ACER’s work and progress on data quality

As part of its data quality framework, ACER continuously assesses the completeness, accuracy and timeliness of the data received under Regulation (EU) No. 1227/2011 on wholesale energy market integrity and transparency (REMIT) and Commission Implementing Regulation (EU) No. 1348/2014 on data reporting under REMIT (REMIT IR).

Ensuring a sufficient level of data quality allows ACER to perform its surveillance activities by implementing an automatic screening process for transactions of energy products traded on European wholesale markets. In addition, the collected REMIT data also provides ACER with an insight into the inner workings of the markets and helps to avoid additional data reporting streams.

The ongoing data quality assessments reveal that the data quality of transactions reported under REMIT is improving, however, continuous efforts are required to improve the quality further. Improvements are required not only to assure compliance with the Transaction Reporting User Manual (TRUM), but also to ensure harmonisation within similar markets or market segments that include various organised market places as well as bilateral trading.

Due to ACER’s unique position, which affords it both a comprehensive overview of REMIT data and access to the national regulatory authorities’ (NRAs’) in-depth knowledge of specific markets, ACER and the NRAs have agreed that ACER will focus more on horizontal data analysis and the analysis of specific market segments, while the NRAs will focus on vertical analysis, in particular the data sets they know best, such as relevant organised market places (OMPs) and national bilateral trading. In other words, ACER will perform the horizontal or segment analysis and report the findings to the NRAs, after which the NRAs will perform their own assessments and provide feedback regarding a specific OMP or market participant.

Figure 1 presents an example of the division of the data quality analysis work based on the horizontal, vertical and segment-based analyses. In the example, the red boxes outline the single day-ahead auction market segments, for which TRUM fields 38-41 are analysed horizontally across various organised market places.
ACER will, in close collaboration with NRAs, continue working with the reporting parties to ensure the harmonisation of the different reporting styles, which will allow ACER and NRA to carry out efficient analyses of the data.

In its process of identifying and rectifying incorrect and inconsistent reporting, ACER may also contact specific organised market places (OMPs) and registered reporting mechanisms (RRMs). The collaboration between ACER and RRMs has so far proved to be fruitful, resulting in improved reporting as well as increased awareness of data quality issues.

ACER also continues to publish relevant guidance in order to ensure proper reporting and a high level of data quality.

On 30 June 2020, ACER published the 4th Edition of the TRUM on the REMIT Portal in order to provide an even more precise guidance for the reporting fields and types of contracts where data quality issues were frequently observed.

ACER also intends to publish the 4th Edition of the Open letter on data quality in the second half of 2020. This edition will describe the recent general findings and summarise the key areas for improvement, as revealed by the recent data quality assessments. The Open letter will, as usual, highlight ACER’s ongoing work on data quality assurance, and indicate what kind of analyses reporting parties may expect from ACER, as well as which data quality improvements ACER expects from the reporting parties. It should be noted that, in the coming months, ACER will already begin paying special attention to the reporting of records of transactions in order to ensure the application of the additional detailed guidance provided in the newest edition of TRUM. Particular supervisory focus will be put on life cycle event reporting, delivery profile definition, and accuracy of specific fields.

REMIT fees

Regulation (EU) 2019/942 of the European Parliament and of the Council of 5 June 2019 establishing a European Union Agency for the Cooperation of Energy Regulators ('ACER Regulation') introduces REMIT fees as an additional source of funding to cover the costs of REMIT-related activities performed by the European Union Agency for the Cooperation of Energy Regulators ('ACER').

The size of the REMIT fees and the way in which they are to be paid will be determined by the Commission after finalising the public consultation that was launched on 8 June 2020 and will remain open until 31 August 2020. The public consultation was presented to relevant stakeholders at the Workshop on REMIT fees on 15 July 2020. More information about the consultation is available here.

The collection of REMIT fees is envisaged to start in 2021.
Completeness of REMIT data based on reported volumes

ACER has been focusing on analysing data quality of the reported trades, in particular on the completeness based on the total reported quantities traded in the EU wholesale energy markets. Such an analysis allows ACER to verify the completeness of its data and assess its consistency. Moreover, it enhances the monitoring of markets by providing an overview of the traded volumes and the related trading trends.

