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ARGUS EUROPEAN ELECTRICITY

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The most up-to-date European Electricity methodology is available on www.argusmedia.com

Methodology overview

Methodology rationale

Argus strives to construct methodologies that reflect the way the market trades. Argus aims to produce price assessments which are reliable and representative indicators of commodity market values and are free from distortion. As a result, the specific currencies, volume units, locations and other particulars of an assessment are determined by industry conventions.

In the European electricity markets, Argus publishes prices in the open market as laid out in the specifications and methodology guide. Argus uses the trading period deemed by Argus to be most appropriate, in consultation with industry, to capture market liquidity.

In order to be included in the assessment process, deals must meet the minimum volume, delivery, timing and specification requirements in our methodology. In illiquid markets, and in other cases where deemed appropriate, Argus assesses the range within which product could have traded by applying a strict process outlined later in this methodology.

Survey process

Argus price assessments are informed by information received from a wide cross section of market participants, including producers, consumers and intermediaries. Argus reporters engage with the industry by proactively polling participants for market data. Argus will contact and accept market data from all credible market sources including front and back office of market participants and brokers. Argus will also receive market data from electronic trading platforms and directly from the back offices of market participants. Argus will accept market data by telephone, instant messenger, email or other means.

Argus encourages all sources of market data to submit all market data to which they are a party that falls within the Argus stated methodological criteria for the relevant assessment. Argus encourages all sources of market data to submit transaction data from back office functions.

Throughout all markets, Argus is constantly seeking to increase the number of companies willing to provide market data. Reporters are mentored and held accountable for expanding their pool of contacts. The number of entities providing market data can vary significantly from day to day based on market conditions.

For certain price assessments identified by local management, if more than 50pc of the market data involved in arriving at a price assessment is sourced from a single party the supervising editor will engage in an analysis of the market data with the primary reporter to ensure that the quality and integrity of the assessment has not been affected.

Market data usage

In each market, Argus uses the methodological approach deemed to be the most reliable and representative for that market. Argus will utilise various types of market data in its methodologies, to include:

- Transactions
- Bids and offers
- Other market information, to include spread values between grades, locations, timings, and many other data.

In many markets, the relevant methodology will assign a relatively higher importance to transactions over bids and offers, and a relatively higher importance to bids and offers over other market information. Certain markets however will exist for which such a hierarchy would produce unreliable and non-representative price assessments, and so the methodology must assign a different relative importance in order to ensure the quality and integrity of the price assessment. And even in markets for which the hierarchy normally applies, certain market situations will at times emerge for which the strict hierarchy would produce non-representative prices, requiring Argus to adapt in order to publish representative prices.

Verification of transaction data

Reporters carefully analyse all data submitted to the price assessment process. These data include transactions, bids, offers, volumes, counterparties, specifications and any other information that contributes materially to the determination of price. This high level of care described applies regardless of the methodology employed. Specific to transactions, bids, and offers, reporters seek to verify the price, the volume, the specifications, location basis, and counterparty. In some transactional average methodologies, reporters also examine the full array of transactions to match counterparties and arrive at a list of unique transactions. In some transactional average methodologies, full details of the transactions verified are published electronically and are accessible by subscribers. The deals are also published in the daily report.

Several tests are applied by reporters in all markets to transactional data to determine if it should be subjected to further scrutiny. If a transaction has been identified as failing such a test, it will receive further scrutiny. For assessments used to settle derivatives and for many other assessments, Argus has established internal procedures that involve escalation of inquiry within the source's company and escalating review within Argus management. Should this process determine that a transaction should be excluded from the price assessment process, the supervising editor will initiate approval and, if necessary, documentation procedures.

Primary tests applied by reporters

- Transactions not transacted at arm's length, including deals between related parties or affiliates.
- Transaction prices that deviate significantly from the mean of all transactions submitted for that day.
- Transaction prices that fall outside of the generally observed lows and highs that operated throughout the trading day.
- Transactions that are suspected to be a leg of another transaction or in some way contingent on an unknown transaction.
- Single deal volumes that significantly exceed the typical transaction volume for that market.
- Transaction details that are identified by other market participants as being for any reason potentially anomalous and perceived by Argus to be as such.

- Transaction details that are reported by one counterparty differently than the other counterparty.
- Any transaction details that appear to the reporter to be illogical or to stray from the norms of trading behaviour. This could include but is not limited to divergent specifications, unusual delivery location and counterparties not typically seen.
- Transactions that involve the same counterparties, the same price and delivery dates are checked to see that they are separate deals and not one deal duplicated in Argus records.

