european network
of transmission system operators
for gas

TEN-YEAR NETWORK DEVELOPMENT PLAN 2017

TYNDP 2017

ANNEX G

GAS QUALITY OUTLOOK

ENTSOG – A FAIR PARTNER TO ALL!

1 Introduction

Article 18 of the Network Code on interoperability and data exchange rules (Commission Regulation EU 2015/703) requires ENTSOG to publish, alongside TYNDP, a long-term gas quality monitoring outlook (Gas Quality Outlook - GQO) for transmission systems in order to identify the potential trends of gas quality parameters and respective potential variability within the next 10 years.

The GQO shall cover at least the gross calorific value (GCV) and the Wobbe Index (WI), produce different forecasts for different regions and be consistent and aligned with TYNDP.

The GQO covers existing and new supply sources, based on measured gas quality values collected from previous years when available or on contractual values otherwise. For each region, the forecast consists of a range within which each parameter is likely to evolve.

As part of the TYNDP, stakeholders are invited to provide their views on the evolution of gas quality parameters.

TYNDP 2017 is the first edition incorporating the Gas Quality Outlook.

Image courtesy of National Grid

2 Methodology

The GQO has been produced under a probabilistic approach, based on historical gas quality data. This analysis has been carried out with a thorough approach based on the data available and taking into account possible changes as defined by the TYNDP scenarios and configurations. However, it should be noted that these are probabilistic values and they do not guarantee that in reality gas quality values may or may not exceed those presented here in extreme situations.

WI and GCV are defined in terms of average (mean value) and standard deviation for each different supply source based on the historical data supplied by TSOs. The section “input data” summarises the relevant values of the parameters for all the sources included in the study.

Those values are combined with TYNDP supply figures resulting from different demand scenarios and price configurations. The result is a probability distribution of gas quality values for each assessed region and year.

Image courtesy of Enagás

The regions considered are the ones defined in the GRIPs with two small modifications:

- Due to their narrower WI and GCV specifications, UK and IE are separated from the North West region to form their own one.
- Consequently, the North West region is analysed excluding UK and IE.

The underlying model for calculations is based on the following assumptions:

- WI and GCV have only been collected at entry points to the EU transmission network including indigenous production points.
- For each supply source, the probability distributions of GCV and WI are derived from the historical data and they are assumed to be representative for the future developments of that source.
- Gas quality parameters per identified supply source are assumed to follow a normal curve (Gauss) probability distribution.
- Low-calorific gas (L-gas) has not been taken into account because:
  - Unless it was analysed in a separate forecast, it would widely distort results.
  - The underlying network model does not make a distinction between L-gas and High-calorific gas (H-gas) networks.
  - L-gas is expected to have a declining contribution in the gas supply mix in the coming years.
- Biomethane gas quality parameters are not included in the assessment for the following reasons:
  - Within the next 10 years, biomethane will be injected in the majority of cases into distribution networks, while the scope of the task given in Article 18 is regarding transmission networks.
  - The underlying network model does not distinguish between biomethane and conventional production.
- LNG is grouped as a single supply origin, assuming that the same range of quality values could reach any terminal in Europe.
  - However, the send out of LNG terminals in the UK will be treated as a different supply source to reflect the results of the ballasting process in place. In the absence of measured values, the average WI is assumed to match the mean value as detailed in the national specifications, whilst the standard deviation is assumed to be equal to the one registered for GCV.
  - Gas quality values for LNG from the US are assumed to be within the WI and GCV limits for worldwide LNG shipped to Europe.
- Indigenous production data has been aggregated per country.
  - In cases where no WI data was available, the statistical parameters are inferred from the respective GCV data.
  - For those countries not listed in the input data section, a generic probability distribution (NP) has been assumed.
- Azeri gas values are derived from contractual specifications due to unavailability of measured values, which lead to a wider range relative to other sources.
- Regarding supply and demand data taken from TYNDP 2017, the infrastructure development level is assumed to be "low" and the demand to follow the "Blue Transition" scenario
- Supply and gas quality figures are combined by means of Monte Carlo simulation.

3 Input data

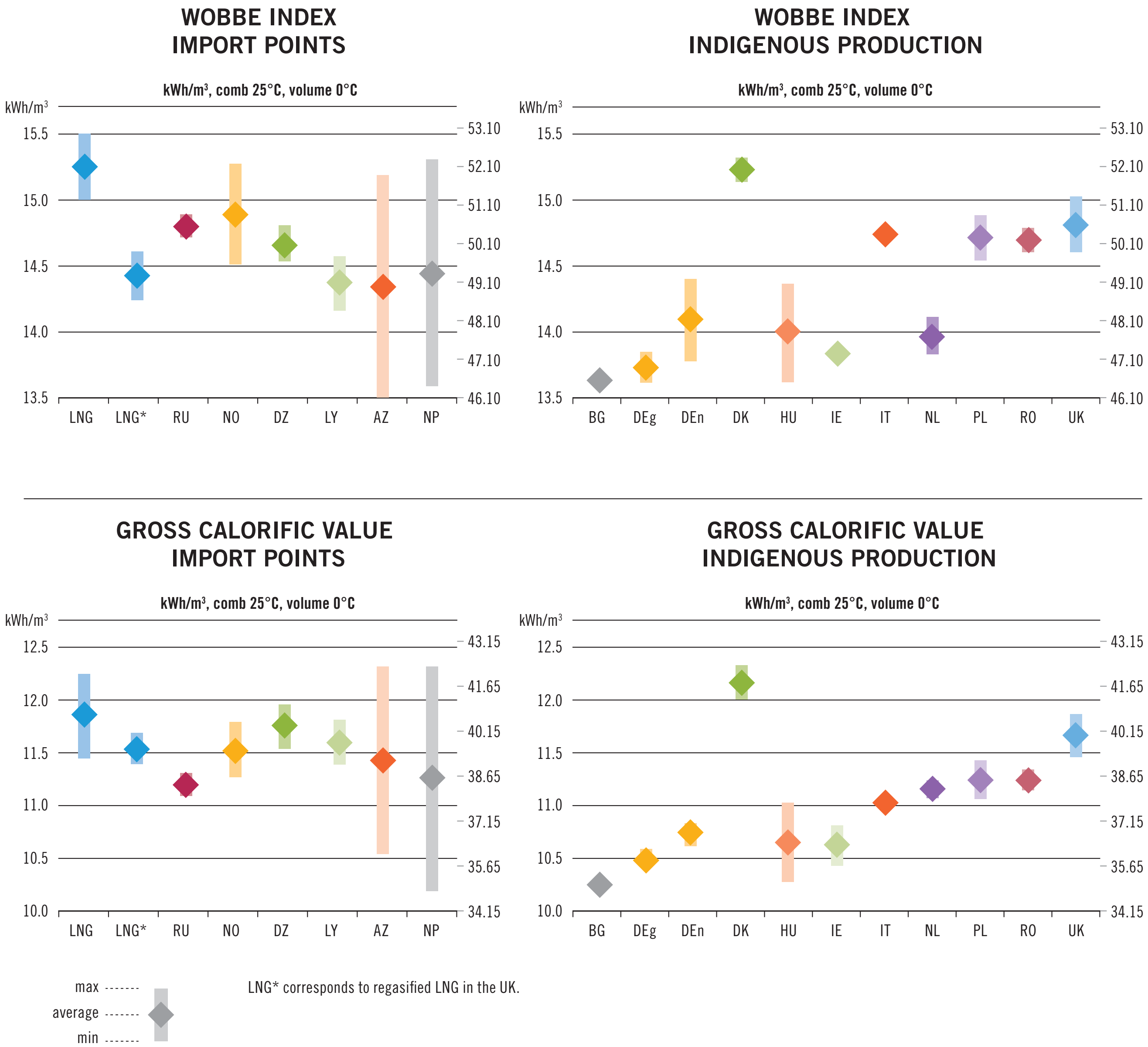


Figure 3.1: Wobbe Index and Gross Calorific Value of import points and indigenous production

4 Results and description of the following graphs

For each of the analysed regions, all TYNDP supply mixes have been assessed to determine the two yielding the widest and the narrowest bandwidths for WI and GCV.

