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National and Supranational Policy Interplay

A Study of the Interaction between the Swedish Electricity Certificate System and the European Union Emissions Trading Scheme

Abstract

Within the policy mix, policy instruments are developed for complimentary purposes where possible interactions can take place. Research has shown that renewable energy support policies on a national level and carbon dioxide emission trading systems on a supranational level can cause negative interaction effects due to the connection through their carbon dioxide component. This problem has been stated to need more empirical research and very few country specific studies have been made to analyze the understanding of the effects and whether this is indeed a problem or not.

The purpose of the study is to examine the perceptions of the interaction between the Swedish Electricity Certificate System (ECS) and the European Union Emissions Trading Scheme (EU ETS) from a Swedish perspective. The study's inductive approach generates a theoretical framework for how this specific interaction can be understood and how policy interactions in general can be understood. A qualitative design was adopted through semi-structured interviews with relevant actors within Sweden to gather the data for the empirical findings.

The results indicate various understandings of the interaction which conforms into two factions; one faction sees the interaction as a non-problem due to the uncertain magnitude of the interaction effect and due to the notion that the ECS is not a climate instrument; whilst the other faction maintains that the interaction is a problem since the ECS is inherently interlinked with carbon dioxide emissions and thus functions partly as a climate policy, and will therefore increase the costs of carbon dioxide emission cuts due to locked-in measures.

The results furthermore demonstrate theoretical developments that show multiple policy-level notions and overlapping policy purposes that may explain the interaction and its components which lastly conclude in policy recommendations on the matter.

Key words: *policy, instrument, interaction, renewable, energy, carbon, emissions, trading.*

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Filip Ehrle Elveling
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Abbreviations and acronyms

CDM	–	Clean Development Mechanism
CHP	–	Combined Heat and Power
EC	–	Electricity Certificate
ECA	–	Electricity Certificate Act
ECS	–	Electricity Certificate System
EU	–	European Union
EUA	–	EU Allowance
EU ETS	–	European Union Emissions Trading Scheme
ETS	–	Emissions Trading System
GDP	–	Gross domestic product
GHG	–	Greenhouse gas
GWP	–	Global warming potential
JI	–	Joint Implementation
MWh	–	Megawatt hour
NAP	–	National Allocation Plan
OECD	–	Organisation for Economic Co-operation and Development
RES-E	–	Electricity from renewable energy sources
SFS	–	Swedish Code of Statutes
SOU	–	Swedish Government Official Report
SUS	–	Swedish Emissions Trading Registry
TGC	–	Tradable Green Certificate
TWh	–	Terawatt hours
UNFCCC	–	United Nations Framework Convention on Climate Change

I–Introduction

Policy instruments are widely employed for different reasons across all fields of governance and government. Described as a means through "which governments seek to influence citizen behavior and achieve policy purposes" (Schneider & Ingram, 1990, p. 511) policy instruments enable or disable the ability to do things one way rather than the other (Schneider & Ingram, 1990, p. 510). Scholars have generally described and studied policy instruments through several perspectives and to date there are various ways of conceptualizing instruments and their design (e.g., Vedung, 1998; Salamon, 2002; Eliadis, Hill & Howlett, 2005). Market-based policy instruments in particular have become increasingly popular over the last three decades (Mason & Muller, 2007, p. 81). These instruments encourage behavior through "market signals rather than through explicit directives" (Stavins, 2001, p. 1) and can be thought of as 'new' types of instruments that are assumed to offer "less interventionist forms of public regulation" (Lascoumes & Le Galès, 2007, p. 13; Jordan, Wurzel & Zito, 2005).

Initially referred to as a novelty when combining monetary and fiscal policies, the issuing of several types of policy instruments in certain policy spaces has been known as the policy mix (Brunner & Meltzer, 1997, p. 69). This policy mix concept implies that the combination of policy instruments interacts and creates a more significant effect than the instruments would have had if otherwise acting in isolation. The notion of an effective policy mix however is harder to determine, and the implication might be a decrease in overall performance of the policy mix if negative interactions take place. Especially climate policies have been known to be affected by interactions, where the instruments are seldom applied in complete isolation since they encompass so many different policy areas such environment, agriculture, transport and energy (Gupta et al., 2007, p. 753).

Two market-based instruments that encompass both climate and energy are the Emissions Trading System (ETS) – a carbon dioxide emissions reduction instrument – and the Tradable Green Certificate (TGC) – a renewable energy promotion instrument. Since energy and climate policies are inherently interlinked, multiple instruments have been implemented simultaneously within energy, climate and environment policy fields at national and supranational levels (Kautto, Arasto, Sijm & Peck, 2012, pp. 117–118). Notions of that the policy space has become increasingly congested have risen where too crowded policy fields with multiple instruments can cause interaction problems when renewable promotion schemes and carbon reduction policies are combined (Linares, Santos & Vantosa, 2007; Kautto et al.,

p. 118). These simultaneous adoptions have sparked concerns of overlapping goals that can cause conflictions and negative synergies (e.g., Oikonomou & Jepma, 2008; Sorrell, 2003a; Sorrell & Sijm, 2003; del Río, 2006).

In the European Union (EU), the introduction of climate policies and policies that promote renewable energy sources has been on the agenda since the 1950s; and in March 2007 the European Council adopted a combined energy and climate package, the Europe 2020[1] strategy (European Council, 2007; Swedish Government, 2009a, p. 18; European Commission, 2010, p. 2; Jordan, Huitema, van Asselt, Rayner, & Berkhout, 2010). Supranational policies enable or disable Member States on the national level to perform in a certain way to reach the targets set up by the EU. In terms of climate change mitigation, renewable energy sources have the potential to greatly reduce greenhouse gas (GHG) emissions – mainly carbon dioxide – associated with electricity production and are thought to contribute towards sustainability (Haas, 2001, p. 5). The importance placed on renewable energy to mitigate climate change, improve energy security and increase local industrial employment and industry opportunities has been highlighted in the Europe 2020 strategy, the EU's Renewables Directive and by national Member State policies (European Commission, 2008a; European Commission, 2008b; European Union, 2009a; Jordan et al., p. 103).

On the renewable energy side, TGC systems have been widely introduced throughout several countries within the European Union (del Río, 2006, pp. 1363–1364). The TGC is a system that aims to introduce market competition into a production of electricity for "technologies that are not fully competitive with traditional supply systems" (Meyer, 2003, p. 669). The TGCs create a certificate for the producing unit which can be sold on a separate market, and thus the producer of electricity from renewable energy sources (RES-E) obtains extra revenue aside from the normal sale of electricity. The demand for the TGCs originates from a statutory obligation put on the electricity consumers or providers (del Río, 2006, p. 1366). This policy has yet solely been adopted by individual Member States within the European Union, and is thus exclusively functioning on a national level.

As a pure climate instrument to reduce the carbon dioxide emissions, the European Union adopted a form of emissions trading system, the European Union Emissions Trading Scheme (EU ETS), which came into force in 2005. Also called cap-and-trade; the system puts a price on emissions by setting an overall ceiling on the total emissions allowed, and creates a market where the emission allowances can be traded amongst the covered entities. Since the total cap

[1] 20% increased renewable energy, 20% reduction in carbon dioxide emissions and 20% increased energy efficiency to year 2020.

is purported to be lower than the otherwise total emissions, the covered entities will have to lower their emissions, for example by investing in carbon dioxide reducing technologies or by buying emission allowances from other entities that need not use all of theirs. This is thought to create a cost-effective way of reducing total carbon dioxide emissions since the emission cuts are made where the conditions are most cost-favorable (Jordan et al., 2010, pp. 125–126). The EU ETS is the first cap-and-trade program covering more than one country (European Commission, 2010, para. 1), and the decision mandate is set at the EU level; the supranational level.

This two-level framework design of national and supranational policy instruments can however cause unwanted problems, and there is a possibility of unintentional effects due to the interaction of the two instruments. A theoretical problem is revealed when looking at research on the interaction of different policy instruments, and in particular the example of renewable energy source promotion instruments coupled with emission trading system instruments. Concerns have been raised by scientific and theoretical scholars on the implications of the interaction of divergent supranational and national policies, where some denote, for example, that TGCs would act as a complement to the EU ETS since the EU ETS is technology-neutral and instead provides an incentive for low-cost abatement technologies (Brick & Visser, 2009, p. 13). Others have, on the other hand, noted that the coexistence causes a complex interaction that can induce conflicts and synergies in both positive and negative ways which will affect the policy output (del Río, 2006, p. 1364). In addition, the interactions between carbon dioxide policies and renewable policies have been proven to drive up costs for reducing carbon dioxide emissions (Anandarajah & Strachan, 2010, p. 6734). Studies have shown that "this is an under searched field concerning theoretical analysis and even more so regarding empirical studies" (del Río, 2006, p. 1388) and that there is a lack of empirical studies on the "interaction in different national settings" (del Río, 2006, pp. 1364, 1387–1388). Moreover, Widerberg believes that "more research within this area, both theoretical and empirical" (Widerberg, 2011, p. 16) is needed, and other studies of the interaction reach an overall consensus in that more empirical research is desired on the matter (e.g., Sorrell, 2003a; Sorrell & Sijm, 2003; Oikonomou & Jepma, 2008; Kautto et al., 2012).

This thesis focuses on the Swedish perspective of the interaction between the Swedish Electricity Certificate System (ECS), a form of TGC, and the EU ETS. By developing a policy instrument perspective on the issue of how national support policies for renewable energy can interact with supranational policies of carbon dioxide emission trading systems, this study approaches this problem through an inductive approach. Since the empirical

research is limited, and the theoretical frameworks of national and supranational policy interplay are not yet fully developed, this inductive approach was chosen to move further on within the field and try to fill an apparent research gap. In order to understand underlying structures of policy instrument interplay, this thesis draws upon the specific case of the interaction and tries to generalize the empirical findings into relevant theory that might, after rigorous testing and further developments, be applied on other policy interactions.

Four central concepts[2] are developed and derived from the problem framing and previous research which will permeate the structure throughout the thesis. This study examines the interaction problem from the Swedish perspective and seeks to clarify how it is perceived and why there are so many different understandings of the effects of the interaction by using a qualitative study design where relevant actors were interviewed to collect the needed data.

I.I–Organization of thesis

The ensuing disposition of the study is as follows; after this introduction chapter, the second chapter will frame the problem to better understand the components and the relevant Swedish perspective. In addition, the chapter will examine previous research on the ECS and the EU ETS eliciting the purpose of the study and subsequent research questions. Lastly, the ECS and the EU ETS are explained in more detail to enhance the understanding of the two instruments that will result into the central concepts of the thesis, derived from the former parts in the same chapter. The third chapter outlines the design of the study and discusses methodological considerations worth mentioning in qualitative research, as well as providing information about the data collection and management, and the selection and delimitation processes.

The fourth chapter presents the empirical findings in a neutral way where the results are presented under each representing central concepts category. Chapter five analyzes the findings based upon the central concepts and the purpose, where the research questions are answered based upon the earlier analysis. The sixth chapter will develop a theoretical framework derived from the empirical findings and the analysis, where theoretical conceptions are made of the relevant results. The last and subsequent chapter will conclude the most important findings in the study and summarize noteworthy results that can contribute to further discussion and research on interacting policy instruments.

[2] The concepts; *perception of problem*; *effectiveness*; *national sovereignty*, and; *harmonization & coordination,* will be described more in-depth in chapter II.VI–Central concepts, see page 20.

II–Problem framing

The increased usage and production of electricity from renewable energy sources (RES-E) are associated with several benefits, such as climate change mitigation – due to reduced emissions of carbon dioxide into the atmosphere –, improved energy security, enhanced local tax revenues as well as increased local employment (Haas, 2001, p. 5; Philibert, 2011, p. 9). However, the chief reason for adopting measures to increase the share of renewable electricity in the energy mix seems to be the carbon dioxide emission reductions that it is thought to induce in the "fight against climate change" (Böhringer & Rosendahl, 2009, p. 3). Different support schemes have been adopted in order to increase the share of renewable electricity and to speed up the transition to a more renewables-based society.

The Swedish Electricity Certificate System (ECS) is one way of encouraging additional production of RES-E. As seen by most of the simulations of future energy scenarios, the increase of energy from renewable sources plays a big part in reaching climate goals and a carbon-neutral society (e.g., European Commission, 2011a; Swedish Environmental Protection Agency, 2012; Gustavsson, Särnholm, Stigsson & Zetterberg, 2011).

In 2009 the Swedish Government issued a joint energy-and-climate bill that highlights the interconnection between climate goal fulfillment and sound energy policies (Swedish Government, 2009a; Swedish Government, 2009b) in order to move away from fossil-energy dependency and thus to forcibly reduce the negative impact of climate change (Swedish Government Offices, 2009, p. 1). The ECS is part of the bill on energy issues, where it is stated that the instruments present a quick way out of the fossil-society with sharp decreases in carbon dioxide emissions and that further promotion of production of renewable electricity is imperative to reach the climate change goals (Swedish Government, 2009a, p. 9).

The ECS, first adopted in January 2003, is a form of a Tradable Green Certificate (TGC) and creates a tool for spurring on the production of RES-E. The system is a market-based policy instrument that entitles producers of electricity from renewable sources one (1) certificate per megawatt hour (MWh) produced. These certificates are then sold on a separate open supply-and-demand market to the electricity users and providers that are obliged to purchase a set annual quota of Electricity Certificates (ECs). Thus, the ECs provide an extra incentive and income to producers of RES-E. The fact that there is an annual quota encourages investment and causes long-term security of supply.

This will, in fact, "reduce [a country's] fossil fuel dependency and mitigate the risks related to the security of energy supply" (del Río, 2006, p. 1364). Accordingly, the supporting

documents of the ECS state that the system is "intended to help Sweden achieve a more ecologically sustainable energy system" (Swedish Energy Agency, 2011, p. 7). Despite these potential positive impacts, a pre-study of the ECS acknowledges the fact that an increased production of RES-E does not necessarily lead to decreased emissions of carbon dioxide unless the total electricity usage diminishes or remains constant. At the same time however, simulations on the adoption of the ECS have shown that it will in fact diminish the total carbon dioxide emissions in Sweden, and extendedly in the Nordic countries (Swedish Government Offices, 2001a, p. 31).

As the ECS is a policy instrument employed by the Swedish government to attain a certain goal, it is vital to analyze its effectiveness. Importantly, the interaction of the ECS with another policy instrument on the same market might cause concern for unintentional interaction effects. This was in one way highlighted in a coproduced report by the Swedish Environmental Protection Agency and the Swedish Energy Agency (2007) that reviewed economic environmental instruments, and especially market-based systems such as ECS and the EU ETS and their possible conjunction with other instruments. However, the two instruments themselves were not compared in detail of the extent of their potential interaction effect due to their conjoining objectives. As highlighted by Runar Brännlund[3] (2011), in the case of the ECS, its co-existence with the European Union Trading Scheme (EU ETS) could pose a potential empirical problem. This conflict could mean that the ECS does not diminish the overall EU carbon dioxide emissions. This can happen because under the EU ETS a cap on the total emissions allowed is set on each individual Member State, which can then, in order to spur on competitiveness and cost-effectiveness, trade their allowances. If Swedish energy consumers and suppliers are forced under the ECS to purchase a certain amount of energy from RES-E, and if this amount increases the share of RES-E so much that Sweden need fewer emission allowances than it receives under the EU ETS, Sweden can then trade – sell – the remaining emission allowances from a Swedish entity to another entity within the EU. Thus, the actual carbon dioxide emission is just moved away from Sweden and emitted somewhere else within the EU (Vredin, Brännlund, Ljungqvist, Strömberg & Wallgren, 2011, p. 198), leading to an offset of the proposed environmental benefits of the ECS. "The actual climate effect of the change [to renewable energy] in […] energy consumption is thus zero; it will only cause a redistribution of the carbon dioxide emissions between different emitting

[3] Professor at Umeå School of Business and Economics, who has voiced concerns regarding the interaction in several articles and papers (e.g., Broberg & Brännlund, 2010; Brännlund, 2011; Vredin, Brännlund, Ljungqvist, Strömberg & Wallgren, 2011).

sources within the emissions trading system" (Broberg & Brännlund, 2010, para. 6). Brännlund further contests the environmental benefits of the ECS's interaction with the EU ETS by saying that the "Electricity Certificates do not lead to decreased emissions, that is a misconception" (Brännlund, 2011, para. 5). His research therefore highlights that there might be a specific problem with interactions between national and supranational level policies. In this case, it has been noted that the EU ETS at a supranational level may cause conflicts with national level policies and offset the environmental benefits that the ECS may induce.

