Private Comment on NEPRA's Adjustments/Indexations for Imported Coal Used to Calculate the Upfront Electricity Tariff for Coal Power Projects

Argus Media's response to the
NEPRA's Proposal on the Reference Coal Price Formula for Imported Coal

By email to:
Insaf_ahmed@hotmail.com

FAO:
Mr. Insaf Ahmed
Director General (Tariff)
National Electric Power Regulatory Authority (NEPRA)
NEPRA Tower
Ataturk Avenue (East)
G-5/1, Islamabad
Islamic Republic of Pakistan

Argus Media welcomes the opportunity to comment on the National Power Regulatory Authority's (NEPRA) *reference coal price formula* to determine the upfront electricity tariff for coal-fired power projects in Pakistan.

1. About Argus Media

- Argus Media is an independent media organisation whose activities include publication of price assessments for physical energy and related commodities. Argus Media's services are created by an international editorial operation with news bureaus located in the world's principal energy centres under the editorial direction of an editor-in-chief, who reports to the chief executive and who has responsibility for the quality of content. Its well-trained journalists operate according to a rigorous and transparent Editorial Code of Conduct and an Ethics Policy (available at: www.argusmedia.com/About-Argus/How-We-Work) that align with the highest standards of journalistic best practice, including the avoidance of conflicts of interest. We have been in business since 1970 and active in Asia for more than 23 years.

- Argus Media is not a financial services company. Argus Media does not provide financial/investment advice, broking or trading services. Its revenues are subscription based, and are not affected by whether market prices rise or fall. In summary, Argus Media is an independent media organisation that reports on energy and commodity markets but is not a participant in the markets and has no vested interest whatsoever in the level of prices in those markets. Its worldwide reputation and continued business success depend on maintaining that independence.

- Argus Media produces over 90 publications focusing on developments in the world's commodity sectors and containing news and analysis about supply, demand and inventories, the politics behind markets, corporate trends and price assessments. Argus Media does not determine which of its price assessments from its various publications are used as benchmarks — it is the market itself that makes this decision.

2. Argus Media and Coal

- Argus Media has extensive experience of reporting on and assessing spot market prices in the international coal markets. Argus assessments form 50pc of the leading international coal price benchmarks API 2 and API 4, which reflect the value of 6,000kcal NAR coal cif Amsterdam/Rotterdam/Antwerp in northwest Europe and fob Richards Bay, South Africa, respectively.

- In Asia, Argus has assessed Australian, Indonesian, and a variety of delivered coal prices since 2001. Argus assessments form 50pc of the emerging Asian benchmarks API 5, for 5500 kcal NAR thermal coal fob Newcastle, and API 8, for 5500 kcal NAR thermal coal cfr south China.
- For Indonesian coal specifically, Argus has assessed the spot price of 6500 kcal GAR coal since 1 October 2001.
- Since June 2006 Argus has produced in a joint venture with PT Coalindo Energy, an Indonesian publishing company, a series of Indonesian Coal Indices (ICI) for currently five different grades of thermal coal. The ICI indices are widely used by Indonesian exporters, international traders and coal purchasers for contract indexation, and by Indonesian federal and provincial governments for tax and royalty calculation.

Please find below Argus Media's comments on NEPRA's *Determination in the Matter of Upfront Tariff for the Projects on Imported/Local Coal communicated to the Federal Government vide letter No. NEPRA/TRF-100/UTC/2013/7195-7197*. We have two specific recommendations:

A) To propose the inclusion of an Argus-PT Coalindo Energy price assessment in the *reference coal price formula* for imported Indonesia coal (Indonesian Coal Index (ICI3) = 5,000kcal/kg GAR).

B) To propose the inclusion of an Argus-McCloskey price assessment in the *reference coal price formula* for imported Australian coal (Argus McCloskey Coal Price Index (API5) = 5,500kcal/kg NAR).