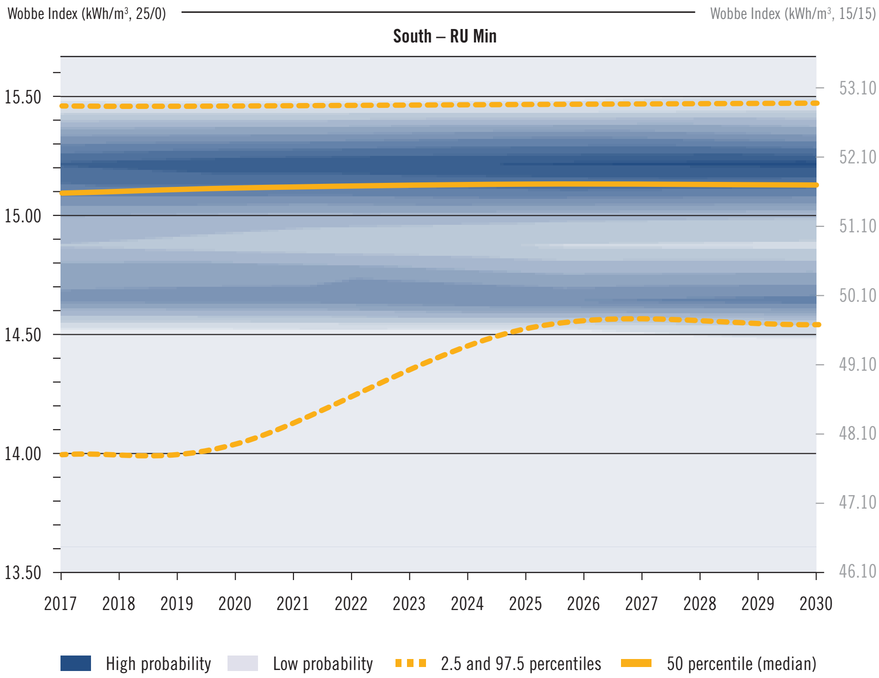
In order to identify trends in WI and GCV, the following figures present a plot of the median (50 percentile) of the resulting probability distribution.

The variability of gas quality parameters is depicted in two different ways:

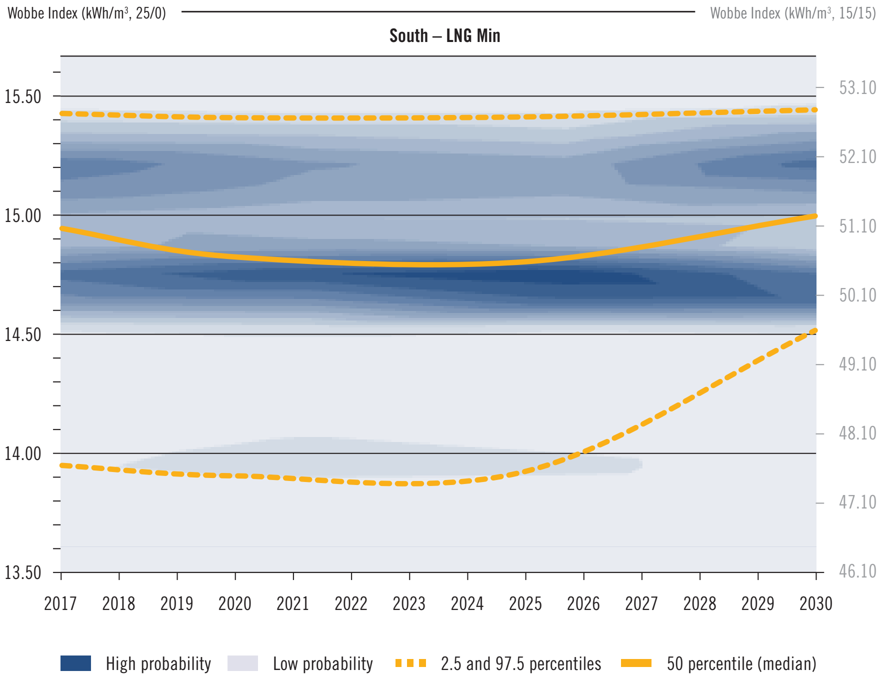
- 2.5 and 97.5 percentiles are plotted in dotted lines to show the extreme values in the forecast.
- The trends are presented on top of a surface plot illustrating the probability distribution of different gas quality values across the assessment period. The darker the background, the higher the probability. This plot serves to highlight the fact that the probability distribution of the output does not follow the normal curve. In general, for one given region and price configuration, different local gas quality bandwidths may be found between the two extreme percentiles. The width and intensity (probability) of each band comes as a result both of the gas quality parameters of supply sources on one hand, and their contribution to satisfy the forecasted gas demand on the other.

SOUTH REGION: ES, FR, PT

South – RU Min



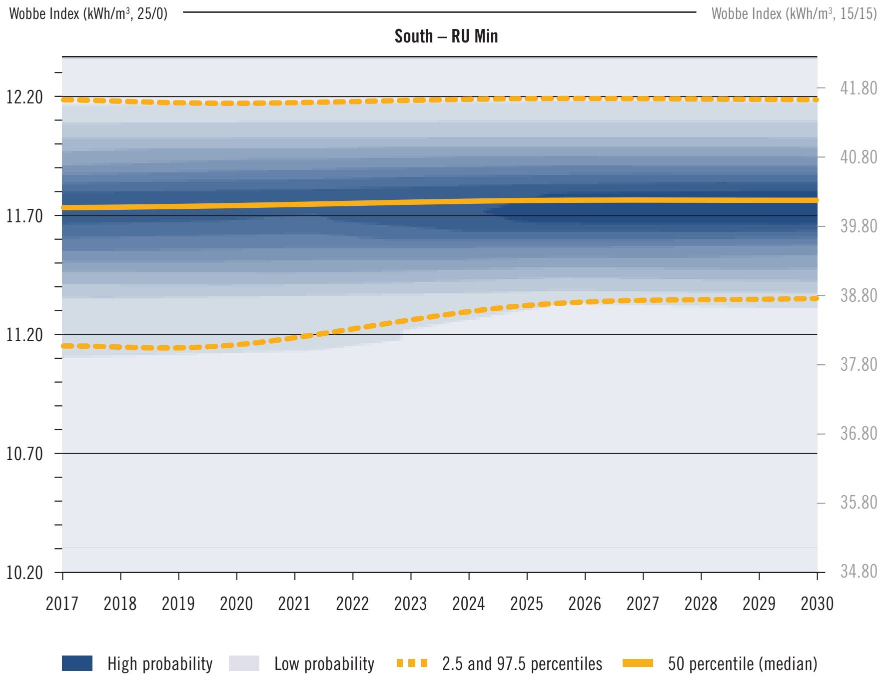
South – LNG Min



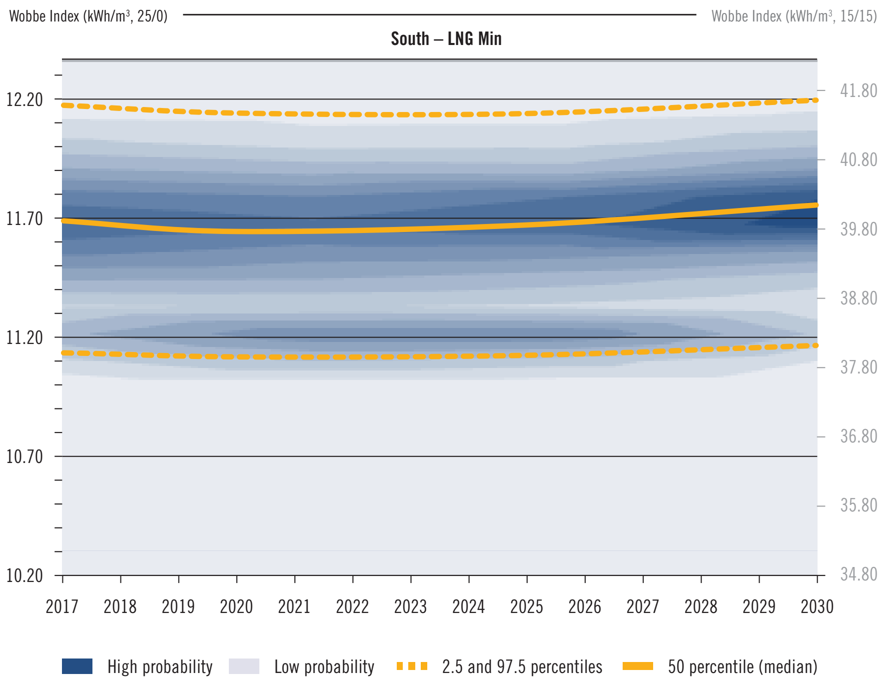
WI ranges in this region will remain stable. A supply mix with minimum supply levels for LNG (LNG min) may lead to higher influence of indigenous production which would push downwards the lower limit.

