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# AUTOMATION OVERTAKING EUROPEAN ENERGY TRADE



By Laura Raus

# MARKET INSIGHT

## AUTOMATION OVERTAKING EUROPEAN ENERGY TRADE

Automated trading is booming on European intra-day power markets and is about to take off on intra-day gas markets. Power and gas companies are looking into more automated trade of long-term products, too. This is still a long way from the high-frequency trading seen on some crude oil futures markets, but the trend for further automation seems unstoppable. This insight looks into the reasons for this and the ways to automate power and gas trade, as well as the extent of automation, regulatory framework and future trends in the area.

**BY LAURA RAUS MAY 2018**

### **BASICS: AUTOMATIC, QUANTITATIVE, ALGORITHMIC, HFT TRADING**

Automation refers to making processes operated by machines to reduce human workload. Automation in energy trading typically falls into one of the following categories:

- Algorithmic trading (algo-trade) – machines make a judgement based on data and broad rules set by humans about whether and in what terms (price, quantity, timing) to place orders to buy or sell.
- Automatic placement of orders for trades to be executed, which requires an IT interface to the trading venue.
- Automation of processes that are linked to trading such as plant optimisation, settlement and regulatory reporting.

**Quantitative trading** is a broader term often used to refer to algo-trade on futures markets. It means the use of trading strategies based on advanced quantitative analysis.

**High-frequency trading (HFT)** is a subset of algo-trade characterised by extremely fast analysis of market data and order placement as well as frequent opening of positions for periods as short as microseconds, which results in large traded volume.

Nowadays, energy trading is typically partly automated. For example, often machines indicate trading opportunities by using algorithms, while the final decision whether or not to place an order lies with the trader. However, there is a trend towards machines increasingly taking such decisions without immediate human interference, which is called **fully automated trading**.

### **REASONS FOR GROWTH**

A considerable volume of financial futures for crude oil benchmarks such as Brent has been traded automatically for years. According to a study by the US Commodity Futures Trading Commission (CFTC), in crude futures

trading at the CME exchange, the share of transactions where both counterparties originated from an automated system increased from around 30% at the start of 2013 to nearly 50% at the end of 2016. A large chunk of CME's US Henry Hub gas futures are also traded automatically. Recently, automated trade has gained ground on European electricity and gas markets, too. There are several reasons for this.

Liquidity tends to be a prerequisite for trade automation. Algorithms are typically inefficient for illiquid markets where a single trade can have a large impact on prices. It is also hard to gain a considerable advantage on illiquid markets by making trading processes quicker via automation. Over recent years, the liberalisation and integration of European power and gas markets has created sufficient liquidity for many products to benefit from automation.

Liquidity tends to make markets efficient, reducing arbitrage opportunities and profit margins of speculative trade. Hence larger volumes need to be traded to generate the same speculative profit. Automation enables a company to increase traded volume without employing additional traders.

The pressure low wholesale energy prices has put on the profit margins of utilities in many European countries over recent years incentivised them to cut costs and seek new profit opportunities with the help of automation.

A recent regulatory drive to increase transparency on energy markets has made more fundamental data available and machines are better placed than humans to analyse it quickly.

Additionally, automation avoids the errors and irrational decisions that humans are prone to, for example, due to being affected by emotions.

Automation has particular advantages in European intra-day power trade due to its complexity and highly time-critical nature:



- Speed and the avoidance of errors are particularly important in intra-day trade as this is the last option to balance positions before delivery and thus avoid imbalance charges.
- Companies that operate wind or solar power installations should be ready to balance positions intra-day 24/7 as generation forecasts for such capacity can change at short notice. Small companies that lack resources to hire a 24/7 intra-day trading team can use machines to cover night shifts.
- The low average wholesale power prices and intra-day price volatility that subsidised renewable energy have contributed to incentivise energy companies to seek profit opportunities by marketing flexible assets on the intra-day market. They can reduce the high personnel needs of intra-day trade by automation.
- The increasing share of volatile wind and solar power in the electricity mix increases complexity for all intra-day market participants. Renewables forecasts can change shortly before delivery and cause intra-day price swings.
- Intra-day traders have additional time-critical tasks such as the nomination of trades with transmission operators (TSOs) for these to be valid.
- The multitude of intra-day products means large amounts of market data need to be analysed quickly to make optimal trading decisions, which machines are more capable of than humans. For example, on the German continuous intra-day market of the EPEX SPOT exchange; hourly, 30-minute and 15-minute products are available – which totals 168 products for a single day. Besides this, EPEX

SPOT has a 15-minute German intra-day auction while continuous German intra-day trade is also available on the Nord Pool exchange.

