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Trading activities and strategies in the European carbon market

Final report

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Trading activities and strategies in the European carbon market

Final report

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Abstract: Trading activities and strategies in the European carbon market

The European Emissions Trading System (EU ETS) constitutes a central European climate policy instrument. Since its start of operation in 2005, the carbon market has grown considerably in terms of trading volume and also with regard to the various players being active. This report is part of the research project "Trading activities and strategies in the European carbon market" and aims to give an insight on the specific trading behaviour of market participants from the energy and financial sector based on publicly available data from the European Union Transaction Log (EUTL). It summarizes the findings and results of the two working packages of this research project. Whereas the first work package focused on the methodological foundations and economic research possibilities within the EUTL itself, the second work package undertook a hands-on analysis and evaluation of twenty entities operating in the EU ETS. The examined period comprises January 2013 to April 2016.

The first chapter of the report at hand provides some background information, while chapter two presents a preliminary analysis of assumptions and observations on the characteristics and role of the energy and financial sector in general. Following the premise that large energy utilities and financial institutions are decisive market players in the EU ETS, ten utilities and ten players from the financial sector were selected for an in-depth analysis of their published transactions in the EUTL in chapter 3. The results of the preliminary analysis were then compared with the derived trading profiles on the basis of the EUTL data. The detailed, data-based understanding of the behaviour of the energy and financial sectors is summarised, discussed, and evaluated in this paper. Chapter 4 concludes on the findings, followed by an outlook and further analysis options in chapter 5.

Kurzbeschreibung: Handelsaktivitäten und -strategien im EU Kohlenstoffmarkt

Das Europäische Emissionshandelssystem (EU ETS) ist ein zentrales Instrument der europäischen Klimapolitik. Seit seinem Start im Jahr 2005 hat der Kohlenstoffmarkt in Hinblick auf Handelsvolumen und auch auf die aktiven Marktakteure beträchtlich an Bedeutung gewonnen. Der vorliegende Bericht ist Bestandteil des Forschungsprojekts „Handelsaktivitäten und -strategien im EU Kohlenstoffmarkt“ und soll einen Einblick in das spezifische Handelsverhalten von Marktakteuren aus den Sektoren Energie und Finanzen geben. Grundlage der Analyse sind die im europäischen Transaktionsprotokoll EUTL (European Union Transaction Log) gespeicherten und veröffentlichten Daten. Dargestellt werden die Ergebnisse der beiden Arbeitspakete dieses Forschungsprojektes. Während das erste Arbeitspaket auf die methodischen Grundlagen und Einsatzmöglichkeiten für ökonomische Fragestellungen fokussierte, wurde im zweiten Arbeitspaket eine Analyse und Auswertung des realen Handelsverhaltens zwanzig ausgewählter Akteure im Rahmen des EU-Emissionshandels vorgenommen. Untersucht wurde der Zeitraum Januar 2013 bis April 2016.

Das erste Kapitel stellt einige Hintergrundinformationen bereit. Kapitel zwei zeigt eine vorbereitende Analyse von Annahmen und Untersuchungen bzgl. Charakteristika und Rolle von Energie- und Finanzsektor im Allgemeinen. Der Annahme folgend, dass große Energieversorger und Finanzinstitute maßgebliche Akteure im EU-Emissionshandel sind, wurden zehn Energieversorgungsunternehmen und zehn Finanz- bzw. Handelshäuser ausgewählt, deren veröffentlichte EUTL-Transaktionen in Kapitel drei detailliert untersucht wurden. Die Ergebnisse dieser Analyse wurden dann mit den zuvor getroffenen Annahmen abgeglichen. Die Ergebnisse dieser detaillierten, datenbasierten Auswertung des Marktverhaltens des Energie- und Finanzsektors werden in vorliegendem Report zusammengefasst, diskutiert und bewertet. Kapitel vier zieht einige Schlussfolgerungen aus den Ergebnissen, gefolgt von einem Ausblick auf mögliche, weiterführende Analysemöglichkeiten in Kapitel fünf.

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List of abbreviations

BE	Belgium
BG	Bulgaria
CER	Certified Emission Reduction
CME	Chicago Mercantile Exchange
CO2	Carbon dioxide
CO2e	Carbon dioxide equivalent
CZ	Czech Republic
DE	Germany
Dec	December
DEHSt	Deutsche Emissionshandelsstelle
DK	Denmark
EC	European Commission
EEX	European Energy Exchange
ES	Spain
ETA	Emission Trading Authority
EU	European Union
EU ETS	European Union Emissions Trading System
EUA	European Union Allowance
EUTL	European Union Transaction Log
FI	Finland
FR	France
GB	Great Britain
GHG	greenhouse gas
GR	Greece
HU	Hungary
ICE	Intercontinental Exchange
IT	Italy
LU	Luxembourg
LULUCF	Land Use, Land Use Change and Forestry
m	million
NL	Netherlands
NO	Norway
OTC	Over-the-Counter
PL	Poland
PT	Portugal
RO	Romania
SE	Sweden
SI	Slovenia
SK	Slovakia
SME	Small and Medium-Sized Enterprises
TL	Transaction Log

BE	Belgium
TP	Trading period
UK	United Kingdom

Zusammenfassung

Das im Jahr 2005 eingeführte Europäische Emissionshandelssystem (EU ETS) ist eines der bedeutendsten Klimapolitikinstrumente der Europäischen Union. Seither wächst der Handel mit EU-Emissionsberechtigungen (EUA), bis zuletzt mit jährlichen Zuwachsraten im zweistelligen Prozentbereich für das Handelsvolumen. Ein Großteil dieser Handelsmengen entfällt dabei auf die großen Energieversorgungsunternehmen und den Finanzsektor als mengenmäßig wichtigste Handelsakteure.

Die Strategie der Marktakteure kann dabei durchaus unterschiedlich sein: So kaufen Industrieunternehmen typischerweise am Markt um ihrer Abgabeverpflichtung aktuell und für die kommenden Jahre kostenoptimiert nachzukommen. Energieversorger kaufen im Rahmen ihrer Hedging-Strategie (d. h. zur Absicherung ihrer Stromverkäufe am Terminmarkt) oder institutionelle Anleger im Sinne einer Geldanlage, um so an einer langfristigen Wertentwicklung am Markt zu partizipieren. Große Energieversorger und Finanzinstitute nehmen darüber hinaus oftmals auch eine Rolle als Intermediär ein, um anderen Unternehmen einen Marktzugang zu verschaffen.

Zwar gibt es in der vorhandenen Literatur Ansätze, um das Handelsverhalten der Marktteilnehmer zu untersuchen, doch besteht nach wie vor Forschungsbedarf hinsichtlich des spezifischen Handelsverhaltens und der zugrunde liegenden Strategien der verschiedenen Akteure im Europäische Emissionshandelssystem.

Ziel dieser Studie ist es, das spezifische Handelsverhalten von Marktteilnehmern aus dem Energie- und Finanzsektor anhand der Transaktionsdaten des EUTL näher zu untersuchen.

Transaction Log der EU

Das European Union Transaction Log (EUTL) bietet einen empirischen Ansatzpunkt zur Analyse des Handelsverhaltens der Marktakteure. Dort werden neben zahlreichen Informationen zu Unternehmen, Konten im Unionsregister und Compliance-Daten (z. B. Abgabe von EUA) auch die Daten der Transaktionen innerhalb des Unionsregisters gespeichert. Letztere werden für einen Jahreszeitraum bis April mit einer Verzögerung von drei Jahren freigegeben und veröffentlicht. Die aktuellsten öffentlichen Daten stammen somit von April 2016.

Eine Extraktion dieser Daten einschließlich Zuordnung zu Konten und somit den Unternehmen im Transaktionsregister ermöglicht eine unternehmensspezifische Auswertung des Transaktionsverhaltens sowie eine sektorspezifische Aussage. Eine direkte Ableitung von Handelsstrategien ist dadurch noch nicht gegeben, da die Daten nur physische Transaktionen umfassen. Unter Kenntnis der Marktspezifika lassen sich allerdings die Transaktionsmuster an Thesen zur Handelsstrategie spiegeln, was eine indirekte Ableitung von Aussagen zu Handelsstrategien der Akteure erlaubt.

Im Rahmen dieses Projekts werden die Daten des EUTL als Grundlage für die Analyse des Handelsverhaltens einiger ausgewählter Akteure des Energieversorgungs- und des Finanzsektors verwendet. Damit stellt das EUTL die wichtigste Datenquelle im Rahmen dieser Studie dar. Zur Analyse wurden u. a. folgende Daten zum EU ETS heruntergeladen und im Rahmen der ICIS-Datenbank weiter aufbereitet:

- Konten
- Zuteilungsmengen

- Compliance-Daten und
- Transaktionen

Restriktionen

Die Interpretation von Transaktionsdaten des EUTL unterliegt zahlreichen Einschränkungen bzw. verlangt Annahmen. Die wichtigsten Punkte betreffen die Zuordnung von Spot- und Termingeschäften sowie die Unterscheidung von Börsen-Transaktionen zwischen Primärmarkt (Auktion) oder Sekundärmarkt (Derivate).

Die EUTL-Daten decken nur die physische Lieferung der verschiedenen Zertifikate ab, geben jedoch keine Angabe zum Handelstag. Daher kann auf Basis der EUTL-Daten allein keine gültige Schlussfolgerung zu den Handelsstrategien gezogen werden. So sind Interpretationen und Annahmen erforderlich, um Handelsstrategien abzuleiten. Gleiches gilt für Korrelationen mit anderen Marktdaten wie Preisen oder Handelsvolumina. Beim Spotgeschäft entspricht das Kaufdatum in etwa dem physischen Liefertermin, aber Spot- oder Termingeschäfte werden im Transaktionsregister nicht separat gekennzeichnet. Infolgedessen kann keine klare Unterscheidung zwischen beiden Handelsprodukten getroffen werden.

Zudem können die Transaktionen, welche von einer Börse mit Auktionsplattform kommen, nicht dahingehend unterschieden werden, ob sie von der Auktion oder dem Sekundärmarkt stammen. Im Register wird dies nicht gesondert ausgewiesen. Daher fehlt im vorliegenden Bericht eine entsprechende Unterscheidung. Die Listung eines Unternehmens als Auktionsteilnehmer (Mitglied) bietet lediglich einen Anhaltspunkt für eine Unterscheidung (nur Mitglieder können an den Auktionen teilnehmen). Auch bieten nur zwei Börsen Auktionen an. Dies wird im Bericht mit ausgewiesen.

Transaktionsprofile

Der vorliegende Bericht liefert einen umfassenden Blick auf die Transaktionsprofile ausgewählter Energieversorgungsunternehmen und Finanzinstitute auf Grundlage einer Analyse, Aufbereitung und Bewertung der veröffentlichten Transaktionsregisterdaten der EU-Kommission. Der Betrachtungszeitraum hierbei ist Januar 2013 bis April 2016.

Für die Auswahl von zehn Energieversorgungsunternehmen und zehn Finanzinstituten wurden folgende Kriterien definiert.

Tabelle 1: Auswahlkriterien zur Bestimmung der Beispielunternehmen (Energieversorger und Finanzinstitute)

Energieversorger	Finanzinstitute
▶ Emissionshöhe im Europäischen Emissionshandelssystem ▶ Verteilung über unterschiedliche Länder in der EU ▶ Aktivitäten im TL: Anzahl Transaktionen, regelmäßige Transaktionen ▶ Möglichst gelistete Auktionsteilnehmer	▶ EUA-Handelsvolumen zwischen 2013 und 2015 ▶ Anzahl der Transaktionen ▶ Regelmäßigkeit von Transaktionen ▶ Unterschiedliche Kategorien: Bank, Fond, Handelshaus

Quelle: ICIS & FutureCamp.

Anhand konkreter Kriterien zu diesen Aspekten wurden zehn Energieversorgungsunternehmen und zehn Finanzinstitute für die detaillierte Analyse der Transaktionsprofile ausgewählt. Bei der Auswahl der Marktakteure kamen zu den quantitativen Auswahlkriterien auch qualitative Bewertungsaspekte hinzu. In der nachfolgenden Tabelle sind die ausgewählten Referenzunternehmen gelistet.

Tabelle 2: Untersuchte Energieversorger und Finanzakteure

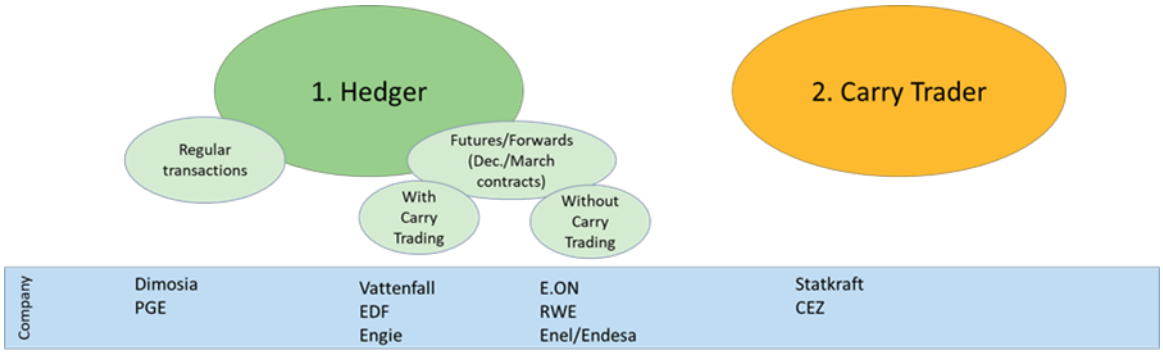
	Energieversorgungsunternehmen	Finanzinstitute
1	CEZ Group	Belektron
2	Dimosia	Blackstone
3	EDF	BNP Paribas
4	Enel /Endesa	Commerzbank
5	Engie Power	Deutsche Bank
6	E.ON	Macquarie
7	PGE	Mercuria
8	RWE	Mitsui Bussan
9	Statkraft	Societe Generale
10	Vattenfall	Vertis

Quelle: ICIS & FutureCamp.

Energiesektor

Auf Basis der analysierten Transaktionsprofile konnten Cluster für den Energie- und Finanzsektor definiert werden. Im Energiesektor wurden zwei Hauptgruppen identifiziert. Diese bezeichnen wir zum einen als „Hedger“ und zum anderen als „Carry Trader“[1]. Dies ist in Abbildung 1 dargestellt.

Abbildung 1: Cluster der Energiewirtschaft und Zuordnung der zehn ausgewählten Energieversorgungsunternehmen



Quelle: ICIS.

„Hedging“ bezeichnet eine risikominimierende Absicherungsstrategie vor zukünftig steigenden Preisen. Bei dieser Strategie sichern sich die Energieversorger Einkaufspreise für EUAs, die sie

[1] “Carry Trade“: Zum Beispiel Kauf eines Vermögenswertes in einem Markt (z. B. Primärmarkt, Auktion) und dessen Verkauf in einem anderen Markt (z. B. Sekundärmarkt) oder mit einer anderen Fälligkeit (z. B. Spot vs. Forward).

für Ihre Abgabepflicht im EU ETS in Zukunft benötigen. Für acht der zehn untersuchten Unternehmen scheinen die Abgabeverpflichtungen im Emissionshandel im Fokus ihrer Handelsstrategie zu stehen.

Auf Basis der Analyseergebnisse der zehn Energieversorgungsunternehmen können für die „Hedger" noch weitere Unterkategorien identifiziert werden. Dimosia und PGE schienen zu **regelmäßigen Zeitpunkten** über das Jahr verteilt Transaktionszuflüsse zu bekommen. Demgegenüber stehen sechs weitere Unternehmen aus dem Energiesektor, die sich mehr auf Terminkontrakte[2] fokussieren. Diese Unterkategorie kann noch weiter differenziert werden nach Unternehmen, die zudem Verhalten von „Carry Trading" aufweisen und solchen, die dies nicht tun.

Hedger mit Terminkontrakten und Carry-Trading-Verhalten: Zu dieser Kategorie zählen Vattenfall, EDF und Engie. Der Schwerpunkt in der Handelsstrategie dieser Unternehmen scheint auf dem Handel zur Deckung ihrer Compliance-Verpflichtung mittels Termingeschäften zu liegen. Des Weiteren weist das kumulierte EUA-Nettotransaktionsprofil dieser Unternehmen regelmäßige Zuflüsse verbunden mit zeitnahen regelmäßigen Abflüssen auf. Dies deutet auf eine zusätzliche Carry-Trading-Strategie hin.

Demgegenüber steht das Transaktionsprofil von E.ON, RWE und Enel/Endesa. Diese Unternehmen schienen ihre Abgabeverpflichtung mittels Terminkontrakten abzusichern, wiesen jedoch im kumulierten EUA-Nettotransaktionsprofil kein Carry Trading auf.

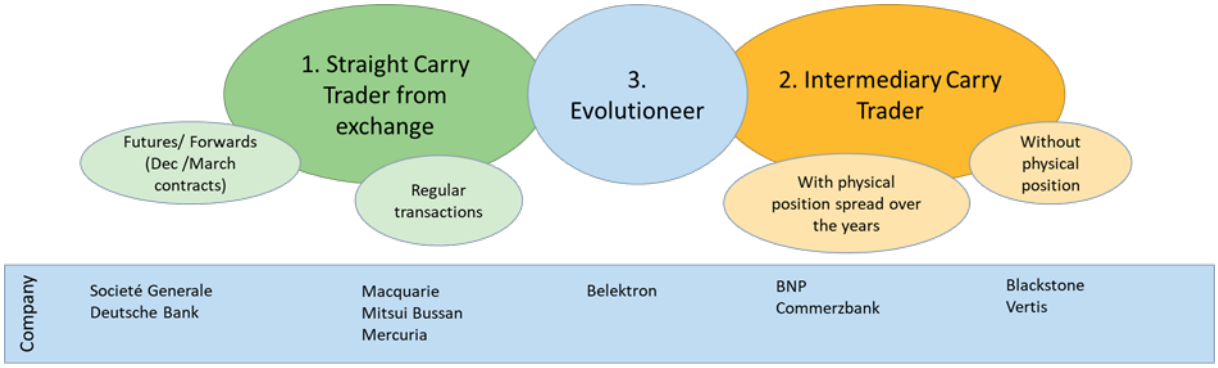
Mit Statkraft und CEZ weisen zwei Unternehmen ein davon verschiedenes Marktverhalten auf. Die Transaktionsprofile dieser Unternehmen ähneln solchen von nicht emissionshandelspflichtigen Akteuren (z. B. aus dem Finanzsektor). Im Fokus ihrer Handelsstrategie scheint das Carry Trading zu stehen und nicht vordergründig die gezielte Erfüllung ihrer Emissionshandelspflicht.

Finanzsektor

Die Finanzinstitute wurden anhand ihres Marktzuganges gruppiert. Insgesamt sind drei Kategorien einschlägig: „Carry Trader" mit Markzugang durch Börse, „Carry Trader" mit Marktzugang durch Unternehmen („Intermediary Carry Trader") und „Evolutioneer" als dritte Kategorie. Letztere zeichnet sich durch eine Verschiebung im Marktzugang während des Betrachtungszeitraums von Unternehmen hin zu Börsen aus. In diese Kategorie fällt nur eines der betrachteten Unternehmen: Belektron. Abbildung 2 bietet eine Übersicht über die identifizierten Cluster und die Zuordnung der untersuchten Finanzinstitute.

[2] In dieser Analyse wurden die meistgehandelten Terminkontrakte, März und Dezember, als solche definiert. Alle weiteren Transaktionen wurden einfachheitshalber als Spot-Geschäfte definiert.

Abbildung 2: Cluster der Finanzbranche und Zuordnung der zehn Finanzinstitute



Quelle: ICIS.

Die erste Kategorie („Straight Carry Trader from exchange“) zeichnet sich durch Finanzinstitute aus, die ihre Zertifikate über die Börse erwerben. Zudem zeigen die Transaktionsprofile dieses Clusters, dass der Fokus der Strategie auf dem Verkauf von kurz zuvor erhaltenen Zertifikaten liegt. Dies zeigt sich auch im Halten relativ geringer Positionen auf ihren Registerkonten. Die kumulierten Nettotransaktionen bewegen sich um Null. Dieses Cluster lässt sich im Hinblick auf den Zeitpunkt der Transaktionen noch weiter unterteilen. Einige Unternehmen scheinen sich auf die üblichen Ausübungszeitpunkte für Termingeschäfte (März und Dezember) zu konzentrieren. Dies gilt für Societe Generale und Deutsche Bank. Andere Finanzakteure bevorzugen regelmäßige Transaktionen. Macquarie, Mercuria und Mitsui Bussan fallen in diese Kategorie.

Das zweite Cluster (“Intermediary Carry Trader”) unterscheidet sich vom ersten vor allem durch den Marktzugang. Finanzinstitute in dieser Gruppe wählen primär den Kauf von Zertifikaten über andere Marktakteure außerhalb der Börse. Auch diese Kategorie kann weiter in zwei Unterkategorien unterteilt werden, zum einen in Akteure, die kaum große Zertifikatmengen halten. Hierunter fallen Blackstone und Vertis, die sich auf klassische Back-to-back-Geschäfte[3] konzentrieren. Abweichend von diesem für Intermediäre typischen Verhalten halten die Akteure BNP Paribas und Commerzbank dagegen relativ hohe Zertifikatpositionen (variierend über die Jahre). Dieses Profil erinnert im Verhalten an das eines emissionshandelspflichtigen Unternehmens. Hierbei vermuten wir, dass es sich um gerolltes Carry Trading handelt. Diese Unternehmen halten EUAs, um EUA-Short-Positionen am Terminmarkt zu sichern, die kurz vor Ablauf geschlossen und durch einen neuen Kontrakt mit einem späteren Verfallsdatum ersetzt werden.

Schlussfolgerung

Basierend auf unserer Analyse können allgemeine Handelsmuster von Unternehmen in Bezug auf ihre Größe, Compliance-Position und Markterfahrung abgeleitet werden. Die Sektor-Zugehörigkeit alleine gibt dabei noch keine eindeutige Indikation auf das mögliche Handelsverhalten eines Unternehmens.

Die Analyse zeigt, dass die untersuchten Akteure aus dem Energie- und Finanzsektor eng miteinander verbunden sind, da zwischen den Sektoren Zertifikate gehandelt werden. In Einzelfällen wurde beobachtet, dass einige Akteure keine "typische" Strategie für ihren Sektor verfolgen. Dazu gehört z. B. der Energieversorger Statkraft, der eine dominierende Rolle als

[3] Back-to-Back-Geschäft: Wenn ein Unternehmen ein bestimmtes Volumen an EUAs benötigt, kaufen Handels- oder Dienstleistungsunternehmen dieses Volumen von anderen Gegenparteien und verkaufen es an ihren Kunden weiter. Sie gehen also keine eigene Position ein.

Intermediär aufweist und damit das Verhalten eines "typischen" Finanzakteurs und nicht das eines Versorgers widerspiegelt.

Die Versorgungsunternehmen scheinen je nach Handelszweck einen anderen Marktzugang zu wählen. Sie scheinen hauptsächlich über ihre Hausbanken zu handeln, um ihrer Abgabepflicht nachzukommen. Andere Transaktionsvolumina, die von den Versorgungsunternehmen (in ihrer Rolle als Intermediär) an andere Marktteilnehmer weitergegeben werden, scheinen von Börsen mit Auktionsplattform zu stammen. Diese Volumina sind im Verhältnis zu den Mengen für die Erfüllung der Abgabepflichten eher gering.

Bei den untersuchten Finanzakteuren scheint sich der jeweils präferierte Marktzugang relativ gleich zu verteilen. Insgesamt nutzen fünf der zehn Finanzinstitutionen überwiegend eine Börse zur Beschaffung von Zertifikaten. Vier der Akteure erwerben EUAs über andere Marktteilnehmer (vor allem aus dem Energie- und Finanzsektor). Eine einzige Finanzinstitution hat im Untersuchungszeitraum ihre Strategie geändert und den Marktzugang von Intermediären auf Börsen umgestellt. Allgemein transferieren die Akteure des Finanzsektors EUAs hauptsächlich auf Konten des Energie- und Finanzsektor, nur relativ geringe Beträge werden auf Konten des Industriesektors transferiert. Nur wenige Finanzinstitute verkaufen an den Börsen.

Summary

The European Emissions Trading System (EU ETS) was introduced in 2005 as a major pillar of the EU energy policy to reduce greenhouse gas (GHG) emissions in the European Union (EU). Ever since, trading of EU emission allowances (EUAs) has been expanded significantly with annual double-digit percentage growth rates of trade volumes. A large part of this trade volume stems from large energy utilities and financial market entities. The rationale behind market activities of the various market players will typically differ according to their role in the EU ETS. Whereas industrial companies usually use the market for their regulatory compliance obligations only, energy utilities often have more sophisticated strategies due to their hedging needs or their role as intermediaries for other market players. With regard to financial entities in the EU ETS, their strategies are assumed to focus on e. g. provision of financial market services to ETS covered entities as well as profit-oriented, i. e. speculative motives.

Although existing literature includes work on trading patterns of market participants, further practical research on trading behaviour and strategies employed in in the EU ETS is still rather scarce. Hence, the aim of this study is to examine and assess the specific trading behaviour of market participants from the energy and financial sectors, mainly based on transaction data from the EUTL.

EU Transaction Log

The European Union Transaction Log (EUTL) provides an empirical starting point to analyse the trading behaviour of market players. It provides extensive information on company's accounts, compliance data (e. g. EUA filing) and transactions within the Union Registry. The latter covers annual periods until April with a delay of three years. Therefore, the most recent public data stems from April 2016 at the time of writing this report.

Retrieval of this data, including the allocation to accounts and ultimately to companies (with the transaction register), enables company-specific evaluation of transaction behaviour and infer sector-specific patterns. A direct derivation of trading strategies is however not possible because the data only reflects/captures physical transactions. Knowing the specifics of the market, however, the transaction patterns can be validated against hypothesis on trading strategy, which allows making indirect inferences of the latter.

This research project uses published EUTL data as a basis for analysing the trading behaviour of selected actors in the energy and financial sectors. The EUTL therefore represents the most important data source in this study. The following data on the EU ETS, among others, were downloaded for analysis and further processed in the ICIS database:

- accounts
- free allocations
- compliance data and
- transactions

Restrictions

The interpretation of transaction data of the EUTL is subject to numerous restrictions and therefore requires assumptions. The most important points concern the allocation of spot and forward transactions and the distinction between exchange transactions on the primary market (auction) and the secondary market (derivatives).

The EUTL data only cover the physical delivery of certificates, but do not provide any information on the trading day. Therefore, no valid conclusion on trading strategies can be drawn from the EUTL data alone. Interpretations and assumptions are required in order to derive trading strategies. The same applies to correlations with other market data such as prices or trading volumes. For spot transactions, purchase dates correlate with physical delivery dates. A clear distinction between the spot and future products cannot be derived as they are not categorized distinctly in the EUTL data.

Similarly, transactions proceeding from exchange platforms (with an auction platform) cannot be distinguished based on whether they come from the auction or derivatives market as both again are not marked separately in the register. The present report therefore makes no distinction in that respect. The listing of a company as an auction participant (member) only provides an approximation for differentiation (only members can participate in the auctions). Also, only certain stock exchanges offer auctions. This is shown in the report.

Transaction profiles

This report provides a comprehensive view of the transaction profiles of the selected energy utilities and financial institutions resulting from the analysis, processing and evaluation of the EU Commission's transaction register data. The examined period comprises January 2013 to April 2016.

The following criteria were defined for the selection/determination of ten power companies and ten financial institutions.

Table 1: Selection criteria for determining the example enterprises

Utilities	Financial institutions
▶ Emission level in the EU ETS ▶ Distribution across different countries in the EU ▶ Activities in TL: number of transactions, regularity of transactions ▶ Listed auction participants (potential use of primary market (auction))	▶ EUA Trading volume between 2013 and 2015 ▶ Number of transactions ▶ Regularity of transactions ▶ Different categories: bank, fund, trading house

Sources: ICIS & FutureCamp.

Based on these criteria, ten power companies and ten financial institutions were selected for the detailed analysis of transaction profiles. When selecting the market players, quantitative selection criteria were supplemented by qualitative aspects. The following table lists the selected reference companies.

Table 2: Analysed utilities and financial players

	Utilities	Financial institutions
1	CEZ Group	Belektron
2	Dimosia	Blackstone
3	EDF	BNP Paribas
4	Enel /Endesa	Commerzbank
5	Engie Power	Deutsche Bank

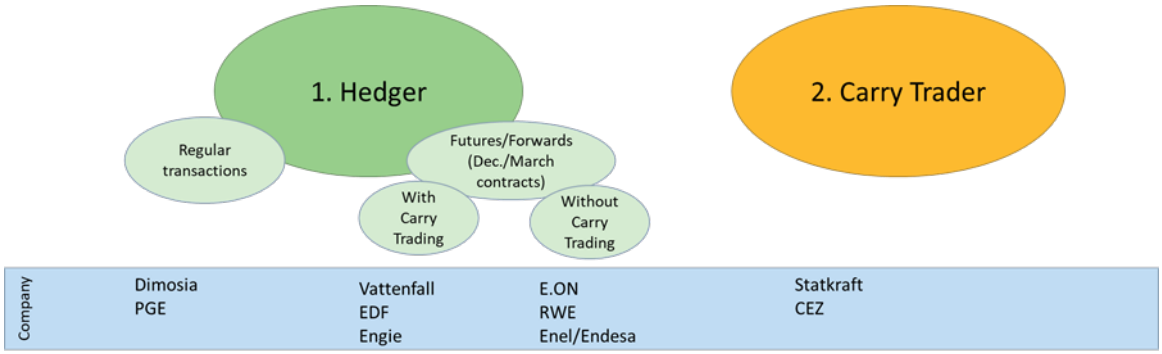
	Utilities	Financial institutions
6	E.ON	Macquarie
7	PGE	Mercuria
8	RWE	Mitsui Bussan
9	Statkraft	Societe Generale
10	Vattenfall	Vertis

Source: ICIS & FutureCamp.

Energy sector

Based on their transaction profiles, certain clusters for the energy supply and financial sectors were defined/ developed. Two main groups have been identified: "Hedger" and "Carry Trader[4]". This is shown in Figure 1.

Figure 1: Cluster of the energy sector and classification of the ten selected utilities



Source: ICIS.

Hedging is a risk reducing strategy against rising prices in the future. Consequently, power companies ensure stable EUA prices in order to cover future demand arising from their regulatory compliance obligations. For eight of the ten companies surveyed, regulatory compliance turns out to be the focus of their trading strategy.

Further subcategories can be identified for the "hedgers". Dimosia and PGE seemed to receive transaction inflows at **regular intervals throughout** the year. On the other hand, there are six more companies from the energy sector that focus on futures contracts[5]. This subcategory can be further differentiated between companies exhibiting carry trading behaviour and those that do not.

Hedger with futures contracts and carry trading behaviour: This category includes Vattenfall, EDF and Engie. The focus of the trading strategy of these companies appears to be on trading to cover their compliance obligations through forward contracts. Furthermore, the cumulative net EUA transaction profile of these companies' shows regular inflows combined with timely regular outflows. This indicates an additional carry trading strategy.

[4] Carry trade is defined as the purchase of an asset in one market (e. g. primary auction) and its sale in a different market (e. g. secondary market) or with a different vintage (e. g. spot vs future)
[5] In this analysis, the most traded futures contracts, March and December, were defined as such. For the sake of simplicity, all other transactions were defined as spot transactions.

On the other hand, there is the transaction profile of E.ON, RWE and Enel/Endesa. These companies appeared to acquire inflows by means of **forward contracts but have no visible carry trading** in the cumulative EUA net transaction profile.

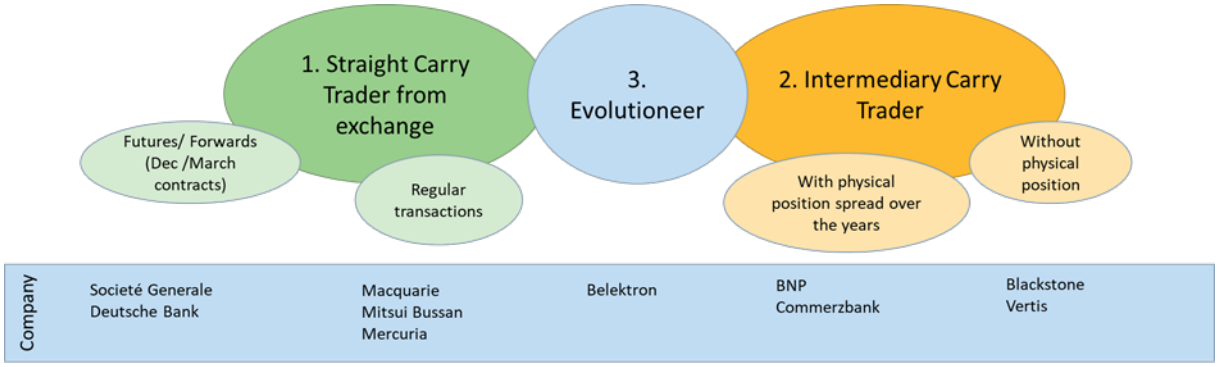
With Statkraft and CEZ, two companies show a rather different type of behaviour. The transaction profiles of these companies are similar to those of players not subject to emissions trading obligations (e. g. financial sector). The focus of their trading strategy seems to be on carry trading rather than on conforming to emissions trading obligations.

Financial sector

Financial institutions were clustered relative to how they access the market. A total of three categories were determined: "Carry Trader" with market access through stock exchange, "Carry Trader" with market access through companies ("Intermediary Carry Trader") and "Evolutioneer" as third category. The latter is characterised by a switch of market access from companies to (stock) exchanges during the relevant period of examination. Only one of the companies analysed falls into this category: Belektron.

