

# **SOUTH KOREA'S EMISSIONS TRADING SCHEME**

**White Paper**

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**Ernst & Young**

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## EXECUTIVE SUMMARY

South Korea will launch its emissions trading scheme in a little over 18 months. The government has yet to finalise the design of the scheme and is currently engaged in an active dialogue with industry. This White Paper aims to contribute to the debate by assessing how the various design options will affect the price of carbon and the efficiency of the market.

- This White Paper has been produced by Bloomberg New Energy Finance in cooperation with Ernst & Young Korea. Our analysis indicates that the country's overall emissions reduction target of 30% below business-as-usual (BAU) levels by 2020 is ambitious.
- The price of carbon in South Korea is likely to be high compared with other schemes, if the ETS is implemented in line with the government's original design proposal. This is because the level of low-cost abatement available in the power and industry sectors is unlikely to be sufficient to meet the 2020 target, even with the option of using offsets up to the proposed limit of 10% of compliance obligation.
- We anticipate that the emission-trading scheme (ETS) will cover around 70% of South Korea's greenhouse-gas output, creating demand for abatement of over 200Mt in 2020 – almost double that forecast for the Australian and EU emission-trading schemes.
- Without a carbon price, we estimate that emissions in the sectors covered by the ETS will grow by 28% between 2010 and 2020. Industrial greenhouse-gas output will rise by almost 40% over that period on the back of the semiconductor and display technology sectors, while power sector growth (20%) will be tempered by renewable and nuclear capacity additions.
- Until 2020, the programme would require 822Mt of cumulative emissions reductions relative to BAU. The current design proposal will limit offset usage to an estimated 238Mt – 29% of abatement demand to 2020. This must be supplied only by domestic offsets if international credits are not allowed until 2021.
- The current pipeline of domestic offset projects is likely to be insufficient – 21Mt of Certified Emission reductions (CER) and 6Mt of Korea Verified Emission Reduction (KVER) credits per year – meaning that additional domestic offset projects will need to be created to meet demand. A domestic forestry offsets scheme is being created and could play a major role in the provision of eligible credits for the ETS.
- Assuming participants submit offsets up to the maximum limit of 10% of emissions, the remaining demand for abatement in for example 2020 will be 169Mt/yr. We have identified only 119Mt/yr of abatement potential in the power and industry sectors, meaning that covered entities will need to achieve 50Mt/yr of additional emission reductions below BAU by 2020.
- The exact cost of abatement in the ETS is unclear, but with this high demand, the carbon price could rise to the long-run cost of new natural gas and renewable capacity, or the implementation of carbon capture and storage (CCS) technology – all above KRW 150,000/tCO<sub>2</sub>e (\$130/tCO<sub>2</sub>e).
- If this price level is deemed too high, the government may consider changing the original design plan with one of the following options: ease the emission reduction target, allow more offset credits before 2020, or implement price containment measures such as a price cap.
- The design plans suggest a penalty surcharge of three times the average market price during the compliance year, up to a maximum of KRW 100,000/tCO<sub>2</sub>e (some \$90/t) if covered entities fail to comply. If participants do not need to submit allowances in addition to paying the penalty charge, this will effectively act as a price ceiling for the scheme.
- As to the other design elements, in our opinion the scheme should cover direct emissions only. Including indirect emissions would incentivise covered sectors to improve their energy efficiency for power consumption. But it could lead to misallocation, while complicating the allocation and reporting process.
- Also, restrictions placed on third-party participation in the ETS will likely be counterproductive for the market as third-party actors are needed to develop trading channels and provide liquidity in order for the market to function smoothly.
- The regulated structure of South Korea's power market will probably impede the efficiency and effectiveness of the ETS. Liberalisation of the power sector is necessary to allow utilities to pass through the cost of carbon to consumers, and gain maximum benefit from the scheme.

# SECTION 1. POLICY BACKGROUND

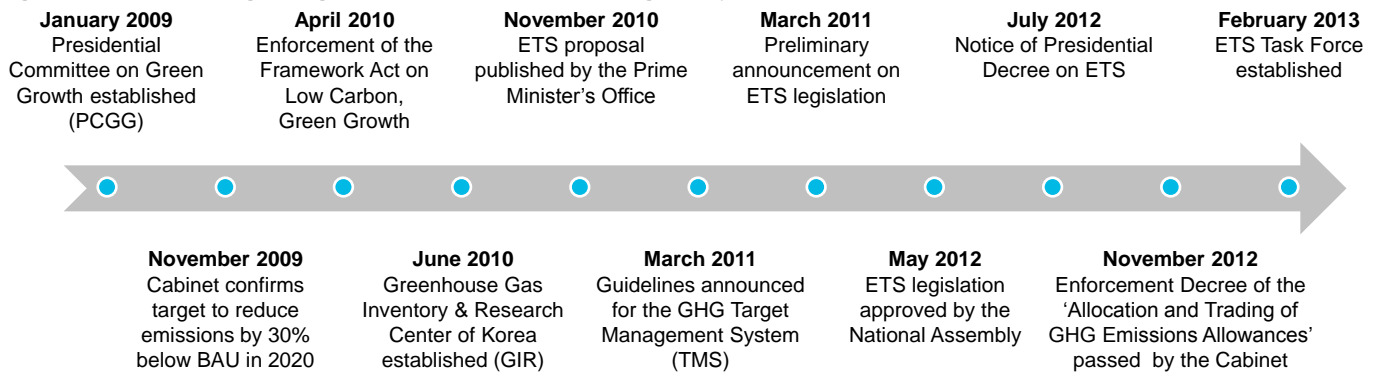
**South Korea has a target to reduce its emissions by 30% below business-as-usual in 2020**

After decades of rapid economic growth, South Korea is actively planning a transition towards low-carbon, sustainable development. Energy security, resource efficiency and climate change are all major concerns for South Korean policy-makers and the Presidential Committee on Green Growth was established in 2009 to coordinate the government's green growth strategy.<sup>1</sup>

The foundation of the green growth agenda in South Korea is the Framework Act on Low Carbon, Green Growth, which came into force in April 2010. The Act sets out a target to reduce national emissions by 30% in 2020 below its business-as-usual scenario, and requires that large emitters and energy consumers "report the quantity of greenhouse gases emitted and energy consumed to the government every year". The GHG Inventory & Research Center of Korea (GIR) was set up in 2010 to enforce this mandate and established a national inventory covering over 60% of the country's emissions.

The Act also requires that the government "operate a system for trading emissions of greenhouse gases" and a proposal for an emissions trading scheme (ETS) was published by the prime minister's office in late 2010.

**Figure 1: Timeline of green growth and emissions trading policy in South Korea**



Source: Bloomberg New Energy Finance

## 1.1. From the GHG and Energy Target Management System...

**The Target Management System is an important precursor to the ETS**

As a precursor to the ETS, the GHG and Energy Target Management System was set up in 2011 and is administered by the GIR. 'Controlled entities' must participate in the System if they emit over 20ktCO<sub>2</sub>e/yr or consume energy over 90TJ/yr. Companies with multiple installations must participate if their total emissions exceed 87.5ktCO<sub>2</sub>e/yr or energy consumption exceeds 350TJ/yr.<sup>2</sup> Over 450 entities are covered by the System across the power, industry, waste and agricultural sectors.

