European Spot Gas Markets Methodology

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Introduction to European Spot Gas Markets (ESGM)

European Spot Gas Markets (ESGM) contains independent price assessments and indices for mature and emerging gas markets, as well as in-depth analysis on price drivers, authoritative commentary on each day's trading activity and daily news. Coverage for some markets stretches back as far as 1994 and a comprehensive price history database is available for this report.

ESGM is published every English working day in the evening as a PDF with data also available through an FTP feed.

An additional service for early price assessments on key markets is available. This service is called ESGM Intraday Update. It is published as an embedded email as well as through an FTP feed.

General methodology

ICIS continuously develops, reviews and revises its methodologies in consultation with industry participants. Product specifications and trading terms and conditions used are intended to reflect typical working practices prevalent in the industry.

ICIS publishes market assessments based on information continuously gathered from market participants about: spot transactions, spot bid and offer levels, contract price negotiations, prices of related commodities, and relevant freight costs.

ICIS does not make retrospective adjustments or changes to price assessments based on information received after publication time in all cases or after any cut-off point specified in individual methodology documents.

ICIS regards all arm's-length transactions which meet its specification criteria as carrying equal weight.

ICIS uses proprietary models where necessary to normalise data to the typical specifications for cargo size and date ranges given for each commodity.

Some ICIS assessments are the product of calculation alone, for example in markets where insufficient market activity takes place to permit price assessment, or where a market habitually itself sets prices according to a formula. Such calculated assessments are noted as such in their detailed methodology specifications.

ICIS endeavours to cross-check all the transaction information it gathers. ICIS will not use information for assessment purposes where such checks call into doubt the accuracy of the original information, or where a transaction appears to have occurred under circumstances that render it non-repeatable or otherwise markedly unusual.

Rationale for gas methodology

All ICIS gas prices contained in ESGM are intended to provide a reliable and accurate measure of physical market value on the over-the-counter (OTC) traded markets.

In order to do this, ICIS has adopted two different methodological approaches, which can be applied as reliable measures but at different stages in the development of trade at a particular location: assessment and index.

Assessment

For markets at all stages of development, ICIS deems its assessment methodology to be appropriate. This methodology is designed to discover the tradable value of a commodity at a particular point in time. It is particularly useful in allowing a comparison in value across various geographies and for various delivery periods. Most assessments in ESGM are made at the close of the trading day, as this is the time at which most companies need to mark their positions to market and finalise their physical trading positions. ICIS provides earlier assessments for some markets as an additional service, subject to customer demand and market liquidity.

The Bid and Offer range published in ICIS assessments represents the highest buyer's bid and the lowest seller's offer at the relevant closing time of each market.

Some companies choose to use the midpoint between this bid and offer as the best indicator of market value.

ICIS uses transaction data as well as bid and offer data in its assessment process. Transaction information is used to verify bid or offer information when available.

Where a transaction can be confirmed at exactly the time of the published market close, it will not necessarily supersede a firm bid-offer spread. This is because on the more active gas markets, ICIS considers the depth and continuity of bid/offer information to be the most reliable measure of market value. On the less active contracts, there will not typically be a transaction exactly at the ICIS published assessment time. See the section entitled "exercise of judgment" below.

Index

An index is formed using transaction data only. This methodology can provide a reliable measure of market value when markets have developed to a point of relatively high liquidity. A mechanistic, deals-based index for a contract with low liquidity leads to erratic switches from defined default methodologies.

This is why ICIS will not typically publish an index until it has at least six months' worth of data showing that at least 10 deals have been completed for each index period.

Indices are not considered to be an accurate way to represent price differentials between different geographies and delivery contracts, as they do not represent market value at a set point in time but rather an average of deals done over a given period of time.

All ICIS indices are formed of a weighted average of deals done. Criteria for inclusion or exclusion of deals are described below.

The indices are published as a single value, to three decimal places.

List of primary price references

Hub	Assessments	Indices	Units quoted
British NBP	Day-ahead, Weekend, WDNW, BOM, six months ahead, 11 quarters ahead, 10 seasons ahead, two gas years ahead and two calendar years ahead	Within-day, Within-day Cumulative, Day-ahead, Day-ahead HCI, Day-ahead Cumulative, Weekend, Spot Weekend, Weekend HCI, Monthly, Monthly Cumulative, Daily Month Ahead, Volatility Index	p/th. Converted to €/MWh and $/MMBtu
Belgian Zeebrugge	Day-ahead, Weekend, WDNW, BOM, three months ahead, six quarters ahead, three seasons ahead, one gas year ahead and one calendar year ahead	Day-ahead, Day-ahead Cumulative, Weekend, Spot Weekend, Monthly, Monthly Cumulative, Daily Month Ahead	p/th. Converted to €/MWh
Belgian/Luxembourgian ZTP	Day-ahead, Weekend (only on the last English working day of the week), one month ahead, one quarter ahead and one season ahead		€/MWh
Dutch TTF	Day-ahead, Weekend, WDNW, BOM, six months ahead, 10 quarters ahead, 10 seasons ahead, one gas year ahead and four calendar years ahead	Day-ahead, Day-ahead Cumulative, Day-ahead HCI, Weekend, Spot Weekend, Weekend HCI, Monthly, Monthly Cumulative, Daily Month Ahead, Volatility Index	€/MWh. Converted to $/MMBtu
French PEG Nord	Day-ahead, Weekend (only on the last English working day of the week), BOM, three months ahead, three quarters ahead, three seasons ahead and one calendar year ahead	Day-ahead, Day-ahead Cumulative, Spot Weekend, Monthly, Monthly Cumulative	€/MWh
French TRS	Day-ahead, Weekend (only on the last English working day of the week), one month ahead, one quarter ahead and one season ahead	Day-ahead, Day-ahead Cumulative, Spot Weekend	€/MWh
German NCG	Day-ahead, Weekend, WDNW, BOM, four months ahead, four quarters ahead, five seasons ahead and three calendar years ahead	Day-ahead, Day-ahead Cumulative, Spot Weekend, Monthly, Monthly Cumulative, Daily Month Ahead	€/MWh
German GASPOOL	Day-ahead, Weekend, WDNW, BOM, three months ahead, four quarters ahead, five seasons ahead and three calendar years ahead	Day-ahead, Day-ahead Cumulative, Spot Weekend, Monthly, Monthly Cumulative	€/MWh
Austrian VTP	Day-ahead, Weekend (only on the last English working day of the week), BOM, three months ahead, two quarters ahead, three seasons ahead and one calendar year ahead	Day-ahead, Day-ahead Cumulative, Spot Weekend, Monthly, Monthly Cumulative	€/MWh
Italian PSV	Day-ahead, Weekend (only on the last English working day of the week), BOM, three months ahead, four quarters ahead, three seasons ahead, one gas year ahead and two calendar years ahead	Day-ahead, Day-ahead Cumulative, Spot Weekend, Monthly, Monthly Cumulative	€/MWh
Czech Republic	Day-ahead, Weekend (only on the last English working day of the week), BOM, three months ahead, two quarters ahead, two seasons ahead and one calendar year ahead		€/MWh
Spanish PVB	Day-ahead, Weekend (only on the last English working day of the week), two months ahead, two quarters ahead and one calendar year ahead		€/MWh
Turkish UDN	Day-ahead and 7-day ex-post. Individual Forward Weekend days published on last English working day of the week. Ex-post Weekend days assessed individually for the days following the latest Ex-Post assessment		TL/kcm. Converted to €/MWh, $/MWh and $/MMBtu.
Slovakia	Day-ahead, Weekend (only on the last English working day of the week), BOM and one month ahead		€/MWh