Secondary tests applied by editors for transactions identified for further scrutiny

Transaction tests

- The impact of linkage of the deal to possible other transactions such as contingent legs, exchanges, options, swaps, or other derivative instruments. This will include a review of transactions in markets that the reporter may not be covering.
- The nature of disagreement between counterparties on transactional details.
- The possibility that a deal is directly linked to an offsetting transaction that is not publicly known, for example a “wash trade” which has the purpose of influencing the published price.
- The impact of non-market factors on price or volume, including distressed delivery, credit issues, scheduling issues, demurrage, or containment.

Source tests

- The credibility of the explanation provided for the outlying nature of the transaction.
- The track record of the source. Sources will be deemed more credible if they
 - Regularly provide transaction data with few errors.
 - Provide data by Argus’ established deadline.
 - Quickly respond to queries from Argus reporters.
 - Have staff designated to respond to such queries.
- How close the information receipt is to the deadline for information, and the impact of that proximity on the validation process.

Assessment guidelines

When insufficient, inadequate, or no transaction information exists, or when Argus concludes that a transaction based methodology will not produce representative prices, Argus reporters will make an assessment of market value by applying intelligent judgment based on a broad array of factual market information. Reporters must use a high degree of care in gathering and validating all market data used in determining price assessments, a degree of care equal to that applying to gathering and validating transactions. The information used to form an assessment could include deals done, bids, offers, tenders, spread trades, exchange trades, fundamental supply and demand information and other inputs.

The assessment process employing judgment is rigorous, replicable, and uses widely accepted valuation metrics. These valuation metrics mirror the process used by physical commodity traders

to internally assess value prior to entering the market with a bid or offer. Applying these valuation metrics along with sound judgment significantly narrows the band within which a commodity can be assessed, and greatly increases the accuracy and consistency of the price series. The application of judgment is conducted jointly with the supervising editor, in order to be sure that guidelines below are being followed. Valuation metrics include the following:

Relative value transactions

Frequently transactions occur which instead of being an outright purchase or sale of a single commodity, are instead exchanges of commodities. Such transactions allow reporters to value less liquid markets against more liquid ones and establish a strong basis for the exercise of judgment.

- Exchange one commodity for a different commodity in the same market at a negotiated value.
- Exchange delivery dates for the same commodity at a negotiated value.
- Exchange a commodity in one location for the same commodity at another location at a negotiated value.

Bids and offers

If a sufficient number of bids and offers populate the market, then in most cases the highest bid and the lowest offer can be assumed to define the boundaries between which a deal could be transacted.

Comparative metrics

The relative values between compared commodities are readily discussed in the market and can be discovered through dialogue with market participants. These discussions are the precursor to negotiation and conclusion of transactions.

- Comparison to the same commodity in another market centre.
- Comparison to a more actively traded but slightly different specification commodity in the same market centre.
- Comparison to the same commodity traded for a different delivery timing.
- Comparison to the commodity’s primary feedstock or primary derived product(s).
- Comparison to trade in the same commodity but in a different modality (as in barge versus oceangoing vessel) or in a different total volume (as in full cargo load versus partial cargo load).

Volume minimums and transaction data thresholds

Argus typically does not establish thresholds strictly on the basis of a count of transactions, as this could lead to unreliable and non-representative assessments and because of the varying transportation infrastructure found in all commodity markets. Instead, minimum volumes are typically established which may apply to each transaction accepted, to the aggregate of transactions, to transactions which set a low or high assessment or to other volumetrically relevant parameters.

For price assessments used to settle derivatives, Argus will seek to establish minimum transaction data thresholds and when no such threshold can be established Argus will explain the reasons. These

thresholds will often reflect the minimum volumes necessary to produce a transaction-based methodology, but may also establish minimum deal parameters for use by a methodology that is based primarily on judgment.

Should no transaction threshold exist, or should submitted data fall below this methodology's stated transaction data threshold for any reason, Argus will follow the procedures outlined elsewhere in this document regarding the exercise of judgment in the price assessment process.

Transparency

Argus values transparency in energy markets. As a result, where available, we publish lists of deals in our reports that include price, basis and volume information. The deal tables allow subscribers to cross check and verify the deals against the prices. Argus feels transparency and openness is vital to developing confidence in the price assessment process.

Swaps and forwards markets

Argus publishes forward assessments for numerous markets. These include forward market contracts that can allow physical delivery and swaps contracts that swap a fixed price for the average of a floating published price. Argus looks at forward swaps to inform physical assessments but places primary emphasis on the physical markets.

Publications and price data

Argus European electricity prices are published in the Argus European Electricity report. Subsets of these prices appear in other Argus market reports and newsletters in various forms. The price data are available independent of the text-based report in electronic files that can feed into various databases. These price data are also supplied through various third-party data integrators. The Argus website also provides access to prices, reports and news with various web-based tools. All Argus prices are kept in a historical database and available for purchase. Contact your local Argus office for information.

