

# IMPACT CARBON

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# Korea Emission Trading Scheme

## Market and Policy Issues

### MARKET - 6 December 2018

- Review in the early opening of GHG allowance derivatives: The KRX is considering to establish a GHG emission derivative market jointly with related ministries. Derivatives trading were originally not allowed but there was a demand for an early operation due to price volatility because of the market's lack of liquidity.
- The Ministry of Environment confirmed its plan to implement a market maker system in the second half of 2019 after a thorough consultation and construction of the necessary system

### POLICY - 18 December 2018

- Expansion of RE Energy Facilities: Based on the work plan of the Ministry of Trade, Industry and Energy, the RE target for 2019 is 2.4GW, up by 38% compared to 2018. A new rate policy called "Green Rate Plan" will be released which will allow consumers or companies to freely select the electricity generation from RE.

### POLICY - 18 December 2018

- The Ministry of Environment announced its plans to reduce the amount of fine dust in 2019 by 40,668 tons (from 2014) and will increase the number of eco-friendly cars to 545,000 by 2022 through the extension of subsidies.

### POLICY - 24 December 2018

- A national assembly representative made a proposal for the enactment to implement the CORSIA measures covering domestic operators as part of the nation's preparation for the system in 2021

#### POLICY - 27 December 2018

- Exclusion of non-renewable waste: Passing of congress resolution to exclude non-renewable waste such as SRF (waste solid fuel). The regulation will take effect in October 2019 wherein the RE produced from non-renewable wastes will not be issued an REC

#### POLICY - 30 December 2018

- In the axis of PV, the distribution capacity of RE will be 2,229 MW until the 3rd quarter of 2018, 56% up by the previous year. The government is implementing the detailed plans to achieve the target of "RE 3020" and in 2019, the subsidy for private solar PV will be expanded to KRW 267 billion while promoting the pilot solar PV projects focusing on 1,189 industrial complexes and public institutions

#### POLICY - 03 January 2019

- According to the KEEI, the total energy demand in 2019 will increase by 2% to 316.2 million TOE and the final energy demand is expected to increase by 2.1% to 243.1 million TOE. Demand growth is expected to decline due to low economic growth rate stemming from the slow down in exports and private consumption and the base effect from energy consumption (heating and cooling)

#### MARKET - 14 January 2018

- Ecoeye Co. Ltd., bidded off 100,000 tons of KAU19 from January 14 - January 17, 2019.

## Korea ETS Auction

The first Korean ETS allowance auction is scheduled on the 23<sup>rd</sup> of January 2019 when the government is set to auction off 500,000 tons of permits. Only compliance entities that are registered members of the Korea Exchange are allowed to participate in the auction. Currently, there are 127 companies from 26 industries that are eligible to participate.

The power generation (15 companies), aviation (7 companies), and the telecom industries (4 companies) are most likely to participate in the first auction.

**Table 1. Auction Process**

Time	Task
13:00~14:00	Bid reception
	Determine bid price and quantity after bid notification
	Payment of the bid deposit to KRX (12:00 auction day)
	Submission of one bid request through the member trading system
14:00~14:30	Aggregation and submission of results (KRX → Ministry of Environment)
14:30~15:00	Confirmation of the lower limit of the winning bid and notification (Ministry of Environment → KRX)
15:00~15:30	Determination of winning bid price and successful bid amount distribution (KRX)
15:30~16:00	Checking of the winning bid history and prepare the auction result (for external use) (KRX)
16:00	Announcement of auction results (individual notification to bidder, homepage disclosure)
16:00~18:00	Verification of the emission balance and closure of the auction market (including market transactions, GIR)

The minimum bid quantity is 1,000 tons in the increments of 100 tons with a price of KRW 50 per ton. Bidding participants can only submit one bid. The total bid quantity must not exceed 30% of the day's auctioned quantity.

A bid deposit must be paid prior to participating in the auction and is calculated as bid price (bid price x bid quantity) + transaction fee (0.1%) + VAT (0.01%)

The lowest bid price among bid quantities will be chosen as the successful bid and the Ministry of Environment will decide the lower bid limit after the bidding deadline of 14:00 which is expected to be not far from the current market prices.

It is estimated that there's a high demand every auction, hence, the 4,650,000 tons scheduled to be supplied until June of this year is likely to be below the demand. In Carbon-i's view, it is necessary to review the status of entities participating in the auction after the result notification

to establish an appropriate market response for those short entities that will fail to secure permits. This review will provide a reference for the additional demand in the market.

Carbon-i also identified some potential issues in the auctioning system. In its analysis, the use of the single bid method might cause insufficient bidding submissions and less opportunities for entities to explore different strategies. In addition, the lack of real-time response information provides limited access to the bidding progress, market trends as well as possibly reflecting a distorted market price temporarily. Carbon-i suggests that multiple bid submissions be accepted in the future, develop a real-time system and expand the involvement of market makers, among others.

\* Carbon-i has issued guidelines to its members to assist in establishing their response strategies.

# Korean Market Update

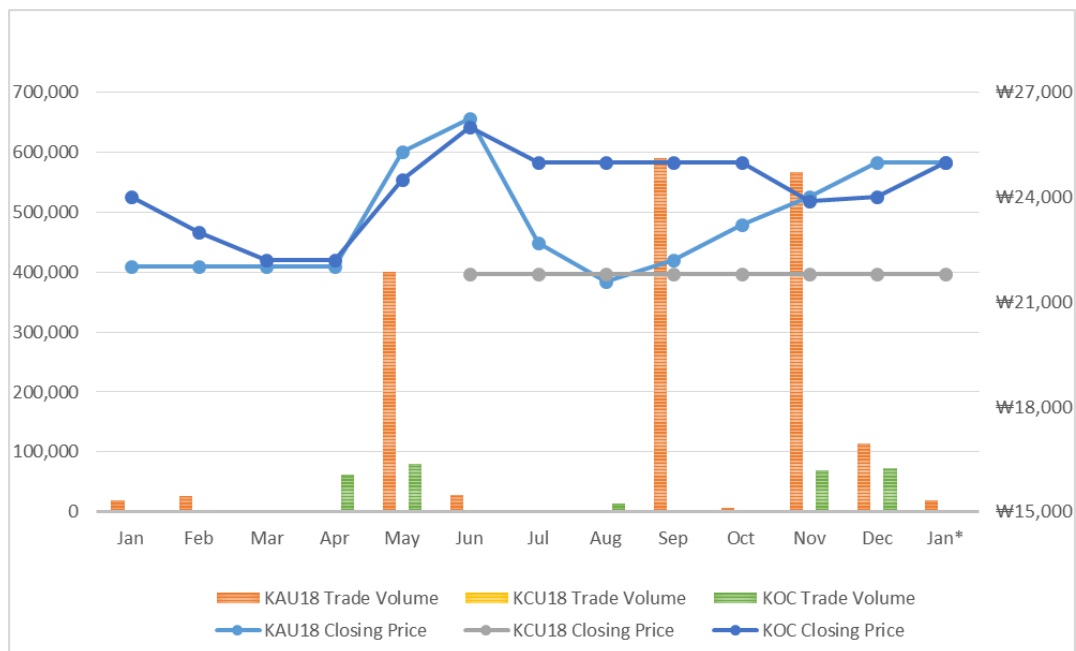
## Recent Analysis of the Market

Supply shortage continued through the months of December 2018 and January 2019. KAU18 entered KRW 25,000 in mid-December cementing the four consecutive months' price uptrend to close the year.

