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ARGUS EO AND DERIVATIVES

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The most up-to-date Argus EO and Derivatives 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 ethylene oxide and derivatives 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. 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 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 judgement 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 judgement 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 judgement.

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 judgement 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 ethylene oxide, ethylene glycols and ethanolamines prices are published in the Argus Ethylene Oxide and Derivatives 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 judgement 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 judgement
- 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 judgement for illiquid markets
- Editors are required to sign-off on all price assessments each day, thus ensuring the consistent application of judgement.

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 EO and Derivatives is a weekly report that publishes prices and market commentary on ethylene oxide and its major derivatives: ethylene glycols and ethanolamines.

Publication schedule

The report is published each Wednesday. See the [Argus publication schedule](#) for a list of dates on which Argus EO and Derivatives is not published.

Units and currencies

Prices are reported in ¢/lb for the US, €/t for Europe and RMB/t for Asia unless stated otherwise, but are also converted to US dollars per metric tonne (\$/t) for regional comparisons, using the exchange rate on the day of assessment.

Ethylene oxide and derivatives market prices

Ethylene oxide and derivatives prices are assessed on free on board (fob), cost and freight (cfr), cost, insurance and freight (cif), free carrier (fca), ex-tank or delivered basis.

Prices are the range in which product traded or could have traded during the assessment period based on trades, bids and offers and other market information.

Formula-priced deals, market fundamentals and information regarding trade in material that does not meet specifications may also inform assessments.

Argus verifies contract prices with major producers and consumers each month.

Ethylene oxide

US

Argus publishes a monthly outright contract price for purified ethylene oxide (EO) calculated using a model of a representative hypothetical mid-sized buyer.

The calculation uses a dynamic formula that takes into account the Argus assessment of ethylene feedstock, freight and energy costs, and a periodically-reviewed "adder".

The energy cost factor is calculated monthly using Argus natural gas prices and only applies if above a periodically-reviewed threshold.

Timing: delivered in the named month

Specification: 99.95pc ethylene oxide

Location: delivery by tank lorry, railcar, pipeline or barge in the lower 48 US states

Ethylene reference price: US ethylene monthly contract price

Energy reference price: Argus Henry Hub day-ahead index

See the [Argus Ethylene and Derivatives](#) and [Argus Natural Gas Americas](#) methodologies.

Settlement timing

Ethylene oxide contract prices depend on the settlement of ethylene contract prices. Ethylene oxide contract prices will be published monthly online as soon as all required inputs are available and in the next print report.

Europe

Argus publishes a monthly outright contract price for purified ethylene oxide calculated using a model of a representative hypothetical mid-sized buyer.

The calculation uses a dynamic formula that takes into account the Argus assessment of ethylene feedstock, freight and energy costs, and a periodically-reviewed "adder".

The energy cost factor is calculated monthly using Argus natural gas prices and only applies if above a periodically-reviewed threshold.

Timing: delivered in the named month

Specification: 99.95pc ethylene oxide

Location: delivery by tank lorry, railcar, pipeline or cross-Channel ferry in western Europe

Ethylene reference price: northwest Europe ethylene monthly contract price

Energy reference price: Argus TTF front-month

See the [Argus Ethylene and Derivatives](#) and [Argus European Natural Gas](#) methodologies.

Settlement timing

Ethylene oxide contract prices depend on the settlement of ethylene contract prices. Ethylene oxide contract prices will be published monthly online as soon as all required inputs are available and in the next print report.

Asia-Pacific

China domestic

The prevailing price offered by east China producers.

The price is published weekly in Yn/t.

Specification: 99.95pc ethylene oxide

Location: ex-tank east China (including Zhejiang, Shanghai and Jiangsu)

Timing: delivery within a week

Volume: 100-500t

Ethylene glycols

US

Monoethylene glycol monthly contract

Argus assesses contract prices for domestically-produced monoethylene glycol in the lower 48 US states during the named month on a fob basis.

Specifications

Molecular weight: 62.07 g/mol

Dynamic viscosity at 20°C: 19.83cP

Diethylene glycol monthly contract price

Argus assesses contract prices for domestically-produced diethylene glycol in the lower 48 states during the named month on a fob basis.

Specifications

Molecular weight: 106.12 g/mol

Dynamic viscosity at 20°C: 35.7cP

Spot MEG, DEG and TEG

Argus publishes weekly spot prices for fob supply (rail or vessel) of domestically-produced or imported monoethylene glycol (MEG), diethylene glycol (DEG) and triethylene glycol (TEG) in the US within 30-days of the assessment date.