Figure 2 gives an overview of the identified clusters and the allocation of the examined financial institutions.

Figure 2: Cluster of the financial sector and allocation of the ten financial institutions



Source: ICIS.

The first category ("Straight Carry Trader from exchange") is characterised by financial institutions acquiring certificates on exchange platforms. The transaction profiles of this cluster moreover show that the focus of this strategy is on carry trades (transfer of recently acquired certificates). This is also reflected by their relatively small positions that are being held on the accounts: accumulated net transactions are around zero. This cluster can be further subdivided relative to transaction dates. Some companies appear to be focusing on typical forward transactions (March and December). This applies to Societe Generale and Deutsche Bank. Other financial actors prefer regular transactions. Macquarie, Mercuria and Mitsui Bussan fall into this category.

The second cluster ("Intermediary Carry Trader") differs from the first cluster in terms of market access. Within this group, institutions primarily choose to purchase certificates via intermediaries rather than on exchanges. This category can also be further divided into two subcategories, firstly into players who hardly hold positions. This includes Blackstone and Vertis, which concentrate on classic back-to-back trades[6]. Contrary to the typical functions of

[6] Back-to-back trading: If a company needs to buy a certain volume of EUAs, trading companies or service providers buy this volume from other counterparties and sell it to their client. Thereby they don't hold an own position.

intermediaries, both BNP Paribas and Commerzbank hold relatively high (certificate) positions (with variations over the years). The behaviour of this profile resembles that of a company bound to regulatory obligations, usually having a high long position at the end of the year. We assume these transactions to be rolled carry trading. Those players keep physical EUAs to back-up short forward EUA positions which are closed shortly before expiry and replaced by a new contract with a later expiry date.

Conclusion

Based on our analysis, general trade patterns can be drawn from certain features of the examined entities, such as company size, compliance obligation and market experience. However, sector-specific characteristics do not necessarily determine a company's trading behaviour.

The analysis shows that the examined entities from the power and financial sector are closely linked since certificates are being traded between the sectors. In individual cases, it was observed that some players do not follow a “typical” strategy for their sector, e.g. energy utility company Statkraft taking on a predominant role as intermediary and hence mirroring the behaviour of a “typical” financial player rather than a utility provider. The observed companies from the power sectors predominantly use intermediaries as main means to access the market rather than the exchanges.

For the power sector, utilities seem to choose a different market access depending on the trading purpose. The examined utility companies seem to trade mainly via their house banks in order to conform to their regulatory compliance obligations. Other transaction volumes, which are passed on by the utility companies (in their role as intermediary) to other market players, seem to originate from stock exchanges with auction platform. These volumes are rather small in comparison to the quantities acquired for compliance obligations.

Among the financial actors surveyed, market access seems to be uniformly distributed among all venues. In total, five of the ten financial institutions predominantly use an exchange to procure certificates. Four of the players acquire EUAs through other market participants (mainly from the energy and financial sectors). A single financial institution switched its strategy within the examined period and changed the market access from intermediaries to exchanges. Overall outflows of financial sector accounts go mainly to the energy and financial sector, only rather small amounts are transferred to industry sector accounts. Few financial entities sell on the stock exchanges.

1 Introduction

The EU Emissions Trading System (EU ETS) was implemented in 2005 as a major pillar of the EU energy policy in order to reduce greenhouse gas (GHG) emissions in the European Union (EU). Entities included in the scope of the system, (i. e. from industry and the energy sector) are obliged to monitor, report, verify and offset their annual emissions. For meeting their compliance, those entities need to surrender allowances in the volume of their emissions. Emission allowances are either freely allocated or auctioned in the primary market. They can also be traded in the secondary market. Over the years, the carbon market has matured and gained in liquidity agglomerating a large number of participants composed of compliance traders from the industry and energy sector as well as non-compliance traders from the financial sector.

Several channels grant access to the carbon market. Companies can (either) purchase allowances through auctions, trade with other market player (OTC), or trade through intermediaries (e. g. a bank or trading company), or trade directly on carbon exchanges. Since its establishment, the carbon market has gained considerably in liquidity as emission allowances can be traded on numerous exchanges. The Intercontinental Exchange (ICE) in London (UK) and the European Energy Exchange (EEX) based in Leipzig (Germany) form the most important trading venues in the EU ETS and constitute the primary market (auction). Both platforms have established themselves as the auction platforms for EUAs and further account for the largest trade volumes and product types (e. g. spot, futures and other derivatives). Through regular auctions, new allowances are introduced into the market via both exchange EUA auction platforms. To participate in an auction, companies need to be listed as auction participants on the platforms. The ICE and EEX in particular moreover offer the possibility to trade on the secondary market in which already issued allowances are traded. Exchange platforms are commonly used by large utilities. Future contracts and derivatives are used as means to hedge against (diversified) portfolios. Given the market size, the various market players and their specific motivation, numerous trading strategies have been evolved.

This paper focuses on derivable trade patterns of market participants from the energy and financial sector. To this end, their trade motivation, strategy and behaviour is thoroughly analysed. The analysed data has been obtained from the Union Registry and the European Union Transaction Log (EUTL) of the European Commission (EC). All EU ETS transaction data is backed up and traceable with a time delay of three years. For this analysis, EUTL data has been the main source of information. The transaction log provides information on accounts, allocation, compliance and transaction data within the EU ETS. Comprehensive databases for the EU ETS provided by the EC were downloaded and processed in the ICIS database. The data used for the analysis covers the time period from January 2013 to April 2016.

While the data allows to draw general patterns of how market participants interact with each other, inferences are however subject to restrictions given that the transaction data solely captures physical transactions but not for example information on the trading agreement. Therefore, own assumptions will be made in this paper when analysing the data of the EUTL for the respective companies with regard to their trading strategy.

2 Characteristics and role of the power and financial sector in the EU ETS

2.1 Significance of the power and the financial sectors in the EU ETS

The correct functioning of the EU ETS and the development of an effective price is fostered by liquidity, enhancing the overall market's efficiency. The carbon market is composed of a broad number of players with distinct trading motivations and strategies. This extends over how they choose strategies, products and channels to access and interact in the market. The aggregate behaviour of all market players influences the price movement of the European Emission Allowances (EUA).

Power sector utility companies, especially large ones, are significant market players. Most of them have been active in the market since the start of the EU ETS in 2005. Financial sector entities, which are typically not covered by the EU ETS, have similarly engaged in emissions trading since the first trading period. [7] Both large utility companies and financial players often have direct access to the primary market and thus play a pivotal role in the European carbon market.

Trading activities and trading frequencies of market players can differ greatly from each other. Market participants can be categorized relative to their role and motivation to trade within the carbon market. Entities within the scope of the EU ETS, such as utility and industrial companies, classify primarily as compliance traders as they are obliged to (annually) surrender allowances. Financial entities, such banks and trading houses as well as service providers and some large utilities, often act as intermediary traders for other entities Furthermore, some market participants trade on their own account in order to generate profits and can, hence, be classified as speculative traders.[8]

In the following sections the relevance and role of the power and financial sector will be described in more detail.

2.1.1 Power sector

The power sector generates more than 50 percent of the total emissions within the EU ETS. Utilities are compliance traders. Their main intention is to cover the annual demand for allowances to conform with regulatory compliance obligations under the EU ETS.

Since the beginning of the EU ETS, utilities have been the most active market players within the trading system. Most were unable to cover their high operative demand from free allocation only. Since allocation for the power sector was reduced as of the start of the second trading period, utilities were partly short of allowances. Large utilities particularly required additional allowances to cover their demand whereas small and medium-sized enterprises (SME) were able to leverage long positions obtained from free allocation for heat production.

As of the third trading period and gradual reduction of free allocations, demand for allowances has increased significantly. Free allocation for electricity production no longer exists; allocation for heat production has been reduced significantly.

Trading strategies and behaviour of the power sector are largely determined by company size.

[7] Source: Betz, R.& Cludius, J. & Schopp, A. (2015)

[8] Source: Wallner et.al., (2014), DEHSt (Eds.), p. 40

Large utilities pursue advanced and elaborated trading strategies to compensate for the structural short position established with the EU ETS. Large (power) production volumes can be sold up to four years in advance as means to hedge against price fluctuations inherent in energy markets (electricity sold, derived therefrom demand of fuel and CO_2 certificates). Trading takes place daily in order to adjust hedging activities. Consequently, EUA trading is spread out uniformly over the year. The EUA hedging demand is determined by strategic factors related to the type of technology and volume of energy that is intended to being produced and sold.

Large utilities predominantly trade through departments or trading desks that emanated from long-standing experience in commodity market activities before the EU ETS. They have direct access to the carbon market through multiple channels, such as auctions (primary market), exchange trading and OTC (secondary market) and thus can take on the role of intermediary trader.

Medium-sized utilities usually have a lower demand for EUA allowances compared to large utilities and thus a more simplified trade strategy. To minimize price risks, smaller players adhere to periodic trade frequencies to distribute volumes throughout the year (often several dated per year). Small utilities such as public utilities trade seldom, sometimes only once a year to meet their compliance demand. The latter relies mostly on intermediaries to purchase emission allowances.

Utilities engage in trade due to strategic requirements and their relevant drivers. One driver can be a shift in electricity prices which will influence the hedging of large utilities. Other drivers are chart analysis and fixed dates/deadlines which medium and small utilities are more likely to pursue.[9]

2.1.2 Financial sector

Financial players are non-compliance market player as they are not covered by the EU ETS. Players are driven by purposes other than those covering demands given their non-existing emission levels with the exception of those owning installations covered by the EU ETS, e. g. large heating/cooling system for a data centre or a company-owned aircraft.

For example, banks and trading houses have a wide-ranging number of purposes and motivations to engage in emission trading. They provide liquidity to other market players by having direct access to exchanges which serves as a key function to enhance the market's efficiency, especially for spot and future contacts.

Banks and other financial actors can act as service providers/intermediaries for other regulated entities. They conduct carry trades e. g. by purchasing allowances at the spot market and selling them on as forward contracts. This provides liquidity to companies holding long positions, enhancing the overall market's efficiency. As part of their services, banks can also agree on bilateral repurchase agreements with companies.

Banks have focused largely on back-to-back trading and occasionally employ EUAs for speculation, hold long-term positions or diversify their portfolios with EUAs. Also hedge funds use EUAs to complement their portfolios with EUAs. The level of engagement of financial players depends on the overall market situation and the EUA price development. It thereby varies over time.

[9] Source: Wallner et.al., (2014), DEHSt (Eds.), p. 47-50; Ferdinand et.al (2017), Angrick, M. & Kühleis, C. & Landgrebe, J. & Weiß, J. (Eds.)

Financial players usually have access to the primary and secondary market and use all existing trade channels. [10]

2.2 Account and corporate structure

Generally, the account structure and transaction patterns of a company, as documented in the EUTL, are indicative of a company's trading structure which allows us to further deduce the trade responsibilities, purpose and hint at trade strategies.

An assignment of accounts to companies and sectors is possible through the data of the EUTL on "account holder", "account information" and "related installation". A clear assignment of accounts and companies is not always possible; each account might differ in the designation of companies and facilities (e. g. the spelling could be different). Thus, accounts have to be assigned manually. Given that the installation databases (EUTL) and the transaction log (TL) use the same accounts, a connection between both tables can be established. This provides a holistic view on installations as well as trades and transactions (for information on database see Appendix 1).

Corporations often have several accounts for their different subsidiaries. Transactions between them and other third party companies can indicate trade strategies and corporate structure. A description of the corporate structure based on the documented transactions between the different account types of one company is provided when possible.

Power sector

The power sector consists of numerous and complex interconnections between players and shareholders, thereby complicating the assignment to companies and corporations. Utilities often have an Operator Holding Account for each installation in the EU ETS. Additionally, the company itself often has one or two Person Holding Accounts or Trading Accounts. Therefore, internal trades are interesting and give an insight of the corporate structure and trading strategy, especially if the trading companies of the utilities are considered.

Financial sector

The complete structure of the financial sector is yet to be determined as information on trade behaviour is very limited. Compared to the power sector, we expect less internal transactions (relative to the volume and number of transactions). That is because there is usually no installation covered by the EU ETS with Operating Holding Account and thus no operative demand of allowances.

2.3 Expected transaction/trading profile of utilities and players of the financial sector

In this section the hypotheses regarding the expected transactions and trading profiles of the two sectors will be described. The latter is the focus of this analysis. Based on our data analysis, it's intended to verify or disprove key statements.

2.3.1 Expected trading profiles of the power sector

Players from the power sector adjust their trading activities to cover their operative demand. Their main purpose is to conform to regulatory compliance. For large utilities we expect significant trade volumes and frequency (because of the expected hedging strategy to cover their

[10] Source: Wallner et.al., (2014), DEHSt (Eds.), p. 44-46; Ferdinand et.al (2017), Angrick, M. & Kühleis, C. & Landgrebe, J. & Weiß, J. (Eds.)

upfront power sales). We furthermore expect large utilities to engage in carry trades which could be due to speculative and intermediary activities.

Internal trading responsibilities likely differ across companies.

For large utilities we expect to see inflowing transactions on Trading Accounts from exchanges as they often have direct access to the primary and secondary market. Furthermore, we expect to observe several internal transactions to be designated for compliance requirements. These are reflected by transfers to Operator Holding Accounts from the Trading Accounts operated by the trading desk. Because of the pursued hedging strategies, we expect to see trading activities on a daily or slightly less frequent basis. Given that hedging is predominantly conducted through future contracts, we expect to see transactions to peak at the delivery dates of future contracts like December and March.

Apart from covering their compliance demand, large utilities also act as intermediaries and trade on behalf of their customers. This usually accounts for small portions of their total carbon portfolio. We therefore expect to see transactions between the intermediary and other companies (e. g. small utilities) bound to EU ETS regulation. Interactions with third party companies ought to occur (mainly) through Trading Accounts and not Operator Holding Accounts. Internal transactions should thus make up a large portion of the total transaction volume.

Medium-sized entities have less trading experience in the norm and assign one or two persons for trading. Companies are expected to make use of chart analyses and trade on fixed dates throughout the year. Transactions comprise spot but predominantly future contracts. Thus, peaks on the future delivery dates are to be expected. All transactions (with third parties) ought to be executed from a Trading or Person Holding Account given that traders are responsible to acquirement of EUAs for several installations. We assume that these companies use banks as their main market access. The costs of acquiring allowances through exchanges outweigh its benefits since direct forms of accessing markets command a certain trade frequency in order to be profitable. Under these circumstances, compliance demand is expected to be internally transferred to the accounts of the installations.

Small players (often public utilities) will most likely trade on the spot market once a year (close to the compliance date in March/April). As small utilities own few installations covered by the ETS the trading is expected to be made via proper Operator Holding Accounts. Medium and small entities tend to trade allowances through intermediaries instead of participating directly at exchanges.

2.3.2 Expected trading profiles of the financial sector

Financial players such as banks rarely own installations which fall under the EU ETS. Therefore, they do not have a natural position in the ETS and do not need to meet an operative demand. We expect them to act as service providers and enhance the market's liquidity. They usually own a few Trading Accounts and no Operator Holding Accounts.

Because of their roles as intermediaries, especially for banks and trading houses, we expect to observe a steady in- and outflow and no large holding positions of EUA. Their trading behaviour is tailored towards and thereby determined by their customer needs. We therefore expect spot transactions to be spread out throughout the year (services for smaller clients) or to see a concentration of forward delivery contracts (for bigger clients).

Banks often purchase EUAs via auctions and sell them (back-to-back) on the futures market as carry trades. Therefore, transactions with other players are expected to account for the majority

of their transactions rather than internal transactions. We also expect acquisitions via accounts mapped to an exchange (could be from the auction platform spot market (primary market) or from the secondary market). An increased volume of transferred EUAs is likely to be seen on the common future delivery dates like the December and March contracts, as future contracts are more likely to be used.

Furthermore, we expect financial players to have bilateral repurchase agreements with industry clients as well. In this case, transactions of the same amount of EUAs will occur as an inflow and at a later point of time as an outflow from the account of the financial player.

Banks and other financial institutions can participate in proprietary trading of EUAs at own risk. This refers to speculative trading. Trading frequency and volume in this case is often price-dependent and linked to market expectations. It fluctuated over the years and saw a sharp decline during 2011 to 2013. With the renewed rise in EUA prices since end 2017 an increased activity from financial players is expected. For the years 2013 to 2016 we expect to see a rather low level of related activities in the documented transactions.

2.3.3 Possible structures within the companies

Because of the sectors' different trading requirements and motivations, we also expect different company structures establish. In the following paragraphs possible company structures are described.

Power sector

Corporation as head office for trading activities
A centralised trading corporation operates all trading activities for the respective company and provides services to regional utilities (for instance).
Decentralized structure for trading activities
Within this structure, several accounts (e. g. Operator Holding Accounts) exist, which trade independently. The majority of the transactions designed to cover compliance demand will originate from accounts outside of the company. There is no centralised trading corporation and little to no internal transactions are carried out.

Power and financial sector

Centralized structure for trading activities
Centralised structure for trading activities, comprise several accounts despite only one being actively operated. This account carries out all transactions with accounts from other entities (companies or exchanges). All other accounts reflect only internal transactions.
Another form of centralized structure is the cross-border structure. These accounts are distributed internationally and transactions between these accounts would be indicated as internal transactions. Only one account per country (e. g. Germany) carries out the trading activities to buy (and sell) allowances for the aggregate demand of the corporation. As an example, the head office of trading could be in Germany.

Financial sector

Hypothetical example trading structure banks : bank concludes a transaction with a customer
Scenario 1: In the first structure, each local bank has an own account. Once the bank concludes the transaction with the customer, the central institution of all banks transfers allowances onto the account of the local bank. The local bank would transfer the EUAs to its customer. In this scenario the central institution is the head trading office.
Scenario 2: A second possible structure could be that the bank only concludes the trading agreement but does not have an own Trading Account. In this scenario, the central institution directly transfers the allowances to the account of the customer. In this case the customer has to approach its local bank in order to trade and cannot approach the central institution directly.

3 Analysis and Assessment of players of the power and financial sector based on TL data

3.1 Methods used

For the sample analysis an extensive data collection was conducted. The examined period of the analysis comprises January 2013 to April 2016[11]. The primary data used was obtained from the EC via the EUTL database which includes information on accounts, the transactions of allowances, their surrender and free allocation (see Appendix 1). These accounts were then manually assigned to the respective companies and sectors, based on the account holder's information e. g. name/address. In order to derive the companies' trading behaviour, a combined data table was created within the ICIS database, consisting of the following fields/tiers: *TransactionID, TransactionDate, Volume, UnitType, TSTransactionType, TransferringAccountCode, TransferringCompany, TransferringSector, AcquiringAccountCode, AcquiringCompany and AcquiringSector.*

Based on predetermined criteria (see table 3), ten utilities and ten market players of the financial sector were selected and further analysed. For each company, an excel file was created that included all relevant data which could be used as proxy to indicate transaction patterns. Based on these insights, cluster were derived and used to develop trading strategy profiles. The information gained throughout the transaction log analysis was then compared with the assumptions made on the sectors' trading behaviour in chapter 2.3.

It should further be noted that the transaction log analysis is subject to restrictions. Firstly, transactions originating from exchanges cannot be distinguished, regardless of the channels they have been conducted; whether the trading activity was conducted on the primary market (auctioning) or secondary market (derivate). Secondly, spot, or future contracts also cannot be distinguished based on the transaction data. Thus, to adjust for these restrictions and be able to generate an indication of the use of future contracts, all transactions conducted within March and December, are assumed to be forward transactions. For the sake of simplicity, all other transactions are considered to be spot transactions. Further details and more restrictions will be explained in chapter 3.5.

3.2 Selection of ten utilities and ten financial players for further analysis

3.2.1 Selection criteria

For the selection process of ten utilities and ten financial players, EUTL data of the period 2013 until 2015[12] were accessed. A set of criteria was defined in order to select the market actors which will be evaluated. These criteria were established with differences between sectors.

[11] The most recent (public) data stems from April 2016 at the time of writing this report.
[12] At the time of the selection process the latest data stemmed from 2015.

Table 3: Selection criteria for the power and financial sector

Power sector	Financial sector
▶ Emission level in the EU ETS ▶ Regional distribution ▶ Trading activities within TL ▶ Listed auction participants; potential use of primary market (auction)	▶ Trading volume of EUA between 2013- 2015 ▶ Number of transactions ▶ Regularity of transactions ▶ Different types of financial players: bank, trading house, fund

Source: ICIS & FutureCamp.

In the power sector, the primary criterion was the emission levels within the EU ETS. All utilities selected have significant high emission levels and are thus presumably active within the EUA market. Furthermore, the trading activities within the TL alongside the number of transactions and the regularity made up the selection criteria. Power utilities that act as regional distributors were preferred. Finally, the markets (primary and secondary market) that is used for the EUA trading was considered in the selection as well. Emphasis was set on exchange listed auction participants (indicator for participating in the primary market). Given their membership, market players could receive their EUAs from an auction delivery account. The latter can however only be assumed given that primary market transactions cannot be distinguished from secondary market transactions in the TL.

The selection criteria for the financial sector relate primarily to the trading volume of EUAs in the period 2013 to 2015. Players were selected based on the number of transactions and their trading frequency. Different market players of the financial sector such as banks, trading houses and funds were considered as well.

The outlined criteria were used to select twenty companies which were analysed subsequently. The selection was however not derived solely from quantitative data but furthermore complemented with a qualitative assessment of the focal companies.

3.2.2 Characteristics of selected utilities and financial players

Based on the criteria, the 20 companies listed below (Table 4) were chosen for further analyses.

Table 4: Selected twenty companies from the power and financial sector

	Power sector	Financial sector
1	CEZ Group	Belektron
2	Dimosia	Blackstone
3	EDF	BNP Paribas
4	Enel/ Endesa	Commerzbank
5	Engie Power	Deutsche Bank
6	E.ON	Macquarie
7	PGE	Mercuria
8	RWE	Mitsui Bussan
9	Statkraft	Societe Generale
10	Vattenfall	Vertis

Source: ICIS & FutureCamp.

Remarks about a few chosen companies of the power sector:

Enel is an Italian energy corporation and majority shareholder of Endesa. Both companies will subsequently be treated as one company in the analysis.

In the course of the selection process Uniper was one of the companies of interest. Uniper was formed as a result of a spin-off of the energy production division (hydropower, coal and gas) from E.ON in April 2016. Despite not being formed during the relevant examination period (2013 until April 2016) the former account names within the EUTL of E.ON which currently belong to Uniper, were overwritten and could be analysed with the present company boundaries. In order to make a correct assessment of the transaction profile and avoid a potential distortion of results, the authors chose to analyse E.ON with its boundaries as of January 2013 to April 2016 instead.

Other companies which were included in the pre-screening were EPH and Vattenfall. These were of special interest because of the CO_2 emission levels resulting from four lignite-fired power plants in the east of Germany that originally belonged to Vattenfall. In September 2016, these power plants were sold to EPH. The sale took place after the examination period of this paper. Therefore, only the Vattenfall transaction profile was analysed. To ensure the correct representation of the results, all four lignite plants were manually assigned to Vattenfall within the database.

In the following sections some characteristics of the chosen entities will be exposed.

3.2.2.1 Power sector

For the analysis, only emitters with large emission levels in the power sector according to the EUTL data were chosen for the period of 2013 to 2015, with the exception of Statkraft, which mainly relies on renewable energies for power generation.

Table 5 compares the utilities in terms of their transactions in the TL and the volume of surrendered EUAs according to their compliance obligation. Furthermore, it illustrates if the utilities are listed auction participants at the ICE or EEX and thus are able to use the auction platform of emission allowances. The data of the auction participant list is from 2019 and therefore no conclusion could be drawn about the period of examination.

Table 5: Overview of the ten selected entities of the power sector

Company	Number of transactions (trades) 2013-15	Transaction volume (trades) 2013-15 [m tonnes]	Number of Operator Holding Accounts	Surrendered EUAs 2013-15 [m tonnes]	Auction participant (status as of 2019)
CEZ Group	129	56.07	30	77.76	EEX [13]
Dimosia	251	113.28	31	117.44	-
E.ON	278	248.07	257	157.44	EEX [14]
EDF	1,008	265.11	115	127.97	EEX, ICE [15]
Enel/Endesa	376	389.53	69	186.67	EEX [16], ICE [17]
Engie Power	503	184.91	215	106.46	EEX, ICE [18]
PGE	657	364.86	20	208.95	EEX [19], ICE [20]
RWE	1,579	439.68	74	403.42	EEX, ICE [21]
Statkraft	1,536	747.61	6	0.42	EEX, ICE [22]
Vattenfall	613	461.05	101	265.15	EEX, ICE [23]

Source: ICIS & FutureCamp based on EEX, ICE and EUTL data.

[13] CEZ, a.s.

[14] E.ON Energia S.p.A.

[15] EDF Trading Limited

[16] Enel Global Trade S.p.A.

[17] Enel Trade SpA

[18] ENGIE Global Markets SAS

[19] PGE Dom Maklerski S.A. & PGE Polska Grupa Energetyczna S.A.; PGE Trading GmbH only Derivatives Market for Futures on Emission Rights and Options on Emission Rights

[20] PGE Dom Maklerski S.A.

[21] RWE Supply and Trading GmbH

[22] Statkraft Markets GmbH; Statkraft Energi AS only Derivatives Market for Futures on Emission Rights and Options on Emission Rights

[23] Vattenfall Energy Trading Netherlands B.V.

Even though RWE operates only a relatively low number of installations covered in the ETS compared to e. g. E.ON and Engie Power, it has by far the highest compliance obligation with more than 400 million tonnes within the analysed time period. Statkraft presents in this analysis the opposite scenario with only six ETS-relevant installations and less than half million surrendered EUAs. Statkraft nevertheless displays by far the highest transaction volume in trades, followed by RWE.

All selected companies have registered accounts in different countries and operate in several countries except Dimosia (only in Greece) and PGE (only in Poland) (see Table 6). Some utilities seem to have a trading company, which is a listed exchange participant with access to auctioning (see footnotes above).

Table 6: Utilities – Country of registered accounts

Company	Amount of countries with registered accounts	Country of registered accounts
CEZ Group	5	NL, PL, BG, CZ, SK
Dimosia	1	GR
E.ON	12	BE, FR, GB, HU, IT, NL, PL, DE, SE, DK, SK, CZ
EDF	8	BE, ES, FR, GB, HU, IT, NL, PL
Enel/Endesa	5	ES, FR, IT, NL, PT
Engie Power	10	BE, ES, FR, GB, IT, NL, PL, DE, LU, NO
PGE	1	PL
RWE	6	BE, GB, NL, PL, DE, CZ
Statkraft	4	NL, DE, SE, NO
Vattenfall	6	FR, NL, DE, SE, DK, FI

Source: ICIS & FutureCamp based on EUTL data.

3.2.2.2 Financial sector

In this analysis the financial sector is represented by five banks, three trading houses, one fund and one "financial other"[24] (see Table 7). Most of the selected companies are listed auction participants at either the ICE or EEX platform or both, except for Blackstone and Deutsche Bank. Comparing the four financial categories, the highest transaction volumes were observed within the bank category. When comparing the trading activities amongst banks, Commerzbank has shown to be the least active regarding the number of transactions as well as transaction volume.

[24] Financial other: conglomerates, diversified industrial corporation which could not be assigned to the other categories of the financial sector

Table 7: Overview of the ten selected entities of the financial sector

Company	Sector	Number of trades 2013-15	Transaction volume 2013-15 [m tonnes]	Auction participant (status as of 2019)	Country of registered accounts
Belektron	Financial - Trading	2,353	140.53	EEX [25]	BG, Sl
Blackstone	Financial - Fund	562	85,90	-	BG, CZ
BNP	Financial - Bank	3,354	2,147.98	EEX [26]	FR, GB, NL
Commerzbank	Financial - Bank	1,131	525.84	EEX, ICE [27]	DE
Deutsche Bank	Financial - Bank	2,265	1,435.14	-	DE, GB, NL
Macquarie Bank	Financial - Bank	1,796	1,232.23	EEX, ICE [28]	GB
Mercuria	Financial - Trading	675	289.13	EEX, ICE [29]	FR, NL
Mitsui	Financial - Other	2,989	261.54	EEX, ICE [30]	GB
Societe Generale	Financial - Bank	4,255	1,481.51	EEX [31], ICE [32]	CZ, FR, GB
Vertis	Financial - Trading	5,248	247.26	ICE [33]	BE, ES, GB, NL, PL, RO

Source: ICIS & FutureCamp based on EEX, ICE and EUTL data.

[25] Belektron d.o.o.

[26] BNP Paribas S.A.

[27] Commerzbank AG

[28] Macquarie Bank Limited (London Branch)

[29] Mercuria Energy Trading SA

[30] Mitsui Bussan Commodities Limited

[31] Société Générale S.A.

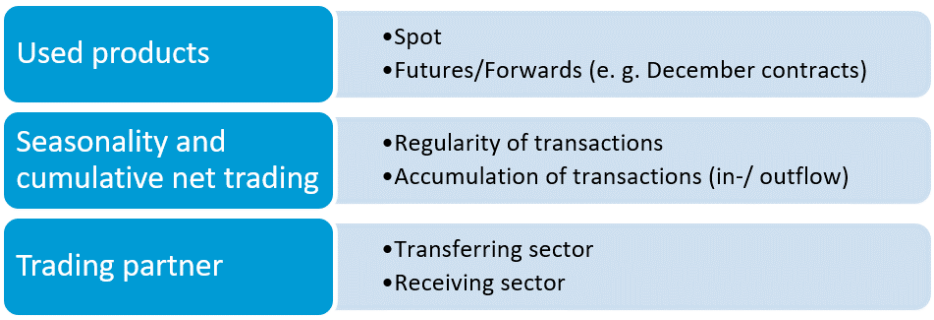
[32] Societe General International Limited

[33] Vertis Environmental Finance Ltd.

3.3 Transaction profiles and evaluation of the results

For the evaluation of results, transaction profile clusters were formed. In order to develop clusters for the financial and power sectors, different aspects were evaluated with regard to recurring patterns (see Figure 3).

Figure 3: Possible aspects for recurring patterns in the power and financial sector



Source: ICIS & FutureCamp.

The main aspects that were looked into were (used) products like spot or futures contracts, the seasonality and cumulated net trading of the company and the main trading partner. For both sectors different aspects were determining factors for forming a cluster which will be described in the following sub-chapters.

3.3.1 Definition of carry trades within this analysis

Carry trade is defined as the purchase of an asset in one market (e. g. primary auction) and its sale in a different market (e. g. secondary market) or the purchase and sale of different vintages (e. g. spot vs future). Within this analysis on a physical transaction level, this implies that volumes mapped to the transaction type "trade" flow into a company's account and later flow out as transaction type "trade" again (also back-to-back trade).

Figure 4: Example of a carry trade

Source: ICIS.

1. Visual carry trade assessment

Carry trades can involve more than two parties (e. g. "company A" buys volumes from a primary auction and sells it to "company B" and "company C") and/or have different transaction amounts. These cases cannot easily be automatically mapped by a script in the TL data analysis and identified as a carry trade. A pattern relative to the use of a product can be identified by graphically depicting the inflows and outflows per trading partner visually. If one trading partner regularly acquires volumes (e. g. on an exchange) and similar volumes are more or less promptly delivered to another agent (e. g. a utility) it can indicate the usage of carry trades. This definition of the visual carry trade will be applied in the following analysis.

2. Rolled carry trade

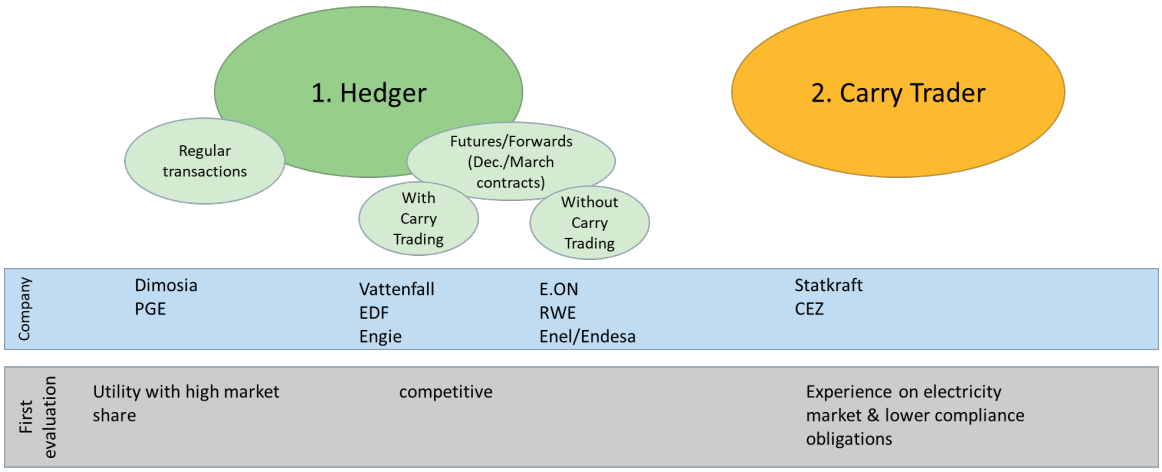
Another type of carry trades within this analysis are the so called rolled carry trades. In a rolled carry trade physical EUAs are kept to back-up short futures EUA positions which are closed shortly before expiry and replaced by a new contract with a later expiry date.

3.3.2 Cluster of the power sector

The principal trade patterns in the power sector were differentiated by the type of products, as well as the seasonality and the cumulated net trading.