A) Indonesian Reference Coal Price to Determine the Upfront Electricity Tariff

Choice of the Indonesian Price Reference

- Argus Media endorses NEPRA's inclusion of Indonesian coal in the *reference coal price formula* for imports into Pakistan. Indonesia has become the largest exporter of thermal coal in the world and is the dominant supplier of coal, especially for the lower rank variety, to power producers in South Asia. It therefore makes eminent sense to include an Indonesian coal price reference into the reference coal price formula.
- However, Argus suggests that it makes more sense to choose a reference, on a calorific value basis, that reflects the most typical grade of coal that Pakistani coal-fired power plants would look to import, rather than a high CV coal price (kindly refer to *Appendix A* for a detailed discussion on the issues faced when normalizing coal prices based on high calorific value thermal coal benchmark prices).
- Globally, Indonesia has become the world's largest exporter of coal, a factor which encouraged Argus in 2006 to collaborate with PT Coalindo Energy, an Indonesian publishing company, to develop the Indonesian Coal Indices (ICI) (see Table 1).

Table 1 *History of the Development of the ICI Price Indices*

ICI (Indonesian Coal Index)	Start date
GAR 6500 (ICI 1)	9 June 2006
GAR 5800 (ICI 2)	9 June 2006
GAR 5000 (ICI 3)	**9 June 2006**
GAR 4200 (ICI 4)	1 August 2008
GAR 3400 (ICI 5)	4 November 2011

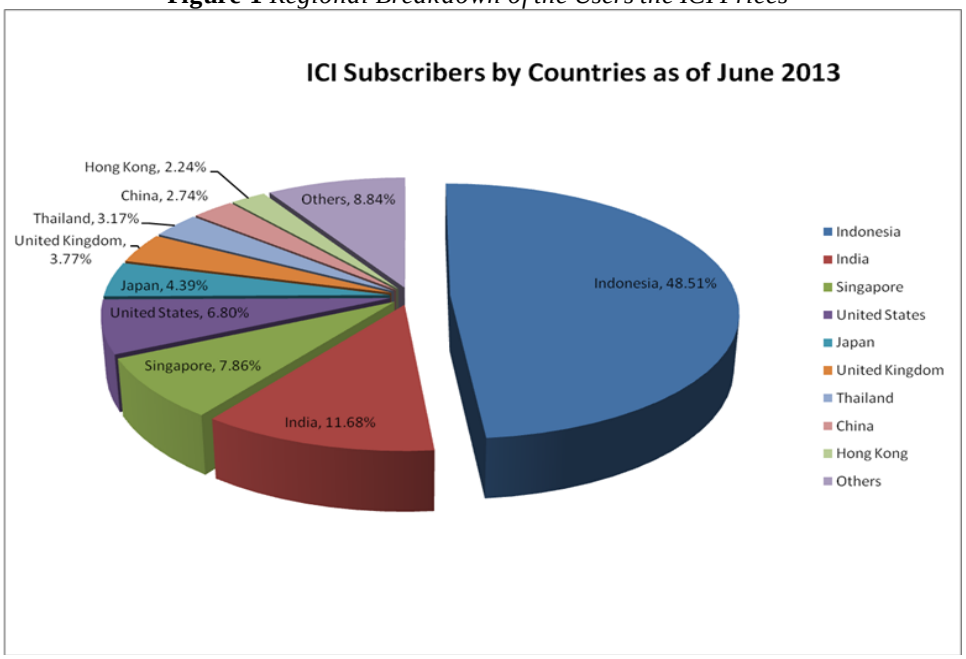
Argus Proposes that the ICI 3 be Used as the Indonesian Price Reference

- The ICI index series is the most widely accepted price reference for Indonesian coal. The ICI is a weekly spot price index for Indonesian steam coal. It has been accepted in pricing applications since its launch in June 2006.[1]

[1] Given that prices are assessed on a weekly basis, the time series data available for ICI3 constitutes around 430 data points and 8 full years of data. This dataset would more than allow for statistical analysis as to the robustness of the data, which is crucial when making a decision as to the inclusion of price series in a price formula.

- The ICI provides indicative prices for the five most referenced grades of Indonesian coal. The ICI is the driver for official Indonesian HBA (or known also as Indonesia Coal Price Reference, ICPR).
- ICI was launched to specifically capture the growing impact of Indonesian coal internationally, the critical requirement for an Indonesian coal price index that is assessed directly, independently, and transparently.
- ICI has drawn strong attention and support from the Indonesian government and the Indonesian Coal Mining Association (ICMA), as well as from the market. Companies in more than 30 different countries currently subscribe to the ICI indices (see Figure 1).