The ratio between KAU18 intramarket and OTC transactions from January 2018 until January 2019 is 13.2% and 86.8%, respectively, and the proportion of intraday and negotiated transactions stand at 2% and 98%, respectively.

The first auction slated to start on January 23<sup>rd</sup> will have a direct impact on the price of intramarket dealings, positively affecting the trading amount.

Figure 1. Korea ETS Performance (January 2018 - January\* 2019)



		KAU18			KCU18			KOC		
		Closing Price	Monthly Increase	Trade Volume	Closing Price	Monthly Increase	Trade Volume	Closing Price	Monthly Increase	Trade Volume
2018	Jan	22,000	-	20,000	-	-	-	24,000	-	-
	Feb	22,000	-	26,000	-	-	-	23,000	▼1,000	-
	Mar	22,000	-	-	-	-	-	22,200	▼800	-
	Apr	22,000	-	-	-	-	-	22,200	-	62,226
	May	25,300	▲3,300	400,000	-	-	-	24,500	▲2,300	80,000
	Jun	26,250	▲950	29,000	21,800	-	-	26,000	▲1,500	2,545
	Jul	22,700	▼3,550	-	21,800	-	-	25,000	▼1,000	-
	Aug	21,600	▼1,100	-	21,800	-	-	25,000	-	13,218
	Sep	22,200	▲600	590,600	21,800	-	-	25,000	-	-
	Oct	23,200	▲1,000	7,289	21,800	-	-	25,000	-	-
	Nov	24,000	▲800	566,800	21,800	-	-	23,900	▼1,100	69,160
	Dec	25,000	▲1,000	113,553	21,800	-	-	24,500	▲500	72,433
2019	Jan*	25,000	-	20,000	21,800	-	-	25,000	▲500	-
	Total	-	-	1,773,242	-	-	-	-	-	299,582

\*Latest information based on 18<sup>th</sup> January 2019

## Trading Status by Commodity Type

**Table 2. KAU18 Price Fluctuations and Trade Volume (2018.12.01 - 2019.01.18)**

	Date	Closing Price (in KRW)	Difference	Fluctuation Rate	Trade Volume		
					Intraday	Negotiated	Total
KAU18	5-Dec-18	24,000	-	-	-	20,000	20,000
	6-Dec-18	24,000	-	-	10	20,000	20,010
	7-Dec-18	24,000	-	-	43	-	43
	10-Dec-18	25,000	▲1000	▲4.17	-	-	-
	17-Dec-18	25,000	-	-	-	50,000	50,000
	19-Dec-18	24,000	▼1000	▼4	3,500	20,000	23,500
	24-Dec-18	25,000	▲1000	▲4.17	-	-	-
	9-Jan-19	25,000	-	-	-	20,000	20,000
Total		-	-	-	3,553	130,000	133,553

The price of KAU18 reached KRW 25,000 even without any trade due to rising momentum. The total trade volume from 1<sup>st</sup> December 2018 to 18<sup>th</sup> January 2019 is 133,553 tons, of which 3,353 tons were concluded as intraday transactions.

Since prices have risen without trading volume, the gap between the closing price and average trading price has widened leading to a stagnation in the market. Based on the latest data on the 18<sup>th</sup> of January, the average price of KAU18 is KRW 22,102. As of December 2018, the average intraday trading price is KRW 24,000 and average negotiated trading price is KRW 23,158 representing a gap of about 3.6%.

**Table 3. KCU18 Closing Price and Trade Status (2018.01.02 - 2019.01.18)**

KCU18	Current Price (Month End, in KRW)	21,800	Accumulated Trade Volume	Intraday	-
	Monthly Highest	21,800	(Ton)	Negotiated	-
	Monthly Lowest	21,800		Total	-
	Maximum Limit Price	23,950	Average Trading Price		-
	Minimum Limit Price	19,650	Accumulated Trading Value (in KRW 100 million)		-

**Table 4. KOC Price Fluctuations and Trade Volume (2018.12.01 - 2019.01.18)**

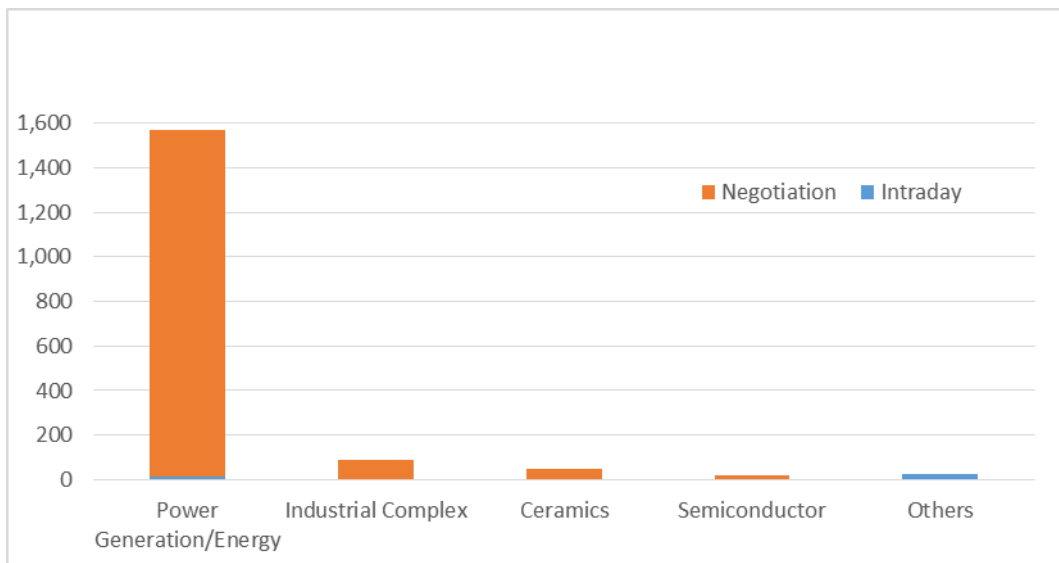
	Date	Closing Price (in	Difference	Fluctuation Rate	Trade Volume		
					Intraday	Negotiated	Total
KOC	5-Dec-18	23,950	▲50	▲0.21	5000	-	5,000
	6-Dec-18	24,000	▲50	▲0.21	433	-	433
	7-Dec-18	24,000	-	-	5,000	-	5,000
	12-Dec-18	24,500	▲500	▲2.08	2,000	-	2,000
	26-Dec-18	24,500	-	-	-	60,000	60,000
	4-Jan-19	25,000	▲500	▲2.04	-	-	-
Total		-	-	-	12,433	60,000	72,433

KCU18 remained without transaction keeping its price of KRW 21,800.