- The expansion of intra-day market coupling, whereby bids and offers can be matched across borders if any free interconnector capacity is available, increases complexity further, giving an advantage to participants that make use of automation.

### AUTOMATION SOLUTIONS

IT companies offer a wide range of automated trading solutions for energy market participants. The companies that offer such solutions are often called independent software vendors (ISVs).

At one end of the range are relatively simple, standard algo-trade solutions, while bespoke products with frequently adjusted algorithms that offer full automation make up the other extreme.

Companies that are small or just starting to trade automatically typically use standard solutions. These often include collections of algorithms that enable trade based on common trading strategies (*Table 1*). These can work well for simple balancing of positions, but do not give users a competitive advantage if applied also by many other market participants. Standard solutions also include tools for writing companies' own individual algorithms, which some users take advantage of.

Large companies often use bespoke solutions, which they develop internally or with the help of ISVs. The latter often offer both standard and bespoke solutions, but might be specialised in one of the two.

Tradesignal in Bremen, Germany – whose clients include

#### ORDER EXECUTION STRATEGIES AVAILABLE VIA TRAYPORT AUTOMATED TRADING

<b>Ghost</b>	Hidden order, seen only by your company, monitors market and executes when price is available.
<b>Discretionary</b>	Shows the market an order level while allowing you to aggress at a pre-defined discretionary price that remains hidden from the marketplace if a matching order becomes available.
<b>Iceberg</b>	Submit fragment of total order to market, with the ability to auto match the market. Total quantity of order is not displayed to the marketplace.
<b>Iceberg discretionary</b>	Combines features of both iceberg and discretionary orders into a single order, allowing you to add discretionary orders with a private hidden quantity.
<b>Spread marker</b>	Trade a standard or bespoke spread without being transparent. Submit synthetic spread orders to the market based on a given tick differential off another contract. Have the ability to simply quote or auto execute the balancing leg and import prices from Excel.

*Table 1*



RWE, Uniper, Vattenfall and EnBW – helps companies conduct algo-trade based on technical analysis, typically applied for curve products. Its solution enables companies to back-test their technical trading ideas and automatically receive trading recommendations based on their chosen strategies. Tradesignal once focused on offering technical analysis and algo-trade solutions for financial market participants, but many of its new clients have come from the energy industry in the past five to seven years.

Udata, which has offices in the UK and the US, is another company popular among European utilities for algo-trading of curve products, based on technical analysis as well as fundamentals. In Udata's experience, algo-trading is mostly done for the most liquid products, such as gas front-month and power front-year contracts. The European coal market is generally too illiquid, while price movements of EU carbon emission allowances are harder to predict, especially when driven by political announcements, and therefore less suitable for algo-trading.

One of the companies specialising in bespoke solutions is US-based iTrading, whose clients include Royal Dutch Shell, Total and BP. It helps companies develop their own automated trading systems and adjust algorithms whenever needed, to take into account non-standard events such as the publication of a financial report that can affect prices.

European consultancy d-fine, which delivers quantitative and technological expertise, also offers bespoke solutions. These focus on algorithms based on fundamental, as opposed to technical analysis for short-term as well as long-term products on various energy commodity markets.

German company Likron is a major ISV at intra-day power

markets of the EPEX SPOT exchange. About a fifth, or 9TWh, of the intra-day power volume traded at EPEX SPOT originated from companies using its automated trading solution in 2017, up from 5TWh in 2016. Likron was the first intra-day ISV at EPEX SPOT in 2014. Its clients include Uniper, Statkraft and Engie.

Automated trade is less common on day-ahead markets, but practiced for bidding at exchange day-ahead power auctions. US-headquartered FIS is one of the companies offering a day-ahead and intra-day trading solution with automated workflows and bi-directional connection to exchanges.