A publication schedule is available at www.argusmedia.com

Corrections to assessments

Argus will on occasion publish corrections to price assessments after the publication date. We will correct errors that arise from clerical mistakes, calculation errors, or a misapplication of our stated methodology. Argus will not retroactively assess markets based on new information learned after the assessments are published. We make our best effort to assess markets based on the information we gather during the trading day assessed.

Ethics and compliance

Argus operates according to the best practices in the publishing field, and maintains thorough compliance procedures throughout the firm. We want to be seen as a preferred provider by our subscribers, who are held to equally high standards, while at the same time maintaining our editorial integrity and independence. Argus has a strict

ethics policy that applies to all staff. The policy can be found on our website at www.argusmedia.com. Included in this policy are restrictions against staff trading in any energy commodity or energy related stocks, and guidelines for accepting gifts. Argus also has strict policies regarding central archiving of email and instant messenger communication, maintenance and archiving of notes, and archiving of spreadsheets and deal lists used in the price assessment process. Argus publishes prices that report and reflect prevailing levels for open-market arms length transactions (please see the [Argus Global Compliance Policy](#) for a detailed definition of arms length).

Consistency in the assessment process

Argus recognises the need to have judgment consistently applied by reporters covering separate markets, and by reporters replacing existing reporters in the assessment process. In order to ensure this consistency, Argus has developed a programme of training and oversight of reporters. This programme includes:

- A global price reporting manual describing among other things the guidelines for the exercise of judgment
- Cross-training of staff between markets to ensure proper holiday and sick leave backup. Editors that float between markets to monitor staff application of best practices
- Experienced editors overseeing reporting teams are involved in daily mentoring and assisting in the application of judgment for illiquid markets
- Editors are required to sign-off on all price assessments each day, thus ensuring the consistent application of judgment.

Review of methodology

The overriding objective of any methodology is to produce price assessments which are reliable and representative indicators of commodity market values and are free from distortion. As a result, Argus editors and reporters are regularly examining our methodologies and are in regular dialogue with the industry in order to ensure that the methodologies are representative of the market being assessed. This process is integral with reporting on a given market. In addition to this ongoing review of methodology, Argus conducts reviews of all of its methodologies and methodology documents on at least an annual basis.

Argus market report editors and management will periodically and as merited initiate reviews of market coverage based on a qualitative analysis that includes measurements of liquidity, visibility of market data, consistency of market data, quality of market data and industry usage of the assessments. Report editors will review:

- Appropriateness of the methodology of existing assessments
- Termination of existing assessments
- Initiation of new assessments.

The report editor will initiate an informal process to examine viability. This process includes:

- Informal discussions with market participants
- Informal discussions with other stakeholders
- Internal review of market data

Should changes, terminations, or initiations be merited, the report editor will submit an internal proposal to management for review and approval. Should changes or terminations of existing assessments be approved, then formal procedures for external consultation are begun.

Changes to methodology

Formal proposals to change methodologies typically emerge out of the ongoing process of internal and external review of the methodologies. Formal procedures for external consultation regarding material changes to existing methodologies will be initiated with an announcement of the proposed change published in the relevant Argus report. This announcement will include:

- Details on the proposed change and the rationale
- Method for submitting comments with a deadline for submissions
- For prices used in derivatives, notice that all formal comments will be published after the given consultation period unless submitter requests confidentiality.

Argus will provide sufficient opportunity for stakeholders to analyse and comment on changes, but will not allow the time needed to follow these procedures to create a situation wherein unrepresentative or false prices are published, markets are disrupted, or market participants are put at unnecessary risk. Argus will engage with industry throughout this process in order to gain acceptance of proposed changes to methodology. Argus cannot however guarantee universal acceptance and will act for the good order of the market and ensure the continued integrity of its price assessments as an overriding objective.

Following the consultation period, Argus management will commence an internal review and decide on the methodology change. This will be followed by an announcement of the decision, which will be published in the relevant Argus report and include a date for implementation. For prices used in derivatives, publication of stakeholders' formal comments that are not subject to confidentiality and Argus' response to those comments will also take place.

Assessment methodology

Price assessments

Price assessments are provided for the following markets — Albania, Austria, Belgium, Bulgaria, Czech Republic, France, Germany, Greece, Hungary, Ireland (ISEM), Italy, the Netherlands, Romania, Serbia, Slovakia, Slovenia, Spain, Switzerland, Turkey and the UK.

Argus price assessments are for physically-settled forward contracts for all markets except Spain, which trades financially-settled contracts.