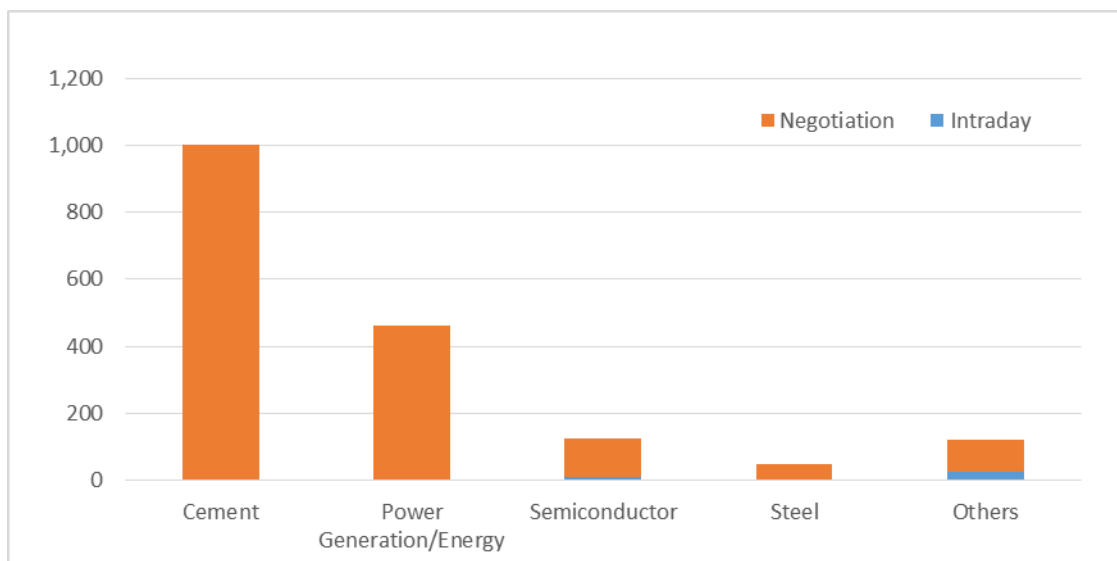
As KAU18 price rose, KOC also closed at KRW 25,000 without trading volume on the 4<sup>th</sup> of January 2019, up by 4.6% on the back of a strong momentum. KOC trade volume was 72,433 tons including 60,000 tons (82.8%) of negotiated transactions between the period of December 1, 2018 until January 18, 2019. The average trading price of KOC is KRW 23,800.

KOC is favored because it does not have a holding period but most of the KOCs are expected to have limited supply in the near future.

**Figure 2. Five biggest buying sector (January 2018 - December 2018)**



**Figure 3. Five biggest selling sector (January 2018 - December 2018)**



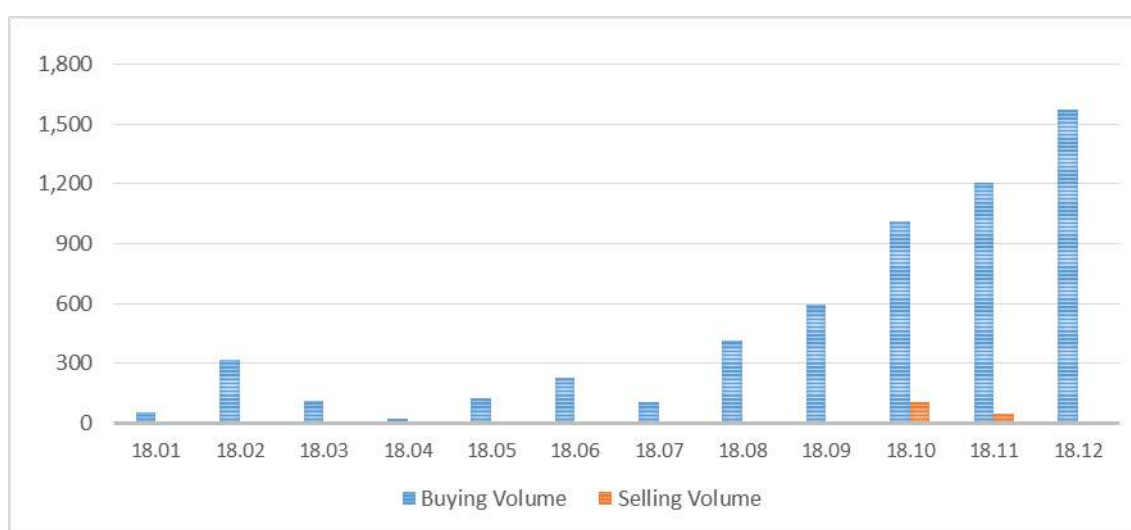


As of December 2018, KAU18 trading volume is 1,753,242 tons, of which 1,718,000 tons of negotiated deals accounted for 98% of the total trading volume, while intraday trading volume was 35,242 tons (2%).

For the period between January 2018 – December 2018, KAU18 purchase by sector showed that 89.6% came from the power generation/energy sector followed by the industrial complex with 5.1%, ceramic industry with 2.9%, and the semiconductor industry with 1.1%.

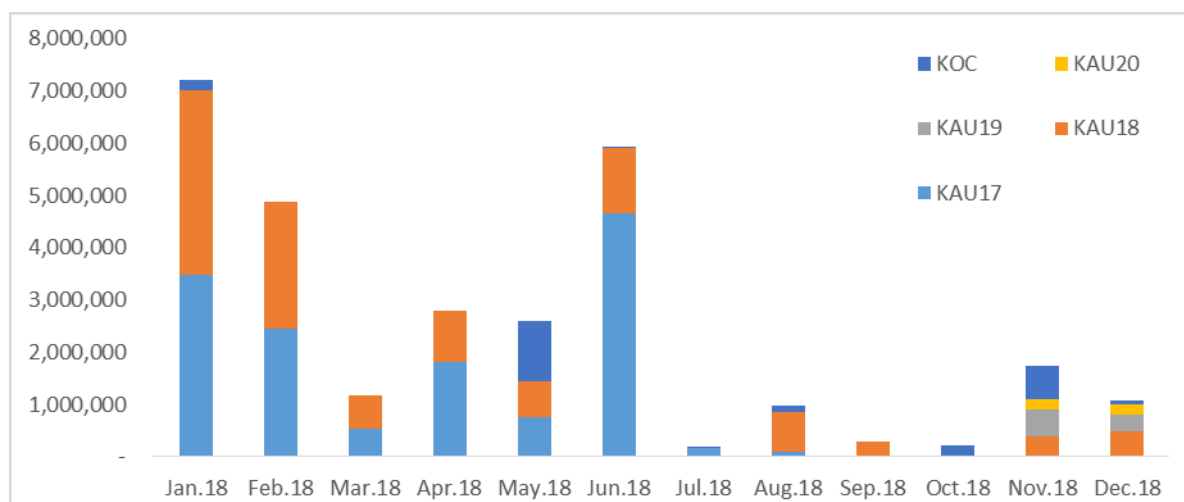
The sectors that sold the most permits in the same period are cement with 57% followed by the power generation/energy with 26.2%, semiconductor with 7%, and the steel industry with 2.9%. In addition, other industries such as machinery, wood, collective energy, etc. also sold a total of 6.9%.