As for many of the following graphs, probability is not uniform across the range but rather concentrated around certain ranges, in this case corresponding to LNG towards the top of the range and pipeline gases (NO, DZ and RU) towards the middle part.

South – RU Min



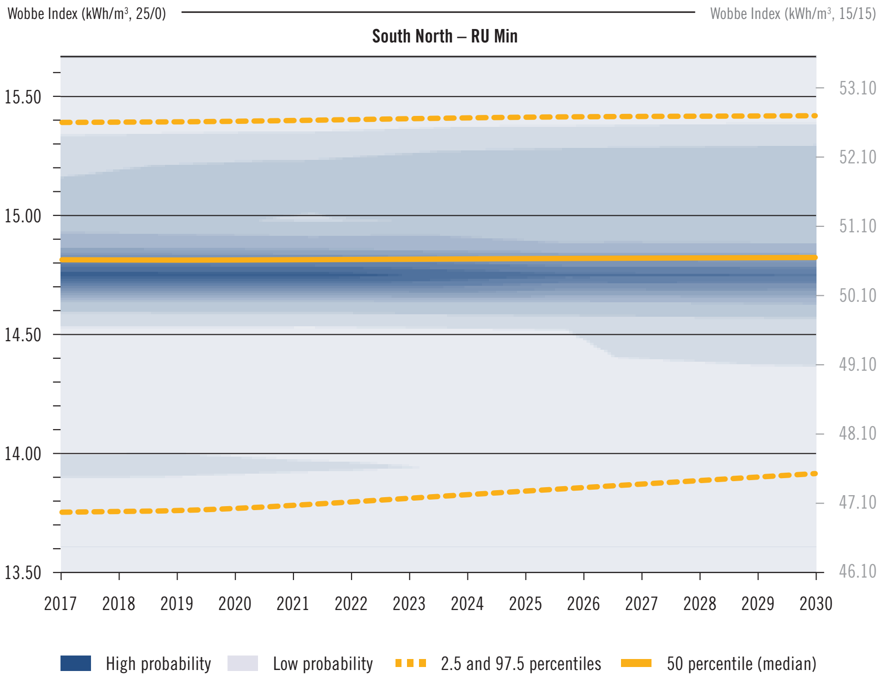
South – LNG Min



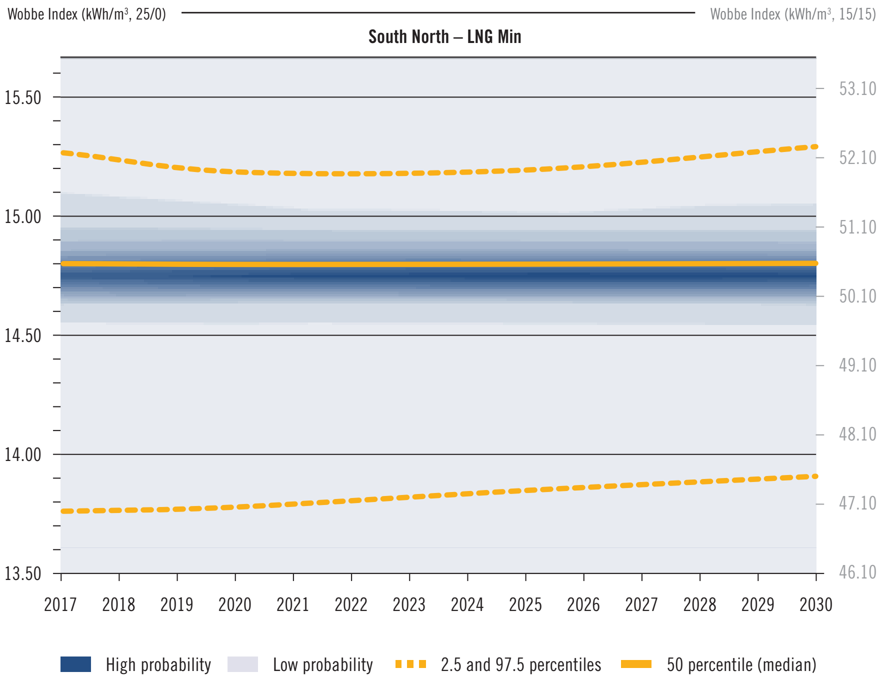
The GCV ranges depicted are rather stable though may tend to narrow in a supply mix with minimum levels of Russian gas (RU Min).

SOUTH-NORTH CORRIDOR: BE, CH, DE, FR, LU, IT

South-North corridor – RU Min



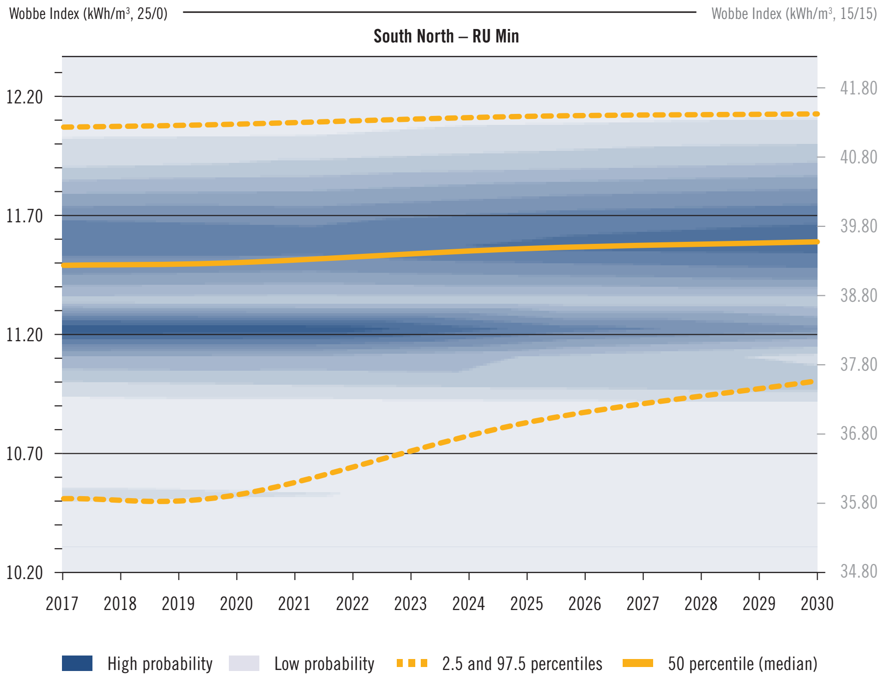
South-North corridor – LNG Min



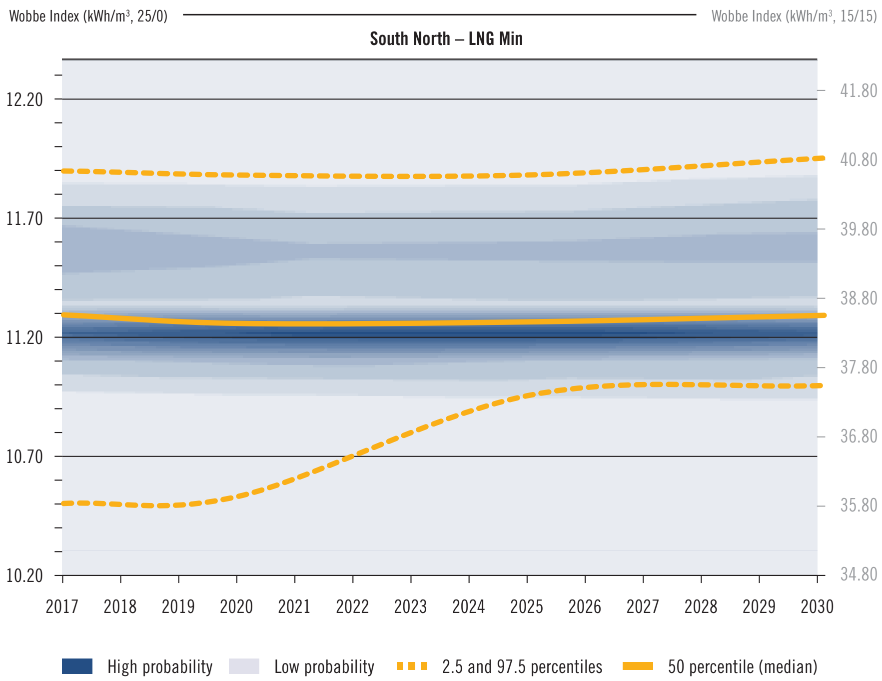
The superior limit of the WI range may be relatively lower under the LNG Min supply mix and around the centre of the time period.

