Reviewing the computation methodology for escalation rate

ABSTRACT:

CERC desired that the escalation and other rates, being computed and notified by the CERC from time to time, be made as realistic as possible. Hence a study with the aim to review the computation methodology of escalation rates for various elements of the power procurement cost has been undertaken. In this study, six new computation methodologies for escalation rate are introduced. The new methodologies are studied alongside the existing methodology to determine their ability to predict the given values with least possible error. This study has been carried out in five areas covering various cost elements. It is observed that the escalation rate obtained by the method of minimum mean square error has the least possible error of prediction in all the areas.

Introduction

In a discussion meeting held in Central Electricity Regulatory Commission (CERC) Office in Chadralok Building (4th Floor), 36 Janapath, New Delhi on 18th August, 2010, CERC disclosed that they have recently received representations from several quarters requesting them to ensure that the escalation and other rates, being computed and notified by the CERC from time to time, be made as realistic as possible. Specifically, representations have been received with respect to two particular cost elements, namely, the transmission cost and the cost of coal transportation. The basic point that is being made by various representations is that the escalation rate for transmission and transportation, as notified by the CERC, are deemed to be unrealistically high because of the methodology being adopted for their computation. These escalations rates are used for evaluation of the power projects bid under the competitive bidding guidelines of the Ministry of Power. The escalation rates as computed by CERC are applied in the calculation of levelised costs for different bidders.

In the discussion meeting it was decided to review the computation methodology of escalation rate for various cost elements like fuel transportation costs, power transmission costs, etc. and suggest a refined methodology, if possible. Consequently, a study was undertaken by the SQC & OR Unit of ISI, Kolkata to examine the feasibility of improving the procedure of estimating different escalation rates. The ISI team has looked at six different methods chosen from theoretical perspectives and compared these methods with each other as well as with the existing method followed by CERC. It is to be noted that currently CERC uses a simple three year moving average for computing the escalation rates. The methods chosen and the results of comparison are given below.

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Computation methodology for escalation rate

Procedure currently used by CERC (as described in the document supplied by CERC)

A simple 3 year moving average method is being used by the CERC to arrive at the escalation rate to be applied over the period over which procurement has been planned. The procedure is as follows:

Step 1. Three years moving average data points computed based on year-wise index

Step 2. Annual escalation factors computed based on 3 years moving average data points

Step 3. Mean escalation rate computed based on annual escalation factors

Proposed methods

We propose six new approaches to compute the escalation rate.

    a) Method of proportion (method A)
    b) Method of range and median (method B)
    c) Method of time series (method C)
    d) Method of overall arithmetic mean (method D)
    e) Method of overall geometric mean (method E)
    f) Method of minimum mean square error (method F)

Method of proportion (method A)

In this method we compute g based on the ratio of y_n and y_1.

Step 1. Compute g from the equation $1 + g = \left(\frac{y_n}{y_1}\right)^{\frac{1}{n-1}}$

Step 2. Compute $e = 100g$

where
y_1: initial observation
y_n: latest observation
n: number of observations
e: annual escalation rate in percent.

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Method of range and median (method B)

In this method we compute g based on the ratio of range and median similar to coefficient of variation.

Step 1. Compute g from the equation $g = \frac{range}{n-1} \times \frac{1}{median}$

Step 2. Compute $e = 100g$

where
$range$: maximum observation – minimum observation
$median$: middle most value of the arranged data
n: number of observations
e: annual escalation rate in percent.

Method of time series (method C)

In this method we fit a time series model. Based on that model e_t at each t is being computed. Finally, we compute annual escalation rate in percent e based on the geometric mean of $e_t, t = 2, 3, \cdots, n$.

Step 1: Fit a time series of the form $y_t = a + b \cdot t$

Step 2: Compute $e_t = \frac{(\hat{y}_{t+1} - \hat{y}_t)}{\hat{y}_t} \times 100, \ t = 2, 3, \cdots, n$

Step 3: Compute $e = (\prod_{i=1}^{n-1} e_i)^{\frac{1}{n-1}}$

where
$\hat{y}_t$: tth fitted values
n: number of observations
e: annual escalation rate in percent.

Method of overall arithmetic mean (method D)

In this method we first equate the average of actual values with the average of escalated values for the period considered. Finally we find g from this equation.

Step 1. Compute g from the equation $y_1 \frac{(1+g)^n - 1}{g} = \sum_{t=1}^{n} y_t$

Step 2. Compute e as $e = 100 \cdot g$
where
y_t : tth observation
n: number of observations
e: annual escalation rate in percent.

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Method of overall geometric mean (method E)

In this method we first equate the geometric mean of actual values with the geometric mean of escalated values for the period considered. Finally we find g from this equation.