**Figure 4. Status of KAU18 Buy/Sell Orders (January 2018 - December 2018)**



	18.01	18.02	18.03	18.04	18.05	18.06	18.07	18.08	18.09	18.10	18.11	18.12	
Buying Volume	56	318	114	24	126	230	107	412	594	1,014	1,203	1,572	
Selling Volume	None									10	104	46	4
Ratio	None									1.6%	10.3%	3.9%	0.2%

**Figure 5. Monthly OTC Volume (January 2018 - December 2018)**



## Comprehensive Analysis of the Emission Market (2015-2018)

Figure 6. Comprehensive Status of KAU Trading (2015-2018)

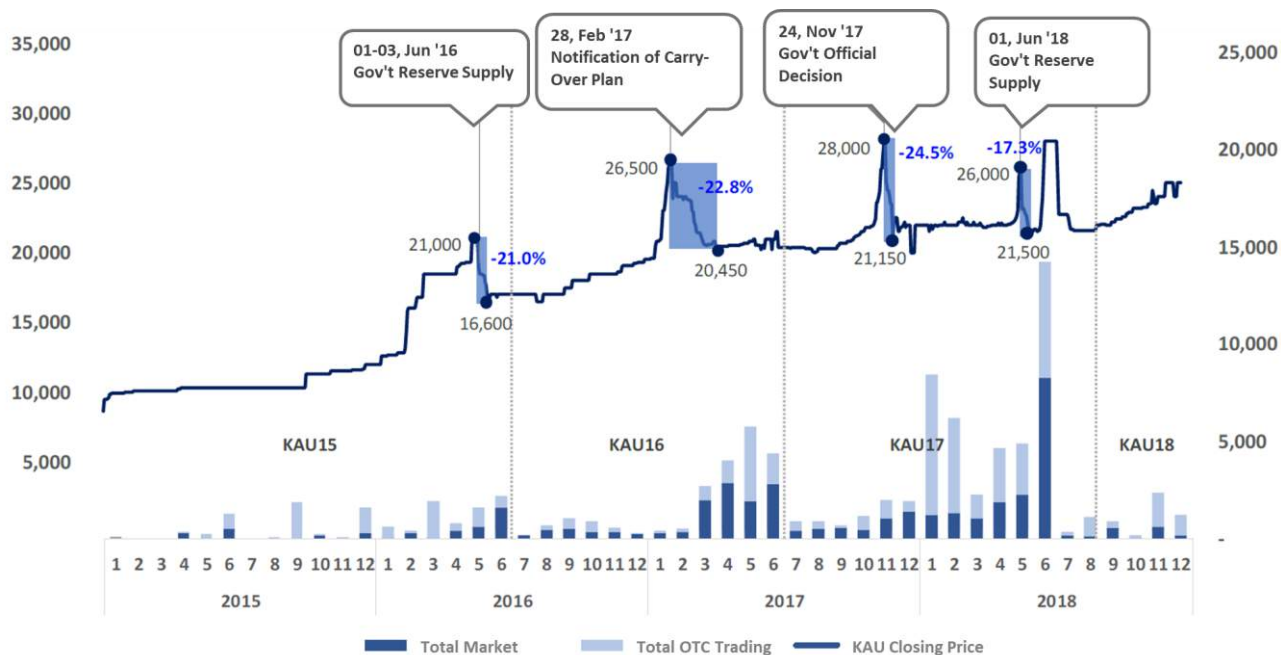


Table 5. Yearly Trade (2015-2018)

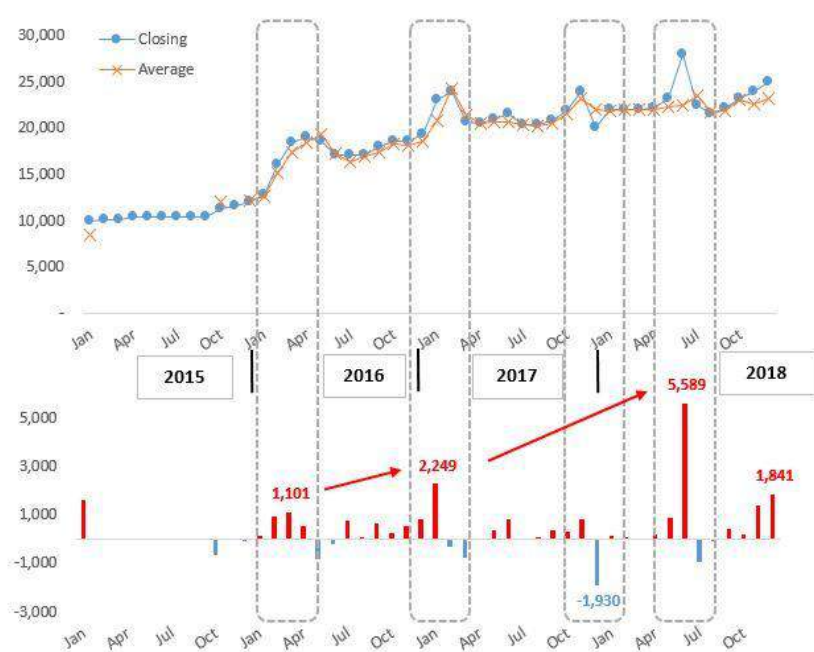
		2015	2016	2017	2018	Total
Trade Volume (Tons)	Intramarket	1,242,097	5,107,657	14,734,136	17,829,968	38,913,858
	Intraday	51,097	2,062,341	4,670,326	4,813,963	11,597,727
	Negotiated	1,191,000	3,045,316	10,063,810	13,016,005	27,316,131
	OTC	4,491,702	6,150,992	10,620,264	29,040,565	50,303,523
	Total	5,733,799	11,258,649	25,354,400	46,870,533	89,217,381
Trade Volume (100 million KRW)		631	2,007	5,447	3,898	11,983
Average Price (KRW)		12,028	17,367	21,131	22,089	

Table 6. Trading by Commodity Type

		Intramarket			OTC	Total
		Intraday	Negotiated	Total		
Allowance	KAU15	336,202	1,284,022	1,620,224	285,957	1,906,181
	KAU16	2,480,335	6,513,265	8,993,600	3,663,271	12,656,871
	KAU17	6,338,240	15,416,356	21,754,596	17,583,737	39,338,333
	KAU18	35,242	1,718,000	1,753,242	11,531,332	13,284,574
	KAU19	-	-	-	800,000	800,000
	KAU20	-	-	-	400,000	400,000
Offset	KCU15	361,452	2,284,400	2,645,852	286,149	2,932,001
	KCU16	455,038	26,870	481,908	10,000	491,908
	KCU17	-	-	-	-	-
Korean Offset Credit (KOC)		1,591,218	73,218	1,664,436	15,743,077	17,407,513
Total		11,597,727	27,316,131	38,913,858	50,303,523	89,217,381

## KAU Monthly Price Analysis (2015-2018)

		Closing	Average	Spread
2015	Jan	9,960	8,370	1,590
	Feb	10,100		
	Mar	10,100		
	Apr	10,300		
	May	10,300		
	Jun	10,300		
	Jul	10,300		
	Aug	10,300		
	Sep	10,300		
	Oct	11,300	12,000	- 700
	Nov	11,500		
	Dec	12,000	12,100	- 100
2016	Jan	12,700	12,600	100
	Feb	16,000	15,100	900
	Mar	18,450	17,349	1,101
	Apr	19,000	18,456	544
	May	18,500	19,326	- 826
	Jun	17,000	17,223	- 223
	Jul	17,000	16,258	742
	Aug	17,000	16,985	15
	Sep	18,000	17,364	636
	Oct	18,500	18,291	209
	Nov	18,600	18,056	544
	Dec	19,300	18,525	775
2017	Jan	23,000	20,751	2,249
	Feb	23,900	24,241	- 341
	Mar	20,600	21,409	- 809
	Apr	20,500	20,511	- 11
	May	20,950	20,600	350
	Jun	21,500	20,704	796
	Jul	20,350	20,350	-
	Aug	20,300	20,276	24
	Sep	20,800	20,437	363
	Oct	21,800	21,512	288
	Nov	24,000	23,184	816
	Dec	20,000	21,930	- 1,930
2018	Jan	22,000	21,902	98
	Feb	22,000	21,983	17
	Mar	22,000	22,032	- 32
	Apr	22,100	21,945	155
	May	23,200	22,335	865
	Jun	28,000	22,411	5,589
	Jul	22,500	23,435	- 935
	Aug	21,600	21,686	- 86
	Sep	22,200	21,820	380
	Oct	23,200	22,997	203
	Nov	24,000	22,657	1,343
	Dec	25,000	23,159	1,841