Figure 1 *Regional Breakdown of the Users the ICI Prices*[2]



- ICI pricing is used across many sectors. It is used as a basis for trading and contract evaluation in international trade to Southeast Asia, and Northeast Asia, both on a spot and term reference. It is used in the Indonesian domestic market to establish the buying price for PLN Persero, the state power generation company. ICI is used to calculate the Domestic Market Obligation (DMO) for Indonesian coal producers.
- The ICI is used by the government Directorate of Mines and Minerals in annual production asset planning. Furthermore, it is the driving component of monthly HBA (ICPR) for Indonesia tax and royalty calculations. The HBA is a basket comprising ICI 1 for 6500 kcal/kg GAR thermal coal, another Indonesian price reference and two Australian price references. However, coal exporters typically use the ICI to track and anticipate changes in the monthly HBA.
- ICI is used by the governor of Kalimantan to assess taxation and mining royalties, and beyond this sphere, companies use the ICI in various financial applications such as project valuation and feasibility, audit and internal reporting.
- Discussion with the market participants in Pakistan and Indonesia reveal that most expect the Indonesian coal that would be imported by Pakistan will be of a lower calorific value than 6500 kcal/kg GAR. In fact, most participants expect the bulk of the coal imports to be of the sub-bituminous variety. Hence, Argus suggests that the 5000 kcal/kg GAR coal price would a more appropriate reference to track Indonesian coal shipments into Pakistan, as it would reflect more closely the typical grade of coal that would be purchased by the power plant operators.

[2] Countries that belong to the "Others" category include Malaysia (1.49pc), Switzerland (1.33pc), Australia (1.23pc), Taiwan (1.1pc) and the Philippines (0.71pc).

- ICI 3 specifications were developed in collaboration with Indonesian exporters and purchasers of the grade, and reflect the qualities (see Table 2). NEPRA can be provided with a price history for this index if it so requests, to enable its staff to conduct analysis of the data.

Table 2 *Specifications of the ICI Coal Grades*

Grade	Calorific value	Sulphur	Ash	Total Moisture	Vessel Size	Timing
ICI-1	6,500Kcal/kg GAR (6200 Kcal/kg NAR)	≤ 1.0%	≤ 12%	≤ 12%	Panamax	in 90 days
ICI-2	5,800kcal/kg GAR (5800 Kcal/kg NAR)	≤ 0.8%	≤ 10%	≤ 18%	Panamax	in 90 days
ICI-3	**5,000kcal/kg GAR** (4600 Kcal/kg NAR)	**≤ 0.6%**	**≤ 8%**	**≤ 30%**	**Panamax**	**in 90 days**
ICI-4	4,200kcal/kg GAR (3800 Kcal/kg NAR)	≤ 0.4%	≤ 6%	≤ 40%	Mother vessel	in 90 days
ICI-5	3,400kcal/kg GAR (3000 Kcal/kg NAR)	≤ 0.2%	≤ 4%	≤ 50%	Mother vessel	in 90 days

ICI Methodology is Robust

- ICI is a partnership between Argus Media and PT Coalindo Energy (Indonesia). Argus Media is the world's largest independent energy price reporting agency, dominant in coal price reporting via the API, ICI and other price benchmarks. Argus has a proven ability of research and analysis, based on 40 years of experience and worldwide cross-market networks.
- PT Coalindo Energy was founded to facilitate the ICI partnership in 2006. It develops weekly panel-based input for the ICI assessment, using a distinctly different methodology to Argus.
- The combination of methodologies means that the ICI is already a basket price, and thus minimizes the susceptibility of the resulting index to manipulation, ensuring that it remains representative of spot market values.
- The ICI is a basket index produced every Friday. The Argus component is an assessment based on deals, bids and offers, plus analysis which reflects observation of the market.
- The Coalindo component is a panel-based calculation which reflects spot price ideas from qualified panelists. Obvious outliers are not considered, then the top and bottom 10pc are eliminated, and the remaining prices are averaged.

Summary

- Thermal coal from Indonesia is expected to represent a significant proportion of Pakistan's total coal imports. It therefore makes eminent sense to include an Indonesian price reference in the *reference coal price formula* to determine the upfront electricity tariff for coal-fired power projects in Pakistan.
- The most appropriate and relevant price reference would be one which both reflects most closely the typical grades and quality of coal that would be imported into Pakistan, and which has already won widespread acceptance in the international coal market.
- The index which most accurately meets these requirements is the ICI 3 index for 5,000 kcal/kg GAR thermal coal.