Böhringer and Rosendahl are touching on the same problem with their economic analysis of the interaction of TGCs and a cap-and-trade system, where they state that the certificates will in fact serve the dirtiest electricity producers and only increase the price of reaching emission reductions targets (Böhringer & Rosendahl, 2009). Since there is a cap on total emissions set by the cap-and-trade system, the TGC system will lower the price of emission allowances within the cap due to increased production of non-carbon emitting electricity, and the most carbon-emitting electricity producers will increase their production in order to keep the emissions cap constant (Böhringer & Rosendahl, 2009, p. 7). Philibert (2011), on the other hand, gives other insights on the interaction's effects and acknowledges that there is an interaction but states that the technological advances of the two connected policies on the renewable electricity production sector are well worth a possible price increase of reaching the short term emission goals (Philibert, 2011, p. 20).

Ultimately, as put forward by del Río (2006, p. 1388) this problem concludes in its lack of research, both theoretically and empirically. There is some research conducted on the implications of both the EU ETS and different national energy policy systems – notably for the United Kingdom and the Netherlands – *before* the adoption of the EU ETS, but there is a strong absence of any kind of consequence analysis *after* the emissions trading system has been adopted (e.g., Sorrell, 2003b; Meyer, 2003; Sijm & van Dril, 2003; del Río 2006; Oikonomou & Jepma, 2008; Kautto et al., 2012). There seems to be a knowledge gap of the existence and the implications of an interaction between the ECS and EU ETS from a Swedish perspective. Therefore it is of great interest to try to bridge that knowledge gap. From a political scientist's perspective, empirical research on how the interaction is perceived and why it is understood differently is the focal point of this thesis where there seems to be a disharmony between the ECS and the EU ETS policies.

II.I–Previous research

Individual research on the ECS and the EU ETS has been conducted and assessed in numerous studies, books and articles. The literature on TGCs in general is well-developed and has been around for some time. In addition, the particular Swedish ECS policy instrument has been assessed for almost a decade and reworked and revised in order to obtain the best possible national effects. The EU ETS however has not been in place for that long a time, and is, as mentioned earlier, the only example of a supranational emissions trading system. Despite this, the core principle of emissions trading and a cap-and-trade system have nonetheless been subject to intense scrutiny and evolvement, and the 1970s and 1980s Acid Rain Program in the U.S. is the best viable example of experiences gained through a cap-and-trade system. As of relevance to this study, the individual performances of the two policy instruments are of some value, and the TGC literature in general can be seen through works from Haas (2001), Fristrup (2003), Lemming (2003), Meyer (2003), Agnolucci (2007) as well as Amundsen and Nese (2009). More specific studies of the Swedish system and the experiences gained from the period of 2003–2008 are outlined in the study of Bergek and Jacobsson (2010), as well as the most recent updates on the ECS from the Swedish Energy Agency (2011a) with statistics, projections and assessments. Numerous other articles, studies and reports have been written on the subject, but the ones chosen above are the most relevant to this study. However, two early studies on a harmonized TGC market in the EU funded by the European Commission under the 5th Framework Programme are of note, namely INTRACERT (The Role of an Integrated Tradable Green Certificate System in a Liberalising Market, 2000) and RECERT (European Renewable Electricity Certificate Trading project, 2001) that mention procedural terms of harmonizing the internal TGC energy markets.

The EU ETS, as with literature on TGC, has been assessed by numerous scholars and organizations. Works on the scheme largely focuses on the efficiency and effectiveness of the supranational instrument, and can be seen in works by Brännlund et al. (1998), Klepper and Peterson (2004), Åhman and Holmgren (2005) as well as Ellerman and Joskow (2008). The efforts are mainly focused around the implications of the scheme in general or for a specific area – such as Åhman and Holmgren (2006), who assess the entrance obstacles in the Nordic energy sector due to the EU ETS – which can provide an overview of the scheme. The most relevant data of the scheme and the core functions can be found at the European Commission's Climate Action homepage (European Commission, 2010).

The real valuable studies for this thesis are the assessments of the *interaction* of the two named policy instruments, and here the literature is not as encompassing and numerous as with the actual individual assessments and studies of the two. Although there are aplenty of papers throughout the past decade that cover the potential for an interaction effect, the real consequence analysis studies are strikingly absent. Two main works on the interactions are the somewhat opposing papers of Böhringer & Rosendahl (2009) and Philibert (2011). The latter is mainly a response paper to the former, and discusses the issues brought up by Böhringer and Rosendahl: namely that the interaction of TGC and EU ETS *serves the dirtiest*. Their economic analysis is based on the effect of the carbon price when coupled with the two differentiated policy instruments. Their main conclusion states that due to the three-fold interaction steps in the medium to long term: the TGCs will decrease the output of carbon-intensive electricity, which will in turn lower the price for carbon emissions that will, consequently, because of the total emissions cap, benefit the most carbon-intensive electricity producers since economic market-forces predict that they will increase their output to keep total emissions constant. The first short-term effect affects all carbon electricity producers symmetrically – and negatively – whereas the second, medium to long term, effect is asymmetrical, since the least-emissions intensive electricity producers will decrease their production the most (Böhringer & Rosendahl, 2009, p. 7). This statement goes well in hand with the problem that Vredin et al. (2011) and Brännlund (2011) acknowledges, which makes strong claims that the environmental benefit may well be offset by the two interacting policies. Nonetheless, Philibert, (2011) responds to the issues brought up by Böhringer and Rosendahl where he assesses the more long-term effects of the technological advantages the two policies will bring for the future transition to a renewables based energy society. Although he somewhat agrees with the interaction effects of Böhringer and Rosendahl and states that the overall costs of achieving the carbon dioxide emission reductions tied to the EU ETS may be increased due to the interaction, the technological advances of the renewable energy sector are important enough in a long-term perspective to justify the effect. Seeing into the future, he argues that renewable energy production will play an even more prominent role to mitigate climate change, and that the cost-effectiveness of the technologies must be in place to facilitate that transition. Lastly, he argues that a "possible policy recommendation would be to take better account of the interactions among policy instruments" (Philibert, 2011, p. 20).

Another relevant study for the purpose of this thesis is the literature review of the interaction between emissions trading and renewable support schemes, where del Río (2006) assesses the literature on the issue and makes general theoretical conclusions based upon his

review. An interesting point of his is that the coexistence of the two instruments can be justified due to their overlapping policy goals, *i.e.* reducing carbon dioxide emissions (del Río, 2006, p. 1378). He also acknowledges the fact that the more mechanisms, sectors and geographical areas the policies cover, the more complex it will be to regulate the synergies and interactions. A common regulation market would thus be desirable but such a notion may clash with national interests (del Río, 2006, p. 1388). The European Commission had plans for harmonization of the renewable electricity support schemes – in particular an EU-wide TGC scheme in the late 1990s (del Río, 2006, p. 1366) – but postponed the plans in order to gain more practical experiences from different measures (Meyer, 2003, p. 666). Moreover, del Río states that the current situation is characterized by "different instruments and targets in different countries" (del Río, 2006, p. 1388). One study of implications due to the interaction was set specifically in the Netherlands, where the conclusion denotes that the two theoretical policy instruments' coexistence "will have a significant impact on the performance of both the EU ETS and the selected instruments in the Netherlands" (Sijm & van Dril, 2003, p. 2). However, the study was made *before* the actual adoption of the EU ETS and was only based on theoretical assumptions and historical data.

Another study conducted before the EU ETS adoption states that "a combination of an international tradable permits market and a green certificate market is seen to be efficient in contributing in achieving the national CO_2-reduction targets if a close co-ordination of the two instruments is undertaken at least at the national level" (Morthorst, 2003, p. 73), a view that somewhat differs from the later assessments by Böhring and Rosendahl. Additional readings for research on the subject of dispersive nature, method and results are works by Morthorst (2001), Bonneville and Riahle (2005), Rathmann (2007), Abrell and Weigt (2008), Brick and Visser (2009), and Will (2010). One of the newer studies conducted by the OECD epitomizes the discourse by stating that "policy makers in countries with a 'cap-and-trade' system in place should consider carefully the actual contributions of any other policy instrument(s) they apply to address emissions from sources already covered by a binding 'cap'. There is a danger that some of the instruments will increase the total cost of reaching a given (environmental) outcome without making future reductions in the 'cap' more likely" (OECD, 2011, p. 12).

What has become clear and evident is that there are some missing pieces within the research conducted on the possible interaction of a TGC scheme and an ETS. Firstly, consequence analysis of the interaction is limited to economical predictions of price changes of carbon dioxide emissions and cost-effectiveness of achieving the emission goals based on historical data with largely differing results, whilst the theoretical research mainly was done before the

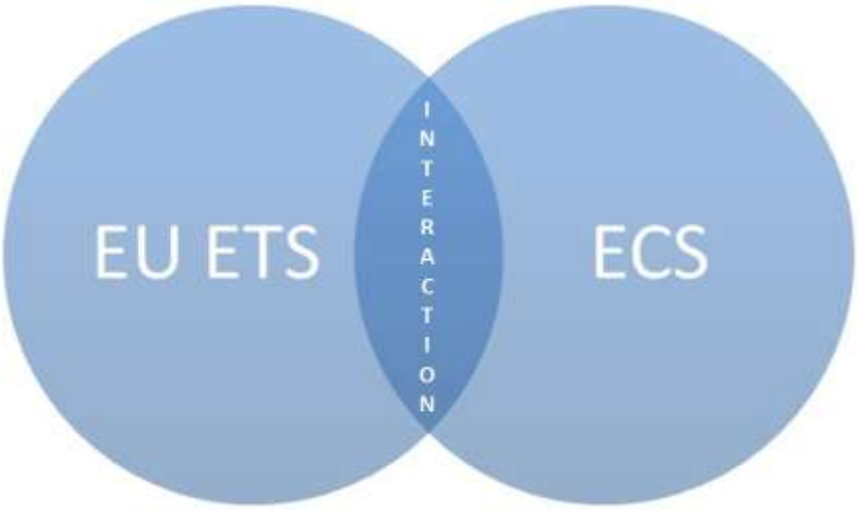
adoption of the EU ETS. It has been stressed that more research is needed, and based on the above mentioned previous research the perspective of how the interaction is perceived by policymakers is clearly missing. Secondly, the research has mainly been made on a general TGC and ETS market based on theoretical assumptions of the interaction of the two policy instruments. There is an apparent knowledge gap of a country specific context in this matter, and the Swedish example is no exception. The empirical research from one specific context set into the theoretical light of the policy instruments design is scarce, and is of the outmost importance in order to make advised and well-conceived policy design choices. Thirdly, and lastly, when adding on the perspective of the two-level framework – where a state's authority over the policies formulated on the supranational level is limited – coordination and harmonization issues arise on the agenda (e.g., Sijm & van Dril, 2003; del Río, 2006; Will, 2010; Brick & Visser, 2009). In order to solve a potential negative interaction effect the coordination between the national and supranational level may have to improve significantly, and there might be a need for harmonizing policy instruments for renewable electricity production on the supranational level.

II.II–Purpose

The purpose of this thesis is to examine the interaction between the Swedish Electricity Certificate System and the European Union Emissions Trading Scheme seen from a Swedish perspective. Research shows that different scholars understand the interaction effects differently and the actual empirical findings on whether the interaction is a problem or not are unclear. Due to the scarcity of available empirical research and relevant theoretical frameworks on the issue, an inductive approach is chosen for this study. By looking at the specific example of the interaction between the Swedish Electricity Certificate System and the European Union Emissions Trading Scheme, the thesis is set out to try to generate theoretical considerations that can explain the interaction in general terms which might enhance policy interplay understanding. This can in one way be described as moving from the specific to the general. The primary mode of analysis will be the development of four central concepts[4] where connections and contradictions of the empirical findings are generated into a theoretical framework that captures the key components of the interaction.

[4] These concepts will be presented more extensively in the chapter II.VI–Central concepts, page 20.

Figure 1. Interaction between the Swedish Electricity Certificate System (ECS) and the European Union Emissions Trading Scheme (EU ETS).



II.III–Research questions

The thesis centers around two research questions. The first one is of a more descriptive nature, which will help map out and create a picture of the connections and contradictions of different perceptions of the interaction. The second question has more explanatory character, by clarifying and illuminating the understanding of the first question. By answering the two questions, explanations and reasons for various viewpoints on the interaction effect are elucidated which will enable the development of a conceptualized theoretical framework.

♦ *How is the interaction between the Swedish Electricity Certificate System and the European Union Emissions Trading Scheme perceived in Sweden?*

♦ *Why is the interaction problem understood so differently?*

II.IV–Electricity Certificate Act

The Electricity Certificate System (ECS) is a form of a Tradable Green Certificate (TGC) system that, by entitling renewable electricity producers with a certificate for a certain amount of electricity produced, creates extra revenue to be obtained through the additional sale of the certificate aside from the normal sale of electricity. The demand of the certificates generally originates from a quota obligation (del Río, 2006, p. 1366). Some of the first countries to adopt a scheme in different forms for increased production of renewable electricity through TGCs were the United Kingdom, Australia, Italy, the Netherlands and the state of Texas in the U.S. (Swedish Government Offices, 2001b, pp. 47–57).

The first initiative to establish the Electricity Certificate Act (ECA) was taken in a committee's terms of reference from the Swedish Ministry of Enterprise, Energy and Communications (2000) which commissioned a Swedish Government Official Report (SOU) on the matter, led by director Nils Andersson. Indications in the committee's terms of reference of how the electricity certificate system could be designed were drawn from the Swedish Government's guidelines set out in an earlier government bill (Swedish Government, 2000). The 2001 SOU report suggested a system based on the guidelines of a market-based quota-system and proposed the ECS to commence in accordance with the committee's terms of reference on January 1st 2003. The ECA was promulgated through adoption in the Swedish Riskdag, adopted in the Swedish Code of Statutes (SFS) and came into force on the 1st of May 2003 (Swedish Code of Statutes, 2003).

Since the first enactment there have been several evaluations, proposals and reports on the system that extended the law on certain technical notes. The Swedish Government commissioned the Swedish Energy Agency in 2003 to conduct a first overhaul of the ECS that led to two reports, which eventually were concluded in the Ministry Publications Series report *The Electricity Certificate System's Development*[5] (Ministry of Enterprise, Energy and Communications, 2005). The newest law that came into force on the 1st of January 2012 (Swedish Code of Statute, 2011) also includes greater leeway for a common ECS market with other countries, and there is currently an agreement with Norway for such a common market.

[5] Translation from Swedish: *Elcertifikatsystemets utveckling*.

II.IV.I–Electricity Certificate System

The ECS obliges a certain annual quota of RES-E to be purchased formally by the end-user, although the electricity provider is obliged to adhere to the quota of the delivered electricity if the end-user does not actively seek to fulfill his or her own quota. The ECS is a market-based policy instrument that, through the obligation of quota-fulfillment, provides an extra revenue income for producers of RES-E where one electricity certificate (EC) is awarded for each megawatt hour (MWh) of electricity produced (Swedish Energy Agency, 2011, pp. 7–8). The ECs and electricity are sold unbundled, which means that the ECs are sold on a separate, open, demand-and-supply market, which, consequently, provides income to the producer from both the sold electricity and certificates (Swedish Energy Agency, 2011, p. 7). In this way is security of supply upheld and the additional revenue for the entitled electricity producers is supposed to spur on additional production, capacity enhancing measures and long-term investments so that the market may mature and create technologies for electricity production that in the future can be commercially viable (Swedish Government Offices, 2001b, p. 41).

The overarching goal of the ECS is to promote the production of RES-E (Swedish Code of Statutes, 2011, para. 1). The goal is a result of the overall shift from traditional fossil-based fuels to a society based on renewable energy sources happening throughout Sweden, the European Union and other industrialized countries (Böhring & Rosendahl, 2009, p. 3). This act is often referred to as the 'transition' of the energy sector and is a step towards mitigating carbon dioxide emissions, as well as improving energy security, building locally decentralized energy systems and fostering sustainable development in order to prevent global warming and climate change (European Union, 2001; Philibert, 2011, p. 9). In accordance with the climate goals, the increased production of RES-E is thought to create a more ecologically sustainable energy system (Swedish Energy Agency, 2011, p. 7). The transition to include more non-carbon dioxide emitting electricity in the energy mix could decrease the carbon dioxide emissions and thus decrease the environmental impacts of electricity production and usage.