Step 1. Compute g from the equation $1 + g = \left(\frac{GM}{y_1}\right)^{\frac{2}{n-1}}$

Step 2. Compute e as $e = 100 \cdot g$

where
$$GM = (y_1 \cdot y_2 \cdot \cdots \cdot y_n)^{\frac{1}{n}}$$
y_i: observation for the ith year, $i = 1, 2, \cdots, n$
n: number of observations
e: annual escalation rate in percent.

Note: This method is applicable to the characteristics defined as ratio namely WPI, CPI, etc.

Method of minimum mean square error (method F)

This method assumes $\hat{y}_t = y_1(1 + g)^{(t-1)}$ is the best fit for the predicted value of y_t. Using least square principle, mean square error, i.e., $\frac{1}{n-1}\sum_{t=2}^{n}(ln y_t - ln\hat{y}_t)^2$, is minimized to obtain the estimate of g.

Step 1. Compute g from the equation $g = exp\left(\frac{6\sum_{t=2}^{n}(t-1)\cdot \ln R_t}{(n-1)\cdot n\cdot(2n-1)}\right) - 1$
Step 2. Compute e as $e = 100 \cdot g$

where
$$R_t = \frac{y_t}{y_1}$$
y_1: initial observation
y_t: tth observation
$\hat{y}_t$: tth predicted value
n: number of observations
e: annual escalation rate in percent.

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Criteria for selecting the computation methodology for escalation rate:

There are different ways to evaluate the performance of estimators. One way is to look at the squared error for each estimated value and choose the estimator in a way such that the average squared error is minimized. The method of computation is given

Compute $S = \sqrt{\frac{1}{n_1} \sum_{t=2}^{n}(y_t - y_t^e)^2}$

where
$n_1 = n - 1$
$y_t^e = y_1 \left(1 + \frac{e}{100}\right)^t.$

Select e for which S is minimum as this will minimize the difference by which the estimator differs from the quantity to be estimated. It is to be noted that S has the same unit of the data being used.

Along with criteria S, we also propose another unit free criteria DC which is the ratio of the two kinds of variability. The formula for DC is

$$DC = \frac{\sum_{t=2}^{n}(y_t - y_t^e)^2}{\sum_{t=2}^{n}(y_t - \bar{y})^2}$$

where $\bar{y} = \frac{\sum_{t=2}^{n} y_t}{n-1}$.

Similar to S, select e for which DC is minimum.

DC: Disagreement Coefficient

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Evaluation of Escalation Rate and Comparative Study

At this stage we use cost data to evaluate the escalation rates with respect to different computation methodologies and to illustrate a systematic procedure for finding better escalation rates. For this study we use the data sets of the following areas:

1. *Escalation rate for inland transportation charges for domestic coal(Separately for evaluation and payment)*
2. *Escalation rate for domestic gas*
3. *Escalation rates for inland transportation charges for gas*
4. *Escalation rate for different escalable sub-components of energy charge for plants (Separately for evaluation and payment)*
5. *Escalation for normative transmission charges*

Ten sets of separate studies (from Table 1 to Table 10) for each of the ten areas are shown below. For each method we compute *e* (annual escalation rate in percent), *S* and *DC* (two measures of selection criteria). We select *e* where *S* and *DC* are minimum.

The transportation of coal to power plants takes place mainly by rail and the Ministry of Railways notifies freight rates for transportation of coal from time to time. The coal freight rates are available for different distances from 1 km to 5000 km. The coal freight rates are sensitive to different distances. The data on coal freight rate for 1000 km, 2000 km and 3000 km has been used for computing the escalation rate for inland transportation upto 1000 km, upto 2000 km and beyond 2000 km respectively. The escalation rate for inland transportation of coal has been computed based on the time series data on coal freight rates for the latest 12 years i.e. for the period from 1997 to 2008. All the rates have been given in the documents supplied by CERC.

Table 1: Values of *e*, *S* and *DC* for inland transportation charges for coal

Method	Escalation rate for inland transportation charges for coal								
	Up to 1000 km			Up to 2000 km			Beyond 2000 km		
	e	*S*	*DC*	*e*	*S*	*DC*	*e*	*S*	*DC*
Existing method	1.91	15.4803	0.1000	2.39	40.5465	0.1285	2.48	50.7080	0.1145
Method A	1.98	18.0369	0.1357	2.34	36.8569	0.1062	2.41	44.2607	0.0873
Method B	2.04	20.5704	0.1765	2.40	41.3217	0.1335	2.46	48.7763	0.1060
Method C	1.89	14.8565	0.0921	2.42	42.9046	0.1439	2.52	54.7482	0.1335
Method D	1.68	12.9546	0.0700	1.95	29.7724	0.0693	2.05	37.3773	0.0622
Method E	1.67	13.1081	0.0717	1.93	30.7112	0.0737	2.03	38.5818	0.0663
Method F	1.73	12.5138	0.0653	2.06	26.6887	0.0557	2.16	33.4711	0.0499