B) Australian Reference Coal Price to Determine the Upfront Electricity Tariff

Choice of the Australian Price Reference

- The Argus Media endorses NEPRA's inclusion of Australian coal in its *reference coal price formula* for imports into Pakistan. Whilst Australia is a dominant coal producer in the Asia-Pacific region, large volumes of Australian coal might not be purchased by Pakistan's power plant complex going forward given the thermal coal industry's market structure and the specifications of coal required by the power plant complex in Pakistan. However, the price formation of the sea-borne thermal coal market is impacted by decisions made by Australian coal producers and hence its inclusion makes for a more robust *reference coal price formula*. For example, price negotiations between Japanese and Australian producers on term pricing sets a price anchor for the spot markets.

- Care ought to be taken when selecting the calorific value of the Australian coal used in the *reference coal price formula*. One reason for this is on account the issue of normalization of prices and the error that this can result when calculating the price of coal with a calorific value that is different from the price benchmark used in the normalization. This has been covered in *Appendix 1*. The second reason is the robustness of the underlying price index used and its volatility, which will be discussed below.

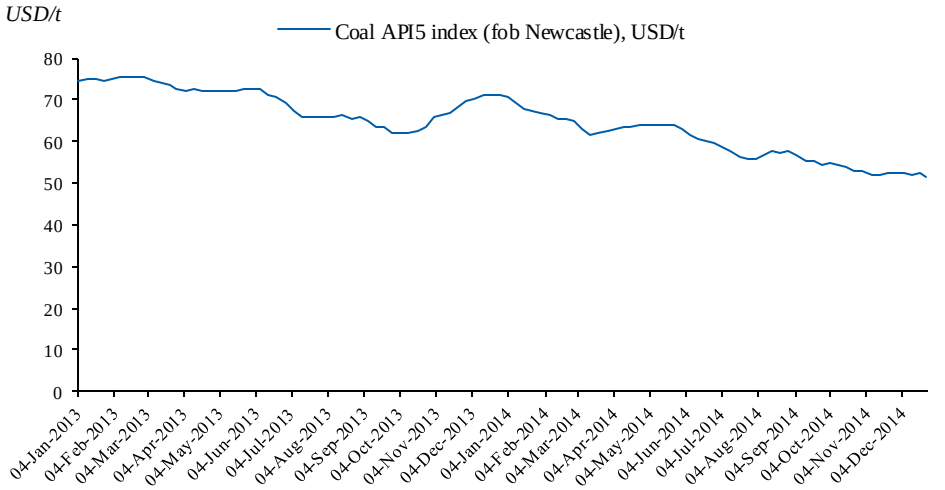
Argus Proposes that the API 5 be Used as the Australian Price Reference

- As discussed earlier, the market's expectation is that the calorific value of coal that will be purchased by the Pakistani power plants will err towards the subbituminous variety. Even the higher calorific value coal that will be used for blending with the low rank material will be closer to the 5,500kcal/kg NAR range. Hence, in order to reduce the errors that emerge due to the normalization of prices as discussed in Appendix 1, Argus proposes that API 5 be used as the Australian reference price in NEPRA's *reference coal price formula*.

- The volatility of the underlying benchmark coal price is important when making a choice as to its inclusion in a price formula. NEPRA as a regulator seeks to maximize the welfare of the country's inhabitants, which would in this case require that firms are incentivized to build and operate coal-fired power plants in the country. It helps firms to invest when they are not exposed to excessive risk when they do so. And price volatility is a measure of risk: the higher the volatility, the riskier a venture becomes *ceteris paribus*.

- Figure 2 plots the weekly Argus/McCloskey API5 price. This dataset consists of 104 price points dating from January 2013 and December 2014. The API5 price series does not exhibit sharp spikes and troughs, hence volatility is low.

Figure 2 *Time series data (Argus/McCloskey API5)*



Notes:
— Argus

The API methodology is robust

- The Argus/McCloskey price is the product of a robust combination of a volume-weighted average of deals and a market survey wherein information is received from a wide cross-section of market participants, including producers, consumers and intermediaries.[3] There is a balance struck between producers and users of the coal such that no unnecessary weightage is given to either group. The prices also undergo a verification process by coal analysts in Argus and IHS McCloskey.

