the very beginning, Gunningham et al. stress the importance of the usage of a combination of instruments and parties in order to compensate for the potential weakness of stand-alone policies. This however does not imply that all instruments work together in the

[19] See appendix (p. 60) "Varieties of regulatory instruments" for an exhaustive list including all the sub-categories

same way or work at all. Some mixes might indeed proof to be counterproductive while others are strongly context-dependent.

In the following I will list inherently complementary combinations, inherently counterproductive instrument combinations, and combinations in which the outcome is context-specific (Gunningham et al., 1998, pp. 14-16).

Inherently complementary combinations

- command and control regulation and voluntarism
- process based command and control regulation and voluntarism

Inherently counterproductive instrument combinations

- command and control regulation and economic instruments

Combinations in which the outcome is context-specific

- voluntarism and self-regulation

Furthermore, following the authors, there is no reason why mixes should not be multipartite (and in reality most are). At this point it is not handy to elaborate on all possible combinations but it is important to know which combinations to avoid and which to embrace under given circumstances[20].

When evaluating policy combinations, one has to be aware of the shere abundance of possible policy mixes and combinations. Heldeweg in his work on hybrid regulation, calculates a total number of a staggering 238.343.500 combinations possible when neglecting the matter of feasibility (Heldeweg, 2014, p. 126). In the following I will elaborate on his thoughts about the importance of good and coherent regulatory design when it comes to the success of a policy.

2.5 Coherent regulation as an important factor

In his introductory remarks Heldeweg refers to the necessity for regulatory instruments to build upon a proper understanding of the respective characteristics and conditions which are essential to a regulatory instrument's success (Heldeweg, 2014, p.105).

He acknowledges an ongoing shift from classic government to governance away from a primacy of government over regulation. When it comes to a definition of regulation as such the work of Black is valued as appropriate. He highlights her definition of regulation as "the sustained and focused attempt to alter the behavior of others according to standards or goals with the intention of producing a broadly identified outcome or outcomes, which may involve mechanisms of standard-setting, information-gathering and behavior modification" (p. 107).

Furthermore, the intent of changing the behavior is stated to be crucial and regulation is is said to be related to behavior prescriptively, descriptively and assertively. This is so as a logical consequence of enforcement (as being an assertive form of behavior modification) building upon monitoring (as a descriptive form of information-gathering), which essentially relies upon standard setting (as a prescriptive form of projecting behavior) (p. 108).

Eventually Heldeweg refrains from using Blacks definition with the intent to limit his scope. Instead he refers to the definition provided by Brownsword and Somsen with regulation being: "any instrument designed to channel behavior, while assuming that this definition particularily regards intentional, focused and sustained standard setting" (p. 113).

In his concluding remarks Heldeweg points out what is of critical importance for this work with again highlighting the significance of a coherent regulatory framework. Today we face a

[20] See appendix (p. 61) "Summary of instrument mixes" for a summary of different instrument mixes

more broadened scheme of regulation than we did decades ago involving a variety of actors. Current circumstances make policy makers face "wicked policy challenges" that call for a proper methodology of (legal) design regarding regulatory instruments in order to being succesful towards ad hoc optimality of regulatory instruments, enhancing both respective effectiveness and legitimacy whilst at the same time minimising normative transaction costs (pp. 136+137).

Having introduced the main concepts and discussions important towards the framework of this paper, I will now continue to introduce you to the conceptualization and operationalization giving insights about how I will pursue my research.

3 Methodology

3.1 Conceptualization

Since various critics have stated that the ETS as an economic instrument is to best function as a standalone instrument and hence being crippled by any additional measure, it is OK for the superficial observer to believe that claim without contesting it and tune in with those economists singing the song of economic freedom and neo-liberalism. So, is it smart to have national support schemes alongside the ETS? If one applies the theoretical frame laid down by Gunningham and Sinclair it shouldn't be considered smart. Although they seem to be advocates of policy mixes wherever possible, in their work they condemn the combination of broad based economic instruments[21] (like the ETS) and supply side incentives[22] (such as the national support schemes).[23]

I consider them to have come to this conclusion on a theoretical basis where there is a perfect market, similar to the economics suggesting that way (unfortunately they do not elaborate further on that assessment in the book). It is valid to make such a claim as the authors do not specifically refer to the instruments in question but do assess on the basis of broader categories.

Considering the research from Sandbag (2012; 2013) on which this paper relies, I feel confident to reject this claim with respect to this matter. Joining in with the authors, I claim that almost all combinations (although possibly having rather positive or negative tendencies of outcome) and the respective success is inherently context dependent. In the conclusion I will come back to the dilemma and assert this claim.

Regarding the background unfurled in the introduction, the ETS-RED combination is expected to be a good one if the national support schemes formalized by the latter work in a successful way, meaning both effective and efficient.

Within the current context of the ETS being a minor contributor to a sustainable development towards improvement in environmental performance within the EU with little prospect to change until 2020, I am of the opinion, that it might very well be a good thing to have the

[21] "Broad based economic instruments comprise measures, such as pollution taxes or tradable emission permits, which apply to industry as a whole, do not distinguish between sectors and/or preferred technical solutions, nor impose performance limits on individual firms. That is, apart from government setting the overall level of the tax or number and value of permits, the market is left to operate freely" (Gunningham et al., 1998, p. 429)

[22] "Supply side incentives comprise subsidies, in the form of, for example, tax concessions or soft loans for environmentally preferred technologies. These are distinguished from broad based instruments in that there is a higher level of government prescription" (Gunningham et al., 1998, p. 429)

[23] Again, for a table displaying a summary of instrument mixes, see Gunningham et al. (Gunningham et al., 1998, pp. 428+429) or the appendix of this paper (p. 61)

national support schemes in place to at least do something in the meantime. Agreeing with Johnstone and Sorrell on this matter, I further highlight the inherent advantage of domestic schemes not having to undergo such incredibly complex and difficult decision-making processes as occurring in EU context. Especially with respect to environmental policy impeded by differing opinions and outside pressure from lobbyist groups and other actors domestic regulators can thus react in a more expedient and coherent manner to changing circumstances, hence not being doomed to ineffectiveness until it is time to shuffle the cards again. "Smart" decisions appear to be made more easily.

Let us remember how Gunningham and Sinclair described smart regulation:

*Foster environmental innovation, regulatory flexibility, and improved environmental performance, but without the use of greater government resources (**that is, "smart" regulation)"** (Gunningham et al., 1998, p.10).*

3.1.1 Four-cases scenario

In order to being able to assess the smartness of an ETS-RED policy mix, I refer to the 4 case scenario used by Gawel et al. (2013b). They distinguish between objectives of regulation and ETS design and come up with four different cases:

Case scenario by Gawel et al.

		Objectives of regulation	
		Single objective: Climate protection	Multiple objectives / externalities
ETS design	corresponds to the textbook model	Case A (Chapter 2)	Case C (Chapter 4.1)
	results from a political bargaining game	Case B (Chapter 3)	Case D (Chapter 4.2)

Source: Gawel et al. (2013b, p. 13)

In my opinion, Case D describes the real world situation as it neither assumes an ideal policy design nor just takes into consideration one policy goal. Here, the ETS needs to be continuously negotiated and multiple objectives are to be attained (as opposed to just a single objective as claimed by a lot of critics (as mentioned earlier)) making a strong case for RES-support as RES policies may help to reduce the political costs of implementing emissions reductions[24]. Furthermore, RES-support may indeed improve the overall efficiency of climate and energy policy as it helps to internalize other externalities than climate change if corresponding first-choice policies are not enforceable (such as under the current situation where the objectives of the ETS are effectively not enforceable due to a faulty ETS-framework resulting in a certificate-price too low to have an effect).

These effects of additional RES-E support policies should also be considered when evaluating the approach to this work as they present additional proof for efficient and effective second-best policy measures to be valuable, even so the first-best policy measure might not be without effect after all.

[24] By lowering the allowance price and abatement costs, RES-support enables negotiations about a tighter emission cap

From that assumption I derive the claim, that in Case D (hereafter referred to as real-world-case=RWC), there should not be any question on whether or not a policy mix makes sense under current circumstances, also picking up on the early remarks towards this concept made e.g. by Johnstone (2002) as well as Sorrel and Sijm (2003). If the different national support schemes as described in Article 2 (k) (p. 27) RED work in a successful manner, there is but one answer: *Yes, embrace a policy mix!*

Generally, assuming the RWC reflects reality where the ETS needs to be continuously negotiated and there are multiple objectives to be achieved, successful additional RES-E policies are a recommendable option, whether or not the ETS functions properly or not.

Thus, the question that will dominate my research and subsequently enables me to answer the main research question is:

"Are the national support schemes working successfully?"

Since I am aware of the fact that this question alone isn't sufficient, there is quite some conceptualization that comes with it. In the following I will provide you with information on the selection of the indicators I intend on using.

3.1.2 Evaluation criteria and regulation

3.1.2.1 Evaluation criteria

Generally, one is best advised to apply a multi-criteria framework when trying to evaluate policy performance. That is based on the premise that one needs various criteria in order to be able to assess and evaluate policy. As evaluation as such is by its very nature a normative undertaking one needs to utilize specific criteria to base one's judgments upon. Simultaneously it is crucial to bear in mind the negative effects that might arise from permutations, hence one ought to limit the criteria accordingly.

As the theoretical discussion above indicated, effectiveness and efficiency play a crucial part when it comes to evaluating success of a given policy that in turn directly relates to the smartness of a policy.

For the sake of clarity and given the limited scope of the bachelor assignment, I opted to go with a two-criterion framework when trying to evaluate the success of national support schemes. Here, I closely stick to the four significant indicators stressed by Gunningham et al.[25] whilst boiling it down to two.

3.1.3 Main indicators

I choose to use *effectiveness* and *efficiency* as being the main indicators to operationalize for my research leaving out a) equity and b) political acceptability. Beside the reason named above I do so, because I merge equity with efficiency in a way explained in more detail in the operationalization section of efficiency. Furthermore, I cancel out political acceptability as I find it quite apparent that any action towards mitigation of climate change is to be highly accepted by the "general will". The only possible and justified reason for opposing measures would be if measures taken seriously conflict with the general interest of the people (e.g. when conducted in a very in-efficient and/or discriminatory manner). This phenomenon in turn, if observed, would be stressed already when investigating indicator two, efficiency of the national support schemes.

As the two main principles named above are too abstract and multidimensional, further conceptualization needs to be done. Hence I checked the data available and found the

[25] let's remember these: effectiveness, efficiency, equity, and political acceptability

following specialisation of the two appropriate. To actually make them measurable, I will apply the following. First, I will observe if the MS actually adhere to the trajectory targets they agreed to. This is affiliated with effectiveness checking if the schemes contribute to improving the environment. Assuming, that the (trajectory) targets for the MS' were developed with keeping in mind the various different circumstances (be they of economical, geographical, or environmental nature), an adherence to these pretty much resembles effectiveness as defined by Gunningham et al.. Furthermore, to follow the authors in their coherent approach, I will observe to what extent MS are holding up to their commitments made with respect to administrational reform and provision of secure support regarding RES-E support systems, conceptualizing efficiency to fitting my approach. As it is extremely difficult to actually measure efficiency, I again opted to go with an existing data-set. The ECOFYS consortium asked three different qualitative questions that enable an evaluation of efficiency.

Referring to Heldeweg and his point on regulation I further stress the importance for my work. He states that it is an inherent tenet of regulation to be seeking to change the behavior of those subject to it. This is the main intention. Combining with Gunningham et al., when evaluating policy and its success, one needs to focus on the perspective of the law-maker and the respective intent.

The intent of the legislator, the COM, is manifested in the RED. This too is a reason for me opting for the particular way of further conceptualizing effectiveness and efficiency. The adherence to agreed upon goals neatly stresses the importance of the intent of the legislator as introduced by Gunningham et al. and further highlighted by Heldeweg. MS' intention to adhere to those goals in turn cannot only be measured ex-post but also ex-ante e.g. with studying predictions provided by analysts from different fields and evaluating assessment made about the adherence to national renewable energy action plans (NREAPs). To do so may also deliver a more comprehensive understanding of the ongoing processes with diving a little deeper into the problematic. This is why both indicators will be accompanied not only by an assessment of the status quo but also with a brief section about the prospects involving qualitative analysis.
In the following, I will outline how I plan on conducting my research with explaining the data collection methods and operationalization of the two indicators.

3.2 Case selection and sampling

The population for the analyses is the 27 MS. As the EU-wide performance of the MS with respect to effectiveness and efficiency of the national support schemes is important and the data available allows for the whole population being studied. Only Croatia had to be left out as the MS just recently joined the EU and did hence not provide any relevant information so far. I opted for this comprehensive approach, as a smaller sample would not reflect the real world situation and would hence undermine representativeness. A future study would for this sake also include Croatia.

Furthermore, given the limited scope of a bachelor assignment, I limit the extent to only include national support schemes fostering RES-E, leaving out the sectors of heating and cooling and transportation. This is viable as RES-E constitutes the major accordance with ETS obligations and is prominently sponsored, using the main instruments questioned for their effectiveness and efficiency, FIT- and quota-systems.

When coming to the analysis of efficiency, a case selection is made in the qualitative assessment section aiming for providing an impression about possible future developments and a more detailed insight into current events in the country with regard to the national

support schemes. Here, Germany and Sweden are selected because both use different main instruments and are known for their rather good performance and leading position in overall RES-E performance. Problems encountered during in-depth qualitative research concerning these two are likely to occur in MS with similar systems hence enabling some sort of generalizability[26]. Furthermore, as both are representing different choices in main instruments this selection helps answering the question about whether or not the choice of instrument (predominant usage of FITs and TGCs in the population) affects the overall success and thus the linked smartness of the policy.

3.3 Data collection

For this paper, I rely solely on secondary data provided by national governments in their NREAPs and in the first bi-annual progress report that all MS were obliged by Art. 22 (1) of the RED to hand in by 31st of December 2011. As most MS did fail to meet this deadline in 2011 (last report was handed in in June 2012) it is apparent that I cannot already draw on current data from the 2013 reports as again only a small margin of progress reports were submitted so far, which substantially complicates an up to date assessment.

Anyhow, for the collection of quantitative data with respect to MS emission-levels important for the evaluation of the effectiveness of respective national support schemes, the use of the NREAPs submitted to and made public by the COM are of great help as well as the MS' progress reports. The national targets for share of energy from renewable sources in gross final consumption of energy are derived from the RED Annex I. The progress reports are then used to evaluate compliance with planned trajectories and measures envisaged.

However, as these reports have been found to be of a rather varying nature with respect to completeness and quality, I made use of reports provided by a consortium headed by ECOFYS (2013), the COM that itself drew on the findings of the former report (European Commission, 2013b), and the accompanying staff working document (European Commission, 2013a) that already included data check procedures in order to fix possible miscalculation and misreporting, assigning a great deal of reliability and validity to the data provided.

Furthermore, EUROSTAT provides information about RES-E total shares and shares by sector, which is partly used to create the tables that come along with the effectiveness observation in this paper.

To come up with an outlook on the future, I rely on the qualitative evaluation of the aforementioned reports as well as newspaper and scientific journal articles.