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Prior to 1987, gas prices were fixed by ONGC/OIL. Later the gas price is being fixed by Government of India (GOI). The price of gas of ONGC and OIL was last revised effective on 1st July, 2005 and is valid till date. All available gas would be supplied to only the power and fertilizer sector consumers along with the specific end users. The price is linked to a calorific value of 10000 K.cal/cubic metre. The Ministry of Petroleum and Natural Gas (MOP&NG) has been regulating the allocation and pricing of gas produced by ONGC and OIL by issuing administrative orders from time to time. Petroleum and Natural Gas Regulatory Board (PNGRB) is now regulating the refining, processing, storage, transportation, marketing and sale of natural gas.

Table 2: Values of e, S and DC for domestic gas

Method	Escalation rate for domestic gas					
	Consumer Price-Off-shore (Landfall point and On-shore)			Consumer Price (North-Eastern States)		
	e	S	DC	e	S	DC
Existing method	1.31	146.5664	0.9029	1.38	92.3395	0.9071
Method A	1.06	114.9768	0.5557	1.11	71.9489	0.5507
Method B	1.12	121.1813	0.6172	1.18	76.2672	0.6188
Method C	1.23	134.9636	0.7656	1.30	85.3446	0.7749
Method D	0.64	108.0103	0.4904	0.67	68.0054	0.4920
Method E	0.62	109.3522	0.5026	0.65	68.8209	0.5039
Method F	0.78	102.6410	0.4428	0.82	64.4848	0.4424

The natural gas produced in India and imported natural gas is being transported mainly by GAIL at the rate prescribed by the MOP&NG/PNGRB. Petroleum and Planning Analysis Cell of MOP&NG publishes the statistics relating to transportation charges of natural gas along Hazira-Vijapur-Jagdishpur (HVJ) pipeline. The escalation rate for transportation charges of gas has been computed based on the transportation charges charged by GAIL along HVJ pipeline.

Table 3. e, S and DC values for inland transportation charges for gas

Method	Escalation rate for inland transportation charges for gas		
	e	S	DC
Existing method	3.51	74.3151	0.2789
Method A	2.79	83.5749	0.3527
Method B	2.45	97.4291	0.4793
Method C	3.72	78.6291	0.3122
Method D	3.23	73.6997	0.2743
Method E	3.15	74.5929	0.2810
Method F	3.33	73.2980	0.2713

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There is no representative index for inland handling of fuel (gas). The choice of an appropriate index or indices is difficult. A hybrid index of Wholesale Price Index (WPI) and Consumer Price Index for industrial workers (CPI-IW) may be used while computing the escalation rate for inland handling of gas subcomponent. For calculating hybrid index, weighted geometric mean can be used instead of weighted arithmetic mean.

Table 4. e, S and DC values for inland handling sub-component

Method	Escalation rate for inland handling sub-component					
	Wholesale Price Index for All Commodities (Base 1993-94=100)			Consumer Price Index for Industrial Workers (Base 2001=100)		
	e	*S*	*DC*	*e*	*S*	*DC*
Existing method	5.11	2.6728	0.0088	4.97	5.8307	0.1278
Method A	5.32	4.3457	0.0233	5.72	3.6185	0.0492
Method B	5.43	5.6031	0.0388	5.63	3.4507	0.0448
Method C	5.16	2.9195	0.0105	5.00	5.6463	0.1198
Method D	5.02	2.6154	0.0085	5.79	3.8416	0.0555
Method E	5.01	2.6415	0.0086	5.88	4.2271	0.0672
Method F	5.03	2.5956	0.0083	5.61	3.4333	0.0443

The CERC determines the Annual Transmission charges of each asset of Powergrid Corporation of India Ltd (PGCIL) by its various orders. Based on the CERC orders, PGCIL compiles the annual transmission charges of all assets. The transmission charges, as reported by PGCIL, are inclusive of income tax, incentive and FERV. The data on annual transmission charges of PGCIL has been used for computing the escalation for normative transmission charges.

Table 5. e, S and DC values for normative transmission charges

Method	Escalation for normative transmission charges		
	e	*S*	*DC*
Existing method	11.66	318.8349	0.1268
Method A	13.03	301.3473	0.1133
Method B	14.00	434.0270	0.2350
Method C	11.56	328.7900	0.1348
Method D	12.72	281.8805	0.0991
Method E	13.03	301.0270	0.1133
Method F	12.38	277.1181	0.0958

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Transportation of coal to power plants takes place mainly by rail and the Ministry of Railways notifies freight rates for transportation of coal from time to time. The coal freight rates are available for different distances from 1 km to 5000 km. The coal freight rates are sensitive to different distances. The data on coal freight rate for 1000 km, 2000 km and 3000 km has been used for computing the escalation rate for inland transportation upto 1000 km, upto 2000 km and beyond 2000 km respectively.