Figure 5 shows the two clusters that were identified. The first encompasses utilities that pursue a strategy focused on risk hedging and conformity of the regulatory compliance obligations. The second cluster includes companies that presumably pursue a carry trade-oriented strategy with less focus on fulfilling compliance obligations.

Figure 5: Cluster of the power sector and assignment to the ten example companies



Source: ICIS.

The first cluster can be divided into two categories: Hedgers with regular transactions largely spread over the year and hedgers with mainly forward contracts. Hedgers with forward contracts can further be divided into two groups depending on whether they engage in/pursue carry trades or not. Hedging seems to be the primary trade driver for the majority of our sample with the exception of Statkraft and CEZ which focus on carry trading.

3.3.2.1 Cluster 1 – Hedgers

Hedgers with regular transactions

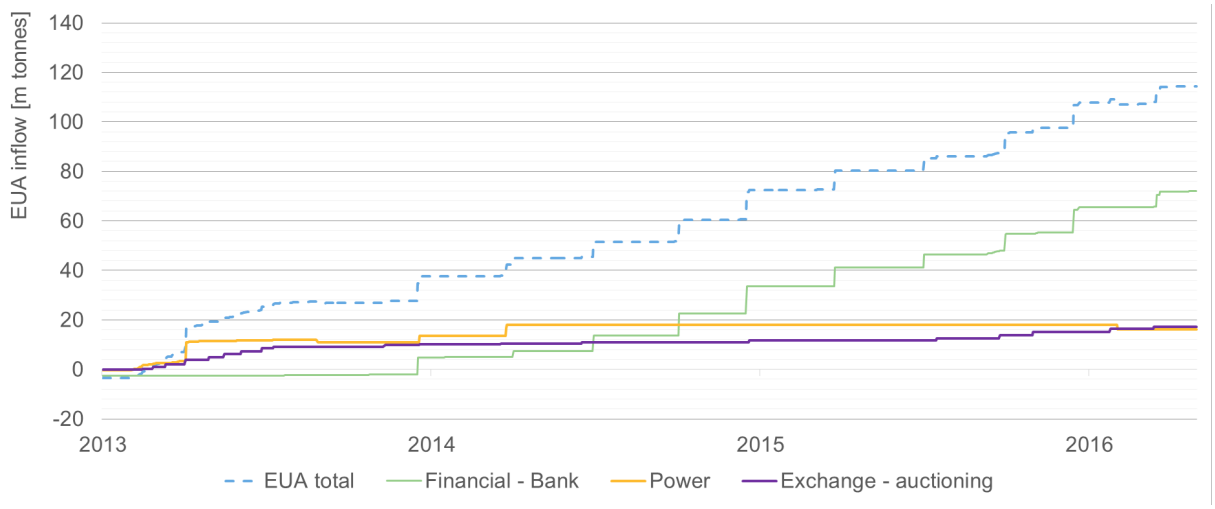
Two companies were considered under this subcategory: Dimosia and PGE. The characteristics of the latter are:

- Focus to meet compliance obligation
- Seems to have less detailed trading strategy
- Overall shows positive EUA cumulated net trading

Figure 6 shows the cumulated net trading of Dimosia per trading sector in million tonnes in the time period from 2013 to April 2016. Dimosia has a constant inflow rate but hardly any outflows. Its main trading partner proceeds from the financial sector, namely ABN AMRO Bank.

The gradual increase in inflow could hint at trading activities to take place on fixed dates each year, usually every three months in March, July, October, and December. In the first half of 2013, a relatively strong inflow from the EEX (see purple line) occurred but stabilised after 2013. Only a few small inflowing transactions occurred spread out over the following years.

Figure 6: Dimosia - Cumulated net trading per trading partner sector[34]

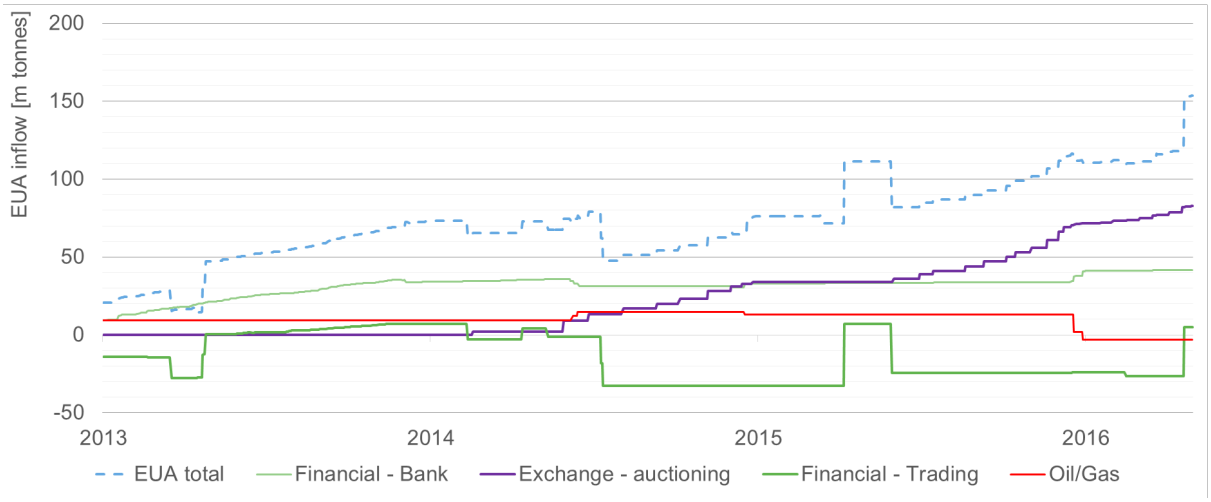


Source: ICIS based on EUTL data.

Transaction activities of PGE are shown in Figure 7 (cumulated net trading). PGE has a regular transaction inflow without any fixed dates. Contrary to Dimosia, it also has EUA outflows. In 2014 PGE seemingly switched its market access by changing from its previous bank partners (Citigroup, ABN AMRO) to an exchange with an auctioning platform, the EEX. The transaction "steps" with the financial-trading sector originate from in- and outflowing transfers with Izba Rozliczeniowa Gield Towarowych S.A. (IRGiT). IRGiT is a Polish Commodity Clearing House, thus it is likely that it serves as an intermediary to enable OTC cleared client transactions. The actual trading partner(s) remains unknown.

[34] Trading partner sector "Exchange – auctioning": This sector includes the two exchanges EEX and ICE which also hold auctions in addition to the secondary market. However, no distinction can be made as to whether the transaction volume comes from the auctions or the secondary market as described in chapter C.1.2.

Figure 7: PGE - Cumulated net trading per trading partner sector



Source: ICIS based on EUTL data.

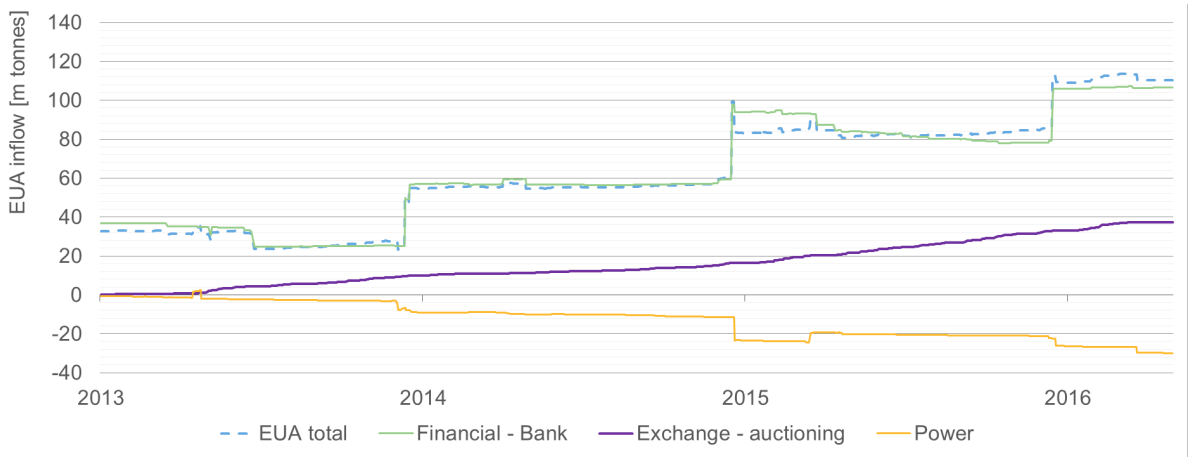
In summary, both companies seem to pursue a less advanced trading strategy. One possible reason for this is their high domestic market share (in terms of electricity production). This could indicate that the commercial pressure to optimize their EUA portfolio remains lower compared to markets in Western Europe.

Hedgers with future contracts and carry trading

Three companies fall under this category: EDF, Engie and Vattenfall. Just like the two previously analysed utilities, the focus of these companies is to trade to cover their compliance obligation. However, in contrast to Dimosia and PGE, they seem to engage in carry trades indicating for example intermediary activity. All profiles show a positive EUA cumulated net trading.

EDF's cumulated trade activity by sector can be seen in Figure 8. Its main access to the market is obtained by the financial bank sector with Dec delivery contracts (main partner: Societe Generale). The cumulated net trading with the financial bank sector correlates almost perfectly with the overall EUA cumulated net trading. Transactions can be traced back to mainly two banks (Credit Agricole until end 2013, then Societe Generale). EDF also regularly (each month) buys allowances through the exchange (EEX). This volume is (partly) used for back-to-back sales to the financial-bank and power sector with presumed future contracts (Dec and March) seen end 2014, 2015 and 2016.

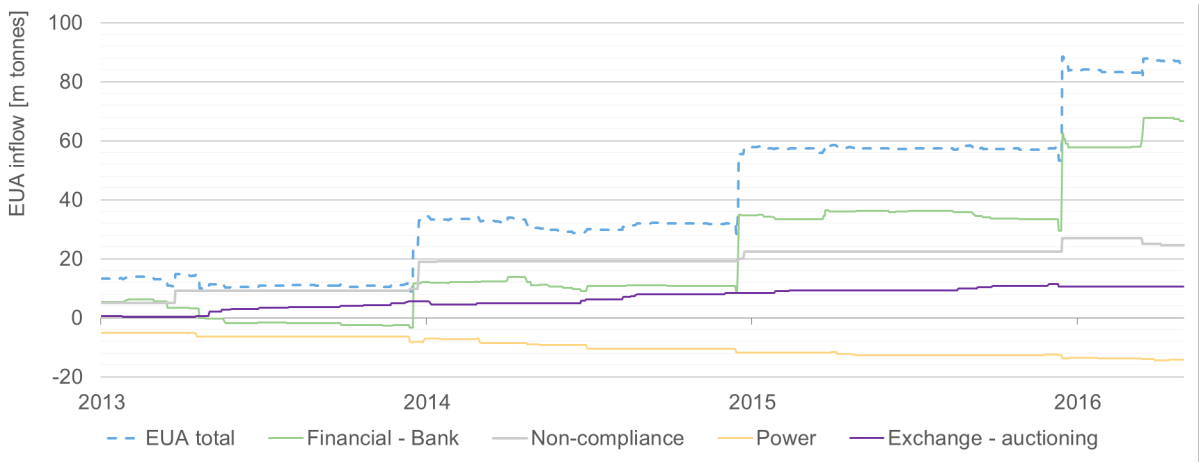
Figure 8: EDF - Cumulated net trading per trading partner sector



Source: ICIS based on EUTL data.

Figure 9 illustrates Engie's cumulated net trading by sector. The main inflow comes from the financial bank sector. Societe Generale constitutes its main (access) partner with Dec delivery contracts. Throughout the years, Engie has shown a tendency to purchase small amounts from exchange EEX and sell them back-to-back to both the power sector and the financial sector (see outflow in graph below).

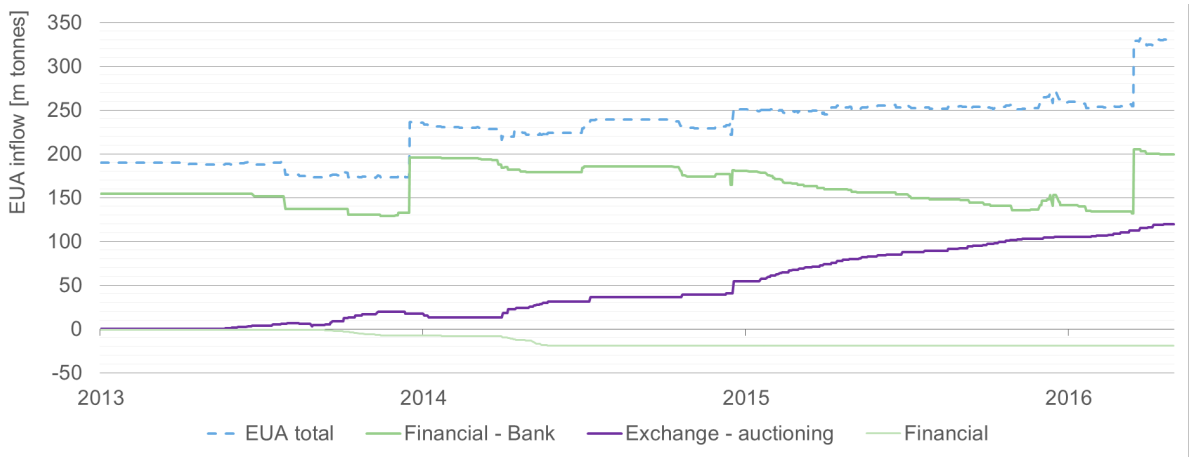
Figure 9: Engie - Cumulated net trading per trading partner sector



Source: ICIS based on EUTL data.

Vattenfall's cumulated net trading activity is depicted in Figure 10 and shows a general pattern in acquiring EUAs from banks, presumably through future contracts. The main trading partner of the financial-bank sector is Nordea. Another important channel is the exchange with auctioning platform, EEX. Starting in mid-2013, a regular inflow from the EEX can be seen throughout the year. This amount appears to be sold back-to-back to the financial sector, particularly for the year 2015. They show little to no trade activity with the power sector.

Figure 10: Vattenfall - Cumulated net trading per trading partner sector



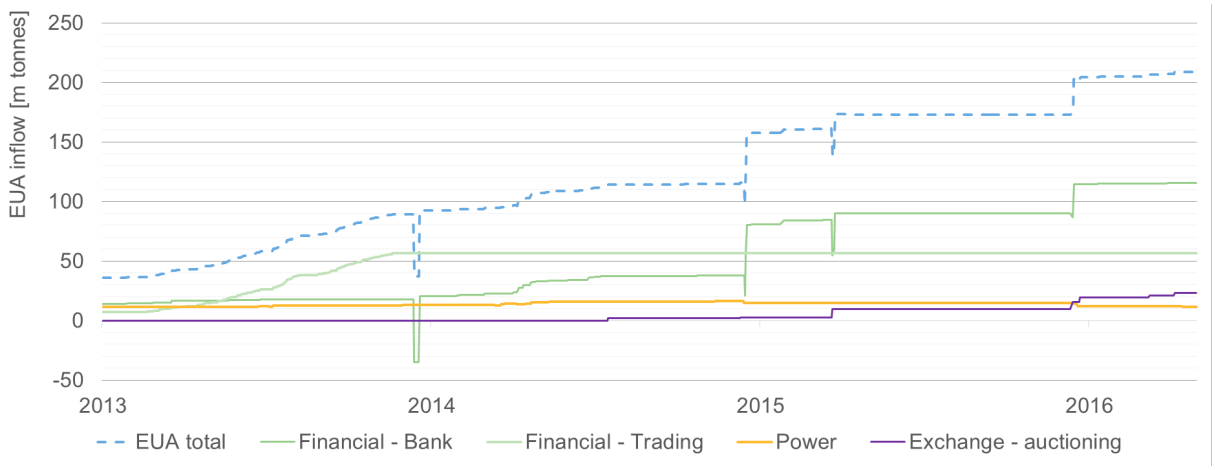
Source: ICIS based on EUTL data.

Hedgers with future contracts and without carry trading

Three players focus primarily on hedging and compliance trading: Enel/Endesa, E.ON and RWE. None of them engage in visible carry trading activity. All three show a positive EUA cumulated net trading.

The cumulated net trading of Enel and Endesa is illustrated in Figure 11. In 2013, the financial trading sector provided market access (mainly through the company AitherCO2) with a monthly inflow over the entire year. At the end of 2013, their strategy shifted and was geared towards both future contracts in December and March from partners proceeding from the financial sector, specifically banks such as Merill Lynch, Goldman Sachs Group. Outflows were delivered to BNP Ltd. They show little activity on the exchange platform EEX with the exception of 2016 that showed a heightened inflow.

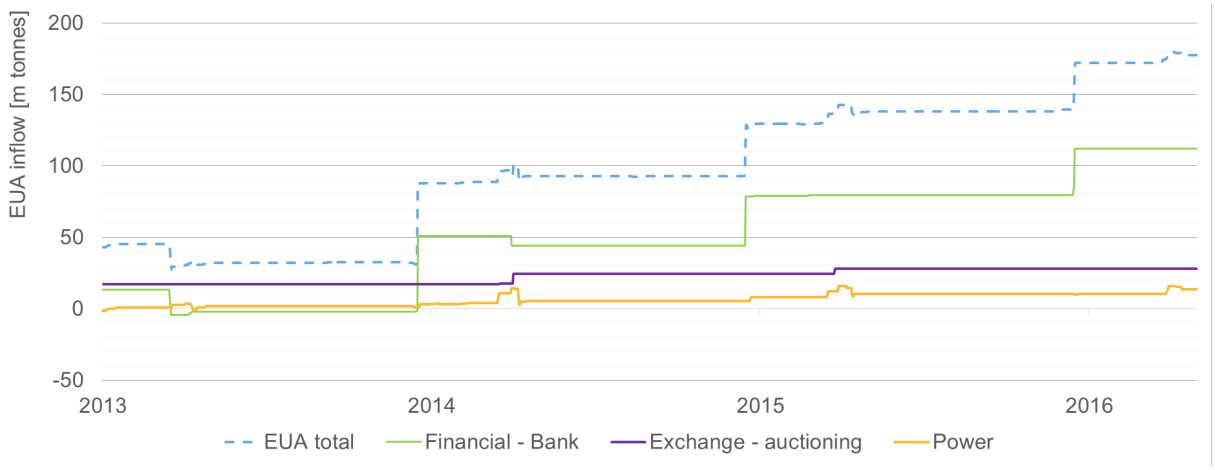
Figure 11: Enel/Endesa - Cumulated net trading per trading partner sector



Source: ICIS based on EUTL data.

E.ON similarly relies on the financial bank sector to access the market using mainly December contracts, as illustrated in Figure 12. Inflows are derived from BNP Ltd (around 30 m tonnes per year). Annually, March and April have little trading activity with the power sector. E.ON shows moreover little trading activity with EEX. Low inflow volumes of 10 m tonnes can be seen in March 2014 and 2015. Overall E.ON shows marginal volumes in outflow.

Figure 12: E.ON - Cumulated net trading per trading partner sector

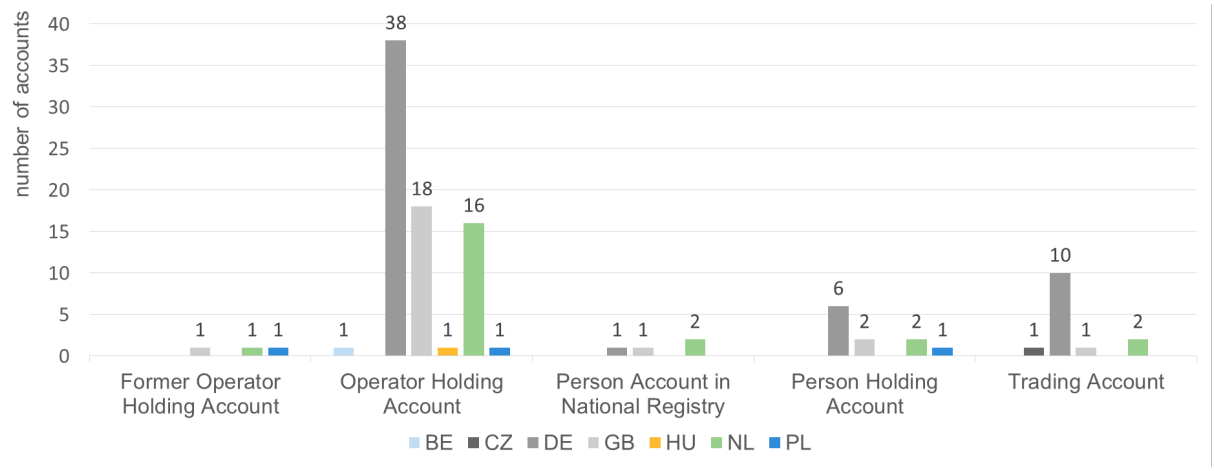


Source: ICIS based on EUTL data.

Detailed analysis of RWEs transaction profile

The German utility RWE has by far the highest compliance obligation amongst the analysed utilities. Its annual emissions between 2013 and 2015 reached up to 135 million tonnes CO_2e. During that time, its installations were located primarily in Germany, the UK and the Netherlands. Figure 13 shows that RWE's trading activities are conducted via accounts registered in Germany. The same applies for its Operator Holding Accounts and Person Holding Accounts. German accounts make up by far the largest part in trading accounts (10/14), followed by accounts held in Britain and the Netherlands.

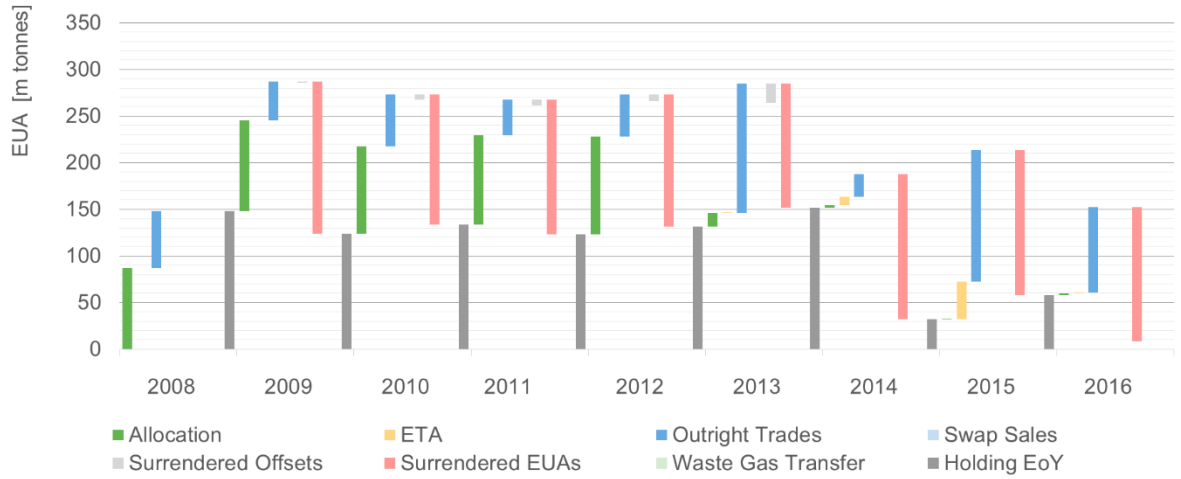
Figure 13: RWE - Number of accounts per account type and country of registration used since 2013



Source: ICIS based on EUTL data.

Figure 14 presents an estimated physical company balance based on transactions within the EUTL.

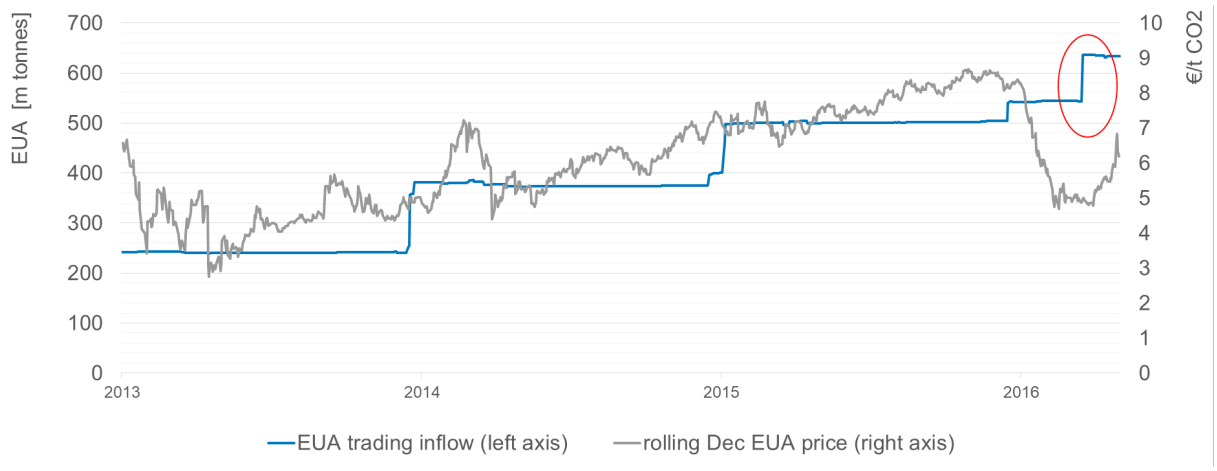
Figure 14: RWE - Estimated physical company balance[35, 36, 37]



Source: ICIS based on EUTL data.

A steep decline in free allocation of allowances sets in with the start of the third trading phase of the EU ETS in 2013, where the volume drops to almost zero. Moreover from 2014 onwards we see a considerably lower end of year holding position and an increased level on the side of compliance with 155 m tonnes surrendered EUAs (versus 133 m for 2013). Similarly, the same patterns/dynamics cross over to purchasing activity. While 2014 data show a reduced number of purchases, the inflow volume again expands significantly up to 140 m tonnes in 2015.

Figure 15: RWE - Cumulated net EUA trading & EUA rolling Dec price



Source: ICIS based on ICE and EUTL data.

Figure 15 combines the EUA price development (rolling Dec price) and the net EUA purchase activities by RWE from 2013 onwards. Between 2013 and April 2016 an EUA inflow volume of +390 m tonnes is visible. In 2013 December deliveries of over +135 m tonnes (potentially Dec futures/forward trades) can be seen. Apart from this, there is almost no net (in- or outflow)

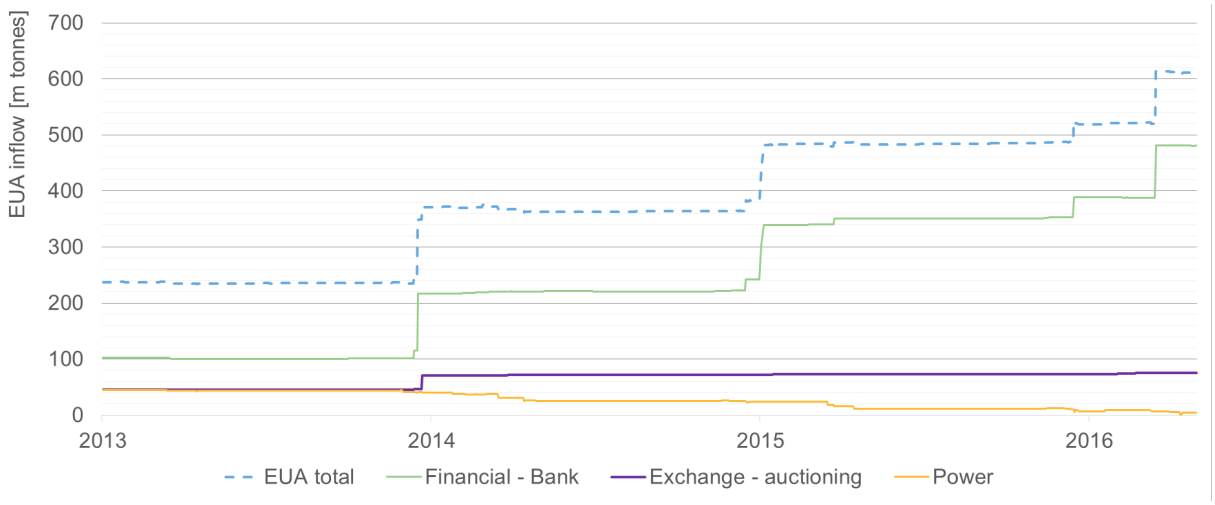
[35] The shown transaction activities and the holding end of year subsumes the transactions and holdings of all accounts assigned to RWE in the ICIS EUTL. Therefore, the shown position is only an estimate based on all registered transaction in the EUTL.

[36] ETA: The nature of ETA transactions within the scope of this analysis remains subject to interpretation. Potentially, these transactions could relate to swaps from TP2 to TP3 allowances or to the transition of allowances from national to EU registries.

[37] Swap sales: For each CER bought, we assume an EUA was swapped (provided the net EUA volume sold is higher than the net offset volume bought). This is represented by swap sales. The remaining EUAs sold are considered to be outright sales.

trade activity over the year. In December 2014, an inflow volume following a similar pattern cuts down to +20 m tonnes and is followed up by a strong purchase volume in January 2015 with +140 m tonnes. The end of year inflow of +40 m tonnes for 2015 is considerably larger than for 2014 but still lower than the volumes in 2013. The purchase of +90 m tonnes in March 2016 suggests a change in RWE's purchase pattern with the shift to acquisition volumes with delivery in March. This change may reflect the attempt to limit related capital costs.

Figure 16: RWE - Cumulated net trading per trading partner sector



Source: ICIS based on EUTL data.

Figure 16 breaks down the net EUA trades by trading partner sector. It shows that for RWE the most significant and fundamental EUA suppliers are banks – with activities in December, January and March as discussed above. In 2013 a trade of +25 m tonnes via EEX stands out. Outflow volumes are seen for Q1 in 2014 and 2015 with a volume of -10 m tonnes each to the power sector.

Table 8 gives a more complete picture including trades with the metal and chemical industry. We observe a limited inflow derived from both exchanges and the previously mentioned banks.

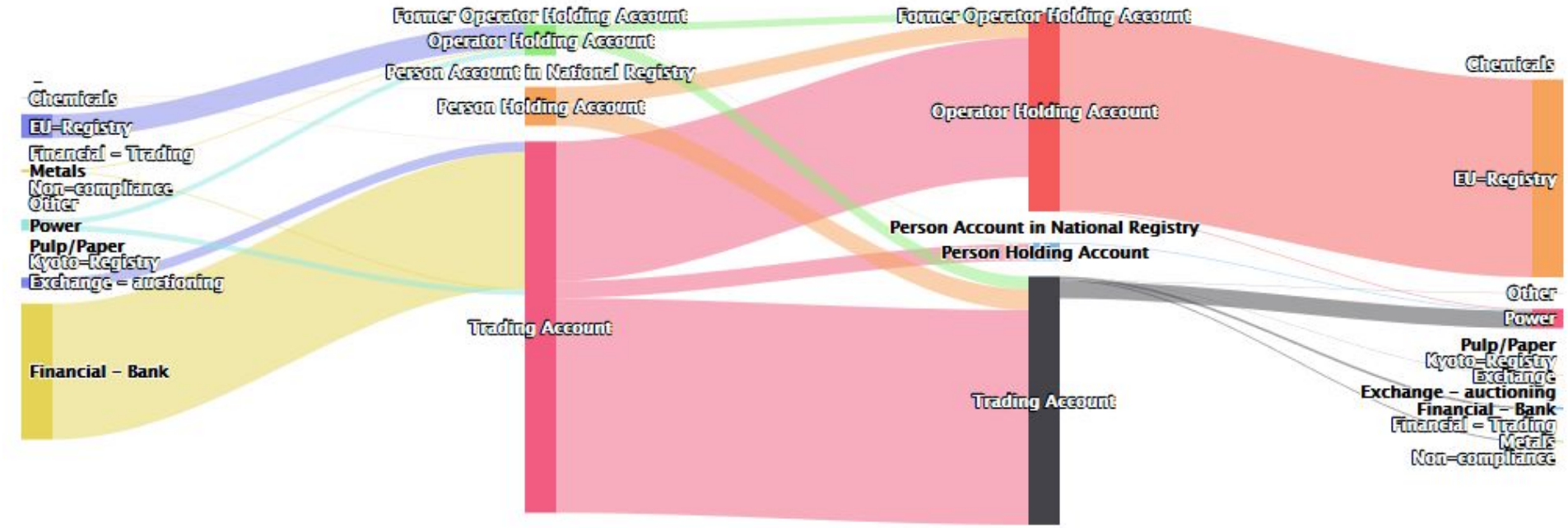
Table 8: RWE - Yearly in- and outflow of EUA by trading partner sector[38]

[m tonnes]	EUA total	Financial - Bank	Exchange - auctioning (EEX)	Power	Metals	Chemicals
2013	138.8	113.3	24.8	0.0	0.0	1.9
2014	20.2	25.8	1.1	-10.2	3.5	0.1
2015	140.7	146.4	1.6	-9.8	1.2	0.6
2016 Jan – Apr	92.0	92.2	2.2	-2.5	0.0	0.0
2013-15	299.7	285.5	27.5	-20.0	4.7	2.6

Source: ICIS based on EUTL data.