To assess the completeness of the quantities reported under the REMIT transaction reporting regime, ACER compares aggregated volumes (on the level of organised market places, registered reporting mechanisms and market participants) against the information made publicly available by individual organised market places or other data providers. Such comparisons can often be challenging, especially since each organised market place or data provider aggregates trading volumes using different methodologies, which are often not specified in detail. Nevertheless, the first results of completeness analyses indicate that the overall completeness of data is satisfactory, but it is important to keep in mind that completeness needs to be assessed on a continuous basis.

ACER has also been assessing whether the traded quantities reported by reporting parties (see TRUM, Data Field No (18) Total notional contract quantity) are consistent with other information provided for trades, e.g. price, quantity, duration, and delivery profile of the contract. While there is a high degree of consistency amongst standard contracts trades referring to contract type ‘AU’ and ‘CO’ (see TRUM, Data Field No (23) Contract type), there is room for improvement when it comes to trades done with contracts of other types, since these are often characterised by inconsistencies related to the different styles of reporting delivery profiles. To counteract such issues in the future, ACER plans to further elaborate the guidance related to the reporting of delivery profiles.

Low and negative electricity prices during COVID-19: part of the cure or part of the disease?

1. Wholesale energy prices are decreasing sharply. The two main drivers of this decrease: renewable power and sustained low demand.
2. Household electricity prices are not following suit, but are nonetheless visibly affected. The energy component is one of the many elements that define household prices.
3. ACER monitors wholesale energy markets and potential market abuse under REMIT. Also with low prices and during lockdown.

1. Wholesale electricity prices are decreasing significantly during lockdowns in the Member States

The lockdowns and other measures following the COVID-19 spread in the European Union have had a clear impact on wholesale electricity prices. The demand for wholesale electricity and its derivatives dwindled with the shutdowns and reductions in much of the industrial production\(^1\). As a result, the prices in the wholesale electricity market have dropped as well.

In comparison to 2019, 2020 data shows that wholesale electricity price drops were most severe in April. Taking the average day-ahead prices as a reference\(^2\), prices dropped around 45% in Croatia, Great Britain, Ireland, Hungary, Romania, and the Baltic states; around 50% in Austria, Czech Republic, Finland, Germany, Greece, Italy, the Netherlands, Slovakia, and Slovenia; around 60% in Belgium, Denmark, France, Portugal, and Spain; and over 80% in certain Swedish bidding zones. Similar, albeit slightly less extreme drops, were observed in May.

When it comes to regular commodities, it usually holds that when the demand drops, the supply will follow suit. However, in terms of electricity generation, the reaction to

\(^2\) IEA, accessed June 2, 2020, link.
\(^2\) ENTSO-E Transparency platform.
a demand drop is more complicated. Each power plant has specific technical operation characteristics, including time needed to start and shut down, minimum running or down time, and the effect of changes in the power plant output in its expected lifetime. Moreover, electricity generation has limited storage options and faces low demand elasticity. These factors affect the ability of the power systems to cope with low demand periods. An operator might therefore prefer to sell electricity, even at negative prices for a certain duration, if this helps to avoid the inefficiency of shutting down a power plant. Negative prices can provide the right incentives for options, such as storage or flexible consumers, to adjust their behaviour.

With many industries not producing or producing at reduced rates during COVID-19, the demand for electricity on the wholesale energy market has become lower overall. The challenges related to the output of renewable sources can exacerbate the effects of low demand. At times of high output from renewable sources, the demand can be lower than the output of renewable power and of other incompressible generation, such as power plants that need to be running while they offer other services to the power system (e.g. ancillary services) or that are not easy to shut down (e.g. non-modulating nuclear power plants). Such power plants often offer their electricity at negative prices on the day-ahead or intraday markets. When the electricity offered at negative prices is enough to cover the demand, as is often the case during the COVID-19 pandemic, markets will clear at negative values.

Figure 2 illustrates the frequent occurrence of day-ahead negative prices for the months of April and May 2020 when compared to the same months in 2019. The figure highlights the negative electricity prices levels caused by COVID-19 in the different bidding zones in Europe.