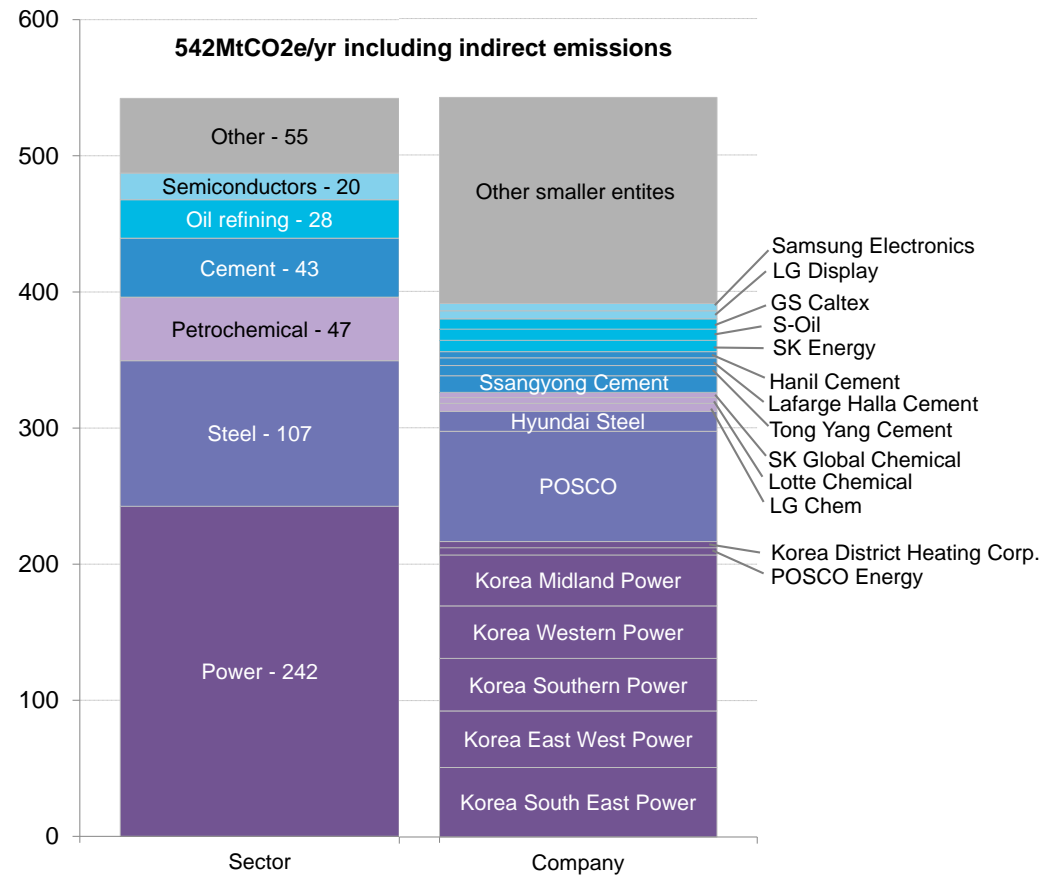
Each participant must provide annual emissions and energy consumption data to the government. The relevant department assigns each entity with an energy/emissions reduction target for the subsequent year. An implementation plan is then fed back to the government, with the target for the following year set according to the operation rate and expansion plans of the controlled entity.

It is envisaged that the ETS will cover broadly the same controlled entities participating in the System – including major power generation, industrial and manufacturing companies (Figure 2).

1 The PCGG was abolished in March 2013 after its responsibilities were subsumed into other government departments  
 2 These thresholds are applied from Jan-12 to Dec-13. From Jan-14 the thresholds will be brought down to 50kCO<sub>2</sub>e/yr and 200TJ/yr for companies and 15kCO<sub>2</sub>e/yr and 80TJ/yr for installations

Figure 2: GHG and Energy Target Management System coverage, 2011 (MtCO2e/yr)

Power generation and the five biggest industry sectors account for the majority of emissions covered by the TMS



Source: Bloomberg New Energy Finance, Greenhouse Gas Inventory & Research Center of Korea. Note: Includes direct and indirect emissions from power or heat purchased from a utility.

Only 10 entities account for over three-quarters of emissions covered by the GHG and Energy Target Management System in 2011

76% of emissions covered by GHG and Energy Target Management System (including indirect emissions) in 2011 came from only 10 entities – including KEPCO, the state-owned utility, and many of South Korea's biggest 'chaebol' conglomerates.

Table 1: GHG and Energy Target Management System – top 10 companies, 2011

Company	Emissions	% of total
KEPCO	211	39%
POSCO	89	16%
Hyundai	26	5%
SK	17	3%
LG	14	3%
Samsung	13	2%
Ssangyong Cement	12	2%
GS	12	2%
S-Oil	8	2%
Tong Yang Cement	8	1%
Others	133	24%
<b>Total</b>	<b>542</b>	<b>100%</b>

Source: Bloomberg New Energy Finance, Greenhouse Gas Inventory & Research Center of Korea

## 1.2. ...to the ETS

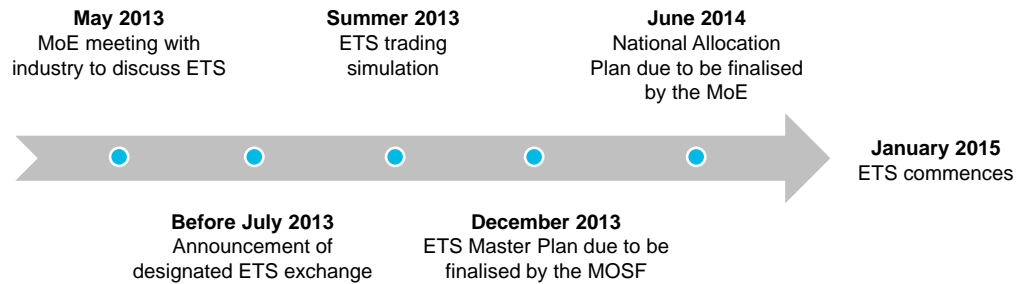
The ETS is due to start in January 2015

The Enforcement Decree of Allocation and Trading of Greenhouse Gas Emissions Allowances Act (the ETS Act) was passed in the Cabinet meeting on 13 November 2012. This outlined the rules and governance structure for the ETS, planned to commence on 1 January 2015 (Table 2).

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Several government departments are involved in the design and implementation of the scheme, building on the governance structure of the GHG and Energy Target Management System. The Ministry of Environment (MoE) is responsible for the scheme overall and has set up a taskforce – an inter-departmental agency – that will lead the work on the design and implementation of the scheme.

**Figure 3: Forecast timeline for design and implementation of the ETS**



Source: Bloomberg New Energy Finance

The taskforce is expected to engage with industry to discuss the design plans over the coming months

### Industry consultation

The taskforce is coordinating the detailed legislative design process for the ETS, including monitoring and reporting procedures, setting the cap and allocation framework, and establishing a trading platform and laws regarding the operation of the market. It will also lead consultations with industry and other government departments on the design of the scheme, and will operate a pilot phase/simulation planned for later this year.

The MoE and taskforce are expected to meet with industry bodies and major companies in May to discuss the design plans. The level of the cap and rules governing free allocation are likely to be central to these consultations, with industry likely to claim that their competitiveness will be negatively affected by the introduction of the ETS (see box on next page).

### Designation of exchange

The exchange that will create a trading platform for the ETS is due to be announced before July with the frontrunners being Korea Power Exchange and Korea Exchange. Once the exchange has been chosen, the taskforce and Korea Environment Corporation are expected to launch a trading simulation to build operational experience and help to educate future ETS market participants.

### 'Master Plan'

The ETS 'Master Plan', which will provide the legal basis for the ETS, is expected to take shape over the coming months. The Ministry of Strategy and Finance (MOSF) must sign off on the Master Plan, due to be published in December 2013. The Master Plan will be revised every five years and will provide a 10-year plan for the operation of the market.

### Decision on BAU forecast

The government 2020 emissions forecast (for BAU) is expected to be revised ahead of the publication of the Master Plan and could have a significant impact on the level of the eventual ETS cap. As South Korea's 2020 target is based on BAU emissions, if the official BAU forecast were to change, it would affect the overall level of ambition of the target.