German company energy & meteo systems offers virtual power plant software for automatically optimising a combination of small distributed generation units at exchange day-ahead and intra-day markets, and for providing balancing reserve. The software also enables users to include batteries and power consumers, which have demand-side flexibility in the bundle.

Austrian-based VisoTech is among the first ISVs to offer an automated trading solution for European gas spot markets. It recently started offering it for PEGAS, the gas trading platform of the EEX exchange providing access to various European hubs. The users of VisoTech's automated power and gas trade solutions include OMV, Iberdrola, Verbund, Next Kraftwerke, STEAG, gas network operator Gas Connect Austria and Austrian power transmission system operator APG.

Likron plans to start offering an automated intra-day gas trading solution later this year, initially for PEGAS. Powel, an ISV headquartered in Norway that offers an automated intra-day power trading solution, is considering expansion to intra-day gas markets.

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The processes that support trading can also be heavily automated. US-headquartered Openlink is one of the ISVs that offers extensive automation of related processes, such as position reporting, confirmation and risk limit checks.

### EXTENT OF AUTOMATION

In Europe, the share of automated trade was less than 10% on power and gas markets at the end of 2015 compared to 40-50% on stock markets, according to data management company Intalus. This share is likely to have grown since then, particularly on power markets.

A large chunk of European intra-day power trade is automated, according to data from its main venues EPEX SPOT and Nord Pool.

EPEX SPOT offers application programming interface (API) solutions that enable trade automation on both its intra-day and day-ahead markets. They are used particularly on continuous intra-day markets. About a third of EPEX SPOT's continuous intra-day market volume has been traded via an API in recent months. An API does not imply that all orders are generated through an automated process, but EPEX SPOT estimates that most API orders stem from automated programmes.

In the first two months of this year, about 12% of Nord Pool's intra-day volume was traded via an API, with the share being 42% on its German intra-day market. The exchange has observed a significant increase of API trading in the power industry.

Full automation is yet to take off on long-term European power and gas markets. Fully automated trade of long-term energy products is technically possible on the EEX and NASDAQ exchanges as well as over the counter via

the inter-dealer broker platform Trayport, but apparently is practised little. Many companies use algorithmic solutions to discover trading opportunities for long-term products, but have traders make final decisions about sending orders. This is partly because long-term markets are often driven by non-standard ad-hoc events and sentiment, which are tricky for algorithms to capture. Also, as a long-term contract transaction tends to represent a larger volume than a spot trade due to a longer delivery period, trades on long-term markets are probably considered too valuable to be determined by machines.

### USERS OF AUTOMATION SOLUTIONS

Automation is most common at large companies, but is gaining ground among smaller market participants. In the experience of FIS, the traditional users of automated trade are large utilities and renewable energy marketers.

Automated trade is also used for marketing demand-side flexibility on the intra-day power market, for example by ES FOR IN, which offers energy services to industrial consumers. One of Germany's largest power consumers, rail company Deutsche Bahn, is among the users of VisoTech automation software.

Transmission system operators (TSOs) are also looking to benefit from trade automation. The Competence Center for Research in Energy, Society and Transition, which brings together groups from nine major Swiss research institutions, has developed and implemented intra-day trading algorithms in a joint project with two TSOs in the German-Austrian bidding zone since 2014. German TSOs are obliged to sell the output of some subsidised renewables installations and need to balance positions on the intra-day market if generation forecasts change.

### MARKET IMPACT

Automated trading is less error-prone than manual, according to Nord Pool. It can help reduce balancing power need. Intra-day trading gate closure times are moving closer to delivery. German intra-day trade on Nord Pool possible up to the very delivery point within each of the country's four TSO zones. This makes it increasingly important to avoid errors in intra-day trade, such as entering an additional zero in an order by mistake. These could create last-minute system balancing challenges.

Automation shields trading from human mistakes, but exposes it more to the risk of software errors and cyber-attacks. However, automated solutions have safeguards against such risks, like position limits and automatic switch-off of trading in certain circumstances.