Figure 2: Number of hours on the day-ahead market with negative electricity prices in April and May 2019/2020 for the most impacted bidding zones

Source: ENSTO-E transparency platform (June 2020).

In general, drops in wholesale electricity prices, even turning negative, are nothing new. What is unusual about the current price evolution, however, is the sustained low demand over a longer period due to COVID-19.

2. Household prices have dropped, but not as much as wholesale prices

Compared to April 2019, April 2020 household electricity bills in all EU capitals have decreased by 7%. Comparing May 2019 to May 2020 shows electricity bills in all EU capitals decreasing by 2%. The decline in electricity prices is therefore also apparent in residential consumption, albeit clearly not to the same extent as in wholesale electricity markets.

The main reason that the household electricity bills do not fully reflect the lowered wholesale prices is that the wholesale price is only one of the components that contribute to the final bill. Indeed, household electricity prices depend on their constituent components, which include energy costs, network charges, charges for renewable energy, other taxes and charges and value added tax. An analysis

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5 Household Energy Price Index (HEPI); HEPI, accessed June 29, 2020, link.
from 2018 reveals that, ‘on average, 37% of the final price consisted of the energy component (contestable charges), while the remaining 63% of the electricity bill consisted of non-contestable charges’. Overall, some decreases in wholesale electricity prices are expected to trickle down to the household level. The extent to which this occurs largely depends on the weight of the energy component in the household electricity bill and on the persistence of lower-than-average wholesale electricity prices.

3. **When can an extreme price be considered abusive under REMIT?**

As with any out-of-the-ordinary developments in the wholesale electricity market, significant price drops and the occurrence of many hours with negative prices can also raise the question of whether the prices truly reflect the ‘fair and competitive interplay between supply and demand’. As stated before, low or negative prices can be completely justified in times of low demand and high output from renewables. Nevertheless, markets with low or negative prices are still susceptible to abuse, be it through insider trading or market manipulation. For example, insider trading could take place when one market participant has knowledge of an important must-run power plant unexpectedly coming back online after an outage, thereby pushing an already low price further down. Market manipulation in the context of low prices could occur through capacity withholding, in order to maintain higher prices, or by bidding overly low (predatory) prices that make it impossible for other market participants to compete, forcing them to leave the market. In both instances, the prices would not reflect the fair and competitive interplay between supply and demand.

ACER and the national regulatory authorities (NRAs) gather the necessary data on the wholesale energy markets and monitor them within the REMIT framework. As communicated in an Infoflash in April 2020, ACER continues to closely collaborate with the NRAs in order to perform oversight of the wholesale energy markets under REMIT, also during the COVID-19 pandemic.

If you suspect any abusive behaviour taking place, do not hesitate to notify this through the Notification Platform.

4. **What can we conclude?**

The COVID-19-induced decrease of demand levels for electricity has exacerbated the occurrence of low and negative wholesale electricity prices. Household price levels reflect the low wholesale market prices, though only to a limited extent, since the latter constitute a relatively small component of the household prices. As with any market situation, a development of low or negative prices warrants appropriate market monitoring in order to detect any potential market abuse under REMIT.

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8 ACER Infoflash: Oversight of European Energy Trading under REMIT Continues, April 16, 2020.
Artificial Intelligence: threat and remedy for energy market integrity

In its recent communications on Artificial Intelligence (AI) and data strategy, the European Commission (EC) revealed that ‘a Europe fit for the digital age’ is now a key priority of the EU. Putting the focus on the need for an inclusive digitalisation, the EC aims to deploy AI technology for the benefits of the entire European society and economy. In this context, effective and efficient wholesale energy market surveillance should be part of this technological progress, with the purpose to enhance appropriate tools to continue ensuring trust in an increasingly complex trading environment.

Introduction

AI is the ability of a computer to perform tasks that are normally thought to require intelligence. Machine Learning (ML) is a branch of AI, e.g. one of the ways computer scientists expect to achieve it. IBM coined the term ‘machine learning’ in 1959 to target the interest of clients and talented employees. American computer scientist Tom Mitchell defined it as ‘the study of computer algorithms that allow computer programs to automatically improve through experience’. There are estimates that AI could generate an additional economic output of around EUR 12 trillion by 2030, boosting the yearly global gross domestic product by about 1.2 percent.

