



# ICIS Price Forward Curves Methodology

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## Introduction to price forward curves

ICIS price forward curves for individual European power and gas markets are based on daily price assessments published in the daily gas and power reports.

Forward curves are distinct from forecasts. A forecast would predict the price level in the market at a designated point in the future. A forward curve reflects the closing price levels for the market on the day the curve is published.

Individual market price forward curves are published every English working day in the evening..

## General principles

ICIS price forward curve levels are based on ICIS price assessment values at the market close. These inform additional calculated prices for daily and monthly delivery periods, based on mathematical calculations. These calculations have been developed in line with industry norms and best practices.

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.

For the methodology behind ICIS European gas price assessments, please see the European Spot Gas Markets methodology available here:

<https://www.icis.com/compliance/reports/european-spot-gas-market/>

For the methodology behind ICIS European power price assessments, please see the European Daily Electricity Markets methodology available here:

<https://www.icis.com/compliance/reports/european-daily-electricity-markets/>

## Rationale for price forward curves methodology

ICIS has adopted some general guiding principles in its price forward curve models.

- ICIS focuses on areas of greatest granularity within the market, on the principle that more granular data makes for more accurate shaping, and our price assessments typically smooth out arbitrages based on liquidity.
- Forward curve models are calculated from the most extensive historical data available, using data up to the last decade. ICIS has chosen five years as a maximum, because the data is extensive enough to smooth out anomalous data sets, where market prices have diverted from typical norms for a specific reason. However, given that market fundamentals change over extended periods, ICIS has chosen to limit the historical data to a period of five years.
- The ICIS curve is purely a mathematical construct based on the daily price assessment, and does not adjust for external fundamental factors such as new capacity or, on a short-term basis, wind and solar forecasts.  
This is because ICIS considers that fundamental drivers will be visible to the market as a whole and therefore factored into market activity, reflected in the assessment of price at market close.  
In addition, ICIS considers that a purely mathematical model is more useful to the market to give a default curve for comparison to proprietary forward models, where participants may choose to take other factors into account.
- Where a less liquid market does not support price assessments further ahead, ICIS will use more liquid markets to inform its forward curve, where a proven correlation exists.

The ICIS price forward curves have monthly and daily price levels, modelled from historical data.

Monthly prices are based on the relationship between forward traded contracts rather than spot delivery levels, on the basis that forward curves are an indication of how the market views current values ahead of delivery, rather than final likely delivery levels.

The length of ICIS' price forward curve varies according to each market. ICIS carefully monitors and assesses liquidity across the market before launching additional price assessments, and is guided by confidence in sustained levels of market activity allowing an accurate assessment to be made.

The ICIS price forward curves show daily delivery prices for a minimum of two months and a maximum of three months. Daily delivery prices start from the next calendar day after the publication date, and are calculated out to the last delivery date of the second month ahead.

Daily prices are based on spot delivery levels, as the most granular data available for calculation.

## Shaping price forward curves for monthly granularity

ICIS bases forward curve shaping on contract data showing strong liquidity, and produces a monthly value as far as the forward curve is assessed.

### Arbitrage for monthly granularity

ICIS gas and power price assessments are typically assessed to smooth out any arbitrage between a contract and its constituent parts. This is because on actively traded markets, participants do not typically leave arbitrage.

In the event of an arbitrage between contracts, ICIS prioritises the price level for the more liquid contract during the session as reported to ICIS. Liquidity is measured by the amount of each contract traded (eg, MW), rather than total volume (eg, MWh).

Additional contract levels are adjusted to match, prioritised according to liquidity, until a monthly granularity is reached.

Example: To reach a monthly granularity for a seasonal contract, liquidity would be compared for component contracts. If the front-quarter contract is more liquid than the component months, the quarter contract price would be chosen first and the months adjusted to fit. If the monthly contracts are all more liquid than the quarter contract, the monthly contract price would be considered first, and the quarter contract price level adjusted to fit.

### Long-term contract shaping

In the most liquid markets, the primary source of data used for shaping the long-term curve is the monthly price assessments, as these are the most relevant to monthly granularity.

In less liquid markets, other contract relationships may be used as the main source of data used for shaping, depending on relative liquidity (see 'Forward curve shaping specifics table' for individual market variation).

The data used is aligned with ICIS' principle of focusing on liquidity within its modelling.

To calculate monthly shaping:

1. For the most liquid markets, ICIS typically uses an average of the price assessment for each monthly contract, for three months before delivery, for each of the preceding years (see table for the period of historical data used for shaping). These price assessments are weighted by the amount of daily trade. The adjustment for traded

volumes allows the model to give more influence to the periods of most liquidity.