The inferior limit shows a slight ascending trend due to the decreasing role of indigenous production

South-North corridor – RU Min



South-North corridor – LNG Min

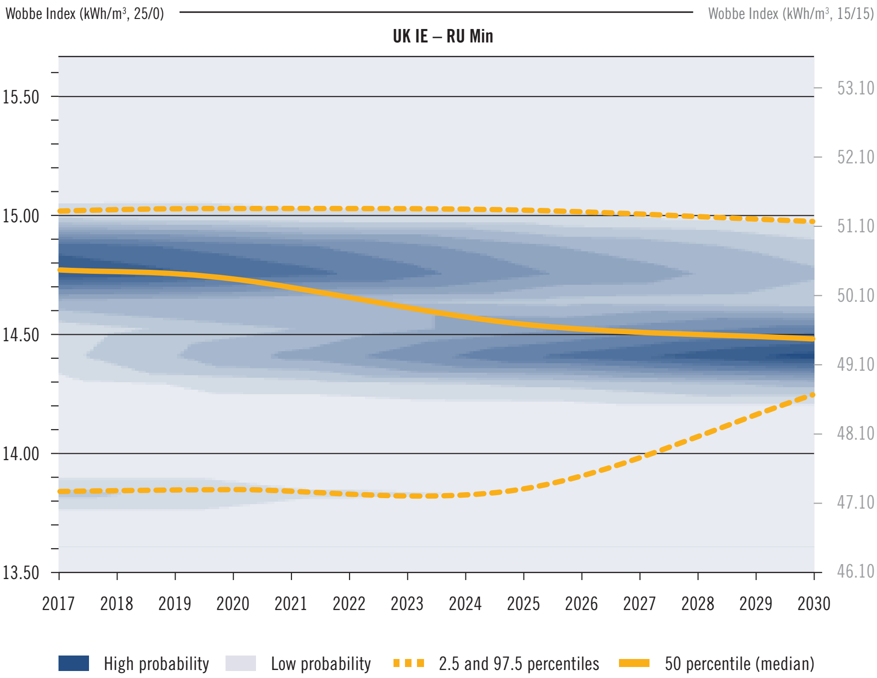


GCV values show a slight ascending trend under the RU Min supply mix due to the higher contribution of LNG.

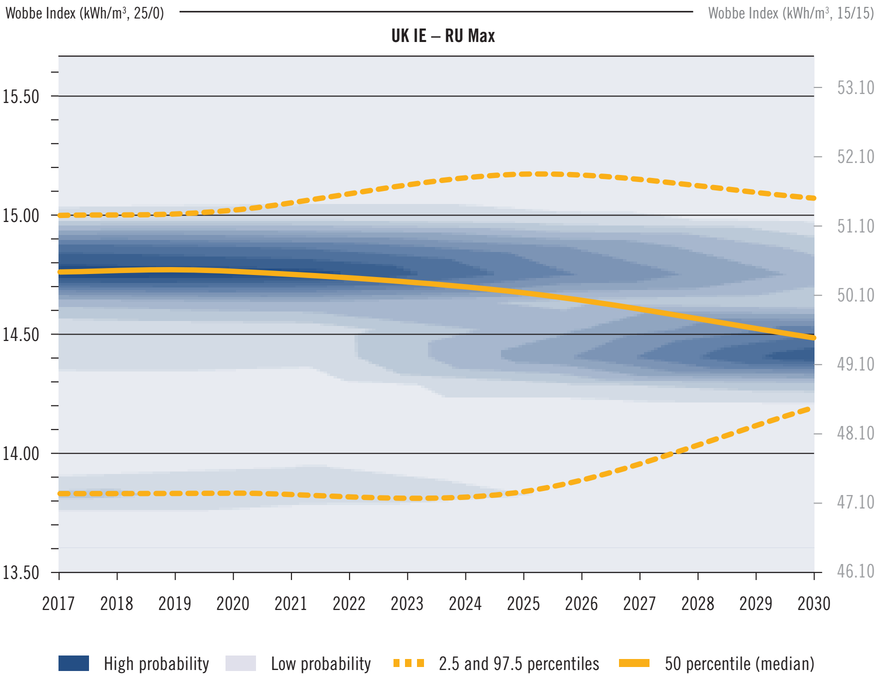
In both supply mixes the decrease of indigenous production will narrow the range.

UK-IE REGION

UK-IE – RU Min



UK-IE – RU Max

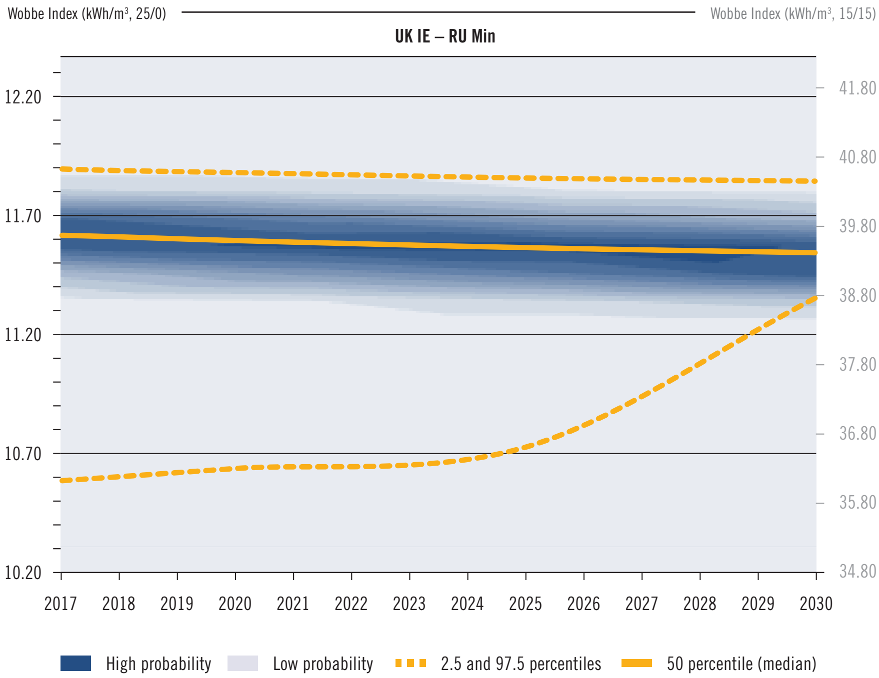


In both supply mixes average WI values may be affected by an increasing contribution of LNG and a decreasing one of indigenous production.

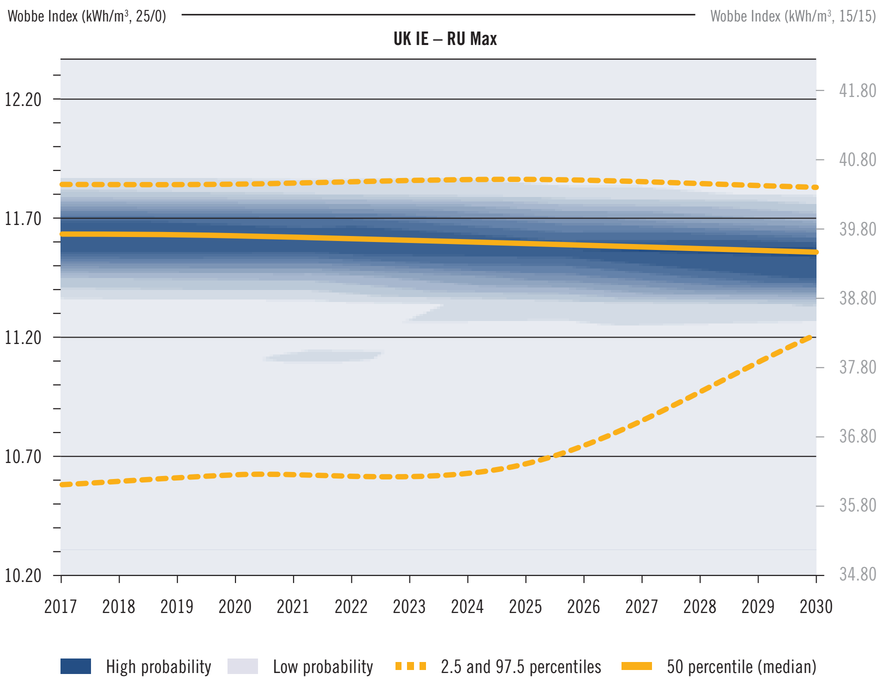
The lower end of the range is linked to national production in IE.

In the RU Max supply mix, imports of other sources through pipeline (including LNG from outside the region) may push the superior limit upwards. It should be noted that the effects of ballasting at cross-border points are not included in the model.