Table 6. e, S and DC values for Coal freight rate for 1000 km (monthly data)

Method	Escalation for inland transportation charges for coal			
	e (monthly)	S	DC	e (annual)
Existing method				2.38
Method A	0.63	31.5636	3.4397	7.15
Method B	0.65	32.5938	3.6679	7.39
Method C	0.27	16.8867	0.9845	3.01
Method D	0.11	15.7678	0.8584	1.22
Method E	0.10	15.8690	0.8694	1.11
Method F	0.15	15.5632	0.8363	1.66

Table 7. e, S and DC values for Coal freight rate for 2000 km (monthly data)

Method	Escalation for inland transportation charges for coal			
	e (monthly)	S	DC	e (annual)
Existing method				2.38
Method A	0.63	58.4653	3.4432	7.15
Method B	0.65	60.3738	3.6719	7.39
Method C	0.27	31.2689	0.9849	3.01
Method D	0.11	29.1908	0.8583	1.22
Method E	0.10	29.3781	0.8694	1.11
Method F	0.15	28.8128	0.8362	1.66

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Table 8. e, S and DC values for Coal freight rate for 3000 km (monthly data)

Method	Escalation for inland transportation charges for coal			
	e (monthly)	S	DC	e (annual)
Existing method				2.38
Method A	0.63	74.7899	3.4384	7.15
Method B	0.65	77.2308	3.6665	7.39
Method C	0.27	40.0177	0.9844	3.01
Method D	0.11	37.3691	0.8584	1.22
Method E	0.10	37.6089	0.8695	1.11
Method F	0.15	36.8837	0.8363	1.66

Annual escalation rate for payment has been computed based on latest twelve months data. A hybrid index comprising of the Wholesale Price Index (WPI) and the Consumer Price Index (CPI) may be considered for arriving at the escalation rate for inland handling sub-component. For calculating hybrid index, weighted geometric mean can be used instead of weighted arithmetic mean.

Table 9. e, S and DC values for inland handling sub-component (monthly data)

Method	Escalation for WPI			
	e (monthly)	S	DC	e (annual)
Existing method				9.57
Method A	0.47	10.6506	2.4678	5.29
Method B	0.45	10.8916	2.5808	5.06
Method C	0.68	8.3708	1.5244	7.74
Method D	1.13	7.0299	1.0751	13.16
Method E	1.13	7.0299	1.0751	13.16
Method F	1.01	6.6997	0.9765	11.69

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Table 10. *e*, *S* and *DC* values for inland handling sub-component (monthly data)

Method	Escalation for CPI			
	e (monthly)	*S*	*DC*	*e* (annual)
Existing method				13.12
Method A	0.85	1.8113	0.1007	9.76
Method B	0.84	1.8904	0.1751	9.64
Method C	0.99	1.0746	0.0566	11.45
Method D	1.01	1.0750	0.0566	11.69
Method E	1.01	1.0750	0.0566	11.69
Method F	1.00	1.0703	0.0561	11.57

Monthly data for the following three areas remain same for the twelve months.

- Escalation rate for Domestic coal component (for Payment)
- Escalation rate for domestic gas (for Payment)
- Escalation rates for inland transportation charges for gas (for Payment)

Hence the annual escalation rates of these three areas are zero.

Based on these escalation rates, comparisons of the actual values and the escalated values are shown in appendix.

Conclusion and Recommendation:

Based on the analysis and comparison of different methods of escalation rate evaluation, it is seen that the **method F**, that is the one based on minimum mean square error, works best on all types of escalation rate evaluation. This procedure produces estimates those differ from the observed values by least possible amount, measured by **criterion *S*** as well as **criteria *DC*** over the period of observed values. It is also noted that the sum of the observed cost values and the sum of the escalated values are not much different with respect to the period (1997-2008).

So it is recommended that the **method F** be deployed in routine use for future predictions.

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APPENDIX

Comparisons of the actual values and the escalated values for inland transportation charges for coal (1000 km)

Year	Actual values	Escalated values based on different methodologies						
		Existing method	Method A	Method B	Method C	Method D	Method E	Method F
1997	703.50	703.50	703.50	703.50	703.50	703.50	703.50	703.50
1998	703.50	716.94	717.43	717.85	716.80	715.32	715.25	715.67
1999	724.58	730.63	731.63	732.50	730.34	727.34	727.19	728.05
2000	742.55	744.59	746.12	747.44	744.15	739.56	739.34	740.65
2001	757.38	758.81	760.89	762.69	758.21	751.98	751.68	753.46
2002	754.20	773.30	775.96	778.25	772.54	764.61	764.24	766.49
2003	751.90	788.07	791.32	794.12	787.14	777.46	777.00	779.76
2004	795.33	803.12	806.99	810.32	802.02	790.52	789.98	793.25
2005	809.80	818.46	822.97	826.85	817.18	803.80	803.17	806.97
2006	823.98	834.09	839.27	843.72	832.62	817.30	816.58	820.93
2007	828.70	850.03	855.88	860.93	848.36	831.04	830.22	835.13
2008	873.10	866.26	872.83	878.49	864.39	845.00	844.08	849.58