[38] "-": indicates outflows

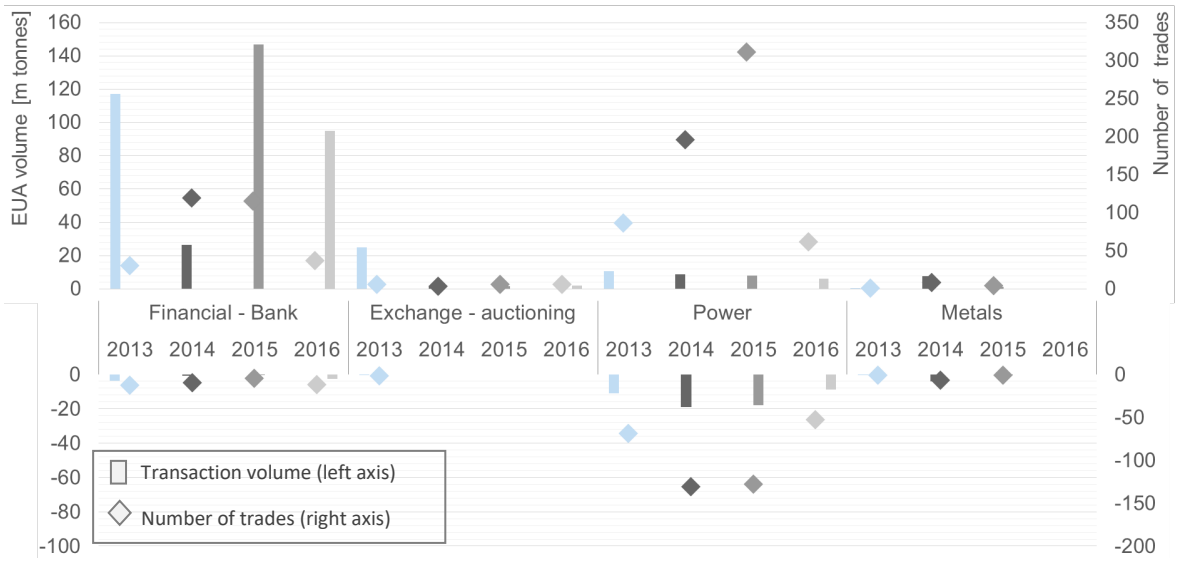
Figure 17: RWE – Transaction flow by account type (inflow, internal transactions, and outflow)



Source: ICIS based on EUTL data.

Figure 17 is a transaction flowchart illustrating all transactions for RWE (incl. transactions regarding compliance obligations) with the involved account type and counterparty by sector. It shows flows to Operator Holding Accounts alongside inflow trading volumes to Trading Accounts as well as the internal distribution via Trading Accounts to Operator Holding Accounts deemed for compliance. It can also be observed that EUA volumes stay within Trading Accounts. These could be intended to be used to hedge for future compliance.

Figure 18: RWE - Evolution of volume and number of transactions for most relevant trading partner sectors over time



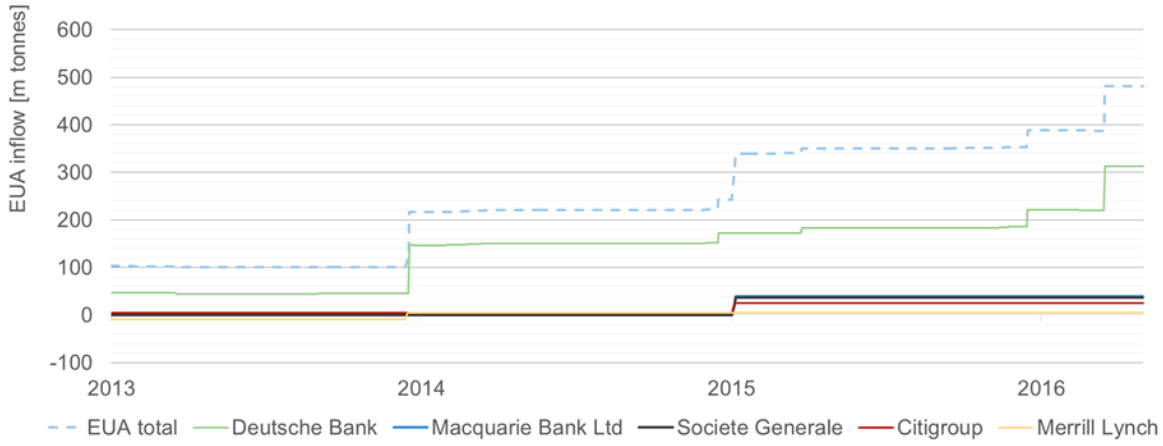
Source: ICIS based on EUTL data.

Figure 18 illustrates how the volume (left axis) and the number of transaction (right axis) with most relevant sectors have changed over time. Regarding the financial sector, it is observed that trade inflow dips in 2014. Between 2013 and 2015 the volume of transactions averages 1.8 m tonnes. A fairly constant number of inflows stemming from the financial bank sector can be seen in 2014 and 2015 (around 115). The outflow to the financial sector is marginal, yet constant.

For the year 2013, six purchase activities conducted on the exchange EEX, reached a total inflow volume of 25 m tonnes. The average volume per transaction during that year was much higher compared to the remaining periods which averaged 0.3 m tonnes.

Furthermore, there is a constant inflow volume from different partners proceeding from the power sector. Number of trade increases from roughly 100 transactions in 2013 to more than 300 transactions in 2015. Significant outflows to the power sector are displayed as well. The average volume per transaction is constant with around 0.15 m tonnes per transaction. Outflows to the power sector could indicate carry trading activity. However, due to the relatively low volume, it does not seem the focus of RWE's trading strategy.

Figure 19: RWE - Cumulated net trading per trading partner in financial bank sector



Source: ICIS based on EUTL data.

Figure 19 shows the distribution of net trading activities per trading partner proceeding from the financial sector. Deutsche Bank is by far the largest trading partner with 96 % of traded volume between January 2013 and April 2016. Trade intensified significantly in January 2015 when roughly 100 m tonnes were bought from three other banks (Macquarie, Societe Generale and Citigroup). This occurred after an untypically low year-end purchase volume from Deutsche Bank in December 2014 (+21 m tonnes). In March 2015 and 2016 purchase volumes stemming from Deutsche Bank can be observed again.

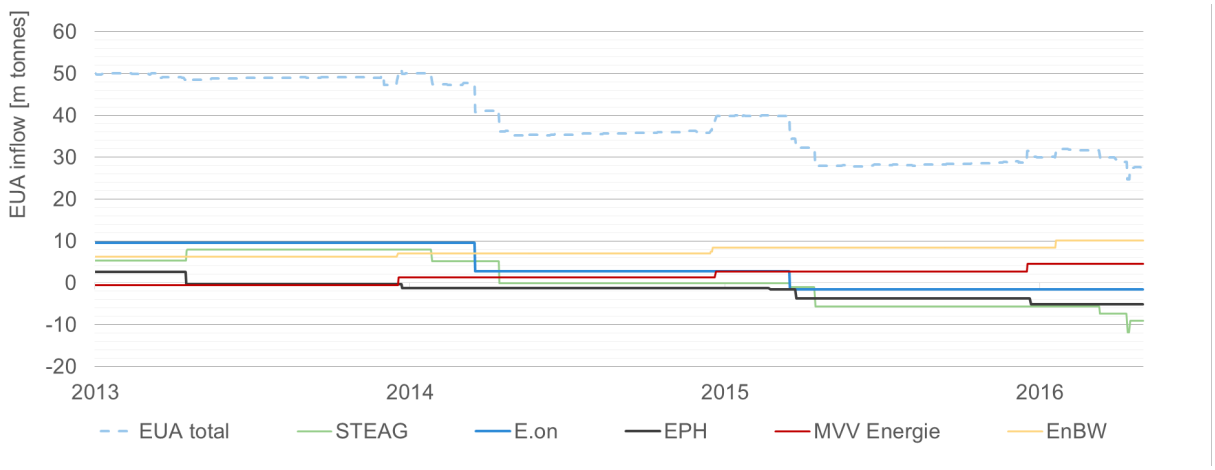
In Table 9 we further see trades with Merrill Lynch (2013) and BayernLB. Only small trades with RWE are documented with BayernLB (2013, 2014).

Table 9: RWE - Yearly in- and outflow of EUAs by company of the financial bank sector

[m tonnes]	EUA total – Financial bank	Deutsche Bank	Macquarie Bank Ltd	Societe Generale	Citigroup	Merrill Lynch	Bayerische Landesbank (BayernLB)
2013	113.3	99.0	0.0	0.0	0.0	14.2	0.1
2014	25.8	25.6	0.0	0.0	0.0	0.0	0.1
2015	146.4	49.3	40.0	37.0	20.0	0.0	0.0
2016 Jan – Apr	92.2	92.3	0.0	-0.2	0.0	0.0	0.0
2013-15	285.5	173.8	40.0	37.0	20.0	14.2	0.2

Source: ICIS based on EUTL data.

Figure 20: RWE - Cumulated net trading per trading partner in power sector



Source: ICIS based on EUTL data.

Figure 20 shows the trade distribution (cumulated net volume) of partners proceeding from the power sector. STEAG (as of 2014), E.ON and EPH show a net outflow over time. EnBW and MVV have a constant inflow that accumulates over time. These volumes may have been transferred to RWE due to shared ownership of plants. RWE's annual EUA inflows and outflows proceeding from trading partners of the power sector are presented in Table 10.

Table 10: RWE - Yearly in- and outflow of EUA by company of the power sector

[m tonnes]	EUA total - Power	STEAG	E.ON	EPH	MVV Energie	EnBW
2013	0.0	2.7	0.1	-3.9	1.8	0.7
2014	-10.2	-8.0	-6.9	0.0	1.3	1.5
2015	-9.8	-5.5	-4.2	-3.8	1.9	0.1
2016 Jan – Apr	-2.5	-3.5	0.0	0.0	0.0	1.7
2013-15	-20.0	-10.9	-11.0	-7.7	5.0	2.2

Source: ICIS based on EUTL data.

Figure 21: RWE - Trades in- and outflow per month

Source: ICIS based on EUTL data.

Figure 21 shows the monthly trade distribution with in- and outflows for RWE. High trade intensity can be observed especially in December trades and particularly January 2015. Similarly, March has significant trading volumes in 2016. Outflows occur mostly in March, April and December. Those volumes are much lower than inflows (around 10 m tonnes).

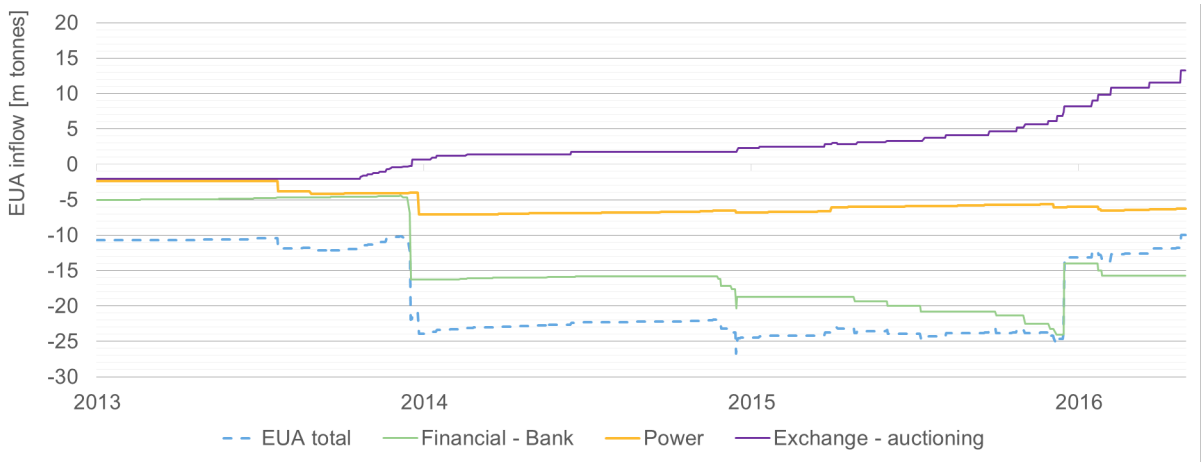
The analysis shows that RWE relies primarily on banks to acquire EUA. Especially Deutsche Bank accounts for the major share of transaction volume between RWE and the bank sector. The transactions with Deutsche Bank strongly influence the course of the curve "EUA total". Over time the main delivery date shifts from Dec to March (seen in 2016) delivery, with the exception of transactions performed in January 2015 which may proceed from 2014 volumes deemed for hedging (which were acquired by Macquarie, Societe Generale and Citigroup).

The outflow volumes transferred to the power sector companies (e. g. STEAG, E.ON) suggests RWE's function as intermediary trader. It moreover may reflect RWE's partial ownership of these plants. However, compared to the total trade volumes, these outflows are relatively low size (-6.7 m tonnes per year), which is why RWE was assigned to the cluster without carry trades.

3.3.2.2 Cluster 2 – Carry traders

Only two companies fall within this category, namely CEZ and Statkraft. Both do not seem to conduct any visible hedging strategy and focus primarily on carry trades.

Figure 22: CEZ - Cumulated net trading per trading partner sector



Source: ICIS based on EUTL data.

CEZ's cumulated net trading activity shows an overall outflow of EUAs as illustrated in Figure 22. It can be inferred that they focus on carry trades rather than fulfilling compliance obligations. Their main trading partners stem from the financial sector and are banks and exchanges. CEZ buys from the EEX on a regular basis and sells primarily to BNP Ltd. The single inflow proceeding from BNP Ltd. in December 2015 particularly stands out due to its high volume compared to all other transactions. They engage in little trade with the power sector.

Detailed analysis of Statkraft's transaction profile

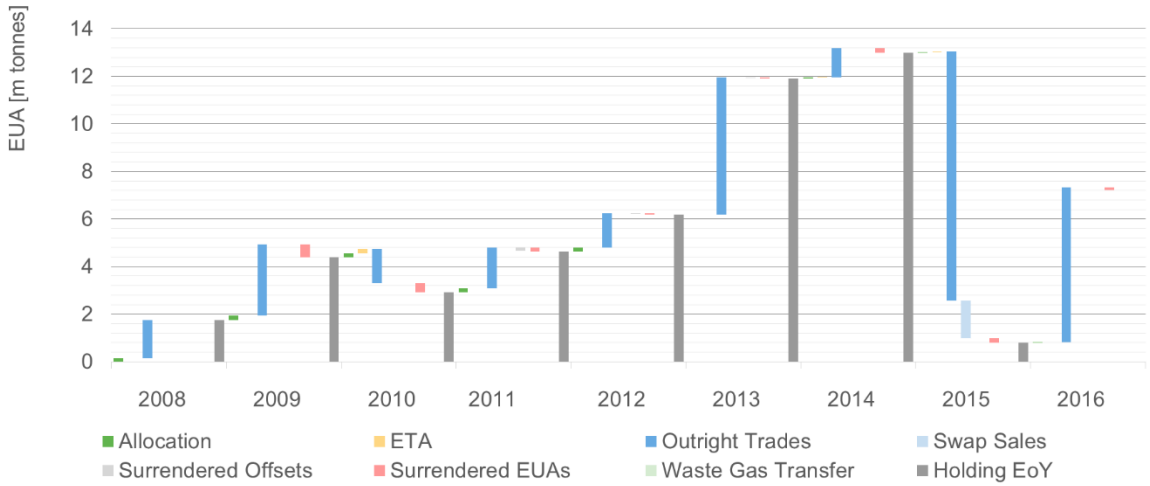
Statkraft is a hydropower utility owned by the Norwegian state with an average of 0.1m tonnes CO_2 per year for the period of 2013 to 2015.

Statkraft operates four installations in Germany and two in Norway (see Figure 23 Operator Holding Accounts). They have been active in the EU ETS since 2008 and have traded from accounts registered in Norway and Germany.

Figure 23: Statkraft - Number of accounts per account type and country of registration used since 2013

Source: ICIS based on EUTL data.

Figure 24: Statkraft - Estimated physical company balance[39, 40]



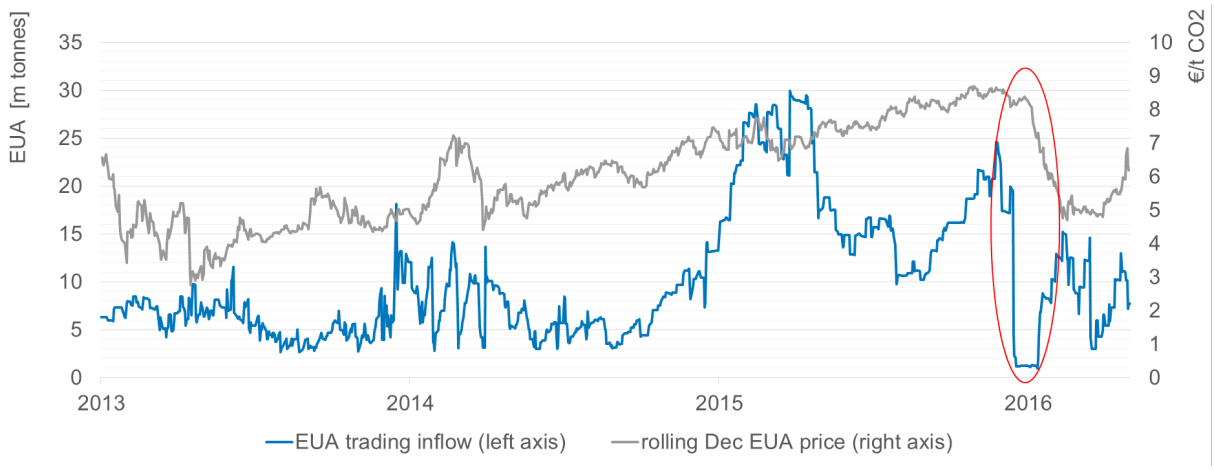
Source: ICIS based on EUTL data.

The allocation and compliance volume for EUAs is relatively negligible and has an annual average of 0.14 m tonnes for surrendered allowances and an annual average of 0.03 m tonnes for allocations (see Figure 24). The estimated holding end of year volume of 13 m tonnes (in 2014) is deemed to be very high in comparison with compliance volume. In the period of 2010 to 2014, Statkraft increased its physical position from 3 to 13 m tonnes. In 2013, trade inflow peaked at 5.8 m tonnes. In 2015, a large amount of EUAs was transferred (around 10 m tonnes) reducing the holding end of year position down to 0.8 m tonnes. In 2016 (January to April), inflow of around 6 m tonnes can be observed.

[39] The transaction activities shown, and the holding end of year subsume the transactions and holdings of all accounts assigned to Statkraft in the ICIS EUTL. Therefore, the position shown is only an estimation based on all registered transaction in the EUTL.

[40] Swap sales: For each CER bought, we assume an EUA was swapped (provided the net EUA volume sold is higher than the net offset volume bought). This is represented by swap sales. The remaining EUAs sold are considered to be outright sales.

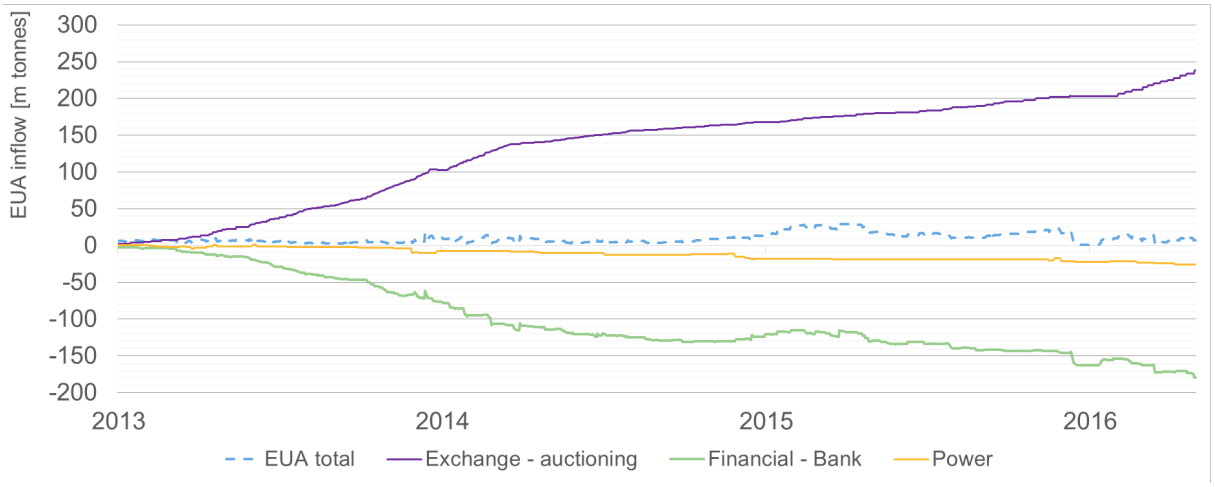
Figure 25: Statkraft - Cumulated net EUA trading & EUA rolling Dec price



Source: ICIS based on ICE and EUTL data.

Statkraft's cumulated net transaction volumes are irregular and range from 10 to 30 m tonnes (see Figure 25), constituting a significant lower volume compared to other market players such as RWE, Macquarie or Commerzbank. The price fall from 9€/tonne to 4.50€/tonne seems to have led to the sale of 18 m tonnes of EUAs in December of 2015 (red circle in figure 25). This was followed by the purchase of 14 m tonnes in the beginning of 2016. The falling price therefore could be related to the outflowing volumes. Statkraft's clients might have reacted to the falling EUA price and decided to purchase emission allowances.

Figure 26: Statkraft - Cumulated net trading per trading partner sector



Source: ICIS based on EUTL data.

Figure 26 depicts EUA trades by trade partner sector. Inflow volumes proceed mainly from the exchange EEX. Since 2013 Statkraft's inflows are evenly distributed over the year and have a total average of 67 m tonnes per year. The outflow rate averages 53 m tonnes per year and is distributed mainly to banks. The outflow rate to the power sector is considerably lower (7 m tonnes/year). Statkraft has a low physical holding position relative to the positions it has acquired and transferred.

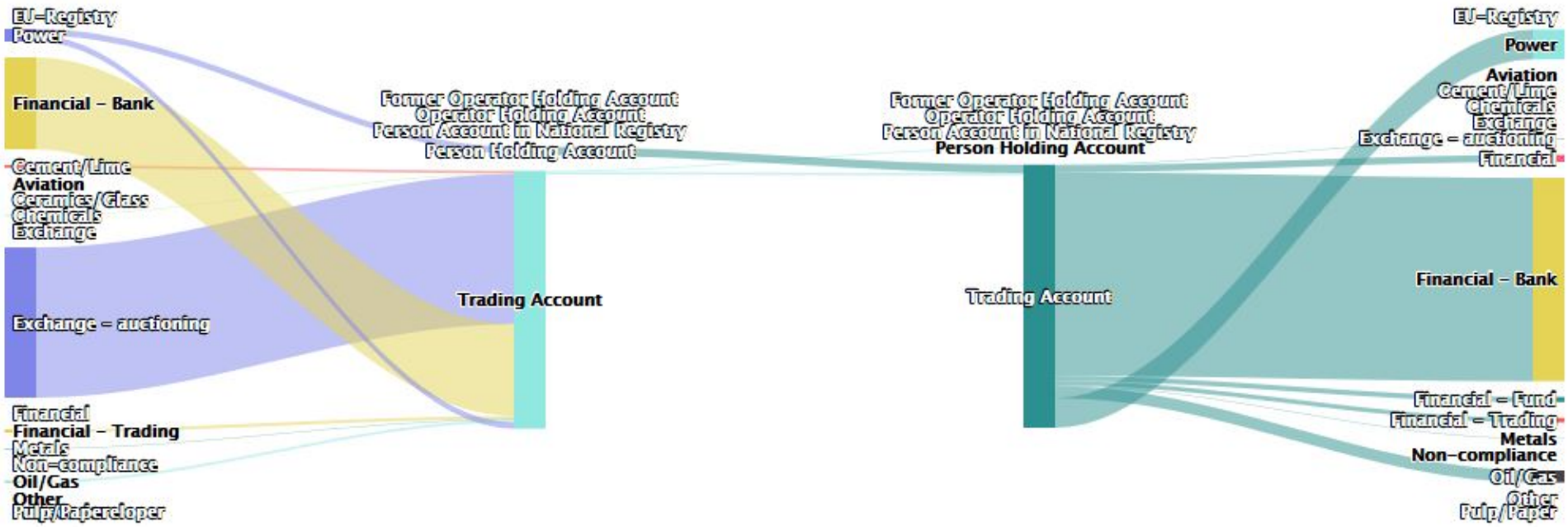
Table 11 provides a more comprehensive picture including trades with the financial-other and the financial-fund sector. Both sectors as well as the power sector show a limited outflow of EUAs. On the other hand, the financial-bank sector shows high outflow volumes.

Table 11: Statkraft - Yearly in- and outflow of EUA by trading partner sector

[m tonnes]	EUA total	Exchange - auctioning	Financial - Bank	Power	Financial - Other	Financial - Fund
2013	5.8	100.7	-73.2	-7.3	-7.9	-8.3
2014	1.2	64.4	-48.3	-11.3	-4.0	-0.2
2015	-12.1	35.5	-37.9	-3.7	0.0	0.0
2016 Jan – Apr	6.5	35.1	-16.9	-4.1	0.0	0.0
2013-15	-5.1	200.6	-159.4	-22.2	-12.0	-8.5

Source: ICIS based on EUTL data.

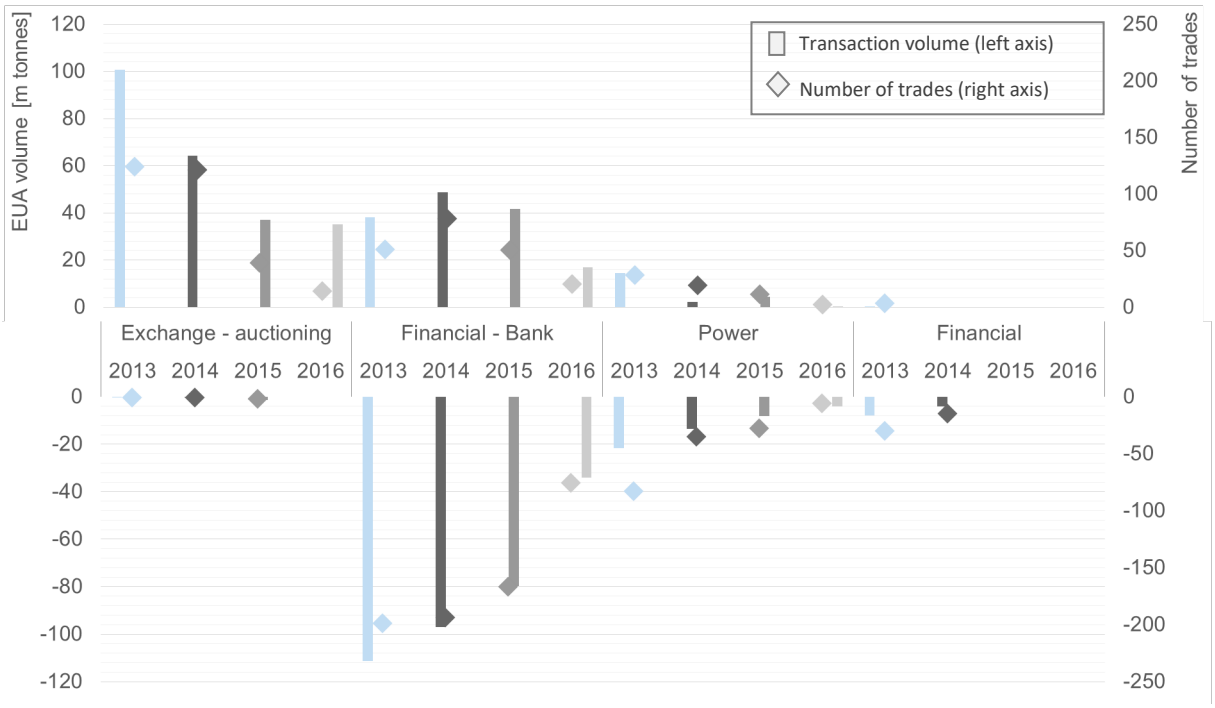
Figure 27: Statkraft – Transaction flow by account type (inflow, internal transactions and outflow



Source: ICIS based on EUTL data.

The transaction flowchart (Figure 27) of Statkraft highlights the marginal volume of internal transactions that occur between Trading Accounts within Statkraft, thus supporting the premise that Statkraft primarily trades as intermediary rather than primarily following a complex compliance strategy.

Figure 28: Statkraft - Evolution of volume and number of transactions for most relevant partner sectors over time

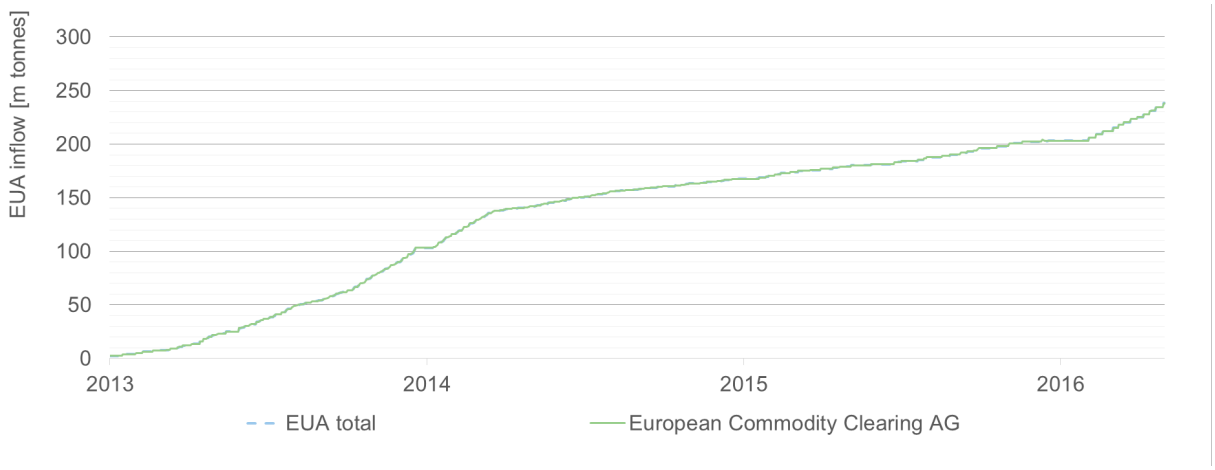


Source: ICIS based on EUTL data.

Figure 28 illustrates how the transaction volume (left axis) and the number of transactions (right axis) with most relevant partner sectors of Statkraft have changed over time. Statkraft primarily relies on the EEX trading venue to acquire allowances. The average rate of EEX transactions and bank-related is 0.8 m tonnes. Inflow volumes proceeding from EEX have however been decreasing over the years, whereas the inflow derived from banks is more or less uniform.

The total outflow to the financial bank sector shows a decreasing tendency over the years and averages 0.5 m tonnes/transaction. The highest outflow volumes, however, are still going to the financial bank sector. Similarly, they show a decreasing interaction with the power sector (on a lower scale).

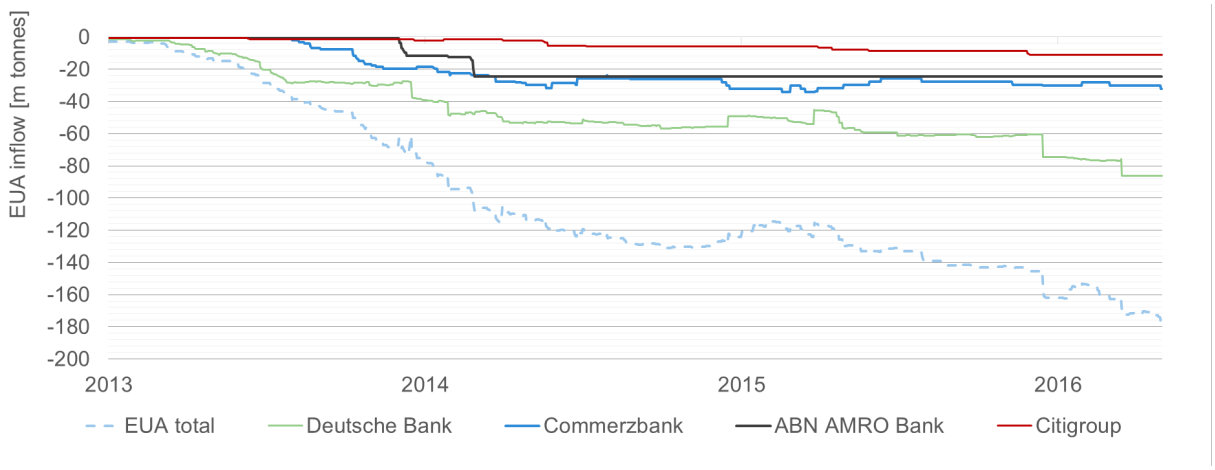
Figure 29: Statkraft - Cumulated net trading with EEX



Source: ICIS based on EUTL data.

Figure 29 shows the net trading activities with the exchange EEX. The EEX constitutes the main trading platform for inflows. Between 2013 and 2015 Statkraft averaged an inflow of 67 m tonnes/year. A decreasing tendency can be observed (lower slope of curve), with strongly regular cycles of inflows of six inflows per month. Because of their membership at EEX, we assume that Statkraft derives a significant share of their volumes from primary auctions.

Figure 30: Statkraft - Cumulated net trading per trading partner in financial-bank sector



Source: ICIS based on EUTL data.

Statkraft has several trading partners in the financial bank sector (see Figure 30). Net trades are negatively sloped indicating sales of EUAs to the financial-bank sector. Outflows are traded to Deutsche Bank and average 24 m tonnes/year and 10 m tonnes/year for Commerzbank. As previously mentioned, Deutsche Bank delivers EUAs primarily to RWE (see RWE analysis). Deliveries from Statkraft to ABN AMRO stopped in 2014.