Hungarian MGP	Day-ahead, Weekend (only on the last English working day of the week)		€/MWh
Small-scale truck-loaded LNG	Front year price spread of truck-loaded LNG contract relative to associated hub		€/MWh

Definition of hubs

NBP: The British virtual gas hub operated by transmission system operator (TSO) National Grid, covering all entry and exit points in mainland Britain.

Zeebrugge: The physical gas hub at Zeebrugge (Zee Beach) in Belgium operated by Huberator, a 100% subsidiary of Belgian TSO Fluxys.

ZTP: The virtual gas hub in Belgium and Luxembourg operated by TSOs Fluxys and Creos covering all high calorific entry and exit points.

TTF: The virtual gas hub covering all high calorific entry and exit points in the Netherlands, operated by Dutch TSO Gasunie Transport Services.

PEG Nord: The French virtual gas hub covered by the high calorific entry/exit market zone operated by GRTgaz.

TRS: The French virtual gas hub which is a partnership between TSOs GRTgaz and TIGF.

NCG: The German virtual trading point covered by the high calorific market. A joint company for operating the market area cooperation from the grid companies bayernets, Fluxys TENP, Open Grid Europe, GRTgaz Deutschland, terranets and Thyssengas.

GASPOOL: The German virtual trading point covered by the high calorific market. A subsidiary of GASCADE, Gastransport Nord, Gasunie Deutschland Transport Services, Nowega and ONTRAS. With the integration of the market area H-Gas Northern Germany, jordgas Transport is also involved in this market area cooperation.

VTP: The Austrian Virtual Trading Point operated by the Central European Gas Hub.

PSV: The virtual gas hub run by Italian network operator Snam Rete Gas.

Czech Republic: The virtual gas hub, VOB, covering the Czech Republic, operated by OTE.

PVB: The virtual trading point covering the Spanish transport system, operated by Enagas.

Turkey: The virtual gas hub, UDN, operated by BOTAS. This excludes system entry points.

Slovakia: The virtual trading point run by Slovak TSO Eustream.

MGP: The virtual trading point run by Hungarian TSO FGSZ.

Poland: The virtual trading point run by Polish TSO GAZ-SYSTEM.

Recent changes to this methodology

Date	Price reference	Change
4 June 2018	MGP Day-ahead and Weekend	Added
16 February 2018	TLX front year assessments for Gate and Fos Tonkin	Added
22 March 2017	NBP and TTF price assessments converted to $/MMBtu	Added
22 March 2017	NCG, GASPOOL and PSV Volatility Index	Added
22 March 2017	Czech second season assessment	Added
3 October 2016	PVB Day-ahead, Weekend, front two months, front two quarters and front calendar year	Added
3 October 2016	AOC front two months, front two quarters and front calendar year	Removed
3 October 2016	Turkish UDN	Clarifies closing time detail
3 October 2016	PEG Nord	Clarifies Index volume thresholds
3 October 2016	N/A	Clarifies Traded Volume specifications
3 October 2016	N/A	Clarifies indicative price assessments confirmation process
30 March 2016	PSV second calendar year and third season assessments; AOC second quarter and first calendar year assessments; TRS first quarter and first season assessments; Slovakia BOM and first month assessments.	Added
1 November 2015	N/A	Removal of Spanish Gas Day exception
1 October 2015	NBP	Definition of British Gas Day changed
1 October 2015	ZTP	Hub expanded to include Luxembourg
16 September 2015	ICE Endex OCM	Removal of current Gas Day Trading Figures
1 July 2015	Slovak Day-ahead and Weekend assessments. Slovak trades.	Added
1 July 2015	MGP trades. Polish trades.	Added
13 May 2015	VTP BOM, front year price assessments; Czech Republic third month ahead; AOC second month ahead, first quarter ahead	Added
1 April 2015	N/A	Removal of minimum width of bid /offer spread threshold
1 April 2015	N/A	Curve close set to 16:30 London time, removing the option to assess the contracts at the last point of liquidity if after 16:30
31 March 2015	TRS Day-ahead, Weekend, front month assessments; TRS Day-ahead Index, Day-ahead Cumulative Index and Spot Weekend Index; TRS trades	Added
31 March 2015	PEG Sud Day-ahead, Weekend and front month assessments; PEG TIGF Day-ahead and Weekend assessments; PEG Sud Day-ahead Index, Day-ahead Cumulative Index and Spot Weekend Index; PEG Sud and PEG TIGF trades	Removed
18 February 2015	TTF Volatility Index	Added
18 February 2015	PSV Day-ahead Index, Day-ahead Cumulative Index, Spot Weekend Index; Spark Spreads	Added
27 August 2014	N/A	Adds detail on ESGM Intraday Update

Price assessments

General definitions

All hub price assessments published in ESGM represent ICIS' close-of-day bid-offer ranges for flat gas (no swing, 100% take-or-pay) delivered at a number of physical and virtual hubs.