Comparisons of the actual values and the escalated values for inland transportation charges for coal (2000 km)

Year	Actual values	Escalated values based on different methodologies						
		Existing method	Method A	Method B	Method C	Method D	Method E	Method F
1997	1254.30	1254.30	1254.30	1254.30	1254.30	1254.30	1254.30	1254.30
1998	1244.93	1284.28	1283.65	1284.40	1284.65	1278.76	1278.51	1280.14
1999	1279.08	1314.97	1313.69	1315.23	1315.74	1303.69	1303.18	1306.51
2000	1310.85	1346.40	1344.43	1346.79	1347.58	1329.12	1328.33	1333.42
2001	1337.03	1378.58	1375.89	1379.12	1380.20	1355.03	1353.97	1360.89
2002	1367.83	1411.53	1408.08	1412.22	1413.60	1381.46	1380.10	1388.93
2003	1375.90	1445.26	1441.03	1446.11	1447.80	1408.40	1406.74	1417.54
2004	1455.33	1479.80	1474.75	1480.82	1482.84	1435.86	1433.89	1446.74
2005	1481.80	1515.17	1509.26	1516.36	1518.73	1463.86	1461.56	1476.54
2006	1521.70	1551.38	1544.58	1552.75	1555.48	1492.40	1489.77	1506.96
2007	1535.00	1588.46	1580.72	1590.01	1593.12	1521.51	1518.52	1538.00
2008	1617.20	1626.43	1617.71	1628.17	1631.68	1551.18	1547.83	1569.69

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Comparisons of the actual values and the escalated values for inland transportation charges for coal (3000 km)

Year	Actual values	Escalated values based on different methodologies						
		Existing method	**Method A**	**Method B**	**Method C**	**Method D**	**Method E**	**Method F**
1997	1592.90	1592.90	1592.90	1592.90	1592.90	1592.90	1592.90	1592.90
1998	1580.98	1632.40	1631.29	1632.09	1633.04	1625.55	1625.24	1627.31
1999	1624.33	1672.89	1670.60	1672.23	1674.19	1658.88	1658.23	1662.46
2000	1664.70	1714.38	1710.86	1713.37	1716.38	1692.89	1691.89	1698.37
2001	1698.03	1756.89	1752.10	1755.52	1759.64	1727.59	1726.24	1735.05
2002	1751.03	1800.46	1794.32	1798.71	1803.98	1763.01	1761.28	1772.53
2003	1765.90	1845.11	1837.56	1842.95	1849.44	1799.15	1797.03	1810.81
2004	1867.83	1890.87	1881.85	1888.29	1896.05	1836.03	1833.51	1849.93
2005	1901.80	1937.77	1927.20	1934.74	1943.83	1873.67	1870.73	1889.89
2006	1948.15	1985.82	1973.65	1982.34	1992.81	1912.08	1908.71	1930.71
2007	1963.60	2035.07	2021.21	2031.10	2043.03	1951.28	1947.45	1972.41
2008	2068.83	2085.54	2069.92	2081.07	2094.51	1991.28	1986.99	2015.01

Comparisons of the actual values and the escalated values for domestic gas **(Landfall point and On-shore)**

Year	Actual values	Escalated values based on different methodologies						
		Existing method	**Method A**	**Method B**	**Method C**	**Method D**	**Method E**	**Method F**
1997	2850.00	2850.00	2850.00	2850.00	2850.00	2850.00	2850.00	2850.00
1998	2850.00	2887.34	2880.21	2881.92	2885.06	2868.24	2867.67	2872.23
1999	2850.00	2925.16	2910.74	2914.20	2920.54	2886.60	2885.45	2894.63
2000	2850.00	2963.48	2941.59	2946.84	2956.46	2905.07	2903.34	2917.21
2001	2850.00	3002.30	2972.77	2979.84	2992.83	2923.66	2921.34	2939.97
2002	2850.00	3041.63	3004.29	3013.22	3029.64	2942.37	2939.45	2962.90
2003	2850.00	3081.48	3036.13	3046.96	3066.90	2961.21	2957.68	2986.01
2004	2850.00	3121.84	3068.31	3081.09	3104.63	2980.16	2976.01	3009.30
2005	3025.00	3162.74	3100.84	3115.60	3142.81	2999.23	2994.47	3032.77
2006	3200.00	3204.17	3133.71	3150.49	3181.47	3018.43	3013.03	3056.43
2007	3200.00	3246.15	3166.93	3185.78	3220.60	3037.74	3031.71	3080.27
2008	3200.00	3288.67	3200.49	3221.46	3260.22	3057.19	3050.51	3104.29

