METHODOLOGY AND SPECIFICATIONS GUIDE

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ENERGY ARGUS PETROLEUM COKE

Contents:

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The most up-to-date Energy Argus Petroleum Coke 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 indicators of commodity market values, free from distortion and representative of market values. As a result, the specific currencies, volume units, locations and other particulars of an assessment are determined by industry conventions.

In petroleum coke markets, Argus publishes weekly price assessments and monthly price indexes 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 bilateral market participants, marketers and brokers. Argus will also receive market data from electronic trading platforms, Argus Open Markets® (AOM®) and directly from the back offices of market participants. Argus will accept market data by telephone, instant messenger, email, *AOM* 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, and location basis.

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 judgement 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 judgement 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, counterparty 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 petroleum coke prices are published in Energy Argus Petroleum Coke, while subsets of these prices appear in other Argus market reports and newsletters. A selection of Argus' coal and freight prices are also published in the report and other services. 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 period assessed.

Argus reviews corrections for material effect on price data and the amount of time that has elapsed from the date of published price data before deciding whether to issue a correction. After 30 days, Argus is unlikely to make a correction to published data.

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 indicators of commodity market values, free from distortion and representative of market values. 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
- 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.

The market

Argus produces weekly price assessments and monthly price indexes for key petroleum coke grades and markets around the world.

If the specifications of a trade differ from those for the assessed grades described below, Argus will seek a market consensus on adjusting the traded value to inform the index. Argus surveys producers, marketers/traders, electricity generators, heavy industry end users and other market participants.

There are several regional supply and demand centres and market hubs in petroleum coke markets, each with unique characteristics based on contract terms, scheduling, logistics, liquidity and transparency.

The most-liquid coke markets — fob markets at the US Gulf and west coasts, and cfr markets in India, China, and Turkey — are assessed independently. Other demand hubs including Europe, Brazil and Japan are priced based on a net forward calculation from key supply regions.

Timing

Prices are for activity negotiated during the assessment period for loading or delivery within 90 days from the end of the period.

Weekly assessments

Argus weekly price assessments are an intelligent assessment of the price at which most deals were transacted or would have transacted over the week assessed. A four-week rolling average of these weekly assessments is calculated and included as an additional reference point. See the fuel-grade petroleum coke assessments table.

Calendar month indexes

Argus publishes calendar month indexes for fuel-grade petroleum coke on the last publication day of the assessed calendar month. Monthly indexes are published for each market for which a weekly assessment is published. Monthly indexes are calculated as an average of weekly assessments published during the assessed calendar month. The highest and lowest weekly assessments of the month are also published for each specification. See the fuel-grade petroleum coke assessments table.

Calendar month assessments

Argus also publishes calendar month assessments for anode-grade petroleum coke markets on the last publication day on or before the 11th of the following month. These assessments are of the range within which anode-grade petroleum coke traded or could have traded during the named calendar month based on market activity during the full month of trade. See the anode-grade petroleum coke assessments table.

Currency and units of measure

Petroleum coke prices are published in US dollars per metric tonne ($/t). China domestic green coke prices are also published in yuan/tonne.

Specifications and assessments

Assessments are of the price of product meeting the below specifications and are not intended to correspond to the output of specific refineries.

Fuel-grade petroleum coke assessments

Prices are assessed weekly on an as-received, or wet, basis except as noted below. Petroleum coke is assumed to have 8pc moisture content.

Cokes that meet the Argus fuel-grade specifications for sulphur and HGI but are sold at a premium or discount to the broader fuel-grade market because of certain quality parameters — including but not limited to sponge content or low metals content — may be excluded from consideration in the fuel-grade price assessment process.

Seaborne fuel-grade assessments are for 50,000t cargoes. Significantly larger or smaller trades may be considered for inclusion in the assessment if considered relevant to the price of a standard trade.

Fuel-grade prices are published weekly for:

Atlantic basin
- fob US Gulf coast
  - 4.5pc sulphur, 40 HGI
  - 6.5pc sulphur, 40 HGI

- Delivered Brazil
  - 4.5pc sulphur, 40 HGI*
  - 6.5pc sulphur, 40 HGI*

- Delivered northwest Europe – ARA (Amsterdam, Rotterdam, Antwerp)
  - 4.5pc sulphur, 40 HGI*
  - 6.5pc sulphur, 40 HGI*

Mediterranean
- Turkey
  - cfr 5.5pc sulphur, 50-60 HGI (dry basis)
  - cfr 6.5pc sulphur, 40 HGI (dry basis)

Pacific basin
- fob US west coast
  - 2pc sulphur, 45 HGI (dry basis)
  - 4.5pc sulphur, 45 HGI (dry basis)

- Delivered Japan
  - 4.5pc sulphur, 45 HGI (dry basis)*

- China
  - cfr 2pc sulphur, 45 HGI (dry basis)
  - cfr 3pc sulphur, 45 HGI
  - delivered 4.5pc sulphur, 40 HGI*
  - delivered 4.5pc sulphur, 45 HGI (dry basis)*
  - cfr 6.5pc sulphur, 40 HGI
  - cfr 8.5pc sulphur, 70 HGI

- India
  - delivered 4.5pc sulphur, 40 HGI*
  - cfr 6.5pc sulphur, 40 HGI
  - cfr west coast India 8.5pc sulphur, 70 HGI

*delivered prices calculated using USGC or USWC fob coke prices and freight rates

Anode-grade petroleum coke assessments

Anode-grade assessments are assessed monthly on an as-received basis for green coke outside the US and on a dry basis for US Gulf green coke. All calcined coke assessments are on a dry basis. Petroleum coke is assumed to have 8pc moisture content.