- Monthly KAU closing prices and average prices remained high in from 2015 until 2018
- The gap between the KAU closing price and the average price tends to widen in the period of price spikes, with four price fluctuations in total, between 2015 and 2018
- In June 2018, the KAU closing price reached KRW 28,000, the highest price ever, and the closing price-average price spread reached a maximum of KRW 5,589
- The average KAU price has stabilized at KRW 20,000 – KRW 22,000 since 2017 and has risen steadily since the 2<sup>nd</sup> quarter of 2018, reaching KRW 23,000 in December after five months
- Each year, KAU trading days were: KAU15 – 33 days (9.1%), KAU16 – 134 days (51.3%), KAU17 – 250 days (66.1%)
- The number of days when price changed without trade: KAU15 – 29 days (8%), KAU16 – 7 days (2.7%), KAU17 – 21 days (5.6%)

Figure 7. KAU Closing Prices and Issues by Period



## *Main issues in each implementation year*

### 1<sup>st</sup> Implementation Year (January 2015 – June 2016)

KAU15 reached a peak price of KRW 21,000 on 19<sup>th</sup> May 2016

The government supplied reserves from 1 – 3 June 2016 and subsequently prices dropped to KRW 16,600, down by 21%

\*Out of the total 900,000 tons of reserves, 289,118 tons were awarded at an average bid price of KRW 16,453

### 2<sup>nd</sup> Implementation Year (July 2016 – June 2017)

As supply shortage continued, KAU16 reached a record high of KRW 26,500 on 7<sup>th</sup> February 2017

The Ministry of Trade, Industry and Energy, through public hearings, decided and announced the restrictions for carry-over. Prices then dropped to KRW 20,450 (-22.8%)

### 3<sup>rd</sup> Implementation Year (July 2017 – August 2018)

The price hiked three times due to supply shortage and anxious companies waiting for the quota allocation. The highest price was recorded on 23<sup>rd</sup> November 2017 at KRW 28,000

Through public hearings, the Ministry of Environment announced that there were no problems in the supply and demand influencing the prices to drop to KRW 21,150 (-24.5%)

After the supply of stabilization reserves on June 1<sup>st</sup> 2018, the price dropped to KRW 21,500

\*Out of a total of 5.5 million tons of reserve, 4.66 million tons were awarded at the winning bid price of KRW 22,500

## *Analysis of Phase 1 and Phase 2 Outlook*

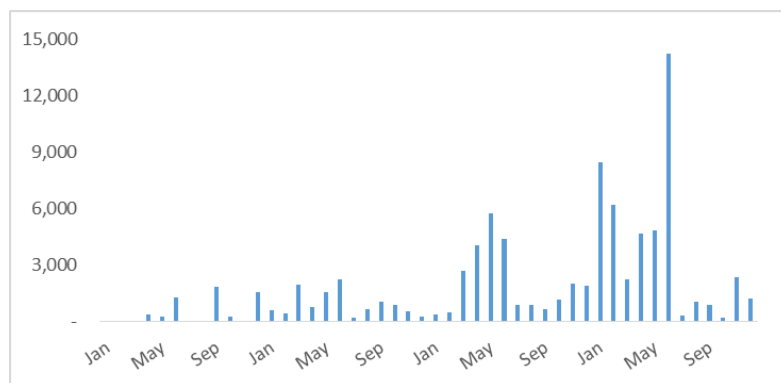
During the first phase, price fluctuation occurred five times. Price volatility increased as a result of the sharp increase and decrease in prices.

The government intervened four times through supply of market reserves or announcement through public hearings. The prices stabilized after each intervention.

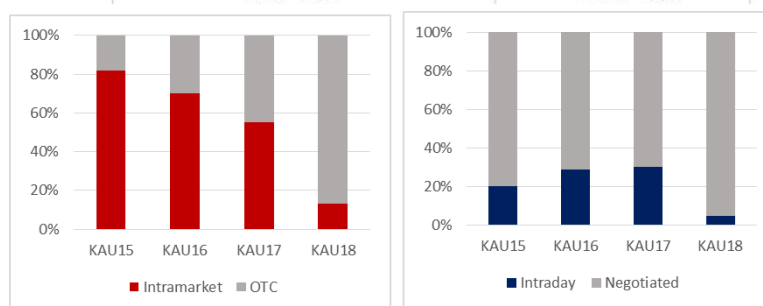
Within the supply shortage in Phase 2, there is a possibility that price hikes might occur before the end of the compliance submissions. However, the monthly auction will help control the price volatility as it will temporarily ease the shortage of permits in the market.

## Analysis of Monthly Trading Volume by Transaction Type (2015-2018)

		Intramarket		Total	OTC	Total
		Intraday	Negotiated			
2015	Jan	1		1		1
	Feb			-		-
	Mar			-		-
	Apr	5	275	280	100	380
	May			-	250	250
	Jun		500	500	780	1,280
	Jul			-		-
	Aug			-	35	35
	Sep			-	1,878	1,878
	Oct	12	168	180	89	269
	Nov			-	56	56
	Dec	33	248	281	1,305	1,586
2016	Jan			-	627	627
	Feb	24	290	314	106	420
	Mar	14	22	36	1,914	1,950
	Apr	168	260	428	345	773
	May	113	509	622	960	1,582
	Jun	330	1,296	1,626	610	2,236
	Jul	50	146	196		196
	Aug	260	182	442	255	697
	Sep	430	90	520	533	1,053
	Oct	363		363	522	885
	Nov	190	150	340	222	562
	Dec	120	100	220	56	276
2017	Jan	286	24	310	74	384
	Feb	287	77	364	160	524
	Mar	428	1,580	2,008	701	2,709
	Apr	490	2,352	2,842	1,189	4,031
	May	565	1,395	1,960	3,798	5,758
	Jun	871	1,962	2,833	1,559	4,392
	Jul	281	120	401	501	902
	Aug	307	203	510	365	875
	Sep	193	382	575	98	673
	Oct	123	358	481	700	1,181
	Nov	225	860	1,085	930	2,015
	Dec	614	752	1,366	546	1,912
2018	Jan	285	948	1,233	7,204	8,437
	Feb	386	957	1,343	4,880	6,223
	Mar	851	225	1,076	1,172	2,248
	Apr	944	945	1,889	2,803	4,692
	May	579	1,704	2,283	2,590	4,873
	Jun	1,460	6,839	8,299	5,930	14,229
	Jul	98	67	165	168	333
	Aug	95	28	123	970	1,093
	Sep	1	590	591	300	891
	Oct	7		7	208	215
	Nov	93	543	636	1,748	2,384
	Dec	16	170	186	1,067	1,253



Phase 1 Monthly Cumulative Trading Volume



ETS trading volume from 2015 to 2018 totaled 89 million tons, an increase of twice in every implementation year, and 52.5% of total trading volume was concentrated in 2018.

Every implementation year, KAU intramarket trading volume accounted for 66% of the total trading volume every March to June, before the deadline for compliance.

As for KAU, the proportion of OTC transactions and negotiated deals is gradually widening. In 2018, KAU18 intramarket trading volume and intraday trading volume accounted for only 13.2% and 2% of the total trading volume, respectively.