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Comparisons of the actual values and the escalated values for domestic gas (North-Eastern States)

Year	Actual values	Escalated values based on different methodologies						
		Existing method	Method A	Method B	Method C	Method D	Method E	Method F
1997	1700.00	1700.00	1700.00	1700.00	1700.00	1700.00	1700.00	1700.00
1998	1700.00	1723.46	1718.87	1720.06	1722.10	1711.39	1711.05	1713.94
1999	1700.00	1747.24	1737.95	1740.36	1744.49	1722.86	1722.17	1727.99
2000	1700.00	1771.36	1757.24	1760.89	1767.17	1734.40	1733.37	1742.16
2001	1700.00	1795.80	1776.75	1781.67	1790.14	1746.02	1744.63	1756.45
2002	1700.00	1820.58	1796.47	1802.70	1813.41	1757.72	1755.97	1770.85
2003	1700.00	1845.71	1816.41	1823.97	1836.98	1769.49	1767.39	1785.37
2004	1700.00	1871.18	1836.57	1845.49	1860.87	1781.35	1778.87	1800.01
2005	1810.00	1897.00	1856.96	1867.27	1885.06	1793.29	1790.44	1814.77
2006	1920.00	1923.18	1877.57	1889.30	1909.56	1805.30	1802.08	1829.65
2007	1920.00	1949.72	1898.41	1911.59	1934.39	1817.40	1813.79	1844.66
2008	1920.00	1976.62	1919.48	1934.15	1959.53	1829.57	1825.58	1859.78

Comparisons of the actual values and the escalated values for inland transportation charges for gas

Year	Actual values	Escalated values based on different methodologies						
		Existing method	Method A	Method B	Method C	Method D	Method E	Method F
1997	850.00	850.00	850.00	850.00	850.00	850.00	850.00	850.00
1998	850.00	879.84	873.72	870.83	881.62	877.46	876.78	878.05
1999	850.00	910.72	898.09	892.16	914.42	905.80	904.39	907.03
2000	850.00	942.68	923.15	914.02	948.43	935.05	932.88	936.96
2001	850.00	975.77	948.90	936.41	983.71	965.26	962.27	967.88
2002	1075.00	1010.02	975.38	959.35	1020.31	996.43	992.58	999.82
2003	1150.00	1045.47	1002.59	982.86	1058.26	1028.62	1023.85	1032.81
2004	1150.00	1082.17	1030.56	1006.94	1097.63	1061.84	1056.10	1066.89
2005	1150.00	1120.15	1059.32	1031.61	1138.46	1096.14	1089.36	1102.10
2006	1150.00	1159.47	1088.87	1056.88	1180.81	1131.55	1123.68	1138.47
2007	1150.00	1200.17	1119.25	1082.78	1224.74	1168.10	1159.07	1176.04
2008	1150.00	1242.29	1150.48	1109.30	1270.30	1205.82	1195.59	1214.85

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Comparisons of the actual values and the escalated values for inland handling sub-component (WPI)

Year	Actual values	Escalated values based on different methodologies						
		Existing method	Method A	Method B	Method C	Method D	Method E	Method F
1997	131.30	131.30	131.30	131.30	131.30	131.30	131.30	131.30
1998	138.90	138.01	138.29	138.43	138.08	137.89	137.88	137.90
1999	143.80	145.06	145.64	145.95	145.20	144.81	144.79	144.84
2000	152.80	152.47	153.39	153.87	152.69	152.08	152.04	152.13
2001	160.70	160.27	161.55	162.23	160.57	159.72	159.66	159.78
2002	164.70	168.46	170.14	171.04	168.86	167.74	167.66	167.82
2003	173.40	177.06	179.20	180.32	177.57	176.16	176.06	176.26
2004	184.90	186.11	188.73	190.11	186.73	185.00	184.88	185.12
2005	193.70	195.62	198.77	200.44	196.37	194.29	194.14	194.43
2006	203.00	205.62	209.34	211.32	206.50	204.04	203.86	204.21
2007	212.80	216.13	220.48	222.80	217.16	214.28	214.08	214.49
2008	232.20	227.17	232.21	234.89	228.36	225.04	224.80	225.27

Comparisons of the actual values and the escalated values for inland handling sub-component (CPI)