The more specific goals for the increased production of renewable energy was set first in the 2001 initial SOU report, proposing to increase RES-E by 10 terawatt hours (TWh) between 2003 and 2010 (Swedish Government Offices, 2001b, p. 37). This goal was seen as ambitious compared to the small increase of 1.5 TWh in the earlier period from 1997–2002 (Swedish Government, 2006, p. 26). The goal has since increased significantly, and is of now set to 25 additional TWh by 2020 – an increase of 13.2 TWh from 2012 to 2020[6]. The latest adoption

[6] See Table 9 in Appendix C for a breakdown of the quotas and forecasted production increase.

has been reached in common with Norway to produce the accumulated target of 26.4 TWh from 2012 to 2020 (Östberg, 2011, p. 3). The joint market is supposed to create a larger market with a greater number of both quota obliged parties as well as renewable electricity producers. This is thought to improve the overall competition of the market and increase liquidity and create more stable prices (Swedish Energy Agency, 2011, p. 8).

Entitled sources of renewable energy for the production of renewable electricity approved for obtaining electricity certificates under the ECS are; wind power, solar energy, wave energy, geothermal energy, biofuels, peat – when burnt in Combined heat and power (CHP) plants – and hydro power – if the producing entity either; at the end of April 2003 had a maximum installed capacity of 1500 kW per production unit; is a new plant; has resumed operation from being closed due to rebuilding or other investments so that the plan can be regarded as new; increased production capacity from existing plants, or; can no longer operate in an economically viable manner do to decisions by the authority or to extensive rebuilding. All new entitled plants commissioned after the enactment of the ECA are entitled to certificates in the ECS for 15 years, or to the end of 2035 (Swedish Energy Agency, 2011, p. 7). The two governing authorities covering the ECS are the Swedish Energy Agency and Svenska Kraftnät (Swedish National Grid), both state-owned public utility companies (Swedish Energy Agency, 2011, p. 8).

As a summary of the ECS, the logic model underneath in Table 1 pictures the parts and processes if the instrument and its intentions.

Table 1. Logic model of the Swedish Electricity Certificate System

Input	Activities	Output	Outcome
Financial means	Renewable electricity certificate obligation	Compliance with quota obligation for RES-E production	Increased production of RES-E
Personnel	RES-E production certificate issuing	Increased revenue for RES-E producers	Increased investments in RES-E production
	Tradable certificate system	Diversified electricity production	Increased competitiveness for RES-E producers

II.V–European Union Emissions Trading Scheme

The European Union Emissions Trading Scheme (EU ETS) is a form of market-based cap-and-trade instrument that ultimately puts a ceiling on allowed emissions of carbon dioxide within one or several sectors. If the allowed emissions are not used, they can be traded to another entity. Built upon the Kyoto Protocol and the Clean Development Mechanism (CDM) as well as the Joint Implementation (JI) flexible mechanisms, the scheme creates a price on carbon dioxide that is thought to be the most cost-effective way of reducing carbon dioxide emissions within the European Union (European Commission, 2008a, pp. 5–7; Jordan et al., 2010, p. 125).

The first notion of a tradable permit was mentioned by Ronald Coase in 1960 on dilemmas of collective action and property rights (Coase, 1960) and has since been developed further into means of a policy instrument, especially within the environmental policy field through Dales (1968) and Montgomery (1972). Emission trading is in theory thought to possess a number of advantages over regulatory policy instruments, such as the mentioned greater cost-effectiveness, along with its spur of technological innovation and flexibility in emissions reduction, as well as its relatively simple policy design that creates a greater democratic legitimacy (Jordan et al., 2010, p. 126). The cap-and-trade program has been compared to taxation where it is denoted that the greater predictability of achieving the carbon dioxide reduction objective gives it an important advantage, and that taxation does in fact force polluters to adjust their emission level to where the marginal costs of abatement are equal to the taxation rate. However, emission trading caps the total amount of emissions, and thus the price adjusts accordingly (Ekins & Barker, 2001; Jordan et al., 2010, p. 126).

The first cap-and-trade program was the Acid Rain Program in the 1970s and 1980s in the U.S. (Ellerman et al., 2000), where a group of market-based-favoring policy-makers generated political support for its adoption (Voß, 2007, p. 335). The program was given praise for its success in achieving reduced emissions with saved costs and technology innovation (see Ellerman et al., 2003). Thus originally imported from the U.S., the European Commission advocated for the establishment of an EU-wide emissions trading system in a 1998 Communication (European Commission, 1998) instead of an EU-wide carbon-and-energy tax that had been put down earlier in 1991–92 (Jordan et al., 2010, p. 69, 131). The reason for the adoption of an emissions trading system instead of taxation can be derived from the fact that tax regulations requires unanimity within the European Council, a reason to why

the carbon-and-energy tax proposal collapsed, whereas the emissions trading system could be adopted by a qualified majority vote (Jordan et al., 2010, p. 69).

The adoption of the Directive was made in 2003 (European Union, 2003) and the scheme formally commenced on the 1st of January 2005. The EU ETS is the first supranational emission trading system for carbon dioxide ever adopted (European Commission, 2010, para. 1), and is ideally set out to provide incentive and lessons for a possible global emissions trading scheme (Delbeke, 2006; Jordan et al., 2010, p. 125). The European Commission released a proposal of a revised Directive in a Communication in January 2008 (European Commission, 2008a) and formally the Directive was changed in 2009 into the current European Union Emissions Trading Scheme (European Union, 2009b).

The EU ETS can be divided into three phases, also called trading periods. Phase I lasted from 2005–2007 and was widely seen as a warm-up phase (Ellerman & Joskow, 2008, p. 7) and covered roughly 40% of EU carbon dioxide emissions (British Broadcasting Corporation, 2006, para. 5). It was labeled a "learn by doing" pilot phase before the crucial Phase II (European Commission, 2008a, p. 8). As noted by the European Commission, the first period's environmental benefits may have been limited due to excessive allocation of allowances in some Member States and sectors, mainly due to allowance projections that were unreliable (European Commission, 2008c, What are the main lessons learned from experience so far, para. 1). The first phase did, however, put in place the necessary infrastructure and opened up a dynamic carbon market for further trading of emission allowances (European Commission, 2008c, What are the main lessons learned from experience so far, para. 1). Phase II spans years 2007–2012 and the allowance allocations process is revised in order to prevent over-allocation. The total amount of allowances compared from 2005 to the Phase II period was decreased by 6.5% (European Commission, 2008a, p. 16).

II.V.I–Principles and functions

The cap-and-trade principle of the EU ETS means that there is a total cap, or limit, on the amount of emissions of certain greenhouse gases (GHGs) that are allowed to be emitted. The companies within the covered sectors receive emission allowances and they must, at the end of the year, surrender as many allowances as to cover all of their emissions. One EU

Allowance (EUA) is currently measured as one ton of carbon dioxide equivalent[7]. If a company cannot surrender enough allowances it has to pay heavy fines and surrender as many allowances as emitted beyond its allowance share the following year. Allowances that are not needed can be traded to other companies that might be short of allowances, which ensures that the emissions are cut where the cost-effectiveness is at its highest. At the moment the EU ETS operates in 30 countries (EU27[8] and Iceland, Liechtenstein and Norway) and covers carbon dioxide emissions from sectors such as power stations, combustion plants, oil refineries, iron and steel works, as well as factories making cement, glass, lime, bricks, ceramics, pulp, paper and board. Since January 2012 the airline sector is also covered by the EU ETS (European Commission, 2010, Growing bigger and stronger, para. 3).

Companies can also choose to invest in emission reduction technologies for their operations or use less carbon-intensive energy in order to decrease their emissions, where they consequently could sell their allowances or even bank them for next year (European Commission, 2010, How does emissions trading work, para. 2). The EU ETS covers some 11,000 installations within its 30 countries, and amounts for almost half of the carbon dioxide emissions within the EU and over 40% of total GHG emissions (European Commission, 2010, Growing bigger and stronger, para. 2). According to the European Commission, the EU ETS "should allow the European Union to achieve its emission reduction target under the Kyoto Protocol at a cost of below 0.1% of GDP, significantly less than would otherwise be the case [if the Member States would individually seek measures for emission reductions]" (European Commission, 2008a, p. 5). According to official statistics, the GHG emissions from "[…] big emitters covered by the EU's Emission Trading System (EU ETS) have fallen by an average of more than 8% since the start of the system in 2005" (European Commission, n.d., para. 1).

In practice, during its current Phase II, the EU ETS is designed so that every Member State will choose how to allocate the emission allowances for its covered sectors and companies, and is required to set up a National Allocation Plan (NAP). The European Commission must however scrutinize the NAPs in order to ensure compatibility with the overall cap for the EU

[7] Carbon dioxide equivalent (CO_2e): "A metric measure used to compare the emissions from various greenhouse gases based upon their global warming potential (GWP). Carbon dioxide equivalents are commonly expressed as 'million metric tons of carbon dioxide equivalents ($MMTCO_2eq$).' The carbon dioxide equivalent for a gas is derived by multiplying the tons of the gas by the associated GWP" (U.S. Environmental Protection Agency, 2011, C, para. 5).

[8] The European Union's 27 Member States are: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and the United Kingdom.

as well as each country's Kyoto Protocol targets (Swedish Energy Agency, 2009a, para. 1). In Sweden, the Swedish Energy Agency is responsible for the operation management of the Swedish registry system for the scheme, the Swedish Emissions Trading Registry (SUS) (Swedish Energy Agency, 2012). The Swedish Environmental Protection Agency deals with and makes decisions of the allocated emission allowances in the Swedish NAP to concerned companies. The agency is also responsible as a supervision body that controls the companies' actual annual emissions, and drafts national legislation regarding the allocation process, monitoring, reporting and verifying processes. The Ministry of the Environment is in turn responsible for EU and national negotiations regarding the EU ETS and the compliance of national legislation on the matter (Swedish Energy Agency, 2009b).

Since the adoption in 2005, the EU ETS has only covered emissions of carbon dioxide. However, with the new revised EU ETS Directive (European Union, 2009b) commencing in Phase III of the new trading period (2013–2020), nitrous oxide will be included from production of nitric, adipic and glyocalic acid production, and perflourocarbons from the aluminum sector. Carbon dioxide emissions from additional sectors such as petrochemicals, ammonia, and aluminum will also be included. The new revised EU ETS is thought to create a more efficient, harmonized and fairer system (European Commission, 2008c, What are the main changes to the EU ETS and as of when will they apply, para. 2).

The main difference of the third trading period is the longer duration, eight years instead of Phase II's five, a more robust emissions cap reduction – 21% cap reduction in 2020 as compared to 2005 – and the substantial change from free allowance allocations through grandfathering – allocations based on historical emissions – to instead auctioning them to the relevant companies and sectors – from less than 4% in Phase II to more than 50% in Phase III. The auctioning process will however be phased in and will not cover all sectors immediately. The NAPs will thus be abolished since the single EU-wide cap will provide the regulations regarding allowances auctioned and allocated based on harmonized rules (European Commission, 2008c, Will there still be national allocation plans (NAPs), para. 1, 2). The EU-wide cap on emission allowances will follow a linear factor of 1.74% decrease and the cap for 2013 has been determined to 2,039,152,882 allowances (European Commission, 2011b, Cap for 2013 determined at 2,04 billion allowances, para. 1, 2).

As a summary, the logic model underneath in Table 2 depicts the components and processes if the EU ETS policy instrument and its intentions.

Table 2. Logic model of the European Union Emissions Trading Scheme

Input	Activities	Output	Outcome
Financial means	Carbon dioxide emissions cap	Cap of carbon dioxide emission allowances	Decrease of carbon dioxide emissions
Personnel	Decrease of carbon dioxide cap over time		Carbon dioxide emissions are priced
	Allowance trading mechanisms		Climate change mitigation
			Increased investments in carbon-neutral technologies

II.VI–Central concepts

The central concepts of this thesis will permeate the structure of the data collection, empirical findings, analysis and conclusion. They form the basis of the scope of the study and thus effectively delimitates unwanted variables and notions that may be raised when using an inductive approach of empirical studying since there is no demarcating theoretical framework to maintain within. This is needed in order to establish a mode of analysis when studying the perception of the interaction. The four central concept categories are created based on the problem framing and previous research on the matter as well as on the detailed descriptions of the ECS and EU ETS. The derivation of the categories are as follows; first the *perception of the problem* is to be investigated and the studied actors give their perspective on the interaction and problem framing; secondly, the *effectiveness* of the two instruments is assessed individually in order to establish their purposes and a source of goal output effectiveness for the instruments and the interaction; thirdly, the different autonomous polity levels where the policy instruments reside is examined through *national sovereignty* over policy formulation and implementation, and fourthly; the need for *harmonization and coordination* is assessed as potential remedies of the interaction effect and its associated synergies. The individual analytical characteristics are discussed more in-depth below. A frame outline table for the descriptive evidence that will summarize the collected data is also shown further down.

Table 3. Central concepts

Perception of problem	The perception of the problem is derived from the problem framing which states that there is a case of an interaction between the two instruments. However, research has shown that different scholars and studies understand the effects differently. The empirical evidences are scarce of what the interaction might actually cause. The interaction is not intrinsically regarded as negative, it might also be positive and provide wanted, although unintended, synergies. This category addresses how the interaction is perceived from the Swedish perspective and its possible effects.
Effectiveness	The effectiveness category examines the actual goal output and the purposes of the two instruments. Effectiveness here means doing the *right* thing, and shall not be confused with efficiency which means doing the *thing* right. The effectiveness of the two instruments of fulfilling their goals and that translation to the interaction will be analyzed from the Swedish perspective.
National sovereignty	The national sovereignty category assesses the potential cause of the interaction since the interacting policy instruments reside at two different autonomous – national and supranational – levels. This fact proposes underlying concerns that there might be a decrease of national sovereignty in policy formulation and implementation on the national level since the supranational level has authority on certain areas which will create a threat against the national sovereignty and obstruct possible correction attempts.
Harmonization & coordination	Possible remedies for the interaction can be of varied characteristics, but especially harmonization and coordination are mentioned throughout the previous research on this subject. Thus, the harmonization and coordination category is derived from previous research that show signs of a much needed coordination of supranational and national level policies, as well as harmonization of policies on supranational level in order to create an integrated single energy market within the EU.

The descriptive evidence found within the empirical findings from the qualitative interviews will be inserted in the table below (Table 4) in order to assess the different viewpoints and perceptions of the interaction. To obtain the connections and contradictions of the data, the table will create an overview that is easily manageable yet comprehensive of the key findings' components. The analysis part of the thesis will be guided by the central concepts and the findings are presented within their respective category. The analysis will assess the findings both under their respective category and in combination. The descriptive evidence table will enhance the overview of the empirical findings and lastly the analyzed data will form the basis for answering the research questions.

Table 4. Descriptive evidence frame

Source	Interaction	Theoretical problem	Empirical problem	Impact
Respondent 1	*Yes/No*	*Yes/No*	*Yes/No/Maybe*	*Description*
Respondent 2…	*Yes/No*	*Yes/No*	*Yes/No/Maybe*	*Description*
Respondent *N*	*Yes/No*	*Yes/No*	*Yes/No/Maybe*	*Description*

Note: The respondents' viewpoints are based on the evidence from the empirical findings and not of any direct quotes.