The ETS master plan will be published in December 2013

## Allocation plan

The allocation plan will be drawn up by June 2014, with free allowances handed out to participants before the end of October 2014. Traded is then set to commence on 1 January 2015.

The ETS plans have been met with opposition from industry

### Opposition to the ETS

The ETS was approved by the National Assembly with cross-party support but there has been significant opposition to the policy from industry bodies representing the major sectors to be covered by the scheme. In particular, opponents have conjectured that the covered sectors will incur higher costs and lose competitiveness relative to peers in countries without a carbon price.

Industry lobbies have suggested various measures that could soften the blow, including:<sup>3</sup>

- 100% free allocation for industrial sectors until 2021: the ETS decree proposes 100% free allocation relative to the cap until 2017 and 97% free allocation relative to the cap in Phase II of the scheme (2018-20)
- Coverage of direct emissions only: the Target Management System covers indirect emissions from grid-connected power consumption, as may the ETS
- Exclude industries such as aluminium and chemicals, which are particularly exposed to international trade and carbon leakage
- Allow unlimited banking and borrowing between phases: the ETS decree permits banking but not borrowing between phases
- No limit on offsets: the ETS decree limits offset usage to 10% of emissions in each year, with no international credits permitted until 2021
- Reduce the maximum penalty charge, which is currently proposed at KRW 100,000/t (\$90/t)
- Delay implementation of the ETS.<sup>4</sup>

<sup>3</sup> <http://bit.ly/11lg0tG>

<sup>4</sup> The Korea Herald, *Korea urged to delay carbon-trading scheme*, 9 April 2013.

## SECTION 2. ETS DESIGN

The ETS Act, summarised in Table 2, serves as a draft plan for the scheme and is the basis for ongoing consultations between government and industry.

**Table 2: ETS design proposal, November 2012**

Element	Details
<b>Coverage</b>	<ul style="list-style-type: none"> <li>All six Kyoto Protocol greenhouse gases</li> <li>Direct and indirect emissions</li> <li>Individual facilities producing over 25ktCO<sub>2</sub>e/yr</li> <li>Companies with multiple installations producing over 125ktCO<sub>2</sub>e/yr</li> <li>Any firm which voluntarily wishes to join the ETS</li> </ul>
<b>Trading phases</b>	<ul style="list-style-type: none"> <li>Scheme to begin on 1 January 2015</li> <li>Two 3-year initial trading phases, followed by 5-year trading phases</li> <li>Phase I 2015-17; Phase II 2018-20; Phase III 2021-25</li> </ul>
<b>Allocation</b>	<ul style="list-style-type: none"> <li>ETS Master Plan to be published by the Ministry of Strategy and Finance in December 2013, planned for a period of 10 years and revised every 5 years</li> <li>Allocation Plan to be completed at least 6 months ahead of commencement of trading phase and allowances to be handed out to participants no later than 2 months before the commencement of each compliance year</li> <li>Both grandfathering and benchmarking are being considered for the methodology to calculate free allocation</li> <li>100% free allocation in Phase I (2015-17); 97% free allocation in Phase II (2018-20); &lt;90% free allocation from Phase III onwards</li> </ul>
<b>Compliance</b>	<ul style="list-style-type: none"> <li>Verified emissions to be reported within 3 months after the end of the compliance year</li> <li>Surrender of allowances to be completed within 6 months after the end of the compliance year</li> </ul>
<b>Offsets</b>	<ul style="list-style-type: none"> <li>Offsets may be used for up to 10% of compliance obligations, with the actual limit for each installation to be decided in the allocation plan</li> <li>International offsets are excluded entirely during Phase I and II</li> <li>From Phase III international offsets can be used for up to 50% of total offset limit, but the absolute number of international offsets submitted for compliance cannot exceed the number of domestic offsets submitted for each compliance year</li> </ul>
<b>Penalties</b>	<ul style="list-style-type: none"> <li>Failure to submit sufficient allowances in each compliance year will result in a penalty surcharge of 3 times the average market price during the compliance year up to a maximum of KRW 100,000/tCO<sub>2</sub>e (approx. \$90/t). It is unclear if participants will also be required to submit allowances in addition to the penalty surcharge, as is the case in the EU ETS. If participants do not need to submit allowances in addition to paying the penalty charge it will effectively act as a price ceiling for the scheme.</li> </ul>
<b>Banking and borrowing</b>	<ul style="list-style-type: none"> <li>Unlimited banking of allowances between compliance years and phases is permitted</li> <li>Borrowing between phases is not permitted, but allowances can be borrowed between compliance years within each trading phase for up to 10% of emissions in each compliance year</li> </ul>
<b>Market stabilisation measures</b>	<ul style="list-style-type: none"> <li>Additional allowance reserve (up to 25%)</li> <li>Maximum/minimum limit for allowance holdings can be imposed on companies</li> <li>Amend borrowing limit between compliance years</li> <li>Amend offset usage limit</li> <li>Price floor/ceiling</li> </ul> <p>Note: these measure are to be negotiated by the government and companies to be covered by the ETS</p>
<b>Third-party participation</b>	<ul style="list-style-type: none"> <li>During Phases I and II, only companies covered by the ETS and the following public financial institutions will be approved to participate in the market: <ul style="list-style-type: none"> <li>- Korea Development Bank</li> <li>- Industrial Bank of Korea</li> <li>- Korea Eximbank</li> <li>- Korea Finance Corporation</li> </ul> </li> </ul>
<b>Financial support measures</b>	<ul style="list-style-type: none"> <li>The ETS Act allows for financial support to be provided to industries whose competitiveness is negatively affected by the ETS. Financial support could be offered in the form of tax breaks or subsidies</li> </ul>

Source: Bloomberg New Energy Finance, Korea Legislation Research Institute, Ministry of Environment



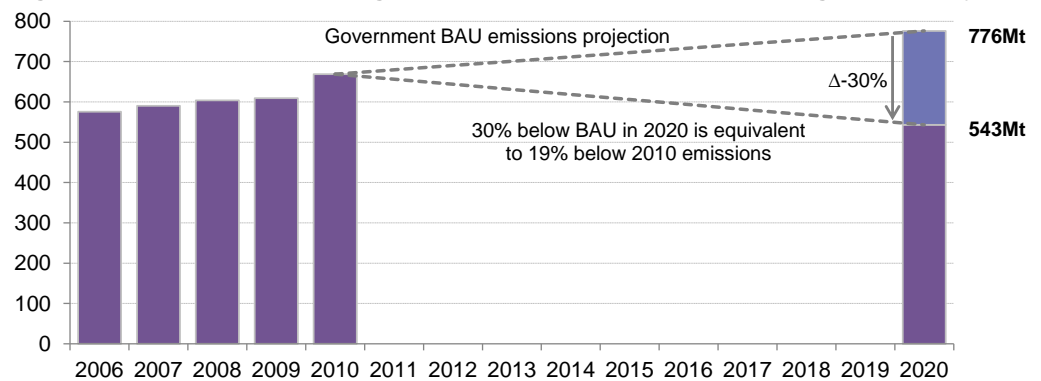
## SECTION 3. EMISSIONS FORECAST AND 2020 TARGET

The 30% below 2020 BAU target is equivalent to a 19% reduction on 2010 emissions

The Framework Act on Low Carbon, Green Growth sets out South Korea's target to cut its emissions by 30% below BAU levels in 2020. BAU is a projection for emissions in the absence of a carbon price. The MoE's latest BAU forecast assesses that emissions will reach 776Mt in 2020, marking a 16% increase on 2010 emissions of 669Mt.<sup>5</sup> The target essentially limits South Korea's greenhouse-gas output to 543Mt in 2020 – a 19% reduction from 2010 levels (Figure 4).

