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ARGUS NORTH AMERICAN SULPHUR AND SULPHURIC ACID

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The most up-to-date Argus North American Sulphur and Sulphuric Acid 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 North American Sulphur and Sulphuric Acid markets, Argus publishes physical market 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.

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 dif-

ferently 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, 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

North American sulphur and sulphuric acid prices are published in the Argus North American Sulphur and Sulphuric Acid 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.

Introduction

Argus publishes Argus North American Sulphur and Sulphuric Acid once a week. The report contains North American sulphur and sulphuric acid prices, market commentary and information on related markets including natural gas, crude, base metals and phosphate fertilizers.

General methodology

The Argus North American Sulphur and Sulphuric Acid team consists of specialist market reporters/analysts in the US as well as Argus' global network of correspondents.

The team surveys a wide cross-section of market participants during the week via telephone, instant messenger, email and in-person interactions. A balance is maintained in the survey between sellers, buyers and trading companies. The survey seeks to discover deals done, bids, offers, other relevant valuations of market levels and fundamentals data. Argus will contact and accept market data from all credible market sources including front and back office of market participants and brokers.

The report seeks to determine ranges in which transactions are taking place or in which transactions could have taken place between a willing buyer and seller. In markets that occasionally lack liquidity, Argus may assess price ranges based on market discussions with buyers and sellers.

Procedure for price assessments

Assessments for benchmark sulphur and sulphuric acid prices represent a range in which a deal between a willing buyer and seller could have been done from Friday morning until the following Thursday afternoon or within the given contract period. Deals, bids and offers and other relevant information over the course of the entire trading week prior to publication may be considered when assessing prices.

When there is adequate liquidity and deals are deemed reliable and representative, Argus will establish the range by using the low and the high of confirmed deals done throughout the trading week, with information gathered Friday morning through to Thursday at 1:00pm Houston time. To qualify to set the low or high of the week, deals must meet the minimum volumes and strict delivery, timing, and specification requirements in our methodology. Argus works to validate all deal prices, counterparties, and volumes.

Should a deal fall well outside of the the generally observed lows and highs that operated throughout the trading period or raise other concerns, Argus will subject the deal to further scrutiny, which will involve consultation with industry sources and review by senior Argus management. This process is critical to ensuring that the Argus range of trade remains representative. Argus reserves the right to exclude deals from the range of trade.

In the absence of verified high or low deals, Argus makes an intelligent assessment of the high-low range at which deals could have been done.

Information on transactions, bids and offers that lie outside the specifications of timing, size, location and quality may be taken into account, especially when making an intelligent assessment, but information that lies within the listed specifications of the assessment will be given most weight.

Publishing schedule

Argus North American Sulphur and Sulphuric Acid is published 51 weeks a year on a Thursday night. A report is not published the week of 25 December-1 January, depending on how the Christmas and New Year holidays fall. In the event of a federally-recognized US holiday falling on a Thursday, Argus North American Sulphur and Sulphuric Acid will assess all prices and publish on the Wednesday prior to the holiday. When the report publishes on a Wednesday, prior-week data will be published for international assessments and used to calculate assessments based on international data normally published on Thursdays.

Markets snapshot

Please see the product methodology for sulphur and sulphuric acid for each price published in the markets snapshot. Related market prices include the crude sweet-sour spread, copper and freight rates.

Sweet-sour crude spread

This is a calculated five-day average (Friday through Thursday) of the difference between the Light Louisiana Sweet (LLS) weighted average front-month differential index less the Mars weighted average front-month differential index. These prices are assessed daily for the Argus Americas Crude report. See the [Argus Americas Crude methodology](#).

Copper

This is a calculated five-day average (Friday through Thursday) of the COMEX HG Copper front-month price based on settlement prices reported by CME.

Corn

This is a calculated five-day average (Friday through Thursday) for corn contracts based on Chicago Mercantile Exchange (CME)/Chicago Board of Trade (CBOT) settlement prices.

Ethanol

Chicago (Argo): This is an average of the fob Chicago (Argo) prompt assessment published in Argus Americas Biofuels since Argus North American Sulphur and Sulphuric Acid was last published. See the [Argus Americas Biofuels methodology](#).

Freight

- Dry sulphur Vancouver - China 50,000-60,000t
- Dry sulphur US Gulf - Brazil 35,000-40,000t
- Sulphuric acid northwest Europe - US Gulf 18,000-30,000t
- Sulphuric acid Mediterranean - US Gulf 18,000-30,000t

For sulphur freight rates, see the [Argus Sulphur methodology](#). For sulphuric acid freight rates, see the [Argus Sulphuric Acid methodology](#).