III–Design and methodology

In order to answer the research questions of this thesis the design choices and methodological considerations were established before the data collection began. The framing of the design and methodology thus investigated how involved actors in the relevant field perceive the problem from a Swedish perspective and tries to explain the underlying structures of the experiences and processes of the empirical findings in order to develop an increased understanding of the interaction and its variability. The inductive approach of generating theory tries to capture the key themes of the previously established central concepts and the connections and contradictions of the processes judged to be important for the generalizable conceptualizing theoretical framework

III.I–Design

The *unit of analysis* in the study is the interaction between the two policy instruments Electricity Certificate System (ECS) and the European Union Emissions Trading Scheme (EU ETS). The study employs a qualitative study of the Swedish perspective of the interaction. Consequently, the study inherits some elements of a cross-sectional and a comparative study. This is due to the single time and place of data collection where similarities to cross-sectional quantitative analysis can be seen where the qualitative research looks for a connotation of causality (Bryman, 2008, pp. 44, 49). In this thesis, the causality derives from the interaction of the two policies and what effects that causes and how those effects are understood. The *level of analysis* is the Swedish perspective of the interaction, and thus the analytical part is twofold. The design therefore features an ideographic approach where the unique elements and characteristics of the Swedish perspective are elucidated of the level of analysis, whereas a nomothetic approach is put upon the generality of the unit of analysis, namely the interaction effect *per se*. The nomothetic approach makes the analysis applicable to different periods of time and place based upon the unique features of the other context – the level of analysis. This sort of study creates a deepened understanding of an already existing problem where research has shown signs of knowledge gaps and empirical deficits (Bryman, 2008, pp. 54–55). Moreover, in terms of what sort of study, it was conducted as an *exemplifying* study since the level of analysis does not contain any extreme features of specific sorts (Bryman, 2008, pp. 55–56).

III.II–Selection and delimitations

The selection of potential level of analysis actors to study can be summarized into three major considerations since the complexity of the problem framing and the different policy instruments vastly diminished the actors even considered for the study. Firstly, although the perspective is set out from Sweden, knowledge of both the national and supranational interaction is required where both technical expertise and overarching policy framing considerations are necessary in order to cogently answer the interview questions. Secondly, the actors must be able to acknowledge any potential interaction of the two policies as well as their individual effectiveness, which are mainly based in different professional fields, namely climate change mitigation and renewable energy promotion. Thirdly, and most importantly, the research questions pose strong ties to political considerations and attitudes on both national and supranational level. It is of vital importance that the actors reveal their perception of the problem based on their empirical expertise of the interaction rather than on their political support or leverage. The political dimension can of course never be neglected entirely, but it is not a prominent factor of investigation of this study. The selection was made using a strategic approach which means that the selection was deliberately made out of the defined criteria and made so to cover several aspects of the studied case (Torell & Svensson, 2007, pp. 83–84). The selected actors all adhere to the previously mentioned criteria of supranational and national interaction associability; expertise and knowledge of either one or both of the two policies; and no obvious political affiliation that may affect the answers. Consequently, the actors researched are civil servants and scholars involved in the construction, analysis, implementation and management of the ECS and the EU ETS. The actors are presented below with a brief description of their main involvement within the problem framing.

Table 5. Strategically selected actors

Swedish Ministry of Enterprise, Energy and Communications – Energy Division *Responsible for providing expertise on the ECS.*
Swedish Environmental Protection Agency – Policy Instruments for Climate and Air Department *Responsible for analyzing consequences of the EU ETS.*
Swedish Ministry of Environment – Division for Climate Change Policy *Responsible for national targets and expertise on the EU ETS.*
Swedish Energy Agency – Policy Analysis Unit; Electricity Certificates Unit *Responsible for analyzing and maintaining the ECS and operating the EU ETS registry.*
The Swedish Permanent Representation to the European Union – Energy Counselor *Provides a link between the European Union and Sweden regarding energy issues.*
University of Gothenburg – Environmental Economics Unit *Conducts research on climate and energy.*
Governing transitions towards Low-Carbon Energy and Transport Systems for 2050 (LETS2050) *Conducts interdisciplinary research on climate and energy issues.*

Other viable actors that could be of possible considerations are interest groups, the European Union, and organizations and actors affected by the two policy instruments – such as renewable electricity producers and companies covered by the EU ETS. However, when looking at the three selection criteria the interest groups do not qualify for the study due to their apparent inherent interests mainly derived from their political affiliation. Neither were there any interest groups to be found that had deep knowledge of the supranational and national perspective of the two interacting policies. The European Union falls out of the selection due to the apparent supranational perspective. Whilst interesting to incorporate, the study was made from a Swedish perspective and does not cover supranational intentions or reasoning. Additionally, the European Union has limited knowledge of the specific conditions of the Swedish ECS and can thus not be strategically selected. Lastly, the affected actors are in a role of inherent inimical affiliation since their motifs may be biased towards their function in either or both of the two instruments.

Out of the strategically selected actors, a total of nine respondents were chosen to be interviewed. The selection of respondents was made by contacting the selected actors and finding the most relevant persons. The contact was made through phone calls and electronic mail after initial research on the actors and their staff. Persons with internal knowledge of the

institutions helped identify the most relevant persons in a form of snowball sampling where the initial contact person's knowledge and network was used to identify the best suitable person choice (Bryman, 2008, p. 184). In one case three persons were selected from one actor in order to tap the full expertise of the concerned institution. The caveat of selecting only one or few persons from a whole organization might induce that the views expressed are not necessarily of the organization as a whole, but of that particular individual respondent. However, since the limited number of people viable for selection and an even lesser number of matching actors and persons of interest based upon the criteria of selection, no other choice was appropriately or even applicable for this study. The persons do however influence the work of their respective institution and can thus be regarded as the actual expertise on the problem framing of the study. Thus the respondents are not relative to a population but can instead be classified as experts within their fields and of this thesis's problem framing. The selected persons were:

Table 6. Chosen respondents from the selected actors

Truls Borgström – Deputy Director *Energy Division*, Ministry of Enterprise, Energy and Communications
Eva Jernbäcker – Senior Advisor *Policy Instruments for Climate and Air Department*, Swedish Environmental Protection Agency
Olle Björk – Deputy Director *Division for Climate Change* Policy, Swedish Ministry of Environment
Gustav Ebenå – Head of Unit *Electricity Certificates Unit*, Swedish Energy Agency
Johan Karlsson – Program Manager *Electricity Certificates Unit*, Swedish Energy Agency
Klaus Hammes – Head of Unit *Policy Analysis Unit*, Swedish Energy Agency
Martina Högberg – Energy Counselor The Swedish Permanent Representation to the European Union
Jessica Coria – Research Fellow *Environmental Economics Unit*, University of Gothenburg
Fredrik NG Andersson – Ph.D. Economics *Department of Economics*, *Lund University*, LETS2050

III.III–Data collection

The data collection was made using qualitative interviews with the selected persons in order to obtain the respondents' perspective and to single out what the interviewees see as important and relevant (Bryman, 2008, p. 437). The interviews were all based on a predetermined set of questions[9] based on the earlier presented central concepts[10]. However, the exact phrasings of the questions varied and were tailored for each respondent depending on the background and context of the respondent. As often seen in qualitative interviewing techniques, follow-up questions were asked (Bryman, 2008, p. 437) and the sequence of the questions asked varied due to differing answers. The goal was to obtain rich, detailed answers of the respondents in order to obtain the most relevant knowledge. The interviews were treated as *informant interviews*, where the respondents act as information sources of a phenomena or occurrence which is suitable for an inductive study design (Esaiasson, Gilljam, Oscarsson & Wängnerud, 2007, pp. 257–258, 285–287). Chosen parts of the data collected were transcribed to facilitate the process of sorting out the relevant data to be presented within the empirical findings.

If categorized, the interviews were conducted in a semi-structured manner since the questions were based on an interview guide but with significant leeway for departing from it in different directions (Bryman, 2008, pp. 437–438). Although the questions in the interview guide may not have been phrased, framed or asked in the same way, all questions were asked at some point and the interviews were conducted in a manner as similar as possible (Bryman, 2008, p. 438). The main reasoning behind the choice of semi-structured interviews is that it allows for flexibility. This is particularly relevant in cases where answers may not be worded in terms of yes and no due to the complexity of the problem framing and the divergent expertise of the respondents. The respondents' understanding of the problem is central where the explaining of each interviewee's patterns in the overall context is of importance (Bryman, 2008, p. 438). Since the study has a clear and explicit focus, the semi-structured interview technique is preferred over more unstructured ones in order to obtain answers to the research questions. In contrast, a structured interviewing was not applicable, as the issue of the interaction is too complex for any quantifiable or coded answers (Bryman, 2008, pp. 437–439). Due to the relatively small number of possible relevant respondents, the semi-structured interview is to be preferred since it combines the rich, detailed answers of an unchartered problem framing with a valid ability of obtaining the answers needed for the study's focus.

[9] See Appendix A for the complete interview guide.

[10] *Perception of problem; effectiveness; national sovereignty, and; harmonization & coordination.* See page 20.

III.IV–Interpreting the results

Certain considerations are worth mentioning when designing and conducting a study and consequently interpreting the results. In the social research design discourse no notions are more prominent than those of validity and reliability. The notions are mainly derived from quantitative research designs, but are valid to be discussed from a qualitative perspective as well. In its purest essence, the discussion centers around the fact that a successful study design needs to adhere to certain standards in order to be regarded as credible (Bryman, 2008, pp. 376–378).

Internal validity sets the tone in regards to how good the match is between the researchers' observations and the theoretical ideas that are developed. A high level of congruence between concepts and observations is needed to fulfill internal validity. As for this thesis, the connection of empirical findings and the developed framework is inherently intertwined and builds upon the former, which creates high internal validity. Although the theoretical framework is not established beforehand, the interconnection between the perception of the interacting policy instruments and the afterwards generated framework establishes a clear link between the observations and the theoretical ideas.

External validity is assessed as to the degree of how the findings can be generalized across social settings and different contexts. Qualitative research tends to be conducted through various case studies with small samples, which in turn will create a problem for generalization of the results (Bryman, 2008, pp. 376–377). This factor can be regarded as being either high and low, depending on the viewpoint. On the one hand, the theoretical developments are constructed in such a way that they are generalizable across other contexts, thus having high external validity. However, the specific case of Sweden might not be generalizable across other contexts and social settings. The specific components of the Swedish case may be unique in such a way that other contexts might not have any use of the research. This, however, seems intuitively unlikely as there ought to be common components over different contexts which will increase the generalizability and make the research worth considering for other contexts. Additionally, it has been argued that qualitative research findings are meant to generalize to theory rather than to populations which is the case in this study due to the inductive approach. The people interviewed are not meant to be representative for a population, but are instead selected due to their specific knowledge and expertise (Bryman, 2008, pp. 391–392).

External reliability on the other hand, is regarded as the degree to which a study can be replicated. This however is a difficult criterion in qualitative research since the ability to freeze social settings and contextual circumstances could be regarded as impossible (Bryman, 2008, p. 376). The initial study can hardly be replicable identically if the circumstances are not the same in later studies, which denotes the degree of external reliability as fairly low for this study. However,

since the methodological and design considerations are clearly stated, the reproducibility of the study's ditto can be regarded as good, whereas the external reliability of the empirical findings is low since the results may differ due to the change in social and contextual settings.

Summarily, the above assessed considerations of the criterions of validity and reliability might determine the quality of the research conducted. Although the picture it paints might not be a universal truth, the indication does at least provide valuable considerations to keep in mind when interpreting the results, analysis, conclusion and subsequent theoretical developments. An important acknowledgement here is the notion of Guba and Lincoln who states that the validity and reliability criterions presuppose that a "single absolute account of social reality is feasible" (cited in Bryman, 2008, p. 377). They argue that the simplistic view of one absolute truth about the social world that is the job of social scientists to reveal is invalid and that there can actually be more and possible several other accounts (Bryman, 2008, p. 377).

Finally, considerations worth mentioning regarding the implications with the qualitative research method through interviewing should be mentioned. To begin with, awareness of factual errors and misunderstandings that could occur during the interview, be they deliberate or involuntary, is crucial. Even experts can make mistakes, and the issue might be complex enough that the answers might be falsified. Misunderstandings can happen from both parts, where the respondent can misinterpret the questions or the interviewer can misinterpret the answers. The interviewer does also have an effect on the shape of the interview, and the personality and the phrasing of the questions can affect the respondent's answers and the way the answers are given (Halvorsen, 1992, p. 89). The interview is shaped by the participating persons (Jacobsen, 2002, p. 270) and the respondents could get bored or afraid of showing a lack of knowledge regarding a certain question, which could lead to made-up answers in order to make the interviewer satisfied (Jacobsen, 2002, p. 162). In addition, there is a possibility of self-interests from the respondent's side, where certain information could be withheld or exaggerated in order to obtain specific interests of the respondent. An understanding of the respondent's self-interests and his or her organization's interests are therefore of great importance (Esaiasson et al., 2007, pp. 327–329). The questions the respondents were asked may seem benign, but neglecting the omnipresent possibility of human error would be overly Panglossian and could prove cataclysmal once conclusions are drawn. In all, this means that the analysis and the conclusions of this thesis were conducted with regards to the above mentioned considerations and with as an objective a mind as possible.

IV–Empirical findings

The data obtained from the respondents of this study are presented below. The empirical findings relevant to the study are depicted under their respective central concepts category in order to create a comprehensive and structured understanding. The findings are presented in a neutral manner, thus leaving room for the reader to make his or her own unbiased scrutiny of the data. Thus, this chapter leaves the analytical and interpretative part to the ensuing Analysis chapter. The interviews yielded a great many differing opinions on the interaction, and diverse tendencies, factions, interpretations and presumptions can be seen. The findings are therefore very divergent at times but despite this there are noteworthy connections and contradictions on certain aspects of how the interaction is perceived.

IV.I–Perception of problem

In regard to whether there is an interaction between the Swedish Electricity Certificate System (ECS) and the European Union Emissions Trading Scheme (EU ETS) or not the findings are relatively unanimous. No respondent denied that the two instruments are overlapping each other, affecting each other and thus interacting dependent on the design of the policies. Since the EU ETS covers electricity production facilities, there is an apparent interaction of the two instruments (Respondent 2, personal communication, 2012) in one way or the other (Respondent 7, personal communication, 2012). Due to this, there is some sort of correlation between the prices that might cause different consequences (Respondent 9, personal communication, 2012), which in turn can neutralize or counteract the two different policy goals (Respondent 8, personal communication, 2012). However, respondents were more diverse in their answers about to which degree the interaction causes any apparent effects. Some respondents proposed more research on the subject to determine the magnitude (Respondent 9; Respondent 3, personal communication, 2012). There were even more diverse answers on whether the interaction was perceived as a problem or not. Some regarded the issue as problematic, more costly and with unnecessary double-regulations, while others did not perceive it as a problem due to the non-conflicting goals of the two instruments, the current cap space available under the EU ETS, the insignificant impact of the Swedish market on the whole of EU, as well as the fact that the Swedish electricity production is practically carbon-neutral to begin with (Respondent 9).

More detailed was the perception of whether the interaction causes a problem or not depicted as two different problems; one theoretical and the other empirical. As mentioned before, everyone acknowledged the fact that there is an interaction of the two instruments, where each affects the other. All respondents were adamant that this was a theoretical problem, but were split on the question whether it was an empirical problem. In particular, the instruments were for example regarded as not being in conflict with each other, especially now as of 2012 where many EU ETS allowances are not in use (Respondent 7; Respondent 1, personal communication, 2012). If it would be a "battle on the knife's edge for every EU ETS allowance" however, the scenario might be different (Respondent 1). There is no demand to perceive the interaction as a problem due to the political and democratic support of the ECS in Sweden (Respondent 4, personal communication, 2012). Also, the effects of the interaction have not been clearly distinguished and therefore cannot be perceived as a problem, nor are there any signs that the effect would be severe enough to alter any price levels or create any goal orientation conflict (Respondent 4; Respondent 6, personal communication, 2012).

The most stressed reason for the interaction to not be perceived as a problem was the notion that the ECS should not be regarded as a climate policy instrument. The ECS was never meant to be a climate instrument, and the reason for adopting the ECS was instead to create a 'third leg' of electricity production independent from nuclear and hydro power in order to create a larger diversity of supply and strengthen the energy security (Respondent 9; Respondent 7; Respondent 4; Respondent 1; Respondent 6). The climate effect of the ECS was also mentioned to be non-existent since almost all of Sweden's electricity production already is carbon-neutral. If new electricity from renewable energy sources (RES-E) from the ECS would push aside old electricity from non-carbon emitting sources, the climate effect would still be the same (Respondent 9).