Setting the target relative to BAU creates some uncertainty over the actual level of ambition implied by the goal. The MoE is likely to revise the BAU forecast this year, according to a phone interview with an MoE representative; indeed, the forecast has already been revised down from 813Mt (a figure that is still quoted in several government sources). We have based our analysis on the 776Mt forecast but recognise that the level of abatement and prevailing price in the ETS is likely to be affected by any revision to the government BAU projection.

Figure 4: Historical emissions, government BAU forecast and 2020 target (MtCO<sub>2</sub>e/yr)



Source: Ministry of Environment Note: includes six Kyoto greenhouse gases

Because this White Paper focuses on the ETS only, it is first necessary to split out the proportion of emissions that will be covered by the scheme and break these down by sector.

### 3.1. Traded sector emissions forecast

In 2010, direct emissions under the Target Management System (and therefore likely to be in the ETS) accounted for some 70% of the country's emissions.<sup>6</sup> Sectors covered by the ETS are referred to as 'traded sectors' while the 'non-traded sectors' include emission sources such as transport fuel and residential gas consumption.

Power generation and industry are responsible for the majority of the traded sector emissions. Bloomberg New Energy Finance and Ernst and Young's analysis estimates that, without a carbon price, traded sector emissions will climb 28% over 2010-20 to 565Mt (Figure 5). As growth in traded sector emissions outpaces the non-traded sectors, we expect the ETS to cover almost 75% of South Korea's greenhouse-gas output by the end of the decade.

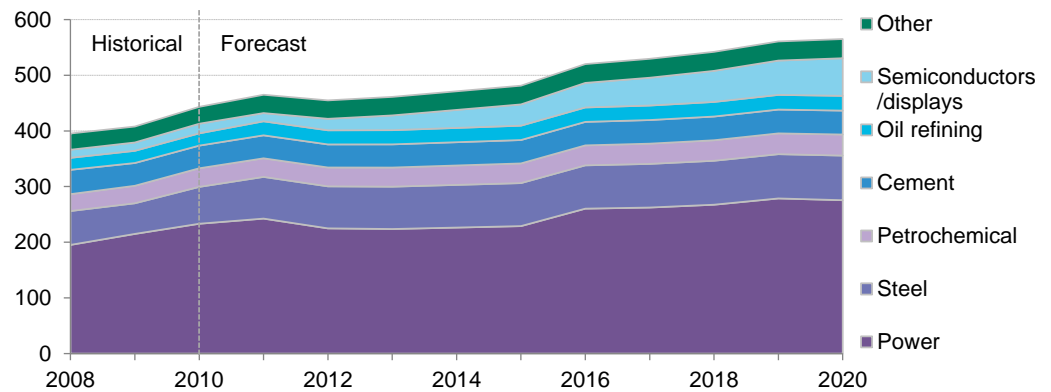
5 Korea's Third National Communication under the UNFCCC, published March 2012

6 From the burning of fossil fuels; indirect emissions refers to end-use utility electricity and heat consumption

We expect the ETS to cover almost 75% of South Korea's emissions in 2020

Without a carbon price, power sector emissions are projected to increase by 20% and industrial emissions by 40% from 2010 to 2020

Figure 5: Traded sector emissions by sector, 2008-20 (MtCO<sub>2</sub>e/yr)



Source: Bloomberg New Energy Finance, Ministry of Environment

### Power

The government is planning to increase supply and curb demand growth in the power sector, by boosting nuclear and renewable capacity, and increasing energy efficiency across the energy-intensive industry sectors. These supply- and demand-side developments are likely to slow emissions growth in the power sector.

We forecast power sector emissions using the electricity supply, demand and capacity build assumptions provided in the 6<sup>th</sup> Basic Plan for Long-term Electricity Supply and Demand, which incorporates the latest government projections for power generation and consumption to 2027.<sup>7</sup>

Power generation will increase by 37% over 2010-20, according to our projections, to keep up with rising demand (Figure 14). Nuclear generation will grow as over 15GW of new nuclear plants are planned to be built by 2024. The country also has a Renewable Portfolio Standard (RPS), which sets targets for renewable power generation that we assume will be met. As a result, renewable generation (including hydropower) will climb to 55GWh in 2020 – a 700% increase on 2010 levels. However, due to a parallel expansion of coal-fired generation capacity, we expect power emissions to increase by almost 20% by 2020 compared with 2010, to 276Mt.

### Industry

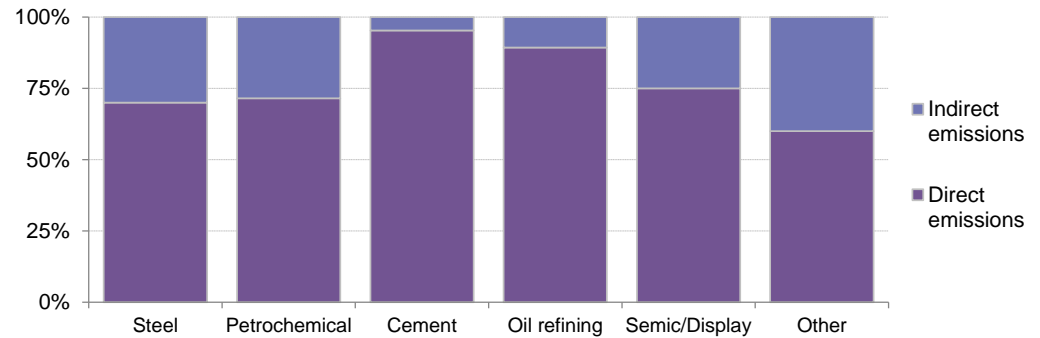
Our emissions forecast for the major industrial sectors covered by the ETS – ie, steel making, petrochemicals, cement, oil refining and semiconductor/display manufacturing – uses TMS emissions data for the Target Management System and projections for each sector published by the government.<sup>8</sup> The emissions data reported under the TMS includes both direct and indirect emissions, which means that emissions from power purchased by industry are counted twice. To account for this we have estimated the split between direct and indirect emissions for each industry sector (Figure 6).

We estimate that without a carbon price, direct emissions from industry will grow by almost 40% over 2010-20 to 289Mt. The largest increase is expected to come from the semiconductor and display technology sector, with emissions expected to quadruple between 2010 and 2020. The majority of this growth is expected to be from fluorinated (f) gases that are emitted from semiconductor and LCD etching and cleaning processes.

7 <http://bit.ly/17My2ss> (in Korean)

8 2020 Low Carbon, Green Society Roadmap, published July 2011 – <http://bit.ly/13WdmBU>

Figure 6: Split of direct and indirect emissions from major industrial sectors



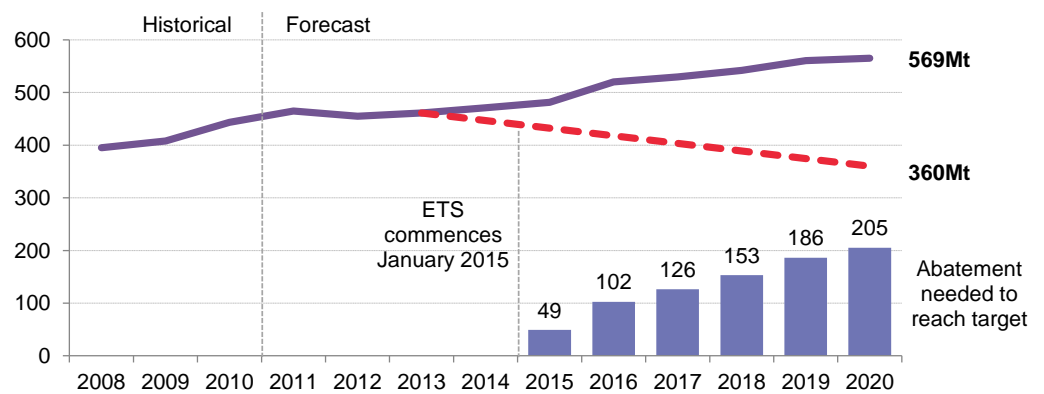
Source: Bloomberg New Energy Finance

### 3.2. Traded sector abatement requirement

Demand for abatement created under the ETS is a function of forecast emissions and the cap on the traded sectors.