Price assessments for base-load and peak-load products are compiled between 4.00pm and 5.30pm London time and reflect fair value of a given product at the market close, as signalled by the cessation of trading in the over-the-counter (OTC) market.

Assessments are published as a best buy and sell price (also referred to as the highest bid and lowest offer), the midpoint of which represents the assessment of the contract's value at the market close.

Indexes

Index values are volume-weighted averages of reported physically-settled trades.

Financially-settled trades are not included in the indexes.

Daily indexes are the volume-weighted average of included trades.

If there is no trade the mid-point of the closing price assessment is published in its place.

Cumulative indexes for the UK working day-ahead market are the rolling, volume-weighted average of included trades since the start of the current electricity forward agreement (EFA) month.

Cumulative indexes for the Czech, Dutch, French and German day-ahead markets are the rolling, volume-weighted average of included trades since the start of the current calendar month.

Cumulative averages for all other contracts are the rolling, volume-weighted average of included trades since the first day of trading of the contract.

Total reported traded volume is the total daily volume of reported trades for all contracts, including those not represented in the indexes, in GWh.

Argus monthly buy-sell indexes

For Turkey, a monthly buy-sell index is published. This index is a running monthly average of the end-of-day bid-offer assessments reported for the Turkish month-ahead market in the Argus European Electricity report.

The average includes values for the days on which the report was published during the current month. The final indexes should be taken as those published on the last UK working day of the month.

For example, the Turkish front-month index on the first publication date of the month is equal to the midpoint of the bid-offer assessment for the Turkish front-month contract published that day. On the second publication day of the month, the index is equal to the average of the midpoints of the bid-offer assessments for the Turkish front-month contract published on the first and second publication day of the month.

Roll dates

With the exception of those UK contracts that continue to trade under the EFA calendar, the following roll dates apply. For more information on the EFA calendar and the transition to the Gregorian calendar, please see the UK power section on page 6.

Roll dates for a monthly contract will be the last working day of the previous month; the roll date for a quarterly contract will be the

last working day of the last month of the previous quarter; the roll date for a seasonal contract will be the last working day of the last quarter before delivery. The roll date for the annual contracts will be determined by market practice at the time.

Generation economics

Argus European Electricity carries implied forward spark and dark spreads, both unadjusted and emissions-adjusted, for France, Germany, the Netherlands and the UK.

Spreads are implied from Argus assessments of power, natural gas, coal (cif ARA) and CO2 emissions prices. Spreads are not assessments of the traded market for spark and dark spreads. (See page 10 for details).

Third-party price data

Argus European Electricity also contains data from third party sources including energy exchanges, balancing and spot markets. Third-party data are provided under agreements with each of the providers. Third-party price data are published for Austria, Belgium, Czech Republic, France, Germany, Greece, Ireland, Italy, the Nordic region, Poland, Portugal, Romania, Slovakia, Spain, Turkey and the UK.

Third-party exchange data are published as received except in cases where simple data processing is undertaken, such as the calculation of averages.

Markets covered

UK

Contract specifications and delivery timings

Minimum size: 5MW for inclusion in indexes or assessments
Unit: £/MWh - pricing is to two decimal places

- Contracts assessed (end of day):
- Day-ahead block 1+2
- Day-ahead block 3+4
- Day-ahead block 5
- Day-ahead block 6
- Three days forward
- One working day forward (working day-ahead refers to the next working day)
- Weekend
- Four weeks ahead
- Six months ahead
- Four quarters ahead
- Seven seasons forward
- One annual contract (from April and/or October depending upon the date of the report, equal to the average of the first two forward seasonal price assessments)

Delivery timing:

The UK power day is divided into six blocks of four hours each

- Block 1: 11pm-3am
- Block 2: 3am-7am
- Block 3: 7am-11am
- Block 4: 11am-3pm
- Block 5: 3pm-7pm
- Block 6: 7pm-11pm

Base-load contracts are for delivery during all blocks on working days, weekends and holidays.

Peak-load contracts are for delivery during blocks 3, 4 and 5 (7am-7pm) on working days.

Off-peak load contracts are for delivery during blocks 1, 2 and 6 on working days and during all blocks on weekends and public holidays.

Roll dates

EFA

Roll dates for monthly, quarterly, seasonal and annual contracts with delivery before 1 October 2014 are based on the Electricity Forward Agreement (EFA) calendar. The roll date for a monthly contract will be the last day of the month, as specified by the EFA calendar found at https://www.theice.com/publicdocs/EFA_Calendar.pdf; the roll date for a quarterly contract will be the last day of the month preceding the quarter; the roll date for a seasonal contract will be the last one of the preceding season. The roll date for the annual contracts will be the last day of March or September.