> *"The Electricity Certificate System promotes new RES-E production that could push aside some power production within the EU ETS, and thus will the emissions move within the system. That is however not a problem if the goal of the ECS not is to diminish any climate effects. I can understand the viewpoint of that it might get more expensive, but since that* [reducing climate effects] *has never been the purpose* [with the ECS] *it* [the interaction] *will not cause any problem."* – Respondent 9

However, the viewpoints part on whether the ECS is actually a climate policy instrument or not, where some state that it actually is since the reason for switching to renewable electricity production is inherently climate positive (Respondent 5, personal communication, 2012; Respondent 8). Several respondents argue that the ECS also stems from trying to fulfill the

targets for Sweden in the EU's Energy 2020 strategy and Renewables Directive (Respondent 2; Respondent 6; Respondent 9). It was also noted that there might be a climate effect of the ECS, but it is not the sole purpose of the policy. Reasons for adopting the ECS were not reasons for climate effects, but the availability of forests, land areas and a long windy coastline instead of the use of other carbon dioxide emitting energy sources (Respondent 1).

> *"The most important reason is that these are types of energy that are readily available in Sweden. We do not have that much coal, we have some uranium but we are not allowed to mine it, also there is no natural gas in Sweden. I think that it* [renewables] *were closest at hand. We have to use what we have."* – Respondent 1

In terms of describing the consequences of the interaction the respondents were yet again divided into the two factions of a theoretical and an empirical problem. Everyone agreed that -- due to the design of the EU ETS of confining the concerned sectors within a cap – there is a chance for excess emission allowances caused by more non-carbon-emitting electricity production and usage in Sweden which could be sold and transferred to other countries within the EU, thus offsetting the environmental benefit of the ECS. This interaction problem is however the case for all energy-support policies inside the cap of the EU ETS. The actual effects of this and their magnitude are very unclear. Some appreciate the effects and think of it as a problem, although some agree that the effect is there, but the impact is negligible. Due to the large cap space within the EU ETS, the effect is diminished since the limitations to production are not the EU ETS allowances since the price is so low and other factors are more important for production (Respondent 7; Respondent 1). In case the EU ETS cap would be tighter, the magnitude of the interaction effect might be more severe and noteworthy. However, the interaction is thought to be self-regulating because if the EU ETS allowance price would be higher due to the lowered cap and thus increase the price for electricity, it would in turn increase the revenue for the electricity producers which would increase RES-E producers' profitability, thus lowering the price for the electricity certificates due to a higher abundance of RES-E at the market since more are willing to invest due to the higher profitability. This would cause the ECS to play a smaller role since the high EU ETS allowance prices would stimulate the market in the right way (Respondent 7; Respondent 1).

Others, as stated before, perceive the offset of the environmental benefit as a problem since it causes goal conflicts. The interaction problem was discussed almost a decade ago in the wake of the ECS adoption and the emergence of the EU ETS, and of its potential interaction effects (Respondent 5; Respondent 2). The main argument for the interaction to be a problem

is the increased price burden put upon the consumers that will have to pay more money for no apparent reason (Respondent 5; Respondent 2; Respondent 8; Respondent 3). "It is too costly for the environmental effects it causes" (Respondent 3) and simulations have been made that show signs that forcing certain measures – as the ECS induces – will in fact increase the price for climate policies (Respondent 5; Respondent 2). The interaction specifies where the measures are to be taken, which adds unnecessary conditions counteracting the argument of the EU ETS where measures are taken when the cost-effectiveness is highest (Respondent 5). Other respondents acknowledged this fact in one way or the other, but were adamant that that is not a problem since the increased cost-burden for consumers, whilst not gaining any climate effect due to the transfer of the allowance to other countries, is not thought to create environmental benefits but instead to fulfill the Swedish national EU renewable energy targets as well as to create a more diverse security of supply.

The answers again go wide apart on whether the interaction serves the most carbon-emitting technologies. This concern originates in the fact that the most carbon-intensive companies will be able to purchase more allowances from other firms since the ECS lowers the demand for allowances and thus decreases the price. It is stated to be true by most respondents, but the appreciation of whether that is a problematic issue or not is more opaque. While some argue that it definitely is the case and that it causes some kind of a subsidy to fossil-intensive industries (Respondent 5; Respondent 4) the notion of the technological incentives for firms to invest in carbon-neutral technologies could be discouraged by the lowered price for the EU ETS allowances (Respondent 3). In the short run, one respondent appreciated this problem, but stated also that it does not have any meaningful effect in the long run since the cap of the EU ETS will diminish over time, and that the sole determinant is the actual cap (Respondent 8). Some perceived it as a non-problem and raised awareness of that although it might not create specific incentives for new technologies, all support-systems for increased renewable energy production are affected by that interaction problem regardless of the actual magnitude (Respondent 6).

> *"I have spent a considerable amount of time to convince politicians that this is the case* [that the interaction effect is a problem] […]*."* – Respondent 5

It was also brought up that if the limiting factor of production are the actual allowances, the interaction might cause concern for the 'serves-the-dirties' effect, but since other facts might be more important, such as coal price, the interaction effect is mainly theoretical whilst not happening in reality (Respondent 1; Respondent 7). Another important aspect of the

interaction was mentioned that although this might be true, there is a form of double-steering that decreases the price for the allowances and increases the cost-burden for consumers. If the EU ETS had acted on itself and the prices had been considerably higher, it is not very likely that the prices had been kept that high in order to protect the industries, and thus other measures would have been taken in order to decrease the EU ETS allowance prices anyway (Respondent 2). It was stressed that it is also good to make certain investments at the right time, and although it might not be rational with conflicting interactions, it is also rational to move away from fossil electricity production towards renewable electricity production. This might enable Sweden to export carbon-neutral electricity which in turn might decrease the carbon dioxide emissions in other countries, despite the initial higher cost-burden (Respondent 2). Investments in new technology is important to move further ahead on climate and energy matters (Respondent 8; Respondent 5) and in order to do that, there is a need for "[…] a mixture of policies for energy and climate. It is all connected." (Respondent 2).

Another factor that was brought up was the constraint on the interaction caused by the EU ETS, since the amount of allowances under the cap is the main determining factor of whether the effect is problematic or negligible (Respondent 8; Respondent 2). The cap in itself is a powerful measure that can spur on technological advances without any other policies interfering (Respondent 8; Respondent 5) but depends mostly on the size of the cap (Respondent 8). Other instruments are necessary in order to create the clusters of technological development needed to reach climate goals and national renewable energy targets which could poise Sweden to become a leading actor in export of both technology and carbon-neutral electricity (Respondent 8; Respondent 6).

IV.II–Effectiveness

In order to understand the interaction, the individual effectiveness of the policy instrument's purposes must also be assessed. Herein does the goal output orientation lie which could potentially explain the interaction or its proposed effects. The ECS is generally thought of as being a good instrument when it comes to fulfilling its goals; which is to increase the production of new renewable electricity at a price as low as possible.

> *"I think it is a pretty good system, partly because it is long term, and partly because it encourages the most cost-effective technologies, is market-based and technology-neutral and does not affect the state budget. Experiences from countries that use feed-in systems show that there is a risk of overcompensation, higher costs for supporting renewable energy and a lack of predictability in the support levels, therefore the Electricity Certificate System looks like a pretty good solution."* – Respondent 6

Moreover, the political support for the system is high since it has survived a government coalition shift and is still very cost-effective (Respondent 9). It definitely fulfills its targets (Respondent 2), and is very good at promoting cheap renewable electricity (Respondent 1). It also creates a base load of clean, carbon-neutral electricity which can help stifle price peaks in winter when electricity demand is higher (Respondent 7). It was yet again stressed by many to not constitute a climate policy instrument (Respondent 7; Respondent 1; Respondent 9; Respondent 4; Respondent 6; Respondent 2), while others did perceive it to be related to climate with one – amongst other – main purpose to reduce the carbon dioxide emissions of Swedish electricity production (Respondent 5; Respondent 8; Respondent 3). It was described that the system worked as designed although the volatility of the certificates' prices could be a potential problem, but since the companies are used to act on a free market they were used to handle price fluctuations (Respondent 4). However, the long term perspective was argued to be of some concern since the concerned companies invest with horizons of up to 60 years, which could be a problem for technological development since the ECS only runs until 2035 (Respondent 8). The system also mostly encourages the almost-market-ready technologies and will not spur on the least-developed ones (Respondent 2). Despite this, the technologies that are not fully competitive on a free market will benefit greatly to be able to stand on their own in the future (Respondent 3). Thus, the ECS promotes the 'easiest' technologies first (Respondent 8). Increasing technological development is difficult to attain, and several externalities are associated with the ECS, in part due to the interaction effect with the EU ETS (Respondent 3).

Most respondents believed that the system will stay in place for its allotted time frame, but after that it mostly depends on any new legislation from the European Union. In case new targets will be set by the EU for new RES-E production, a prolongation of the system is possible, but decisions will not be taken before 2020 (Respondent 9; Respondent 6). However, one respondent pointed out that the current analysis showed that the system might not be needed after its expiration date since the technologies by then will most likely be mature enough to compete on the open market, and also that the EU ETS allowance price will

be higher and thus create more incentives for carbon-neutral electricity production (Respondent 4). Other policy instruments, such as feed-in tariffs and feed-in premiums used in other EU countries were not thought to be any better *per se*, but instead had higher costs for the amount of RES-E produced (Respondent 7; Respondent 1; Respondent 4).

Assessing the EU ETS, the respondents were overwhelmingly in accord that technically the system is good, but the political side of it is lacking since the targets are set too low. The system itself works as it was designed to work, and it creates a price on carbon dioxide emissions (Respondent 8). The price volatility however could be problematic and the issue of over-allocating allowances in order to create acceptance for the instrument has created very low allowance prices which causes the system to not work as intended (Respondent 8). The cap is thought to be too generous, but several respondents argue that the system is better than nothing, where for example an EU-wide carbon tax is not politically feasible and thus the EU ETS is described as a second best (Respondent 9; Respondent 7). Independent on the price of the allowances, the system creates a cap which in itself is good since the emissions cannot exceed the cap (Respondent 4). However, there are details in the system that are not working as thought (Respondent 4) and it is more of a political issue to correct the system to appropriate levels but not of the actual design of the policy (Respondent 5; Respondent 2; Respondent 6). In theoretical terms it is a very powerful policy, but too many phases with loopholes and different opt-out clauses prevent the system from working as it is intended to (Respondent 2).

> *"It's a text-book solution. You can complain against a policy but then you need to think about the alternatives, and then you need to see the alternative implemented and then you can start looking at the failures that are going to be relevant to that policy. I don't think it's a system that will have no problems since the EU is very diverse."* – Respondent 3

In reality, it is hard to implement the perfect cap-and-trade system and the situation right now was thought to be very worrisome (Respondent 2). Initiatives have been taken to decrease the cap or to withhold or remove allowances from the system, but several Member States have strenuously opposed such measures, partly because they feel their industries' competitiveness would suffer and because their economic situation is fragile as it is already (Respondent 5). However, as noted by several respondents, the quest for the perfect policy instrument must not lead to doing nothing (Respondent 7). In this way, the EU ETS can, by minor tunings, be a very powerful policy instrument (Respondent 2; Respondent 5;

Respondent 4). It was also noted that since the prices are so low, it might not actually be that expensive to take the required measures to keep the emissions under the total cap. Although the price level might not currently encourage long term investments in carbon-neutral technologies and electricity, it might also be a result of the EU being able to take actions that are very cheap in order for the price to drop so low (Respondent 6). Although this points to that there are no apparent problems with the low allowance prices if the cap is set correctly, the projected carbon emission reductions of the EU ETS are roughly 70% for 2050 which needs to be considerably higher if global climate goals are to be reached, thus rendering the low carbon prices as a failure of the cap (Respondent 5; Respondent 2).

All respondents agreed on that the EU ETS is here to stay, in one form or the other. Despite the flaws in the system, the necessary commitment it took to implement it, and for the stability of the concerned sectors, there is no apparent reason why the system would be abolished. Further developments are dependent on international climate negotiations (Respondent 3) where similar cap-and-trade systems are to be implemented in Australia, New Zealand and California. These are systems that could be merged and harmonized with, thus creating greater political stability (Respondent 5). Complementary policies might be necessary however – such as policies that promote research and innovation (Respondent 2) – in order to spur on technological advances (Respondent 8). This is in spite of the fact that the system most likely will be in place for a long foreseeable future, even though some Member States want to abolish it (Respondent 5). An additional potential sector to be included is for example the maritime shipping industry (Respondent 5; Respondent 6).

IV.III–National sovereignty

Most respondents agreed that the national level, and consequently Sweden's authority, is threatened by the supranational level of the European Union. The extent and consequences of this fact are however less clear. There are examples of EU legislation that can threaten the Swedish policy formulation and implementation, but usually the overall targets are set at the EU level whilst the Member States have some leeway of how to manage and reach the targets (Respondent 9). It was believed to be a problem by some, especially if other countries can block certain Swedish initiatives in the EU (Respondent 2). Although the threat might be there, some argue that it should not be seen as a problematic issue all the time, but rather only in some cases and for some Member States (Respondent 5).

> *"If you have a mechanism on the EU level and Sweden cannot find support from other countries for its opinion, then of course Sweden has lost its autonomy. That is somewhat the point of the EU. But if Sweden would not have been a member of the EU we would not have had any real autonomy either since we live in a globalized world* […]*."* – Respondent 8

The issue was described as affecting the national sovereignty, since some issues are conducted at the EU level where Sweden cannot do exactly how it pleases all the time (Respondent 6). The scope lies not solely within Sweden, but also within the EU. The system is still democratic; regardless if it is within Sweden or the European Union, the democratic rules are still the same (Respondent 8). The process to integrate with the EU was deliberate, and some competences where handed over to the supranational level, especially after the ratification of the Lisbon Treaty (Respondent 4). Thus, it can be described as a threat since some competences reside at the supranational level, but it is also a democratic decision and a circumstance due to Sweden's EU membership (Respondent 4).

In terms of correcting any potential negative interaction effects, the decrease of national sovereignty could definitely be a factor and a problem, especially if Sweden has to change the ways of subsidizing renewable electricity production (Respondent 6). For example can the European Commission exert autonomy over energy policies when claiming internal market reasons (Respondent 6). By formulating the policies to deal with the Single European market, with regard to unjust competitiveness between different Member States, the EU can obtain autonomy over the Member States, and in particular over this interacting issue regarding the ECS and the EU ETS (Respondent 6). Also there are reasons to believe that the European Commission is trying to obtain autonomy over such issues that are of relevance to the union and the internal market (Respondent 6). Due to the many different levels of government and governance, there are reasons to believe that it should be a problem since it is not only national and international, but also municipalities and regions that want to take actions even though the externalities are always transferable (Respondent 3). Admittedly, there are interactions between different polity levels, but there are also interactions on the same level. For example there are several EU directives that might be at odds with each other. There are also policies within the Swedish level that do not connect very well, simply because reality is not as easy as theoretical models (Respondent 7). There are interactions both between and within different levels, but as long as Sweden has some control over one part of the interaction, can it be influenced and consequently corrected (Respondent 7).

IV.IV–Harmonization & coordination

The issue of whether an EU-wide ECS would be desirable for Sweden comprised of two main arguments. Firstly, the general notion was that Sweden would benefit from such a system and would proceed with processes to open up the ECS's market for other countries. It is stated in the government legislation surrounding the ECS that Sweden would be open to expand the system to other countries, as has recently happened with Norway for example (Respondent 9). Theoretically, it would be advantageous for Sweden since a lot of wind power, for example, could be built in Sweden, thus increasing Sweden's security of supply, local development, foreign investments and potential sales of renewable electricity to other countries (Respondent 9; Respondent 8). Secondly, the other side would be more problematic, where questions regarding on how the EU-wide system would be designed, and who would decide what in terms of sales and building permits, arise (Respondent 6). It was also revealed that the renewable energy potential in Sweden could be fully tapped which could backlash and eventually increase the costs for Swedish renewable electricity production in the future (Respondent 7; Respondent 6). However, this scenario is not very likely in reality (Respondent 8).