Again, to assess the efficiency, I will use the data generated by ECOFYS in the 2013 report (ECOFYS, 2013). When it comes to the qualitative section on recent and possible future developments I rely on the existing evaluations provided for by the reports mentioned already as well as MS fact sheets, scientific contributions, and newspaper articles that deal with either Sweden or Germany and their support schemes.

3.4 Operationalization of indicators

To make the best out of the data available, I chose to apply a mix of quantitative and qualitative research, respectively applied to one of the two indicators to be operationalized.

3.4.1 Effectiveness

[26] Since the scope is necessarily limited, I want to opt for the two countries that are known for their good performance. Problems encountered here are likely to be valid also for other MS using similar national support schemes and hence enabling generalizability.

Effectiveness is operationalized with respect to the schemes contributing to improving the environment. This is in line with the general framework of Gunningham et al. who define effectiveness as *"contributing to improving the environment"* (Gunningham & Sinclair, 1998, p. 26).

Again, in order to make that measurable I will have to apply a more narrow scope, limiting myself to the states performance with respect to being on course with the respective MS' planned targets[27]. Under the assumption that the national support schemes as defined in Article 2 (k) RED are *the* driver for renewables under current circumstances the adherence to agreed upon objectives constitutes a highly significant aspect of effectiveness that is measurable with the data available.

The conclusion will be straightforward with providing definite answers to the question of effectiveness as there is just two answers possible with regard to each MS' performance - in line with the legally binding targets, or not. Here, one however has to set clear decision rules.

I opted for general assessment criteria labelling the national support schemes as being effective in case the EU average progress meets the average trajectory target. That appears to be the only feasible option, as any other assessment framework necessarily involves a more in-depth country by country evaluation and would exceed the scope and the coverage of this paper. Moreover, this operationalization seems appropriate with solidarity being one of the EU's main characteristics. The big, successful MS's with well-established institutions and sufficient means at hand have responsibility to be the forerunners when it comes to policy implementation, enabling the weaker, sometimes younger democracies to flourish with them and learn from the big neighbours and respective best practices. That is the spirit of an ever-closer Union.

Nevertheless, observations about differing performances per MS will be indicated and analysed as well to put the overall impression into perspective.

As indicated already, it is however also necessary to take into account outlooks with regard to future development as this may under given circumstances also have a decisive influence on the assessment.

For this reason and since latest numerical data available as of today stems from 2010 and there is possibly more to the effectiveness than reaching the target, the section will be completed by an introduction of an outlook for the future effectiveness, relying on assessments made in the very documents introduced above. The latter will then provide for a smooth transition to the assessment of efficiency, which will be of a rather qualitative nature.

Possible positive or negative impressions derived from this section will however not influence the initial assessment, as it is the point of my approach to provide a simplified evaluation of the success of national support schemes.

3.4.2 Efficiency

When paying attention to this indicator, improving the environment at minimum cost including administrative simplicity will constitute the general definition derived from Gunningham et al.. In 2011 already, the COM identified sub-optimal administration

[27] Find the formula for the respective planned targets as laid down in annex 1 B of the RED in the appendix (pp. 62 + 63) of this paper in the section "Indicative trajectory" (reads combined with the section "National overall targets")

procedures as the main challenge[28]. Herein, especially authorization and administrative procedures were deemed largely inefficient. The RED was supposed to tackle that challenge through introduction of Art. 13, setting obligatory targets for improvement and pushing the national systems towards optimal efficiency given the respective circumstances.

There is a lot of headroom for improvement with respect to streamlining authorisation and planning procedures, remove non-cost barriers to renewable energy growth and after all, in simply making the national planning regimes faster and more transparent. This is to be done whilst respecting existing environmental legislation.

In the ECOFYS report (ECOFYS, 2013), three questions were asked enabling a qualitative assessment of efficiency:

Q1. Has the MS fulfilled its NREAP commitments to RES-E policies and measures?

Q2. Are the support levels adequate for each technology?

Q3. Is the long-term security of the support measure ensured?

These questions deal with different aspects of efficiency, fitting my approach to the concept. As the COM scrutinized the NREAPs to make sure that necessary administrative reforms were included in the MS' planning to address the challenges indicated above, Q1 is of crucial importance for this work. Furthermore, efficiency is undermined, if there is only inadequate or short-term support for renewable energy projects, creating an investment environment of uncertainty and caution. Q2 and 3 deal with issues regarding these aspects that potentially subvert an efficient working of respective national support schemes (ECOFYS, 2013).

In more detail:
Q1assesses the administrational progress made by MS towards commitments made in the respective NREAP and delivers a "yes", "no", or "partially". The assessment made here is highly valuable for my work, as it primarily deals with the status quo and progress made on the challenges mentioned earlier. It also reflects the MS' intention to commit to the changes set out in cooperation with the COM which is of high importance given the prominent status of coherent regulation highlighted by Heldeweg and deemed crucial for this paper.

Q2 deals with (cost-)efficiency of national support schemes. When respective levels of support are significantly higher than generation costs, (cost-)efficiency is labelled "poor". If the opposite is the case, the adequacy of support is labelled "good", and if there is only minor inequity in the system, the label is "fair". As promised earlier, this question also touches the equity criteria, although only for the business side (producers), leaving out implications of inequities that might occur due to negligence of the polluter pays principle with an unfair bias towards private end-consumers.

Q3 deals with long-term security provided by the respective system important for creating a sense of security for potential investors. Without the private sector investing in renewables, a system cannot function efficiently due to necessary government-budget constraints. A longer support period offers higher security. Additionally, support levels should be predictable over the whole support period. Both dimensions are highly relevant to investors (ECOFYS, 2013). Again, the assessment scheme of Q2 is applied using the same labelling.

I will use these questions and the available qualitative assessment to provide a yes-no answer on efficiency with transferring the 3 respective categories used in Q1-Q3 to a numerical scale (-1;0;1).

[28] Together with different national support schemes and the slow progress in electricity grid expansion

Transfer description:

Qualitative assessment	Numerical assignment
no/poor	-1
partially/fair	0
yes/good	1

I will rescale the numerical assignment for Q1 (multiplying it with 2) because this question deals with fulfilment of NREAP policy commitments and thus reflects MS' efforts to change existing structures to more transparent and faster ones, addressing entrapment in national schemes. Using my theoretical framework based on Gunningham's remarks also taking into account Heldeweg's remarks, these administrational changes are very important for evaluation of efficiency in this context.

For final assessment of success or not, the total score of all 27 MS with all 3 questions is consulted. This can either be negative, zero, or positive. In the latter case, the effectiveness of support schemes is considered a success, hence positively contributing to the preliminary assessment of smartness.

While that assessment will eventually contribute to the overall preliminary assessment in combination with the results of the effectiveness indicator, a short discussion about possible differences in scores throughout the different MS and questions will be required.

This section is then followed by a two-case-study including Sweden and Germany.

A brief qualitative case study will provide insights into current developments. Moreover, a more in-depth view on the issues at hand will provide additional criteria helping to put the final assessment into perspective and will be accompanied not only by the data derived from the 3Qs but also by some remarks on the situation extracted from country analyses provided by the experts from RE-SHAPE and the COM as well as information derived from newspaper articles and scientific contributions. True intentions towards complying with the goals set out can best be attained through qualitative analysis of this kind.

Other than that, this pursuit will further enable me to elaborate on the last research question about how the choice of instrument affects the success of the support scheme.

3.5 Combined observation and analysis

In order to make a statement about the success and of national support schemes and related smartness of the combination with the ETS, one needs to plot the two indicators together. This is done to provide the final assessment of the success of the national support schemes enabling an answer to the main research question and to see if it is possible to make any inferences from performance to choice of main-instrument. For the sake of clear overview, the data will be plotted in a dotplot. If the majority of the MS lie within the upper right corner of the 4-cornered dotplot, they can be considered successful and hence the main research question could be answered positively.3.6 Research implications

The operationalization put forward should enable me to provide a straightforward assessment of the success of the national support schemes in place in the EU 27 and the smartness of a combination with the ETS, without engaging in an inherently philosophical debate about smartness as such. For the sake of practicality the approach needed to be fairly simplified.

I am aware of the fact that a simplified approach like this bears substantial risks, with relating the progress made towards the agreed upon goals solely to the instruments applied in accordance with the RED. Furthermore, the choice of a cross-sectional design contains additional risk as one cannot check e.g. for time order. Moreover, with opting for this kind of research design, I have to accept the fact that I take my chances with the problem of differentiating cause and effect from simple association.

With the scope limited to the RES-E sector, the assumption that the ETS doesn't contribute at all or marginally at best and other EU policies as e.g. the EED not accounted for, I am aware of the fact that this operationalization could be perceived as being quite controversial and superficial. This is especially so, as I highlighted before that climate policy is inherently complex and that there is a variety of factors to be considered. Also, besides those remedied by the choice for the indicators and respective conceptualization, there might be other external factors like e.g. economic circumstances or one-time events that have an influence on the data used.

Moreover, besides the introduction of the simplistic framework towards evaluating smartness, the study isn't likely to produce any substantially new findings. That is assumed to be so as I only relate to secondary data and frequently refer to reports on issues made already. The limited scope also implies the limited capability to dive deeper into the "why?" behind the quantitative findings.

Nevertheless, along with the qualitative assessments that are conducted in this paper, I am confident that my approach will contribute to the discussion about effectiveness and efficiency and the related smartness of national support schemes. It can be a valuable contribution to a simple understanding of the necessity to act as matters are pressing and re-highlight deficiencies of the current system, as explorative research is supposed to.

4 Observations

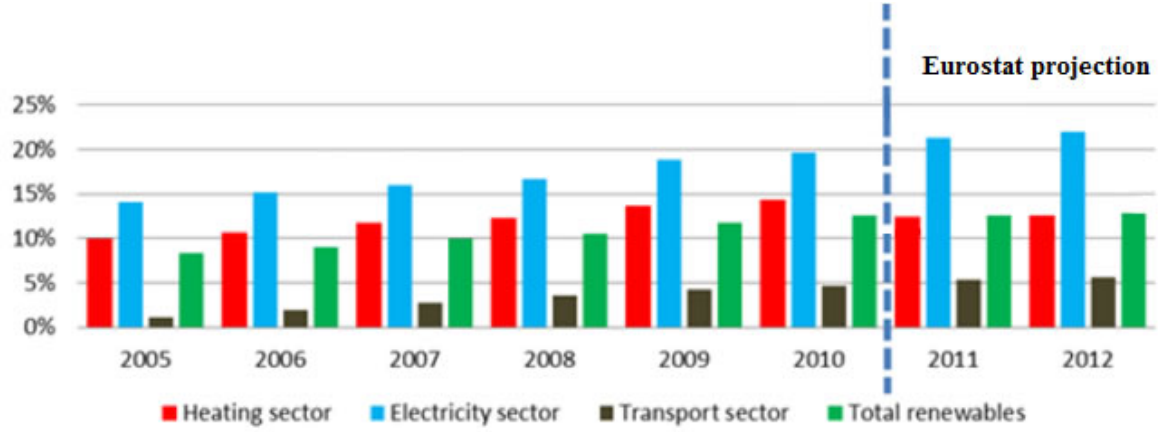
4.1 Effectiveness

4.1.2 Observation

As already mentioned in the introduction, the RED (European Commission, 2009) sets out a European framework for supporting the generation of electricity from renewable sources together with fixed national targets to at least reach an overall EU-wide share of 20% renewables from overall energy consumption. This is in line with the main goals of the Europe 2020 Strategy for growth, contributing to innovative solutions in industry and leading to Europe being the frontrunner in technology on the matter. It also, and predominantly, has a positive impact on emission reduction, improves energy security, and decreases European dependency on energy imports (European Commission, 2013b, p. 2)

In 2010, the share of renewables of overall EU-wide consumption in the power sector exceeded the set goal.

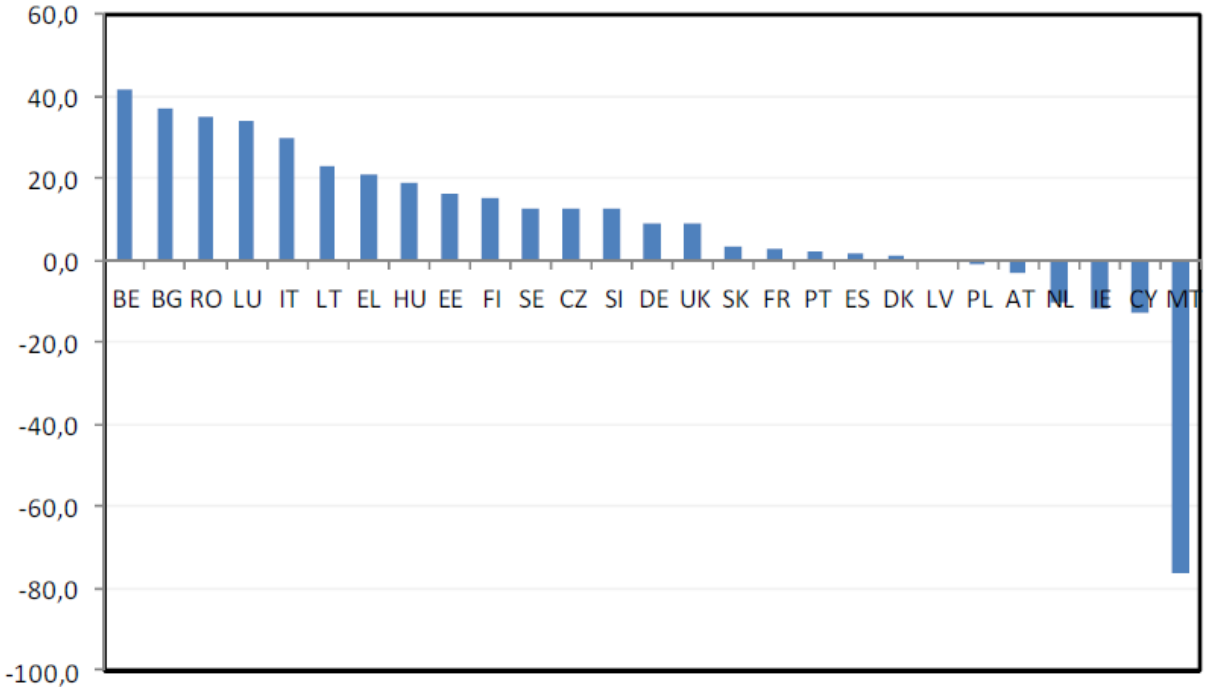
Sectoral and overall growth of renewable energy in the EU (Eurostat)



Source: European Commission (2013b, p. 4)

When looking at the development since 2005 and the Eurostat projection for 2011 and 2012, one observes a significant achievement when it comes to the overall share of renewables in the electricity sector (EU-wide) exceeding the planned targets while achievements of the MS in the heating and cooling sector remain less convincing and data of the transport sector displaying a continuous failure of the MSs to comply with the set targets.
This already provides enough information to render the support schemes effective, applying the assessment criteria set out in the operationalization. For the sake of completeness, a more differentiated view will nevertheless be provided in the following paragraphs.
Looking at the overall deviations from planned renewables shares in 2010 one gets the following picture:

Deviation of actual 2010 RES shares (EUROSTAT) from NREAP 2010 target (by %)



Source: ECOFYS (2013, p.19)

While 8 MS deviate from the planned shares, 4 do so just slightly (Latvia, France, Poland, and Austria), 3 on a recognizable level (the Netherlands, Ireland, and Cyprus), and Malta deviates massively.