- The sharp rise in coal demand in recent years has been driven by requirements from Asian giants China and India. Unlike traditional import demand centres such as Japan, which sought coal with a heating value of 6,000 kcal/kg NAR coal, the new cost-conscious Asian industrial powerhouses are increasingly seeking 5,500 kcal/kg NAR.

- The API 5 index tracks this key market on a fob Newcastle basis and is the most closely watched coal assessment with its profound influence on global markets. The index represents 5,500 kcal/kg NAR

[3] For more details, please see http://www.argusmedia.com/Coal/~/media/113AF0912D814FE1A29E9AA25B32391A.ashx and http://www.argusmedia.com/Coal/Argus-McCloskeys-Coal-Price-Index-Report.

high-ash coal shipped from Australia. It was launched jointly by global energy price reporting agency Argus and IHS McCloskey at the start of May 2012 and has quickly gained the confidence of the coal trading community as a reliable, independent price assessment for contracts.

Summary

- Whilst Australian coal imports are expected to make up a small proportion of total thermal coal imports into Pakistan, the inclusion of an Australian preference price in NEPRA's *reference coal price formula* is important given the impact that the continent's exports have on the Asian sea-borne thermal coal markets.
- The most appropriate and relevant price reference would be one which both reflects most closely the typical grades and quality of coal that would be imported into Pakistan, and which has already won widespread acceptance in the international coal market.
- The index which best meets these requirements, in terms of robustness and minimizing the errors due to price normalization, is the API 5 index for 5,500 kcal/kg NAR thermal coal.

Conclusion

Argus Media thanks NEPRA for the opportunity to comment on the National Power Regulatory Authority's (NEPRA) *reference coal price formula* to determine the upfront electricity tariff for coal-fired power projects in Pakistan. The recommendations for the prices to be included in the formula as discussed in the previous section are as follows:

- For Indonesia
  - Indonesian Coal Index (ICI 3) – 5,000kcal/kg GAR
- For South Africa
  - Argus/McCloskey's Coal Price Index (API 4) – 6,000kcal/kg NAR[4]
- For Australia
  - Argus/McCloskey's Coal Price Index (API 5) – 5,500kcal/kg NAR

We stand ready to respond to any further questions that the Authority might have.

Jim Nicholson
Senior Vice President
Argus Media Ltd.
50 Raffles Place,
#10-01 Singapore Land Tower
Singapore 048623

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[4] The API 4 index is the average of the weekly Argus' fob Richards Bay 6,000kcal/kg NAR assessment and the weekly IHS McCloskey South African 6,000kcal/kg NAR FOB marker. The recommendation for the use of the API 4 index rather than the API 3, which is the price of 5,500kcal/kg NAR South African coal, follows from the wide acceptability of this coal grade amongst both buyers and sellers of coal in the sea-borne thermal coal market.