We calculate the cap on emissions from the traded sectors to be 432Mt in 2015 and 360Mt in 2020

Figure 7: Traded sector emissions, 2020 target and abatement required to reach target, 2008-20 (MtCO<sub>2</sub>e)



Source: Bloomberg New Energy Finance. Note: Assumes no usage of offsets

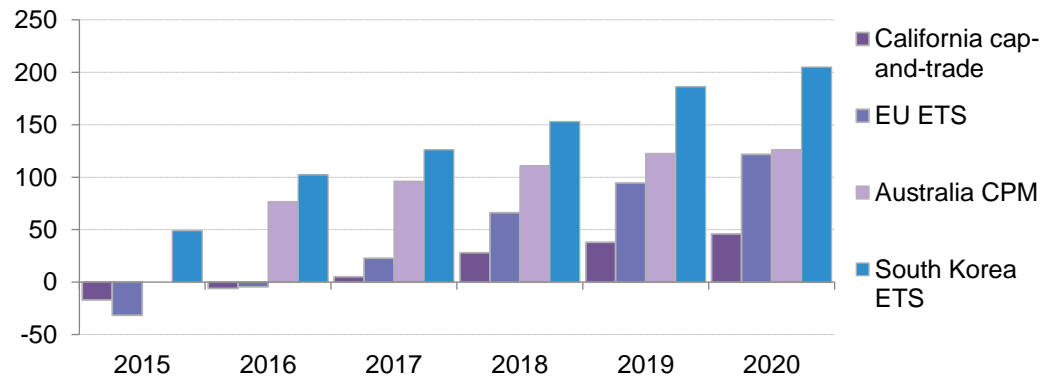
The actual level and trajectory of the ETS cap remains to be decided. We assume that the cap declines linearly from estimated emissions in 2013 to the target level in 2020, with equal burden on the traded and non-traded sectors (ie, emissions for both are reduced by 30% below BAU in 2020). This is in line with the MoE's projection for emission reductions across each sector published in 2012.<sup>9</sup> The implied cap on emissions from the traded sectors will be 432Mt in 2015 and 360Mt in 2020.

Annual demand for abatement, excluding the use of offsets, under the ETS is expected to increase to over 200Mt per annum in 2020. The total cumulative demand for abatement over 2015-20 will depend on the trajectory of the cap over Phases I and II of the scheme, and is approximately 800Mt based on the assumptions explained above.

9 <http://bit.ly/13WdmBU> (in Korean)

South Korea's ETS will create demand for abatement in 2020 almost double that forecast for the Australian and EU programmes

Figure 8: Estimated annual demand for abatement excluding usage of offsets, comparison between different emission trading schemes, 2015-20 (MtCO2e)



Source: Bloomberg New Energy Finance. Note: excludes historically banked volumes of allowances

The projected demand for the South Korean ETS is high compared with other emission trading schemes around the world. Figure 8 shows annual demand for abatement for the EU ETS, Australian Carbon Pricing Mechanism (CPM) and California cap-and-trade programme to 2020.

Using the above-described assumptions, the South Korea ETS will create demand for abatement in 2020 over four times more than the California cap-and-trade scheme and over 60% greater than the Australian CPM (126Mt in 2020) and the EU ETS (122Mt in 2020). Demand for abatement can be reduced if the government opts for a less ambitious emission reduction target for the ETS or if BAU emissions rise by less than expected.

The carbon price will be determined by the opportunities for abatement, which is the focus of the next section.

## SECTION 4. ABATEMENT POTENTIAL

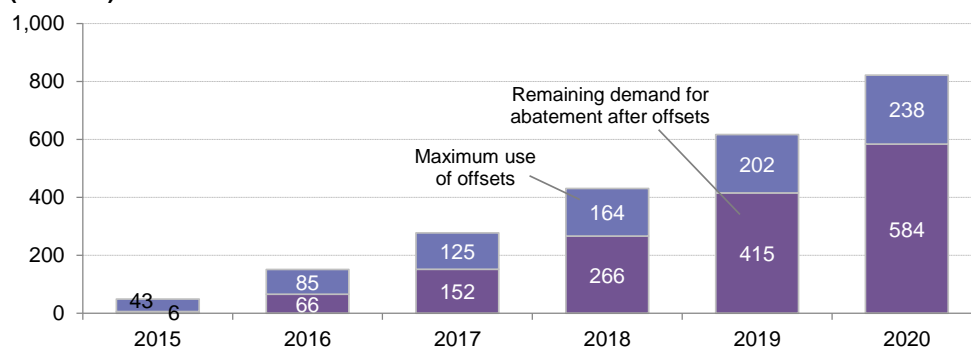
The prevailing price in the South Korean ETS will depend on the abatement opportunities available in the covered sectors and the use of offset credits. This section looks at the potential abatement opportunities in the power and industrial sectors and the price that might be required in the ETS in order to achieve the long-term target reductions.

### 4.1. Abatement demand

Our emissions forecast implies that the ETS will create over 200Mt of annual demand for abatement by 2020. Figure 9 shows the cumulative demand split by offset usage and required abatement by entities covered by the scheme.

With a projected maximum limit of 238Mt of offsets that can be used until 2020, 584Mt of abatement will need to be achieved by covered companies

**Figure 9: Cumulative estimated demand for abatement in the South Korea ETS, 2015-20** (MtCO<sub>2</sub>e)



Source: Bloomberg New Energy Finance

### 4.2. Offsets

Offsets play a major role in other trading schemes such as the Australian CPM, New Zealand ETS and EU ETS. The use of offsets reduces the overall cost of compliance for covered entities, provided that credit prices are lower than the marginal cost of compliance without offsets. The credit price is determined by the supply and demand fundamentals for those particular units, as opposed to the allowance price which is determined by the marginal cost of abatement within a cap-and-trade scheme.

We assume that 10% of compliance obligation (ie, emissions) in the South Korean scheme can be met with offsets in accordance with the ETS Enforcement Decree (Table 2). Based on this assumption, we estimate that the ETS will create 238Mt of demand for offsets until 2020 – 43Mt/yr in 2015 declining to 36Mt/yr in 2020. The limit on offset usage falls in absolute terms over time as the total level of emissions falls under the ETS.

According to the decree, only domestic offsets will be eligible until the start of Phase III in 2021. It is unclear exactly what will be considered a 'domestic offset' project, but government sources have indicated that UN-approved CDM projects located in South Korea will be eligible.<sup>10</sup> In addition to CERs, it is possible that the Korea Voluntary Emission Reduction (KVER) programme will be linked with the ETS. The KVER programme currently generates almost 6Mt of offsets per year and could be scaled up into a larger domestic offset scheme.

Domestic offset supply may not be sufficient to meet demand out to 2020

10 Interview with official from PCGG

The current pipeline of domestic offset projects may not be sufficient to meet the maximum demand from the ETS to 2020 of 238Mt. We estimate that existing South Korean CDM projects could supply 100-150Mt of CERs and that approximately 45Mt of KVERs could be generated by the current project pipeline out to 2020. Furthermore, these supply estimates could be brought down if the eligibility of domestic offsets is restricted – ie, excluding CDM projects within the ETS covered sectors.

In order to satisfy ETS offset demand to 2020, new domestic offset projects need to materialise. We assume that domestic offset supply will grow as the KVER programme is scaled up and CDM project developers focus their efforts on the South Korean market. Historically, where there has been demand for offset credits in other markets, supply has quickly been created to satisfy – and often exceed – that demand. However, when deciding on the offset eligibility criteria for Phases I and II, the government should consider the time that it may take for new projects to be created and the possibility that the supply of domestic offsets out to 2020 may not meet demand.