When it comes to a need for harmonization at the EU level on policies surrounding renewable electricity production and especially the ECS, the responses were largely the same. It would not be bad for Sweden if other countries would adopt the same system, and thus leave the Swedish system as it is, but if harmonization were to be conducted, Sweden might have to adapt to another system which, from the Swedish perspective, might not work as efficiently and effectively (Respondent 9; Respondent 6). An argument for an EU-wide certificate system would be the cost-effectiveness of it, because the investments are made where costs are the lowest. However, this would also mean that the electricity is produced in certain cost-effective areas, which could decrease the energy security, diversity of supply and local and green development, which several countries would oppose and therefore such a scenario is not very likely to happen (Respondent 9). Despite this, other reasons for harmonizing the systems would be the increased homogeneity for companies operating in several countries within the EU (Respondent 9; Respondent 6) and the fulfillment of the renewable targets within Sweden which would benefit the EU (Respondent 7). Since harmonization could be described as something between what currently is (Respondent 3), this type of streamlining of the policies on the supranational level might increase the chances to produce larger quantities of renewable electricity, but might also have legitimacy and

accountability issues when the authority is moved so far away from the individual (Respondent 8).

> *"The electricity prices in each country are different, so even if you harmonize the systems you would still have differences in terms of the relative magnitude of the impact of different countries."* – Respondent 3

Questions arose of how the system would be designed, and whether there would be separate targets for each Member State, or a common target for the whole of the EU (Respondent 6).

On the issue of coordination, the respondents gave a wide variety of answers on whether there was a need for increased coordination or not. To a large extent, most respondents were very positive to more and better coordination between different polity levels and within them. Especially when interlinked with global climate issues, an arena where the EU has taken the driver's seat in many international climate negotiations, coordination is needed to stave off potential interaction effects and environmental offsets (Respondent 2; Respondent 5). Moreover, more and better coordination is needed regarding a wide range of policy instruments within the field that could create technological developments, and there is a need for a complete vision that can be communicated throughout the different levels of governance and policies (Respondent 8). Coordination should be the basis of EU legislation, where more direct policy instruments could reside at the national levels (Respondent 8). However, it is easy to say that more coordination is needed but not as easy to implement due to the myriad of different policies and polity levels (Respondent 3). Integrated policy coordination is very complex, and many policymakers have their own hobby-horses which could be hard to overcome and give up (Respondent 5; Respondent 3).

> *"At the end of the day there are so many interactions everywhere. If you are going to have so many different levels, you need to have good collaboration and coordination to stave off these kinds of interaction effects between different policy instruments."* – Respondent 3

Ultimately, there cannot be perfect coordination, but one can always try to improve it (Respondent 3), or at least express a desire to improve it (Respondent 5). There is an interaction effect – although the impact is uncertain – and it is known of, and should thus be coordinated accordingly to diminish any possible negative effects (Respondent 5; Respondent 3). The political side can neither be forgotten, where policymakers might not always respond to technical criteria since other factors might be more important (Respondent 3). The

preferences of different instruments, strategies and assessments from various Member States are aspects that are difficult to coordinate (Respondent 3).

On the other side, other respondents downplayed the potential of more coordination. In some cases there might be advantages of formulating policies individually since, when other instruments are factored in, it otherwise might get very complex and chances are that one misses the target of the policy (Respondent 1). Since there are so many other policies in other countries, the care and consideration for them might just overshadow what was thought to be created in the first place (Respondent 1; Respondent 4).

> *"More on the philosophical side will the quest for the perfect policy instrument only lead to paralysis. It is somewhat given in the current situation that there are risks associated with finite resources, climate change and other environmental issues. Despite these risks, it is still better to do something with decent efficiency than to sit and draft a design of an instrument until you find the* [perfect] *solution. Because you can be certain that the reality will change and cause problems in the future anyway."*
> – Respondent 7

The perfect policy instrument does not always reveal itself from coordination with other policies, and questions arise when other policies are altered which might start a chain reaction of effects since the other policies where based on the first one (Respondent 7; Respondent 1). Additionally, the coordination is still thought to be good and analysis-information is delivered to relevant actors within Sweden and the EU (Respondent 4).

> *"We take every opportunity offered to voice our opinions to ensure that policy instruments are not undermined or that interaction effects are noticed, so the ones we have, we use. So there is no space to do more right now. If they* [the EU] *would signal that they were receptive to more information would we also provide more."*
> – Respondent 4

The opinions already expressed found the basis on where coordination can be achieved and more of that would not necessarily lead to any change for the better (Respondent 4). It was also expressed that there seems to be an unwillingness to listen to individual Member States opinions' from the EU side. Were that to change, the coordination process would still be very complex and iterative to take advantage of (Respondent 4).

V–Analysis

To ease up the structuring of the analysis, this chapter is divided into three major parts. Firstly, the descriptive evidence table (Table 7, as previously outlined in Chapter II.VI–Central concepts) is assessed to make an overall judgment of the respondents and their opinions. Secondly, the empirical findings are analyzed in more detail under their respective central concepts category to withhold the structuring of the previous chapter. Thirdly, and lastly, the research questions of this thesis are answered on the basis of the aforementioned other two parts of this chapter.

V.I–Overall assessment of the findings

The findings that were made in the empirical findings of the data collection are very diverse and have several elements of underlying factors that can explain the variances. The table below gives an overview of the opinions expressed.

Table 7. Descriptive evidence

Source	Interaction	Theoretical problem	Empirical problem	Impact
Respondent 1	Yes	Yes	No	No instrument conflict, ECS is not a climate instrument
Respondent 2	Yes	Yes	Yes	Problematic, but might be needed to spur on technological advances
Respondent 3	Yes	Yes	Yes	No real impact, but problematic with external effects
Respondent 4	Yes	Yes	No	No real impact, ECS is not a climate instrument, might increase EU ETS allowance price volatility
Respondent 5	Yes	Yes	Yes	Climate measures become more expensive unnecessarily
Respondent 6	Yes	Yes	No	No real impact, ECS is not a climate instrument
Respondent 7	Yes	Yes	No	No instrument conflict, ECS is not a climate instrument
Respondent 8	Yes	Yes	Yes	Problematic, too high EU ETS cap is the problem
Respondent 9	Yes	Yes	No	ECS is not a climate instrument, unclear impact

Note: The respondents' viewpoints are based on the evidence from the empirical findings and not of any direct quotes.

What is noteworthy in the above table is the unanimity of the perception of that there is an interaction between the Swedish Electricity Certificate System (ECS) and the European Union Emissions Trading Scheme (EU ETS). All respondents agreed on that there is an interaction, and all respondents also believed it to be a theoretical problem. Cause for concern about the theoretical effects of the interaction was voiced, and no respondent believed that there can be no negative effects *in theory*. However, on the fact whether the interaction is an empirical problem or not, the results depart from the unity and the naysayers are five against four. This raises awareness of the great uncertainty of the interaction as mentioned in the previous research on the interaction and is mirrored by the empirical findings of this thesis. Evidently, there seem to be no real consensus on the matter. Moving on to the impact assessment, the respondents viewpoints of the interaction emerges and specifies the reasons for it to be an empirical problem or not. The two factions are confounded in their inherent opinion where the naysayers assert that the ECS is not a climate policy instrument, where the other faction does not state that opinion. Looking even closer, the naysayers are also persons who are or have worked with the ECS directly within the Swedish public administration, whereas none in the other faction has. This is a very interesting and unexpected finding which will be further developed and elaborated in the second part of the analysis.

V.II–Operationalization of the central concepts

The empirical findings are hereunder analyzed through their respective central concepts category to ease the use of the collected data. The operationalization will form the basis of the third analysis part where the research questions are answered.

V.II.I–Perception of problem

The viewpoints on whether the interaction is a problem or not go wide apart as previously noted. As seen in the Descriptive evidence table (Table 7) all respondents agreed on that there is an interaction between the two policy instruments and that the interaction effects could theoretically be a problem. However, the empirical problem opinion varied, and the reasons for that can be divided into two categories. Firstly, the persons whose opinion is that there is no empirical problem with the interaction are all adamant that the ECS is not a climate policy

instrument – henceforth called the NCP (No Climate Policy) Faction. Alongside the mentioned literature on Tradable Green Certificates (TGCs), which reference to its climate impact value, Swedish Government Official Report simulations before the adoption of the Electricity Certificate Act (ECA) on its potential for carbon dioxide emission reductions, and other hints, suggest the ECS to be an energy *and* climate policy. Despite this, the NCP faction elevates other reasons for the ECS to exist. Diversity of supply is cited as the most prominent one which increases new base load renewable electricity in the energy system and creates a third leg of sorts alongside the two main sources of electricity in Sweden; nuclear and hydro power. Another reason mentioned was that renewable energy sources are readily available in Sweden, where the long coastline provides fortunate conditions for wind power and large land areas for biomass opportunities. Other sources that could also be available to diversify the electricity mix and increase the energy security, such as coal and gas, are not abundantly available in Sweden and would thus fall off the table. The natural choice then fell upon renewable energy sources. Additionally, the new electricity from renewable energy sources (RES-E) also helped to fulfill Sweden's goals of a 49% share of renewable energy in the gross final consumption of energy from the European Union's Renewables Directive (European Union, 2009a). Therefore, the ECS was not intended to create any environmental effects and, according to the NCP Faction, is therefore not to be regarded as contradictory to the EU ETS. This faction only consists of persons working directly or having directly worked with the ECS within the Swedish public administration.

The other person's viewpoints – the CP (Climate Policy) Faction – contradicted the former by not rejecting the fact that the ECS is in fact a climate policy instrument. Albeit the legislators' intentions, the RES-E is *de facto* connected to carbon dioxide emission reductions and consequently climate policies. The ECS is thus inferring on the climate policy instruments domain and the interaction causes unwanted effects. This faction consist of persons that are working with either the EU ETS within the Swedish public administration or are academic scholars who analyze the policies and their impacts from an outside perspective. Although this faction might have an understanding for that the ECS is not solely a climate policy, the instruments' interaction still creates a problem.

What the reasons are for the two factions to appreciate the purposes of the instruments differently are however hard to isolate. The possible explanation might depict fundamental intrinsic beliefs and values of the two factions. Since the NCP Faction solely represents the energy side of it, with technical and emotional ties to the ECS instrument, their beliefs might be shaped by the organizational translation of the goals. However, the CP Faction is engrained

with climate policies such as the EU ETS or other related instruments, and their technical and emotional ties to the ECS instrument are shaped as an intruder on the climate policy arena – due to its inherent climate component – and is thus regarded as an unnecessary evil. The consequences of this are clear to see in the various perceptions of the interaction.

That the EU ETS allowances are – as mentioned in the previous research by Brännlund and Broberg (2011) –, theoretically freed up because of the increased influx of carbon-neutral electricity in the energy mix as a consequence of the ECS, and later on transferred to other EU countries so that there is no positive environmental effect of the ECS and the higher price-burden for the Swedish energy consumers, is uncontested by both factions. However, the NPC Faction contests the *problem* of the environmental offset by stating that the ECS is not a climate policy, and thus should not be judged for something it is not supposed to do. Also, the high number of EU ETS allowances under the cap diminishes the impact of the interaction since the carbon allowances are thought to not be the limiting factor of production. The CP Faction however claims this to be problematic since the interaction undermines the EU ETS effect. Additionally, the prices of the allowances are lowered since the demand for them is decreased because the electricity mix is less carbon-intensive. This causes a contradictory effect when the EU ETS allowance price is diminished due to the ECS, and consequently reduces the impact of the EU ETS. Also, the CP Faction asserts that this will only lead to higher prices for the consumers for no apparent climate effect – as researched by Böhringer and Rosendahl (2009). This factor is nevertheless ignored by the NCP Faction since the pure size of the Swedish electricity market and the ECS makes the impact on the whole of the EU ETS system negligible. Lastly, the investments in new technology might require extra incentives which could be generated by the ECS and in the long run cause effects that are positive for climate change mitigation – as noted by Philibert (2011). The CP Faction has some understanding for this and admits that the higher price might be needed in some cases.

What these results ultimately boil down to are two standpoints where one disagrees with the other. One the one hand, the interaction is perceived to be a theoretical problem, but not an empirical one since the impact is very uncertain and is rendered negligible, along with the fact that the ECS is not even supposed to be a climate policy instrument. On the other hand, the theoretical problem of the interaction prevails along with the empirical problem that causes climate change mitigation policies to be more costly although the impacts for such an assessment are uncertain. Thus, the interaction between the ECS and the EU ETS exists, but discrepancies arise about its impact and whether it is a problem or not since no comprehensive empirical research has been carried out on the magnitudes of the effect.

V.II.II–Effectiveness

The major findings in this category are the different goal outputs of the two policy instruments and their contradictory effects due to their purposes. The ECS is thought to be a very good instrument for delivering new RES-E production at low costs, and is set to reach the targets that have been put upon the system. The EU ETS however is technically working well, since the emissions are under a cap, but the overflow of emission allowances is decreasing the price for the allowances and is therefore not sending the strong signals needed for firms to invest in new and less carbon-intensive technologies. This low EU ETS allowance prices does not have to be seen as a failure of the system since the carbon emissions are still under the cap, and even well under, which could be a receipt of effective and cheap emission cut measures. However, the cap is projected to generate emission reductions by 70% to 2050 which is far too little to reach the global climate goals, such as the Copenhagen Accord (UNFCCC, 2009, p. 5). Therefore, the large number of allowances under the cap *is a problem*, and therein lies the goal conflict. The goal of the ECS is to increase the production of renewable electricity which is carbon-neutral, which will then decrease the price for EU ETS allowances since the demand for them will decrease with the higher share of non-carbon-emitting energy usage. By deploying these two instruments simultaneously, the reasons for them to exist and their overall goals will contradict each other.

On the other side, since the electricity production in Sweden was mentioned to be almost carbon-neutral, any new input of RES-E will only push away non-carbon-emitting electricity anyway. This would mean that the goal conflict is erased since there is no effect on the carbon price allowance market of the EU ETS. This case was however not agreed on by all respondents which lead to thoughts about the underlying structures of the policy instruments. There seems to be a conflict of the goals and the outputs of the respective instruments, where the ECS is thought to have two different goals at the same time, both increasing RES-E production and also reducing carbon dioxide emissions. However, the NCP Faction does not agree with this, but thinks instead of the ECS as only providing incentives for new RES-E production to diversify the electricity production and thence improved energy security. By looking at the Logic Models of the two instruments (Table 1 and 2) the conclusion leads to an apparent goal conflict where A thinks of B differently than what B thinks of B and vice versa. More detailed, the CP Faction thinks differently of the ECS and of what the NPC Faction thinks of the ECS, as compared to how the NCP Faction thinks of the ECS and thinks of how the CP Faction thinks of the ECS. The goals are thus thought to be overlapping by one faction but not by the other.

V.II.III–National sovereignty

What can be drawn from the data on the national sovereignty category is closely tied to the interaction itself. As previously stated, the interaction effect is evident, and a proposed reason for it to exist is partly due to the two autonomous levels at which the two instruments reside. By being a member of the European Union, Sweden has transferred some authority from the national level to the supranational level. The EU ETS is regulated from the supranational EU level where Sweden has limited authority to control and change it. But, as expressed by one respondent, as long as Sweden has authority over one of the interacting policy instruments any unwanted effects can be staved off – in this case the ECS. However, as expressed by another respondent, if the EU will claim internal market reasons for any changes of or control over the ECS, the authority will thus be moved away from the national level up to the supranational level, leaving Sweden with no sovereign authority over either of the two interacting policies. This would thus be a factor when it comes to correcting instrument(s) for any negative and unwanted effects due to a possible interaction.

Whereas the multi-level polity system plays a role in the interaction, the decrease of the national state sovereignty is not clearly evident to be a cause for the interaction. The respondents varied their answers on this point, and gave inconclusive and inconsistent remarks on this issue. There might be a threat to the national sovereignty which can increase interaction effects, but instruments at the same polity level are known to be interacting as well and there are no clear suggestions that this example is unique for supranational and national polity level interactions. Interactions are omnipresent in policymaking areas that are overlapping in the policy mix. The EU and Sweden will have several interacting policy instruments both within each level and also spanning across the two with notions to that regional and local levels matter too. This can thus create problematic issues for instruments when the governance systems are encompassing several policy areas and polity levels, but are not a distinct cause for the interaction between the ECS and the EU ETS. The autonomous levels in this case can presumably make the interaction more resilient and harder to correct since neither have full authority over both polity levels during normal circumstances.