All closing prices, with the exception of Turkey, are assessed at 16:30 London time on all English working days, except on the final working day immediately preceding 25 December and 1 January each year, when these prices are assessed at 12:00 London time.

The Turkish market is assessed at 15:30 London time on all English working days, except on the final working day immediately preceding 25 December and 1 January each year, when these prices are assessed at 12:00 London time.

Assessments are based on bids and offers widely available to the market at the ICIS closing times above.

The additional ESGM Intraday Update service assesses selected contracts at 11:00 London time. The update is published every English working day, with the exception of the final working day that proceeds 25 December and 1 January each year.

"Bid" is deemed to be the highest price bid by buyers at the published assessment time.

"Offer" is deemed to be the lowest price offered by sellers at the published assessment time.

Price assessments – Guidelines for the exercise of judgment

ICIS gives priority to the highest bid and the lowest offer in its assessment process.

ICIS first attempts to establish a firm bid/offer spread as the basis for all of its assessments. ICIS also discovers transaction information. This transaction information is used as supporting evidence to establish market value. Where this transaction information is within the established bid/offer spread it may also be used to narrow the ICIS assessment bid/offer spread.

Where no confirmed transaction or bid and offer information is available at the time ICIS assesses the market, it will use other types of market information to assess value.

The most regular form of alternative market information used to make assessments is the value of spreads, either between contracts for different delivery periods on the same hub or between contracts for the same delivery period on other European hubs.

The value of component periods within a given contract will typically be used where confirmed market information is available for these component periods and not the contract itself. Similarly, where confirmed market information is available for a contract for a longer delivery period, this will typically be used to assess component contracts. This is described as interpolation/extrapolation.

Where only a bid or offer is available, or where the bid/offer spread is wider than the ICIS published maximum (see section below: "Width of bid/offer spreads") at the time ICIS assesses the market, confirmed spread information may take priority over bid/offer information in forming the assessment.

Where transaction information is available at the assessment time, it may be superseded by market spread information in instances where the transaction is deemed not to be repeatable. ICIS may make this judgment in cases where there is no bid/offer information immediately following the transaction to support a movement in value. It may also make this judgment where a single deal at the closing assessment time falls outside of the prevailing range of confirmed bid/offer or spread activity at other times of day. This logic also applies to situations where a bid/offer spread at the close is uncorrelated with the rest of the day's market activity and where ICIS can discover no fundamental reason for the change in market structure.

ICIS may also disregard transaction information where the deal is for a contract with a delivery period overlapping another more liquid contract, and where market information for the more liquid of the two indicates a different price level or price trend. This is because on actively traded gas markets, participants do not typically leave arbitrage between a contract and its constituent parts.

ICIS only uses geographic spread information between hubs where a strong price correlation has been demonstrated by past trading activity.

ICIS discovers the value of both time and geographic spreads through both the collection of spread trade and bid/offer information, as well as the relationship between

hubs when both outright contracts are trading.

Where ICIS uses spread information in its assessment process, it gives priority to information available for 16:30 London time. If this is not available, it will take evidence of market activity closest to this time.

Where a market typically does not trade as a spread to other markets and where there is no confirmed bid/offer or transaction information at the time of the closing assessment, ICIS may use bid/offer or transaction information closest to this time. ICIS may refer to shifts in fundamental supply and demand information to explain and understand a significant change in price direction at market close.

Price assessments – Data used key

For each assessment published in ESGM, ICIS gives a concise description of which type of market data was used to form the assessment. This is done using a standardised key code. A single letter published alongside the assessment denotes the type of information used as the primary basis for the assessment. Any other type of information ICIS may have gathered for that grade can be considered as supporting and of secondary importance in the formation of the assessment.

The definition of the key is as follows:

B – Bid/offer

T – Transaction

S – Spread

I – Interpolation/extrapolation

F – Fundamentals

Price assessments – Exclusion of data

In line with its Editorial Standards policy, ICIS reporters actively seek to identify anomalous market information and exclude it from the assessment process. For gas market assessments, this is done by the daily information gathering and verification process carried out by reporters, whereby market transaction, bid and offer information is confirmed and verified by multiple sources. The context of ICIS reporters' knowledge of the fundamental supply/demand situation on a given market is also used to verify transaction data that appears to be anomalous but may be done at a price level explained by changes in the physical market.

In assessing gas markets, ICIS takes into consideration only arm's-length transactions between non-affiliated parties.

ICIS does not accept bids or offers that are not firm. Any bid or offer which is demonstrably not firm will be disregarded and further bids or offers from the same counterparty may also be disregarded. For example, if a company indicates to the market that it is bidding or offering at a certain price and volume but ICIS can confirm that it later refused to transact when that bid was hit or offer lifted, it will not use that company's bid/offer information.

ICIS also excludes from its assessment process transactions where ICIS reporters have reasonable grounds to doubt the transaction is representative of typical market behaviour: for example, where a deal is concluded disregarding the best bid or offer on the market; where there is evidence that a market participant has disclosed only part of its market activity to ICIS; or where a transaction lies outside the prevailing range of typical market activity as established through other market evidence.

ICIS actively seeks to verify the time at which reported transactions took place. If such verification cannot be obtained, ICIS may exclude the transaction information.

ICIS records instances of anomalous data and reviews these instances on a regular basis with a view to determining if a pattern exists.

Where market reporters have concerns over the behaviour of a market participant, this will be escalated using the ICIS Escalation Process for Compliance and Regulatory Issues. This can be found in the company's Compliance Manual.

Price assessments – Indicative assessments

ICIS seeks confirmation of bids and offers from at least three independent and non-affiliated market participants or an automated and independent screenshot including the highest bid and lowest offer available to the market in order to assess a price as non-indicative.