Gregorian

From 1 November 2013, roll dates for contracts with delivery after 1 October 2014 are based on the standard Gregorian calendar.

From 30 September 2014, roll dates for a monthly contract will be the last working day of the previous month; the roll date for a quarterly contract will be the last working day of the last month of the previous quarter; the roll date for a seasonal contract will be the last working day of the last quarter before delivery. The roll date for the annual contracts will be determined by market practice at the time.

Ireland (ISEM)

Contract specifications and delivery timings

Minimum size: 5MW for inclusion in assessments
Unit: €/MWh - pricing is to two decimal places

- Contracts assessed:
- One month ahead
- Four quarters ahead

Delivery timing

Base load covers all hours, working days and weekends/public holidays.

Note: Assessments are made once each week, on Wednesday.

Germany

Contract specifications and delivery timings

Minimum size: 5MW for inclusion in indexes or assessments

Unit: €/MWh - pricing is to two decimal places

Contracts assessed:

Two days forward

One working day forward (working day-ahead refers to the next working day)

Weekend

Four weeks ahead

Six months ahead

Six quarters ahead

Four years ahead

Delivery timing

Base load covers all hours, working days and weekends/public holidays. Peak load is 8am-8pm CET, Monday to Friday.

Note: Germany and Austria were a single price zone until October 2018 and price assessments for contracts delivering before that date are the same in both countries. From 1 October 2018, the countries operate as two separate price zones.

Austria

Contract specifications and delivery timings

Minimum size: 5MW for inclusion in indexes or assessments

Unit: €/MWh - pricing is to two decimal places

Contracts assessed:

Day-ahead (day-ahead refers to the next working day)

One month ahead

Two quarters ahead

Two years ahead

Delivery timing

Base load covers all hours, working days and weekends/public holidays. Peak load is 8am-8pm CET, Monday to Friday.

Note: Germany and Austria were a single price zone until October 2018 and price assessments for contracts delivering before that date are the same in both countries. From 1 October 2018, the countries operate as two separate price zones.

Switzerland

Contract specifications and delivery timings

Minimum size: 5MW for inclusion in indexes or assessments

Unit: €/MWh - pricing is to two decimal places

Contracts assessed:

Day-ahead (day-ahead refers to the next working day)

One months ahead

Two quarters ahead

One year ahead

Delivery timing:

Base load covers all hours, working days and weekends/public holidays. Peak load is 8am-8pm CET, Monday to Friday.

France

Contract specifications and delivery timings

Minimum size: 5MW for inclusion in indexes or assessments

Unit: €/MWh - pricing is to two decimal places

Contracts assessed:

Day-ahead (day-ahead refers to the next working day)

Weekend

Two weeks ahead

Three months ahead

Four quarters ahead

Three years ahead

Delivery timing:

Base load covers all hours, working days and weekends/public holidays. Peak load is 8am-8pm CET, Monday to Friday. Off peaks are 12am-8am and 8pm-12am, Monday to Friday, and all day week-ends and public holidays. Hourly contracts are listed as such.

Netherlands

Contract specifications and delivery timings

Minimum size: 5MW for inclusion in indexes or assessments

Unit: €/MWh - pricing is to two decimal places

Contracts assessed:

Day-ahead (day-ahead refers to the next working day)

Weekend

Two weeks ahead

Three months ahead

Four quarters ahead

Three years ahead

Note: Argus publishes the weekend price only on the last publishing day before the weekend.

Delivery timing:

Base load covers all hours, working days and weekends/public holidays. Peak load is 8am-8pm, Monday to Friday. Off peaks are 12am-8am and 8pm-12am, Monday to Friday, and all day week-ends and public holidays. Hourly contracts are listed as such.

Belgium

Contract specifications and delivery timings

Minimum size: 5MW for inclusion in indexes or assessments

Unit: €/MWh - pricing is to two decimal places

Contracts assessed:

Day-ahead (day-ahead refers to the next working day)

One month ahead

One quarter ahead

One year ahead

Delivery timing:

Base load covers all hours, working days and weekends/public holidays.

Spain

Contract specifications and delivery timings

Minimum size: 5MW for inclusion in indexes or assessments

Unit: €/MWh - pricing is to two decimal places

Contracts assessed:

Day-ahead (day-ahead refers to the next working day)

One week ahead

Three months ahead

Four quarters ahead

Two years ahead

Delivery timing:

Base load covers all hours, working days and weekends/public holidays.

Italy

Contract specifications and delivery timings

Minimum size: 5MW for inclusion in indexes or assessments

Unit: €/MWh - pricing is to two decimal places

Contracts assessed:

Day-ahead (day-ahead refers to the next working day)

Two weeks ahead

Three months ahead

Four quarters ahead

Two years ahead

Delivery timing:

Base load covers all hours, working days and weekends/public holidays. Peak load is 8am-8pm CET, Monday to Friday.