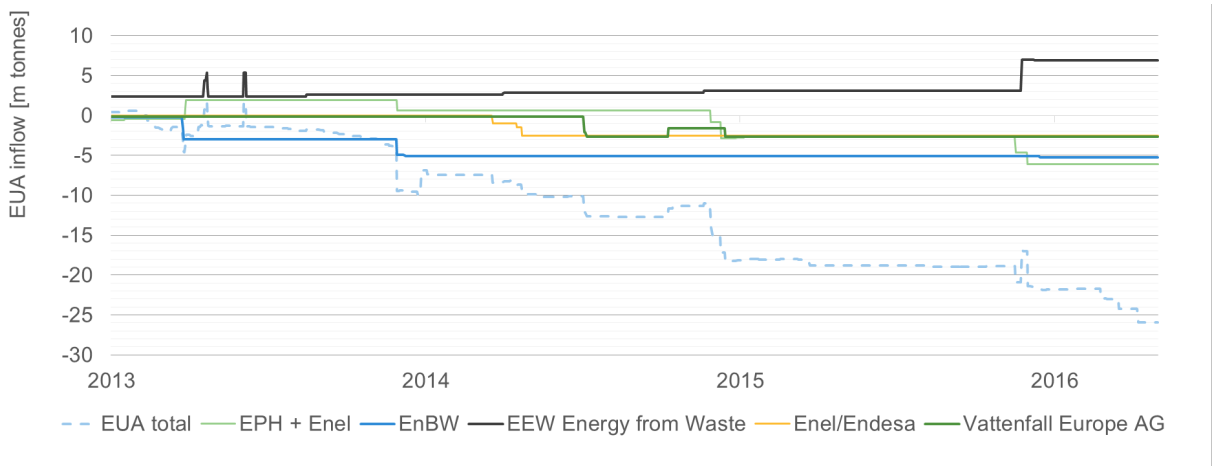
Table 12 gives an overview of Statkraft's trade partners proceeding from the financial bank sector with the highest trading activity. Statkraft conducts trading activities with the listed banks during every year. Exceptions are Bayern LB and ABM AMRO, as already mentioned. Trading activities with Bayern LB started in 2016.

Table 12: Statkraft - Yearly in- and outflow of EUA by company of the financial bank sector

[m tonnes]	2013	2014	2015	Jan – Apr 2016	2013-15
EUA total – financial bank	-73.2	-48.3	-37.9	-16.9	-159.4
Deutsche Bank	-37.6	-10.1	-25.3	-11.8	-73.0
Commerzbank	-18.7	-13.5	1.9	-2.0	-30.3
ABN AMRO Bank	-11.7	-13.0	0.0	0.0	-24.7
Citigroup	-1.8	-3.5	-5.5	0.0	-10.8
BNP Ltd	1.5	-9.5	-2.5	2.0	-10.5
Macquarie Bank Ltd	-3.9	1.5	-4.3	-0.5	-6.6
Skandinaviska Enskilda Banken AB	0.2	-0.2	-2.3	0.0	-2.3
Barclays	-1.3	0.0	0.0	0.0	-1.3
Bayerische Landesbank (BayernLB)	0.0	0.0	0.0	-5.5	-5.5

Source: ICIS based on EUTL data.

Figure 31: Statkraft - Cumulated net trading per trading partner in power sector



Source: ICIS based on EUTL data.

Figure 31 shows the distribution of net trading activities per power sector trading partner. The outflow to power companies is evenly distributed and less concentrated between individual players, compared to other analysed utilities. Outflow to the power sector involves numerous partners but still accounting for less volume than that of banks. The main trading partners are Enel, EnBW, EEW and Dimosia.

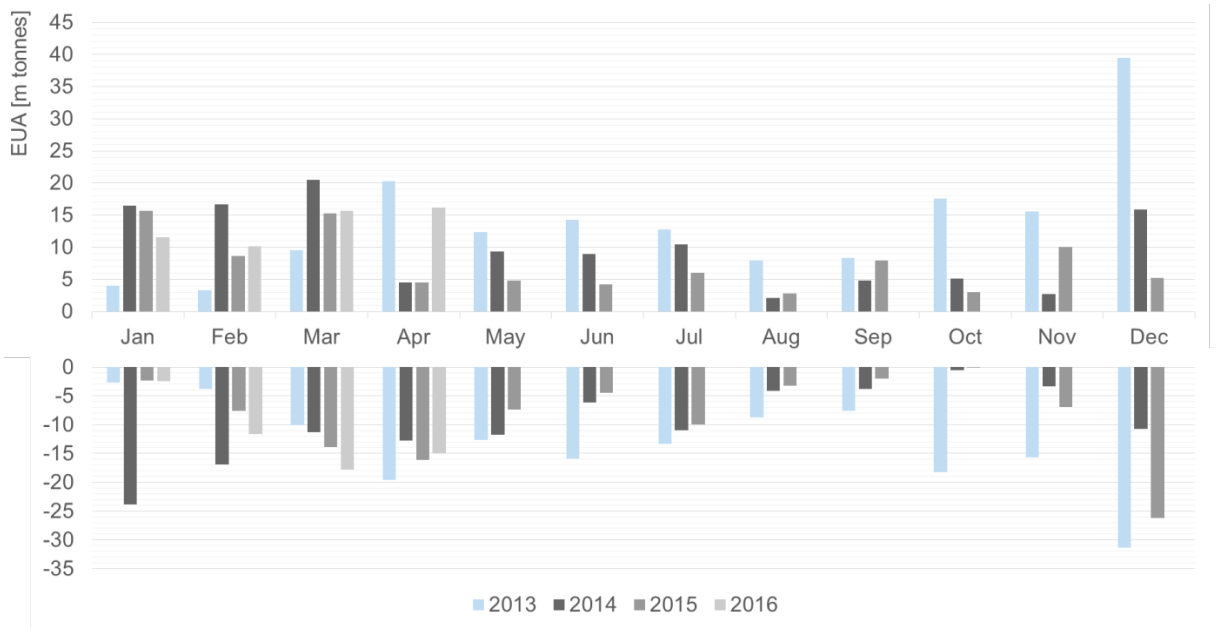
Table 13 depicts Statkraft's annual EUA inflows and outflows by trading partner from the power sector. Two inflows from EEW Energy and CEZ Group are noteworthy because of their large magnitude compared to the overall net outflow to the power sector.

Table 13: Statkraft - Yearly in- and outflow of EUA by company of the power sector

[m tonnes]	EUA total - power	EPH + Enel[41]	EnBW	EEW Energy from Waste	Dimosia	CEZ Group	Enel/ Endesa	Vattenfall Europe AG	DB Energy	PGE
2013	-7.3	1.2	-4.9	0.2	-3.3	3.0	0.0	0.0	0.0	-2.3
2014	-11.3	-3.4	0.0	0.5	0.0	0.0	-2.5	-2.5	-0.6	0.1
2015	-3.7	-3.4	-0.2	3.8	0.0	0.0	0.0	0.0	-1.8	0.0
2016 Jan – Apr	-4.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0
2013-15	-22.2	-5.5	-5.1	4.5	-3.3	3.0	-2.5	-2.5	-2.4	-2.2

Source: ICIS based on EUTL data.

Figure 32: Statkraft - Trades in-/outflow per month



Source: ICIS based on EUTL data.

As illustrated in Figure 32, the ratio of inflows and outflows is proportional over time except for December 2013 showing exceptionally high trading volumes.

Contrary to other large utilities which are driven by compliance obligations, Statkraft does not pursue hedging strategies in the EU ETS given their low demand for emission allowances. This can be attributed to the energy production arising from hydropower plants.

Statkraft seems to act as intermediary and offers market access to banks and players in the power sector who refrain from auctions. It has a broad profile of customers with regular deliveries to banks and to a lesser extent to power companies. Trading services are composed of carry trades with physical delivery. Rolled carry trades[42] (covered but without delivery) are

[41] Mainly EPH accounts, includes one operator holding account which belongs to a shared power plant with Enel.

[42] Physical EUAs are kept to back-up short futures EUA positions which are closed shortly before expiry and replaced by a new contract with a later expiry date.

deemed less relevant due to the company's relatively low physical position of EUAs compared to that of Commerzbank for instance. Statkraft has extensive domain knowledge in energy related commodities and potential large capital available to invest at low costs.

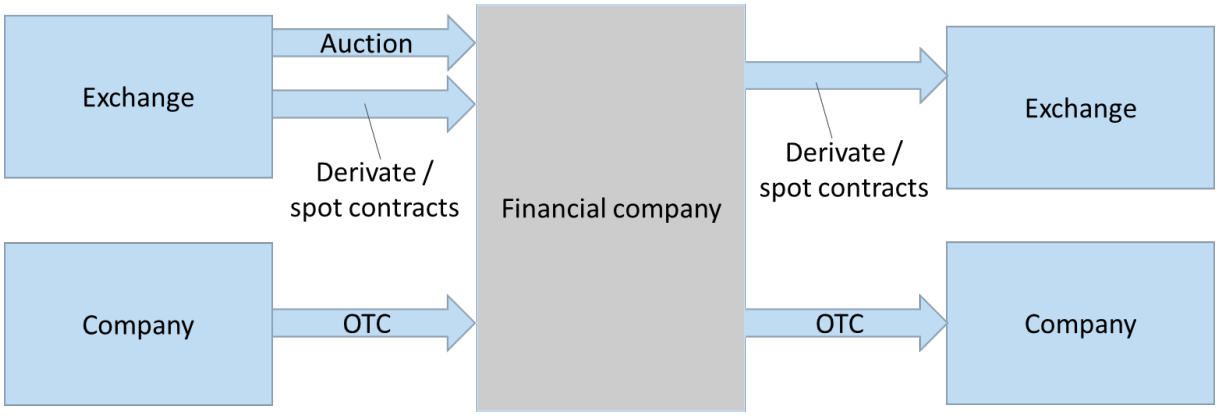
Physical delivery occurs through the purchase at EEX and delivery to banks and power companies. Additional trades not being covered in this analysis could be cleared on the EEX and delivered directly from the EEX to Statkraft's clients.

Statkraft's trade volumes are comparable to those of Macquarie, despite transfers occurring physically. Even though Statkraft is classified as utility pertaining/belonging to the power sector, it rather functions as a financial player.

3.3.3 Cluster of the financial sector

Regarding the analysis of financial companies, the general trading patterns were deducted based on trading partners, especially in terms of market access. Market players can access the market either through intermediaries or through exchanges (Figure 33). Exchanges sell products via auctions or as spot contracts/derivatives on the secondary market. As described in chapter C.1.2, the data from the EUTL does not differentiate auctions from secondary market based transactions, thus no separation could be made for the analysis.

Figure 33: Possible physical flow of transactions



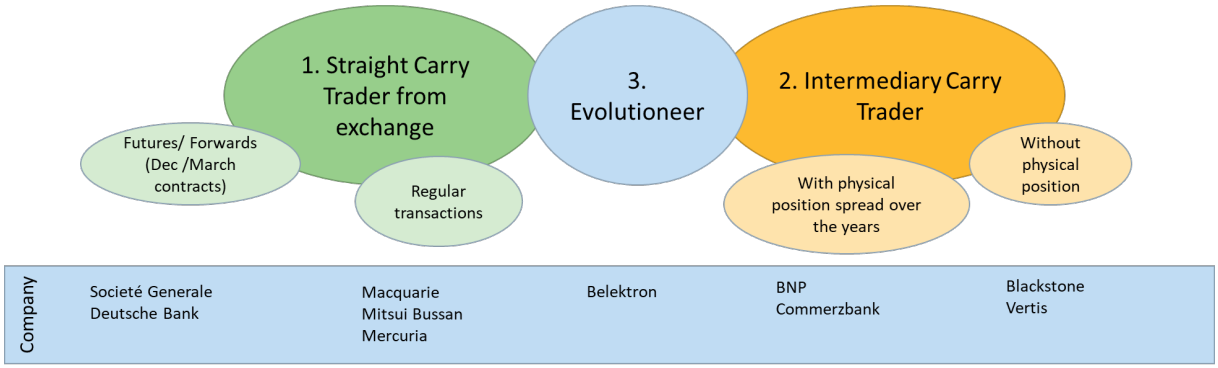
Source: ICIS.

During the analysis, three main clusters were developed to categorise financial players: Straight carry traders from exchange, Intermediary carry traders and Evolutioneers as shown in Figure 34. The core distinction between players is how they access the market. Companies covered in the first cluster enter the carbon market mainly through exchanges. Companies classified into the second cluster acquire allowances from intermediaries. The third cluster is defined as "Evolutioneers" and is composed of market players that have switched from intermediaries to exchange to access the market.

Further subcategories were developed relative to the seasonality, the choice of the product (forward or spot) and the cumulated net trading volume of the respective companies. Straight carry traders proceeding from exchanges can be distinguished based on their seasonality as some focus their trade activity on forwards like December and March contracts ("Straight Carry Trader from exchange – Future/Forwards") and other show regular transactions ("Straight Carry Trader from exchange – Regular transactions"). Intermediary carry traders can be grouped according to their physical position. One sub-cluster holds no large EUA position and in- and outflowing transactions are netted: "Intermediary Carry Trader - Without physical position". For companies without any anomalous behaviour, trades can easily be retraced. The other sub-

cluster of "Intermediary Carry Trader" increases its cumulated net trading and continuously builds up physical position over the years: "Intermediary Carry Trader – with physical position spread over the years".

Figure 34: Cluster of the financial sector and assignment to the ten selected companies



Source: ICIS.

3.3.3.1 Cluster 1 - Straight carry trader from exchange

This cluster can be summarised as follows:

- Exchanges constitute the primary access to markets
- Focus set on selling back-to-back
- No large holding position: Overall cumulated net trading tending to zero; inflowing transactions flow out shortly after
- Further subdivided: using futures or regular transactions

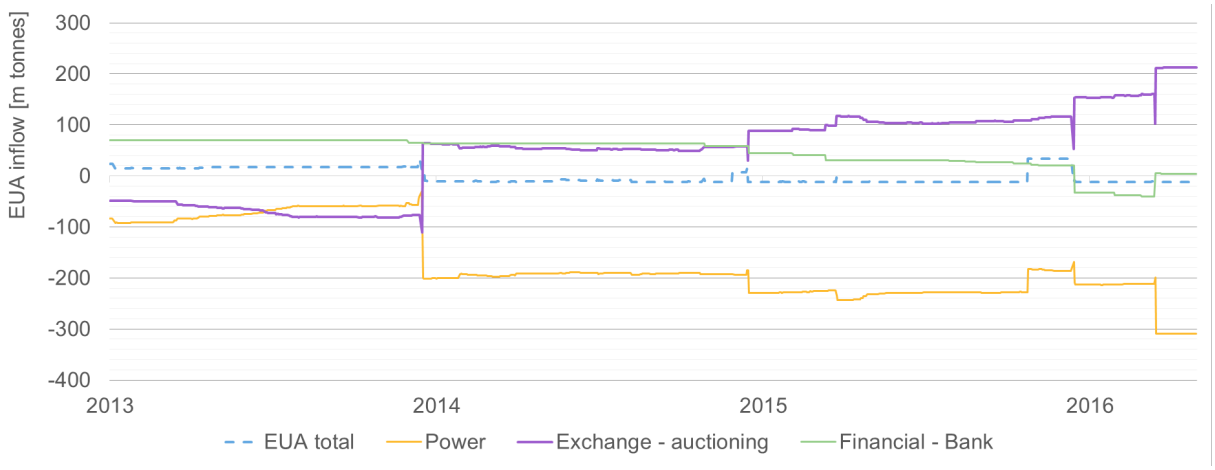
Straight carry trader from exchange – Mainly future contracts

Two companies fit into this cluster: Deutsche Bank and Societe Generale. Both companies mainly use future deliveries from exchanges to access to the market as depicted in the following figures.

Figure 35 shows the cumulated net trading of Deutsche Bank (sector: financial bank) per main trading partner sector. Deutsche Bank used the exchange ICE as market access. As of 2019, the company ought to use the secondary market as it is no longer listed as auction participant. Some of the purchased volume is transferred to ICE as well but is mostly transferred back-to-back to the power sector, specifically RWE. Trading volume with the financial bank sector is low during the study period.

The highest volume was traded using December delivery contracts. In 2016, transactions might also be indicative of a higher use of March contracts. For the remaining months of the year, little transaction activity could be determined. Overall, Deutsche Bank does not present any significant holding position of EUA (due to transactions).

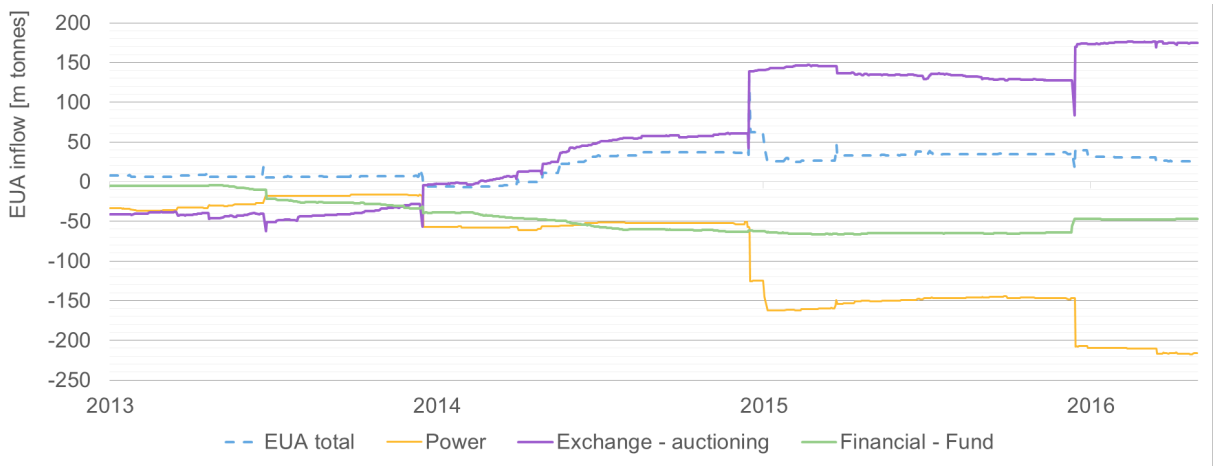
Figure 35: Deutsche Bank - Cumulated net trading per trading partner sector



Source: ICIS based on EUTL data.

Societe Generale (sector: financial bank) presents a similar picture of cumulated net trading (see Figure 36) as Deutsche Bank. It also acquires EUAs from exchanges (ICE) and transfers these back-to-back to several players of the power sector. Despite a relatively uniform trade activity, predominantly December contracts were used. Since mid-2014 Societe Generale holds a little physical position of around 30 m tonnes of EUAs.

Figure 36: Societe Generale - Cumulated net trading per trading partner sector



Source: ICIS based on EUTL data.

Straight carry trader from exchange – regular transactions

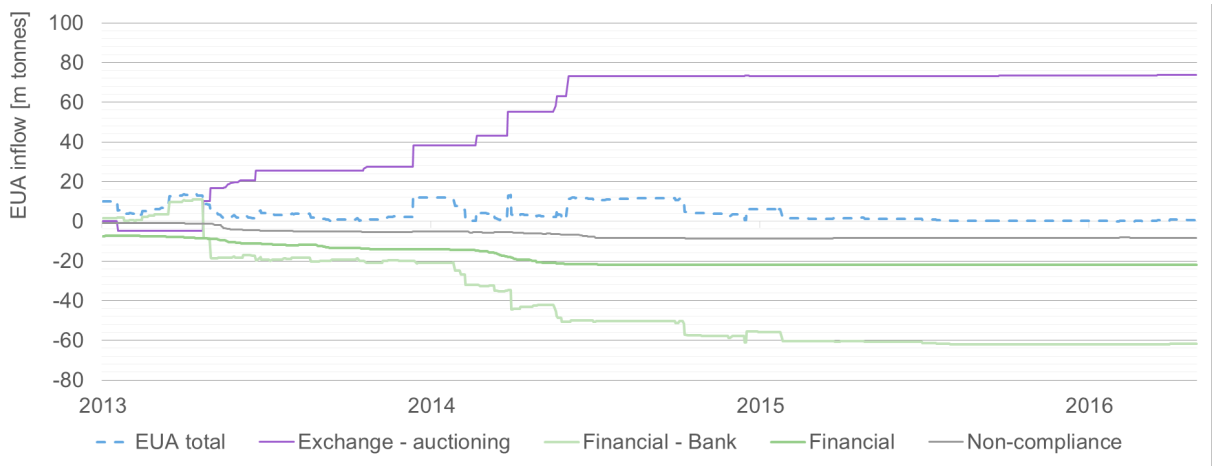
Three companies were categorised as "Straight carry trader from exchange with regularly transactions": Macquarie, Mercuria and Mitsui Bussan. These companies conduct transactions on a regular basis and do not present any accumulation of future contracts. After a short analysis of Mercuria and Mutsui Bussan, Macquarie will be analysed in more detail for this cluster.

Based on the analysis, the trading and transaction profile of Mercuria (sector: financial trading) (see Figure 37) can be summarised as follows:

- was active on the market until end 2015

- until mid-2014 buying from exchange EEX and selling mainly to sector financial bank until end 2015
- one main partner in financial-bank sector was BNP Ltd
- trading throughout the year with a focus on the first half of the year and December delivery contracts
- Starting 2016 approaching zero activity

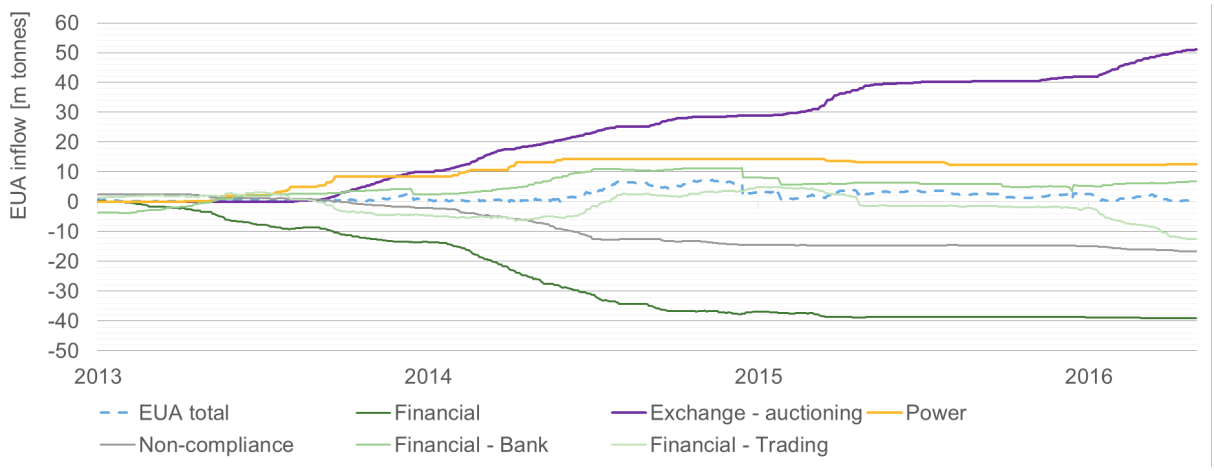
Figure 37: Mercuria - Cumulated net trading per trading partner sector



Source: ICIS based on EUTL data.

Figure 38 shows Mitsui Bussan's (sector: financial) cumulated transaction profile. The company's profile shows regular inflows from the exchange EEX and outflows to its main partner of the financial sector (Saga Commodities). Overall Mitsui has many (trading) partners from numerous sectors.

Figure 38: Mitsui Bussan - Cumulated net trading per trading partner sector



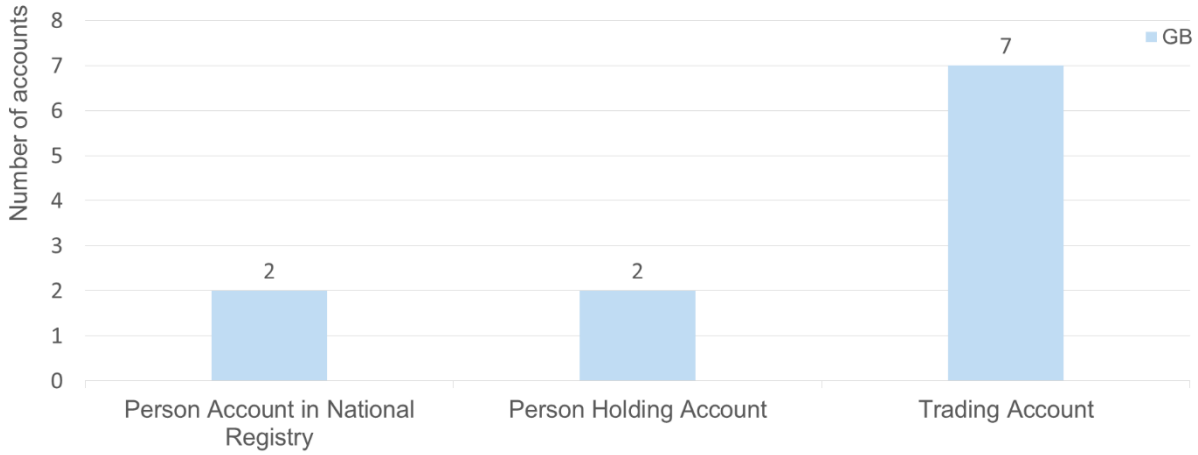
Source: ICIS based on EUTL data.

Detailed analysis of Macquarie's transaction profile

Macquarie is a diversified financial group based in Sydney and operates in the areas of asset management, finance, capital markets as well as physical and financial commodity markets.

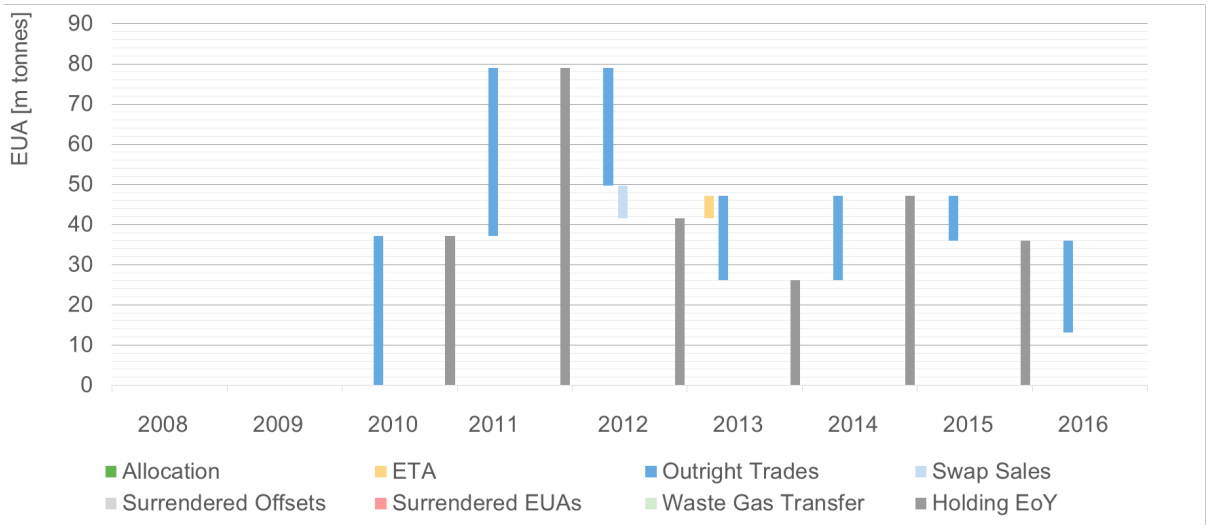
Since 2010 the Group actively participates in the EU ETS owning eleven accounts registered in the UK. As seen in Figure 39, most accounts are Trading Accounts. Since the Macquarie Group does not own any installations covered by the EU ETS it is exempt from regulatory compliance and thus doesn't own Operator Holding Accounts.

Figure 39: Macquarie - Number of accounts per account type and country of registration used since 2013



Source: ICIS based on EUTL data.

Figure 40: Macquarie – Estimated company balance[43, 44, 45]



Source: ICIS based on EUTL data.

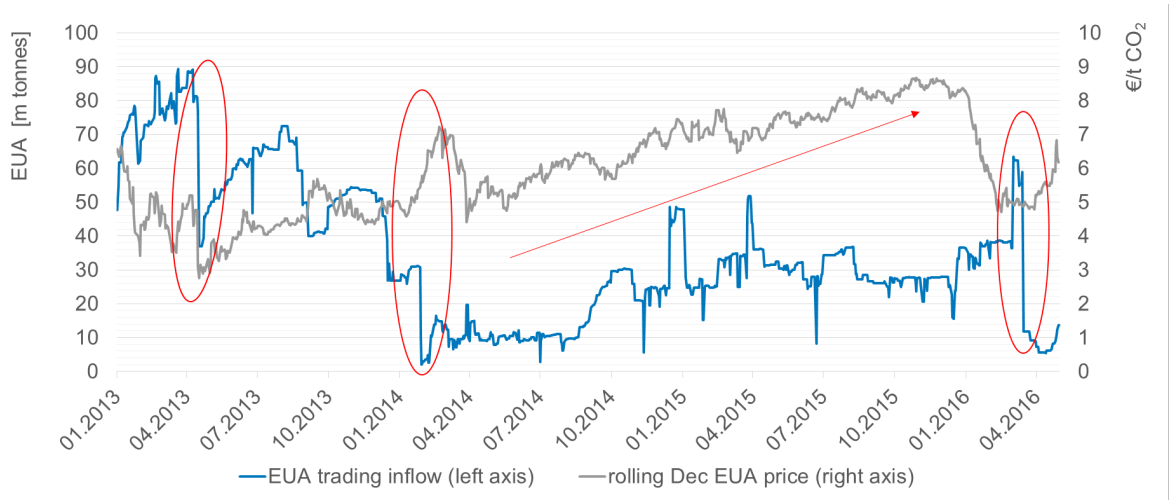
Figure 40 breaks down the yearly trading activities and the estimated company balance from the market entrance to April 2016. The graph shows that Macquarie focuses on trading EUAs. No activities related to compliance take place. The holding end of year fluctuates between 30 and 80 m tonnes.

[43] The shown transaction activities and the holding end of year subsumes the transactions and holdings of all accounts assigned to Macquarie in the ICIS EUTL. Therefore, the shown position is only an estimate based on all registered transaction in the EUTL.

[44] ETA: The nature of ETA transactions within the scope of this analysis remains subject to interpretation. Potentially, these transactions could relate to swaps from TP2 to TP3 allowances or to the transition of allowances from national to EU registries.

[45] Swap sales: For each CER bought, we assume an EUA was swapped (provided the net EUA volume sold is higher than the net offset volume bought). This is represented by swap sales. The remaining EUAs sold are considered to be outright sales.

Figure 41: Macquarie – Cumulated net EUA trading and EUS rolling Dec price

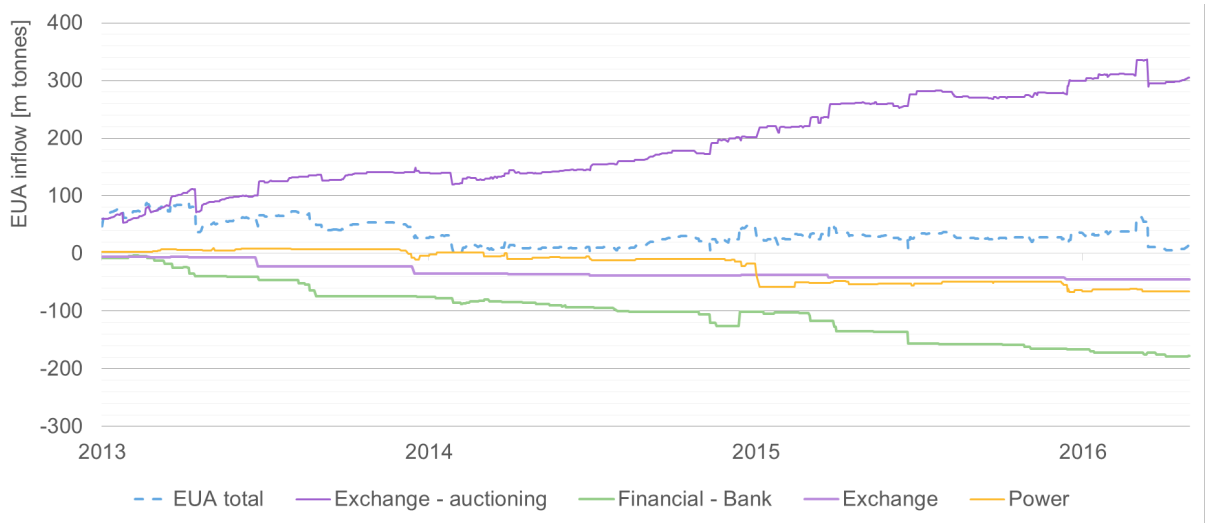


Source: ICIS based on ICE and EUTL data.

Macquarie's Group net trading volume in conjunction with the course of the EUA price is illustrated in Figure 41. Possible cohesions are marked in red. In April 2013 when the EUA price fell by 35 percent (16 April 2013), Macquarie sold 40 m tonnes of EUAs (17 April 2013) but again increased their balance in the following months. At an EUA price peak in the beginning of 2014, a further 21 m tonnes in allowances were sold. From 2014 to spring 2016 a more or less continuous cumulated net trading inflow (parallel to the constantly rising) proportional to the EUA price can be noticed. When there was a drastic price drop in 2016, the groups allowance inflows rose considerably followed by outflowing transactions of 47 m tonnes presumably with March contracts.

The level of cumulated net transaction volumes accounts for extreme fluctuations where the group owned up to 90 m tonnes in 2013 and less than 10 m tonnes in the beginning of 2014. Taking into account their exemption from regulatory compliance, 90 m tonnes is considered a high cumulated net position.