*Analysis of Trading Volume by Buying/Selling Sector (2015 - 2018)*

**(Total)**

In the period from 2015 to 2018, the volume of transactions in the market is about 39 million tons (70.3% of negotiations and 29.7% of intraday). The trading portion of KAU was 87.7%, KCU 8% and KOC 4.3%

**(Buying)**

In terms of the number of transactions by sector, the energy sector showed the highest rate at 68.3%, followed by the petrochemical sector (10.5%), cement sector (4.3%), semiconductor sector (3.2%) and non-ferrous sector (2.8%)

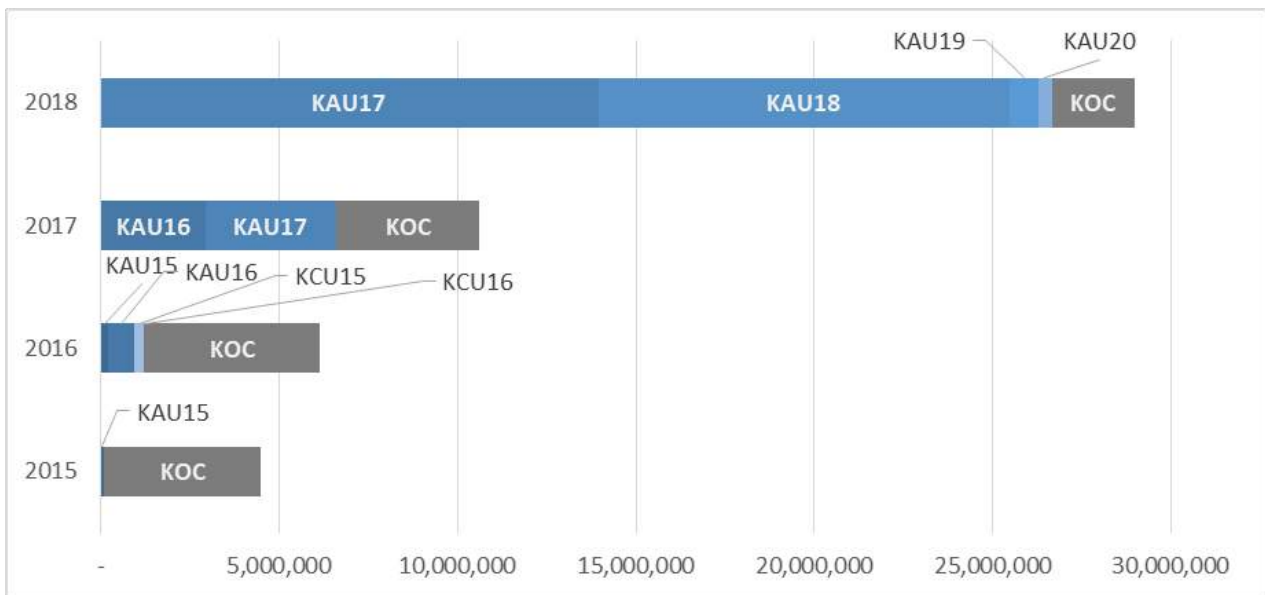
In the case of the power generation sector, which had a large amount of allocated permits, the purchase ratio of KCU to KOC was also high at 60.1% and 69.6%. In the semiconductor industry, KCU purchase ratio was at 27.5%

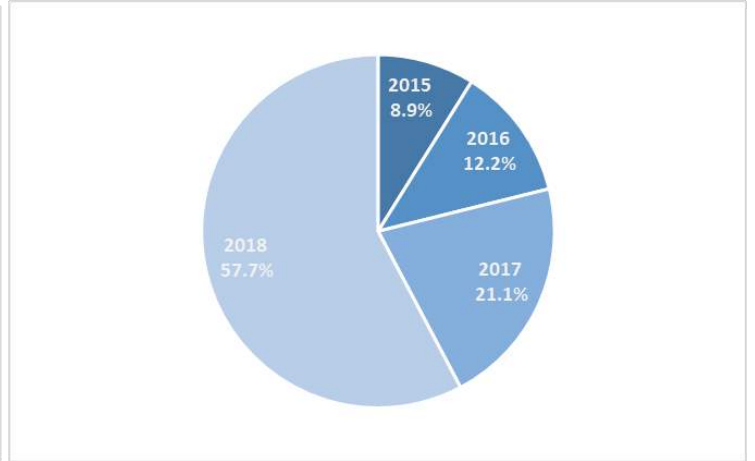
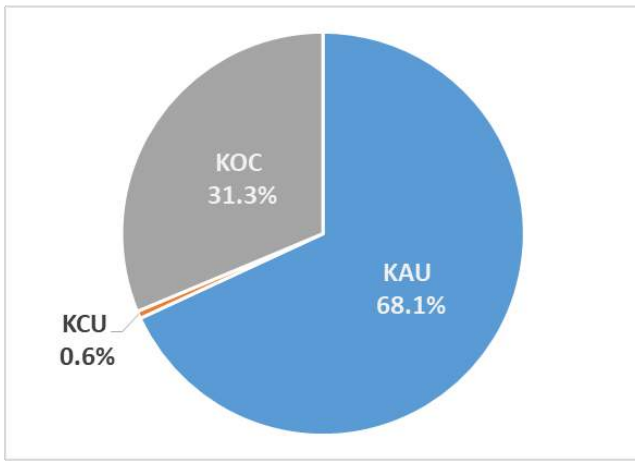
**(Selling)**

The share of sales by sector was in the order of power/energy generation (23.1%), other industries (13.2%), steel industry (9.9%), petrochemical industry (9.8%) and waste industry (8.1%)

The sales ratio of KCU was as high at 41.9%, 24.9% and 20.1% for waste, petrochemical, and water industries, respectively, and the sales ratio of KOC for waste and water industry was also high at 49.7% and 38.9%, respectively

*OTC Trading by Year (2015 - 2018)*





The amount of over-the-counter transactions from 2015 to 2018 is about 50.3 million tons, and the share of transactions by each commodity type is 68.1% for KAU, 0.6% for KCU and 31.3% for KOC.