V.II.IV–Harmonization & coordination

As often proposed by studies on the matter of interacting policies, harmonization and coordination are two viable remedies to dampen or completely solve a possible negative interaction effect. The respondents gave in essence quite similar answers on the harmonization issue which is thought to be beneficial for both the EU and Sweden in terms of increasing the new RES-E production in a cost-effective way. Such a harmonization would lead to a more level playing field for the companies within the EU since the rules would be the same throughout the Member States. Harmonization would also create stronger signals for firms throughout the union to invest in new RES-E production. However, the chances that such a harmonization would occur are slim, since most of the Member States in the EU have different policy instruments for spurring on RES-E production, and the idea of a greater share of renewable electricity in the energy mix is not always favorable. Although unlikely, such a harmonization would diminish the effect of the transferable emission allowances due to the greater share of carbon-neutral energy usage since the whole union would be covered by that particular policy. Despite this, such a harmonization would also possibly increase the price decrease of the EU ETS allowances further due to the influx of more carbon-neutral electricity in the mix, and would thus not solve nor diminish that effect of the interaction.

In regards to better coordination between the polity levels, the respondents had more varied answers to give. Most thought of it as being a good idea in general, and acknowledged especially that it was an area that could always be improved. To coordinate policy issues around overall goals and possible unwanted effects on all levels seems to be needed in many ways to diminish any contradictory policy effects. However, some respondents were adamant that the coordination hardly could be improved, and that designing policy instruments independent of other instruments on various polity levels in various Member States was a positive thing. Too much coordination and consideration for other policies could potentially hamper the effectiveness and efficiency of the policy that is being designed. To go ahead and implement policies that are working and working decently was thought to be better than to not implement anything in search for the perfect policy instrument. Such a search would only lead to paralysis and could cause more damage than good. It seems here that *better coordination* is more of a text-book solution which is harder to make real use of in reality, where for example theoretical notions of the importance of this factor are highlighted by del Río (2006). In this case would such coordination not diminish any effects of the interaction, partly since the EU level is already aware of the interaction problem and partly because such coordination would require a complete reformulation of the current policies. Better coordination in this case

would be to streamline the climate policies and make them more separate from the energy policies and let the EU ETS act on its own without any interference of the ECS and other RES-E support policies. Such streamlining would however require different goals to be set since the Renewables Directive is set separately by the EU and seems to be a target that has a strong political backing from within the EU regardless of its effects in Member States.

V.III–Answering the research questions

Providing the information collected and assessed above, an answer to the research questions of this thesis begins to emerge. However complex and circuitous the situation may seem, a pattern can be distinguished when answering the question: *how is the interaction between the Swedish Electricity Certificate System and the European Union Emissions Trading Scheme perceived in Sweden*? Two standout findings occur, when the perception of the interaction resides in their inherent goal mishmash where some people perceive the ECS in part as a climate policy and some do not. This inherent distinction of the purpose of the instruments addresses the fact that there is a problem or not with the interaction; if it is a climate policy, then the effects of the interaction are negative and are not helping the climate cause, and if it is not a climate policy, it should not be judged to not deliver something it is not supposed to do. On the one hand, the persons working directly with the ECS within the Swedish public administration cite other reasons for the ECS to exist, such as diversification of supply, energy security and fulfilling the Swedish EU renewable energy goals. On the other hand, persons not working directly with the ECS but instead acting with the EU ETS or are standalone from either of the two policies persistently assert that this interaction is causing damage to the EU ETS as a climate policy and is not driving any carbon dioxide emission reductions. This is a very interesting finding due to the underlying understanding of the policies, which can by connected to both goal conflict and the intrinsic interests of the actors and how they respond to organizational translation of instruments' goals and purposes. This creates a disparate view of the instruments and causes differentiated beliefs about the interaction problem. Since the impact of the interaction is not clearly established, the magnitude of the ECS effect on the EU ETS is not fully understood. This fact was repeatedly stated by several of the respondents, as well as that the sole size of the Swedish energy market is not significant enough to cause any actual effects. Due to the low demand on EU ETS allowances, the interaction's effects are diminished even further which disables any

environmental benefit offsets brought up by scholars such as Brännlund (2011) and Vredin et al. (2011).

In the wake of the autonomous polity level discussion, a pattern emerges as the national sovereignty is decreased, but willingly so by membership in the EU, and thus decreases the chances for correcting any possible negative interactions. However, the different levels do not seem to be the cause of the interaction, partly due to the different goals of the supranational level where the EU both encourages the EU ETS and also incentivizes increased renewable energy production through its Renewables Directive (European Union, 2009a). This gives legitimacy for the ECS at the national level, and does in such not cause the interaction due to the autonomous levels acting with different and contradictory purposes. However, the autonomous levels in this case can make the interaction more resilient and harder to correct since neither have full authority over both polity levels in normal circumstances. These normal circumstances could however be altered if the EU would claim internal market reasons in order to be able to interfere with the Swedish ECS. As stated by one respondent, if Sweden has authority over one of the two interacting instruments the negative consequences can be corrected, but if this is not the case through internal market reasons – such as unfavorable or unjust market reasons –, the EU might gain full authority to intervene in any Swedish RES-E support policy. Whether this would be advantageous or not in correcting any possible interaction effect is not distinguishable.

Harmonization and coordination are the two elements (e.g., del Río, 2006) where remedies could be found to correct any such negative interaction effect. The appreciation of these two mechanisms are very much in line with the literature and can in appropriate terms be regarded as text-book solutions. To actually harmonize the support systems for renewable electricity production would be a feat not likely to happen due to divergent interests of the Member States. Creating better coordination between and within the polity levels could create more efficient and effective policies if handled correctly, but could also cause cluttering of policies that are over-worked and thus fail to deliver what they were supposed to do. By keeping the goals and the instruments separately, the goal focus is not lost and the effectiveness is more likely to be higher than if the utopian perfect policy instrument is designed and coordinated between and within different levels of governance in all eternity.

Summarily, the first research question on how the interaction is perceived gives nonidentical viewpoints of the effects and the impact, which comes down to the goal conflict of the two complimentary policies. The interaction is perceived differently by different people, depending on their understanding of the climate component in the policies and not the

energy component. It is safe to say that the interaction is complex enough to create these diverse opinions of impact assessment, goal orientation and how to best design climate and energy policies.

The second research question of this thesis – *why the interaction problem is understood so differently* – is closely tied to the first question of how it is perceived in Sweden. Evidently, the impact and the magnitude of the interaction are not yet established, and thus several theoretical assumptions are made without any real empirical claim. To establish a connection of the interaction effect and impact would require extensive research into European and Swedish energy and carbon market interactions and could potentially be very hard to isolate and distinguish. Assessing supranational and national policy interplay is complex in itself and does not by any means reside in a straightforward environment which would be needed to isolate one single effect. Social and political scientists repeatedly make up simplified normative models of how governance systems function, which could get consequences when analyzing the models due to one simple reason; there are always interactions! Due to this, interactions are bound to be understood differently since they are hard to distinguish. The international research community is not homogenous on the issue whether or not the interaction is problematic or not, nor what the actual impact or the real consequences may be. Therein can one explanation of the differing viewpoints lie since the TGCs are in many international contexts described as both an energy and a climate policy where the chief aim for spurring on more renewable electricity production is the carbon dioxide emission cuts that the TGC system may induced. However, in the case of Sweden, as expressed by most respondents, the ECS is not thought to be a climate policy and the reasons for adopting the instrument are not reasons that are tied to any carbon dioxide emission reductions. Since the Swedish gross electricity production is tantamount to carbon-free, there will be no carbon emissions reduction effect of any new additional influx of RES-E into the electricity mix. In addition, since renewable energy sources are readily available within Sweden – windy coastline, forests and land areas – the diversification of energy supply was best executed through renewables, and not with coal or gas which are not abundantly available in Sweden. Due to the TGC system being internationally regarded as a climate policy, whilst in Sweden the chief aim for the ECS does not relate to climate change mitigation, there are bound to be discrepancies about the understanding of the interaction of the ECS and the EU ETS.

Different opinions on the interaction and how it is understood are cause for concern since the two different goals of the instruments are in some ways connected but in some other ways contradictory. If the fulfillment of one policy causes negative impacts on another, then there is

definitely a problem of a negative interaction. If the effects of one policy are offset by the other, then that is most definitely a negative interaction as well. Despite this, if the impacts of those two interactions are not clearly defined there can be no *one* explanation of the interaction and thus will the viewpoints on it vary greatly. Summarily can it be noted that the problem is thought to be either a non-problem by some since the interaction is not evident to offset or impact the other policy instrument in any clear way, or by some that the interaction will in fact lead to more costly locked-in measures being taken for no apparent extra climate benefit however uncertain the impact is. Complimentary policies within the policy mix are intuitively supposed to create an enhanced effect than otherwise if the instruments were adopted in isolation. This, however, should not overshadow the fact that negative interactions can occur which will decrease the policy mix's overall performance which must not be forgotten when designing overlapping policy instruments.

VI–Theoretical developments

What, then, do stand out from the empirical findings between the interaction of the Electricity Certificate System (ECS) and the European Union Emissions Trading Scheme (EU ETS) where theoretical developments can be made out of? What lessons can be learned? By conceptualizing the connections and contradictions of the empirical findings through the analysis of this thesis's purpose and research questions, new theoretical notions can be generated in order to contribute to new research and knowledge on policy interplay, most importantly within multi-level policy instrument interactions and multiple policy instruments purposes and goal conflicts. These theoretical considerations can then be employed on other policy interactions. These contributes might, after being tested and scrutinized in different circumstances and situations, increase the awareness of policy interplay in general terms and furthermore deployed theoretically on other policy interactions. Two main concepts stand out of the empirical findings and the analysis and can be described in words of; *multi-level policy instrument interactions*, and; *multiple policy instruments and goal conflicts*.

The multi-level policy instrument interaction is evident when two policies interact from different polity levels. As noted earlier, a potential reason for the interaction to occur as it does is the interplay of two autonomous polity levels that can cause problems for managing two different interacting policies. However, this notion was not confirmed in the empirical findings and could thus not be said to hold true. What was instead found was that the two autonomous levels made the interaction *worse* in terms of managing it since no level had full authority of both instruments. This sparks ideas of multi-level governance theory that was developed in the 1990s by American scholars Gary Hooghe and Liesbet Marks on European Union cohesion policy (Bache, 2005, p. 5). The theory was described as "a system of continuous negotiation among nested governments at several territorial tiers" (Marks, 1993, p. 392). Where supranational, national and local policy networks are intertwined (Marks, 1993, pp. 402–403), the multi-level governance process can be described as an ongoing "interplay between different autonomous entities without assigning sovereignty to any other of them" (Ederlein, Wälti & Zürn, 2010, p. 3) which seems to fit directly into the national sovereignty central concept brought up earlier in this study. What do not go unnoticed are the complications that arise within such a multi-level governance system that enmeshes the European Union and its Member States. When the sovereignty is divided upon several tiers of polity levels neither level will have full control of the entire policy process chain.

One of the core principles of the multi-level governance theory is the notion of the growing interdependence of sub-national actors within the multi-tiered system (Bache & Flinders, 2004, p. 3). This raises awareness for stakeholder intervention on policy design and formulation, especially when policies such as the EU ETS encompasses and affects so many different Member States, regions and actors. Due to the sub-national actors and the supranational level there are sentiments of a demise of the national state sovereignty. When so many stakeholders and polity levels are entrenched in the policy process of different policies, interactions are bound to happen, and policies are bound to affect different countries and actors with diverging institutions and social norms differently. "Does the concept of sovereignty need to be redefined?" (Ederlein, Wälti & Zürn, 2010, p. 2) is a viable question when assessing the national level's authority over the policy process and its consequences. So how does the interaction express itself in this 'new' multi-level governance environment? Harmonization is, as stated several times before, traditionally mentioned as a possible remedy, but the mere existence of the different polity levels within the European Union are potential stumble blocks for harmonizing any policies over all Member States. The consensus of harmonization would be hard to reach within the EU because it is unclear whether it is politically feasible, and if it were, it remains uncertain to which level policies should be harmonized. Consequently, the policy interactions within multiple polity-level systems seem to be a result of a constantly globalizing world, where international conventions and policies conducted at the supranational level require policy processes to go through several tiers of governance systems. An interaction situation is therefore destined to occur when complex systems of governance levels operate different policies at different levels.

The multiple policy instruments and goal conflicts concept of the findings that can be theorized reside in the multiple purposes of the two interacting policy instruments. When two policies interact negatively, the individual purposes of the policies must first be analyzed to see whether a goal conflict is eminent. On this matter, the findings of this study show that the goal of the ECS is to increase the production of electricity from renewable energy sources (RES-E), whilst the goal of the EU ETS is to cap, and eventually reduce, total carbon dioxide emissions. That is all well and good, but the purposes of these goals come together when the reasons for adopting them interact. If a greater share of renewable energy is included in the gross energy mix of a Member State, that greater share will affect the carbon dioxide emissions and thus affect the goal of the EU ETS. The purpose of promoting increased RES-E production must be sorted out – whether it is mainly due to energy diversification or carbon dioxide emission reductions – since the two goals could otherwise interfere. In the empirical

findings, Sweden's purpose of promoting RES-E production through the ECS was however *not* for carbon dioxide emissions reduction reasons, but for other reasons such as diversification of supply and increased energy security. These findings raise notions of conflict theory (e.g., Lebow, 1981) when the EU's reasons for promoting increased RES-E production are chiefly for the cuts in greenhouse gas (GHG) emissions it delivers (see European Union, 2009a) as contradictory to the Swedish reasons of adopting the ECS. The conflict here, where entity A thinks of B in another way than B thinks of B, and vice versa, can also be transferred over to the fact of the discrepancies regarding whether the ECS is a climate policy or not as seen from a Swedish perspective and shown in the empirical findings. There are clear indications of that there are conflicts over the purposes of the instruments and whether they interact or not. Goal conflict scenarios have been studied in academics by organizational theorists where complex conflicting goals settings attached to goal difficulty might hamper productiveness and cause unwanted effects (e.g., Locke, Smith, Erez, Chuh & Schaffer, 1994; Slocum, Cron & Brown, 2002; Kehr, 2003; Cheng, Luckett & Mahama, 2007). This can indicate signs of debilitating the overall purpose of either of the interacting instruments.

The other sides of the goal conflict scenario are multiple policy instruments for multiple goals. In Stavins' (2010) example of the U.S. Acid Rain cap-and-trade program where two policies were used for two different goals – acid rain and displaced miners due to the high levels of sulfur in Appalachian coal mines –, $1 billion dollar were perpetually saved from the economy due to the multiple instruments used instead of one single instrument that sought to address two different problems. The distinction here is how, and for what reasons, the two goals should be addressed. The EU ETS seeks to reduce carbon dioxide emissions and the ECS seeks to increase RES-E production. Since it is hard to kill two birds with one stone, multiple instruments are sometimes needed, but might come at a cost of complimentary policy interplay. It was mentioned by the respondents that the ECS's interaction with the EU ETS can cause higher aggregate abatement costs, and that fact remains true for all complimentary policies that interfere with the EU ETS such as energy efficiency measures, feed-in tariffs and energy and carbon taxes. Thus, whenever politicians pursue two different goals, two different policy instruments to address them is usually the best viable option. However, the goal combination must also be assessed over the reasons for adopting the two goals. If the goals are interfering and causing negative interaction effects, there might be a need for a single policy to address a single problem, namely carbon dioxide emission cuts.

The Swedish ECS seems to be exempt from this goal combination disorder since the reasons from as Swedish perspective for adopting the ECS was not to decrease carbon dioxide emissions, but to increase diversification of supply, energy security and to fulfill EU legislation of new RES-E production. What becomes evident is the goal combination paradox that the European Union then has to tackle, where the union's goals are mirrored by the Member States who have significant leeway in how to reach the goals which can create side effects for other policy instruments. Coordination arises as the general solution to such multiple goal combination policies where the EU has to coordinate the policy interplay not only between the supranational level and Member States on the national level but also within its domains – carbon dioxide reductions and increased RES-E production – so that the goals are reached as cost-effectively as possible.