While the heating and cooling and transport sector are of no concern for this work, it is valuable to take a closer look at the electricity sector and individual achievements of MS in order to being better able to perform an educated assessment with respect to effectiveness.

The table below shows the respective RES-E shares together with the NREAP targets for 2009 and 2010.

Deviation of actual 2010 RES-E shares (EUROSTAT) from 2010 target share (NREAP) (by %)

Source: ECOFYS (2013, p.22)

The data displayed shows that in 2010, with Belgium, Bulgaria, the Czech Republic, Germany, Estonia, Spain, Italy, Hungary, the Netherlands, Romania, Finland, and Sweden, 12 out of the 27 MS were in line with respect to reaching the planned targets.

In relative numbers 44,44% of MS comply with the planned targets while 55,55% fail to do so. When taking admission-date into account and differentiating between EU 15 and EU 27-EU 15, the established MS outperform the "younger" ones by a margin (5% (46,66% to 41,66%)). Bulgaria and Romania, the MS that joined the latest reach their targets. However, when missing the target, MS, with Malta being an exception, only deviate at a reasonable level.

Generally, when comparing 2010 data to 2009, a positive trend can be observed with only 4 countries (namely Austria, Slovakia, Slovenia, and Sweden) showing a decrease in RES-E share.

While the snapshot view provided by the added shares of renewables suggests that the MS' respective support schemes work effectively with an over-accomplishment with respect to the 2010 goals, the deviation chart already paints a different picture. Anyhow, when then looking closer at the progress in the electricity sector, the initial impression loses weight. However, applying the assessment criteria set out in the operationalization, the answer to whether or not the support schemes are effective is yes!

4.1.3 Differentiated picture and outlook

A differentiated view on the matter however dims the clear assessment with only 44,44% of the MSs having performed according to the planned goals. Even applying the EU-15 filter doesn't quite change the situation (only polishing the result by a margin). Astonishingly, only 7 out of the 12 target-reaching MSs are EU 15 countries. However, due to the reasonably low levels of negative deviation and the overall surplus target achievement one can still argue that the MS are on course regarding the global target.

To put the whole issue into perspective, an outlook provides useful information. With regard to the future goal-achievements, the COM expects general fulfilment until 2012 with a subsequent decrease in growth of renewable technology deployment, leading to an eventual failure to comply with the 20% goal in 2020 (European Commission, 2013a, p. 7).

While this perspective would under a different evaluation framework lead to an evaluation of national support schemes as *not sufficient with respect to effectiveness*, the progress report by the COM highlights some issues of why the progress might be stagnating or even declining.

Qualitative assessment leads to the impression, that there are major issues with the national action plans departing from the agreed upon framework. Central distortions for the growth of renewables remain to be tackled slower than expected, increasing the legal risks of (potential) investors. Although the snapshot perspective looks well, because of remaining administrative as well as infrastructural obstacles, a generally conservative growth-pattern, and breaches with the pursued domestic policies alongside with incoherent subsidization, the COM has reason to believe, that investments may decrease in the future or be substantially delayed. This is when MS don't take further measures to adhere to the rules of the game[29].

Why is that so? What exactly goes on in the MS? After introducing the efficiency observations and the respective assessment of EU-wide progress on the matter an analysis of the application of national support schemes in Germany and Sweden aims at providing insight into national issues with respect to MS' progress and discussions on the matter.

4.2 Efficiency

After having transferred the qualitative assessment made by the consortium led by ECOFYS (2013) into numerical data, the rescaling provides us with the forthright answer to the question of support schemes being efficient. Yes![30]

The total score is 4, indicating an overall positive tendency when it comes to efficiency according to the indicators represented by the three questions.

While that alone is not sufficient according to the assessment criterion for success, also the total share of positive scores represents a majority with 14 positive scores resembling 51,9% of the MS population, rendering the efficiency criterion fulfilled.

When looking at the table displaying the results for the total score and the respective categories (Q1-Q3) shaded with green, yellow, and red for positive, equal to zero, and negative respectively a differentiated picture appears. Except for Q1, where green dominates 44,5 % of the columns, a rather yellowish impression remains with a 70,2 % share with Q2 and a 63% share with Q3. In those columns (Q2+Q3), the green fields are outnumbered not only by the yellow, but also by the red ones (6 to 2 (Q2) and 8 to 2 (Q3)). This observation points towards Q1 having significant influence on the positive total score, which isn't

[29] Although MS had seven years' worth of time to reach the first 20% percent of their goal, the subsequent steps are shorter and steeper. 2 years for the next 10% until 2014, 15% until 2016, 20 until 2018 and finally 35% until 2020 (European Commission, 2013b, p. 21).

[30] See appendix (p. 64) "Rescaled (Q1*2)" for the full table

surprising considering the rescaling that was conducted. The considerable large positive score in Q1 (14) outweighs the two negative columns (-4 (Q2) and -6 (Q3)). When looking at the equal-scaled table then, a different picture shows. With Q1 only providing a positive total of 7, the overall total score is a dashy red -3.

4.2.1 Renewable energy support schemes - FIT vs. TGC

To shed some light on the two main instruments and their application in practice, Germany (FIT) and Sweden (TGC) will be canvassed. Starting with a brief introduction of the system in place, the countries status quo with respect to efficiency regarding the 3 questions will be examined afterwards. The section will be concluded by an assessment of the current situation and the attempt to provide an outlook through using scientific journal articles and newspaper articles.

4.2.2 Case study – Germany and Sweden

4.2.2.1 Germany

Germany's main support instrument for RES-E of choice is a feed-in tariff scheme. This is scripted in the Renewable Sources Act (Erneuerbare-Energien-Gesetz (EEG)) which superseded the "Stromeinsparungsgesetzt" from 1991 in 2000. Today, the scheme provides a guarantee for fixed FITs. Tariffs as such are then differentiated by technology and size of the installation. Herein, all relevant technologies are eligible to this scheme[31] and are subject to annual degression for new installations. As the scheme is financed by allocation to the final customer, there is no cap on the support as would be likely to be so when financed by means of government budget. In addition to the FIT-system additional fiscal measures are in place to support RES-E installations. These may be combined with the tariff (ECOFYS, 2011, p. 110).

4.2.2.1.1 Efficiency assessment

4.2.2.1.1.1 NREAP policy commitments

Germany can be considered the exemplary student with scoring highest (4) under the rescaled efficiency criteria observed earlier. It is also the only country that scored positive on all three questions. This is due to various reasons. The most stunning accomplishment was made when the chancellor announced to permanently shut down 8 of the countries reactors in August 2011. While that quick decision is arguably owed to a great extent to the disaster in Fukushima, the "Energiewende" foresees a gradual shut-down of all remaining reactors until 2022 with most of the lost capacity to be replaced by RES-E plants (ECOFYS, 2013, p. 113).

Furthermore, the country performed well in adopting new RES-E measures between the submission of the NREAP and the submission of the first bi-annual progress report even exceeding the targets for implementation of new and revision of existing measures as set out by the former. Besides others, Germany improved its existing feed-in system with introducing feed-in premiums that aim at making the market more competitive and underlining the current trend towards market premiums (ECOFYS, 2011, p. 109).

Apart from performing well, there is the need to accelerate grid expansion.

4.2.2.1.1.2 Adequacy of support levels

While through the FIT based system support levels for electricity from renewables is considered good and sufficient for all technologies, biomass and biogas plants seem to be advantaged by the system.

[31] Except for the co-firing in conventional power plants

4.2.2.1.1.3 Long-term security

As tariffs are paid over a period of 20 years, the long-term security can be considered good. However, the system might be possibly endangered by increasing costs and a growing support for substantial change towards a more balanced distribution of costs, relieving the private consumers (ECOFYS, 2013, p. 113; Reuters, 2012).

4.2.2.2 Discussion

When diving deeper into the country and the approach towards renewable energy, the picture of the exemplary students gets little cracks. While the EEG proved to be very efficient with respect to expansion of the renewables, there is a tense discussion going on concerning the economic and ecological efficiency as well as the exemption clauses freeing some industries from the obligation to pay the tariff.

Private consumers increasingly rebel against ever-rising electricity prices (Reuters, 2012). The outcry for reform was reinforced, when just recently, EON and RWE, two major energy corporations announced that they would have to let go 6750 employees (4750 of which in Germany) if the "Energiewende" would proceed as planned. This was perceived by many as an attempt to hold the government hostage (Hoffmann, 2013).

Eroding public support caused by high electricity prices and negative perceptions that follow the bad press covering the possible mass-layoffs triggers action within the government. After the recent inauguration of the new grand coalition between social (SPD) and Christian (CDU) democrats, the new incumbent of the ministry for economics and energy, Sigmar Gabriel, who is also the vice chancellor, in his benchmark paper released in January, announced to cut down support for renewable energy providers from 17 to 12 cents per kwh as of 2015 onwards. With respect to energy prices he stated that "this dramatic increase has to be stopped after all" but at the same time didn't promise any benefits for the private customers saying that "no promises can be made" (Tagesschau.de, 2014).

Greenpeace already labels his plans as "thwarting the Energiewende" (dpa Insight, 2014).

In the public, discontent is growing over the many exemptions for industries which further contribute to a high energy price (Reuters, 2012). The Association for Renewable Energies (Bundesverband Erneuerbare Energie e.V. = BEE) published numbers that show the massive difference these make. Without exemption clauses, the costs would be 2,54 cents instead of 6,24 cents per kWh. Furthermore, the BEE claims that the low energy price that is a further driver of high tariff costs is promoted by massive competition distortions in favour of nuclear and coal-fired power plants (Kluge, 2013).

Others ask the question about remaining subsidies for coal-fired power plants. Here, the new government in the coalition agreement announced a continued existence until fully replaced with renewables (CDU/CSU SPD, 2013). When asked, Gabriel puts the blame on non-functioning ETS that according to his opinion, experienced a "complete break-down" (Tagesschau.de, 2014).

While the COM considers to take legal action against Germany because of the exemption clause, German government remains firm on its' position, claiming that it is necessary for some industries to be exempted but promises to revise the scheme to get rid of possible freeloaders generating excessive profits (EurActiv, 2013).

Furthermore, specialists acknowledge the inherent need for grid expansion already mentioned in the RE-SHAPE report and see the privatized grid infrastructure as a major problem for expansion of renewables in the future (C. Morris, 2013).

4.2.2.2 Sweden

The Kingdom of Sweden promotes renewable energy through various incentives, the most important of them being the quota system, which is based on a certificate trading system (Pobłocka, 2013). Norway and Sweden have agreed to pursue a joint green electricity certificate market as of January 2012. All RES-E technologies are eligible to a quota obligation with TGCs. The system came into effect in 2003 already and is valid until 2035.

Under the system established by the Act on Electricity Certificates, companies supplying electricity to the consumers and have to have a particular amount of RES-E to satisfy an annual specific quota. Market forces - supply and demand, determine the price of the certificate. The latter are supplied by RES and peat electricity producers who participate in the system and get a specific amount of certificates which are then to be sold at the certificate market where the formerly mentioned consumers will buy them to avoid being penalized for non-compliance with the quota obligation.

Furthermore, tax regulation mechanisms and a subsidy scheme have been introduced. E.g. biomass and peat used for electricity production are tax-free and electricity is not taxable if it is produced in at wind farms or in a power plan with a capacity lower than 100kW.

4.2.2.2.1 Efficiency assessment

4.2.2.2.1.1 NREAP policy commitments

Sweden satisfied the NREAP commitments with adopting new and revising existing RES-E measures. Most importantly they strengthened their primary instrument, the quota system, with raising quota levels and creating a common certificate market with Norway.

4.2.2.2.1.2 Adequacy of support levels

The adequacy of support levels is labelled fair as Sweden applies a technology-neutral scheme with TGC as its main support scheme. Additionally, investment incentives for solar photovoltaic's (PV) are available. While funding for onshore windfarms and solid and liquid biomass is sufficient, funding for biogas could be improved and support for solar PV and offshore windfarms is insufficient. This imbalance creates an inefficient market giving biased support for more mature technologies.

4.2.2.2.1.3 Long-term security

RES power plants do receive certificates for 15 years under the TGC scheme. Also with long-term security, the problem lies with solar PV and biogas, as for those installations only short-term arrangements exist. Although revision is planned, no substantial reforms have been conducted so far.

4.2.2.2.2 Discussion

Sweden is the prime example when it comes to cooperation with it having introduced the certificate scheme, which Norway joined in 2012. As it is a common scheme between Sweden and Norway, any certificates issued in Sweden may be surrendered in Norway and vice versa. This mechanism ensures that the renewable energy installations will be deployed where it is most cost efficient to do so, independent of whether the location is in Norway or Sweden. In 2011, Sweden issued 19.8 million certificates to renewable energy electricity producers. As the average spot price of green certificates was EUR 20.7 per MWh the ex-ante value of support to renewable energy in 2011 amounts to EUR 410 million (IEA, 2013).

While the COM with their approach towards enhanced integration is to embrace international cooperation of such kind, leading scholars criticize the system as being characterised by generating excessive profits for RES-E producers. This is said to be so both due to

incorporating existing, fully operational plans in the system when it was established and plants that already received substantial demonstration subsidies. Conservative estimates suggest that up to half of the payment to power producers will be excess profits to biomass combustion plants and land-based wind power (Jacobsson et al., 2009).

While being the leading MS with respect to renewables share in total energy consumption, it can be doubted the effectiveness of the scheme with generating huge excess profits.

At the moment, Swedish Prime Minister Reinfeldt is accused of not taking the challenges that come along with the climate change serious enough. Åsa Romson of the Green Party stated "It's the climate and environmental devastation. Clearly it's not something that keeps Reinfeldt awake at night" (The Local, 2014). This statement was done in the context of recent figures showing that state-owned energy giant Vattenfall recently increased use of coal despite promising otherwise earlier when meeting with U.S. president Obama (The Local, 2014). Romson, prior to a bilateral meeting of Obama and Reinfeldt claimed that: " […] Swedish climate policies have thus far been inadequate, both to achieve necessary reductions of our own emissions and to break the deadlock in the international arena" (The Local, 2013). This statement comes as a bit of surprise as Sweden was just recently awarded the title "most sustainable country in the world" by Swiss investment group RobecoSAM. Amongst others, Sweden's environmental strengths including the use of renewable energy sources and low CO2 emissions were praised in the report (ROBECOSAM, 2013).
Meanwhile, Swedish energy policy is further criticized from the inside. "It is about a lot of money. The differences also show that we have no coherent energy policy," says Joacim Olsson, Deputy Director at the Swedish Homeowners Association, to news agency TT. He refers to the discussion about the prices for electricity varying considerably between different areas in Sweden. E.g. homeowners with electric heating in Torsås in south-east Sweden supposedly have the highest electricity bills, while consumers living in central Sweden face the lowest prices[32]. This is mainly due to an electricity tax added to the price and varying based on where you live in Sweden. Additional confusion is said to also be caused by the supplement charge of "electricity certificates", which are used to subsidize renewable energy (Jonasson, 2012).
In contrast to the eventually straightforward exit from nuclear power that the Germans pursue, the Swedish parliament, in 2010, voted in favour of allowing new nuclear reactors to be built. This decision added further oil to the fire of proponents of the opinion, that Sweden has an incoherent energy policy (Stockholm News, 2012).