The last 20 years have seen a surge in the availability of enormous quantities of data from a wide range of industries. Consequently, the interest in algorithms capable of analysing and extracting valuable information from large data sets has increased rapidly.

Energy trading is no exception. On the one hand, energy trading companies optimise their profit using improved predictive and prescriptive analytics to support their decisions (potentially, at some point, entirely delegated to computers), while surveillance bodies may, on the other hand, greatly benefit from a shift from deterministic to ML algorithms trained to support the detection of manipulative activity on the wholesale energy market.

Market abuse risks

Julia Hoggett, director of Market Oversight at the Financial Conduct Authority, has recently pointed out that AI is giving rise to evolving market misconduct risks. Hoggett envisages situations where ‘seemingly “rational” AI, unconstrained and exposed to certain markets and data, would deem it entirely rational to commit market manipulation’. The emergence of this risk in the wholesale energy market was highlighted by surveillance experts at ACER’s Market Surveillance Forum in 2018 and was recently acknowledged by several organised market places (OMPs) participating in an anonymous survey conducted by ACER. Five different OMPs answered the survey.

Respondents indicated that algorithms can today profile the market and traders’ activity, potentially suggest and automatically exploit approaches for abuse. Algorithmic trading associated with, and designed by, learning algorithms gives rise to new market manipulation risks. Adverse effects can be expected in the form of system overload, market stress and, in general, new trading strategies which are becoming increasingly too complex to be captured by simple analytical checks. In addition, some experts highlight a potential risk of unfair competition between large market players with better abilities to collect and use data, and their smaller competitors. When looking at market abuse under REMIT, Figure 3 shows a high-level overview of the level of growing risk, as perceived by OMPs, caused by the use of big data and AI in trading activity in the energy market.

13 In this context, ML algorithms are considered non-deterministic in the sense that they can compute a big number of (non-linear and, maybe, random) variables to learn very complex sets of equations, with the ability to arrive at outcomes using various routes.
15 ACER kindly thanks surveillance experts from European Energy Exchange (EEX), EPEX SPOT SE, Nasdaq Oslo, Nord Pool and Gestore dei Mercati Energetici (GME) for providing their contributions.
Figure 3: OMPs’ perceived risk associated with big data and AI in energy trading – 2020
(1 = no risk, 2 = moderate risk, 3 = high risk)

Source: ACER (2020). Note 1: OMP surveillance experts answered the question ‘What level of risk do you see for the market, due to the use of big data and Artificial Intelligence?’ Average values are rounded off. Note 2: Automated market manipulation: Enforcement actions against the use of algorithms designed to manipulate the market have already occurred, in the financial sector\(^\text{16}\). Another case is the one of algorithms, which unintentionally learn trading strategies that constitute market manipulation. In both cases, REMIT is applicable\(^\text{17}\). Since most of AI techniques are based on black box computations, market participants need to be aware of this risk. Particular attention should also be paid to the fact that most AI systems evolve and learn from experience, which may require repeated assessments over the lifetime of the AI tools in use, as indicated in the already mentioned communication by the EC\(^\text{18}\). Dissemination of false and misleading information: Algorithms can perform manipulation through dissemination of false or misleading information. For example, the use of probabilistic ML to trigger balancing decisions by TSOs, could give rise to manipulation risks, in case this information would, unintentionally, become misleading. New forms of insider trading: Surveillance bodies should also start paying attention to algorithms that can learn inside information with a certain degree of confidence and a relevant time advantage, i.e. intentionally designed to “sniff” inside information.

Market surveillance opportunities

As pure manual trading, characterised by limited information and high reaction time, shifts to highly sophisticated trading algorithm, new possibilities to protect the market from abuse are emerging. Market surveillance experts from OMPs were asked to provide their views on the main current market surveillance challenges and the possibility to tackle them through the deployment of AI tools. ACER has developed a ‘relevance level’, which ranges from 0 (irrelevant) to 5 (most relevant)\(^\text{18}\), to measure the OMPs’ rating.