Specifications

MEG

Molecular weight: 62.07 g/mol

Dynamic viscosity at 20°C: 19.83cP

Minimum lot size: 500t for MEG

DEG

Molecular weight: 106.12 g/mol

Dynamic viscosity at 20°C: 35.7cP

Minimum lot size: 250t for DEG

TEG

Specific gravity, at 20°C: 1.124 -1.26

Minimum lot size: 100t

Europe

Monoethylene glycol monthly contract

See the [Argus Ethylene and Derivatives methodology](#).

Spot prices

Argus publishes weekly spot prices for delivery of domestically-produced or imported monoethylene glycol (MEG), diethylene glycol (DEG) and triethylene glycol (TEG) in the Amsterdam-Rotterdam-Antwerp (ARA) region within 30-days of the assessment date.

Spot prices are published for:

- MEG T2 bulk cif
- MEG T2 fca
- DEG T2 bulk cif
- DEG T2 fca
- TEG fca

Specifications

Spot MEG prices are for trade in both fiber and technical grade product.

MEG fiber grade

Minimum purity: 99.9pc

Maximum DEG content: 0.05pc

Maximum water content: 0.05pc

Acidity: 0.002pc

Minimum lot size: 1,000t bulk or 24t for truck or rail fca deliveries

MEG technical grade

Minimum purity: 99pc

Maximum DEG content: 0.5pc

Maximum water content: 0.2pc

Acidity: 0.005pc

Minimum lot size: 1,000t bulk or 24t for truck or rail fca deliveries

DEG

Minimum purity: 99.5pc

Maximum water content: 0.2pc

Minimum lot size: 1,000t bulk or 24t for truck or rail fca deliveries

TEG

Minimum purity: 99pc

Maximum water content: 0.2pc

Minimum lot size: 24t for truck or rail fca deliveries

Asia-Pacific

MEG

Daily

Argus publishes daily MEG prices on a cfr China and delivered domestic China basis. Daily assessments include trades, bids and offers up to 5.00pm Shanghai time on the day of assessment and are published on the Argus Direct platform and via other digital distribution channels.

- If multiple trades meeting the below specifications are reported, Argus will publish the lowest and highest trade price for that day
- If no trades meeting the below specifications are reported, Argus will publish the highest bid and the lowest offer of the day

cfr China

Specifications

Location: China

Timing: up to 30 days from the date of publication

Trade size: 1,000t

Specification: minimum purity 99.5pc

Basis: cfr

Port Basis: Ningbo, Zhangjiagang and Taicang

Domestic China

Specifications:

Location: ex-tank domestic China

Timing: up to 14 days from the date of publication

Trade size: 1,000-2,000t

Specifications: minimum purity 99.5pc

Basis: ex-tank

Weekly

Weekly cfr China and fob South Korea MEG prices are also published, see the [Argus Toluene, Xylenes and Isomers/PET methodology](#).

Ethanolamines

US

Argus publishes weekly freely-negotiated prices for bulk loading of monoethanolamine (MEA), diethanolamine (DEA) and triethanolamine (TEA) in the lower 48 states of the US within 30-days of the assessment date.

Prices are published for:

- MEA fob
- DEA fob
- TEA fob

Specification

MEA molecular weight: 61.08 g/mol

DEA molecular weight: 105.14 g/mol

TEA molecular weight: 149.19 g/mol

Minimum lot size: 50t

Europe

Argus publishes weekly spot prices for bulk deliveries of monoethanolamine (MEA), diethanolamine (DEA) and triethanolamine (TEA) in the ARA region within 30-days of the assessment date.

Prices are published for:

- MEA fca
- DEA fca
- TEA fca

Specification

MEA minimum purity: 99pc

DEA minimum purity: 98pc

TEA minimum purity: 99pc

Minimum lot size: 20t for truck deliveries in bulk

Raw material cost deltas

Argus publishes the month-on-month change in raw material costs needed to produce monoethanolamine (MEA), diethanolamine (DEA) and triethanolamine (TEA) in the US and Europe based on the relevant ethylene oxide contract prices described above and monthly average fob US Gulf and cfr northwest Europe ammonia prices (see the [Argus Ammonia](#) and [Argus North American Fertilizer](#) methodologies).

For each product, ethylene oxide and ammonia are assumed to contribute to the raw material cost in the below ratios (ethylene oxide:ammonia)

- MEA: 72:28
- DEA: 84:16
- TEA: 89:11

Related markets

Crude

- Ice Brent
- Nymex WTI

Naphtha

- 70mn paraffin US Gulf coast waterborne del - see the [Argus US Products methodology](#)
- 65 para NEW cif - see the [Argus European Products methodology](#)
- Japan c+f - see the [Argus Asia-Pacific Products methodology](#)

Ethylene

- del US Gulf coast contract (\$/lb \$/t)
- del Europe contract (€/t, \$/t)
- cfr northeast Asia

See the [Argus Ethylene and Derivatives methodology](#)