UK-IE – RU Min



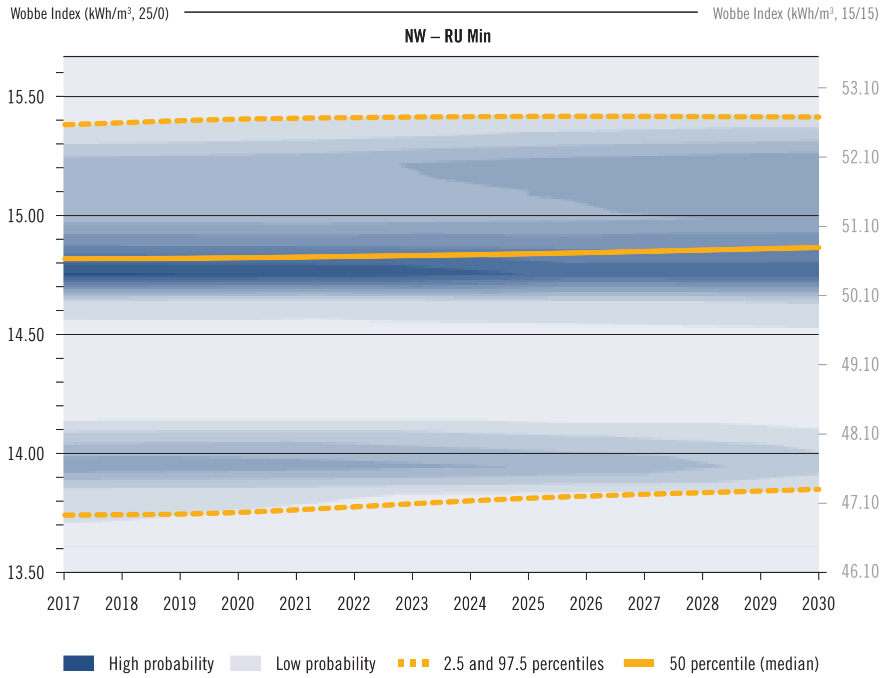
UK-IE – RU Max



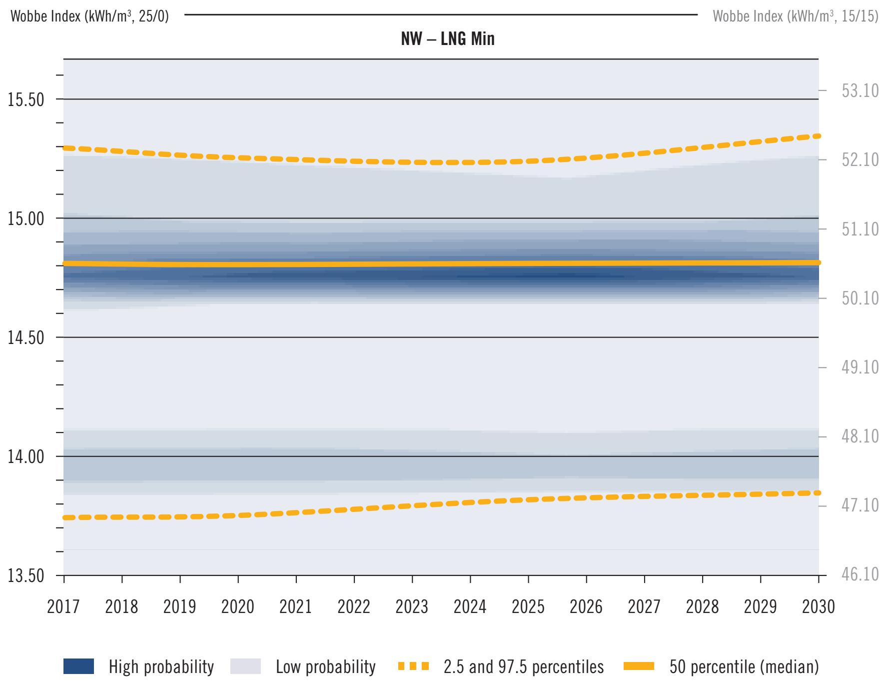
In both configurations GCV ranges tend to be narrower at the end of the period.

NORTH-WEST REGION: SE, DK, DE, NL, BE, LU, FR

NW – RU Min

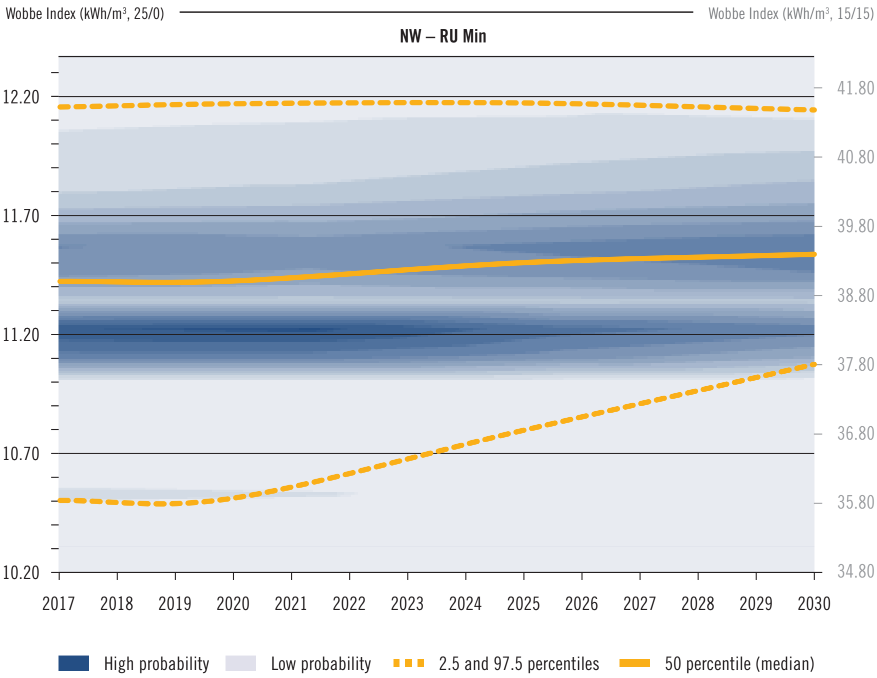


NW – LNG Min

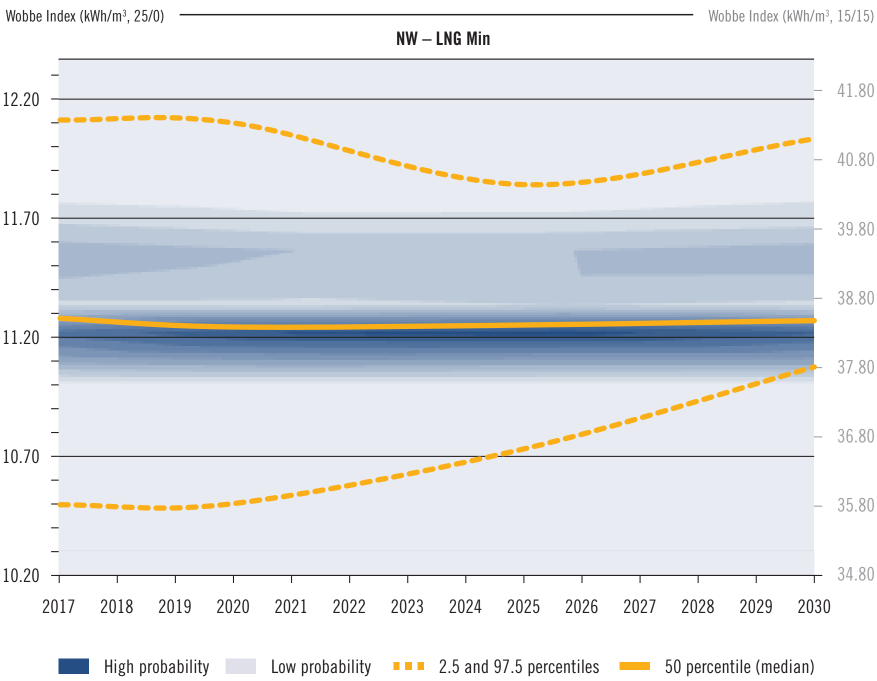


In both supply mixes WI ranges are relatively wider than for other regions due to the important contribution of indigenous production and the significant contribution of LNG.