If spread value has been confirmed at the assessment time and the price of the related outright contract value has been confirmed, ICIS will mark an assessment as non-indicative.

For example, where the value of the basis contract

(spread between the NBP and Zeebrugge markets) has been confirmed and the NBP closing assessment is confirmed, the Zeebrugge assessment will not be marked as indicative.

Where a bid and offer at the assessment time have not been confirmed by ICIS, the assessment will be marked as indicative.

ICIS will not publish a bid/offer spread wider than 0.5p/th or €0.5/MWh. If the confirmed bid/offer spread is wider than this range, ICIS will narrow the spread using the alternative market evidence described above and mark the assessment as indicative.

Price assessments – Width of bid/offer spreads

ICIS publishes a maximum bid/offer spread of 0.50p/th or €0.50/MWh.

The exception is the Turkish market, where there are no maximum spread limits at the time of the latest methodology update. The Turkish market is in the very early stages of development. Transactions are still occurring at widely varying prices not always dictated by market fundamentals, making it impractical and unrealistic to narrow bid/offer spreads.

There is no minimum bid/offer spread width. This allows contracts to be priced as choice, where the bid and offer are equal to each other.

Price assessments – Types of market information used and collection process

ICIS gathers market information primarily via telephone, instant messenger and e-mail. Lists of transactions are primarily collected electronically and ICIS employs a data management team to collect and de-duplicate this data. ICIS has designed bespoke programmes to standardise the various data feeds received, for the purposes of reporter verification and publication.

Market information includes bids, offers and deals done by sources or seen/heard by sources. ICIS reporters also investigate the reasons for market price movements and cross-check information received against market fundamentals data, primarily gathered from transmission system operators.

Information is typically gathered between 10:00 and 17:30 London time on the day the assessment is published. ICIS may disregard information received after 17:30 London time.

On the working days immediately preceding 25 December and 1 January, when these are English working days, ICIS assesses markets earlier and gathers information between 09:00 and 13:15 London time.

ICIS will never use information received after assessments have been published to retroactively correct an assessment.

Price assessments – Transaction data threshold

ICIS does not impose a minimum transaction data threshold on its assessment process.

Alongside its role in assessing the more active and mature gas markets, ICIS plays a role in bringing price transparency to new markets where trading and market information can be sporadic. Such markets are not conducive to minimum data thresholds.

In the absence of both transaction and bid/offer information, ICIS procedures are described above in the “exercise of judgment” section.

ICIS does impose a minimum data threshold on its indices, however (see section below: “DEFINITION OF HEREN INDICES”).

Price assessments - Verification of sources

ICIS verifies that all sources are active participants of the European gas markets by checking they have a shipper and/or supplier licence or are registered to trade at a relevant venue.

In addition, ICIS reporters use the indicators contained in the section entitled Validation Checks on Sources from the company’s Data Standards Policy. This policy can be read in full in the ICIS Compliance Manual.

Price assessments – Definitions of periods

All periods quoted are based on the standard European definition of the Gas Day. This runs from 06:00:00 until 05:59:59 local time on the following day. The exceptions are as follows:

1. Turkey 08:00:00 to 07:59:59 local time.

2. Britain, 05:00:00 to 04:59:59 local time.

All prices are for flat gas, no swing and 100% take-or-pay to be delivered for the duration of the contract to the hub.

Prompt contracts:

Day-ahead: This refers to the next working Gas Day in England following the date of the report. In a report published on Friday, Day-ahead would normally apply to the following Monday, provided that Monday is not a public holiday. In this case, Day-ahead would refer to the next working day, that is Tuesday.

7 Day ex-post: (Turkish market only) This is the price traded the day after delivery and reported by ICIS seven days after the transaction date. Transactions are financial and not physical. Saturday and Sunday assessments are published separately, rather than a Weekend contract, and appear on the second Monday following the transaction dates, assuming this is an English working day. If the Monday is not a working day in England, the assessments are published on the next working day.

Weekend: This covers the first Saturday and Sunday following the date of the report. Other contiguous non-working days – typically Bank Holiday Mondays and Good Friday – will be added to the contract to create a three- or four-day delivery period.

When Christmas Day and Boxing Day (25-26 December) and New Year's Day (1 January) fall mid-week these shall be considered additional Weekend delivery periods. For example, if 25-26 December fall on a Tuesday and Wednesday, the Weekend contract quoted on the Monday of the same week would refer to Tuesday and Wednesday. The weekend after 25-26 December would be assessed as a contract for the first time on 27 December.

WDNW: The contract covers the Working Days Next Week period to be delivered on every working day in the week following the date of the report. Typically this covers the five days following the next Weekend contract. In the case of a three-day weekend covering Saturday to Monday, Monday would be excluded from the WDNW contract, which would instead cover Tuesday-Friday.

Similarly, in the case where Christmas Day and Boxing Day (25-26 December) fall on a Tuesday and Wednesday, the WDNW contract assessed on the previous Friday (21 December) will refer only to the following Monday (24 December). The WDNW contract assessed on Monday (24 December) will refer to Thursday and Friday (27-28 December) only.

BOM: Balance-of-month is for delivery on each of the remaining days of the current month, excluding the next Day-ahead or Weekend contract, whichever is the sooner.

For example, on a Thursday, BOM would normally apply from the following Saturday to the end of the month (remaining days of the month minus Day-ahead). On a Friday, BOM would normally apply from the following Monday to the end of the month (remaining days of the month minus Weekend).

Should the next Day-ahead or Weekend contract cover the last day or days of the current month, the delivery period to which BOM applies will switch to the next month. Should the next Day-ahead or Weekend contract cover the first day or days of the next month, BOM will apply to the subsequent days of that month.

Curve contracts:

Months: Monthly contracts refer to the Gas Days of the standard calendar months.

Quarters: A Quarter refers to the Gas Days of the three-month periods beginning on 1 January (Q1), 1 April (Q2), 1 July (Q3) and 1 October (Q4).

Seasons: A Season refers to the Gas Days of the six-month period running from either 1 April - 30 September (Summer) or from 1 October of one year to 31 March of the following year (Winter). The title of the Winter always refers to the year in which the contract commences. For example, Winter 2013 starts on 1 October 2013.