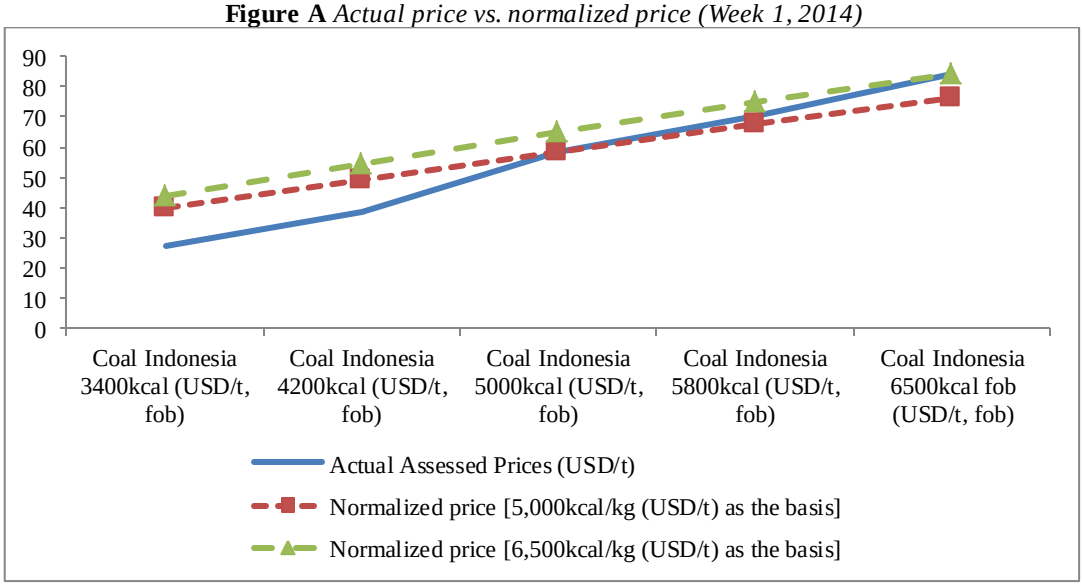
APPENDIX 1

Non-linearity of coal prices

Coal prices are non-linear in their calorific value. This implies that a linear normalization of prices based on relative calorific value would yield a price that differs from the market price of the coal grade being estimated. This is illustrated by Figure A. The blue line in Figure A plots the actual Argus assessed price for Indonesian coal for 3,400kcal/kg GAR, 4,200kcal/kg GAR, 5,000kcal/kg GAR, 5,800kcal/kg GAR and 6,500kcal/kg GAR Indonesian coal. The red line plots the normalized prices for the five grades based on the assessed prices for the 5,000kcal/kg GAR coal grade assuming that the conversion is linear. This means that in Week 1, 2014, when the assessed market price for 5,000kcal/kg GAR coal was USD58.5/t, the linearized calculated price of 3,400kcal/kg GAR coal would work out to be USD39.8/t (=3400/5000×58.5).

It is clear from Figure A that the discrepancy between the calculated price for 3,400kcal/kg GAR coal, based on the assumption that prices are linear in their calorific value, and the market price is quite substantial. The market price for the low calorific value coal grade was assessed as USD27.3/t in Week 1, 2014. This discrepancy can also be observed when prices are normalized on the basis of the 6,500kcal/kg GAR Indonesian coal price as illustrated by the green dashed line in Figure A. In fact, the difference between the actual market price and the calculated price is larger than when the 6,5000kcal/kg GAR coal grade is used as the basis for normalization.

Figure A *Actual price vs. normalized price (Week 1, 2014)*



The key takeaway from the discussion above is that given that the prices of thermal coal are non-linear in their calorific value, care should be taken when choosing the underlying coal price to be including in the construction of an index/reference coal price formula. The further away the underlying benchmark price is in terms of its calorific value from the coal that is used by the country's power producers, the greater is the discrepancy between the market value of the coal and the calculated price of the coal.

Thus, a policy maker is best served by choosing the benchmark that is closest in calorific value to the coal being burnt/or is expected to be burnt in the country

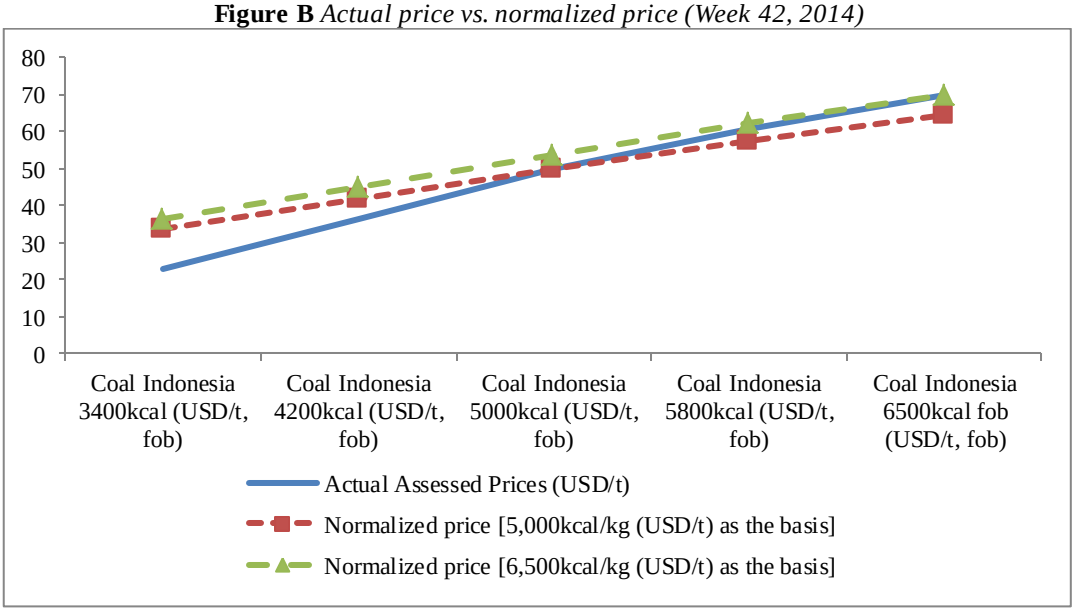
Another reason that care ought to be exercised when choosing the calorific value of the coal benchmark price to be used in any index/ reference coal price formula is the variation in the market's valuation of the coal. A comparison of the blue line in Figures A and B shows that

- the magnitude of the prices have changed over the year and
- the relative shape of the curve has changed as well.