NW – RU Min



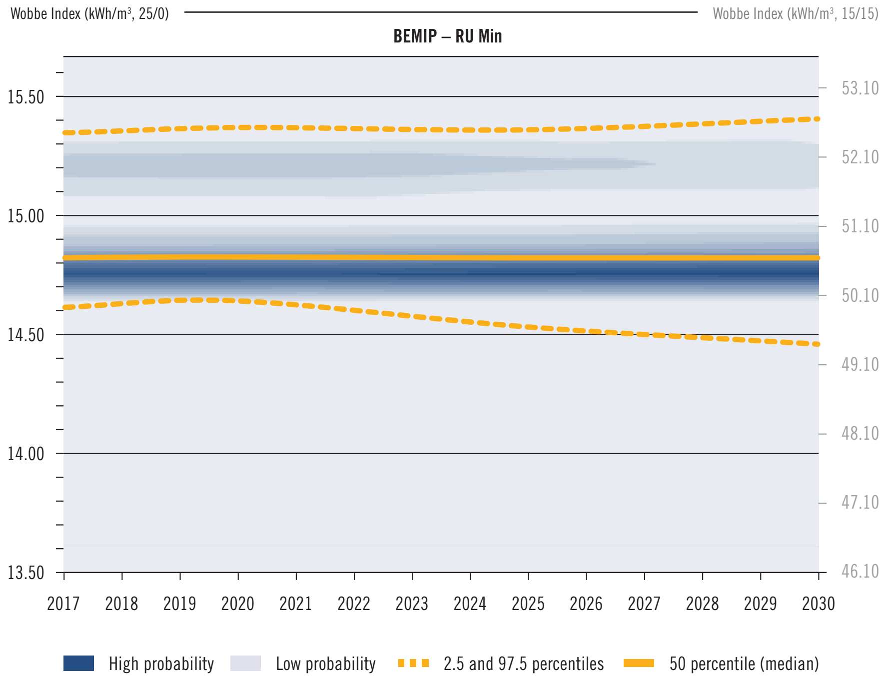
NW – LNG Min



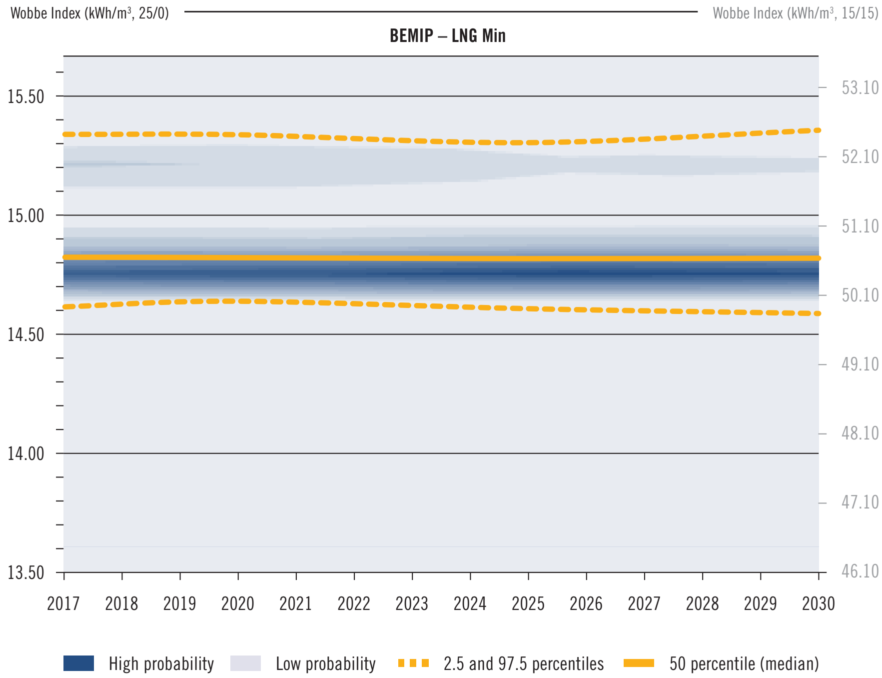
In the two graphs above, it can be observed that inferior limit for GCV shows an ascending trend. The superior limit is less stable in a supply mix with minimum levels of LNG, registering the lowest value towards the middle of the period and rising again towards the end due to an increase of LNG flows.

BEMIP REGION: DK, SE, FI, PL, EE, LT, LV

BEMIP – RU Min

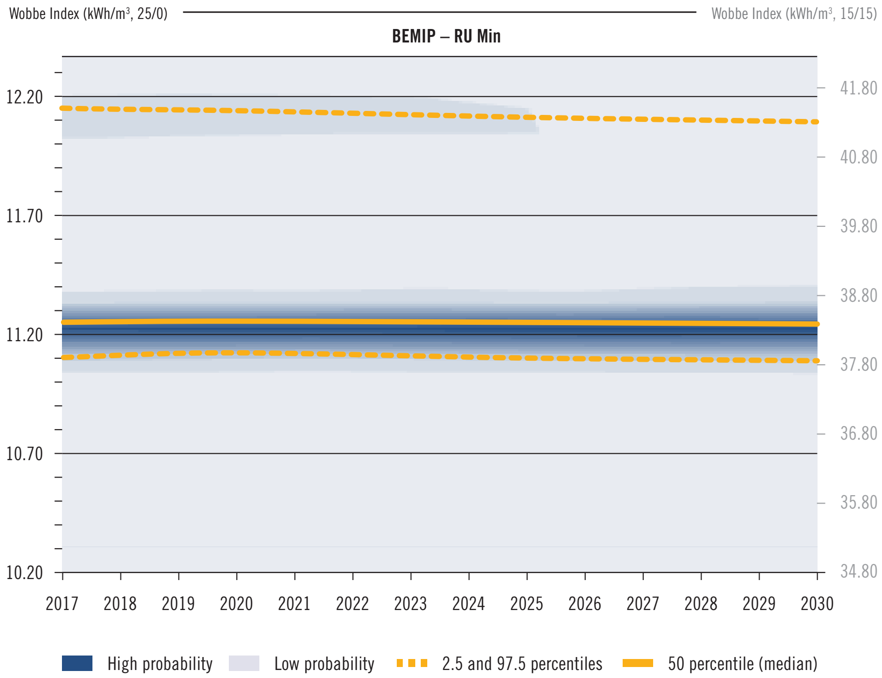


BEMIP – LNG Min

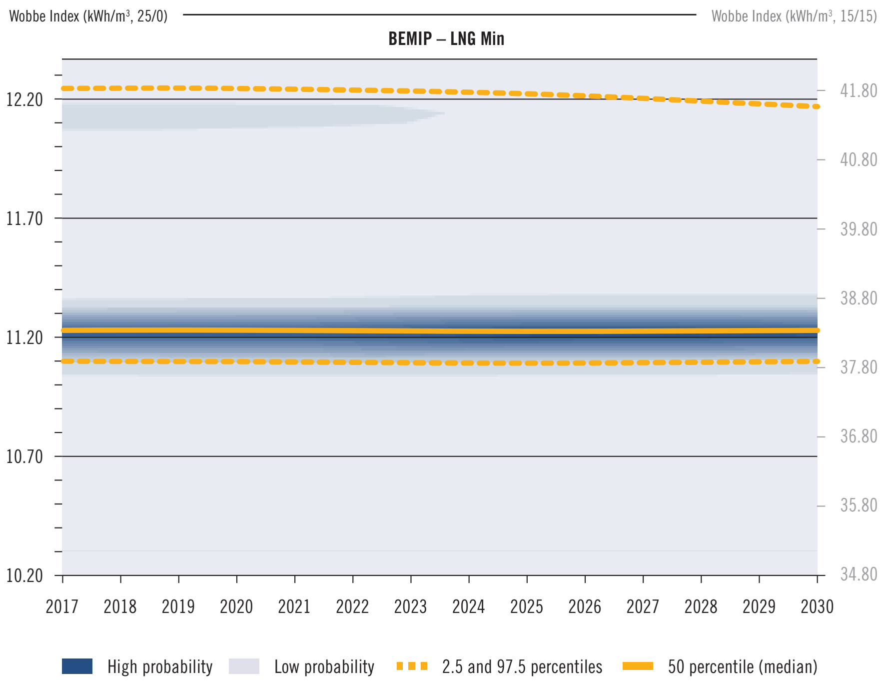


The WI ranges shown above are very stable and relatively narrower than for other regions due to the high influence of Russian gas. Indigenous production (e.g. DK) pushes the superior limit upwards.