Figure 4: OMPs’ market surveillance challenges and possibility to tackle them by the use of AI – 2020

Source: ACER (2020). Note: OMPs answered the questions ‘What are the 5 biggest challenges in your daily market surveillance work?’ and ‘Which ones of these challenges (if any) can be tackled by the use of AI?’

\(^{16}\) For instance, in August 2015, FCA successfully obtained penalties in the High Court of Justice (EWHC) against Da Vinci Invest and Others, for an algorithm-based, layering case.

\(^{17}\) Algorithmic trading. REMIT Quarterly issue No 15/Q4 2018.

\(^{18}\) It is defined as the average of the ratings received from all survey respondents.
In line with the results shown in Figure 4, and based on ACER’s expertise in the surveillance of the wholesale energy market, surveillance bodies can take a number of steps in order to exploit the potential of big data and AI/ML, strengthening their tools for the detection of abusive instances.

1. Lack of resources

It appears to be quite clear to the majority of surveillance experts that the lack of available resources to perform surveillance tasks can at least be partially solved with the use of AI, provided that there are sufficient resources to develop AI applications in market surveillance. This could, for example, be done through the reduction of (non-data-related) false positives (see item 6) or the introduction of proactive surveillance. The currently most common surveillance systems available are based on reactive, ex-post controls. In the future, unsupervised ML algorithms could identify new clusters of behaviour and risk indicators, in order to evaluate the likelihood of market abuse happening beforehand or to make surveillance analysis more efficient.

2. Market design complexity

A challenge that experts believe cannot be tackled effectively by AI/ML is the increased market design complexity. As many ‘opportunities’ for abusive behaviour stem from market design issues, market surveillance experts should be increasingly involved in the market design process, in order to prevent market abusive behaviour ex-ante. Whenever new market or product designs are agreed, their ability to be surveilled properly needs to be assessed.

3. Increasing number of records

The issue of the increasing number of records seems to be a suitable field for AI/ML deployment. AI could support the analysis of short-time trading situations, where thousands of order changes within milliseconds make manual analysis impossible, and help to tackle the large amounts of data from observations on a longer time scale, involving multiple participants, products of different maturities, or even multiple trading venues. Whether a bottom-up (from behaviour to market impact) or a top-down (from market impact to behaviour) approach is applied, ML may support the current surveillance set-ups to deal with the increasing number of records by performing a number of tasks, such as the detection of price outliers and pattern recognition (e.g. by means of multilayer feed-forward neural networks).

4. Tackling algorithmic trading

Another field that seems to be well-suited for the application of AI surveillance and is directly connected to the large numbers of records, is algorithmic trading. From the surveillance perspective, a clear identification of the trading algorithms is necessary (author, responsible, company). In order to lower the risk of market manipulation by algorithms, they should be evaluated by experts ex-ante (before allowing them to trade) and ex-post (monitoring their performance over a testing period of time). Specific efforts need to be taken to put market participants and monitoring institutions and authorities on a level-playing field.

5. Data management

Proper data management is a prerequisite for surveillance activity, and therefore a prerequisite for AI deployment for surveillance purposes as well. In view of big data, data points from different sources could be merged meaningfully together. Surveillance systems that were once monitoring only trades and orders can now set conditions for a holistic surveillance, which relies on additional information coming from, for example, Urgent Market Messages (UMMs), fundamental data (e.g. available transmission capacity), weather forecasts, etc.

6. High number of false positives

Experts agree that AI could be helpful in the reduction of false positives. A potential interpretation of the low relevance level of this challenge could be that additional algorithmic checks are already applied to this task. However, this (binary or multi-class) classification problem may also be solved by supervised learning algorithms as regularised logistic regression or decision tree learning, which can learn how to score the output of current alerting systems, making the process less costly and more efficient.

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19 One respondent claimed that the lack of resources cannot be tackled by ML/Al, specifically referring to resources in IT department (e.g. infrastructure, new databases, security, etc.).