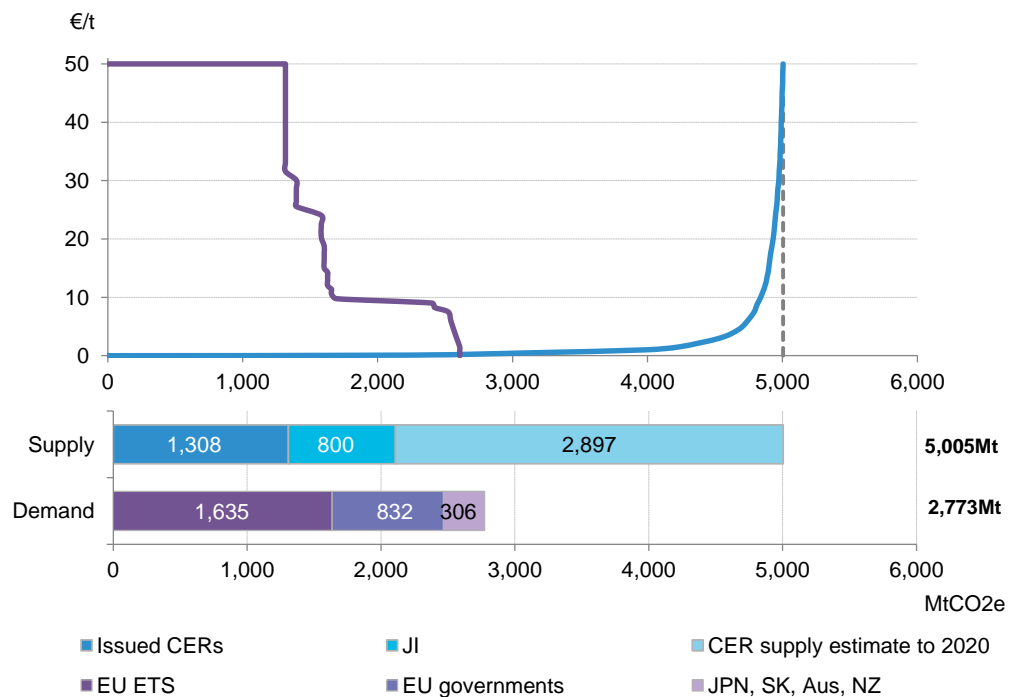
**UN offsets**

The Kyoto Protocol flexible mechanisms (CDM and JI, together referred to as 'UN offsets') provide a readily available supply of credits, though these are ineligible in the South Korean ETS until 2021 according to the decree. To date, over 2.1Gt of offsets (1.3Gt of CERs and 0.8Gt of ERUs) have been issued to approximately 3,000 projects in over 90 countries. In addition, we estimate that the current CDM project pipeline will deliver a further 2.5-3.0Gt of credits by the end of 2020 (Figure 10).

UN offsets have been integrated into several schemes, namely the EU ETS, Australian CPM and New Zealand ETS. The politics of UN climate policy and the credibility of UN accreditation have encouraged national and regional trading schemes to link with the Kyoto mechanisms.

UN offset prices have fallen close to zero as supply far exceeds demand

**Figure 10: UN offset supply and demand balance, 2008-20**



Source: Bloomberg New Energy Finance. Note: Excluding HFC23/adipic acid N2O credits post 2012

The most notable feature of the UN offset market at present is that supply overwhelmingly exceeds demand out to 2020. Supply has grown faster than demand as the UN climate talks have made limited progress on strengthening country-level emission reduction targets; and developers

Current ETS design plans exclude international offsets until 2021

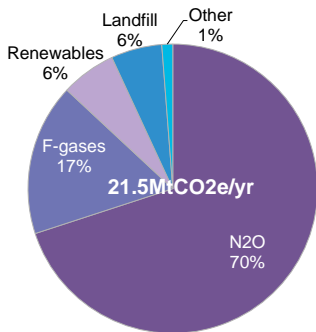
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have rapidly built up the project pipeline, particularly in China, India, Brazil, Russia and Ukraine. This situation has led to the UN offset price falling close to zero – at the time of writing the Dec-13 CER contract traded around €0.30-0.40/t (KRW 440-600/t).

With regard to the South Korea ETS, there is ample supply of UN offsets available to meet any level of demand that can be created under the scheme out to 2020. It should be noted, however, that the oversupply in the UN offset market means that prices are likely to stay close to their currently levels, well below €1/t. If the limit on the use of UN offsets is greater than the total level of abatement demand created under the ETS, the allowance price will fall towards the UN offset price as covered entities will opt to purchase cheaper offsets for compliance instead of allowances.

The Kyoto mechanisms are undergoing reform and a fresh incarnation of the UN crediting programme is due to emerge over the next two years, referred to as the 'new market mechanism'. As part of the post-2020 UNFCCC agreement, envisaged to be negotiated by the end of 2015, the new market mechanism could play a major role in how countries meet their mitigation and finance commitments under the international climate policy framework. For this reason it could be beneficial for the South Korea ETS to remain open to international offsets so it can link into the evolving UN offset programme without the need for significant future legislative changes.

**Figure 11: Breakdown of maximum CER supply from South Korean CDM projects (MtCO<sub>2</sub>e/yr)**



Source: Bloomberg New Energy Finance

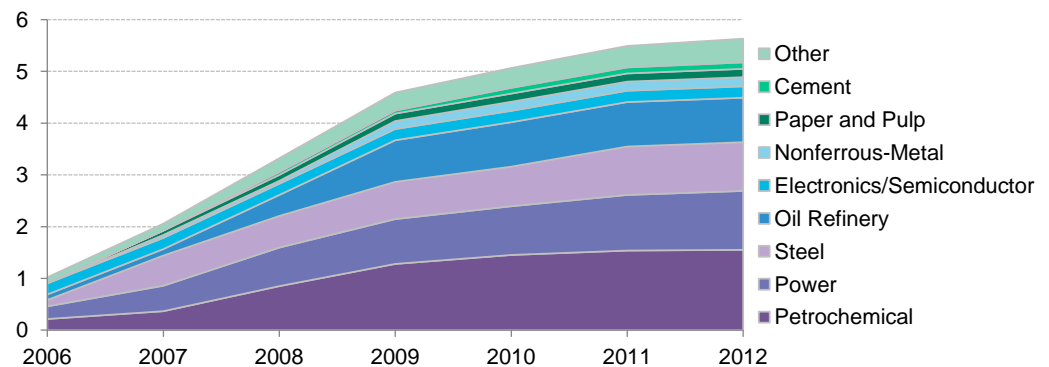
### South Korean CDM projects

There are 100 active projects in the CDM pipeline located in South Korea, able to generate over 20Mt of credits per year (Figure 11). As of April 2013, South Korean CDM projects have generated over 100Mt of CERs, though the majority of this volume has already been purchased by buyers in other trading schemes. It is not yet clear how South Korean CERs will be treated under the ETS. It is possible that they will be considered as 'domestic offsets' (see below) and will be eligible for compliance in Phase I and II. Clarification needs to be given on the eligibility of South Korean CERs and how CDM projects in sectors also covered by the ETS will be treated, such as N2O or f-gas destruction projects that make up the majority of the pipeline.

### Domestic offsets

Although South Korean CERs may be considered domestic offsets, the country also has its own offset programme that currently generates 5.6MtCO<sub>2</sub>e/yr from 400 projects across a plethora of industry sectors.