BEMIP– RU Min



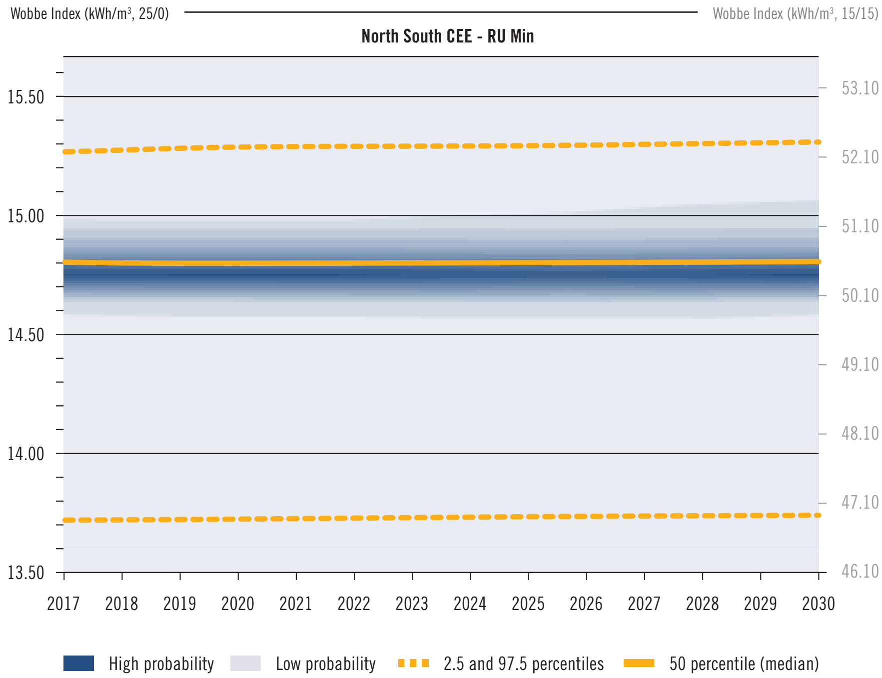
BEMIP – LNG Min



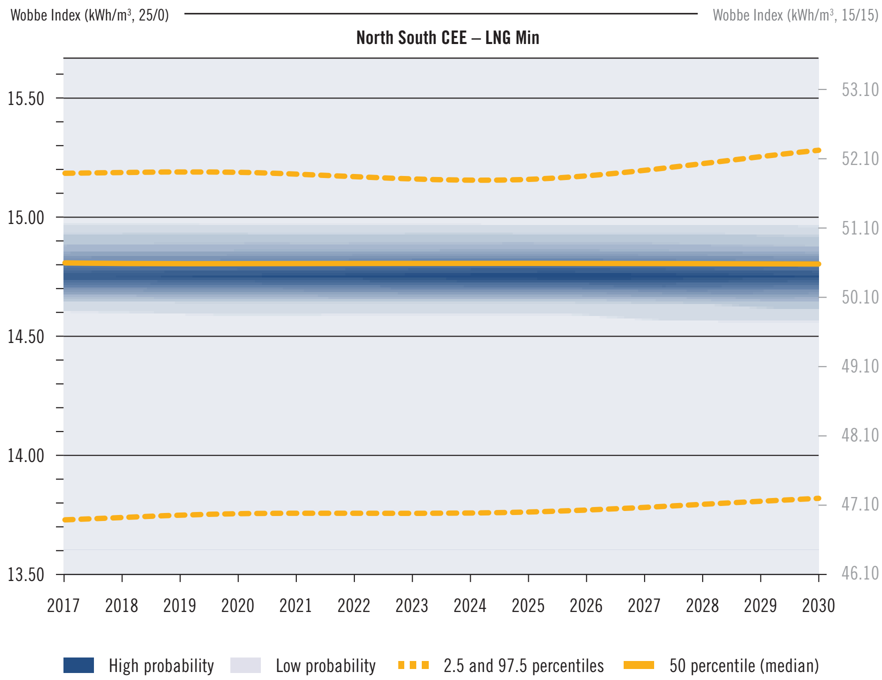
The GCV ranges shown above are very stable due to the high influence of Russian gas. Indigenous production (e.g. DK) pushes the superior limit upwards. As in many other cases probability across the range is not uniform and rather biased.

CENTRAL EASTERN EUROPE: DE, PL, CZ, SK, AT, HU, HR, RO, BG

Central Eastern Europe – RU Min

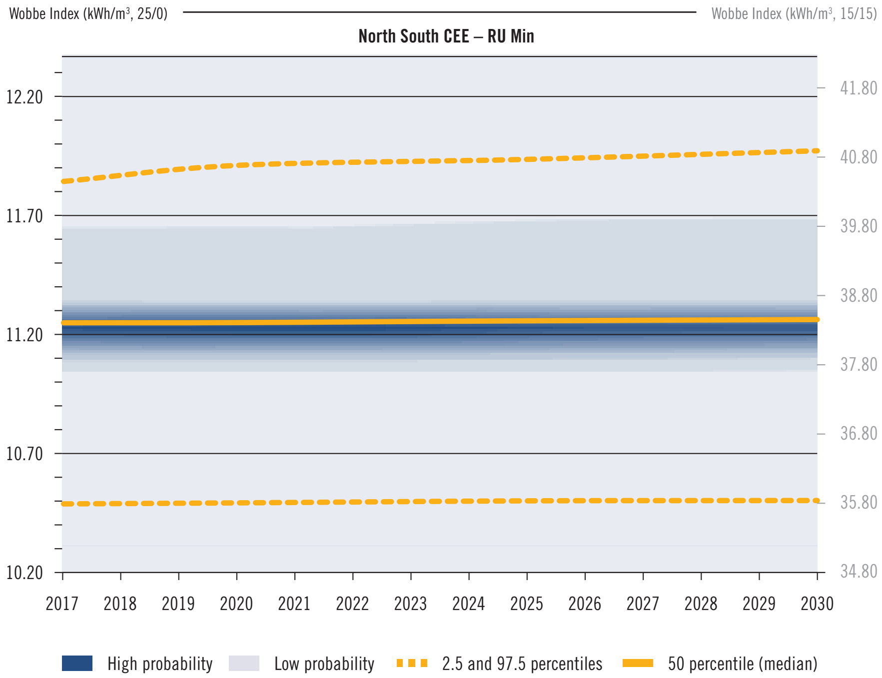


Central Eastern Europe – LNG Min

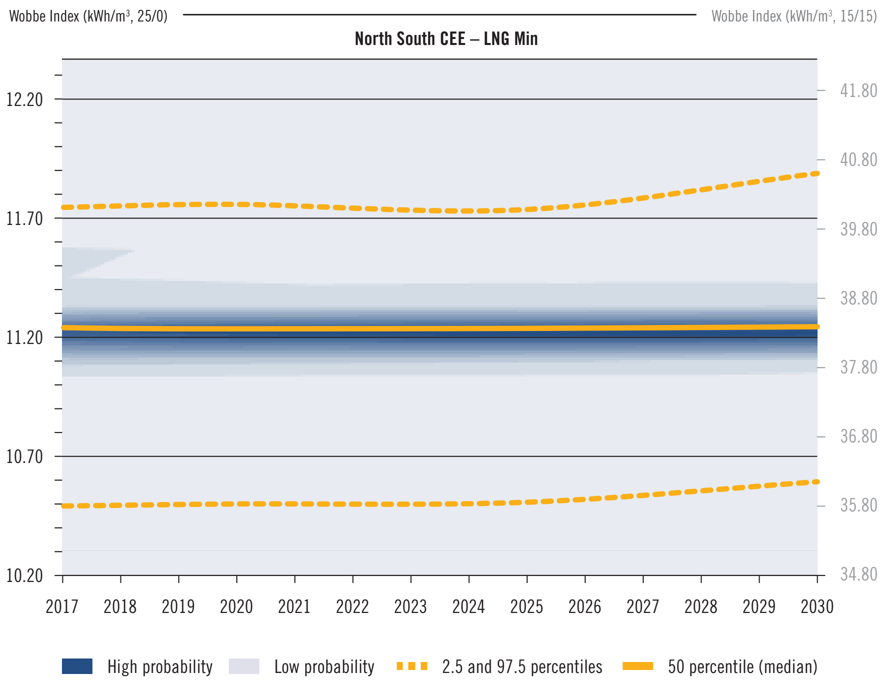


WI values are noticeably stable and concentrated around Russian gas reference values. However, the 2.75 percentile is significantly low due to the influence of local national production.