Czech Republic

Contract specifications and delivery timings

Minimum size: 5MW for inclusion in indexes or assessments

Unit: €/MWh - pricing is to two decimal places

Contracts assessed:

Day-ahead (day-ahead refers to the next working day)

Two weeks ahead

Three months ahead

Four quarters ahead

Three years ahead

Delivery timing:

Base load covers all hours, working days and weekends/public holidays.

Slovakia

Contract specifications and delivery timings

Minimum size: 5MW for inclusion in indexes or assessments

Unit: €/MWh - pricing is to two decimal places

Contracts assessed:

Day-ahead (day-ahead refers to the next working day)

One week ahead

One month ahead

One quarter ahead

One year ahead

Delivery timing:

Base load covers all hours, working days and weekends/public holidays.

Hungary

Contract specifications and delivery timings

Minimum size: 5MW for inclusion in indexes or assessments

Unit: €/MWh and converted to Hungarian forints/MWh (HUF/MWh).

Pricing is to two decimal places

Contracts assessed:

Day-ahead (day-ahead refers to the next working day)

One week ahead

Three months ahead

Four quarter ahead

Two years ahead

Delivery timing:

Base load covers all hours, working days and weekends/public holidays. Peak load is 8am-8pm Monday to Friday.

Serbia

Contract specifications and delivery timings

Minimum size: 5MW for inclusion in indexes or assessments

Unit: €/MWh - pricing is to two decimal places

Contracts assessed:

Day-ahead (day-ahead refers to the next working day)

One week ahead

One month ahead

One year ahead

Delivery timing:

Base load covers all hours, working days and weekends/public holidays.

Slovenia

Contract specifications and delivery timings

Minimum size: 5MW for inclusion in indexes or assessments

Unit: €/MWh - pricing is to two decimal places

Contracts assessed:

Day-ahead (day-ahead refers to the next working day)

One week ahead

One month ahead

One year ahead

Delivery timing:

Base load covers all hours, working days and weekends/public holidays.

Romania

Contract specifications and delivery timings

Minimum size: 1MW for inclusion in indexes or assessments

Unit: Romanian leu/MWh (RON/MWh) and converted to €/MWh.

Pricing is to two decimal places

Contracts assessed:

Three months ahead

Two quarters ahead

One year ahead

Delivery timing:

Base load covers all hours, working days and weekends/public holidays.

Turkey

Contract specifications and delivery timings

Unit: Turkish lira/MWh (TL/MWh) and converted to €/MWh. Pricing is to two decimal places

Contracts assessed:

One month ahead

Four quarters ahead

One year ahead

One rolling 52-week-ahead contract. Physical delivery begins from the start of the month ahead.

Delivery timing:

Base load covers all hours, working days and weekends/public holidays.

Bulgaria

Contract specifications and delivery timings

Unit: €/MWh - pricing is to two decimal places

Contracts assessed:

One month ahead

Delivery timing:

Base load covers all hours, working days and weekends/public holidays.

Note: Assessments are made once each week, on Thursday.

Greece

Contract specifications and delivery timings

Unit: €/MWh - pricing is to two decimal places

Contracts assessed:

One month ahead

Delivery timing:

Base load covers all hours, working days and weekends/public holidays.

Note: Assessments are made once each week, on Thursday.

Albania

Contract specifications and delivery timings

Unit: €/MWh - pricing is to two decimal places

Contracts assessed: One month ahead

Delivery timing: Base load covers all hours, working days and weekends/public holidays.

Note: Assessments are made once each week, on Thursday.

Generating costs

Generation margins

Argus spark and dark spreads provide illustrative information about generation economics.

Published spark and dark spreads are derived from Argus' power, fuel and emissions price assessments and are not an assessment of trade in the over-the-counter spark-spread market.

A full set of spark and dark spreads is published in Argus Direct and available through Argus data feeds. A limited range of spark and dark spreads is published in the print editions of Argus European Electricity, Argus Coal Daily International, Argus European Natural Gas and Argus European Emissions Markets.

Argus publishes unadjusted generation margins for gas and coal for the UK, Germany, the Netherlands and France.

Argus publishes unadjusted generation margins for gas and coal in Spain and Turkey.

Argus publishes unadjusted generation margins for gas in Belgium, Slovakia, Hungary and the Czech Republic.

Argus also publishes CO₂ emissions-adjusted, or “clean”, spark and dark spreads for the UK, Germany, the Netherlands, Italy, France, Spain, Belgium the Czech Republic, Slovakia and Hungary.