Automated trade typically makes price movements quicker and increases traded volume. It can increase demand for new products and help bring these on the market. Its

#### CERTIFIED ISVs AT EPEX SPOT AND NORD POOL

EPEX spot	Nord Pool
• Brady	• Brady
• d-fine	• d-fine
• EXXETA	• EXXETA
• Likron	• Likron
• Powel	• Powel
• ProCom	• ProCom
• VisoTech	• VisoTech
• Contigo	
• DACHS	
• energy & meteo systems	
• ETRMServices	
• eZ-nergy	
• FIS Global	
• Inercomp	
• Misurio	
• SOPTIM	
• Trayport	
• University of St Gallen	

other effects, such as impact on price volatility, are more ambiguous.

Automated high-frequency trading (HFT) occurring on some commodity futures markets has caused considerable concerns. A 2012 study by the United Nations Conference on Trade and Development (UNCTAD), which analysed US commodity market data, found evidence that HFT and algorithmic strategies are raising the correlation of commodity prices with financial market movements and making them increasingly deviate from fundamentals. This makes commodity markets more prone to external destabilising effects and sudden sharp price corrections while reducing the efficiency of diversification to reduce risks.

The EU's second markets in financial instruments directive (MiFID II), which also affects energy companies, says algo-trade has benefits, but it also creates risks. It enables wider market participation, higher liquidity, narrower spreads, lower short-time volatility and better execution of client orders. Meanwhile, it might overload the systems of trading venues with large order volume, generate duplicative or erroneous orders or malfunction otherwise in a way that creates a disorderly market. Besides, algo-trade systems can overreact to market events, thereby exacerbating volatility. This can happen if many automated systems react in the same way to a certain technical signal, such as breaking a key price support level. HFT may also prompt some companies to trade on venues where they can avoid high-frequency traders, the regulation says.

### REGULATORY OBLIGATIONS

Regulatory uncertainty around automated trade appears to be hindering some energy companies from engaging in it. Some of them have expressed fears that they would face additional regulatory obligations if engaging in automated trade due to MiFID II, which came into force in January.

In the experience of FIS, no additional regulatory reporting requirements fall on companies due to their use of automated trading solutions for intra-day and day-ahead trading on power exchanges. According to Likron, too, the obligations stemming from MiFID II do not apply to the short-term market.

On forwards and futures markets, algo-trade can bring additional regulatory obligations based on MiFID II.

Typically, energy companies can get an exemption from MiFID II if they prove their trading activity supports their core business, rather than being the core business. However, the engagement of a company in HFT can give ground for it not being exempt from MiFID II.

The European Securities and Markets Authority did



not comment in detail on how algo-trade can affect the obligations of an energy company under MiFID II. Any company engaging in HFT seems to fall under MiFID II, according to ISV Openlink. But in Openlink's view, it is not clear currently from what point algo-trading becomes HFT.

### ACCORDING TO MiFID II, HFT IS CHARACTERISED BY THE THREE FOLLOWING TRAITS:

- Order initiation and execution without human intervention for individual trades
- Submitting large numbers of orders, quotes or cancellations within a very short time (on average at least two per second for a product on a venue or four per second for any products on a venue)
- Infrastructure intended to minimise network and other latencies such as the placement of market participants' systems close to the matching engine of a trading venue or high-speed direct electronic access

Such a description leaves some room for interpretation, but existing automated trade on European power and gas markets is unlikely to meet all three conditions.

The companies that fall under MiFID II for any reason have additional reporting obligations if they engage in algo-trade. Such companies as well as trading venues should have robust measures in place to ensure that algo-trade does not create a disorderly market and cannot be used for abusive purposes, MiFID II says. A company falling under MiFID II and engaging in algo-trade has the following obligations:

- It has to notify the relevant national regulator and trading

venue that it uses algo-trade.

- It has to flag orders generated by algorithms and make the information available to the regulator upon request. The regulator should be able to distinguish orders originating from different algorithms and evaluate the strategies algo-traders employ.

- It has to have efficient risk controls to ensure its systems are subject to appropriate trading limits, prevent sending erroneous orders or otherwise malfunctioning in a way that can create or contribute to a disorderly market.

The national regulator may require a company falling under MiFID II to provide regularly or on an ad-hoc basis a description of its algo-trading strategies and the key risk controls it has in place.

Countries may allow trading venues to impose higher fees on companies engaging in HFT to reflect the additional burden on system capacity that does not necessarily benefit other market participants, MiFID II also says.