Year	Actual values	Escalated values based on different methodologies						
		Existing method	Method A	Method B	Method C	Method D	Method E	Method F
1997	77.00	77.00	77.00	77.00	77.00	77.00	77.00	77.00
1998	87.00	80.83	81.40	81.34	80.85	81.46	81.53	81.32
1999	92.00	84.84	86.06	85.91	84.89	86.17	86.32	85.88
2000	95.00	89.06	90.98	90.75	89.14	91.16	91.40	90.70
2001	99.00	93.49	96.19	95.86	93.59	96.44	96.77	95.79
2002	103.00	98.13	101.69	101.26	98.27	102.03	102.46	101.16
2003	107.00	103.01	107.51	106.96	103.19	107.93	108.49	106.84
2004	111.00	108.13	113.66	112.98	108.35	114.18	114.87	112.83
2005	116.00	113.50	120.16	119.34	113.76	120.79	121.62	119.16
2006	123.00	119.15	127.03	126.06	119.45	127.79	128.77	125.85
2007	131.00	125.07	134.30	133.16	125.42	135.19	136.34	132.90
2008	142.00	131.28	141.98	140.65	131.70	143.01	144.36	140.36

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Comparisons of the actual values and the escalated values for normative transmission charges

Year	Actual values	Escalated values based on different methodologies						
		Existing method	Method A	Method B	Method C	Method D	Method E	Method F
1997	1168.45	1168.45	1168.45	1168.45	1168.45	1168.45	1168.45	1168.45
1998	1494.39	1304.69	1320.70	1332.03	1303.52	1317.08	1320.70	1313.10
1999	1736.38	1456.82	1492.79	1518.52	1454.21	1484.61	1492.79	1475.67
2000	2185.61	1626.68	1687.30	1731.11	1622.32	1673.45	1687.30	1658.35
2001	2126.87	1816.35	1907.15	1973.47	1809.86	1886.31	1907.15	1863.66
2002	1983.93	2028.14	2155.65	2249.75	2019.08	2126.25	2155.65	2094.38
2003	2132.33	2264.62	2436.53	2564.72	2252.48	2396.71	2436.53	2353.66
2004	2270.28	2528.68	2754.01	2923.78	2512.87	2701.57	2754.01	2645.05
2005	2753.16	2823.52	3112.86	3333.10	2803.36	3045.22	3112.86	2972.50
2006	3162.32	3152.74	3518.47	3799.74	3127.42	3432.57	3518.47	3340.50
2007	3953.39	3520.35	3976.93	4331.70	3488.95	3869.19	3976.93	3754.05
2008	4493.38	3930.83	4495.12	4938.14	3892.28	4361.35	4495.12	4218.80

Comparisons of the actual values and the escalated values for coal freight rate for 1000 km (monthly data)

Year	Actual values	Escalated values based on different methodologies						
		Existing method	Method A	Method B	Method C	Method D	Method E	Method F
2008-01	828.70	828.70	828.70	828.70	828.70	828.70	828.70	828.70
2008-02	828.70	830.85	833.92	834.09	830.94	829.61	829.53	829.94
2008-03	828.70	833.01	839.17	839.51	833.18	830.52	830.36	831.19
2008-04	828.70	835.18	844.46	844.96	835.43	831.44	831.19	832.43
2008-05	828.70	837.35	849.78	850.46	837.69	832.35	832.02	833.68
2008-06	828.70	839.53	855.14	855.99	839.95	833.27	832.85	834.93
2008-07	828.70	841.71	860.52	861.55	842.22	834.18	833.68	836.19
2008-08	828.70	843.90	865.94	867.15	844.49	835.10	834.52	837.44
2008-09	828.70	846.09	871.40	872.79	846.77	836.02	835.35	838.70
2008-10	828.70	848.29	876.89	878.46	849.06	836.94	836.19	839.95
2008-11	828.70	850.50	882.41	884.17	851.35	837.86	837.02	841.21
2008-12	887.90	852.71	887.97	889.92	853.65	838.78	837.86	842.48

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Comparisons of the actual values and the escalated values for coal freight rate for 2000 km (monthly data)

Year	Actual values	Escalated values based on different methodologies						
		Existing method	Method A	Method B	Method C	Method D	Method E	Method F
2008-01	1535.00	1535.00	1535.00	1535.00	1535.00	1535.00	1535.00	1535.00
2008-02	1535.00	1538.99	1544.67	1544.98	1539.14	1536.69	1536.54	1537.30
2008-03	1535.00	1542.99	1554.40	1555.02	1543.30	1538.38	1538.07	1539.61
2008-04	1535.00	1547.00	1564.19	1565.13	1547.47	1540.07	1539.61	1541.92
2008-05	1535.00	1551.03	1574.05	1575.30	1551.65	1541.77	1541.15	1544.23
2008-06	1535.00	1555.06	1583.97	1585.54	1555.83	1543.46	1542.69	1546.55
2008-07	1535.00	1559.10	1593.94	1595.85	1560.04	1545.16	1544.23	1548.87
2008-08	1535.00	1563.16	1603.99	1606.22	1564.25	1546.86	1545.78	1551.19
2008-09	1535.00	1567.22	1614.09	1616.66	1568.47	1548.56	1547.32	1553.52
2008-10	1535.00	1571.29	1624.26	1627.17	1572.71	1550.26	1548.87	1555.85
2008-11	1535.00	1575.38	1634.49	1637.74	1576.95	1551.97	1550.42	1558.18
2008-12	1644.60	1579.48	1644.79	1648.39	1581.21	1553.68	1551.97	1560.52