Sulphur

Sulphur (formed)

- US Gulf export spot \$/t fob
- US west coast export spot \$/t fob
- Vancouver export spot \$/t fob

Formed sulphur (granular) specifications:

Purity on a dry basis min 99.5% by weight
Ash content max 0.05% by weight
Moisture max 0.5% by weight

All solid sulphur prices are assessed on a fob basis at the main North American export points — US Gulf, US west coast and Vancouver. All prices are assessed in \$/t. Prices are assessed through the aforementioned market survey process. In addition to information obtained through market surveys, fob prices for these export points are assessed on the basis of cfr business to main delivery

In all references:

- t = metric tonne
- st = short ton
- lt = long ton
- eq = equivalent
- cfr = cost and freight
- del = delivered
- fob = free on board
- fot = free on truck

points with appropriate freight cost deducted, but this is never the sole basis of the assessment.

The US Gulf export price is assessed on a spot basis and as a quarterly contract price range (January-March, April-June, etc) for material exported through ports in Louisiana and Texas. US Gulf export prices are assessed in London for the Argus Sulphur weekly report and will be assessed based on information gathered until 5:00pm UK time. The assessment window for this price closes at 5:00pm UK time every Thursday.

See the [Argus Sulphur methodology](#).

The US west coast and Vancouver price assessments are of spot market prices at those locations. The Vancouver price is assessed in London for the Argus Sulphur weekly report. The US west coast price is assessed in Houston. Market information will be collected up until 5:00pm London time and 1:00pm Houston time, respectively, on the day of publication (Thursday).

Sulphur (molten)

- Tampa del qly contract \$/lt del
- Lower Atlantic del qly contract \$/lt del
- Gulf coast ex-refinery qly contract \$/lt fob
- Midwest ex-refinery qly contract \$/lt fob

Molten sulphur specifications:

Purity 99.9% as elemental sulphur by weight
Moisture max 0.5% by weight
Reduced carbon max 0.1% by weight
As, Se and Te content - each less than 0.1ppm

Cfr Tampa quarterly - see the [Argus Sulphur methodology](#).

Gulf coast/Midwest ex-refinery quarterly contract - assessed on a quarterly contract (January- March, April-June, etc) basis and reported per long ton on a fob basis in US dollars.

The Gulf coast is defined as sulphur produced at refineries in Louisiana and Texas because of the significant capacity in these regions. The Midwest ex-refinery assessment, the Midwest region includes sulphur produced at refineries in Illinois, Indiana, Kentucky, Michigan, Ohio and Oklahoma.

These assessments are of the price range refiners are selling product for directly from the point of production based on market information from producers, end users and freight providers. The

price will be assessed in the publication the week after the settlement of the Tampa del qly contract sulphur price is reported in Argus Sulphur.

Market information will be collected up until 1:00pm Houston time on the day of publication (Thursday).

Lower Atlantic quarterly contract - defined as the states of Georgia, North Carolina, South Carolina, Virginia and West Virginia. The Lower Atlantic price is an assessment of the differential consumers are paying to the cfr Tampa quarterly contract price.

The price is assessed on a quarterly contract (January-March, April-June, etc) basis in US dollars per long ton, delivered by any transport mode: truck, rail, barge or vessel from any domestic or foreign source.

The price is assessed in the publication the week after the settlement of the cfr Tampa quarterly contract sulphur price is reported.

Sulphuric acid

Sulphuric acid prices:

- US imports spot \$/t cfr
- Midwest qly contract \$/st del
- Gulf coast qly contract \$/st del
- Lower Atlantic qly contract \$/st del

Sulphuric acid specifications:

93-98% grade

Iron (Fe) <50 ppm concentration

Nitrate (NO₃⁺) <5 ppm concentration

Mercury (Hg) <1 ppm concentration

Arsenic (As) <1 ppm concentration

US southeast cfr vessel import - see the [Argus Sulphuric Acid methodology](#) for more information.

Midwest, Gulf coast and Lower Atlantic qly contract — Argus reports three regional consumer prices for the Gulf coast (PADD 3), Lower Atlantic (PADD 1C) and Midwest (PADD 2) regions. The PADD delineations are set by the US Energy Administration (EIA) and a map indicating the regions is published in the report each week. Prices are assessed through the market survey process and reported as quarterly contracts (January-March, April-June, etc) for each market on a per short ton delivered basis.

The price is assessed and published the week after the settlement of the cfr Tampa quarterly contract sulphur price is reported in Argus Sulphur.

Sulphur-based product typically will represent the high end of the price range while smelter-based product will represent the low end of the range as this sulphuric acid is generally of lower quality.

Prices are delivered to consumer, defined as delivery of sulphuric acid from North America or Mexico via rail directly to the buyer. Contract prices are included in the assessment process if the product falls within the specifications described above with a minimum annual purchase volume of 10,000st at one location. Prices for material delivered by truck or barge are excluded.

Volumes purchased from producers by resellers and distributors will be considered for inclusion in the assessment. Contract prices for volume that they then resell or distribute will only be considered for inclusion in the assessment if it falls within the above-described parameters.

Phosphate

Tampa fob t (exports)

See the [Argus Phosphates methodology](#).