## AUTOMATION TRENDS

### Further expansion

It is widely expected that the share of automated trade will continue to grow on energy markets. Intra-day gas markets could be the next segment where it gains considerable ground. In the view of the NASDAQ exchange, automation could increase in energy futures trading as it has happened on other derivatives markets.

Automated trade is likely to become possible at more

venues. The number of software firms that provide automated trading solutions is set to continue growing while algo-trading competence within energy companies will also increase.

Some companies currently using standardised automated trading solutions are likely to opt for customised solutions looking ahead to increase their competitiveness. They are likely to still seek assistance from ISVs, but also develop more in-house algo-trading expertise. Recently, even small energy companies have been looking into developing algo-trading solutions in-house, in the experience of iTrading.

Some companies currently conducting algo-trade without full automation are likely to complement it with an interface that enables automatic orders. For example, some users of Tradesignal's technical algo-trading solutions are looking into having interfaces that connect them to brokers.

Automated optimisation of generation assets on top of automated trade is likely to develop and expand further. Automation can increase efficiency, particularly for portfolios that consist of many small generation units. The processes linked to trading are generally likely to be automated more, in some cases possibly with the help of the blockchain technology.

As a step further, automated power trade between individuals owning solar panels and batteries could become possible via blockchain, though regulatory changes are needed for this.

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### Higher speed

Once a considerable share of volume is traded automatically on a market, the companies that rely only on human traders are likely to feel pressure to introduce automation just to keep up with the speed of price movements and stay competitive. In Nord Pool's experience, it is already almost impossible to keep up with intra-day power market developments at times of high liquidity without the use of automated trade.

At least in the near future, HFT is unlikely to gain ground on European power and gas markets as liquidity is insufficient for this, ISVs tend to think. The interest of financial players, which particularly tend to engage in HFT on some commodity markets, in European power and gas trading has been sluggish recently. Many of them withdrew a few years ago and might not be interested in returning considering energy trading has become heavily regulated in Europe. Traded volume on the German power market, which is by far the largest power market in Europe, is divided between various exchanges and brokers, which also reduces the chances for HFT.

### Machine learning

The improvement of algo-trading solutions by machine learning and artificial intelligence is at an early stage and is likely to develop. Machine learning enables algorithms to improve themselves automatically. As one of the forerunners in the energy industry, eSmart Systems is developing an algorithm with a machine learning feature for power trading, which it intends to make commercially available in the near future. However, machine learning consumes a lot of software resources, which could limit the number of energy companies that opt to use it.

### More regulation

Automated energy trade is likely to become more heavily regulated once it gains further ground, according to several ISVs. One of them described the issue as "an elephant in the room". In the US, the CFTC proposed in 2015 a regulation for risk controls, transparency measures and other safeguards to enhance the safety and soundness of automated trade, although it is yet to be finalised. Similar developments could follow in the EU.

Trading venues themselves are also likely to be active in ensuring the companies that use automation do not gain an unfair advantage over other market participants and in reducing any other risks related to automated trade. This could help prevent additional regulation coming from the authorities.

### Future of trading profession

The financial industry, where automated trade has long been common, can give a clue as to what automation

means for energy traders looking ahead. Automation could reduce the number of energy traders, but does not necessarily mean they will disappear.

Automation is changing the nature of the trading profession. It can free traders from many routine, error-prone tasks. Meanwhile, they will be needed to develop and adjust algorithms and trading software.

A programmer can easily code a strategy based on given parameters, but the hard part is coming up with a successful strategy. Traders who can do this will still be in high demand, as long as they can formulate strategies clearly for building algorithms rather than relying on a gut feeling.

On short-term power markets, fully automated trade could become prevalent at times of low price volatility while humans would still take trading decisions at more turbulent times.

Certain long-term product transactions would probably never be fully automated for risk management reasons. This could be the case for high-volume trades of annual physical power and gas contracts, particularly close to their expiry.

Human traders will also always be needed on illiquid markets, where a single transaction can have a big impact on prices and technical analysis tends to be inefficient.



## ABOUT THE AUTHOR

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Laura Raus is a senior reporter at ICIS, focusing on the German power market. She also follows several other European electricity and global crude oil markets. Laura has a degree in economics and has been covering energy markets for about five years.

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