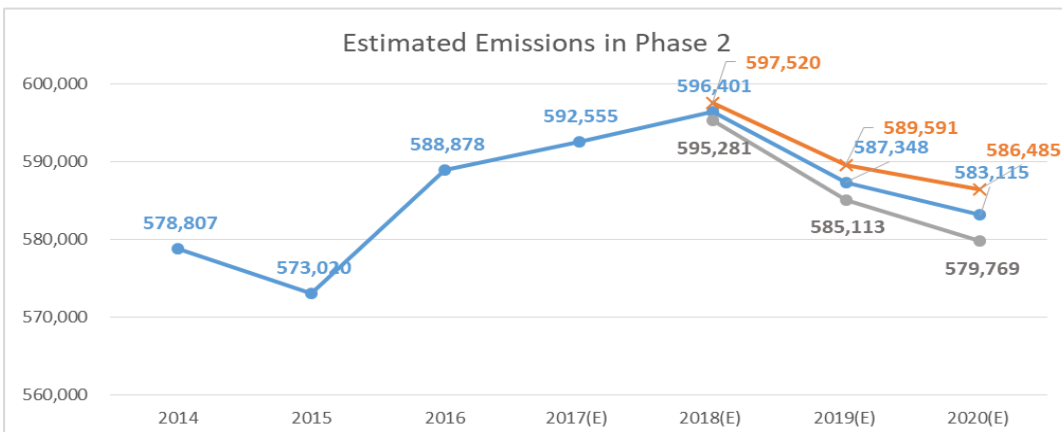
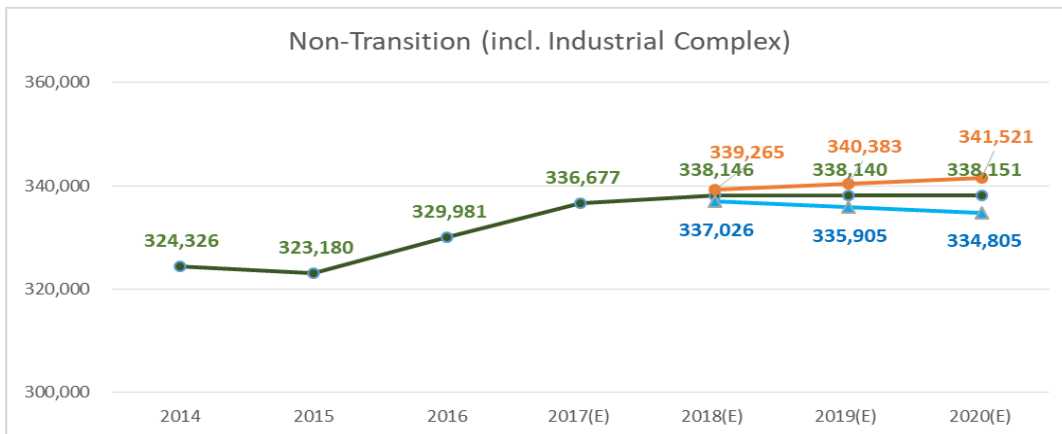
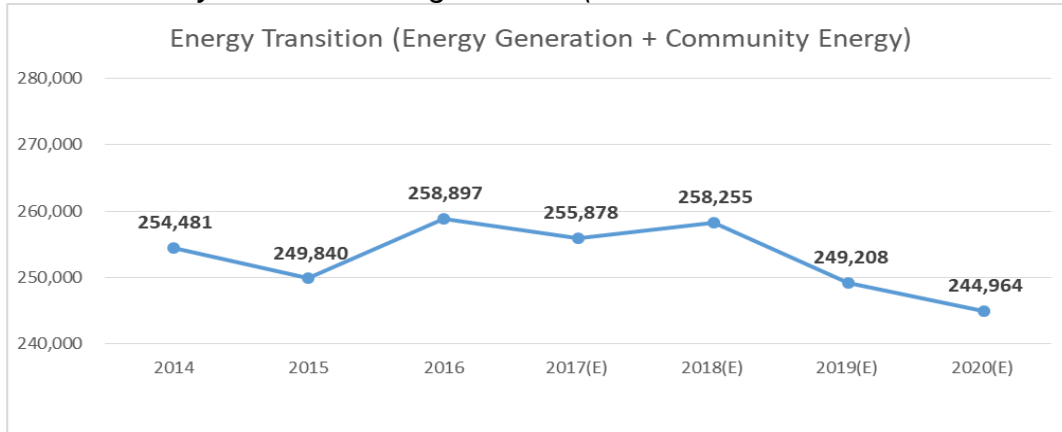
The annual OTC transaction volume showed an annual increase, and in 2018, the volume increased nearly three times to 57.7% of the total volume.

The reason for the large increase in OTC trading volume in 2018 is the large number of SWAP transactions between the excess KAU17 of companies and KAU18 of short companies during the last year of the first phase.



## Phase 2 Supply and Demand Potential and Price Forecast

### Estimated Emissions by Scenario during Phase 2 (based on 2018 2<sup>nd</sup> Quarter Production)



		Phase 2			
		2018 (E)	2019 (E)	2020 (E)	Total
Energy Transition		258,255	249,208	244,964	752,427
Non-Transition	-	338,146	338,140	338,151	1,014,437
	0.35%	339,265	340,383	341,521	1,021,169
	-0.35%	337,026	335,905	334,805	1,007,736
Total	Reference	596,400	587,348	583,116	1,766,864
	Optimistic	597,520	589,591	586,485	1,773,596
	Pessimistic	595,281	585,113	579,769	1,760,163

### (Transition Sector)

Estimated emissions from the conversion sector were calculated using the emission estimation simulation model developed by Carbon-i in May 2018 reflecting the plans on the 8<sup>th</sup> Basic Plan for Power Supply and Demand. From this, the estimated emissions from 2018 to 2020 showed a gradual decrease from 258,255,000 tons to 244,964,000 tons.

### (Non-transition Sector)

Estimated non-transition emissions are classified into major sectors (steel, cement, petrochemical, oil) and other industries, and are calculated based on the production performance and GDP growth rates, which are highly correlated with emissions by industry. We set three scenarios reflecting the economic outlook ( $\pm 0.35\%$ ) based on the emission targets for 2014 – 2018. The emissions from new facilities have not been reflected.

### (Total)

In the case of projected emissions from the transition sector, there is a possibility that the projected emission amount will change if new construction/abolition of power plants are changed. In the case of the projected emission amount outside the transition sector, emissions are expected to increase. Estimated emissions for transition and non-transition sectors are expected to be between 1,660.1 million tons and 177.76 million tons.

### Phase 2 Estimated Surplus/Deficit by Scenarios

		Phase 2				
		2018 (E)	2019 (E)	2020 (E)	Total	
<i>(unit: in thousand tons)</i>						
Supply	Pre-allocation	547,660	547,660	547,660	1,642,980	
	Phase 1 Carry-Over Amount	37,013	-	-	37,013	
	Offset	Domestic	10,672	2,856	2,856	16,384
		Overseas	-	500	2,000	2,500
	Other Reserves (Transition)	16,667	16,667	16,667	62,679	
Estimated Emissions	Reference	597,520	589,591	586,485	1,773,596	
	Optimistic	596,400	587,348	583,116	1,766,864	
	Pessimistic	595,281	585,113	579,769	1,760,163	
Balance (A-B)	Reference	14,492	(21,908)	(17,302)	(12,038)	
	Optimistic	15,612	(19,665)	(13,933)	(5,307)	
	Pessimistic	16,731	(17,430)	(10,586)	1,394	

The Phase 2 preliminary quota is estimated to be at 547.66 million tons a year and it is assumed that all 37 million tons of carryover amount from Phase 1 were supplied in 2018.