Figure 42: Macquarie - Cumulated net trading per trading partner sector



Source: ICIS based on EUTL data.

Figure 42 illustrates the cumulated net trading interaction of Macquarie with its different trading partners. The main procurement sources are exchanges with an EUA auction platform (mainly EEX, but also ICE). Macquarie purchased annually 80 m tonnes on average from 2013 to 2015. EUAs are predominantly transferred to the financial sector with mostly minor outflows to power utilities and even less outflows the Chicago Mercantile Exchange. The average annual outflow per main sector is:

- Banks, on average -53 m tonnes/year (2013-15)
- Power on average -22 m tonnes/year (2013-15)
- Exchange (not auctioning) on average -13 m tonnes/year (2013-15)

The in- and outflow pattern illustrated in Figure 42 indicate carry trading behaviour.

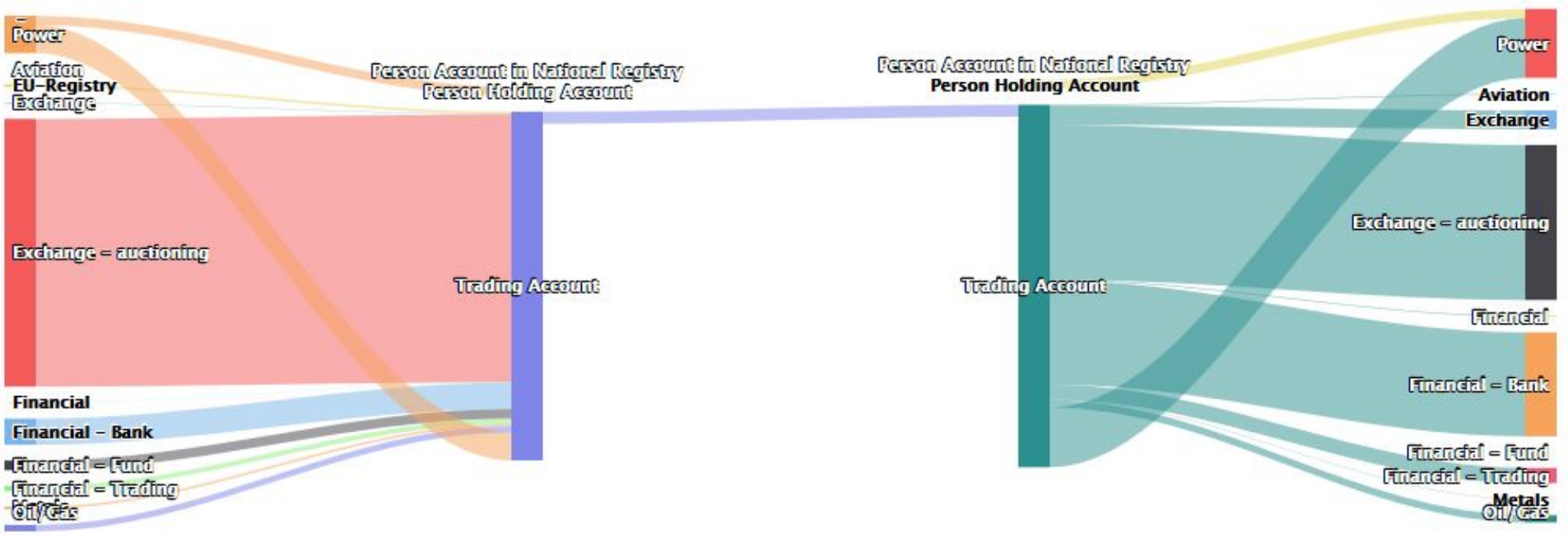
The exact numbers of EUA transactions per year with the different partner sectors are listed in Table 14.

Table 14: Macquarie - Yearly in- and outflow of EUA by trading partner sector

[m tonnes]	EUA total	Exchange auctioning	Financial bank	Power	Exchange	Financial trading	Financial fund	Oil/Gas
2013	-20.8	79.8	-67.1	-7.1	-29.0	-19.4	21.5	-1.0
2014	21.0	61.5	-26.0	-13.8	-3.0	2.5	0.0	-1.2
2015	-11.3	98.3	-65.0	-46.2	-7.4	0.1	0.0	10.8
2016 Jan – Apr	22.7	5.4	-11.0	-1.8	0.0	-5.1	0.0	-10.2
2013-15	-11.1	239.6	-158.1	-67.2	-39.4	-16.8	21.5	8.6

Source: ICIS based on EUTL data.

Figure 43: Macquarie – Transaction flow by account type (inflow, internal transactions and outflow) [46]

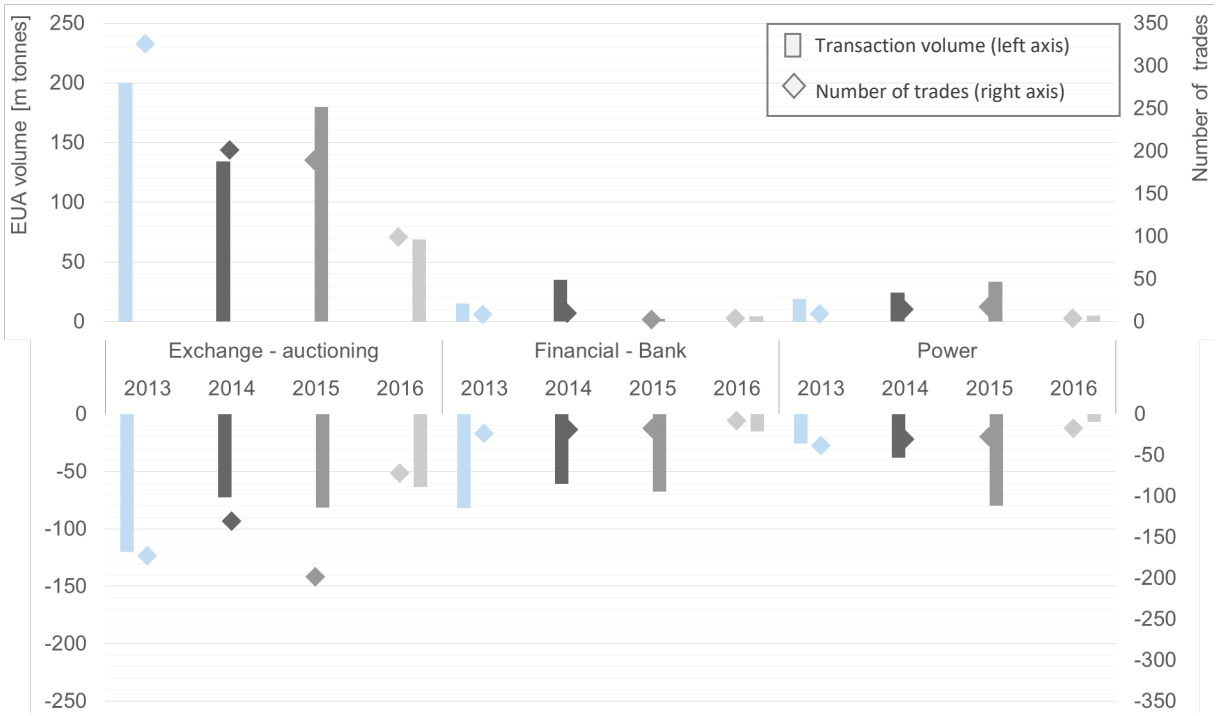


Source: ICIS based on EUTL data.

Detailed transaction flows from purchasing to receiving account, internal transactions and sales are illustrated in Figure 43. It is evident that only low volumes are transferred internally between Trading Accounts. In the case of a power supplier, higher amounts of internal transactions would be displayed. Market participants of the financial sector with no compliance obligation use their Trading or Person Holding Account for transactions. It is noteworthy to mention that Macquarie conducts nearly all transactions with third parties through their Trading Accounts

[46] This graph displays all Trading Accounts together and all Person Holding Accounts together as one bar.

Figure 44: Macquarie - Evolution of volume and number of transactions for most relevant partner sectors over time



Source: ICIS based on EUTL data.

Figure 44 provides an overview of the transaction volume and number of trades performed with the partners previously mentioned. The ratio of inflows to outflows stemming from an exchange with an EUA auction platform changes proportionally over the course of time. The largest trading volume took place in 2013. The backflows to EEX could be OTC cleared forward trades. The trades with banks and power utilities are negatively correlated to the interactions with EEX. The inflow from both sectors increases in 2014 whereas EUA's were acquired to a lesser extent on the EEX. A marginal increase in the number of interactions with the power sector is noticeable.

As shown in Figure 45 the main venue for procurement is the EEX. The cumulated net trading with this exchange increases over the years with hardly any outflows. This volume could potentially be auction volumes[47]. Inflows from the EEX take place regularly within six-month intervals:

- 2013: Jan – July
- 2014: Feb-Aug
- Nov 14- April 15
- Sept 15 – March 16

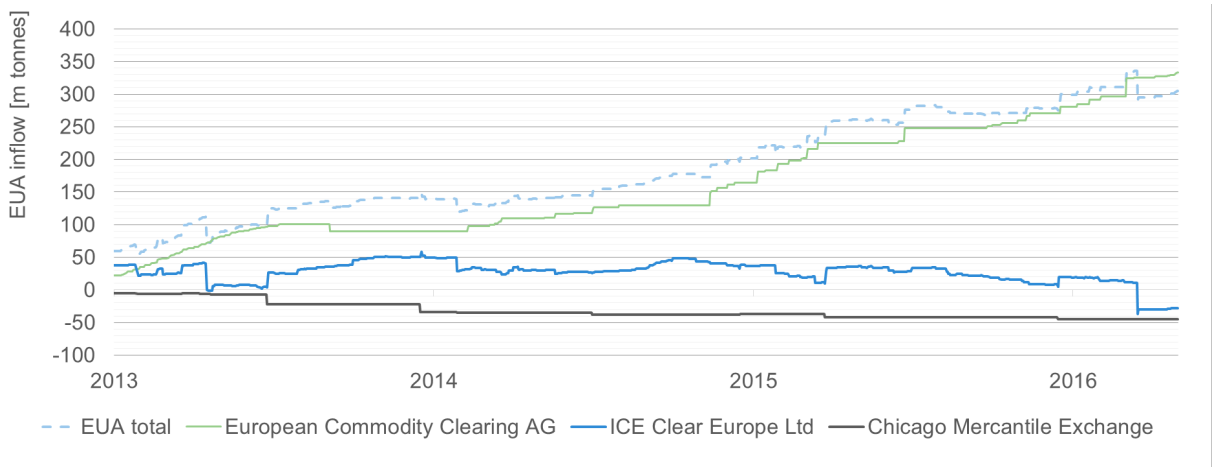
Macquarie is also active on the ICE. In contrast to the transactions with EEX these activities are regular net outflows that are netted towards the end of year in 2013 and 2014. As of 2015 net outflows with sporadic periods of inflow take place. One interpretation of the tendentially

[47] This assumption is based on the fact that they are regular inflows and not December or March deliveries. Macquarie is also quite active at the auctions.

mirrored curves could be that EEX auctioning volumes could potentially be rolled to ICE secondary market.

Outflows to the CME, a non-auctioning exchange, decrease over time. Settlement dates are June and December and could potentially indicate the use of future contracts.

Figure 45: Macquarie - Cumulated net trading per trading partner from exchanges



Source: ICIS based on EUTL data.

The annual traded volumes on exchanges of Macquarie are displayed in the table below.

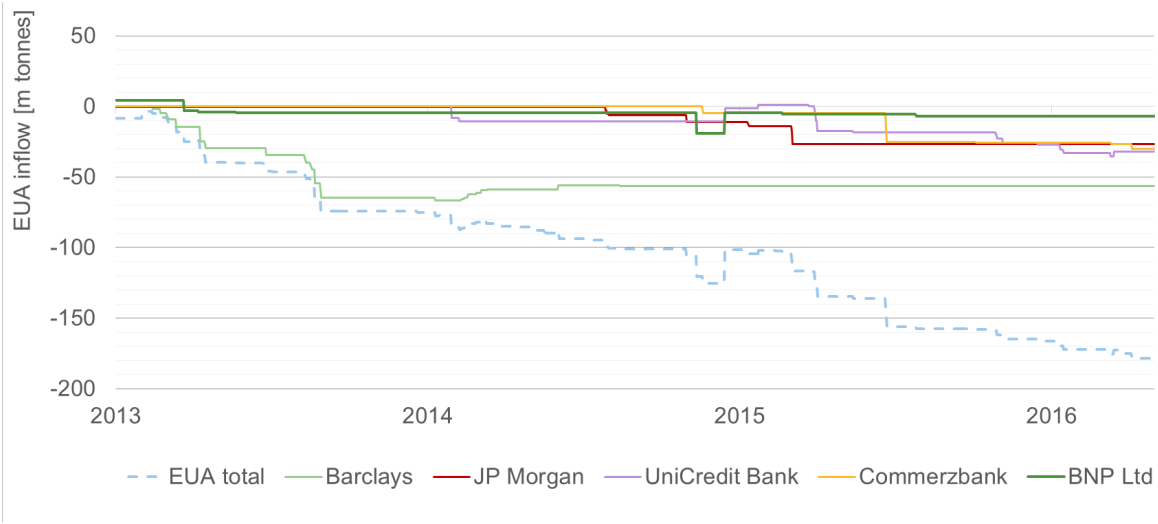
Table 15: Macquarie - Yearly in- and outflow of EUAs by exchange

[m tonnes]	EUA total - exchange	European Commodity Clearing AG	ICE Clear Europe Ltd	Chicago Mercantile Exchange
2013	79.8	68.0	11.8	-29.0
2014	61.5	73.9	-12.4	-3.0
2015	98.3	116.1	-17.8	-7.4
2016 Jan – Apr	5.4	52.6	-47.3	0.0
2013-15	239.6	257.9	-18.3	-39.4

Source: ICIS based on EUTL data.

The following two figures differentiate the cumulated net trading of Macquarie from its main trade partners of the financial (Figure 46) and power sector (Figure 47). Trading activities with these sectors were almost limited to sale transactions.

Figure 46: Macquarie - Cumulated net trading per main trading partner company of the financial bank sector



Source: ICIS based on EUTL data.

In 2013 Macquarie's main trading partner in the financial bank sector was Barclays with 65 m tonnes in sales. The largest outflow took place in April and August. Outflows to banks decreased considerably in 2014 and accounted for less than the previous year. The largest share went to JP Morgan and Citigroup. Despite observing a minor inflow for the same year, the overall interaction with Barclays stopped in 2014. At the end of 2014 netting with BNP took place. In 2015, the main trade partners changed again (now UniCredit Bank and Commerzbank), the net/total EUA outflow being comparable to that of 2013.

Overall, Macquarie changed trade partners frequently and tended to transfer considerable volumes to the financial bank sector. The annual trading volumes with partner of the financial bank sector of Macquarie are displayed in the table below.

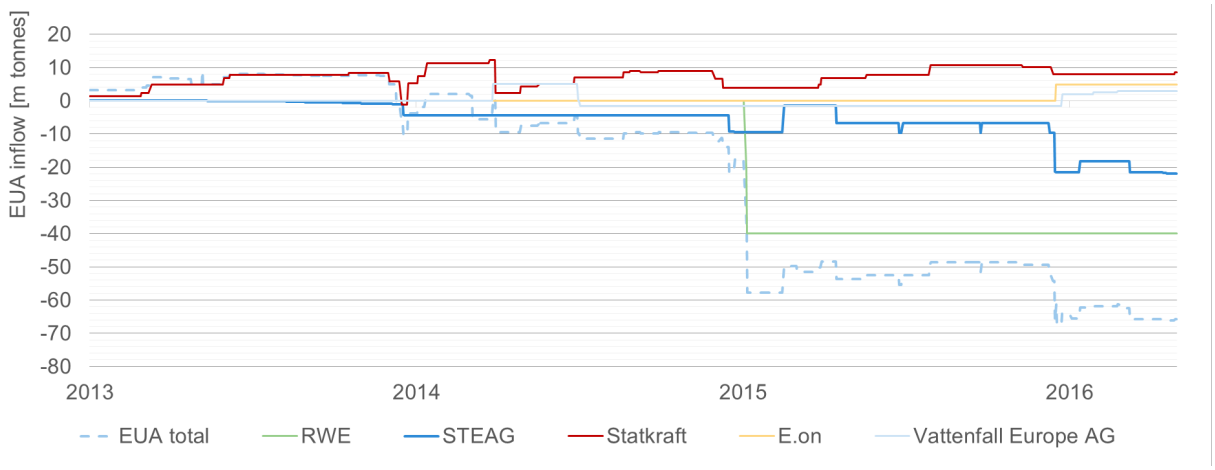
Table 16: Macquarie - Yearly in- and outflow of EUAs by company of the sector financial - bank

[m tonnes]	EUA total – financial bank	Barclays	UniCredit Bank	JP Morgan	Commerz bank	BNP Ltd	Citigroup	ABN AMRO Bank
2013	-67.1	-64.7	0.0	0.0	0.0	-8.5	7.5	-1.3
2014	-26.0	8.5	-1.4	-10.7	-5.0	0.0	-13.9	-3.5
2015	-65.0	0.0	-25.7	-15.9	-20.6	-2.6	-0.4	0.0
2016 Jan – Apr	-11.0	0.0	-5.0	0.0	-4.5	0.0	-1.5	0.0
2013-15	-158.1	-56.2	-27.1	-26.6	-25.6	-11.1	-6.8	-4.9

Source: ICIS based on EUTL data.

The power sector constitutes the second largest partner group with about 40 percent of the trading volumes of the financial sector (67.2 m tonnes compared to 158.1 m tonnes, see Table 16 and Table 17).

Figure 47: Macquarie - Cumulated net trading per main trading partner company of the power sector



Source: ICIS based on EUTL data.

During 2013 to 2015, a large outflow to the power sector can be noticed (7.1 to 46.2 m tonnes, see Table 17). The largest volume accounting for 40 m tonnes took place in January 2015 (to RWE). A continuous inflow proceeding from E.ON and Vattenfall can be observed for 2016.

Netting transactions[48] take place with some partners:

- Statkraft: inflow to Macquarie at beginning of year, partially outflow (netting) to Statkraft towards end of year
- STEAG: outflows that are netted within/after two months or some days (see figure above: little peaks in 2015)

Trading with the power sector is generally characterised by outflows to utilities. Particularly prominent is the large transaction volume to RWE. In some cases, the trading activities are more balanced which for example, is reflected by the netting transaction volumes with STEAG and Statkraft.

Table 17: Macquarie - Yearly in- and outflow of EUAs by company of the sector financial – bank

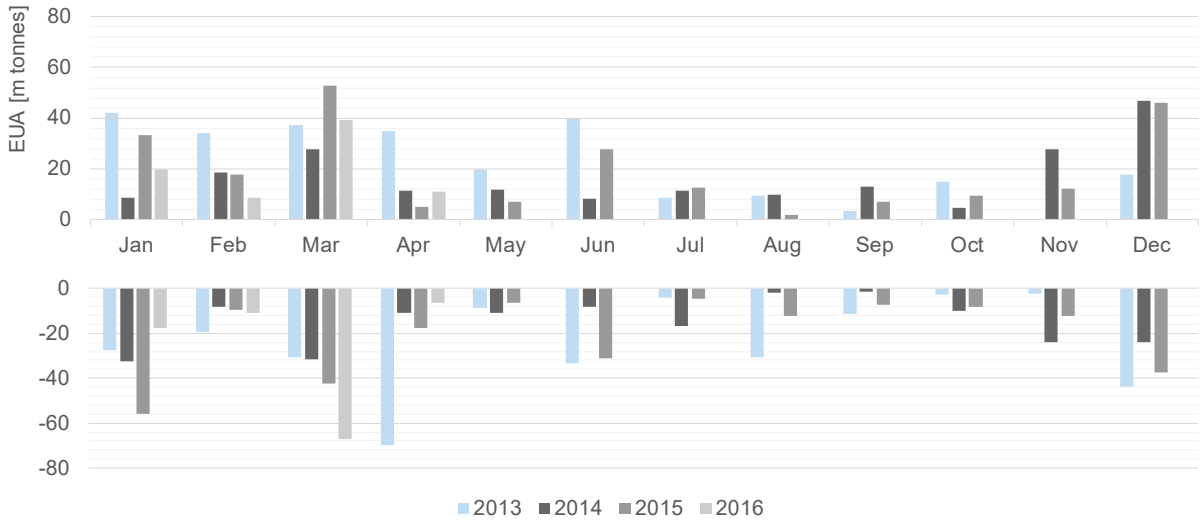
[m tonnes]	EUA total - power	RWE	STEAG	Eesti Energia	Statkraft	E.ON	Enel/ Endesa	Vitol	Vattenfall Europe AG
2013	-7.1	0.0	-4.4	-5.0	3.9	0.0	0.0	-1.9	0.0
2014	-13.8	0.0	-5.0	-2.0	-1.5	0.0	-2.7	0.0	-1.5
2015	-46.2	-40.0	-12.1	-5.8	4.3	4.9	0.0	-0.2	3.5
2016 Jan – Apr	-1.8	0.0	-0.4	0.0	0.5	0.0	0.0	0.0	1.0
2013-15	-67.2	-40.0	-21.5	-12.8	6.6	4.9	-2.7	-2.1	2.0

[48] Netting transaction: A certain amount of EUA are transferred to an account of a trading partner and at a later time the same amount is received back from the said trading partner or vice versa.

Source: ICIS based on EUTL data.

The seasonal distribution of trading volumes is displayed in Figure 48. Trading is evenly distributed with major concentrations in the first quarter of the years and particularly December.

Figure 48: Macquarie - Trade transactions per month



Source: ICIS based on EUTL data.

The transaction/trading behaviour of Macquarie can be summarised as follows:

- Net inflow from EEX and partly ICE
- These inflows are delivered mostly to banks and companies from the power sector
- The resulting physical position is around 50 m tonnes
- Potentially conducted transactions involve:
  - Carry trades with physical delivery: Buy (and get volumes directly transferred) from EEX, sell (and deliver) to banks/power companies
    - These trades could be partly exchange cleared (delivered to exchanges)
    - Or rolled into the secondary market (transactions with ICE)
  - Rolled (no physical delivery), e. g. sell Dec-15 futures that are backed-up by the physical position (holding), before expiry of the Dec-15 contract a Dec-15 future is bought and thus the position is cleared. A new position is opened by selling the same amount of Dec-16 futures which are again backed-up by the physical holding as no physical outflows took place. Overall, the Dec-15 short position is thus replaced by a Dec-16 short position without any physical EUA outflow but with price risk management. In the case prices increase between selling the Dec-15 contract and buying it back before expiry the EUAs physically held can cover at least some of the losses realized.

3.3.3.2 Cluster 2 - Intermediary carry trader

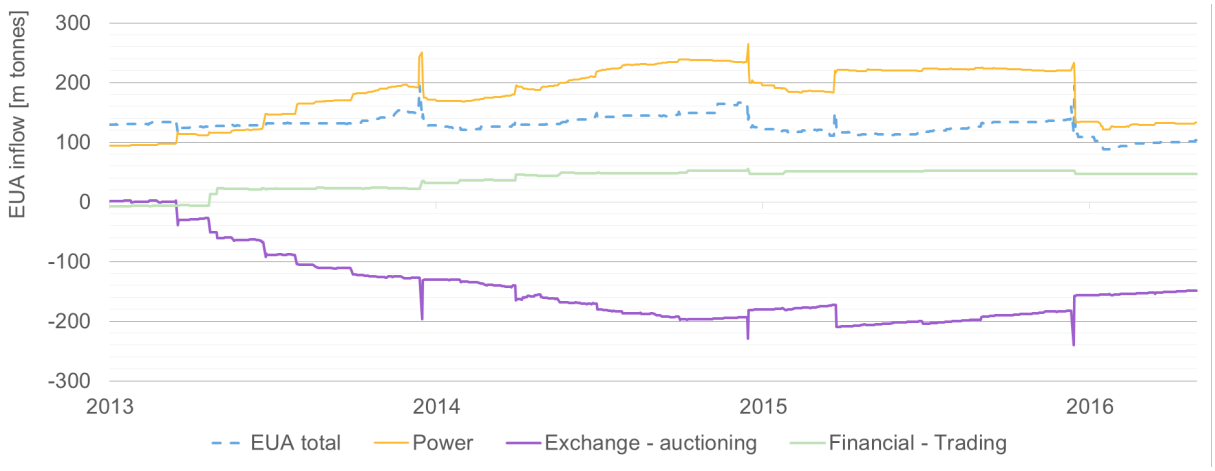
The second cluster identified in the financial sector is the "Intermediary Carry Trader". Companies within this cluster use intermediaries as means to access to the carbon market. Their trading strategy focuses on selling EUAs back-to-back. Two further subcategories were outlined within this cluster as described in the following sections.

Intermediary carry trader – with physical position spread over the year

Two financial entities could be identified as Intermediary carry traders with a comparatively high holding physical position: BNP and Commerzbank. Out of these two entities Commerzbank will be analysed in more detail after a short analysis of BNP.

Figure 49 illustrates the cumulated net trading of BNP (sector: financials bank) which accesses the market through the power sector and trades with several partners. Selling occurs primarily on the ICE exchange. Transactions are conducted throughout the entire year. Transaction peaks can be seen on December contracts in the graph below. The physical holding position of EUA ranges between 100 to 150 m tonnes and seems to be unusual high for a non-compliance market player. The carry trading activity can easily be identified by the perfect inverse relationship of the yellow and purple lines.

Figure 49: BNP - Cumulated net trading per trading partner sector

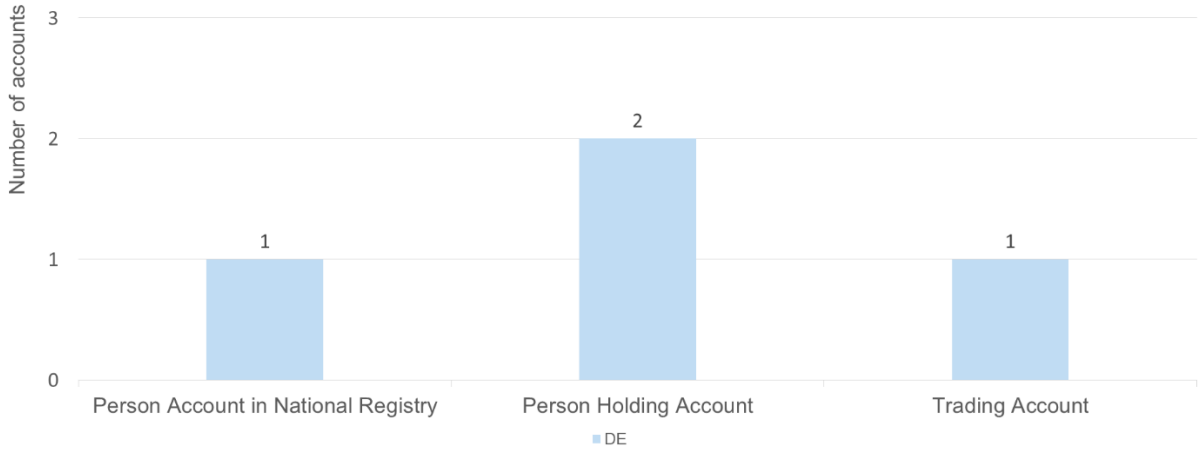


Source: ICIS based on EUTL data.

Detailed analysis of Commerzbank's transaction profile

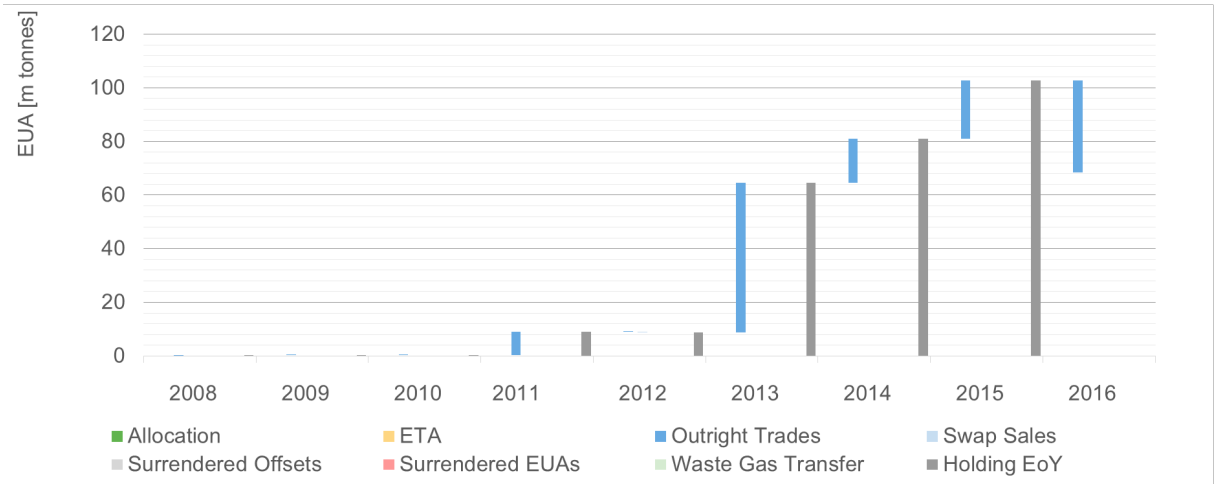
Commerzbank is a German Bank with headquarters in Frankfurt with its core business being in retail and commercial banking services. Since 2008, the bank shows little interaction in the carbon market as seen in Figure 51. Overall, four accounts (three Person Holding Accounts and one Trading Account) were mapped to Commerzbank that were active during the examination period 2013-2016. These accounts were all registered in Germany as shown in Figure 50.

Figure 50: Commerzbank - Number of accounts per account type and country of registration used since 2013



Source: ICIS based on EUTL data.

Figure 51: Commerzbank - Estimated physical company balance[49, 50]



Source: ICIS based on EUTL data.

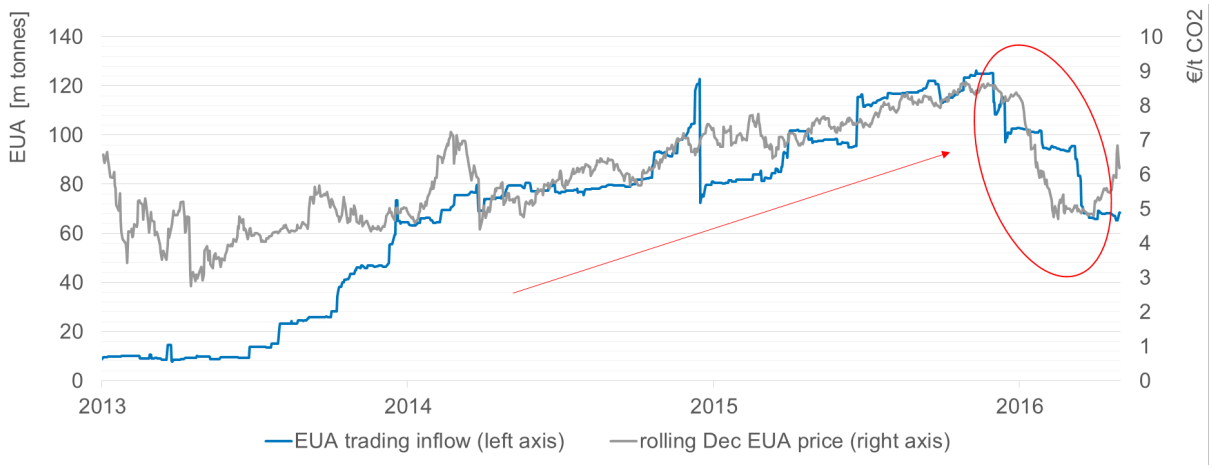
Figure 51 breaks down the bank's annual trading activities by type and the estimated company balance in the period from the year of market access to April 2016.

Commerzbank started participating in the carbon market in 2008 with relatively low physical positions (< 1 m tonne). Starting in 2011, it showed a higher level of activity and in 2013 an enormous increase of its physical position (+58 m tonnes). It grew by +37 m tonnes until 2015.

[49]The transaction activities shown and the holding end of year subsumes the transactions and holdings of all accounts assigned to Commerzbank in the ICIS EUTL. Therefore, the position shown is only an estimation based on all registered transaction in the EUTL.

[50] Swap sales: For each CER bought, we assume an EUA was swapped (provided the net EUA volume sold is higher than the net offset volume bought). This is represented by swap sales. The remaining EUAs sold are considered to be outright sales.

Figure 52: Commerzbank - Cumulated net EUA trading & EUA rolling Dec price



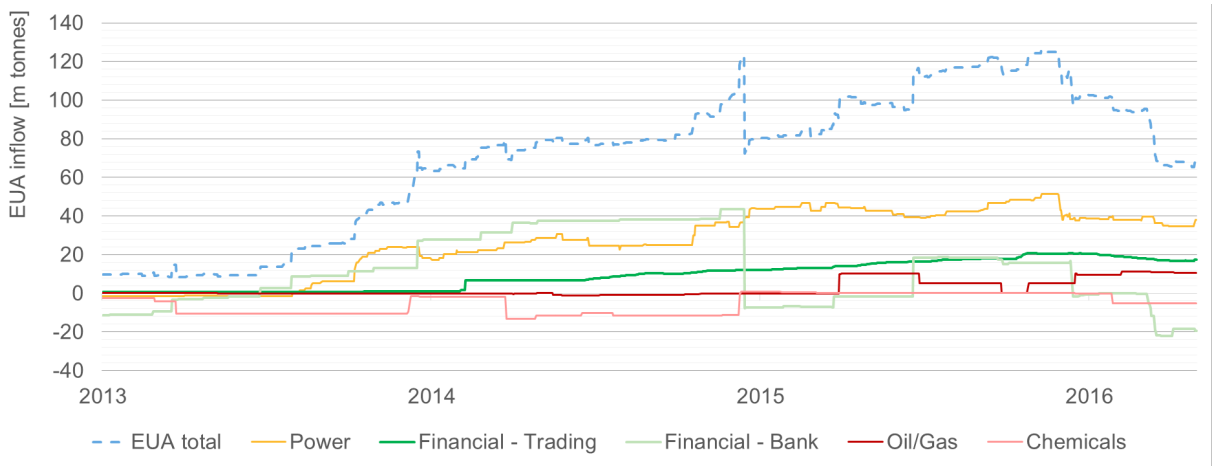
Source: ICIS based on ICE and EUTL data.