*Note: Individual ICIS price assessments may be interpolated using alternative means of modelling.*

*Example: The NBP Q2-Q3 spread – where no other market data is available, the price assessment focuses on the spread between the two quarters as the quarters have previously traded as the best indicator for an assessment of the quarterly contract value. However, the forward curve focuses on how the monthly contracts have traded as part of the season or quarter. Historical data suggests a disconnect between market values based on the duration of the contract.*

2. A mean is then taken of these volume-weighted averages, to give a 'typical' price level for each individual month of the year.
3. The resulting typical monthly price level is then used to calculate the typical levels for larger assessed contracts.  
Example: January+February+March average = Q1  
or: Oct+Nov+Dec+Jan+Feb+Mar = Winter
4. Shaping takes place on the basis of the relationship between the typical month to the typical quarter, and the resulting monthly shaping is based on the price assessment for the underlying contract.  
Example:

ICIS shaping example		
Typical Q1 price = y		
January	February	March
4.00% higher than y as Q1 [example]	1.25% lower than y as Q1 [example]	2.75% lower than y as Q1 [example]

ICIS uses the price assessment for the smallest period available to give the greatest granularity to the curve.

This monthly shaping calculation is recalculated on the first UK working day of each month, to include data for the new monthly contract delivered on the previous trading session. The regular recalculation ensures ICIS' forward curves use the most current market data available.

The monthly shaping calculation is updated after the monthly contract has delivered, because the month before delivery is typically the period of highest liquidity. ICIS does not include data from contracts still actively traded in the market, to ensure that periods of lower liquidity do not gain undue influence.

## Shaping price forward curves for daily granularity

ICIS bases daily shaping on the most liquid and granular contract data available, and produces a daily value for each day up to and including the last day of the second month ahead (month+2).

### Arbitrage for daily granularity

ICIS gas prompt price assessments include contracts that may overlap delivery periods, such as Working Days Next Week (WDNW) and Balance of Month (BOM).

To ensure an arbitrage-free daily curve, ICIS allocates a value to each day, based on the underlying contract value. The contract values for the shortest periods are allocated first, such as Day-ahead, and then the daily values for longer contracts that overlap in delivery are adjusted to take account of the shorter contract values.

Example: If an NBP WDNW contract is assessed at 40p/th and the BOM contract at 39p/th on Tuesday 12 January 2016, the daily values for Wednesday 13 January reflect the Day-ahead price assessment value and the values for 16-17 January reflect the Weekend contract value. The daily values for 18-22 January are 40p/th to reflect the WDNW. However, the remaining daily values for 14-15 and 23-31 January (the unallocated days left in the BOM delivery period) are adjusted to ensure that all the daily values from Thursday 14 January to Sunday 31 January, while individually different, equate to an average of 39p/th.

### Short-term contract shaping

The primary sources of data used for shaping the short-term curve in the most liquid markets are the daily and weekend indices, as the most granular indication of daily price levels over time.

However, in less liquid markets, daily price assessments are used, and adjusted for traded volumes.

To calculate daily shaping:

1. ICIS separates each calendar date for each of the years of historical data used, including weekend and public holiday dates, and calculates the average as a mean to give a value for each individual calendar date over the last five years.
2. Shaping within individual contracts takes place on the basis of the relationship between the typical

daily delivery price to the typical monthly contract price.

ICIS uses shaping by individual calendar date to reflect differing trends for each individual month. For example, November daily values are typically lower at the start of the month than the end.

3. Daily values shaped by date are then normalised to the underlying contract value.
4. ICIS then applies a shape based on values for each day of the week during an individual month. Consumption varies between working days and weekend days, but the level of difference varies by month.

ICIS weekday shaping example		
Typical weekly price = y as 1		
Day of the week	January [examples]	June [examples]
Monday	99.5% of y [example]	99.5% of y [example]
Tuesday	101% of y	99.5% of y
Wednesday	101% of y	101% of y
Thursday	101% of y	101% of y
Friday	100.5% of y	100% of y
Saturday	99% of y	100% of y
Sunday	98% of y	99% of y

5. Daily values shaped by weekday are then normalised to the underlying contract value.

This daily shaping calculation is recalculated every day, while weekday shaping is recalculated for each month after the full month has delivered.

The regular recalculation ensures ICIS' forward curves use the most current market data available.

### Adjustment for holidays and leap years

In gas markets, English and Welsh public holidays are traded and assessed as part of the Weekend price assessment, so individual holidays without a fixed calendar date, such as Easter, are treated as Sundays and calculated accordingly.

To calculate daily shaping values for 29 February, data for the preceding five years is included, using a mean average of 28 February and 1 March values for non-leap years.

## Price forward curve shaping specifics

*All curves are calculated each working day in England and Wales unless otherwise stated.*

Price forward curve market	Length of historical data set used for shaping	Duration of trading data used ahead of delivery	Units quoted	Information included in shaping
NBP	Five years	Three months.	p/th	Price assessments, trades, indices
TTF	Five years	Three months	€/MWh	Price assessments, trades, indices

*Additional markets to be added - for less liquid markets, the 'Information included in shaping' column will include other more liquid forward curves, where there is an existing relationship between markets.*

## ICIS contact details

ICIS actively welcomes feedback on its price forward curve methodologies. To comment on this document or request further information please contact:

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