Years: A Year refers to the Gas Days of the 12-month period from 1 January-31 December.

Gas Year: A Gas Year refers to the Gas Days of the 12-month period from 1 October of a particular calendar year and ending on 30 September of the following calendar year. The title of the Gas Year always refers to the year in which the contract commences. For example, Gas Year 2013 starts on 1 October 2013.

Price assessments – Small-scale truck-loaded LNG

The small-scale LNG truck loading assessment (TLX) represents the differential price of the commodity relative to the front-year price assessment at an associated hub on the day of publication.

ICIS assesses the free-on-board cost of LNG loaded onto trucks at the Dutch Gate terminal operated by Gasunie and Vopak, and the French Fos Tonkin terminal operated by Elengy.

The assessment represents the loading of a full standard cargo, which is considered to be 20-40 tonnes of LNG.

The assessment is for loading during the next calendar year. The assessment rolls forward on the first working day of a new year.

ICIS publishes the assessment weekly, on the last working day of the week (typically a Friday), taking into account bids and offers, trades, pricing and market information collected throughout that week until 16:30 London time.

The TLX is published in €/MWh. The minimum assessment range is €0/MWh, while the maximum is €1.00/MWh.

Indices

The Heren Index – General definition

All ICIS' market indices are volume-weighted averages of trades gathered and verified by ICIS during the course of its market reporting activities. All of the trades verified by ICIS and not excluded according to the criteria set out below are published by ICIS on a daily basis via its FTP service and transactions for a selection of key contracts are summarised in ESGM on a daily basis.

Indices – Guidelines for the exercise of judgment

ICIS reporters are responsible for identifying anomalous trades and excluding them before the index is calculated. Please see the section below "Criteria for Exclusion of Data".

Indices – Criteria for the exclusion of data

In line with its Editorial Standards policy, ICIS reporters actively seek to identify anomalous deals and exclude them from the index creation process. For gas market indices this is done by the daily information gathering and verification process carried out by reporters, whereby transaction information is confirmed and verified by multiple sources.

Confirmation is sought from both parties to the deal. If, as is often the case, both counter-parties are unwilling to confirm, confirmation is accepted from one side only. However, corroboration is also sought from other market participants. If no direct confirmation is available, the deal may still be included if it is corroborated by other market sources and if ICIS itself regards it as being within the prevailing market trend for the period in question.

ICIS only accepts arm's-length transactions between non-affiliated parties for inclusion in its indices.

ICIS does not accept "wash" or "round-trip" trades for inclusion within its indices.

ICIS excludes from its indices transactions where market reporters have reasonable grounds to doubt that a transaction is representative of typical market behaviour: for example, where a deal is concluded disregarding the best bid or offer on the market; where there is evidence that a market participant has disclosed only part of its market activity to ICIS; or where a transaction lies outside the prevailing range of typical market activity as established through other market evidence.

The context of ICIS reporters' knowledge of the fundamental supply/demand situation on a given market is also used to verify transaction data that appears to be anomalous but may be done at a price level explained by changes in the physical market.

Deals may be excluded if ICIS is not able to satisfactorily confirm the transaction time.

Deals done in non-standard volumes will be automatically excluded from ICIS indices. See "volume" section below.

Where sleeve deals have been identified and are not deemed to be off-market, ICIS will remove one leg of the sleeve in order to prevent skewing of the index through double volume reporting for one agreed transaction price.

ICIS records instances of anomalous data and reviews these instances on a regular basis with a view to determining if a pattern exists.

Where market reporters have concerns over the behaviour of a market participant, this will be escalated using the ICIS Escalation Process for Compliance and Regulatory Issues. This can be found in the company's Compliance Manual.

Indices – Volume

In markets where ICIS publishes a gas index, with the exception of France, all deals deemed non-standard in volume size will be automatically excluded. This means deals of a clip size which is not a multiple of 5,000 therms/day or 5MWh/hour.

ICIS sets a maximum volume limit above which deals will automatically be excluded as non-standard. For the NBP and Zeebrugge hubs the maximum volume is 2,000,000 therms for all prompt deals and 500,000 therms for all curve deals. These limits apply to the amount being delivered per day.

For all other European markets the maximum limit is 2,000 MWh/hour for prompt deals and 300 MWh/hour for curve deals.

In the French gas markets, where deals are traded in MWh/day the comparative hourly volume is considered when identifying the maximum limit for the prompt and curve transactions.

Indices – Types of market information used and collection process

ICIS gathers market information via telephone, instant messenger and e-mail. Transactions are primarily collected electronically and ICIS employs a data management team to collect and de-duplicate this data. ICIS has designed bespoke programmes to standardise the various data feeds received, for the purposes of reporter verification and publication.

Market information includes bids, offers and deals done by sources or seen/heard by sources. ICIS reporters also investigate the reasons for market price movements and cross-check information received during the course of this information gathering process against market fundamentals data, primarily gathered from transmission system operators.

Information is typically gathered between 10:00 and 17:30 London time on the day the assessment is published. ICIS may disregard information received after 17:30 London time.

Transactions eligible for inclusion in ICIS indices, with the exception of the Heren Closing Index (HCI), must have been conducted between 06:00 and 17:30 London time on an English working day.

On the working day immediately preceding 25 December and 1 January, ICIS assesses markets earlier and gathers transaction information between 09:00 and 13:15 London time.

Transactions eligible for inclusion in ICIS indices in the above circumstances must have been conducted between 06:00 and 13:15 London time.

Transactions eligible for inclusion in the HCI must have been conducted between 16:15:00 and 16:30:00 London time on an English working day.

On the working day immediately preceding 25 December and 1 January, ICIS uses an earlier closing time and the HCI will include deals done between 11:45:00 and 12:00:00 London time

ICIS will never use information received after indices have been published to retroactively correct an index.

Formulation of Heren Indices

ICIS publishes a variety of volume-weighted trade-based indices for different contracts. These are priced in pence/therm for the NBP and Zeebrugge markets and in €/MWh for all other markets. For the duration of the contract covered by the index, the price values flat gas, delivered on a no-swing, 100% take-or-pay basis.