Figure 52 shows the cumulated net trading of Commerzbank with the development of the EUA price during the same time period. The overall high cumulated position of Commerzbank reaching up to 120 m tonnes is especially noteworthy. It is assumed that this volume was monetised (rolled into the forward market and not passively banked).

In the beginning to mid-2013, low cumulated net volumes (inflow) were observed that started taking off at the end of the year.

The correlation of price and volume from 2014 to 2016 magnifies over time, with price continuously ascending proportionally to the net inflow volumes. In December 2014, a high outflow volume can be seen which potentially is a Dec-2014 delivery.

Figure 53: Commerzbank - Cumulated net trading per trading partner sector



Source: ICIS based on EUTL data.

As seen in Figure 53, Commerzbank does not interact with exchange platforms. The inflow volume from the power sector averages 13 m tonnes from 2013 to 2015. Inflows stemming from banks account for 39m tonnes until the end of 2014 and witness a sharp decline with an outflow volume of 50 m tonnes in December 2014. Trading activity with the financial-trading sector averages +7 m tonnes between 2013 and 2015.

Trading activity with the chemical and oil/gas sector occurs gradually. Both inflows and outflows are netted swiftly through individual transactions ("steps") as seen in the oil/gas sector

(Shell) for 2015 or the chemical sector (BASF) for 2014. Given that these transactions originate from one trading partner, they might be an indication for repurchase agreements.

Table 18 gives a more detailed overview of Commerzbank's yearly trading activity by trading partner sector.

Table 18: Commerzbank - Yearly in- and outflow of EUAs by trading partner sector

[m tonnes]	EUA total	Power	Financial trading	Financial bank	Oil/Gas	Cement/ Lime	Other	Metals
2013	55.8	19.6	0.3	38.9	-0.4	0.2	-1.5	-2.1
2014	16.5	25.6	11.0	-35.1	0.1	7.8	-3.9	3.1
2015	21.7	-5.0	8.5	6.6	9.8	1.3	-0.3	2.5
2016 Jan – Apr	-34.3	-0.9	-3.0	-18.9	1.0	-0.5	-1.9	-1.3
2013-15	94.0	40.2	19.8	10.5	9.4	9.3	-5.7	3.5

Source: ICIS based on EUTL data.

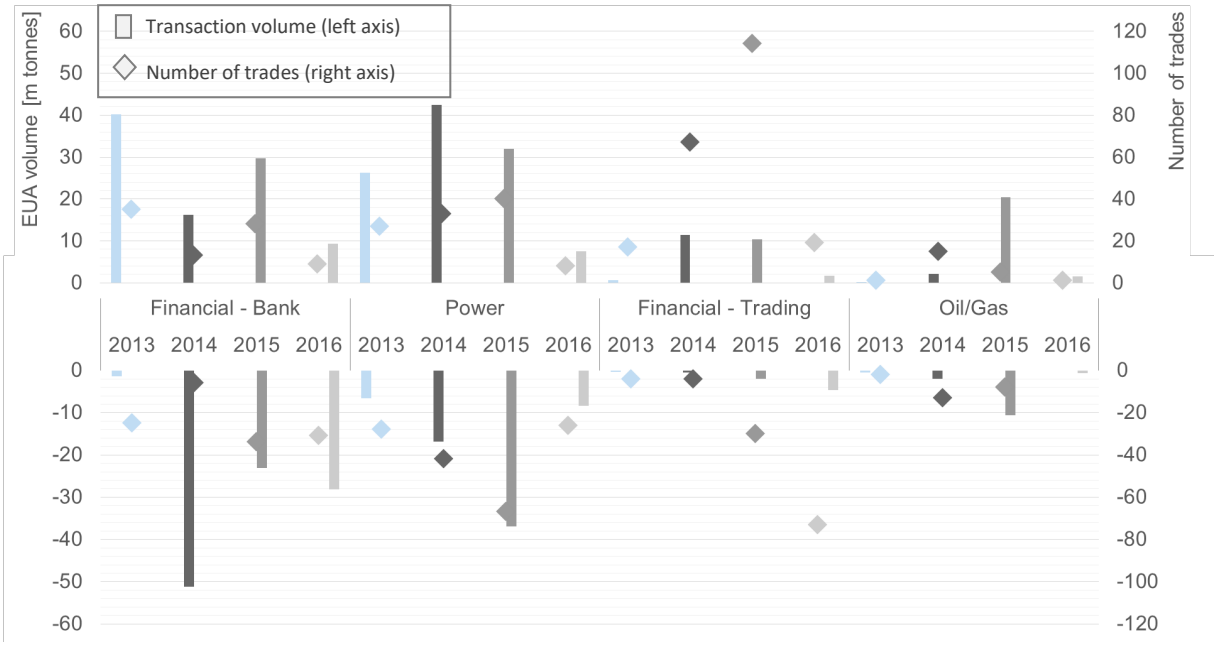
Figure 54: Commerzbank – Transaction flow by account type (inflow, internal transactions, and outflow[51]

Source: ICIS based on EUTL data.

As observed in Figure 54, Commerzbank shows no internal transactions. Furthermore, all transactions are conducted by their one Trading Account.

[51] This graph displays all Person Holding Accounts together as one bar. Commerzbank has only one Trading account

Figure 55: Commerzbank - Evolution of volume and number of transactions for most relevant partner sectors over time



Source: ICIS based on EUTL data.

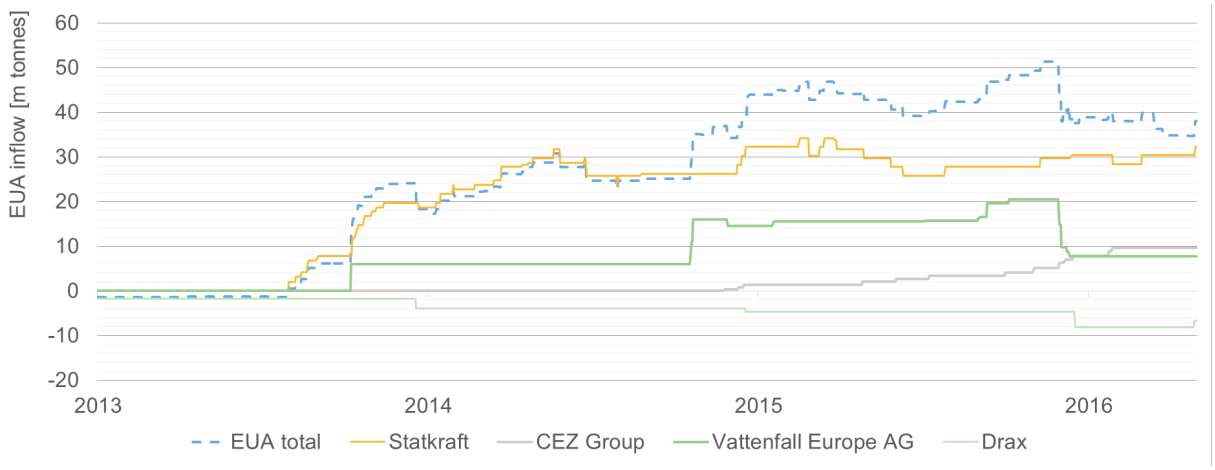
Figure 55 illustrates how the volume (left axis) and the number of transactions (right axis) with the financial-bank, power, financial-trading and oil/gas sector have changed over time. Inflows derived from other banks ascended to 1.2 m tonnes/transaction with inconsistent patterns. In 2013 the highest inflow volume (40 m tonnes) can be observed. The net outflow reached 8.5 m tonnes/transaction in 2014. 2014 is the only year where a net outflow to banks (excluding 2016 as this data includes only the time-period until April) can be observed.

Inflows stemming from the power sector increased from 2013 to 2014 and subsequently dropped in 2015. The total number of trades goes up from roughly 30 trades in 2013 to 40 trades in 2015. Outflows to the power sector increased (2013: ~8 m tonnes; 2015: ~35 m tonnes) and were accompanied by a general increase in the number of transactions.

Transaction volumes derived from the financial-trading sector show relative stable sales and purchase volumes while the number of trades went up. This means that the trading volume per transaction is decreasing which indicates a more sophisticated strategy of trading partners. It can be assumed that the (compliance) trading partners of Commerzbank buy EUAs on a more frequent basis with lower volumes.

Inflow volumes precedent from the oil and gas sector significantly increased in 2015.

Figure 56: Commerzbank - Cumulated net trading per trading partner in power sector



Source: ICIS based on EUTL data.

Figure 56 illustrates the net inflow proceeding from power companies. The main supplier over the time span of 2013 and 2014 was Statkraft, which delivered more than 30 m tonnes, most of them being continuous deliveries. This could potentially indicate engagement in carry trades activities by Statkraft. After mid-2014, annual transactions are netted by transfers back to the company. This could potentially point towards repurchasement agreements between Commerzbank and utilities like Statkraft and Vattenfall.

The primary net outflow to the power sector was channelled to Drax and reached up to 4 m tonnes. Trading activities with the CEZ Group started at the end of 2014. Since then a continuous net inflow can be seen.

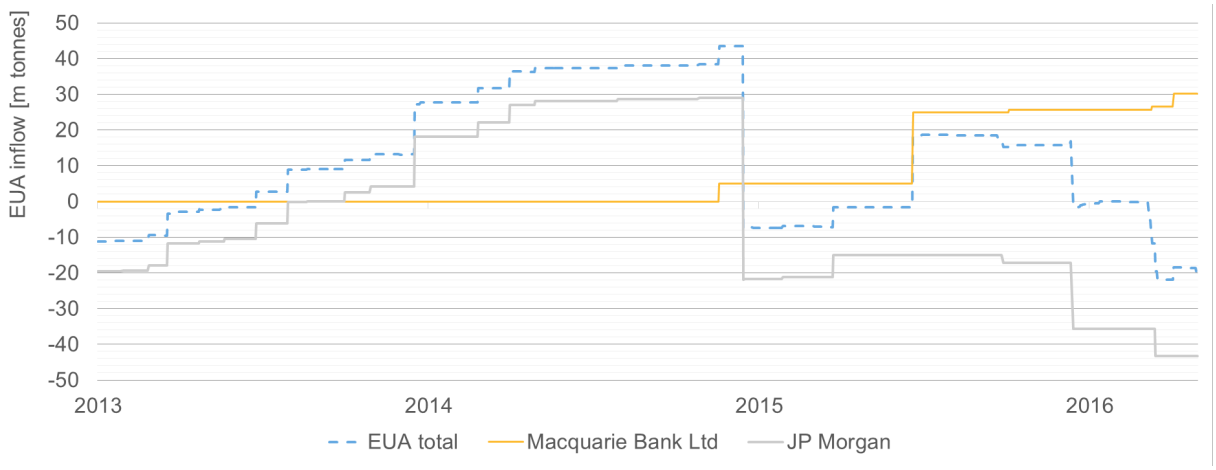
Table 19 provides a more detailed overview of the annual net trading volumes per partner of the power sector.

Table 19: Commerzbank - Yearly in- and outflow of EUAs by company of the power sector

[m tonnes]	EUA total - power	Statkraft	CEZ Group	Vattenfall Europe AG	EnBW	Drax	Enercity	EPH
2013	19.6	18.7	0.0	6.0	0.0	-2.3	-1.1	-0.1
2014	25.6	13.5	1.3	8.5	1.7	-0.8	-0.5	-0.2
2015	-5.0	-1.9	6.5	-6.8	3.8	-3.4	-0.6	-2.0
2016 Jan – Apr	-0.9	2.0	1.7	0.0	-0.5	1.4	0.0	0.0
2013-15	40.2	30.3	7.8	7.7	5.5	-6.4	-2.3	-2.2

Source: ICIS based on EUTL data.

Figure 57: Commerzbank - Cumulated net trading per trading partner in bank sector



Source: ICIS based on EUTL data.

Commerzbank's trading activity with the main trading partners of the financial-bank sector is illustrated in Figure 57. The main trading partner from the banking sector is JP Morgan which accounted for a cumulated net outflow of -20 m tonnes in the beginning of 2013. Net inflows thereafter increased considerably (about +50 m tonnes) until mid-2014 and reached +30 m tonnes. During mid 2014 up to the end of 2014 no net trading activity can be perceived.

In December 2014, an outflow transaction of about 50 m tonnes to JP Morgan can be seen in the graph. This potentially indicates December delivery contracts which are netting the position compared to the position obtained in 2013. At the same time JP Morgan delivers 90 m to ICE. JP Morgan netting position could be an indicator of a repurchase agreement between Commerzbank and JP Morgan. JP Morgan might have been lending volumes to Commerzbank which were delivered back as Dec forward. Furthermore, the question arises whether JP Morgan and Commerzbank act as trading or clearing partner. It is both possible that JP Morgan bought volumes from Commerzbank in order to deliver EUAs to their clients and that JP Morgan clears trades between Commerzbank and another player. More insights on this issue would allow for a better understanding of the role of banks in the EU ETS as a clearing authority.

At the end of 2014, irregular inflows from Macquarie can be observed. On 20 June 2015, 20 m tonnes were delivered and potentially indicate the settlement of a June contract. Outflows also occurred on an irregular basis to JP Morgan presumably with forward contracts.

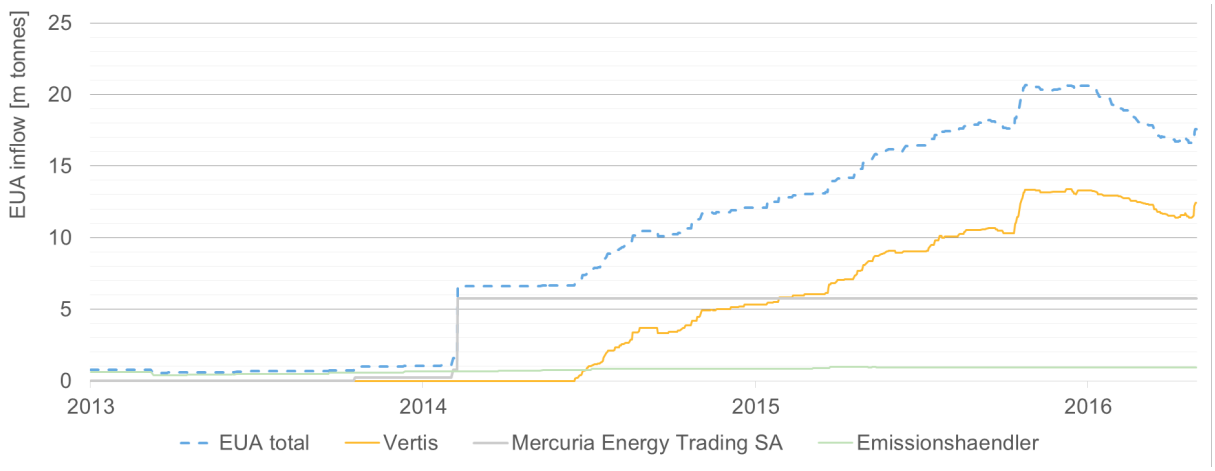
Table 20 provides an overview of the annual trading volumes between Commerzbank and the main trading partner of the financial-bank sector during the timeframe of the analysis.

Table 20: Commerzbank - Yearly in- and outflow of EUAs by company of the financial-bank sector

[m tonnes]	EUA total – financial bank	Macquarie Bank Ltd	JP Morgan	Bayerische Landesbank (BayernLB)	DnB ASA	UniCredit Bank	Banca Finnat	mBank S.A.
2013	38.9	0.0	37.8	0.0	0.1	0.0	0.0	0.0
2014	-35.1	5.0	-39.9	0.0	0.0	0.0	0.0	-0.1
2015	6.6	20.6	-14.0	0.0	0.0	0.0	0.7	-0.5
2016 Jan – Apr	-18.9	4.5	-7.8	-17.0	4.0	-2.5	0.7	-0.6
2013-15	10.5	25.6	-16.1	0.0	0.1	0.0	0.7	-0.6

Source: ICIS based on EUTL data.

Figure 58: Commerzbank - Cumulated net trading per trading partner in financial trade sector



Source: ICIS based on EUTL data.

Next the trading partner of the financial trading sector will be explored in more detail. A single inflow from Mercuria accounting for 6 m tonnes was transferred at the beginning of 2014, as seen in Figure 58. As of mid-2014, Commerzbank received a regular inflow from Vertis.

In the table below a more detailed list of the main trading partners of this sector and the annual trading volumes is provided.

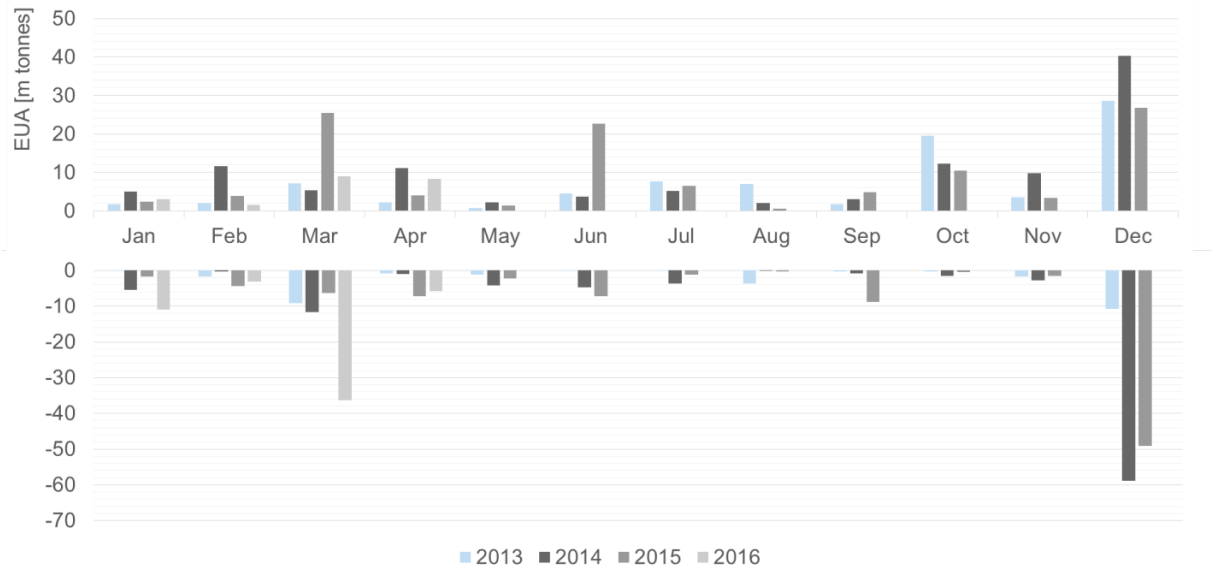
Table 21: Commerzbank - Yearly in- and outflow of EUAs by company of the financial-trade sector

[m tonnes]	EUA total – financial trade	Vertis	Mercuria Energy Trading SA	Amsterdam Capital Trading B.V.	AitherCO2	Emissions haendler	CF Partners	Belektron d.o.o.
2013	0.3	0.0	0.3	0.0	0.0	0.0	0.0	0.0
2014	11.0	5.3	5.5	0.0	0.0	0.2	0.0	0.0
2015	8.5	7.9	0.0	0.0	-0.2	0.1	0.3	0.3
2016 Jan – Apr	-3.0	-0.9	0.0	-1.9	-0.2	0.0	0.0	0.0
2013-15	19.8	13.3	5.8	0.0	-0.2	0.3	0.3	0.3

Source: ICIS based on EUTL data.

Over the respective time span, we observe an increased concentration of March and December deliveries for Commerzbank, as illustrated in Figure 59. Trading activities occur nonetheless on a monthly basis throughout the year.

Figure 59: Commerzbank - Trades in-/outflow per month



Source: ICIS based on EUTL data.

Commerzbank purchased 55 m tonnes in 2013 and reached a high physical position with 120 m tonnes in 2014 and again in 2015. The main trading partners comprise Statkraft, Vertis and JP Morgan.

Carry trades are assumed to be the primary transaction. Compared to Macquarie no carry trades with physical delivery were visible. Commerzbank is able to monetize its physical EUAs without selling /transferring it. Instead, it holds the physical EUA and makes profits on the selling of a corresponding future. For instance, the bank sells covered Dec-15 futures, before delivery buy Dec-15 future (clear position) and sells the same amount of Dec-16 futures. Thus, the bank

shows a similar behaviour to Macquarie but does not enter the market through exchange platforms but companies (in particular Statkraft).

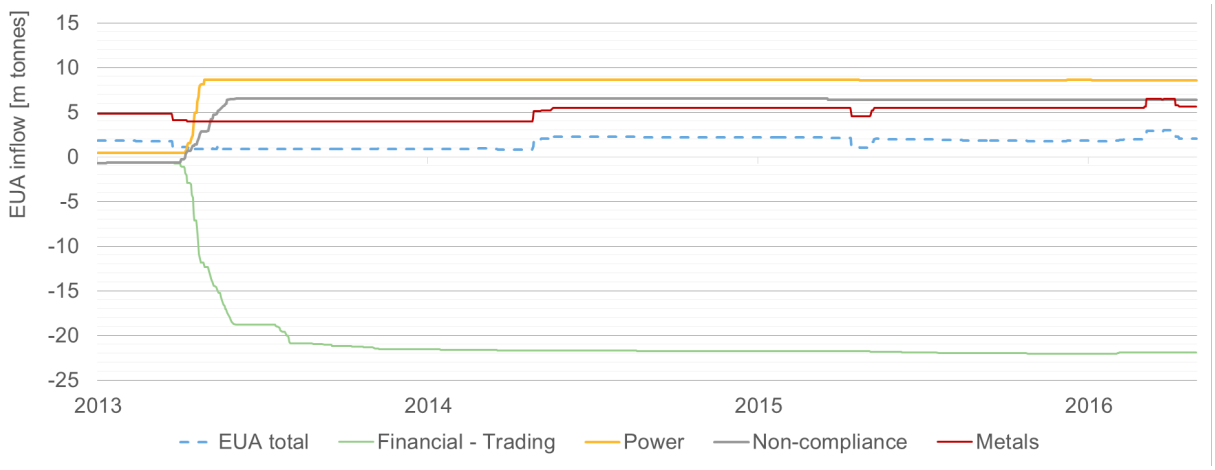
Intermediary carry trader – without physical position

Two companies fall under this category: Blackstone and Vertis. Both use intermediaries to access the market but do not hold large (physical) positions. Both companies refrain from trade on exchanges within the analysed timeframe.

Blackstone has been (barely) active since 2014 with minor interactions with the metal sector in 2015 and 2016, as shown in Figure 60. Inflows stem primarily from the power sector and non-compliance players unrelated to the financial sector. Outflows are channelled to the financial-trading sector. Blackstone's main trading partner from the financial-trading sector is the company YPOINT ITALIA SRL.

The dip in the cumulated net trading with the metal sector in mid-2015 and beginning of 2016 could indicate a repurchase agreement with this sector as the outflow and inflow volume seem to be of the same volume.

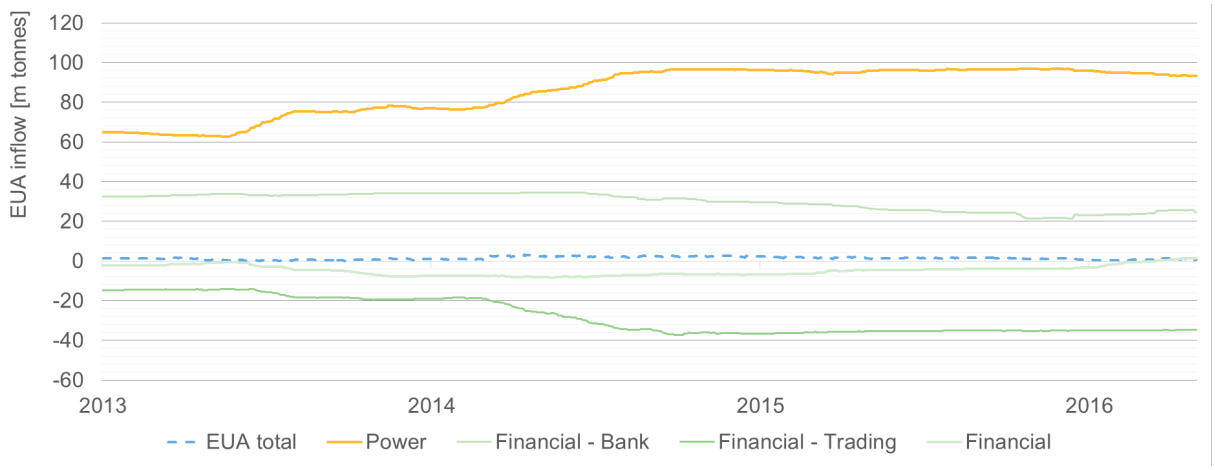
Figure 60: Blackstone - Cumulated net trading per trading partner sector



Source: ICIS based on EUTL data.

Vertis (sector: financial-trading) enters the market through the power sector as shown in Figure 61. Between mid-2013 to mid-2014 A2A groups is the main trading partner of the power sector with regular inflowing volumes. It mostly sells to players from the financial sector, both financial-bank and financial-trading. They have various trading partners and trade regularly throughout the year with minor peaks in March and April.

Figure 61: Vertis - Cumulated net trading per trading partner sector



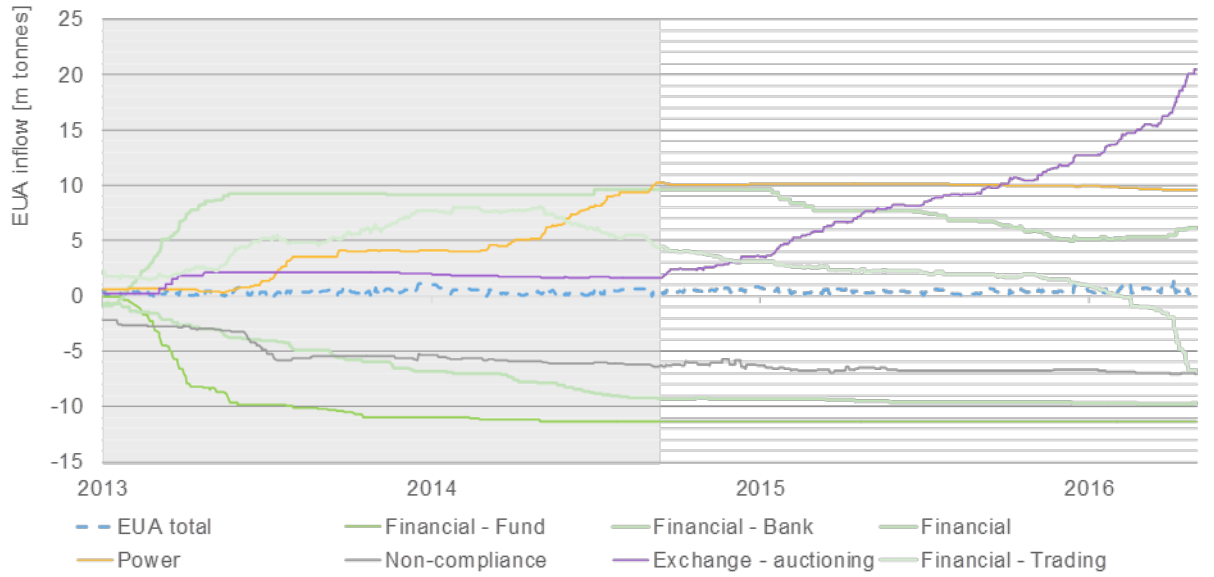
Source: ICIS based on EUTL data.

3.3.3.3 Cluster 3 – Evolutioneers

The next cluster "Evolutioneers" consists of one company only, Belektron. Belektron started trading in 2008 focussing on the carbon market.

With growing trade volume, Belektron switched its supply source from intermediaries to the exchange platform EEX towards the end of 2014 (where it later became official market maker), indicated by the change in slope of both curves as shown in Figure 62. This allows for lower prices when buying EUAs directly on the primary market for the purpose of reselling it and thus higher margin opportunities. During the first half, the inflow was derived from financial-banks, financial-trading and the power sector, whereas outflows went to financial-funds, and financial-other. Since the end of 2014, Belektron has been selling mainly to the financial-trading and the financial-bank sector. Transactions occur on a regular basis (monthly).

Figure 62: Belektron - Cumulated net trading per trading partner sector



Source: ICIS based on EUTL data.

3.4 Evaluation of the results for the power and financial sector - Trading behaviour of the market players

3.4.1 Comparison of trading behaviour within one sector

3.4.1.1 Power sector

Within the power sector, two main groups are to be considered, the typical utility hedger and carry trader which mainly serve as an intermediary for EUA delivery to the market.

In the group of hedgers, two main hedging strategies can be identified: The first is a continuous inflow/buying of EUAs over the year; the second entails future delivery contracts occurring in December or March. A continuous delivery, as seen e.g. for Dimosia, can be interpreted disadvantageous in terms of capital lockup. As derivatives are paid once they are delivered, the capital is bound even though the emissions are only needed physically in April for compliance. It is possible though that this factor can be deprioritized compared to a high security in physical holdings for players with a high market share in their region. Another possibility is the lack of experience or trust in the market. In contrast to that, the group of hedgers using liquid benchmark contracts (March and December) are located mainly in Western Europe and are partly in competition with each other (e.g. E.ON, Vattenfall and RWE). This more competitive environment can explain the more capital effective hedging with liquid futures or forwards. Additionally, some utilities execute Carry Trading for their clients and/or as proprietary trading. Utilities could use their knowledge in the market (also cross commodities) and try to gain additional income through speculation. These players add to the general liquidity of the market. Independent of the usage of continuous or futures/forward deliveries, these players mainly receive their hedge volumes from one firm's bank (cf. Table 22).

The group of carry trader (e.g. Statkraft) only has a low compliance obligation compared to the other utilities. Nevertheless, they were very active in the market, though rather for back-to-back trading for their clients than to fulfilling their own compliance obligation. This group seems to use its knowledge in the energy complex and their trusted relationships with clients to mainly act as an intermediary. Their behaviour is more similar to that of a financial than that of a utility company.

Table 22: Utilities and their main trading partner from the financial-bank sector

Utility	Associated bank with highest transaction volume
Dimosia	ABN AMRO
Enel/Endesa	Merrill Lynch, (BNP Outflow)
RWE	Deutsche Bank
Engie	Societe Generale
EDF	Societe Generale
E.ON	BNP
Vattenfall	Nordea

Source: ICIS based on EUTL data.

3.4.1.2 Financial sector

The financial sector focused on two main procurement sources for their volume inflow. That can be either exchanges or intermediaries (that again received their volumes from exchanges). The access to the market mainly used can change over the time as seen with Belektron.

Inflow and outflow volumes occur shortly after each other and therefore could indicate carry trades. Here, the inflow and outflow can be either continuously or take place at specific date of delivery. Especially Commerzbank, BNP and Macquarie (only in 2013) sum up high physical positions of up to 100 m tonnes.

In the group of carry traders with inflows from exchanges, the subgroup of Deutsche Bank and Societe Generale serve as a utility firm's bank (cf. Table 22) and acquire their volumes from an auctioning exchange mainly on December or March delivery which points towards the main usage of futures or forwards. These volumes are then transferred to the respective utility which was also their main client. The other subgroup (Macquarie, Mitsui Bussan, Mercuria) continuously physically acquires volumes from an exchange and transfers the volumes in a timely manner. These points towards the acquisition of EUAs in the primary market with prompt physical delivery and the transfer as a carry trade to their clients. In contrast to the first subgroup, their main clients are financial companies that are mostly not participating themselves in auctions. This indicates that this subgroup enables a market access and that in contrast to utilities, some financial companies appear to demand physical deliveries outside the ones from liquid benchmarks.

Within the second group of intermediary carry traders that acquire their volumes from exchanges from agents from the group mentioned above, another two subgroups could be distinguished: BNP and Commerzbank held a significant physical position of up to 100m tonnes while Blackstone and Vertis did not hold a higher physical position. The physical position can be used as securities for price risks of rolled carry trades. BNP and Commerzbank may have pursued more complex or riskier trading strategies, including less liquid futures/forwards, which may require physical risk management.

3.4.2 Comparison of trading patterns between financial and power sector

The financial sector obtains volumes through exchanges with EUA auction platform or intermediaries. The outflow channels for EUAs comprise mainly companies from two sectors (power and financial) and exchange platforms. It is important to note that some companies keep relatively high physical positions.

A basic distinction between financials and companies from the power sector is the obligation to comply with EUAs under the EU ETS. This implies that compliance obligated utilities have to hold a physical position. Financials with their negligible compliance obligations (if at all) can either back up derivatives with physical holding or other derivatives (e.g. options). Furthermore, companies from the power sector have to regularly participate in the market if they sell or produce fossil fuelled power generation. Financials can join and leave the market more flexibly according to indicators, such as liquidity, mid-term price trajectories and policy ambitions.