**Figure 12: KVER cumulative annual emission reductions, 2006-12 (MtCO<sub>2</sub>e/yr)**



Source: KEMCO

**The KVER programme could become the platform for a larger domestic offset scheme**

The KVER programme is administered by the Korea Energy Management Corporation and focuses on low-carbon investment by small- and medium-sized enterprises not covered by the Target Management System. Set up in 2005, the programme is essentially a subsidy channel for government support for investment in energy efficiency, renewables and other low-carbon

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technologies. The government has purchased the majority of KVERs generated to date, at a price of KRW 5,000-12,000/tCO<sub>2</sub>e (\$4.30-10.50/tCO<sub>2</sub>e).

The role that the KVER programme may play within the ETS remains unclear, but it could be scaled up to become a major source of offsets, building on the platform already in place for project approval and monitoring of emission reductions.

Domestic crediting is likely to be expanded into forestry and land-use projects. The 'Act on Maintenance and Promotion of Carbon Sinks' was approved in March 2013. This calls for the creation a forest carbon offset registry that could allow South Korean forestry preservation initiatives to qualify as offset projects for the ETS. The eligible project types are yet to be confirmed but the act stipulates that "internationally accepted standards" must be followed in the design of a domestic forestry offset scheme.<sup>11</sup>

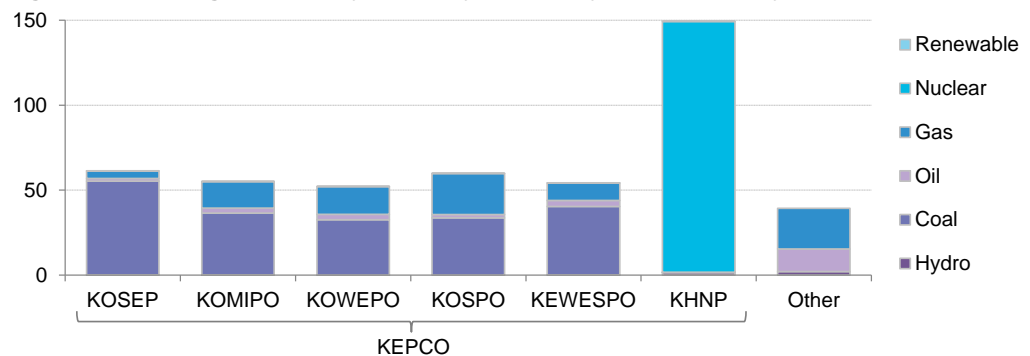
### 4.3. Power generation

Power generation accounts for around half of the emissions from the traded sectors with KEPCO, the state-owned utility, responsible for over 90% of total generation (Figure 13).

#### Role of the power sector

As with cap-and-trade schemes around the world, the power sector is expected to play a central role in South Korea's ETS. Not only is it generally the biggest source of emissions, but it also offers the widest range of abatement opportunities across both the short and long term. In the short term, abatement can be achieved by prioritising the use of lower-carbon fossil fuel generation, such as natural gas within the existing power station fleet, and in the long term a wide range of new-build generation technologies are available such as higher-efficiency fossil fuel generation or renewable plants.

Figure 13: Power generation by company and fuel type, 2010 (TWh/yr)



Source: KEPCO Note: KEPCO is split into six 100% owned subsidiary companies

#### Forecasts for the power sector

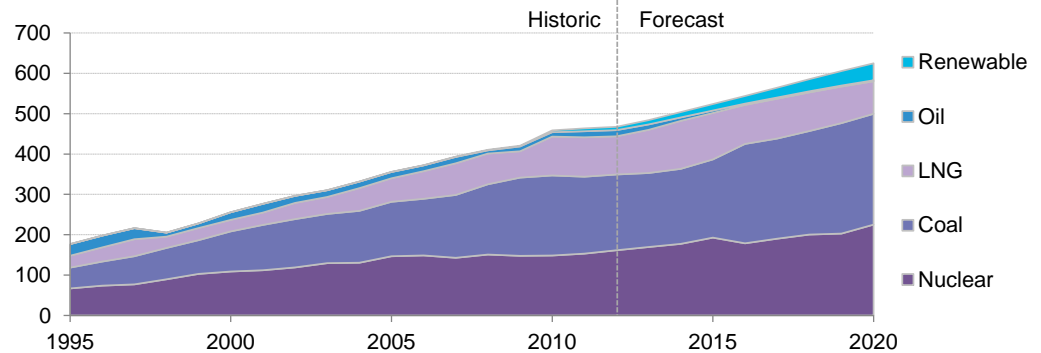
Our emissions forecast takes into consideration the government's current long-term plans for nuclear power and renewable energy capacity expansion, according to the 6<sup>th</sup> Basic Plan for Long-term Electricity Supply and Demand. We estimate that the planned build of low-carbon generation will significantly reduce the average emissions per MWh of generation, which is expected to fall by over 10%, from 0.50tCO<sub>2</sub>e to 0.43tCO<sub>2</sub>e between 2010 and 2020. To yield further long-term emission reductions from the power sector, nuclear and renewable capacity will need to increase in excess of the government's current expansion plans shown in Figure 14.

Average emissions per MWh of power generation is expected to fall by over 10% between 2010 and 2020

11 South Korea National Law Information Center – <http://bit.ly/13sFton> (in Korean)



Figure 14: Power generation by fuel type, 2010-20 BAU (TWh)



Source: Bloomberg New Energy Finance, MKE/MOTIE

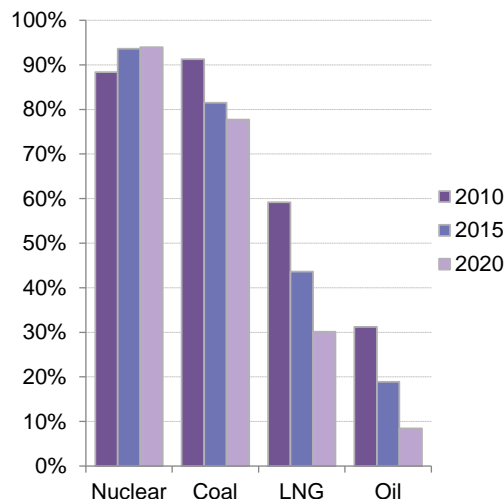
### Fuel-switching capacity

In addition to long-term development of low-carbon generation, power sector emissions can be reduced by replacing coal-fired generation with natural gas in the generation mix. The 6<sup>th</sup> Basic Plan shows the government expects gas generation to decline in favour of increased coal, nuclear and renewables. This is because South Korea relies on liquefied natural gas – an expensive fuel source relative to coal for power generation. According to our estimates, gas generation will run with a low 27% load factor in 2020 as its share within the generation mix falls (see Figure 14).

As a result, there is likely to be spare gas generation capacity available within the South Korean grid for 'fuel switching'. If the utilisation rate of gas-fired capacity were to increase, from a load factor of 27% to 70%, it could be possible to abate around 64MtCO<sub>2</sub>e per year in 2020, assuming that the additional gas generation is substituted for coal. This fuel-switching capacity would deliver approximately 40% of the abatement needed from the traded sectors in that year, once full use of offsets has been taken into account.

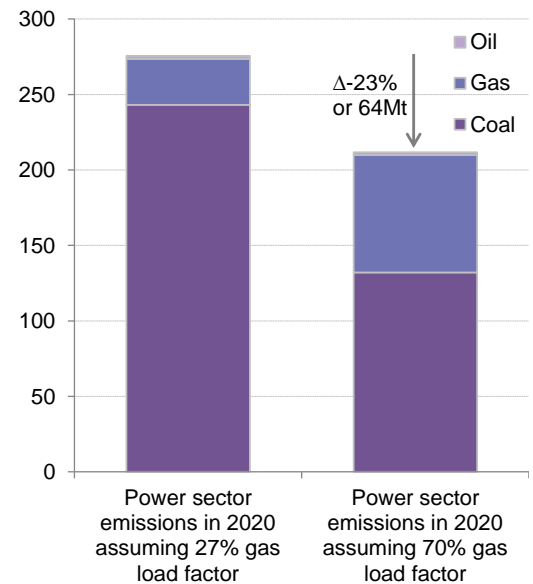
It may be possible to reduce emissions in 2020 by up to 64Mt/yr if coal-fired power is substituted by spare gas generation

Figure 15: Load factor estimated for each generation type



Source: MKE/MOTIE

Figure 16: Projected emissions from power generation in 2020 (MtCO<sub>2</sub>e/yr)



Source: Bloomberg New Energy Finance

Figure 15 shows the government estimates for the changing load factor of each generation type. The drop in load factors for all fossil technologies is a result of capacity expansion plans

outpacing projected demand out to 2020. Figure 16 shows the estimated emission reductions that can be achieved if coal generation is substituted for gas. We estimate that gas generation can be increased to a 70% load factor, leaving approximately 10GW of additional gas capacity available to meet peaking power demand.