This is due to the fact that there is heterogeneity in the demand/supply dynamics of the different coal grades. Thus, the relative price of the low calorific value coal could rise faster than its high calorific value counterparts and vice versa.

This heterogeneity in market fundamentals makes the choice of the coal price benchmark to be used in any index/reference coal price formula quite important.

Figure B *Actual price vs. normalized price (Week 42, 2014)*

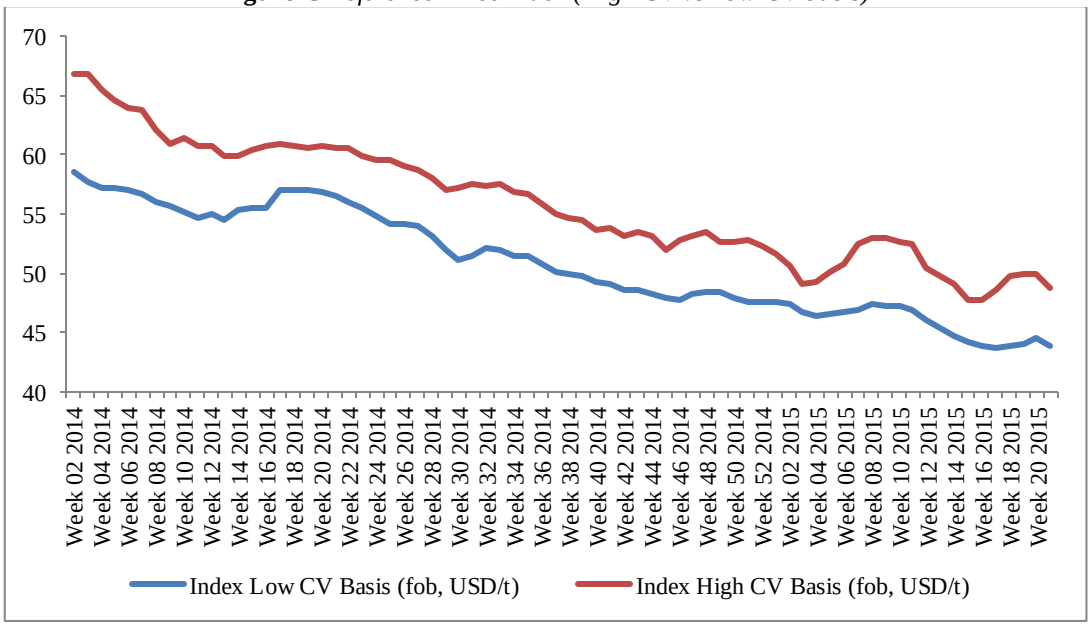


Impact on the price index/reference coal price formula

In order to illustrate the importance of the choice of calorific value of the coal price benchmarks used to construct the price index/reference coal price formula, two indices have been constructed.

The index named *Index High CV Basis* illustrated in red in Figure C consists of high calorific South African (NAR 6,000kcal/kg), Australian (NAR 6,000kcal/kg) and Indonesian (NAR 6,200kcal/kg) coal prices normalized to GAR 5,000kcal/kg, which the calorific value of coal most likely to be used in Pakistan, and weighted in the ratio 40:20:40 as prescribed by NEPRA. The index named *Index Low CV Basis* illustrated in blue in Figure C consists of lower calorific South African (NAR 5,500kcal/kg), Australian (NAR 5,500kcal/kg) and Indonesian (NAR 4,700kcal/kg) coal prices normalized to GAR 5,000kcal/kg in the same ratio.

Figure C *Reference Price Index (High CV vs Low CV basis)*



The difference between the *Index Low CV Basis and Index High CV Basis* over the sample period (Week 2, 2014 to Week19, 2015) is USD5/t on average. This underscores the need for careful selection of the prices to be included in the index as well as their calorific value.