The discussions at hand show that there is no such thing as a perfect role model. Both the German and the Swedish case show internal unrest. While it was not expected to find one perfect role model, from the case studies conducted, it is also not possible to decide on one model to be better than the other either. Besides the relative sketchy nature of this case study, this is certainly owed to a great deal to the fact, that the choice of instrument is in any case strongly context dependant.

4.3 Preliminary conclusion on success

Having fulfilled both criteria set out, the national support schemes can be labelled successful considering the observations conducted separately. Given the straightforward assessment scope, this is not altered by the nuanced picture that shows both with effectiveness and

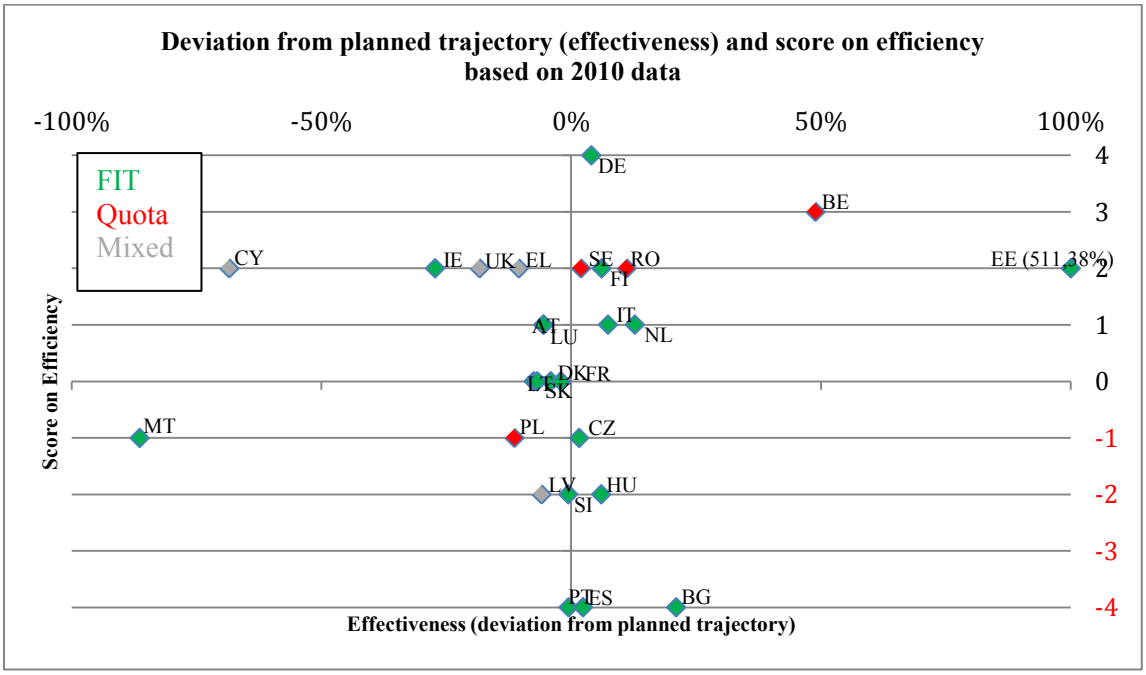
[32] The difference is said to be just over 8000 Swedish Crowns (about 900 Euro)

efficiency[33]. The following section will provide a more comprehensive look upon the link between the two indicators and possible influence of the MS' choice of instrument.

5 Combined observation and analysis

Considering the theoretical framework along with the conceptualisation applied and the subsequent observations made, the combination of national support schemes with the ETS regardless of the respective choice of instrument can be considered a smart one. This is if one takes the evaluations of the observations of the two indicators separately and then combines the two independent findings.

In order to make a statement about the success and related smartness of the ETS-RED combination however, one needs to plot the two indicators together. For this purpose and to see if it is possible to make any inferences from performance to choice of main-instrument, the data is plotted in a dotplot. The dotplot derived from the summarized data of the two indicators[34] displays the following[35]:



It is obvious here, that the observations made earlier, including the respective assessment, loose validity when only 8 countries in total are located in the upper right corner (Germany, Belgium, Sweden, Romania, Finland, Italy, the Netherlands, and Estonia). One extreme outlier to the right is to be mentioned with Estonia positively deviating 511,38% from the trajectory target. While Germany scores highest on efficiency, Belgium lies on the line between Estonia and Germany, if one were to draw one.

With two negative (Malta and Cyprus) and two positive outliers (Estonia and Belgium) on effectiveness, the plot is otherwise organized in proximity to the vertical axis, score on efficiency. Given the largely marginal deviation, it can be assumed that the trajectory targets

[33] A summary of the countries' performance with respect to both indicators and the related instrument choice can be found in the appendix (p. 70) "Choice of instrument-combination and score on effectiveness and efficiency"
[34] Find the corresponding table in the appendix (p. 70) "Choice of instrument-combination and score on effectiveness and efficiency"
[35] Find larger dot plot in the appendix (p. 72) "Deviation from planned trajectory (effectiveness) and score on efficiency based on 2010 data"

set for the individual MS were well thought through and strong deviations can be assigned to unforeseen events.

On the vertical axis, the full range from -4 to 4 is present, with the majority ranging in the positive spectrum. Nevertheless, with 9 MS scoring negative and Portugal, Spain, and Bulgaria even hitting rock bottom (-4), the efficiency criteria deserves a closer investigation.

Certainly, the rescaling of the first question had significant impact on the total score of the MS. As mentioned earlier, it changed the outcome for three MS to positive, which would have been labelled average (0) without the rescaling.

While the weighing of criteria is not up for discussion at this point, what is, is the freakishly high variation between the assessments of Q1 and those from Q2+Q3 already briefly mentioned earlier. This seems odd, as one would assume that fulfilment of the NREAP policy commitments would necessarily lead to relatively high scores on both adequacy of support levels for each technology and long-term security of support as the appropriate measures indicated in the NREAP are amongst others to target deficiencies of those. If there is a positive score on Q1 followed by a fair or even negative score on Q2 and/or 3, the NREAPs can be assumed to be either too unambiguous or having been subject to (too) soft scrutiny by the COM.

While the Q1 positive and Q2+3 zero combination occurs seven times, in three instances there is even a negative score for Q3 after a positive one on Q1.

Furthermore, the assumption made is also valid for the adverse result, where Q1 is evaluated negative with non-corresponding evaluations of Q2+3. Although after having thoroughly scrutinised the indicators set out by ECOFYS I approved them to being sufficient for my purposes, analysing the observations made here leads me to doubt the feasibility for my work.

This also compromises the inferences that can be derived using the indicators. Neglecting the just mentioned, with three out of a total of four MS using quota-based support schemes being in the upper right corner, the obvious recommendation would have been to prefer a quota-based system over feed-in systems.

As the analyses of the combined observations seem to be dubious the least, no such inference can be made based on the given data.

What can be used though, are the findings that were derived from outlooks and insights about both prospect development of effectiveness and the study of Germany and Sweden.

Because the prospect has been labelled rather gloomy, it is suggested that considerable action is to be undertaken if the 2020 targets are to be reached at least on EU average.

Furthermore, experiences from Germany show, how a solid scheme can work and thus the MS can serve as the general best-practice role model, notwithstanding the public opposition to the scheme that is currently emerging. In comparison with the Swedish approach, it does especially well with respect to providing appropriate, unbiased levels of support for each technology does so in a manner transparent providing long-term security for investors. The Swedish case highlights the problem of certificate based instruments potentially neglecting immature technologies and providing windfall profits for mature ones.

Although it might be controversial to investigate the two MS being the best performing representatives of the respective main instrument, the study reinforces the theoretical assumptions with regard to the different approaches and subsequently enables a recommendation towards feed-in-based support schemes, at least by tendency.

6 Conclusion

The goal of this work was to disprove the claim about the combination of the ETS and national support schemes being inherently contra-productive. Here, the leading research question was phrased accordingly:

"Is it smart to combine the EU ETS with national support schemes?"

Assuming that the ETS doesn't function properly due to various significant design flaws, this study attempted to show that a combination of the broad based economic instrument ETS and supply side incentives in this case represented by the respective national support schemes is completely rational and can be considered smart. While the separate observations first misleadingly suggested a success of the support schemes, the combined observation and analysis suggests otherwise and even implies the observations made being of little use to support my claim.

With both indicators, there are substantial differences with respect to the performance of the MS. The analysis of these differences couldn't reveal an obvious pattern with regard to a dominant best instrument combination. However, deriving from the qualitative analysis of Germany it can be suggested that feed-in related schemes seem to be more feasible as they are better able to provide for equity within tech-support, similarly fostering investment through better long-term security, which can be considered the key element for success.
Nevertheless, it is just no option to simply impose the obligation to go with a FIT-like scheme on the MS. That is due to the complex matter of environmental policy being of shared competence within the EU, and hence being subject to even more intense political bargaining. Furthermore, the overall success and progress with respect to renewables seems to be inherently context dependent, not only regarding the choice of instrument but also considering the various national economic and societal circumstances. You just can't expect e.g. Cyprus to go ahead and plainly copy the successful German scheme.
Although the initial recommendation from the COM to follow a similar approach by limiting MS' choice of instrument to quota-related (and hence tradable) seems odd in this context, it is totally understandable that the COM, constantly pushing for further integration of the internal market, embraces the one instrument that is competition based. I consider that approach to be wrong, as the pursuit to foster the completion of the internal market in this context clearly disturbs the important combat against climate change.
With regret it is to be stated, that due to contradictory observations I fail to achieve the research goal of disproving the claim about the combination of the ETS and national support schemes being inherently contra-productive and recommendations for improvement are made in the suggestions for further research.
Notwithstanding the downsides of this study, it is able to re-stress the importance for action in the field of environmental policy. Both the prospect for the 2020 target achievement and the bad state of the respective national support schemes despite the sometimes positive evaluation on commitment show, that considerable need for reform or at least improved stringency on the matter is urgently needed. Although the majority of MS seems to be committed to change, the set goals for the latter are lacking ambition, just like is the case with the ETS.
Despite me not being able to sufficiently answer my primary research question, I still consider it a good idea, a really smart idea even, to accompany the ETS with national support schemes. My point of view is that we can use all the support we can get in order to successfully face the ecological challenges ahead and should not just rely on the markets to solve the problems for us. That again, is especially so when the markets have failed us in this particular aspect more than once and partly due to that fact, the first-best policy alternative is a failure. There must

be a nominator that safeguards a minimum level of action. As the EU at times proves to be inefficient and toothless with regard to that aspect, the domestic solution is always better than no solution and can even save the day, maybe not the whole 24 hours, but still.
Hence, conducting the research for this paper has reinforced my initial claim in H1 where any supporting instrument is to be welcomed. Nevertheless I wouldn't go so far as to say that *any* supporting instrument *must* be welcomed but would rather suggest being more selective.
Here, H2 can be confirmed and this research can actually provide for some starting point towards the selection of successful working instruments regarding the fostering of RES-E support.

Although my findings being limited, some *recommendations* can be derived from having observed the overall situation:

1. Strengthen the conditions fostering long-term security of support
   In order to increase capacities of the various renewable technologies existing, support levels are to be geared to the generation costs. While with price-based support systems such as FIT-related schemes, these have to be adjusted to realistic assumptions with regard to costs of capital and investment costs, quota system's recompensations have to be adapted indirectly through changes in quotas, penalties or other factors.

2. Reassess NREAPs to include more efficient measures
   As the results from the efficiency analysis show, the NREAPs approved by the COM are obviously add odds with reality and need to be revised in order to deliver sufficient outcomes

3. Set more rigid standards referring to best practices/use individual approaches towards different technologies
   MS facing the challenging situation of a rather immature market deployment for a given technology can strongly benefit from learning from best-practice support designs of successful MS. This goes for both administrational and policy design matters. Additionally, it is in the best interest of the COM to root out ways of support that have proven to be highly insufficient by means of amending Article 2 of the RED. It is advised to differentiate support instruments according to the maturity of a specific technology, project size, and the type of investor. The avoidance of too general approaches covering more than one technology is likely to improve the issue of equity with respect to technology support.

4. Get real with infringement procedures
   As the RED doesn't include a specific enforcement or respective penalty mechanism in case of poor or non-compliance, normal infringement procedures are applicable, based on Article 258 TFEU. In case of the pressing issue of climate protection, the slow progress of these ordinary infringement procedures poses an obstacle to the smooth working of the system and delay progress. There is a draft for introduction of a direct penalty on the table already. It is now time for the COM to pick it up. Further raise public awareness
   The case of Germany brings the importance of political acceptability into play again. Opposed to what was assumed earlier in this paper, the constituencies seem to be substantially ill-informed as I claim that any informed member of Western society would have to agree with strong measures towards combatting climate change. I

would recommend remedying the lack of information with making environmental policies one main issue for the 2014 EP election campaign.

5. Foster cooperation besides pushing for quota systems

   Quota systems are not only considered largely imbalanced by theory, also the case of Sweden shows that its primary feature is the excess profits that it creates for those operating renewable plants running mature technologies. While that seems to be a phenomenon similar to the windfall profits generated through the ETS and should be avoided by all means necessary, the general idea of enhanced cooperation that has the potential to eventually lead to a common market or even be merged with the ETS-market has to be embraced in order to tap into all existing potential. On these grounds I highly recommend that the COM should take the initiative to provide guidance on the implementation of cooperation mechanisms. Furthermore, to facilitate the assessment of cooperation opportunities, I advise amending Article 24 RED as to exclude the notion of MS being able to prevent the COM to publish information with regard to estimated potential for joint projects and the excess production of energy from renewable sources compared to the indicative trajectory which could be transferred to other MS.

Further research:

Although the conceptual framework applied in this paper was supposed to be blunt and straightforward to enable answering the inherently philosophical question of smartness, the lack of clear conclusions suggests that the framework hasn't been just simplistic, but too simplistic. The issue of environmental policy both on EU and national level is just too complex to be boiled down to just a few indicators, applying a narrow scope.

Thus, I suggest for further research to include an in-depth study of all MS, also covering the different renewable technologies specifically. This would enable context specific evaluation taking into account the varying national and technological circumstances apart from those included in this work. Moreover, the choice for operationalization of the efficiency criteria proved to be rather equivocal with respect to investigating causal interference. While the table provided a useful overview, future research using the same or updated data with these indicators and dimensions should re-operationalize the indicator applying e.g. a quantitative comparative analysis invoking necessary and sufficient conditions. Furthermore, it is suggested, that a rather naïve usage of given indicators (like the efficiency questions) is dangerous at best, as this study has shown, that qualitative assessment can appear to be quite arbitrary. When considering the 3-question evaluation done by ECOFYS (2013) and used in this paper to evaluate efficiency of the national support schemes, the findings at least partly display odd relations between the questions. How can e.g. Italy score positive with Q1 but negative with Q3? As the questions are necessarily related (issues addressed by Q2+3 are also addressed in the NREAPs) this points towards a faulty evaluation framework or sloppy work from the COM with scrutiny of the NREAPs in the first place.