Contract delivery periods are identical to those described above in Price Assessments – Definition of Periods.

Formulation of the Within-day index

Heren Within-day indices are volume-weighted averages of all Within-day transactions collected in ESGM on the same day for gas to be delivered on the specified market.

The Within-day index requires a minimum of three transactions. On days when there are fewer than three eligible transactions, the index is published as the arithmetic average of the previous 20 indices.

Formulation of the Cumulative Within-day index

The Cumulative Within-day index is a volume-weighted average price of all the Within-day transactions included in ESGM so far that calendar month, up to and including the publication date. On the first English working day of a new month, the Cumulative Within-day index will reset and will be identical to the Within-day index.

The cumulative index requires a minimum of three transactions. When there are fewer than three eligible transactions the index will not be displayed.

Formulation of the Day-ahead index

The Day-ahead index is a volume-weighted average price of all the Day-ahead transactions included in ESGM for gas to be delivered to the associated market.

The Day-ahead index requires a minimum of three transactions. On days when there are fewer than three eligible transactions, the index is published as the midpoint of the bid/offer price assessment published for the Day-ahead contract.

Formulation of the Cumulative Day-ahead index

The Cumulative Day-ahead index is a volume-weighted average price of all the Day-ahead trades included in ESGM so far that calendar month, up to and including the publication date. On the first English working day of a new month, the Cumulative Day-ahead index will reset and will be identical to the Day-ahead index.

The cumulative index requires a minimum of three transactions. When there are fewer than three eligible

transactions the index will not be displayed.

Formulation of the Day-ahead HCI

The Day-ahead HCI is a volume-weighted average price of all the Day-ahead transactions meeting ICIS criteria for inclusion and transacted during the closing time period described above.

The Day-ahead HCI requires a minimum of three transactions. On days when there are fewer than three eligible transactions within the 15 minute closing period, ICIS will go back in time until it has three eligible trades. These trades must have been completed on the day of publication.

If less than three eligible trades are available for the day of publication, the ICIS HCI will be published as the midpoint of the Day-ahead Assessment bid/offer spread published in ESGM for that day.

Formulation of the Weekend index:

The Weekend index is a volume-weighted average price of all the Weekend transactions included in ESGM since the expiry of the previous Weekend contract and for gas to be delivered to the associated market. In a typical working week this would cover all Weekend transactions sourced between Monday and Friday before the period of delivery.

The index requires a minimum of three transactions. On days when there are fewer than three eligible transactions, the index is published as the average of the midpoints of the bid/offer Weekend price assessment published for that market during all the working days which fall in the same calendar week as the Weekend index and precede the previous index weekend.

Formulation of the Spot Weekend index

The Spot Weekend index is a volume-weighted average price of all the Weekend transactions included in ESGM on the date before the start of the delivery period. In a typical working week this would refer to all Weekend transactions sourced on a Friday.

The index requires a minimum of three transactions. On days when there are fewer than three eligible transactions the index is published as the midpoint of the bid/offer Weekend price assessment published for that market during the final working day immediately preceding the index weekend.

Formulation of the Weekend HCI

The Weekend HCI is a volume-weighted average price of all the Weekend transactions meeting ICIS criteria for inclusion and transacted during the closing time period described above. The Weekend index is only calculated on the last working day of the week. The Weekend HCI requires a minimum of three transactions. On days when there are fewer than three eligible transactions within the 15 minute closing period, ICIS will go back in time until it has three eligible trades. These trades must have been completed on the day of publication.

If less than three eligible trades are available for the day of publication, the ICIS HCI will be published as the midpoint of the Weekend Assessment bid/offer spread publish in ESGM for that day.

Formulation of the Monthly index

The Monthly index is calculated on the final working day prior to the start of delivery. The Monthly index is a volume-weighted average price of all the Month-ahead transactions included in ESGM for gas to be delivered to the associated market and which have been sourced since the start of the month prior to delivery.

The index requires a minimum of three transactions. When there are fewer than three eligible transactions, the index is published as the arithmetical average of the all the month-ahead bid/offer price assessment midpoints published for that market during the calendar month prior to the delivery month.

Formulation of the Monthly Cumulative index

The Monthly Cumulative index is a volume-weighted average of all month-ahead trades sourced since the start of the month prior to delivery. The index is updated on each working day. By the end of the month prior to delivery the Monthly Cumulative index will be the same as the Monthly index.

The index requires a minimum of three eligible transactions. When there are fewer than three eligible transactions, the index will display N/A.

Formulation of the Daily Month-ahead index

The Daily Month-ahead index is a volume-weighted average price of all the month-ahead transactions

included in ESGM on the day of publication for gas to be delivered to the associated market.

The index requires a minimum of three transactions. When there are fewer than three eligible transactions, the index is published as the arithmetical midpoint of that market's month-ahead assessment published that day.

Other primary data tables in ESGM

ESGM trades tables – General and country-specific definitions

Trading data is published for the British, Belgian, Dutch, French, German, Austrian, Italian, Czech, Slovak, Spanish, Turkish, Hungarian and Polish markets on a daily basis. Full trade listings are available by FTP download. The OTC transactions provided are those reliably identified by ESGM on the date of the report. Deals are listed by delivery date, volume and price.

Deals excluded by ICIS reporters as non-standard or anomalous are not included in this data (see section on Indices – Volumes for further details).

In ESGM under the page with the title 'Trades' two tables are published. The first table shows the total volume traded in each market, in MWh, with a percentage breakdown of trade between curve and prompt contracts. Prompt is defined as all contracts with delivery up to Balance-of-month. Curve is defined as all contracts with delivery including and forwards of the front calendar month. The total number of trades is also listed.

The second table shows the daily high and low trades for each market for the following key contracts: Day-ahead, front month, front quarter, front season and front Calendar Year, all in MWh. If no trade has been reported then "n/a" will be shown.

Turkish trades do not appear in these tables.