Central Eastern Europe – RU Min



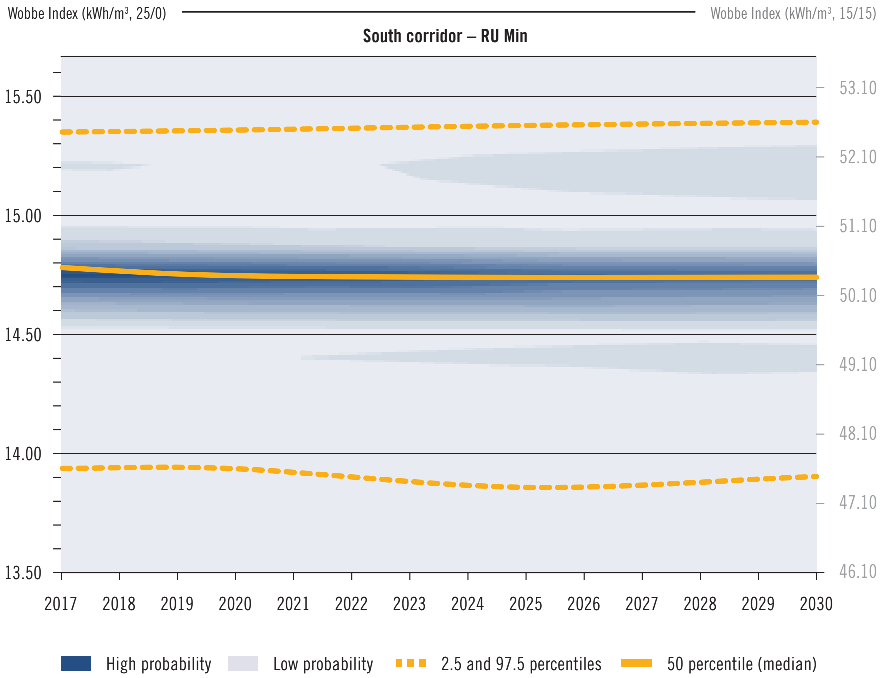
Central Eastern Europe – LNG Min



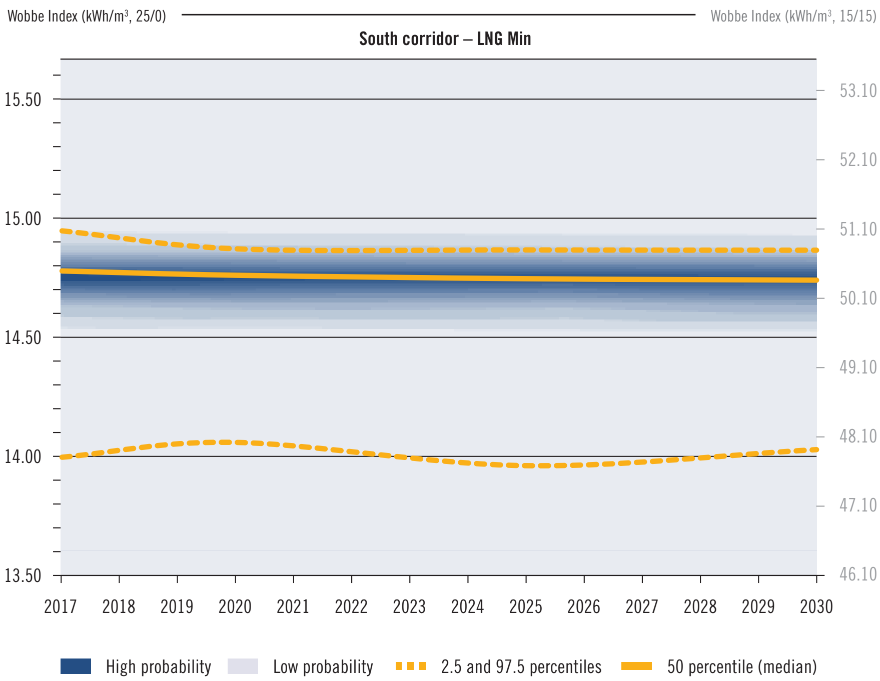
Though average values will be remarkably stable, the superior value may be pushed upwards in scenarios leading to higher LNG flows (RU Min). The low percentile is, as for WI, pushed downwards by the indigenous production.

SOUTHERN CORRIDOR: IT, AT, SI, SK, HU, HR, RO, BG, GR

Southern corridor – RU Min

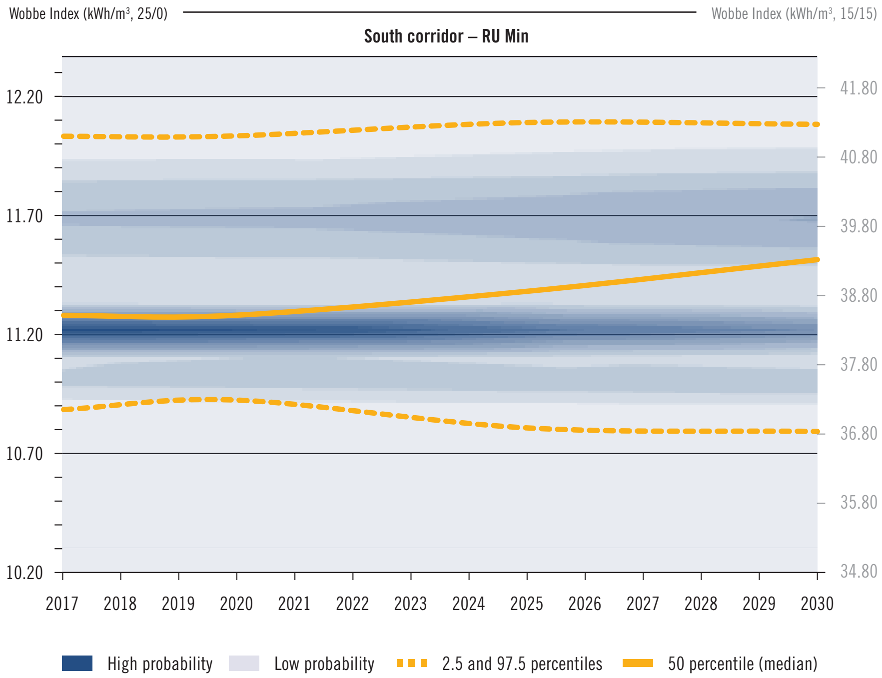


Southern corridor – LNG Min

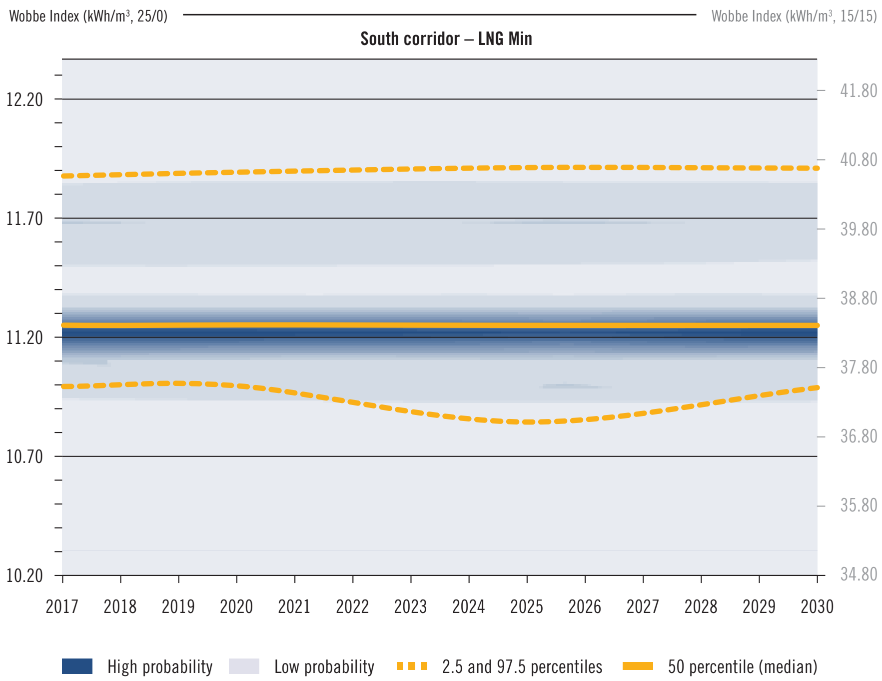


While average values show no significant trend, the 97.5 percentile will heavily depend on the level of LNG supply into this region.

Southern corridor – RU Min



Southern corridor – LNG Min



GCV average values show a clear ascending trend in those scenarios leading to higher flows of LNG. Again, probability distributions are far from being uniform.

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All Annexes are available as PDF or Excel-file on
www.entsog.eu/publications/tyndp

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