6.1 Discussion; upon further reflection

While, as of now, European governments invested billions of Euros into renewable alternatives to fossil fuels, the German case is the prime example for the current discussion about the EU being clean, or being economically competitive, as there is the increasing feeling that Europe can't accomplish both at the same time.

In this vein, the new energy blueprint released on the 22nd of January, meets the expected scaling back of mid-term commitment to greener policies. Reacting to governments, with

Germany and Sigmar Gabriel leading the way, and big industrial lobby groups complaining about EU energy policy threatening the economy, Brussels took a step back from the once very ambitious environmental agenda, shifting the focus towards the need for economic growth and industrial competitiveness.

While the target can still be considered rather strong compared to other non-EU players, the most significant regress is the elimination of any binding targets with respect to renewable energies. While a goal of a 27% share for 2030 is set, it will be in the MS' discretion how to meet it.

A major reason for this decision seems to have been the relatively high electricity prices throughout the EU, compared to US American ones. While Europe struggles with the aftermath of the financial crisis, high unemployment rates and decreasing economic competitiveness, the US was able to accomplish an energy-driven renaissance without any sophisticated energy policy in place at all, mainly driven by extensive investments in highly controversial fracking-technologies for exploiting shale.

Costs for business and private consumers are substantially higher for Europeans, with US industries paying an average of 6.9 cents per kwh and European industries having to pay 16 cents ($) on average over the last two years. While prices in the US remained the same over that same period, MS in Europe had to face a 10 percent increase.

Given the above mentioned, it is not surprising, that the new blueprint includes a "go" for shale exploration throughout Europe.

The goal for greenhouse gas abatement is set at 40 percent for 2030 against the 1990 benchmark with a market stability reserve suggested to address both the surplus of allowances and improve the system's resilience to major shocks by automatically adjusting the supply of allowances to be auctioned.

While the blueprint was well received by business and endorsed by politicians from all MS, environmental groups call the COM responsible for the draft "a shadow of its former self, hiding behind backwards-looking MS" (Clark & Oliver, 2014).

Those same groups claim that the 40 percent reduction target will be too low to stop global temperatures rising to potentially dangerous levels.

Adding the termination of binding goals for renewables to the formula, the blueprint sends dangerous signals to the already timid renewable energy community and potential investors leaving the market for renewable energy technology increasingly to players like China and South Korea, neglecting the inherent job-creation potential.

Because investments usually have lead times of around eight to ten years, every major mistake that is being made today, is going to have substantial influences on the development of renewables in the years to come.

If the council and the EP endorse the approach, I am convinced that this will not only significantly hamper the combat of climate change but has the potential to retrospectively destroy achievements made already.

With respect to the blueprint, it is especially concerning that big players like Germany, which managed the crisis rather well and can afford the costly national support scheme, seem to be amongst the leaders for this retraction.

This is of crucial concern because Germany traditionally has been a "leader" state with respect to strongly advocating new policies following a philosophy of ecological

modernisation. The inherent push-pull dynamic of progressive leader states let "laggard" states like the UK catch up in the last decades and pushed the process in Brussels.

While the UK today again is a rather un-ambitious player and can hence be expected to contradict the green agenda, Germany sending strong signals against further fostering initiatives towards greener policies has the potential to tip the whole agenda as they serve not only as a forerunner but also as a role model. With Germany pulling back and a toothless infringement procedure there are little incentives for other MS to try harder.

I find that particularly disgraceful as the current backwards-oriented blueprint is in stark contrast to the inter-generational equity. It appears to be inacceptable to just step back from responsible behaviour in order to satisfy industrial lobbyists' wants and give in to the fluffy public demand for cheaper energy to score some political points, especially when you can actually afford the green policy. Herewith I then also withdraw my earlier remark about political acceptability not having to be considered in this study as everyone simply has to agree to measures that will eventually contribute to save the planet and human kind.

I consider public opposition to green policies to be a matter of mis- and/or uninformed electorate. Strong political leaders need to tackle these grievances instead of going the easy way caving over the issue of some cents, neglecting future generations and chances that come with the needed change.

As a concerned citizen you want to yell at them: "Go ahead and pollute, just light your cigarettes of negligence, smoke and create your own air pollution. Create your own cancer whilst being on chemotherapy. How easy it is for you fear-mongers to worry that to save a few cents per kWh is a sufficient reason to go ahead and kill the European effort towards a greener, safer, and less toxic world. Go ahead and enjoy your cigars while being busy diving for the lasts cents. Don't even consider the dying planet."

The exact opposite is what one would expect from responsible, modern, post-modern leaders. Here, as a counter-approach to the energy blueprint I suggest global changes beyond the scope of those already mentioned in the recommendations for the national support systems earlier. First of all, a change badly needed is to phase out subsidies for fossil fuels. A setting in which fossil fuels remain to be heavily subsidized is renownedly a stranger to cost-effectiveness in the long-term (cf. Aldy & Stavins, 2012; Ellerman et al., 2014; Gawel et al., 2014; Graus, Roglieri, Jaworski, Alberio, & Worrell, 2011; Lehmann & Gawel, 2013; Magné, Chateau, & Dellink, 2013). Second of all, tightening the emissions cap beyond simple backloading, in 2020 the latest, is strongly recommended as current levels clearly don't reflect the reality and hence put the whole system in a position where it doesn't tap its potential. As Taylor (2012) and others propose, an adaption to reality coming along with serious cutbacks (and again not only backloading) is a favourable option in order to foster climate protection and re-empower the ETS (cf. Grubb, 2012; Reyes & Gilbertson, 2010; Skjærseth & Wettestad, 2010; Taylor, 2012). Last but not least, I propose introducing a price floor of some kind to address insignificance of the allowance price and in the same vein foster the liberalisation of electricity markets. Many scholars suggested it as an appropriate tool to stimulate investment and long-term commitments towards renewables by private investors as the underlying security provided by a guaranteed price creates a more encouraging investment environment (cf. Grubb, 2012; Hepburn, 2006; Menanteau, Finon, & Lamy, 2003; Wood & Jotzo, 2011).

Some of the suggestions were not extensively elaborated upon in this paper. As they are inspired by scientific literature read for the purpose of this paper, elaborating on these issues will be a task for later scientific quests.

7 Abbreviations

BEE = Bundesverband Erneuerbare Energie e.V.
COM = European Commission
EA = Emission Allowances
EED = Energy Efficiency Directive
ESD = Effort Sharing Decision
ETS = Emission Trading Scheme
EU = European Union
EU ETS = European Union Emission Trading Scheme
FIT = Feed-In-Tariff
GHG = Greenhouse Gas
MS = Member States
NREAP = National Renewable Energy Action Plan
PV = Photovoltaic
RE = Renewable Energy
RES = Renewable Energy Sources
RED = Renewable Energy Directive
RES-E = Electricity Generated from Renewable Energy Sources
RWC = Real-World-Case
TGC = Tradable Green Certificate
UNFCCC = United Nations Framework Convention on Climate Change

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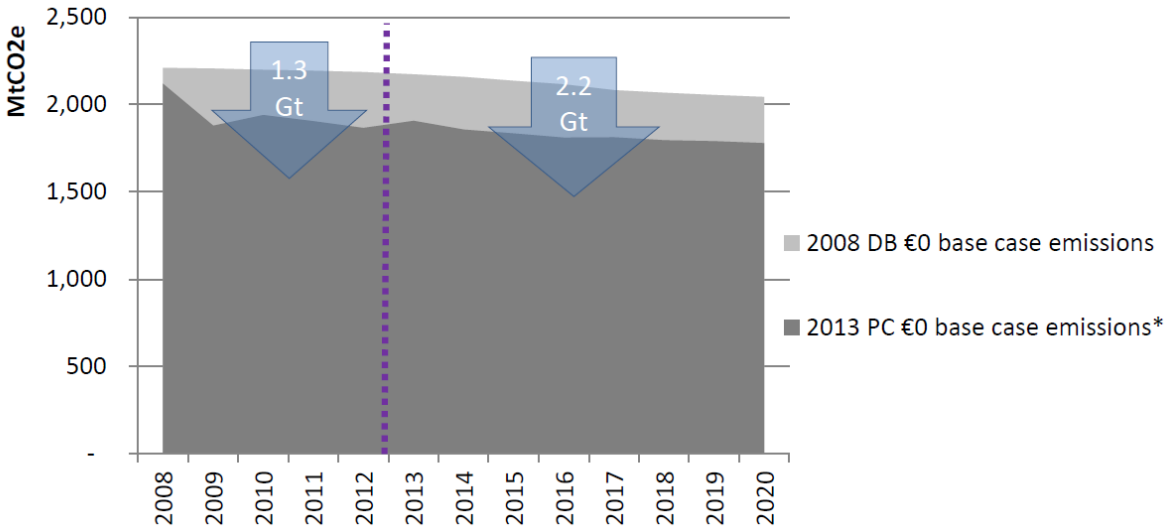
9 Appendix

Comparison of 2008 and 2013 "base case" emissions (BAU minus non-ETS policies)



Source: D. Morris & Campaign (2013, p. 11)

History and the need for change

It is common knowledge that GHGs and the related impact of CO2 on climate change is important for life on earth. This was first discovered in the 1960s and got political attention during the 1980s with several single-issue political parties popping up. In the early 1990s, the United Nations started negotiating over possible remedies to the increasing threat that springs from global warming. The 1992 UN Framework Convention on Climate Change (UNFCCC) manifested the goal of the "stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system" (UNFCCC, 1992). Also in the EU as a political entity the awareness of the need for action concerning a climate-based instrument arose during the 1990s. First studies regarding the applicability of a common carbon tax were conducted but eventually rejected as a carbon tax faced strong opposition of enterprises fearing that it would undermine their international competitiveness. Eventually the carbon tax idea was scrapped as it failed to reach unanimity in the European Council in 1994. However, the 1997 Kyoto Protocol set a cap for GHG emission reduction for the EU15 of 8%. Since the carbon tax was off the table other ways had to be found to reach the set goal the EU member states committed themselves to. In 2000 the COM issued a first green paper on emission trading to start the consultation procedure involving all stakeholders concerned followed by an official COM proposal for a trading scheme in 2001. In 2003 the EU directive on emission trading was accepted with free allocation of allowances being embraced as the main allocation mechanism in the beginning to minimize harm for companies involved. The scheme was set out with having three phases. The first period from 2005 to 2007 was to function as a trial and error period. In the following second period, running from 2008 to 2012, the aim was to introduce auctioning as an allocation method and to create a non-zero price. In the first two phases, it was the EU that divided the EU-cap into a cap for member states which then further divide their cap in an ETS and non-ETS part. The currently running third period (2013 to 2020) was then meant to put

greater emphasis on generally harmonized allocation rules, establishment of auctioning as the primary allocation method and the inclusion of aviation in the scheme.

The ETS works as follows: a limit (or cap) is put on the total amount of agreed upon greenhouse gases that are emitted by power plants, factories, and other installations part of the system. This limit is then reduced over time so that total allowed emissions are falling. Plan is for emissions covered by the system[36] to be 21% lower in 2020 than in 2005.
Within the system, emitters receive or buy emission allowances (EA)[37] which are then open for trade. The limited total number of allowances in the system is supposed to secure that EAs actually have some value. Every year, emitters covered by the scheme must surrender enough allowances to cover respective emissions as otherwise they face heavy penalties (100€ per ton). Spare allowances can be kept and sold to other emitters or stored for later usage. The rationale behind this is to secure that emissions are cut where it is most cost-efficient to do so (European Commission, 2014).
The ETS is the most important measure out of the four of which together comprise the EU climate and energy package, which is supposed to deliver on the 20-20-20 targets. Together they represent the EU's approach of combating climate change. Also, they are the headlines of the Europe 2020 strategy for a smart, sustainable, and inclusive growth. Besides the necessary reform on the EU ETS there is national targets for non-EU ETS emissions, national renewable energy targets, and a strategy on carbon capture and storage (European Commission, 2010).

The three key objectives of the 20-20-20 targets:

1. a 20% reduction in EU greenhouse gas emissions from 1990 levels
2. raising the share of EU energy consumption produced from renewable energy sources to 20%
3. a 20% improvement in the EU's energy efficiency

While the climate and energy package does not address the energy efficiency targets in a direct manner this is done through the Energy Efficiency Plan and the Energy Efficiency Directive.

Main threats the ETS faces

The immense surplus of allowances poses the biggest threat to the scheme. This surplus, according to Morris and Campaign (2013) is the product of two things:

- After the recession the cap is now too high to deliver emissions reductions and is instead even cancelling out the abatement being delivered by other policies (e.g. by the Renewable Energy Supply Directive or the Energy Efficiency Directive).
- Since the ETS has been designed compatible with CDMs under the Kyoto protocol, the EU has been a "dumping ground" for cheap carbon offset credits of which a lot have been abandoned from the system by now.

When phase 3 caps were put together, the scheme was originally expected to deliver some 2.8 billion tons of emission reductions against business-as-usual emissions in addition to the abatement delivered by renewable energy targets and energy efficiency targets. If everything would have gone as planned, the EU ETS would have been the single largest driver of emission reductions up until 2020, driving emissions even below the set ETS cap. However, since recession kind of blew the whole planning with the system now transforming into an

[36] Altogether the ETS covers around 45% of total greenhouse gas emissions from the 28 EU countries
[37] One per ton of emissions

anti-climate instrument cancelling out around 700 million tons of emission reductions that are delivered by other policies over the period (D. Morris & Campaign, 2013, p. 11).

Furthermore, a huge problem is imposed on the scheme by international CDM credits surrendered into the scheme, despite the already lacking domestic demand. In phase 2 alone, 1.1 billion so-called offsets were surrendered into the EU ETS, 85% of which have been blocked since as they failed to comply with environmental concerns (an additional 7% are under close scrutiny for potential abandonment).

Large sums of offsets were surrendered, were domestic certificates could have been used. This is in contradiction to the Kyoto protocols specification of the offsets being supplemental to domestic efforts.

Within Europe, large surpluses of allowances threaten the whole system but still policy makers remain shy on putting at least a small level of ambition back to the scheme with the highlighted concern of putting too much pressure on the manufacturing sector. However, these claims or threats should be neglected immediately as one discovers that the manufacturing sector, without exceptions, has been oversupplied with allowances throughout phase 2. Moreover, if emission levels stay at the current level, not only will the manufacturing industry hold their surplus allowances but they will accrue more surpluses that can be sold on to electricity generators or banked against future obligations.

Having said this, reducing the supply of allowances even further than the proposed 900 million included in the backloading proposal is crucial and would increase the value of allowances which in turn could be sold for more on the market, putting an additional penny into the pockets of the moaning manufacturing sector (D. Morris & Campaign, 2013, pp. 13+14).

It is important to mention, that a low price for allowances and/or the high surplus of allowances for themselves don't pose a problem, but are rather the symptom of an inflexible system and lacking political ambition.

Regulatory design principles

Again, not claiming to provide specific solutions to specific environmental problems, the authors yet highlight the following five principles to be inherently crucial to arrive at those specific solutions.

1 – Prefer policy mixes incorporating instrument and institutional combinations

In general, most individual instruments lack the power to effectively address all issues at hand. Given respective strengths and weaknesses it is thus handy to combine instruments in some way.