Summarily, what can be described as a demise of the national sovereignty affects the authority over policy formulation and implementation exerted by Member States in the European Union. When so many stakeholders, Member States, interests and polity levels are intertwined, policy interactions are prone to take place. This national authority decrease has however not been found to be the reason for any policy interactions to appear, but may cause the interaction to be more resilient and make it harder to correct. Harmonization is a viable path to head down if interactions are to be eliminated, but when enmeshed in complex multi-level governance systems the task of harmonizing the rules for all Member States becomes increasingly harder. In addition, as mentioned, having two policy goals often requires two policy instruments, but when the reasons for adopting the two goals are connected, chances are slim that any interaction effects would fail to occur. The reasons for adopting the policy goals must be developed in coordination so that no negative interactions take place. As the supranational level formulates overarching policy goals, these goals can affect different nations and institutions differently and might cause concern for reasons to adopt adequate measures. As in the case with the ECS, since the adoption of the instrument was not tied to carbon dioxide emission cuts, the main reason for the Renewable Directive (European Union, 2009a) goal from the supranational level was thus overthrown. If two policies are needed for one goal, the incentive of the individual purposes of them must be thoroughly motivated and communicated so as to diminish conflict paradoxes of the respective instruments' goals and purposes, such as advances for renewables and new 'green technologies' as contra to only supporting a carbon dioxide pricing market. As within this study's example can the effect of all complimentary support policies for renewable energy and energy efficiency in the European Union have an incremental effect on allowance prices of the EU ETS and thus

negatively impact the carbon dioxide emissions price. This would in turn create higher aggregated abatement costs for the consumers who are unaware of any interacting policies that they will have to pay for. By separating the policy instruments and the goals and purposes of national and supranational policies, interactions might thus be decreased and not negatively affect the effectiveness of the instruments and the overall performance of the policy mix.

VII–Conclusion

In accordance with the previous research on the interaction between policy instruments and particularly on the interaction between renewable energy promotion and carbon emission reduction systems, this study shows many different understandings of the interaction. However, since the research is solely conducted from a Swedish perspective, some elements are of special note for the research community to which this study can contribute.

The conclusions of this study are drawn from the research questions and the generated theoretical conceptions. Firstly, the empirical findings of the thesis set out to answer how the interaction between the Swedish Electricity Certificate System (ECS) and the European Union Emissions Trading Scheme (EU ETS) is perceived from the Swedish perspective. The findings gave several viewpoints on the interaction and the respondents varied greatly in their answers. Most notably did the respondents agreed on that there is a theoretical interaction, but whether it poses an empirical problem or not is unclear. In essence, the understanding whether the ECS is a climate policy or not determines whether the interaction is perceived as a problem or not. Where one faction of the respondents argues that the ECS was not adopted for carbon dioxide emission reduction reasons but instead due to diversification of supply, increased energy security and to fulfill the EU's Renewables Directive, the other side argued that the climate component in the ECS still negatively interferes on the EU ETS allowance price. This goal conflict resembles a failure of translating organizational goals of how to perceive the instrument's overall purpose: whether as a climate policy or not. Since the two factions were dominantly on either side of the energy and climate policy sphere, the intrinsic emotional interests of the two different factions might be the reason for them to understand the policy differently. The interaction impact was however predominantly perceived to be a non-problem since the magnitude of the effects is uncertain and presumably negligible. Thus, the interaction between the ECS and the EU ETS exists, but discrepancies arise about its impact and whether it is a problem or not since insufficient empirical research has been carried out on the magnitudes of the effect. Harmonization and coordination are potential remedies for negative interaction effects but can be said to be more of text-book solutions whilst harder to implement in reality due to dissimilar views on to what level and how to design the harmonized instrument and for an actual will to better coordinate through and within polity levels without creating too cluttered instruments that fails to reach their targets.

Secondly, the question of why the interaction problem is perceived so differently is closely related to the first question since the different perceptions of the interaction mirror the reasons

for it to be understood so differently. Since the increased electricity from renewable energy sources (RES-E) production on EU and international level is chiefly related to climate change mitigation, the understandings of the Swedish ECS policy will evidently hold different people to believe that to be one of the purposes of the instrument and the understanding of the interaction will therefore vary accordingly. However the ECS policy is understood, the theoretical effects of the interaction might still undermine the EU ETS prices and create increased aggregate abatement costs put on the consumers for no apparent reason due to locked-in measures. The goal conflict arises here when the purposes of the instruments are related but not thought to be directly linked – namely increased RES-E production and carbon dioxide emission reductions. What the reasons are for adopting these policies is however the main driver of whether the purposes are interlinked or not. The interaction is theoretically factual but not empirically assessed and since the impact is uncertain the viewpoints on the problem will be disparate as well.

The theoretical developments of the thesis take hold of the concepts of multi-level governance systems within the autonomous polity levels where the interacting policies reside. The national sovereignty over policy formulation and implementation has been limited due to sub-national and supranational interests and various actors and stakeholders that will decrease national sovereignty and can thus create complimentary policies since the authority is moved away from the national level. This was found to not be a significant reason for the interaction to occur, but might make it harder to correct via coordination and harmonization of policy instruments on different levels. In addition, policy goal conflicts take place when multiple polity-levels formulate multiple policies for multiple goals. The reason for adopting the policies need to be sufficiently developed in coordination with other policies and might need multiple policies to be effectively and efficiently fulfilled. If different policy goals are pursued, two or more policies might be the best option if the purposes are differentiated and not connected. However, if the two policies' overall purposes are intertwined in the policy mix, interactions are bound to happen that can create negative effects on either of the two policies, and thence might decrease the overall performance of the instruments.

VII.I–Discussion

Based on the conclusions of this study, the empirical findings, analysis and theoretical developments, what is there to learn from these results? At first, differences between various support policies for renewable electricity highlight the importance of a national context of understanding different interacting policies. The Swedish ECS had different reasons for being adopted as compared to what other countries in the European Union might have had for other RES-E support policies. The importance of looking at policy formulations and implications from different perspectives is evident when the reasons for adopting the policies vary. This is especially true when RES-E production support policies are implemented in an already crowded policy space where several instruments are thought to perform effectively and efficiently towards one or several targets. In this way, interactions are very likely to occur and the complimentary policies, for which the reason to adopt them are more obscure, can carry over effects to the policy mix – both negatively and positively.

One way of trying to solve these issues is to streamline the climate and energy policies and make them more standalone. However, climate and energy issues are tightly connected and policies have to be intertwined in the policy mix in some way in order to create the positive incentives needed to spur on climate change mitigation, technological developments and still maintain a healthy and competitive industry sector. If the main policy driver is deemed not adequate enough to create the incentives needed, then complimentary policies might be needed. This must however be communicated and motivated sufficiently so that any interaction can be legitimately justified. In addition, the details of the EU ETS cap are in desperate need of being adjusted. If the overall purpose of the cap-and-trade system is to create a price for carbon dioxide emissions then the price level needs to be in accordance with the scope of the EU ETS target and effectively decreasing carbon dioxide emissions. As mentioned throughout the empirical findings, the EU ETS cap is set too high, and the price for the allowances is much too low to create sufficient incentives to invest in carbon-neutral technologies. A low allowance price level must not *per se* be described as problematic since it only reflects low marginal abatement costs where carbon dioxide emission reduction measures are effective and efficient. If the emissions are under the cap, the goal is reached and low prices reflect low costs for the society. This holds true, but only so when the level of the cap is taking countries where they want to go. As of now, the carbon dioxide emissions will only be reduced by roughly 70% until 2050 which is not sufficient enough to reach overall climate targets such as the Copenhagen Accord (UNFCCC, 2009, p. 5). Therefore, the

EU needs to tighten up the cap of the EU ETS to create a main incentives driver through a cap-and-trade system. Another measure that can be taken is to create a price floor of the allowance prices which would guarantee a minimum price which the industry can adhere to and use in its planning horizons. Also, a price ceiling, or yet even a price collar – price floor and ceiling combined –, could be put upon the system to increase the incentives for firms to invest in new technologies. This is necessary since reaching the climate targets regardless of the cap of the EU ETS is globally inescapable. If the superior goal is to reduce the carbon dioxide emissions cost-effectively then *one* policy instrument would be the best choice. Alas, if there are two goals, one to decrease carbon dioxide emissions and one to specifically increase RES-E production, two policies are needed that will most likely interfere with each other and create an interaction effect however uncertain the impact is within the policy mix.

To conclude, four policy recommendations summarize the findings that can be of use for policy makers at both national and supranational level when determining how to combine renewable electricity support systems with carbon dioxide reduction systems.

♦ One instrument for one problem, two instruments for two problems. If carbon dioxide emission reductions are the only goal, one policy will most likely be the best viable choice. However, if two goals are to be attained, both carbon dioxide reduction and increased production of RES-E, then two policies are highly desirable.

♦ The reasons for deploying different policies must be sufficiently communicated and motivated in order to create legitimate instruments. If the reason for adopting a Tradable Green Certificate system is not to reduce carbon dioxide emissions, communicating the real reasons – energy security, diversification of supply or fulfillment of supranational targets – are imperative to avoid unjustified criticism.

♦ Avoid overlapping instruments whenever the purposes are the same. Although the interaction's impact is negligible, the shadow costs will be more difficult to determine and subsequently will the efficiency of the policies be highly uncertain. Since one policy might 'pay' for the other, the policies must be coordinated and harmonized accordingly so that both objectives are reached at the lowest costs possible within the policy mix.

♦ Supranational targets must take into account different national settings. A target set at EU level can induce similar types of policies in different countries, such as RES-E support policies, whilst the outcome of the EU target might not be the same in all Member States. This can cause higher aggregate costs which could have been avoided if the EU targets were set more appropriately for different Member States. A more rigid design of an Emissions Trading System such as the EU ETS – with mechanisms such as price floor, ceiling or collar – could provide enough incentives to invest so that complimentary policies are not needed which consequently can eradicate potential negative effects of interacting policy instruments.

VII.II–Further research

Several viable topics for further research on the subject could be of relevance, and especially other examples of the perceptions of other countries understanding of the interaction. Since this thesis is set out from the Swedish perspective, an analysis of other countries with renewable energy support policies that could interfere with the EU ETS is likely to broaden the knowledge on the matter. Since changes in the EU ETS legislation will take effect in Phase III from 2013 onwards, these effects could also be assessed in order to see whether they change anything regarding the interaction effect. Auctioning of EU ETS allowances could possibly mitigate the trading effect that takes place when renewable energy offsets emission allowances in one country that can be emitted in another country. However, the effects on the interaction of the changes during the EU ETS Phase III are as of now uncertain and more research is needed.

Another possible dimension of the interaction effect could be to include a more political dimension within the scope of the study, where politicians and not only policymakers are included in the data collection. This could presumably highlight other factors that cause complimentary policies to be adopted and might give a better overall comprehension of the democratic sphere of policymaking. Additional effects of the interaction, such as effects on energy security, competitiveness and energy poverty as outlined in the EU's core principles for EU energy policy – as laid down in the Lisbon Treaty Article 194 (European Union, 2008) – might further highlight the policy mix's overall outcome. This is highly relevant from a

political science perspective where the economic consequences of a negative interaction might cause effects to other institutions and human welfare.

The most important research that still has to be conducted is the impact assessment of the interacting policies as numerous scholars have concluded before, and there is no reason that this does not hold valid as of this date. Despite the difficulty of isolating the effects of interacting policies in an EU-wide carbon allowance market, research will have to be conducted if the magnitude and the gravity of the impact of complimentary supranational and national policy interplay are ever to be understood. The impact assessment however appears to be a winding and thorny research path for a political scientist and might best be left to better equipped economists to deal with.

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Appendix A

Interview guide

Note that the order of the questions does not necessarily reflect the sequence during the interviews. The exact phrasing might also not have been used. Follow-up questions were asked and the respondent's where encouraged to elaborate on their key notions.

Perception of problem

♦ Is there an interaction between the Electricity Certificate System and the European Union Emissions Trading Scheme?

♦ What are the consequences, and is it a problematic issue?

For example:

- ♦ Will the interaction offset the environmental benefits of the Electricity Certificate due to the emissions trading within the European Union Emissions Trading Scheme?
- ♦ Will the interaction increase the price of reaching the emission targets?
- ♦ Will the interaction "serve the dirtiest", as in when the most carbon-emitting technologies are benefited since the shadow cost of the emissions constraint is decreased due to the Electricity Certificate System?
- ♦ Will the interaction undermine the Electricity Certificate market and cause a higher pricing of renewable electricity?
- ♦ Are there other effects associated with the interaction?
- ♦ Will the interaction cause any positive or negative synergies?

Effectiveness

Electricity Certificate System

♦ What do you think of the Electricity Certificate System as a means to increase the production of electricity from renewable energy sources?

♦ What do you think of the Electricity Certificate System as a means to decrease overall carbon dioxide emissions from Swedish electricity production?

♦ Do you think that the Electricity Certificate System will be developed further in the future?

♦ Are there other policy instruments that would be better in order to increase the production of electricity from renewable energy sources than the Electricity Certificate System?

♦ Are there other policy instruments that would be better in order to decrease the carbon dioxide emissions more than the Electricity Certificate System?

European Union Emissions Trading Scheme

♦ What do you think of the European Union Emissions Trading Scheme as a means to decrease carbon dioxide emissions within Sweden and the European Union?

♦ Do you think that the European Union Emissions Trading Scheme will be developed further in the future?

♦ Are there other policy instruments that would be better in order to decrease the carbon dioxide emissions more than the European Union Emissions Trading Scheme?

♦ Are there any problems with the European Union Emissions Trading Scheme in regards to decreasing carbon dioxide emissions?

National sovereignty

♦ Is the Swedish sovereignty (national level) of policy formulation and implementation threatened due to the European Union (supranational level)?

♦ Are there signs that the Swedish authority (national level) in terms of correcting any negative effects of the interconnection is diminishing due to the autonomous European Union (supranational level)?

♦ Is it desirable from a Swedish perspective to have a pan-European Electricity Certificate System?

Harmonization and coordination

♦ Is there a need for harmonization of the Electricity Certificate System on a supranational level to minimize the negative interaction effects or maximize positive interaction effects?

♦ Do you believe that the total electricity produced from renewable energy sources would be increased if there were a pan-European Union Electricity Certificate System?

♦ Do you believe that carbon dioxide emissions would be reduced further if there were a pan-European Union Electricity Certificate System?

♦ Is there a need for better policy coordination between the supranational level of the European Union Emissions Trading Scheme and the national level of Electricity Certificate System to minimize possible negative interaction effects or maximize positive interaction effects?

Appendix B

Table 8. Personal communication

Andersson, F. NG. (2012). Personal communication, March 16, 2012 in Lund, Sweden.
Borgström, T. (2012). Personal communication, March 21, 2012 in Stockholm, Sweden.
Björk, O. (2012). Personal communication, March 22, 2012 in Stockholm, Sweden.
Coria, J. (2012). Personal communication, March 29, 2012 in Gothenburg, Sweden.
Ebenå, G. (2012). Personal communication, March 14, 2012 in Gothenburg, Sweden.
Hammes, K. (2012). Personal communication, March 14, 2012 in Gothenburg, Sweden.
Högberg, M. (2012). Personal communication, April 10, 2012 in Brussels, Belgium.
Jernbäcker, E. (2012). Personal communication, March 22 2012 in Stockholm, Sweden.
Karlsson, J. (2012). Personal communication, March 14, 2012 in Gothenburg, Sweden.

Appendix C

Table 9. ECS quotas and forecasted production

Quotas for the period 2003–2035 with forecasted accumulated new renewable electricity production and actual accumulated new renewable electricity production.

Year	Quota [%]	Forecasted RES-E production (accum.) [TWh]	Actual new RES-E production (accum. increase) [TWh]
2003	7.4		1.96
2004	8.1	–	4.55
2004	10.4	–	4.80
2006	12.6	–	5.66
2007	15.1	–	6.76
2008	16.3	–	8.54
2009	17.0	9.31	9.07
2010	17.9	10.81	11.55
2011	17.9	11.84	
2012	17.9	12.94	
2013	13.5	14.80	
2014	14.2	16.26	
2015	14.3	17.71	
2016	14.4	19.17	
2017	15.2	20.63	
2018	16.8	22.09	
2019	18.1	23.54	
2020	19.5	25.00	
2021	19.0	25.00	
2022	18.0	25.00	
2023	17.0	25.00	
2024	16.1	25.00	
2025	14.9	25.00	
2026	13.7	25.00	
2027	12.4	25.00	
2028	10.7	25.00	
2029	9.2	25.00	
2030	7.6	25.00	
2031	6.1	25.00	
2032	4.5	25.00	
2033	2.8	25.00	
2034	1.2	25.00	
2035	0.8	25.00	

Source: Reworked from Swedish Energy Agency (2011a), p. 15