For the UK, Argus also provides generation margins that include the cost of complying with both the EU emissions trading scheme (ETS) and the UK carbon support scheme.

For Turkey, Argus also provides generation margins that include the cost of complying with the tax on imported coal.

Underlying prices

Prices used to calculate spark and dark spreads are drawn from various Argus reports on the day of publication.

Electricity: Argus European Electricity

Natural Gas: Argus European Natural Gas

- Germany — spark spreads are calculated using both NCG and Gaspool gas prices
- Italy — all spark spreads are calculated using PSV gas prices
- France — all spark spreads are calculated using Peg gas prices
- UK — all spark spreads are calculated using NBP gas prices
- Netherlands — all spark spreads are calculated using TTF gas prices
- Belgium — all spark spreads are calculated using ZTP gas prices
- Spain — all spark spreads are calculated using PVB gas prices
- Hungary — all spark spreads are calculated MGP gas prices
- Czech Republic — all spark spreads are calculated using Czech Republic VTP gas prices
- Slovakia — all spark spreads are calculated using Slovak VTP gas prices
- Turkey — spark spreads are calculated using Argus’ Turkey day-ahead gas prices, state-run gas firm Botas’ monthly regulated industrial gas tariffs and Argus’ Turkey des LNG front half-month prices. Turkish front-month LNG spark spreads are calculated using the second forward half-month Turkey des LNG price in the first half of the current month and the arithmetic mean of the first two forward half-month Turkey des LNG prices in the second half of the month

See the [Argus European Natural Gas methodology](#) and the [Argus LNG Daily methodology](#).

Coal: Argus Coal Daily International

All dark spreads are calculated using cif ARA coal price assessments. See the [Argus Coal Daily International methodology](#).

CO₂ emissions: Argus European Emissions Markets
See the [Argus European Emissions Markets methodology](#).

Turkish coal tax: The Turkish government applies a tax on imported coal used in power generation.

The levy is calculated on the basis on an external price published on the [Ice exchange](#).

Levy = 70 – closing value of “ATW-Rotterdam Coal Future” for the relevant month on the previous Friday

Timing of underlying prices

Wherever possible, Argus aligns the forward periods of the underlying electricity, fuels and CO₂ price assessments when calculating generation margins.

Dark spreads: For spot dark spreads and for the first two forward months, Argus uses the spot coal price. For dark spreads further forward, Argus uses corresponding forward coal swaps prices.

CO₂ emissions: For CO₂-adjusted spark and dark spreads, Argus uses the EU ETS allowance price for the corresponding delivery year. For UK winter season generation margins (October-March), the October and November months are assumed to fall in one ETS allowance year and the December-March months are assumed to fall in the following year.

Power plant efficiencies

Generating margins are calculated in all markets and for all fuels at efficiencies of 30pc, 34pc, 38pc, 49.12pc and 55pc. For the UK, margins are also calculated for 58pc and 60pc efficiencies.

CO₂ emissions factors

For German, French, Italian and Dutch generation margins, clean spark and dark spreads are calculated using emissions factors of 0.341 t/MWh for coal and 0.202 t/MWh for gas.

UK Carbon Price Support

The UK government applies additional costs in the form of the Carbon Price Support (CPS) rates of the Climate Change Levy. Argus uses the applicable emissions and energy content factors as published by the UK government in calculating the CPS component of UK generation margins.

The UK Treasury sets the level of the CPS two years in advance of the relevant tax year, which begins on 1 April. In the absence of definitive guidance, Argus will use the latest available CPS rate in calculating future generation margins.

The CPS is levied on a gross calorific value basis. As coal prices are assessed on a net calorific value basis, Argus uses conversion factors as published by the Department for Business, Energy and Industrial Strategy’s Digest of UK Energy Statistics in calculating the CPS component of UK generation margins.

The CPS is set using the most recent emissions factors available from the Greenhouse Gas Conversion Factor Repository published by the Department for Environment, Food and Rural Affairs.

For the ETS, UK emissions factors are taken from the carbon emission factors and calorific values from the UK Greenhouse Gas Inventory, which is published on an annual basis.

The most recent emissions factors are used to calculate generation margins for future delivery periods. Natural gas CO₂ emissions fac-

tors are published on a regional basis. The median UK figure will be used in calculating UK generation margins.

Currency conversion

Prices are converted into UK pounds sterling (£) and euros (€) per megawatt hour for comparative purposes.