While command and control regulation is favourable because of its properties as being highly dependable and predictable it has proven to be highly inflexible and even inefficient as well. Economic instruments (such as the EU ETS) on the other hand seem to represent an efficient way to address an issue with having the disadvantage of lacking dependability in most cases.

Then again, information-based strategies, voluntarism, and self-regulation have the merits of being cost-effective, un-intrusive, and more or less informal they also appear to imply little reliability when used in isolation.

Having said this, the logical conclusion for the first principle is to find suitable combinations of different instruments to exploit the individual strengths and overcoming the individual deficiencies.

Since the government is far from being omnipotent it makes sense to involve a greater range of actors including commercial third parties to take weight off government intervention enabling government authorities to use the limited resources to problematic cases, which need strict intervention.

Anyhow, it is not the intention to claim that 'the more, the better' is a general scheme to be applied to policy design as regulatory overload is posing a serious threat to the success of regulation. Additionally, not all combinations might prove to be complementary and spending might be excessive when using the whole range of available approaches (Gunningham et al., 1998, p. 3).

2 – Prefer less interventionist measures

As prescription[38] and coercion[39] being the two main components of intervention, policy makers face a trade-off situation. E.g. industry self-regulation might be considered to be higher in terms of its prescriptiveness than its coercion. Compared to this, economic instruments are supposedly high on coercion and low on prescription.

To be able to rank instruments on their level of intervention hence requires a fundamental understanding and assessment of the two components just described.

A lot of reasons exist that tell the story of least interventionist measures being favourable. For instance, highly coercive instruments require expensive monitoring to be effective. Additionally, subjects to regulation generally respond less positive to coercive measures than to voluntary ones. Having said this, it doesn't come as a surprise, that high interventionist measures score low on political acceptability. In addition, prescriptive instruments tend to lack necessary flexibility and are not favourable considering the least cost solution.

Low interventionist instruments generally stand out for providing greater flexibility to enterprises in their response, greater leeway with respect to choice of implementation und hence less resistance and greater legitimacy.

Again, from the legislator's perspective, opting for least interventionist option has the advantage of freeing up resources that in turn can serve well to strengthen the regulators position towards those actors reluctant to comply with the requirements.

However favourable the least interventionist measure may be, the underlying assumption here is, that it actually works in delivering the wished outcome. This is different from case to case where in some instances one might encounter a situation where a more interventionist instrument is actually inevitable.

A crucial aspect to be considered by policy makers when choosing the level of intervention is the capacity to adjust it when necessary due to change of circumstances. This concept is laid down in the following principle 3.

3 – Escalate up an instrument pyramid to the extent necessary to achieve policy goals

It is not inherently easy to, from the very beginning onwards, anticipate if a chosen measure will eventually work or not. This is primarily the case for two reasons:

[38] "Prescription refers to the extent to which external parties determine the level, type, and method of environmental improvement." (Gunningham & Sinclair, 1998, p. 4).

[39] "Coercion refers to the extent to which external parties or instruments place negative pressure on a firm to improve its performance" (Gunningham & Sinclair, 1998, p. 4).

1. A given instrument might be effective in influencing the behaviour of some but not of others.
2. An instrument which, prior to its introduction, seemed viable in its entirety, might in reality prove not to be so

1-The authors identify the "enforcement pyramid" by John Braithwaite to be a sophisticated approach to encounter the first reason for instrument failure. Herein, legislators start out with assuming the virtue of the chosen instrument with changing the strategy and measures when non-compliance is observed. More coercive strategies are then pursued until the respective regulatee complies.

Central herein is the capacity to gradually escalate from low to high intervention. While Braithwaite limits his approach to the dichotomous state-business relationship Gunningham et al reconceptualize the pyramid by introducing the third-party-dimension with third parties to act as quasi-regulators. In their expanded model, escalation would be possible up any face of the pyramid.

Additionally, changes concerning the number of instrument categories were conducted. While Braithwaite's model uses a single instrument category, the reconceptualized model used here conceives of the possibility of regulation using a number of different instruments implemented by across a number of parties. This also affects the possibility to escalate even between several different instruments (Gunningham et al., 1998, p. 5).

Here, it is also crucial that there is substantial coordination between different regulatory actors to build up and maintain a frame where communication is fast and efficient and thus fosters the efficiency of a possible escalation.

However the authors do not claim that such controlled escalation is practicable under any circumstances. Rather it is only possible where the instruments concerned lend themselves to a graduated, responsive, and interactive enforcement strategy. Two instruments very valuable in this context are command and control and self-regulation, which is owed to the fact that the two are readily manipulated. Besides these, there are other instruments, which are at least partly amenable to such a favourable response, the most apparent being banking and insurance (Gunningham et al., 1998, p. 6).

In those cases, in which coordinated escalation is not readily available, the government (or in our case, the COM) must step in to fill the gaps in the pyramid. Nevertheless the main role of the government in doing so, in filling the gaps, is, to facilitate an environment where second and third parties flourish and are climbing the pyramid. The government more or less acts like a catalyst for effective second and/or third party action.

Excluded from the scheme of gradual escalation are situations in which involve "a serious risk of irreversible loss or catastrophic damage" (Gunningham et al., 1998, p. 6) and such ones where "there is only one chance to influence the behavior in question" (Gunningham et al., 1998, p. 6).

2-Combatting the second reason for an instrument to not work in practise Gunningham et al introduce *instrument sequencing to increase dependability.* Here the authors refer to a system in which e.g. an industry sector might be allowed to self-regulate but are aware of the fact that, should they fail to meet the requirements, madatory sanctions will be invoked. In essence, only when the preferred least interventionist measures clearly failed does one escalate up the pyramid invoking a wider range of instruments and parties. Also and even in this case, escalation should only happen to an expedient extent.

These sequencing arrangements are considerably shaped by the level of discretion that is assigned with its implementation. To change the level of discretion once agreed upon guidelines have been breached can send a strong message to the industry subject to the regulation (Gunningham et al., 1998, p. 7).

For the proposed methods to work it is also improtant to have respective *triggers*[40] and *buffer zones*. Triggers for warning the authorities when least interventionist measures have failed and buffer zones to forestall situations in which e.g. the level of harm to the environment would be inacceptably high – providing time to react after a trigger was activated (Gunningham et al., 1998, p. 8).

An additional strategy is the usage of so-called *circuit breakers*, an instrument which is usually introduced as a short-term measure to support a second instrument which is likely to fail when introduced in isolation. They are usually low in level of intervention while the instruments they are to support tend to be of high interventionist nature (Gunningham & Sinclair, 1998, p. 8). The difference of circuit breakers compared to sequencing is that with sequencing the sanctions only occur when lower policies fail whereas with circuit breakers one assumes from the very beginning that it is a short term measure which might eventually be replaced by a more efficient measure or prove useless and be shut down (Gunningham et al., 1998, p. 9).

4 – Empower participants which are in the best position to act as surrogate regulators

As has been mentioned earlier, there is a range of second and third parties that can prove valuable in the regulatory process. Both commercial and non-commercial actors ranging from industry associations through financial institutions to pressure groups in general (especially environmental pressure groups in our case). With including those players into the process, serious shortcomings of the traditional approach might be overcome. This is for a variety of different reasons, the most important of which are listed below:

- on some occasions third party quasi-regulation might be more potent than government intervention
- intervention by parties that 'know the business' might be considered as more legitimate
- government resources are limited, hence it makes sense to distribute the burden where appropriate to free up resources that can in turn be used to pursue 'difficult cases'
- since government is not omnipotent, there are instances where government intervention is simply impractical

Since in most cases though, there is little intrinsic motivation of the respective second or third parties, government plays an important role in facilitating the participation of those parties to the cause of environmental improvement (Gunningham et al., 1998, p. 9).

Most of the mechanisms which could be used by the government to this require it to seek out lateral means of extending ist reach through innovative market orderings of which an apparent starting point is the provision of reliable and adequate information. Without reliable data no one in the process is able or gets an incentive to becoming active.

Some of the empowerment-strategies are to be specific to a target group (e.g. providing funds to an NGO to pursue monitoring of adherence to some benchmark). Also, a way of creating

[40] Appropriate triggers are e.g.: in-house whistle blowers; community oversight; random government inspections; independent auditors; mechanisms for industry association reporting; compulsory firm reporting (Gunningham & Sinclair, 1998, p. 8)

an intrinsic value for e.g. the industry sector to monitor their suppliers is to make it mandatory for them to only get supplies from those companies that adhere to a certain standard. Thus, taking advantage of the power of supply chain pressure (Gunningham et al., 1998, p. 10).

In general, with this principle again, the preferred role of the government is to facilitate greater engagement of second and third parties in the regulatory process rather than to engage in direct intervention. Here, government has the crucial role in providing the mandate, the incentive and necessary information for third parties to engage and then only inervene when action is triggered by those installed parties when the circumstances under consultation of the enforcement pyramid ask for direct intervention by e.g. the COM. Concluding for this principle one can say that we have a combination of third party and government regulation coordinated between the different layers of the pyramid to provide the opportunity for coordinated enforcement escalation (Gunningham et al., 1998, p. 11).

5 – Maximise opportunities for win/win outcomes

A key challange with environmental today is, according to the authors, to ensure that regulation aims at creating win/win situations which directly foster the engagement of commercial actors to actively pursue the goals set out by the regulators.

There are already a lot of benefits for companies at hand with regard to going beyond compliance. Amongst them ist the obvious improvement of the image ("clean"); improvement of efficiency; reduce potential legal liability etc. Anyhow, due to the fact that most up-front investment would be short term while most effects will show rather in mid- to long-term, the interest in investing considerably in environmental improvement is very limited amongst businesses.

This bound rationality imposed by the market explains businesses' failure to proactively engage in environmental protection even if it would be in their own interest (Gunningham et al., 1998, p. 11).

Having said that, the market cannot be trusted to deliver win/win outcomes singlehandedly.

Accordingle, government has to step in. The authors state that it is most crucial for regulators to consider pushing companies at the margin towards cleaner production, heightening awareness with regard to environmental issues, and encouraging the re-structurisation of corporate priorities towards an increased environmental performance.

Again, for achieving this ambitious goal, information is the key to any strategy. Where information alone is not sufficient, information strategies are to be supported by additional promotional schemes attempting to formalise a commitment by management to cost-effective environmantal improvement. Should that not be enough, financial support is crucial. Subsidising the process in any form might prove useful. E.g. one possibility is to pay for advisors that work out a firm-specific plan towards environmental improvement. Some, particularily small, caompanies might also be in need of support to cover up-front investments. Here, government funding is seen to be appropriate (Gunningham et al., 1998, p. 12).

To especially support companies that achieve beyond compliance while still reagrding the average achievers, the authors recommend a two-track, parallel regulatory system. Here, firms that commit highly to environmental improvement would benefit more and can follow the 'green track' while others still benefit moderatly. The regular track functions as a fall-back mechanism with the intention to get as much companies as possible on the green track.

Nonetheless the efforts and benefits at stake, there will, according to theory, always e a point where win/win turn into win/lose situations as further spending on environmental protection exceeds the benefits that can be reaped from this very investment.

The authors recognise two strategies available to government:

1-recognise the tension between profit and envornmental protection and design policy accordingly

➔ using the pyramidical enforcement strategy

2-push back the point at which win/win becomes win/lose

➔ encourage companies to engage in developing environmental technologies to strengthen the respective position on global markets for environmental services (Gunningham et al., 1998, p. 14)

Instrument combinations

As already highlighted in the very beginning, Gunningham et al stress the importance of the usage of a combination of instruments and parties in order to compensate for the potential weakness of stand-alone policies. This however does not imply that all instruments work together in the same way or work at all. Some mixes might indeed proof to be counterproductive while others are strongly context-dependent.

In the following I will list inherently complementary combinations, inherently counterproductive instrument combinations, and combinations in which the outcome is context-specific (Gunningham et al., 1998, pp. 14-16).

Inherently complementary combinations
- command and control regulation and voluntarism
- process based command and control regulation and voluntarism

Inherently counterproductive instrument combinations
- command and control regulation and economic instruments

Combinations in which the outcome is context-specific
- voluntarism and self-regulation

Furthermore, following the authors, there is no reason why mixes should not be multipartite (and in reality most are). Here it is just very important to know which combinations to avoid and which to embrace where it is not handy here to assess all possible combinations.

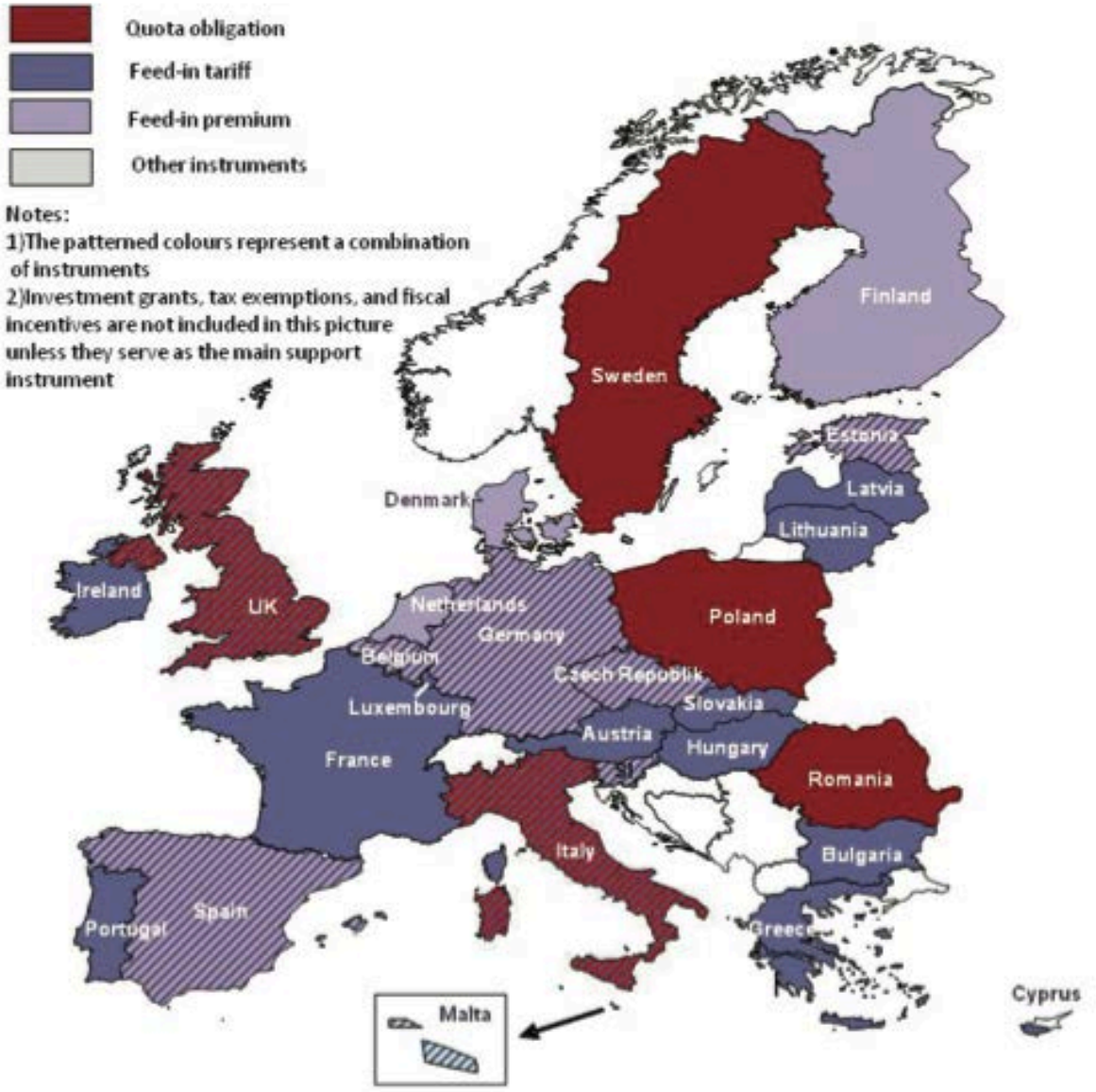
Conclusion

Gunningham et al. make a clear-cut point for the usage of a broader range of policy instruments with including second and third parties to enhance the preferred outcome. It is also very apparent that it is important to match those instruments with particular environmental problems and the parties best able to tackle the issue at hand. It also became quite clear that a successful regulatory design is dependent on at least five regulatory design principles bearing in mind the necessity of preferring least-interventionist instruments where appropriate. Moreover, with the introduction of the three dimensional enforcement pyramid, the importance of involvement of second and third parties is stressed further. This is primarily

to take away a share of the burden from the public sector to make room to conduct regulatory actions more thoroughly and only where direct government involvement is inevitable.