20 REMIT data is not considered ‘big data.’ The REMIT data reporting regime relies on standardised electronic formats (XSD), harmonised guidance and a set of validation rules that facilitate the centralised data collection sourced at various reporting parties. ACER manages a centralised relational database that feeds downstream BI systems with structured data for surveillance and analytical purposes.
7. Surveillance system updates and maintenance

Properly maintained surveillance systems, supplied with data of adequate quality and in step with market development, are another prerequisite for successful surveillance. Missing data, incomplete data, wrong data, or data that is not properly extracted and mapped within the surveillance systems, lead to poor calibration of ML models and will most likely output inaccurate results. In ACER’s opinion, in order to ensure clean and standardised data sets, already audited and validated by reporting parties, sanctions for wrong reporting need to occur more frequently when appropriate.

Conclusion

The majority of surveillance experts perceive AI as a potential source of new manipulation risks in the wholesale energy market. At the same time, AI can offer new tools to surveillance bodies, allowing them to tackle a variety of their key supervision challenges more efficiently. Interestingly, AI deployment seems to be less useful for the tasks that set the preconditions for successful work.

However, in ACER’s view, developing an effective and efficient AI application for market surveillance requires appropriate funding for development. Without these investments today, there is a risk of a growing gap between supervising bodies and the industry employing AI for trading in energy markets.

Overview of contingency reports opened by registered reporting mechanisms (RRMs)

Following the go-live of the new online form dedicated to contingencies on 15 April 2020, ACER has decided to reintroduce this section in the REMIT Quarterly to communicate the number and status of contingency reports opened by RRMs, as well as the most common reasons for which RRMs resort to contingency in the first place.

The latest statistics show that a total of 13 different RRMs submitted 21 contingencies between April 2020 and June 2020. The most common scenario chosen by RRMs in this quarter has been the one related to registered RRMs being able to report, but not meeting all of the RRM requirements, such as the completeness of data, the timeliness of submission, the accuracy of data, and validity. In particular, the timeliness in reporting data related to Table 1 standard contract as defined by the Regulation and Implementing Acts is the most affected.

Out of the 21 registered contingency reports, 17 have already been closed, while 4 reports remain open. The average contingency duration is approximately 9 days.

During the first six months of 2020, a total of 54 contingency were opened by 27 different RRMs. So far, 46 of them have already been successfully closed.

Figure 5: Number of contingencies opened and closed in Q2 divided by scenario

![Figure 5: Number of contingencies opened and closed in Q2 divided by scenario](source: ACER (2020).)
Updates of REMIT documentation

Update of the Q&A on REMIT, TRUM and FAQs on transaction reporting


The new edition of the Q&A on REMIT contains the most up-to-date information concerning REMIT policy issues and was developed in cooperation with the NRAs. The new Q&As were prompted by the discussions ACER had with its stakeholders during webinars and Roundtable meetings, as well as by the queries received via the REMIT Query form.

This edition includes 11 new Q&As and provide additional information on:

- REMIT definitions,
- obligations and prohibitions for market participants,
- inside Information.

Access the latest edition of the Q&As here.

The new edition of the Transaction Reporting User Manual (TRUM) contains updates and alignment with the FAQs on REMIT transaction reporting, and introduces further guidance on reporting lifecycle events in a dedicated new Annex.

Access the latest edition of the TRUM here and the latest edition of the FAQs on REMIT transaction reporting here.

These updated documents are the outcome of a comprehensive exercise ACER carried out in 2019 and 2020 in cooperation with the NRAs and other REMIT stakeholders.

ACER acknowledges that, because of the COVID-19 pandemic, reporting parties may face difficulties in implementing the changes foreseen by the updated guidance by the end of 2020. Nevertheless, reporting parties shall strive to achieve compliance with the updated transaction reporting guidance to the greatest extent possible.

Update of the List of accepted EIC codes

Also on 30 June 2020, the List of Accepted EIC codes was updated on the REMIT Portal according to the quarterly update. The list was updated with the inclusion of three new codes, all of which are related to the supply or transportation of natural gas. According to the application of validation rule 2ADPDPOZR1, reporting parties are now able to use the new codes for the population of field(48) ‘Delivery point or zone’. Access the latest List of Accepted EIC codes here.

The next update of the List of accepted EIC codes will occur in late September 2020. The involved parties are invited to check the Annex VI of TRUM before submitting their requests, and to make sure to submit their requests for the inclusion of new codes in the List of accepted EIC codes no later than two weeks before the end of a quarter. Late requests will be considered for the next planned quarterly publication.

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