Comparisons of the actual values and the escalated values for coal freight rate for 3000 km (monthly data)

Year	Actual values	Escalated values based on different methodologies						
		Existing method	Method A	Method B	Method C	Method D	Method E	Method F
2008-01	1963.60	1963.60	1963.60	1963.60	1963.60	1963.60	1963.60	1963.60
2008-02	1963.60	1968.71	1975.97	1976.36	1968.90	1965.76	1965.56	1966.55
2008-03	1963.60	1973.82	1988.42	1989.21	1974.22	1967.92	1967.53	1969.50
2008-04	1963.60	1978.96	2000.95	2002.14	1979.55	1970.09	1969.50	1972.45
2008-05	1963.60	1984.10	2013.55	2015.15	1984.89	1972.25	1971.47	1975.41
2008-06	1963.60	1989.26	2026.24	2028.25	1990.25	1974.42	1973.44	1978.37
2008-07	1963.60	1994.43	2039.00	2041.44	1995.63	1976.60	1975.41	1981.34
2008-08	1963.60	1999.62	2051.85	2054.71	2001.01	1978.77	1977.39	1984.31
2008-09	1963.60	2004.82	2064.78	2068.06	2006.42	1980.95	1979.36	1987.29
2008-10	1963.60	2010.03	2077.78	2081.50	2011.83	1983.13	1981.34	1990.27
2008-11	1963.60	2015.26	2090.87	2095.03	2017.27	1985.31	1983.32	1993.25
2008-12	2103.90	2020.49	2104.05	2108.65	2022.71	1987.49	1985.31	1996.24

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Comparisons of the actual values and the escalated values for inland handling sub-component for WPI (monthly data)

Year	Actual values	Escalated values based on different methodologies						
		Existing method	Method A	Method B	Method C	Method D	Method E	Method F
2008-01	218.10	218.10	218.10	218.10	218.10	218.10	218.10	218.10
2008-02	219.90	219.52	219.13	219.08	219.58	220.56	220.56	220.30
2008-03	225.50	220.94	220.15	220.07	221.08	223.06	223.06	222.53
2008-04	228.50	222.38	221.19	221.06	222.58	225.58	225.58	224.78
2008-05	231.10	223.83	222.23	222.05	224.09	228.13	228.13	227.05
2008-06	237.40	225.28	223.27	223.05	225.62	230.70	230.70	229.34
2008-07	240.00	226.75	224.32	224.06	227.15	233.31	233.31	231.66
2008-08	241.20	228.22	225.38	225.06	228.70	235.95	235.95	233.99
2008-09	241.50	229.70	226.44	226.08	230.25	238.61	238.61	236.36
2008-10	239.00	231.20	227.50	227.09	231.82	241.31	241.31	238.75
2008-11	234.20	232.70	228.57	228.12	233.39	244.04	244.04	241.16
2008-12	229.70	234.21	229.64	229.14	234.98	246.79	246.79	243.59

Comparisons of the actual values and the escalated values for inland handling sub-component for CPI (monthly data)

Year	Actual values	Escalated values based on different methodologies						
		Existing method	Method A	Method B	Method C	Method D	Method E	Method F
2008-01	134.00	134.00	134.00	134.00	134.00	134.00	134.00	134.00
2008-02	135.00	135.30	135.14	135.13	135.33	135.35	135.35	135.34
2008-03	137.00	136.61	136.29	136.26	136.67	136.72	136.72	136.69
2008-04	138.00	137.94	137.45	137.41	138.02	138.10	138.10	138.06
2008-05	139.00	139.28	138.61	138.56	139.39	139.50	139.50	139.44
2008-06	140.00	140.63	139.79	139.72	140.77	140.91	140.91	140.84
2008-07	143.00	141.99	140.98	140.90	142.16	142.33	142.33	142.24
2008-08	145.00	143.37	142.18	142.08	143.57	143.77	143.77	143.67
2008-09	146.00	144.76	143.39	143.27	144.99	145.22	145.22	145.10
2008-10	148.00	146.16	144.61	144.48	146.42	146.68	146.68	146.55
2008-11	148.00	147.58	145.84	145.69	147.87	148.17	148.17	148.02
2008-12	147.00	149.01	147.08	146.91	149.34	149.66	149.66	149.50

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