Overall, the idea behind how "smart regulation" in the environmental context should look like is quite clear now.

Summary of RES-E support in MS



Source: Ragwitz, Steinhilber, et al. (2012)

Definition emission trading scheme

Emissions trading schemes, also known as cap-and-trade systems, encourage companies to curb their carbon dioxide emissions by setting a limit, or cap, on the level of carbon dioxide that can be emitted in a country or region, and then distributing allowances, or permits, equal to one ton of carbon to each business.

Cleaner companies can sell their permits to businesses that pollute more, and therefore need more allowances to meet their individual cap, thus setting a price on carbon dioxide emissions (Clark, 2013).

Overview of selected incentive mechanisms

The definitions of the main incentive mechanisms found in this section have been borrowed from Philipp Brown (2013).

For renewable electricity generation, EU countries have used several different types of incentive mechanisms to stimulate the development and investment required to meet EU 2020 targets. Generally, each country uses a unique mix of policy incentives. The application of those policy tools is customized to suit the objectives of each EU member. Also, each EU country has discretion with regard to the types of financial incentives offered to renewable electricity projects. The most commonly cited and referenced EU financial incentive is the feed-in tariff, described below, which has been used in several EU countries to encourage deployment of renewable electricity generation projects. However, there are other incentive mechanisms used to support renewable power in the EU. Some member countries have started to transition from feed-in tariffs to other incentive types as a way to control costs, manage capacity installations, and integrate renewable electricity with power markets. The following sections provide a brief overview of four primary types of financial incentive mechanisms used by EU member countries to stimulate renewable electricity generation.

Feed-in tariff

A feed-in tariff (FIT) is a renewable electricity incentive mechanism that generally serves two primary functions. First, it guarantees that all electricity generated from a renewable project will be purchased and will have access to the electric power grid (the "feed-in" portion of the FIT). Second, it guarantees the renewable project a long-term price for electricity produced, generally 15 to 30 years or even for the lifetime of a project, (the "tariff" portion of the FIT). The tariff, or rate, paid for renewable electricity is generally set higher than the prevailing wholesale electric power price. Thus, FIT incentives eliminate two key investment risks: (1) purchase risk, and (2) price risk. As a result, the FIT mechanism can create an attractive finance and investment opportunity that could stimulate development and installation of renewable power generation capacity.

FIT incentive designs vary by country and the costs associated with FIT incentives can be paid for in different ways. Some countries distribute FIT costs to certain electricity rate-payers by adding a surcharge to consumer electricity bills. Other countries guarantee FIT compensation to power system operators, thus resulting in a national government budget commitment. FIT mechanisms can also include other design elements such as caps, which set a maximum amount of renewable electricity capacity that may be supported by the FIT, and "degression," which provides for a periodic reduction of the FIT rate based on defined criteria. Additionally, some countries require regular reviews of FIT incentives in order to make rate adjustments that reflect changes to electric power, technology, and capital markets.

One key challenge for a FIT incentive is for the national government to set a tariff rate that is high enough to incentivize development and investment in the renewable electricity sector,

but not so high as to create windfall profits or stimulate capacity installations that result in power system operational issues and/or cost concerns. Despite these challenges, several EU countries have supported renewable electricity development through the use of FIT incentives.

Market premium

A market premium is a financial incentive that provides renewable power producers additional revenue above the market price for electricity. The market premium can either be fixed or variable. A fixed market premium provides a constant value for electricity generated from renewable energy sources in addition to the revenue received from wholesale power market sales. The value of the premium never changes regardless of the underlying wholesale power price, which can fluctuate up or down depending on the season and time-of-day.

A variable market premium provides a renewable power producer with an electricity price premium, above the wholesale market price that results in the power producer receiving a pre-determined value for each unit of electricity generated and sold. For example, a market premium policy may be designed to provide solar power projects total compensation of $0.30 for each kilowatt-hour (kWh) of electricity sold. The solar project would first sell power into the wholesale market and, for this example, the project received $0.18 per kWh. The market premium incentive mechanism would then provide an additional $0.12 per kWh to the solar project in order to reach the $0.30 per kWh pre-determined value. In essence, the variable market premium is equal to the pre-determined compensation value minus the wholesale power price. A variable market premium policy may also require the renewable power project to return some of its revenue should the wholesale market price exceed the pre-determined value. Initially, market premium incentives were designed to provide a fixed payment above the wholesale electricity price. Now, many market premium incentive policies provide a variable premium that places a cap on total compensation received for renewable electricity. The variable market premium provides a greater degree of revenue certainty to the project; however, it also limits the potential for investment returns.

The market premium incentive can function much like a FIT in that a pre-determined value for electricity is received by the renewable power project owner. This is especially true for a variable premium. However, one key difference between the two incentives is that the market premium may just focus on price risk. Depending on how it is designed, the market premium may not eliminate purchase risk by guaranteeing access to the electricity grid. As a result, a renewable power project owner may be required to secure a purchase agreement with a third party for its electricity generation, consume the renewable electricity generated on site, or participate in wholesale market activities in order to sell its power.

Green certificates

Green certificate incentive programs provide additional revenue, above that received from power sales, to renewable electricity generators through accumulation and sale of certificates to entities required to comply with annual renewable electricity quotas. The value of green certificates is generally determined through a market mechanism and typically fluctuates based on supply and demand. Green certificate programs can include various design elements (i.e., multipliers for different technologies, validity lifetimes for certificates). Certificates can be granted based on different metrics. For example, some countries might grant green certificates for each megawatt-hour (MWh) of electricity generated from a renewable power project, while other countries might award green certificates based on calculated carbon dioxide emission reductions. Power production at a renewable electricity generation facility is monitored and measured so green certificates can be issued based on the metric (i.e., electricity generation, carbon emission reduction) used. Generally, each certificate is assigned

an identification number and is recorded in a central registry. A green certificate program results in the creation of a saleable commodity that is separate from the actual electricity generated by the renewable power project. Once granted, green certificates can be sold to entities that are required by law to comply with a defined renewable electricity quota obligation.

Green certificate programs instituted in Europe have characteristics similar to renewable portfolio standards (RPS) and tradable renewable energy certificates (RECs) used in certain U.S. states. Whereas state RPS requirements set the renewable electricity obligations, RECs can be bought, sold, and traded among renewable power generators and obligated entities as a means of complying with annual renewable electricity requirements.

Tenders/reverse auctions

Reverse auctions, sometimes included as part of the tender process, are policy mechanisms that encourage project developers to offer renewable electricity at the lowest cost. Since the reverse auction mechanism awards renewable power capacity based on the lowest renewable electricity bids, this approach can limit government financial commitments associated with renewable electric power incentives. When using reverse auctions, governments can set both minimum and maximum tariffs that will be paid for each unit (kilowatt-hour) of renewable electricity generated. Ideally, respondents are able to calculate the minimum tariff value needed in order for the project to obtain financing and be economically viable—this tariff level is typically the price per kWh included in the respondent's application. When evaluating respondent offers, government agencies generally give preference to projects that offer the lowest tariffs they are willing to receive, assuming that respondents meet other qualification criteria included in the tender. The overall goal of reverse auctions is to stimulate deployment of a certain amount of renewable electricity capacity at the lowest possible cost.

Varieties of regulatory instruments (Gunningham & Sinclair, 1998, pp. 38-87):

1. Command and control regulation
2. Self-regulation
3. Voluntarism
4. Education and information instruments
    i. Education and training
    ii. Corporate environmental reports
    iii. Community right to know and pollution inventories
    iv. Product certification
    v. Award schemes
5. Economic instruments
    i. Property-rights
    ii. Market creation
    iii. Fiscal instruments
    iv. Liability instruments
    v. Performance bonds
    vi. Deposit refund systems
    vii. Removing perverse incentives
6. Free market environmentalism

Summary of instrument mixes

	information & education	voluntarism	self-regulation	supply side incentives[1]	broad based economic instruments[2]	liability	property rights[3]	process standards	performance standards	prescription standards
information & education		Positive	Positive	Positive	Positive	Positive	Positive	Positive	Positive	Positive
voluntarism	Positive		Contextual	Positive	Contextual	Positive	Positive or duplicative	Positive	Positive, if beyond compliance	Positive
self-regulation	Positive	Contextual		Positive	Negative, but positive if sequential or targeting different activities	Positive or duplicative	Negative	Positive or duplicative	Positive if beyond compliance or duplicative	Negative or duplicative
supply side incentives	Positive	Positive	Positive		Negative	Positive	Contextual	Positive	Positive	Duplicative
broad based economic instruments	Positive	Contextual	Negative, but positive if sequential or targeting different activities	Negative		Negative	Duplicative	Positive	Negative, but positive if sequential or targeting different activities	Negative
liability	Positive	Positive	Positive or duplicative	Positive	Negative		Negative	Negative	Positive	Positive
property rights	Positive	Positive or duplicative	Negative	Contextual	Duplicative	Negative		Contextual	Negative	Negative
process standards	Positive	Positive	Positive or duplicative	Positive	Positive	Negative	Contextual		Positive	Negative
performance standards	Positive	Positive, if beyond compliance[4]	Positive if beyond compliance or duplicative	Positive	Negative, but positive if sequential or targeting different activities	Positive[5]	Negative	Positive		Negative
prescription standards	Positive	Positive	Negative or duplicative	Duplicative	Negative	Positive	Negative	Negative	Negative	

[1] Supply side incentives comprise subsidies, in the form of, for example, tax concessions or soft loans for environmentally preferred technologies. These are distinguished from broad based instruments in that there is a higher level of government prescription.
[2] Broad based economic instruments comprise measures, such as pollution taxes or tradeable emission permits, which apply to industry as a whole, do not distinguish between sectors and/or preferred technological solutions, nor impose performance limits on individual firms. That is, apart from government setting the overall level of the tax or number and value of permits, the market is left to operate freely.
[3] We refer here to the creation of property rights over natural resource were none previously existed, as proposed by free-market environmentalists, not too the manipulation of existing property rights such as easement restrictions.
[4] That is, the voluntary component requires firms to exceed minimum performance standards.
[5] Provided the standard under tort law is higher than that under regulation.

Source: Gunningham & Sinclair (1998, pp. 428+429)

National overall targets (according to the RED)

	Share of energy from renewable sources in gross final consumption of energy, 2005 (S_{2005})	Target for share of energy from renewable sources in gross final consumption of energy, 2020 (S_{2020})
Belgium	2,2%	13%
Bulgaria	9,4%	16%
Czech Republic	6,1%	13%
Denmark	17,0%	30%
Germany	5,8%	18%
Estonia	18,0%	25%
Ireland	3,1%	16%
Greece	6,9%	18%
Spain	8,7%	20%
France	10,3%	23%
Italy	5,2%	17%
Cyprus	2,9%	13%
Latvia	32,6%	40%
Lithuania	15,0%	23%
Luxembourg	0,9%	11%
Hungary	4,3%	13%
Malta	0,0%	10%
Netherlands	2,4%	14%
Austria	23,3%	34%
Poland	7,2%	15%
Portugal	20,5%	31%
Romania	17,8%	24%
Slovenia	16,0%	25%
Slovak Republic	6,7%	14%
Finland	28,5%	38%
Sweden	39,8%	49%
United Kingdom	1,3%	15%

Indicative trajectory

The indicative trajectory referred to in Article 3(2) shall consist of the following shares of energy from renewable sources:

$S_{2005} + 0{,}20\ (S_{2020} - S_{2005})$, as an average for the two-year period 2011 to 2012;

$S_{2005} + 0{,}30\ (S_{2020} - S_{2005})$, as an average for the two-year period 2013 to 2014;

$S_{2005} + 0{,}45\ (S_{2020} - S_{2005})$, as an average for the two-year period 2015 to 2016; and

$S_{2005} + 0{,}65\ (S_{2020} - S_{2005})$, as an average for the two-year period 2017 to 2018,

where

S_{2005} = the share for that MS in 2005 as indicated in the table "National overall targets"

and

S_{2020} = the share for that MS in 2020 as indicated in the table "National overall targets"

Rescaled (Q1*2)

Rescaled (Q1*2)				
Member State	Q1: Fulfillment of NREAP policy commitments	Q2: Adaquacy of support levels for each technology	Q3: Long-term security of support	Score
Belgium	2	0	-1	1
Bulgaria	-2	-1	-1	-4
Czech Republik	0	0	-1	-1
Denmark	0	0	0	0
Germany	2	1	1	4
Estonia	2	0	0	2
Ireland	2	0	0	2
Greece	2	0	0	2
Spain	-2	-1	-1	-4
France	0	0	0	0
Italy	2	0	-1	1
Cyprus	2	0	0	2
Latvia	0	-1	-1	-2
Lithuania	0	0	0	0
Luxembourg	0	0	1	1
Hungary	-2	0	0	-2
Malta	0	-1	0	-1
The Netherlands	2	0	-1	1
Austria	0	1	0	1
Poland	0	-1	0	-1
Portugal	-2	-1	-1	-4
Romania	2	0	0	2
Slovakia	0	0	0	0
Slovenia	-2	0	0	-2
Finland	2	0	0	2
Sweden	2	0	0	2
United Kingdom	2	0	0	2
Total	14	-4	-6	4
	5;10;12	6;19;2	8;17;2	

Totals efficient MS		
by absolute numbers		
rescaled		
9	4	14
equal scale		
9	7	11

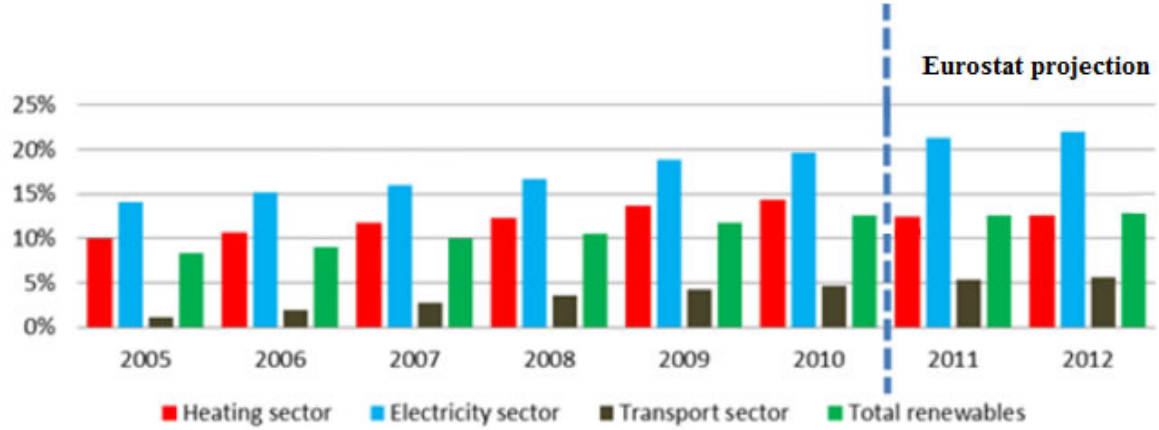
Totals efficient MS		
by percentage		
rescaled		
33,33333	14,81481	51,85185
equal scale		
33,33333	25,92593	40,74074

Progress renewable energies

As already mentioned in the introduction, the Renewable Energy Directive (European Commission, 2009) sets out a European framework for supporting the generation of electricity from renewable sources together with fixed national targets to at least reach an overall EU-wide share of 20% renewables from overall energy consumption. This is in line with the main goals of the Europe 2020 Strategy for growth, contributing to innovative solutions in industry and leading to Europe being the frontrunner in technology on the matter. In addition, it has a positive impact on emission reduction, improves energy security, and decreases European dependency on energy imports (European Commission, 2013b, p. 2)

In 2010, the share of renewables of overall EU-wide consumption in the power sector exceeded the set goal (see table in the appendix for a more detailed status overview).