Spark spreads

The British, German and Italian sparks spreads are derived from the gas and power price assessment tables and daily indices in ESGM and sister publication European Daily Electricity Markets (EDEM). All the power prices quoted are for baseload delivery and, with the exception of Day-ahead, are the mid-point of the closing price assessment of the respective contract on the day of publication. Day-ahead spark spreads are based on their respective power and gas Day-ahead indices.

German sparks spreads use TTF gas prices, given the Dutch market is more liquid that either NCG or GASPOOL.

ICIS calculates the spark spread profit margin by taking the cost of power per MWh minus the cost of the gas needed to generate that power.

The cost is calculated using industry standard plant efficiencies to take account of energy not converted into electrical energy and therefore lost.

ICIS uses the standard gas-fired plant efficiency factor of 49.13%, an industry standard to allow for efficient spark spread trading, on the basis that 100,000 therms of gas could generate 60MW of power.

The spark spread value is therefore the power price minus the gas price divided by 0.4913.

The British gas price in pence/therm is converted to £/MWh by dividing by a standard factor of 2.93071.

A positive spread means that it is theoretically profitable to generate electricity for the period in question, while a negative spread means that generation would be a loss-making activity. However, it is important to note that the spreads do not take into account additional generating charges beyond fuel, such as operational costs and carbon allowances.

For further information on the calculation of Spark Spreads please refer to the methodology document for EDEM.

Volatility Indices

The NBP, TTF, NCG, GASPOOL and PSV volatility index is a 20-trading day rolling percentage which is defined as the annualised standard deviation of the percentage change in price between periods. The index is the standard deviation of the percentage change in the daily prices for the last 20 trading days multiplied by the square root of 252. There are on average 252 trading days in the year. The index is calculated and reported for each contract traded except the BOM contract because it is rarely traded for more than 20 days.

Secondary data in ESGM

ICE Natural Gas Futures

The ICE table shows the closing ("settle") prices for the NBP natural gas futures contracts traded on the Intercontinental Exchange, ICE. Prices and other data are passed to ESGM by ICE at settlement time, currently between 16:00-16:15 London time. Close of business is 17:00 London time. "Change" is the change from the previous working day's settlement price. "High" and "Low" represent the high and low traded prices for the day in question. "Lots" represents the volume of trade for each contract: 1 lot = 1,000 therms per day, although it should be noted that under current exchange rules the minimum trade size is five lots. "M th total" represents the total number of therms traded, expressed in millions of therms. "Open interest" represents the open interest for each contract at the previous day's close. For further information please contact the ICE.

Day-Ahead Beach Terminal Capacity Prices

These are secondary market prices for British entry capacity at the most active beach terminals for the following working day. Prices are assessed by ESGM in the same manner and at the same time as spot commodity prices.

OCM SMP/SAP Report

This table provides a snapshot of the previous day's activity on Britain's On-the-day Commodity Market (OCM), which is operated by exchange group ICE Endex in order to physically balance the British gas system. All information presented comes from TSO National Grid. The table shows the OCM activity from the previous Gas Day. SAP (System Average Price) is the volume-weighted average of all OCM buys and sells on the day. SMP (System Marginal Price) Buy is the highest price at which National Grid bought gas for the system. SMP Sell is the lowest price at which National Grid sold gas out of the system. SAP 7-day and SAP 30-day are seven-day and 30-day rolling averages. For further information, please contact ICE Endex.

Oil market price assessments

ICIS publishes the front month ICE Brent crude price at 16:30 London time each day.

Gasoil and Fuel Oil prices are taken from the ICIS European Products report. The assessments value barges for a forward delivery window of 2-12 days and in the industry standard size of 1,000-5,000 tonnes.

The Gasoil 0.1% sulphur assessment is for barges on an FOB ARA basis. It is uses German DIN quality in line with the IPE Gasoil Futures Contract. Cold properties vary seasonally.

The Fuel Oil 1% sulphur barge contract is for barges on an FOB ARA basis. It uses cracked material with a typical viscosity of 380cst at 50˚C and a density of 0.965 to 0.990 at 15˚C.

National Grid Daily Capacity Summary

These are National Grid daily auction average prices for Within-day firm and interruptible entry capacity at the nine most active British beach terminals. The table lists the average price paid, in pence per kilowatt hour (p/kWh), for both firm and interruptible capacity, as well as the total volume of capacity available as well as booked in kWh. For further information please contact National Grid.

Weather

Pan-European weather forecasts on a 1-5 day and 6-10 day basis are provided to ESGM by Weather Services International. For more information, please contact WSI.

Currency conversions

Forward currency rates are calculated using 29 pricing points, sourced from Bloomberg, at 16:30 London time every day. The pricing points used are all of those available: spot, one week ahead, 24 months ahead, and three to five years ahead.

Using these points, ICIS calculates a smooth curve which provides rates for each day out to five years. From these values, ICIS calculates rates corresponding to the contracts quoted in ESGM.

Other principles and guidelines

Changes to methodology

All markets evolve, and ICIS has a duty to ensure its methodologies for market-reporting evolve in step with markets.

ICIS therefore regularly conducts internal reviews of the appropriateness of its methodologies.

Draft changes are then made public and comment requested from industry participants, with a minimum one-month notice period, except where, exceptionally, a force majeure event (natural disaster, war, bankruptcy of a trading exchange etc) makes necessary a shorter notice period.

ICIS is committed to reviewing all comments on proposed methodology changes, but in some cases may find it necessary to alter its methodologies against the wishes of some market participants.

In addition, ICIS has a formal methodology consultation process. The company commits to holding this consultation every two years for ESGM. The date of the last consultation launched and the expiry date by which the company commits to conducting the next consultation can be seen at the top of the methodology document.

Please also refer to the Methodology Consultation Process section of the company's Compliance Manual. This contains detailed flow charts documenting the internal and external review and consultation process.

Consistency

ICIS achieves consistency between its assessors in exercising their judgment by requiring all assessors to understand and follow this detailed methodology as well as the company's Editorial Standards document. In addition, ICIS employees are required to complete standard training before undertaking the work of a market reporter. Every reporter's work is peer reviewed daily and spot checked by senior management.