Inflows to the power sector are determined by different motivations for trading. EUA volumes designated for compliance ("power hedging") are acquired from specific firms' banks with continuous or March/December deliveries. If a utility also acts as an intermediary, delivering volumes to clients, these volumes are acquired from exchanges with EUA auction platform (EEX or ICE). Outflows related to trading activity are channelled towards both sectors, power and financial sector.

Given the market dynamics and the companies' strategies and backgrounds, power companies can provide services comparable with those of the financial sector (e. g. Statkraft). As consequence no uniform trade patterns can be deduced from the companies' sector. The presented data does however help to identify recurring patterns.

Several indicators can be used to potentially indicate how companies conduct physical trade, regardless of their sector.

Another indicator for trade patterns can be deduced by whether actors chose to enter the market through exchanges or intermediaries. In some cases, this also might be indicative of/reveal the main trade purpose. Activities are either driven by:

- Services for clients, targeting on revenues from the services (financial players and to a smaller degree some utilities),
- Revenues generated based on margins (financial players) or
- Compliance requirements and risk management/hedging (utilities).

Table 23: Comparison of trading patterns between financial and power sector

	Companies from the financial sector	Companies from the power sector
Source volume inflow	▶ An exchange with EUA auction platform ▶ Another company	▶ Compliance volume: bank with different delivery/maturity terms ▶ Intermediary volumes: auctioning exchange
Receivers of volume outflow	▶ Companies: Mainly power, financial ▶ Exchange	▶ Compliance (although this is not trading) ▶ Companies: Mainly power, financial

Source: ICIS based on EUTL data.

3.5 Restrictions of the transaction log analysis

As previously mentioned, the analysis is subject to constraints. The restrictions are split into technology-related and market-related limitations. The following tables give a rough overview of the restrictions. More details are described in Appendix C.

Table 24: Technology-related analysis restrictions

Assignment to companies and corporate groups
Errors in the manual assignment from account holder to company cannot be fully excluded, even though verification and validation steps are conducted.
Assignment to transaction types
When assigning transactions to ICIS transaction types, incorrect classifications might occur, even if they correspond to the logic of the respective transaction type.
Comparison EUTL Data (Compliance/Allocation)
There may be minor differences between the allocation and issuance in the installation database and those listed in the transaction log.
Distinction between primary and secondary market on the stock exchange
Inferences drawn from this analysis are restricted by the lack of transparency regarding the source of the allowances volume, as the outflows from the exchanges' secondary market and auctions (primary market) cannot be differentiated. This is due to the fact that both originate from the same clearing account of the stock exchange.

Table 25: Restrictions related to market conditions

Identification of forward and spot transactions / Discrepancy between date of purchase and physical transfer
The EUTL only covers the physical delivery of the various certificates (EUA, CER etc.), but no information on the trading date. An overall differentiation between spot and futures contracts based on transaction dates cannot be made for the aggregate market. As an approximation, processed transactions in March or December serve as indication for forward contracts.
Implication of hedging of power utilities
Hedging trades are not marked as those. Differentiating hedging from other strategies is often not possible, especially for large volumes of emission certificates.
Netting of trading volume
Particularly between large market players, it is the norm to settle a large number of trading transactions throughout the year with a specific settlement date. Thus, only the balance volume on this settlement date (netted transactions) being transferred from exchange to buying accounts and only the netted transaction volume will be mapped in the EUTL.
Trading through third party (e. g. broker/bank)
Financial players as well as large utilities may trade on behalf of compliance obligated market players. In this case, their individual trading behavior cannot be distinguished.
Company structure
Trading decision-making processes of large utilities are often diverse and complex. The traceability of trading patterns is largely determined by the transparency of physical transactions (internal and with third parties) that are provided by the EUTL.

4 Conclusion

The analysis carried out in this report shows that general trading patterns are deducible based on company size, compliance obligation and market experience. Both sectors analysed, power and financial, are highly interlinked and trade EUA. Furthermore, some players in both sectors apply typical trading behaviour patterns of the respective other sector. Utilities can act like financial players (e. g. Statkraft), while it was shown that also financial players hold physical positions like compliance operators (i. e. Commerzbank with high physical net position). Transactions in the carbon market often take place in a cascading way with more than just two counterparts involved. The results of the analysis show that many players use intermediaries to access the market. Furthermore, it highlights the importance and role of the financial sector, which enhances market efficiency through increased liquidity and maturation.

It was further visible that some companies have established “trusted trade relationships” with other market participants to cover their demand, reflecting the importance of quick transfers of units without jeopardizing market security.

Surprisingly, the results of this analysis do not indicate a direct correlation of physical trading behaviour with price developments or auctions. The inferences made relative to this are however bound to restrictions since no clear distinction of transactions from the exchanges between primary or secondary market and between spot or future contracts could be made.

The data provided by the EC in the EUTL provide deep and valuable insights, particularly into trading partners, volumes, and thus physical stocks. However, due to the physical nature of the transactions provided in the data, conclusions about the market and the derivatives used can only be evaluated by making assumptions, e.g. based on delivery time. This reduces the reliability of the derived conclusions. Additional data, e.g. on open interest and from ESMA (European Securities and Markets Authority), could provide further insights.

The huge amount of data in the EUTL makes grouping and clustering for a better overview a good way to interpret trends and patterns. However, a downside of grouping is that outliers and atypical findings can be overlooked. Nevertheless, this analysis could provide valuable insights into the different trading strategies of EU ETS market participants.

Comparison of the starting hypothesis and the results

In the energy sector, mainly large utilities were analysed within this study. Therefore, only the expected transaction profile of large utility companies is compared to the result (Table 26) as well as the financial sector (Table 27).

Table 26: Power sector: hypothesis and results

Hypothesis, main statements	Result
Focus on compliance obligation/hedging	This is mostly confirmed by the analysis. However, there seem to be two exceptions: Statkraft and CEZ. Compared to their trading volume, Statkraft has a considerable small amount of emissions. Therefore, carry trade is the focus of their trading strategy. The overall cumulated trading volume of CEZ was negative. This indicates that CEZ sold more certificates than it purchased. In addition, until the end of 2014 its free allocation surpassed its surrender obligations. Therefore, it seems the trading strategy focuses on carry trade.
Large utilities show carry trade behaviour. This could either indicate intermediary activities or speculative trading.	This turned out to be mostly true. As overall five out of the 10 utilities analysed seem to pursue carry trading activities - some exclusively and some additionally to their hedging strategy. A clear differentiation between intermediary or speculative trading cannot be made as it is not possible to derive this from transaction data only.
Centralised structure for trading activities → Interactions with third party through Trading Account → Involves several internal trades	This hypothesis was confirmed to be true. Trading interactions with third party were mainly or exclusively carried out via Trading Account in all the analysed cases (companies). All companies with a hedging strategy show a relative high amount of internal transaction volumes from Trading to Operator Holding Account.
We expect to see transaction peaks at the delivery dates of future contracts like December and March since mainly future contracts are used for hedging purposes	This turned out to be mostly true. Almost all companies show trading volume peaks in December and/or March including the carry traders CEZ and Statkraft. Of the two hedgers with regular transactions, the hypothesis turns out to be true for, Dimosia, but not for PGE, where no peaks at fixed dates could be detected.

Source: FutureCamp.

Table 27: Financial sector: hypothesis and the results

Hypothesis main statements	Result
Focus on trading on behalf of their clients and act as intermediaries → Are expected to have steady in- and outflow of transactions and no large holding positions of EUAs	This hypothesis is true for most financial players. There were, however, t exceptions: Commerzbank, Macquarie and BNP, which held relatively high EUA positions.
Financial institutions often purchase EUAs via auctions	This could neither be confirmed nor rejected. Five financial institutions mainly purchased EUAs through exchanges with an auctioning platform, whereas four used intermediary traders. One company changed its main access during the study period from intermediary to exchange.
Transactions with other players in the EU ETS like utilities are expected to account for the majority of their transactions	This statement is not necessarily true. Despite being one of the main trading partner sectors, not many financial institutions mainly sell to players from the power sector (exception: Societe Generale and Deutsche Bank). A high number of financial institutions sell high volumes to other financial players or on an exchange (e. g. BNP).
Financial institutions have bilateral repurchase agreements with industry clients	This was not often observed in the study but Commerzbank, for example, seemed to have repurchase agreements with sector Chemicals (BASF) and Oil/Gas (Shell)
Speculative trading is less likely to be seen because of low prices in market (indicator: relatively large holding position)	This hypothesis is assumed to be true in the period observed. Only Commerzbank and BNP were holding relatively high EUA positions. This is assumed to be monetised volumes (rolled into the forward market and not passively banked).

Source: FutureCamp.

5 Outlook and further analysis options

As the EUTL transaction data is only published with a delay of three years, the trading patterns analysed do not show the latest state of the market. A follow-up study would allow for updated insights into the trading patterns and would also show if or how trading patterns change over the years.

Due to the analysis restrictions and in order to get a closer insight into the trading patterns, expert interviews could be a helpful tool to verify and validate the results found in this report. Obviously, restrictions apply regarding the level of detail that interview partners can report on.

Further analyses to find out about the importance of auctioning for different sectors could be conducted using target surveys of companies. These targeted surveys should also be used to find out more precisely which products (spot and/or forward contracts) are used.

The overall analysis used in this study could also be expanded to other emission-intensive sectors such as steel, cement/lime, metals, and oil/gas industries.

In terms of their trading strategies the majority of industrial players have been mainly passive until 2017. In 2017, the EU Commission has announced the reform of the EU ETS. Shortly afterwards, a sharp increase of the EUA price could be seen on the market, from below 5 Euro/t in June 2017 to above 26 Euro/t in September 2018 (EUA Dec-20). Analysts have linked these two points directly to each other. It can be hypothesised that a big part of this price increase is assigned to speculative buying from financial (or large energy) players, may it be short, middle, or long term. But another conclusion can be considered as obvious as well. Due to rising prices and decreasing free allocation, EUA trading became increasingly more important for industrial EU ETS companies. This hypothesis can be supported by the observation of FutureCamp and ICIS, with more industrial players ordering trading reports and workshops in order to be prepared for the rising prices and more sophisticated trading strategies also with regard to the fourth EU ETS trading period from 2021 to 2030.

A follow-up study could give an insight into the effects of this reform on the behaviour of all sectors (financial, industrial, and power). The hypothesis that the increasing prices will lead to a change in the trading behaviour of industrial players as well as an outlook on the trading behaviour of all sectors in the fourth trading period could thereby be examined in a follow-up study.

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A Appendix: Database EUTL

The data provided by the EC[52] can be divided into annual surrender, allocation data (Installation Database, EUTL) and transactions between accounts (transaction log, TL) (see Figure 65).

The EUTL contains information about the National Allocation Tables for installations and aircraft operators, which determines the annual allocations within the respective EU ETS country. The compliance obligation is presented in another database and is classified into country, installation and year level. The *Installation Information* table furthermore includes data of the installations (name, address, contact person).

Each transaction is assigned an explicit combination of a country short code and an integer number (*Transaction ID*). Transactions are moreover classified into their type, their status, the date and time of the transaction, the number and type of units transferred and information about the transferring and acquiring account.

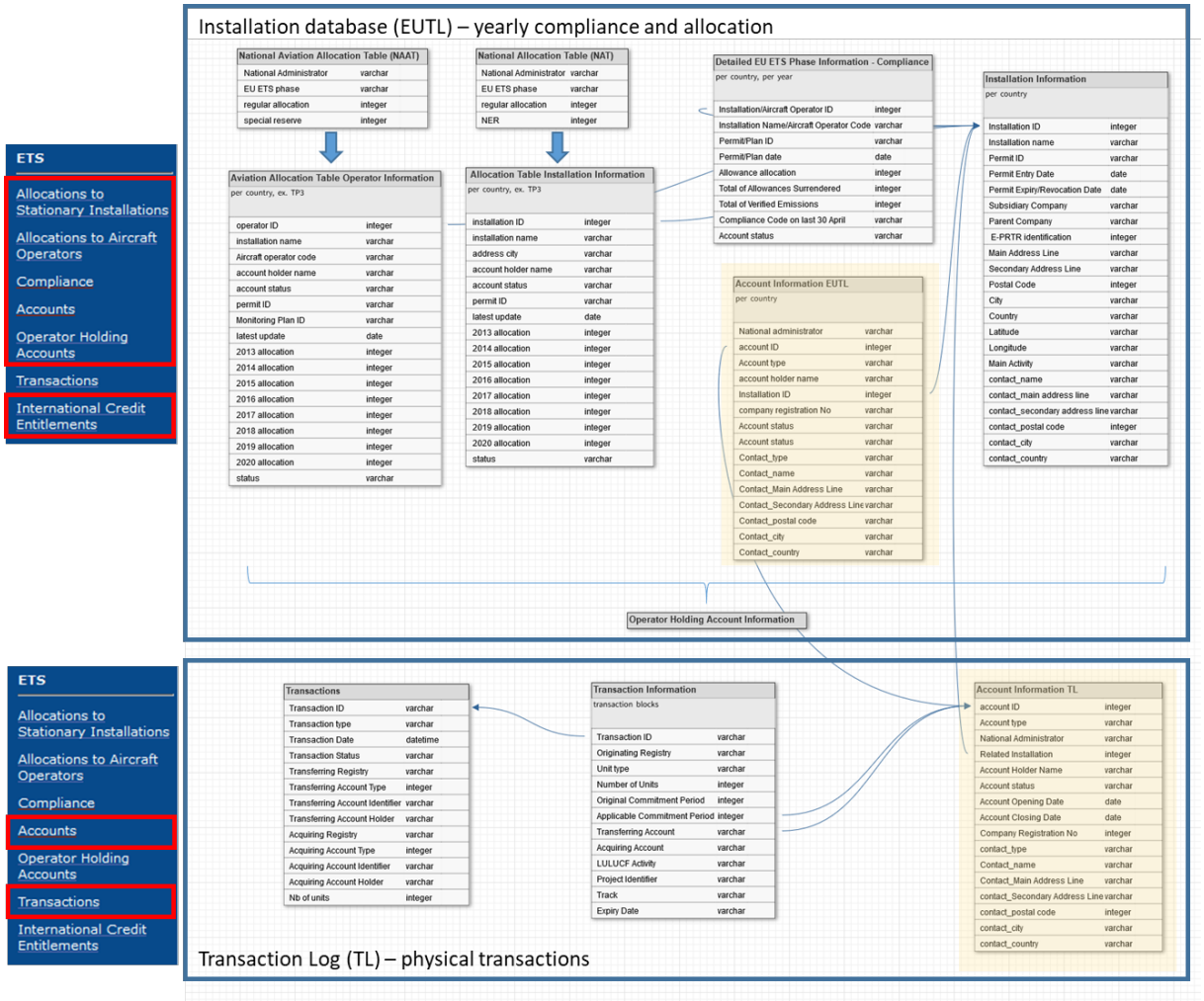
The transaction information includes the *Transferring* and Acquiring *Account*. Each account is i. a. determined by its registry (country names or EC), the *Account Type* and an *Account Identifier*. The *Account Identifier* is not an explicit ID, but generally consists of the associated account's company name and is often similar to the *Account Holder*. It can be chosen by the account holder.

The section *Details* allows the interface user to switch from the *Transaction Table* to the *Transaction Information Table*. A transaction can consist of different blocks with different certificate types (*Unit Type*). This information is bundled in the *Transaction Information Table*. Similarly, data on the accounts and the number of units transferred is provided together with information on the *Original Commitment Period*, the *Applicable Commitment Period, LULUCF Activity, Project Identifier, Track* and *Expiry Date* of the units (where applicable for the respecting *Unit Type*).

Further information on the Account are the *Account Type, National Administrator, Related Installation / Aircraft Operator ID, Account Holder Name, Account Status, Account Opening Date, Account Closing Date* and contact details. The *Related Installation / Aircraft Operator ID* is linked to the Installation Database if the account manages the position of an EU ETS installation.

[52] Source: EUTL (2019)

Figure 63: Database scheme made available by EC for EU ETS



Source: ICIS based on EC data.

B Appendix: Classification of transaction types

For the analysis of trading activities in general, the following types of transaction are classified as relevant and are stored as *TSTransactionType* within the ICIS database for the EUTL.

Table 28: Transaction types, definition within TL ICIS and involved trading partners types

Transaction typ	t	t+a	Definition
Allocation	ETA — Company		Transactions with Transaction Types 10-53, 10-35, 10-36, which are transferred from an account of the Emission Trading Authority [ETA] (Transferring Company) to a non-ETA account
Surrender	Company — ETA		Transactions of transaction types 10-2 and 3-2, which are transferred from a non-ETA account to an account of the Emission Trading Authority (Acquiring Company) (Reversal of Surrenders not included)
ETA	ETA — ETA		Other Emission Trading Authority transactions: all other transactions in which an ETA participates, that are not allocation or surrender transaction types
Internal	Company A — Company A		Transactions where the sender and recipient company are the same but not ETA
Waste gas	Metals company — Power company	Metals company — Power company	Regular EUA transactions over a period of three years or more by companies in the metal sector with installations producing cogeneration gases and non-metals companies
Trade	Company A — Company B		Transactions in which EUAs or Offsets are transferred to another company with no other related transaction
Swap	Company A — EUA — Company B	Company A — CER — Company B	Transactions in which EUAs are transferred to another company and returned with the same amount of offsets at a later date
Carry Trade	Company A — EUA — Company B	Company B — EUA — Company A	Transactions in which EUAs or Offsets are transferred to another company and returned with the same amount of the same unit type

Source: ICIS.

C Appendix: Details on the restrictions of the transaction log analysis

C.1.1 Technology-related analysis restrictions

As previously mentioned, the analysis is subject to constraints.

Assignment to companies and corporate groups

The manual assignment of account holders is significantly error-prone. Due to the extensive data provided by the EUTL and the complex ownership structures, an accurate allocation and mapping of corporate structures is highly complex and sometimes impossible in the face of scarce information.

Assignment to transaction types

A second process constraint is the assignment of transactions in relation to their transaction types according ICIS TL, especially for waste gas, carry trades and swap transactions (see Appendix 2). For example, an EUA transaction might not represent the complete trade, but be part of a carry trade or an EUA-CER swap trade.

Comparison EUTL data

This comprises discrepancies between compliance or allocation data stemming from the installation database (EUTL) and the TL.

C.1.2 Analysis possibilities to deduce trading patterns to physical transactions from primary market

Since its establishment, the carbon market has considerably gained in liquidity as emission allowances can be traded on numerous exchanges. The ICE (Intercontinental Exchange) in London and the EEX (European Energy Exchange) in Leipzig, are the two biggest exchanges that serve as auction trading venues for carbon allowances.

Within this paper the analysis possibilities to deduce auction buying from physical transactions were assessed. In the registry/EUTL accounts are assigned to the specific exchange. However, a differentiation on account level between the primary market (auction) and secondary market (spot and future) is not possible since delivery is conducted via the same clearing account of the platform.

The analysis shows the complexity in matching physical transactions from exchanges with EUA auction platform to transactions originating either from primary or secondary markets (see Appendix 3). Subsequent days after auctions that take place, transactions would have to be examined manually. Given that auctions mostly take place on a daily basis, this would be very time-consuming. Inferences drawn from this analysis are restricted by the lack of transparency regarding the source of the allowances volume, as the outflows from the exchanges' secondary market and auctions (primary market) cannot be differentiated. This is due to the fact that both originate from the same clearing account of the stock exchange. The costs arising from such analysis would significantly outweigh the potential value generated. Therefore, the distinction between primary and secondary market is not further explored in this paper.

Analysis - matching physical transactions from auctioning exchanges to transactions originating from the primary or secondary market

Auctions take place on the spot market of the ICE and EEX, the physical transactions take place a few working days after the actual auctioning date.

To analyse this, the following auction sample dates (see Table 29) have been selected to compare the auction volume with the outflow (transaction) volume after one or two days after the auction date (physical delivery dates).

Table 29: Reviewed auction dates and volumes

Auction date	Exchange	Auction volume
14 July 2014, Monday	**EEX**	**1,873,000**
16 July 2014, Wednesday	**ICE**	**2,515,000**

Source: ICIS based on ICE and EEX data.

In the following tables the auction volumes of 14 July 2014 are compared to the sum of the outflowing transactions from the EEX account.

Table 30: Physical transactions on 14 July 2014

Transferring account	Acquiring company	Net Volume [EUA]	Auction volume on 14 July 2014 on EEX
EEX	Shell	600,000	
EEX	Statkraft	300,000	
EEX	Mitsui Bussan Commodities Ltd.	125,000	
EEX	EDF	100,000	
EEX	MorganStanley	91,000	
EEX	Gunvor Group	75,000	
Sum		**1,291,000**	**1,873,000**

Source: ICIS based on ICE and EEX data.

Table 31: Physical transactions on 15 July 2014

Transferring account	Acquiring company	Net volume [EUA]	Auction volume on 14 July 2014 on EEX
Five Rings Capital LLC	EEX	1,000	
EEX	Statkraft	300,000	
EEX	Citigroup	250,000	
EEX	Shell	250,000	
EEX	Mitsui Bussan Commodities Ltd.	125,000	
EEX	EDF	100,000	
EEX	Gunvor Group	50,000	
Sum from EEX		**1,075,000**	**1,873,000**

Source: ICIS based on ICE and EEX data.

Table 32: Physical transactions on 16 July 2014

Transferring account	Acquiring company	Net volume [EUA]	Auction volume on 14 July 2014 on EEX
EEX	Shell	500,000	
EEX	Citigroup	400,000	
EEX	Mitsui Bussan Commodities Ltd.	125,000	
Sum		**1,025,000**	**1,873,000**

Source: ICIS based on ICE and EEX data.

Table 33: Physical transactions on 17 July 2014

Transferring account	Acquiring company	Net volume [EUA]	Auction volume on 14 July 2014 / 15 July 2014 on EEX
Factor CO2 Integral Trading Services S.A	EEX	40,000	
EEX	Enel	1,947,000	
EEX	Axpo Group	1,400,000	
EEX	Statkraft	500,000	
EEX	Citigroup	250,000	
EEX	Shell	250,000	
EEX	Mitsui Bussan Commodities Ltd.	150,000	
EEX	Gunvor Group	11,000	
Sum		**4,508,000**	**1,873,000**

Source: ICIS based on ICE and EEX data.

When comparing the sum of the outflowing transactions on the auction day on the EEX on 14 July 2014 and its subsequent two days the volumes don't match. Each day shows transaction volumes lower than the auction volume. On 15 July 2014, we observe an inflow to the account of the EEX which shows that the EEX account includes the secondary market. (Inflows to the exchange accounts are not included in the sum).

Another auction analysed was carried out by the ICE on 16 July 2014. The following tables contrast the sum of transferring transaction from the ICE account and the auction volume.

Table 34: Physical transactions on 16 July 2014

Transferring account	Acquiring account	Net volume [EUA]	Auction volume on 16 July 2014 on ICE
BNP Ltd	ICE Clear Europe Ltd	341,000	
Deutsche Bank	ICE Clear Europe Ltd	72,000	
JEFFERIES BACHE Ltd	ICE Clear Europe Ltd	8,000	
Nordea	ICE Clear Europe Ltd	4,000	
ICE Clear Europe Ltd	Societe Generale	255,000	
ICE Clear Europe Ltd	ABN AMRO Bank	100,000	
ICE Clear Europe Ltd	Macquarie Bank Ltd	70,000	
Sum from ICE		**425,000**	**2,515,000**

Source: ICIS based on ICE and EEX data.

Table 35: Physical transactions on 17 July 2014

Transferring account	Acquiring account	Net volume [EUA]	Auction volume on 16 July 2014 on ICE
BNP Ltd	ICE Clear Europe Ltd	189,000	
Deutsche Bank	ICE Clear Europe Ltd	117,000	
ICE Clear Europe Ltd	Societe Generale	153,000	
ICE Clear Europe Ltd	ABN AMRO Bank	120,000	
ICE Clear Europe Ltd	Macquarie Bank Ltd	26,000	
ICE Clear Europe Ltd	Royal Bank of Canada	7,000	
Sum from ICE		**306,000**	**2,515,000**

Source: ICIS based on ICE and EEX data.

Table 36: Physical transactions on 18 July 2014

Transferring account	Acquiring account	Net volume [EUA]	Auction volume on 16 July 2014 on ICE
JEFFERIES BACHE Ltd	ICE Clear Europe Ltd	2,000	
ICE Clear Europe Ltd	Shell	812,000	
ICE Clear Europe Ltd	Citigroup	500,000	
ICE Clear Europe Ltd	Societe Generale	495,000	
ICE Clear Europe Ltd	Deutsche Bank	228,000	
ICE Clear Europe Ltd	Macquarie Bank Ltd	217,000	
ICE Clear Europe Ltd	BNP Ltd	175,000	
ICE Clear Europe Ltd	ABN AMRO Bank	85,000	
ICE Clear Europe Ltd	Nordea	5,000	
Sum from ICE		**2,517,000**	**2,515,000**

Source: ICIS based on ICE and EEX data.

The comparison of the auction volume of the ICE on 16 July 2014 and the outflowing transactions from the ICE account on the auction day and the subsequent days do not match. On 18 July 2014, the transferring volume from the ICE account is about 2,000 EUA higher than the auction volume. No similar outflow volume could be determined as a trade from the secondary market. On 19 and 20 July 2014, no physical transactions on the ICE account took place.

C.1.3 Identification of forward and spot transactions

The data obtained by the EUTL only reflects the physical transactions of emission allowances. Trade dates are unavailable and thus exacerbate the ambiguity of the relationship between purchase dates and physical transfers of EUA.

For spot trades, purchase dates are closely related to physical delivery dates. Physical settlement occurs within five days after the trading agreement. Common future delivery contracts take place in March and December. Forwards however can technically be transferred at any date given the numerous (and flexible) delivery dates. These arise from the trading agreement between both parties.

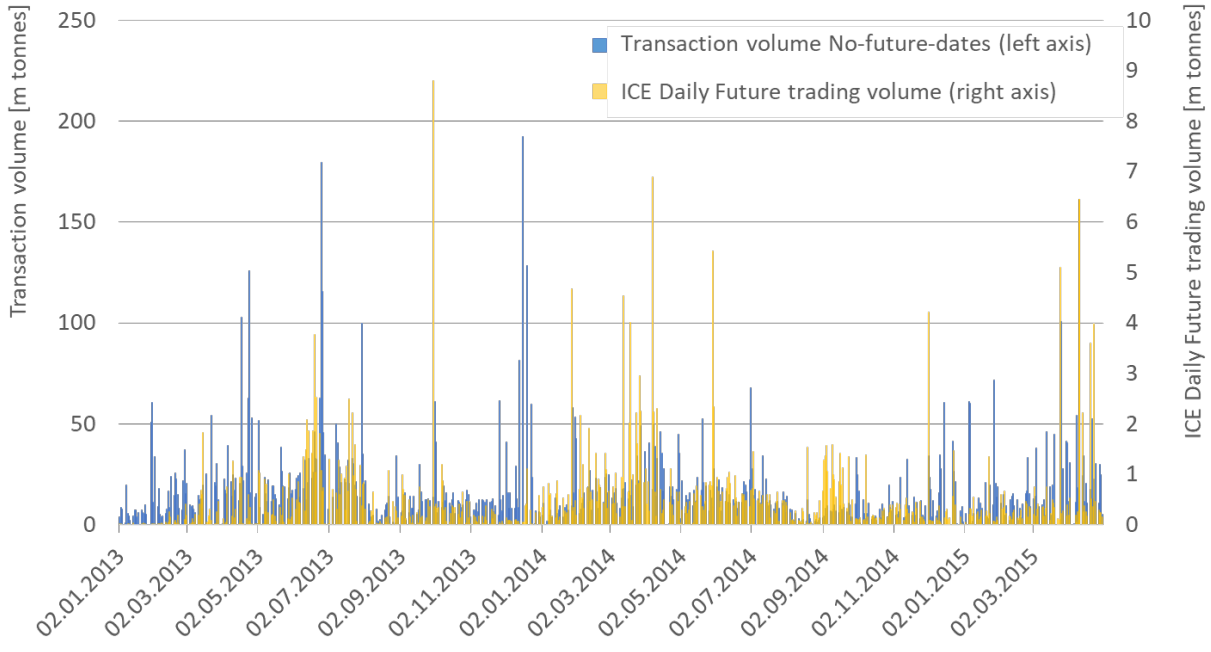
A clear distinction between the spot and forward products cannot be derived as they are not categorised distinctly in the EUTL data. For this reason, assumptions are made with regard to the choice of product and relationships with other market factors such as prices or trade volumes and of the trading strategy.

The approach taken differentiates both trade products (forward and spot). Hereinafter, forward transaction volumes determined conventional forward delivery contracts (March and December). All other volumes are assumed to be spot transactions.

Firstly the transaction volume of the EUTL identified as spot trades and ICE daily future trading volume (spot trades) were contrasted (see Figure 63).

This comparison shows no clear connection between the two factors and therefore is not taken into account for further detailed analyses of companies.

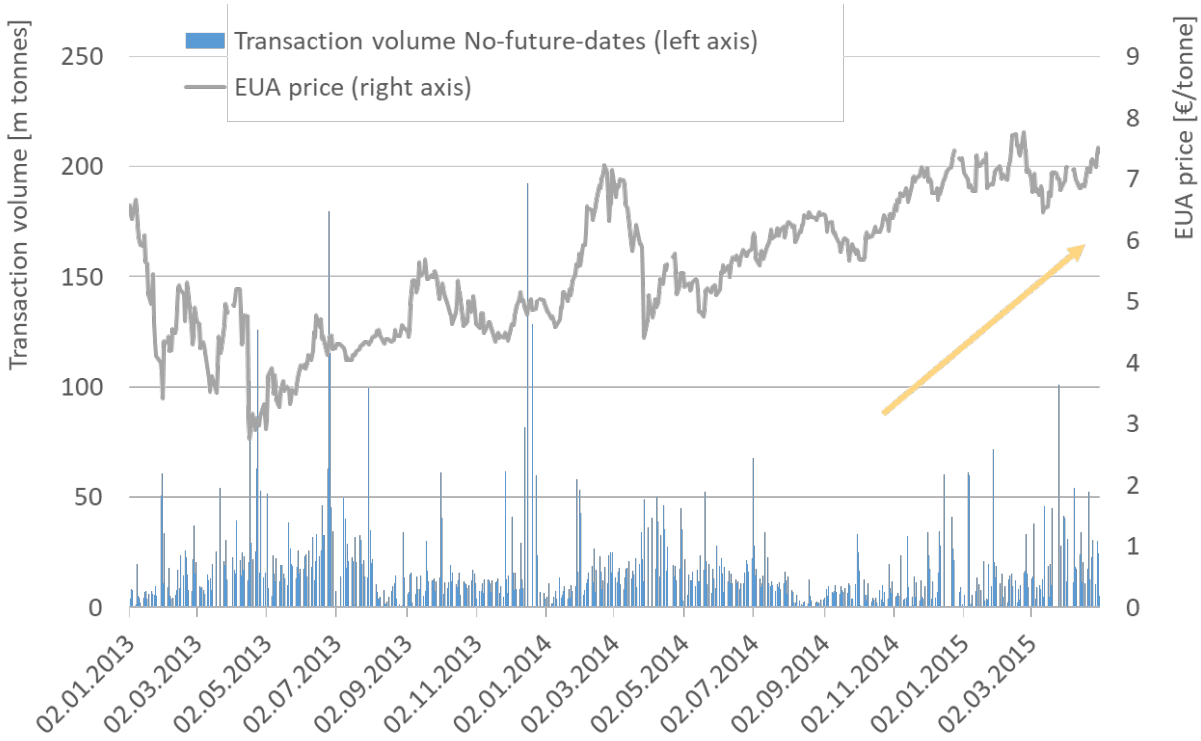
Figure 64: ICE Daily Future trading volume and defined spot transaction volume



Source: ICIS based on ICE and EUTL data.

Next, the correlation between the EUA price and the mapped spot transaction volume was analysed. Based on Figure 64 no clear relation between the spot transactions and the price of the allowances could be inferred. By the turn of the year 2014/2015 a slight upward trend in price and trade intensity can be appreciated for EUA emission allowances.

Figure 65: EUA price and defined spot transaction volume from EUTL



Source: ICIS based on ICE and EUTL data.

In summary, an overall differentiation between spot and futures contracts based on transaction dates cannot be made for the aggregate market. A correlation between spot transaction volumes and EUA prices could not be determined explicitly either. The approach will nonetheless be used as an approximation to serve as indication for March or December future derivate settlement.

C.1.4 Further Restrictions related to market conditions

Implication of hedging of power utilities

Differentiating hedging from other strategies is often not possible, especially for large volumes of emission certificates. The interpretations of the results may be biased due the inability to retrace hedging activities.

Netting of trading volumes

Particularly between large market players, it is the norm to settle a large number of trading transactions throughout the year with a specific settlement date. This is mostly done via the December forward contract. Thus, only the balance volume on this settlement date (netted transaction) being transferred from exchange to buying accounts (registered in the EUTL) has been considered.

Trading through third party (e. g. broker/bank)

Trading patterns cannot be fully inferred from companies choosing to outsource trade services provided by third parties such as broker or intermediaries. Financial players as well as large utilities may trade on behalf of other market players. In this case, their individual trading behaviour cannot be distinguished.

Company structure

Trading decision-making processes of large utilities are often diverse and complex. The traceability of trading patterns is largely determined by the transparency of physical transactions (internal and with third parties) that are provided by the EUTL. Trading could be determined by operators designated for Operator Holding Account. At the same time, (central) trade head offices can also be authorised to conduct trades and the operators of ETS plants solely conduct physical transactions via the Operator Holding Account.