Sectoral and overall growth of renewable energy in the EU (Eurostat)



Source: European Commission (2013b, p. 4)

Anyhow, the COM identifies some major issues with the national action plans departing from the agreed upon framework. Central distortions for the growth of renewables remain to be tackled slower than expected, increasing the legal risks of (potential) investors. Although the snapshot perspective looks well, because of remaining administrative as well as infrastructural obstacles, a generally conservative growth-pattern, and breaches with the pursued domestic policies alongside with incoherent subsidization, the COM has reason to believe, that investments may decrease in the future or be substantially delayed. This is when MS don't take further measures to adhere to the rules of the game[41].

Because investments usually have lead times of around eight to ten years, every major mistake that is being made today, is going to have substantial influences on the development of renewables in the years to come.

When evaluating the national results with respect to the original intermediate goals one has to bear in mind that these just are the starting point of a track that becomes steeper as it draws near to 2020. Even if MS would keep up the current pace of growth in renewables, the COM projects 11 MS to reach the final goal. Besides the national obstacles named earlier this is also partly due to the financial crisis which had crucial influence on capital costs. Even more so, it

[41] Although MS had seven years' time to reach the first 20% percent of their goal, the subsequent steps are shorter and steeper. 2 years for the next 10% until 2014, 15% until 2016, 20 until 2018 and finally 35% until 2020 (European Commission, 2013b, p. 21).

is emphasized, that relatively cheap measures to reduce administrational burden and therefore increase energy efficiency are highly relevant at this point. With regret, it also has to be acknowledged, that most MS don't even bother to react to Article 22 paragraph 3 of the RED, which is about the MS' obligation to report on which measures they plan on pursuing in order to reform the administrational system.

Also absent in most domestic approaches is a single administrational body overseeing and deciding upon projects to be granted permission and in consequence being supported by the scheme, let alone providing sufficient information in order to support applicants. This doesn't quite contribute to transparency either (European Commission, 2013b, p. 11).

It cannot be stressed enough how big the impact of sub-optimal regulation on the cost-effectiveness of renewable energies is. The simplification and subsequent increase in energy efficiency is thus a substantial factor in fostering the whole undertaking (European Commission, 2013b, pp. 10-12).

This is specifically stated in context to the EU ETS not having been able to contribute successfully on the part of posing incentives for investors to invest in long-term solutions towards CO2 abating technologies (European Commission, 2013b, p. 11).

There are plenty of instruments out there that are operationalized within different domestic frameworks. All of them have good and bad attributes. Because with some the share positive attributes not only might be but in fact is bigger, the COM supports the idea of invoking the cooperative instrument of best practices for the MS to harmonize the respective systems in a way that society benefits. Because financial instruments as a measure play an outstanding role in the intent to expand the renewable energy sector, reforms on the matter are badly needed to assure cost-efficient and market-oriented conceptualization. It is of high importance that one makes sure that state involvement does remedy market failure and does not foster market distortion (European Commission, 2013b, p. 14).

In addition to the need for developing common concepts of supporting renewable, the COM highlights the importance of European-wide cross-border cooperation.

Four elements of the reform and integration of renewable energies are reemphasized (European Commission, 2013b, p. 15):

- Strong growth
- Cost reduction
- Market integration
- Europeanization

As mentioned earlier, there is the inherent need for progress in the field of sustainable solutions to combating climate change. A major point within this framework is the development and improvement of sources of renewable energy sources.

Here, companies and their respective research departments play a crucial role - especially when using market instruments as implied by EU climate regulation at the moment.

As a matter of fact it doesn't come as a surprise that companies are generally not behaving and investing in a benevolent manner. For them to invest in anything there needs to be an incentive. This may be the prospect of future gains or the threat of facing financial reprisals in case of violation of set rules.

The ETS was set out to expose emitters to a benchmark that was eventually meant to force them to reduce emissions and subsequently also opt for improving their facilities as prices for

certificates or the threat of heavy fines would exceed the cost of investing in a more sustainable operation, hence, giving an incentive for investing and thus also fostering innovation in the field of renewables. Well, that failed big time for the various reasons named above and there is little prospect for the ETS to have a recognizable positive impact on climate change until 2020. This also acknowledged by the COM in their report on the progress of renewable energies (European Commission, 2013b, p. 11).

Luckily, EU climate policy may hold a trump with their Renewable Energy Directive. Various national approaches towards supporting RES-E enhancement have been made over the last two decades, with varying success. The COM states that it might also be time for a harmonized European framework on Renewable Energies support. In 2009 with the introduction of the directive, a further approach has been made towards a more unified system, introducing measures of cooperation related to the various national support schemes allowing for joint projects amongst MS and with 3rd countries.

It is the aim of this work to investigate upon the possible impact the Renewable Energy Directive had on national improvements towards more sustainability in the Energy Sector subsequently being able to evaluate the combination of the two measures (renewable energy support and the EU ETS) as being a good or bad one. While economic theorists claim that an economic instrument like the EU ETS is to be functioning alone since according to them and additional measures hamper the proper working of the instrument, reality along with various theorists from different departments suggest otherwise.

The following theory part introduces concepts on how to evaluate and measure success of environmental regulation. Moreover, the discussion about whether or not the EU ETS should be complemented by additional measures is picked up along with theoretical insights on environmental instrument combinations.

TGC or FIT

Because of the fact that energy generation is a high contributor to CO2 emissions it is of particular importance that there is an increased use of renewable energy, especially with respect to energy being produced from renewable sources in a sustainable manner. This was also acknowledged throughout the various legislative bodies in the EU (European Commission, 1997; European Parliament and Council, 2001).

Member states currently do quite well when it comes to the progress of reaching their individually set goals (insert link to table – find table). However the prospect of this undertaking is, it is still nice to hear as the EU ETS is performing rather bad when it comes to the actual results (as described earlier). For the whole Climate Package to have a real-world impact, much stronger efforts are necessary to reach the reduction targets for GHG emission set in 2007, which calls for a 20% reduction by 2020 and a 60–80% reduction by 2050 compared to the 1990 baseline (European Parliament, 2007, 2008).

This being said, the question of which policy instrument is most likely to be effective in creating an environment stimulating the strongly required investments in RES[42] pops up immediately.

In the past, besides there being a series of different instruments, two main instruments were applied in the EU member states, supposedly fostering the wished for technological advances in RES. Those two are namely: feed-in tariffs (FITs) and tradable green certificates-based quotas (TGCs) (Bergek & Jacobsson, 2010, p. 1255).

[42] such as wind turbines, photovoltaic cells and biomass, combined heat and power plants (Bergek & Jacobsson, 2010, p. 1255)

***FITs**:*

In countries relying on FITs, government mandates owners of the distribution networks to accept RES-E and pay a regulated (fixed) price or alternatively a price premium for that very electricity.

Early adopters were Denmark, Germany and Spain with the FITs being the dominant system in the EU (Bergek & Jacobsson, 2010, p. 1255). The system is paid for involving cross-subsidies among electricity consumers, the taxpayer through the government budget or through various combinations (Menanteau et al., 2003).

***TGCs**:*

The TGC model is a more competitive one, where RES-E competes in the ordinary electricity market to the regular prices, but then being accompanied by certificate trading in a separate market for green certificates. Early adopters are Belgium, Sweden and the UK. Although again all having quite some different approaches towards the application of the TGC instrument.

Government who imposes the obligation to buy certificates corresponding to a certain quota of the respective overall electricity sales or consumption creates demand for these certificates (Bergek & Jacobsson, 2010, p. 1256).

Advantages

According to leading scholars in the field (cf. Contaldi, Gracceva, & Tosato, 2007; Morthorst, 2000; Verhaegen, Meeus, & Belmans, 2009) expected main advantages of TGCs are the following:

1. Cost-efficiency
2. TGCs ensure a stable development towards set deployment goals
3. It drives innovation and cost-reduction through ‘‘double’’ competition in both electricity and certificate markets

The COM, in early stages already, acknowledged the benefits of a harmonised system of Member States efforts in order to “(a) be compatible with the EU treaty rules, (b) provide a considerable level of security (depending on design) and (c) ensure static efficiency, i.e., that electricity is generated and sold at minimum cost” (European Commission, 1999, p. 15). Subsequently, the COM advocated a competitive, quota-based approach (cf. European Commission, 1999).

When regarding the cost-efficiency, not only did the responsible authors refer to social, but also to consumer costs as they believed that an inappropriately high price for consumer might render RES-E too expensive and hence erode public support for the cause (European Parliament and Council, 2001, p. 34). In addition, this way of thinking is quite logical as it is one of the main goals of EU environmental policy to keep energy prices for consumers at a low level (Sáenz de Miera et al., 2008).

It is hence a bit of a surprise, that the COM didn’t suggest a harmonised quota based system. This was mainly due to the fact that by the end of 1990s some Member States, among them big players like Germany, had already introduced FITs. The officials argued, that “although a harmonised European-level support scheme would be beneficial, the experiences of different support schemes were too limited to conclude which model” (Bergek & Jacobsson, 2010, p. 1256).

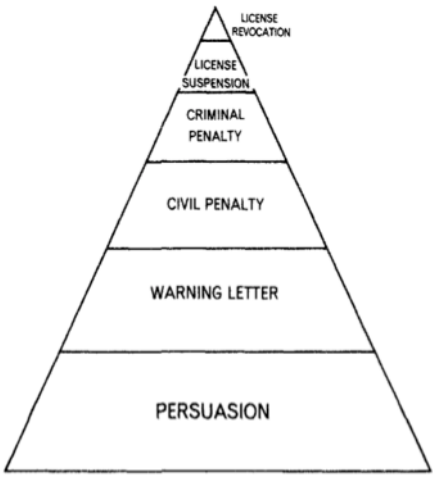
With respect to the scope of this paper, this biding approach is particularly annoying, as TGC-like systems were additionally expected to stimulate innovation. The COM (1999) found that

since a FIT-system is not based on competition while a quota based system is, it should by definition impose less incentive for innovation. Furthermore, it was stated that competition-based schemes had proven to be the most efficient instrument for driving down prices of generating RES-E and again, as a result of competition, for fostering innovation and hence ensuring the improvement of renewable in the long-run.

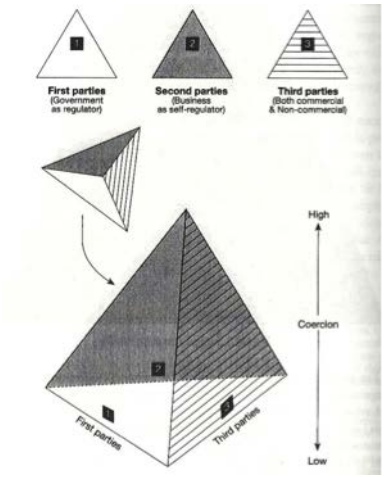
Criteria Bergkek and Jacobsson used for assessing the performance of the Swedish TGC system:

1. effectiveness (ability to increase renewable electricity generation/meet targets)
2. costs efficiency, in terms of both social cost and consumer cost
3. equity (avoiding overcompensation)
4. the ability to stimulate technical change and drive costs down in the longer term

Enforcement pyramid by John Braithwaite and expanded enforcement pyramid by Gunningham, Grabosky, and Sinclair



Enforcement pyramid by John Braithwaite *(1992, p.35)*



Expanded enforcement pyramid by Gunningham, Grabosky, and Sinclair

(1998, p. 398)

Choice of instrument-combination and score on effectiveness and efficiency													
X	**Main Instrument**	**FIT**	**Premiums**	**Quota System**	**Subsidies**	**Tenders/Reverse auctions**	**Loans**	**Tax exemptions**	**Tax reductions**	**Tax refunds**	**Net-metering**	**Effectiveness**	**Efficiency**
Austria	FIT	X			X							-5,51	1
Belgium	Quota (Regional mixture with respect to supplementary measures)			X	X						X	48,9	3
Bulgaria	FIT	X			X		X					21,02	-4
Cyprus	Mixed (subsidies, premium, net-metering)		X		X						X	-68,44	2
Czech Republic	FIT (choice between tariff or premium)	X	X		X							1,60	-1
Denmark	FIT		X		X		X				X	-4,07	0
Estonia	FIT		X		X							511,38	2
Finland	FIT		X		X							6,12	2
France	FIT	X				X			X	X		-2,03	0
Germany	FIT	X	X		X		X					4,06	4

Greece	FIT	X			X			X			X	-10,47	2
Hungary	FIT	X			X							6,01	-2
Ireland	FIT	X							X			-27,25	2
Italy	FIT	X	X			X			X			7,89	1
Latvia	FIT (currently on hold)	X				X						-5,93	-2
Lithuania	FIT	X			X		X	X				-7,51	0
Luxembourg	FIT	X			X			X				-5,59	1
Malta	FIT?	X			X							-86,34	-1
Poland	Quota			X				X				-11,36	-1
Portugal	FIT	X										-0,53	-4
Romania	Quota			X	X							11,10	2
Slovakia	FIT	X			X			X				-6,81	0
Slovenia	FIT	X	X		X		X					-0,56	-2
Spain	FIT (currently phased out)	X	X							X		2,37	-4
Sweden	Quota			X					X			1,96	2
The Netherlands	FIT		X		X		X	X		X	X	12,73	1
United Kingdom	Mixed	X		X			X	X				-18,33	2

Deviation from planned trajectory (effectiveness) and score on efficiency based on 2010 data