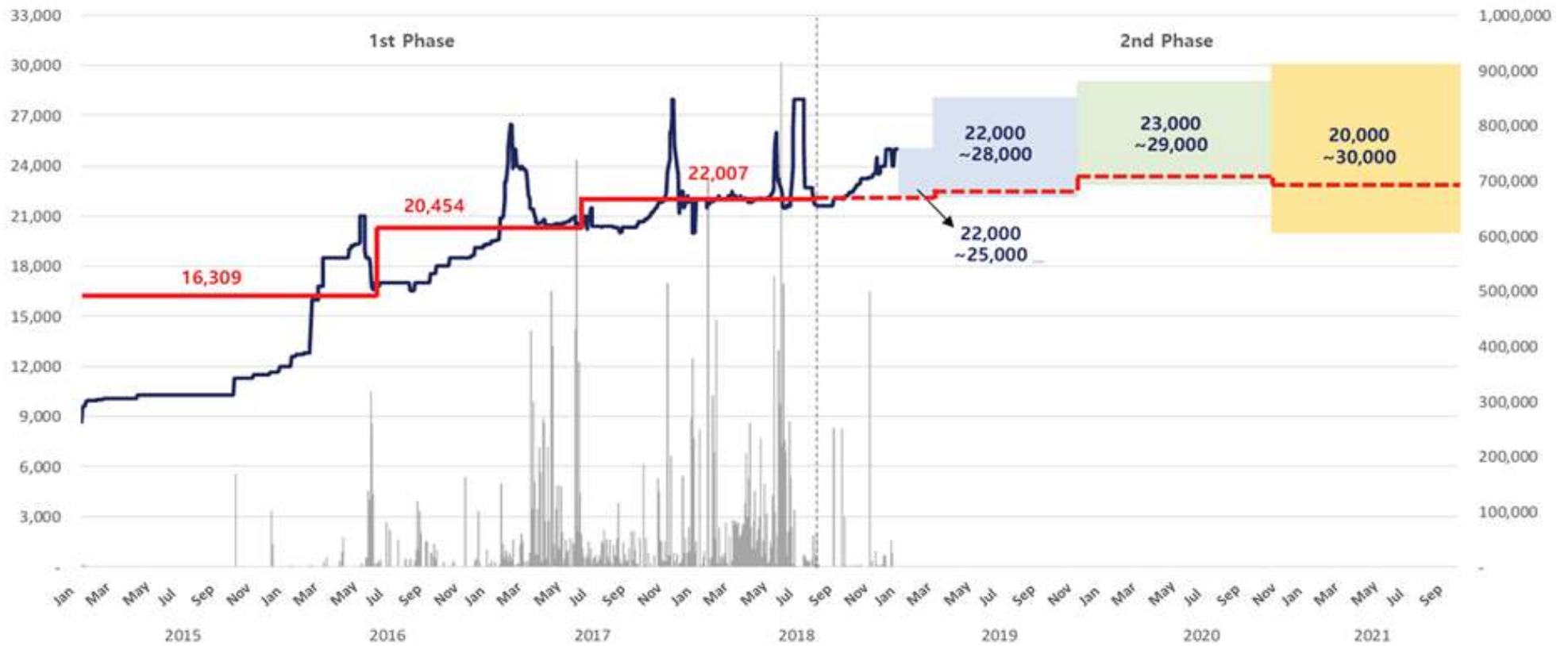
In the case of offsets, 10.67 million tons which included 7 million tons of KOCs were accounted for in 2018. In 2019 and 2020, about 2.86 million tons is scheduled to be issued annually. From the end of 2019, 2.5 million tons of overseas offsets are expected to flow into the market.

In the case of projected emissions of the transition sector, it is assumed that out of the total amount of other reserves which is 78.3 million tons, around 80% or 62.7 million tons are to be supplied. This assumption is made based on the 8<sup>th</sup> Basic Plan for Power Supply and Demand.

As a result, there is a possibility that the surplus or deficit in the second phase will be short of 12.04 million tons or an excess of 1.39 million tons depending on the scenario. 2018 is expected

to have a surplus of 14.49 million tons to 16.73 million tons while 2019 and 2020 is expected to have a shortage 17.43 million tons to 21.91 million tons and 10.59 million tons to 17.30 million tons, respectively.

Figure 8. Phase 2 Yearly Price Forecast



	Price Range	Estimate Average Trading Price
2019 (2019.01 - 2019.12)	KRW 22,000 - KRW 28,000	KRW 22,500
2020 (2020.01 - 2020.12)	KRW 23,000 - KRW 29,000	KRW 23,500
2021 (2021.01 - 2021.09)	KRW 20,000 - KRW 30,000	KRW 23,000

(Price Outlook for 2019)

Despite thousands of tons of carryover amounts from the first phase, the supply of surplus volume is expected to be limited, and all companies with surplus/shortfall are expected to make full use of the carryover/borrowing option while observing market conditions.

The auction, which is scheduled to be held monthly, and its bid price will help in stabilizing the market price. Accordingly, price volatility is likely to ease compared with Phase 1 but temporary price overheating may occur due to the aggressive buying by some companies after March.

(Price Outlook for 2020)

Demand for permits will increase due to the reduction in the borrowing limit of companies. As the supply of selling volume is expected to start full swing from the third implementation year, the price increase due to supply shortage is expected to intensify. As a result, the average trading price is expected to be at the highest level during Phase 2, and some of the market stabilization reserves may be supplied due to the temporary price increase or the possibility of a supply/demand imbalance.

(Price Outlook for 2021)

Price volatility is expected to intensify as the supply of surplus permits is concentrated in the last year of the second phase. During Phase 2, a deficit of 12.04 million tons or surplus of 1.39 million tons is expected.

If permits are insufficient depending on the economic outlook or the size of supply after implementing carryover restrictions, market formation and stabilization measures are expected to stabilize the prices downwards until the end of the phase.

## Estimated Power Generation and Projected Emissions (2018)

(Data based on October 2018)

### *Analysis of Total Power Generation by Energy Source*

From January 2018 – October 2018, power generation reached 472,455 GWh, up by 3.7% compared to the previous year. There is a decrease in base power generation (nuclear and coal) due to the increase in preventive maintenance.

Coal accounted for 42.1%, gas by 26.7%, nuclear by 23.1%, alternative energy by 5.6%, hydro by 1.3% and oil by 1.3%

- The country's total electricity generation in 2018 is expected to be up by 3% from the previous year, rising to 570,385GWh. However, the demand for electric power in 2019 is forecasted to decrease by 2.2% due to the slowdown of the economy according to the Korea Energy Economics Institute (KEEI)
- (Nuclear) Nuclear power generation plummeted due to increase in schedule maintenance but has since recovered during the 2<sup>nd</sup> half of the year. Nuclear power generation amounted to 108,917 GWh, a decrease of 14% from the same period of last year due to the early closure of the Wolsung facility. In December 2018, nuclear plant utilization rate is estimated to be at 76.6% and it is estimated to increase up to 90% from February 2019 when the planned preventive maintenance of Hanbit Units 1, 2 and 4, and Haneul Unit 1 ends.
- (Coal) Power generation in the first half of the year sharply increased due to the entry of new power plants in the end of 2017 but quickly decreased in the 2<sup>nd</sup> quarter due to the maintenance of old power plants and the limits imposed by the government due to the persistent high concentration of fine dust. The generation reached 198,806 GWh from January to October, up by only 0.5% from the previous year. According to KEEI, there would be no additional coal plants in 2019 and old plants will be stopped leading to a usage decline
- (Gas) Cumulative gas power generation from January to October 2018 was 126,171 GWh, exceeding nuclear generation, up by 33.2% from the previous year. The increase in demand was due to a decrease in base power generation of coal and nuclear and the summer heat.

### *Estimated ETS emissions and Supply Surplus/Deficit*

Estimated ETS emissions in the power generation sector in 2018 is estimated to be 272,556,000 tons, an increase of 0.4%

It was estimated that there were 45 companies (16 from the power generation, 15 from the collective energy, and 15 from the industrial complex) in the power generation sector including new entrants in 2018 with estimated emissions of about 272,556,000 tons

In a September 2018 Carbon-i analysis, ETS emissions for 2018 were estimated to be at 278,169,000 tons but nuclear power generation recovered to normal levels in October 2018 thereby slightly increasing the forecasted amount.

There is an estimated shortage of 31,172,000 tons compared to 241,384,000 tons of pre-allocation to power generation in 2018. ETS emissions should amount to 272,556,000 tons which means that the emission quota of 241,384,000 tons will be insufficient.

[Disclaimer]

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**Maureen Balamiento-Lee**  
Market Analyst | [mlee@ecoeye.com](mailto:mlee@ecoeye.com)