Adherence to these processes is documented at every stage.

Data standards

ICIS has a public Data Standards Policy which covers the type and quality of information it asks market participants to report.

The following principles relate to ICIS gas market assessments and commentaries:

- Where possible, please allow access to active market traders and allow them to comment on active news stories.
- Where possible, please provide market data from both front and back-office functions.
- Where possible, please provide complete data and not a subsection.
- Flag inter-affiliate transactions.
- Flag sleeve trade.
- Flag spread trades.
- When a source or contact leaves the organisation please contact ICIS to the replacement (ICIS requests that both the source and the organisation contacts them).
- Where information is not validated by the source (i.e. rumour) please indicate as such.

Delivery locations

Locations for ICIS ESGM assessments and indices are chosen to reflect areas of traded liquidity. For most markets, delivery is at a virtual hub. Where trade takes place at a physical point on a network, ICIS may also provide a pricing reference for this point. The nature of the delivery point is described in the methodology document above in the section "Definitions of Hubs".

Key submitter dependency

Because of the sometimes thinly-traded nature of certain gas markets and the existence of markets where there are a limited pool of active counterparties, ICIS does not employ minimum rules on the number of submitters. This is particularly true of the newest European traded markets, where ICIS plays a key role in bringing price transparency and efficient trading to markets in the early stages of development.

For all markets ICIS only considers bid/offer data to be confirmed when it has been verified by three independent, non-affiliated sources. If this was not the case then ICIS will mark an assessment indicative. See section above, "Price Assessments – Indicative Assessments".

Market Communication

ICIS communicates with a broad range of market participants – traders, brokers, back-office employees, supply managers, operations personnel and company executives – to obtain market information.

ICIS communicates with participants by telephone, email, instant messenger and face to face. All instant messenger, email communication and notes of any face-to-face communication are archived and details of telephone communication are logged and data-based.

ICIS does not accept instant messenger communication from unknown parties, and reporters are required to verify a market participant's identity prior to using instant message communication.

ICIS does not regard in any way as binding, attempts by market participant companies to restrict ICIS communication with their employees. ICIS has a duty to its subscribers to obtain the maximum possible amount of market information. ICIS treats all communication from market participants as confidential.

ICIS reporters are bound by a Code of Conduct to report to their superiors any coercive or threatening communication from market participants, or any offers of inducements of any kind intended to influence an assessment.

Where improper communication appears to have taken place, ICIS will communicate in the first instance with senior management at the company or companies involved, and if necessary with relevant market authorities.

ICIS expects the highest standards of propriety from all market participants, and regards all communications from market participants as representative of the views of an individual's employer.

ICIS is committed to the highest levels of customer service, and has a formal feedback and complaints policy, which can be viewed here http://www.icis.com/about/icis-feedback-policy/.

Market data verification

ICIS will always make best endeavours to confirm bids, offers and transactions with the relevant party/parties. ICIS attempts to cross-check all market data received from a buy or sell-side participant with a participant's trading counterparty.

Where both counterparties to a transaction cannot or will not confirm the data, ICIS seeks corroboration from other market sources.

Where transaction or bid/offer information has been received from a trader rather than from a company's back office, ICIS always seeks confirmation from other sources.

Where ICIS has grounds to doubt an item of market data, it may request further evidence that a transaction has taken place, including documentary evidence.

ICIS treats transaction data received from active brokerages as confirmed and treats bid/offer information as firm. This information will be considered in conjunction with other sources during the assessment and index process as described above.

In markets with low liquidity and a low number of counterparties, ICIS may choose to use unconfirmed data, but only in so far as it is aligned with other market information and comes from a source deemed reliable by ICIS based on previous interactions.

Minimum data threshold

Because of the sometimes thinly-traded nature of certain gas markets and contracts, ICIS does not have a minimum data threshold for its assessment methodologies in these markets. ICIS' gas methodology is designed to function accurately under all market conditions and to make use of parallel data where no direct transaction or bid/offer data is available. See the section entitled "Price Assessments – exercise of judgment" above.

ICIS does implement a minimum data threshold for its indices, however. ICIS will not typically launch an index until it has at least six months' worth of data showing that at least 10 deals have been completed for each index period.

When an index series is launched, ICIS publishes a minimum number of transactions an index must meet in order for a weighted average to be calculated. If the number of deals falls below this threshold, ICIS reverts to a default methodology using its assessments or previous index values. These defaults are specified above in the section entitled "Indices – definitions". ICIS does not consider such methodology switches desirable in terms of consistency and transparency and endeavours not to launch an index where it believes there is a likelihood that the minimum data threshold will not be met.

Quality specifications

The physical characteristics of the gas valued by ICIS in its assessments and indices is defined by the network operator of the virtual hub or physical infrastructure owner. For a list of these operating companies please see the section above entitled “Definitions of Hubs”.

Selection of participants

ICIS’ policy on general market data is that it welcomes all information regardless of source or constitution as long as it is provided in good faith as true.

However, only active market participants verified as such by existing active industry participants and verified as a viable business by ICIS investigations will be allowed to contribute price data to ICIS for the purpose of assessing tradable market value under this methodology.

Units

ICIS assesses gas markets in the units which attract the majority of trade. For most hubs in Europe, trading activity has conformed to one standard unit, usually either pence per therm (p/th) or euros per megawatt hour (€/MWh). Conversions to dollars per million British thermal unit ($/MMBtu) are also used for the most liquid hubs. Turkey mainly trades in lira per thousand cubic meter (TL/kcm).

ICIS uses a conversion factor of 1 th = 0.0293 MWh when such a conversion is required.

ICIS uses a conversion factor of 1MWh = 3.4121 MMBtu when such a conversion is required.

ICIS uses a conversion factor of 1 th = 0.10 MMBtu when such a conversion is required.

ICIS uses a conversion factor of 1 kcm = 10.6395 MWh when this such a conversion is required.

Units of energy are used for trading purposes in all active European markets, rather than units of volume.

In the early days of market development, however, there may be multiple units trading. ICIS will typically assess using the most regularly traded unit and publish parallel assessments in other active units.

ICIS contact details

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