Example: 27 March 2019 CSP adjusted, front month dark spread

Input	Value
UK carbon support tax (CSP) £/t	18.00
UK carbon intensity CPS	0.3243
UK carbon intensity ETS	0.3312
ETS prompt assessment £/t	18.62
Electricity base-load April assessment £/MWh	43.90
Coal ARA 6,000 kcal NAR cif month-ahead assessment £/MWh	6.64
Efficiency	0.30

Carbon price support adjusted calculation

Formula: Power - (Coal + (ETS* UK Carbon intensity ETS + UK Carbon Support Tax * UK Carbon intensity EPS))/Efficiency

Calculation	Output £/MWh
43.9 - (6.64 + (18.62*0.3312 + 18*0.3243))/0.3	-18.24

Example: 27 March 2019 ETS adjusted, front month dark spread

Input	Value
Carbon intensity ETS	0.3410
ETS prompt assessment €/t	21.77
Electricity base-load April assessment €/MWh	36.20
Coal ARA 6,000kcal NAR cif month-ahead assessment €/MWh	7.80
Efficiency	0.30

ETS adjusted calculation

Formula: Power - (Coal + (ETS*Carbon intensity ETS))/Efficiency

Calculation	Output €/MWh
36.2 - (7.8 + (21.77*0.341))/0.3	-14.55

Guarantee of origin (GOO)

Guarantees of origin (GOOs) are a voluntary scheme under which certificates are issued to document the origin of electricity produced from specified sources as regulated in Article 15 of the European Directive 2009/28/EC. To be considered consumed or used by an electricity consumer or utility, a GOO must be cancelled in a national electronic certificate registry.

Spot trading involves buying and selling of GOOs generated at any point during the 12 months before the date of trade. Calendar year contracts specify the generation period.

Price assessments are published for Nordic unsupported hydro-power GOOs and European unsupported or supported wind GOOs.

Nordic hydropower GOO price assessments are for GOOs issued for hydropower generation in Denmark, Sweden, Norway and Finland, unsupported by other direct market subsidies. European wind power GOO price assessments are for GOOs issued for wind

generation that is supported or unsupported by other direct market subsidies. All products are generated in countries with European Energy Certificate System (EECS) certification.

End-of-day price assessments are compiled between 4.00pm and 5.30pm London time and reflect fair value of a given product at the market close, as signalled by the cessation of trading in the over-the-counter (OTC) market.

End-of-day price assessments are published as a best buy and sell price (also referred to as the highest bid and lowest offer), the midpoint of which represents the assessment of the contract's value at the market close.

Prices are published in €/MWh.

Contract specifications and delivery timings

Delivery timing: The year of generation for which the GOO applies

Minimum size: 1GWh

Contracts assessed: Previous year, current year and one year ahead.

Published generating margins						
Fuel	CO ₂	Prompt	Months	Quarters	Seasons	Years
Dutch base and peak load						
ARA coal	ETS and unadjusted	Day-ahead and weekend*	3	4	-	3
TTF gas	ETS and unadjusted	Day-ahead and weekend*	3	4	-	3
France base and peak load						
ARA coal	ETS and unadjusted	Day-ahead and weekend*	3	4	-	3
Peg gas	ETS and unadjusted	Day-ahead and weekend*	3	3	-	1
German base and peak load						
ARA coal	ETS and unadjusted	Day-ahead and weekend	3	5	-	3
Gaspool gas	ETS and unadjusted	Day-ahead and weekend	3	6	-	3
NCG gas	ETS and unadjusted	Day-ahead and weekend	3	6	-	3
Italy base and peak load						
ARA coal	ETS and unadjusted	Day-ahead	3	3	-	1
PSV gas	ETS and unadjusted	Day-ahead	3	3	-	1
UK base and peak load						
ARA coal	ETS, ETS + CPS and unadjusted	Day-ahead and weekend*	3	4	1	1
NBP gas	ETS, ETS + CPS and unadjusted	Day-ahead and weekend*	5	4	7	1
Spain base load						
ARA coal	ETS and unadjusted	Day-ahead	2	1	-	1
PVB gas	ETS and unadjusted	Day-ahead	1	1	-	-
Belgium base load						
ZTP gas	ETS and unadjusted	Day-ahead	1	1	-	1
Hungary base and peak load						
Hungary MGP	ETS and unadjusted	Day-ahead	-	-	-	-
Slovak base load						
Slovak VTP	ETS and unadjusted	Day-ahead	1	-	-	-
Czech base load						
Czech VTP	ETS and unadjusted	Day-ahead	2	2	-	1
Turkish base load						
OTC gas	Unadjusted	Day-ahead	-	-	-	-
BOTAS industrial gasl tariff	Unadjusted	-	1	-	-	-
LNG Turkey delivered spot	Unadjusted	-	1	-	-	-
Turkey supra plus coal	Unadjusted and coal tax adjusted	-	2	-	-	-

*Note: Where indicated, only base-load weekend spark and dark spreads are published