Cokes that meet the Argus anode-grade specifications for sulphur and vanadium but are sold at a premium or discount to the broader anode-grade market because of certain logistical or regulatory factors — including but not limited to proximity, logistical constraints or government policies — may be excluded from consideration in the anode-grade price assessment process.

Seaborne anode-grade assessments are for 20,000-30,000t cargoes. Significantly larger or smaller trades may be considered for inclusion in the assessment if considered relevant to the price of a standard trade.

Anode-grade price assessments are published monthly for:

Green coke
- US Gulf coast
  - cif green 0.8pc sulphur dry basis, 150ppm vanadium
  - cif green 3pc sulphur dry basis, 300-400ppm vanadium
  - cif green 5pc sulphur dry basis, 500-600ppm vanadium

- China
  - cif green 0.8pc sulphur as received, 150ppm vanadium
  - ex-works green 0.8pc sulphur as received, 150ppm vanadium (yuan/t)
  - ex-works green 3pc sulphur as received, 400ppm vanadium (yuan/t)

- Mideast Gulf
  - fob green 4pc sulphur as received, 100-200ppm vanadium

Calcined coke
- US Gulf coast
  - fob calcined 3pc sulphur dry basis, 250-350ppm vanadium

- China
  - fob calcined 3pc sulphur dry basis, 250-350ppm vanadium

- Europe
  - cif calcined 1.5pc sulphur dry basis, 150-250ppm vanadium

- Mideast Gulf
  - cif calcined 3pc sulphur dry basis, 250-350ppm vanadium

Quality and discounting mechanisms

Argus indexes allow users to adjust for quality variances in supply contracts, such as for sulphur, Hardgrove Grindability Index (HGI), or delivery port. For fuel coke, sulphur has the most significant effect on price and the 4.5pc-over-6.5pc spread can be used to construct discounting mechanisms for sulphur on the US Gulf coast. Argus produces discounting mechanisms for the US Gulf coast based on the sulphur spread in regional coke and coal prices by prorating the spread between the US Gulf fob 4.5pc sulphur, 40 HGI and 6.5pc sulphur, 40 HGI coke price assessments per 0.1pc sulphur content.

Coke and coal

Petroleum coke is considered to have a heat content of 7,500 kcal/kg net as received (NAR), roughly equal to 13,970 Btu/lb gross as received (GAR), where 1 kcal = 3.968 Btu (1 Btu = 0.251 kcal) and there is a difference of 260 kcal/kg, or 470 Btu/lb, between NAR and GAR. The heat value of petroleum coke is typically expressed in kcal/kg NAR outside the US, but in Btu/lb GAR inside the US. The latest available coal prices are used in the comparisons and forward curves.

Coke-to-coal calorific comparisons

Argus publishes weekly coke-to-coal comparisons for select regional hubs. Each coke and corresponding coal price is converted from $/t into $/mn Btu, to adjust for the two commodities' differing heat contents. A $/mn Btu price is published for each coke price, and each is shown as a percentage of the corresponding coal price to illustrate its relative economic value compared with the major competitive fuel.

Comparisons are published for:

As a comparison to fob New Orleans 6,000 kcal/kg NAR coal
- US Gulf coast 4.5pc sulphur coke
- US Gulf coast 6.5pc sulphur coke

See the Argus Coal Daily methodology

As a comparison to cif ARA 6,000 kcal/kg NAR coal
- ARA 4.5pc sulphur coke
- ARA 6.5pc sulphur coke

As a comparison to cif Turkey supra plus 6,000 kcal/kg NAR coal
- Turkey 5.5pc sulphur coke
- Turkey 6.5pc sulphur coke

As a comparison to 5,500kcal/kg NAR cfr India coal
- India 6.5pc sulphur coke
- India 8.5pc sulphur coke

As a comparison to cfr south China 5,500kcal NAR coal
- China 6.5pc sulphur coke
- China 8.5pc sulphur coke

See the Argus Coal Daily International methodology.

Coke freight rates

Energy Argus Petroleum Coke includes weekly snapshots of daily petroleum coke freight rate assessments published in Argus Dry Freight. Rates are the latest available at the time of publication. See the Argus Dry Freight methodology.

- East coast Saudi Arabia to west coast India 50,000t
- US Gulf coast to Turkey 50,000t
- US Gulf coast to ARA 50,000t
- US Gulf coast to east coast India 50,000t
- US west coast to Japan 70,000t