### Impact of demand-side efficiency

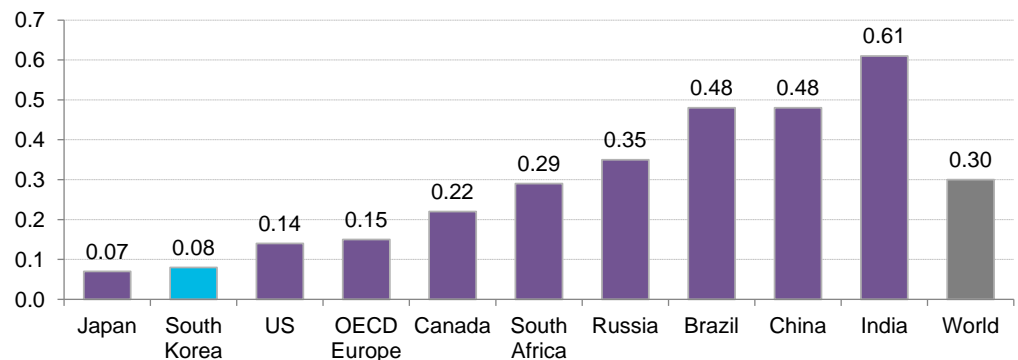
Emissions from power generation could fall further as a result of reduced demand for electricity. South Korea's green growth strategy prioritises energy efficiency with standards set for appliances and lighting and KRW 2.5 trillion (\$2.2bn) for investment in industrial energy efficiency measures between 2010 and 2024.<sup>12</sup> It is unclear to what extent these measures have been included in the government's BAU emissions forecast, and therefore the 2020 target, but over-achievement of energy efficiency measures will lead to additional abatement from our power sector emissions forecast.

## 4.4. Industrial abatement

There is a limited number of abatement opportunities in the energy-intensive industrial and manufacturing sectors, as many production processes can only be marginally optimised to increase their energy efficiency. Major overhaul and replacement of equipment in sectors such as steel making and petrochemicals can yield efficiency gains, but the overall potential is limited by the already high level of energy efficiency across South Korea's industrial sectors compared with its OECD peers.<sup>13</sup> For instance, the emission reduction potential per tonne of steel production in the South Korea is lower than that of Europe or the US, according to the International Energy Agency.<sup>14</sup> Historically high energy prices and exposure to international price shocks, due to a dependency on energy imports, has already encouraged investment in energy-efficient equipment and processes, bringing South Korea's energy intensity per unit of GDP to a level close to that of the US.<sup>15</sup>

South Korea's industry is already relatively efficient, particularly in the iron and steel sector.

**Figure 17: Specific abatement potential from iron and steel production, based on best available technology (tCO<sub>2</sub>e per tonne of steel production)**



Source: International Energy Agency

South Korea's relatively high level of energy efficiency is particularly prominent in the iron and steel sector. The International Energy Agency has identified only 0.08tCO<sub>2</sub>e abatement potential per tonne of steel production for the Asian country, compared with 0.14tCO<sub>2</sub>e in the US and a global average of 0.30tCO<sub>2</sub>e (Figure 17). This implies that there is limited potential remaining and

12 Ministry of Knowledge Economy, 5th Basic Plan for Long-term Electricity Supply and Demand

13 OECD/IEA, Worldwide trends in energy use and efficiency, 2008

14 Ibid p.32

15 OECD Factbook – US 0.19, South Korea 0.20 tonnes of oil eq. per 1,000 US dollars (year 2000 prices) – <http://bit.ly/12ae0ro>

55Mt of abatement may be achieved within the major industry sectors...

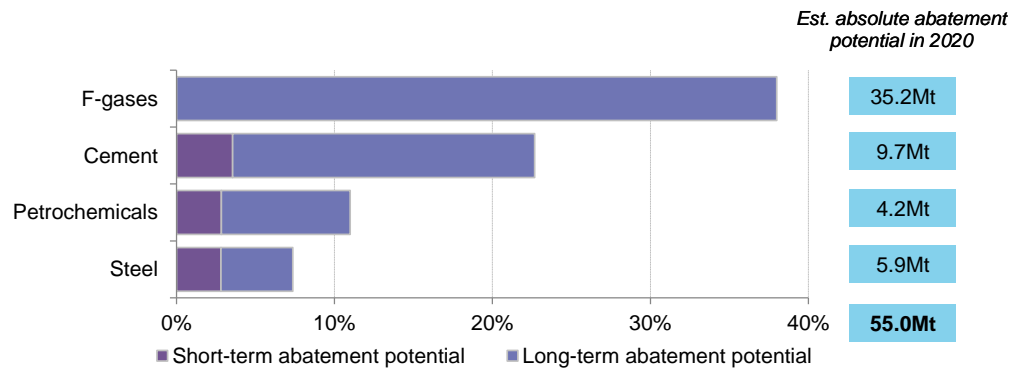
that the cost of abatement in South Korea, particularly in the iron and steel sector, may be high compared with its OECD peers.

Our forecast assumes that emissions of f-gases from semiconductor and display industries grow by an average 8% per year between 2010 and 2020. The recovery or destruction of f-gases represents a sizable abatement opportunity in South Korea's industrial emissions.

We estimate that approximately 55Mt/yr of abatement can be achieved in South Korea's industrial sectors by 2020 (Figure 18). This would deliver some 33% of the annual abatement needed from the traded sectors, after maximum offset usage. The largest single source of abatement is the recovery and destruction of f-gases. Industrial abatement potential has been estimated using 2013 emission reduction targets under the Target Management System for each sector; International Energy Agency data on the long-term efficiency improvement potential in the steel, cement and petrochemical sectors; and estimates for growth and abatement potential for f-gases published by the MoE.

This analysis is based on theoretical assumptions for the level of abatement that can be achieved in the major industrial sectors, but it is likely that this is an overestimate due to many abatement measures being highly capital intensive and difficult to implement.

**Figure 18: Estimated abatement potential in key industrial sectors (percentage of BAU forecast emissions in 2020 and MtCO<sub>2</sub>e)**



Source: Bloomberg New Energy Finance, South Korea Ministry of Environment, IEA

... but industrial abatement is likely to be difficult to implement

### Short-term abatement potential

The emission reduction targets set for each entity covered by the Target Management System indicates the short-term abatement opportunities in the key industrial sectors. Short-term abatement opportunities such as behavioural changes or minor tweaks to industrial processes can be achieved quickly and relatively cheaply. The Target Management System target for 2013 for the steel, cement and petrochemicals sectors is a reduction of 2.5-3.5% below the previous year.

We assume that the System targets are a realistic level of short-term abatement opportunities. If the System targets are applied to our emissions forecast for each industrial sector, the total short-term abatement potential for industrial emissions is around 5MtCO<sub>2</sub>e/yr. Most of this will come from the cement, steel and petrochemicals industries. If we take the 2015 volume of abatement required from the traded sectors, after the use of offsets, this would cover approximately 75%.

### Long-term abatement potential

Significant energy and emissions savings can be achieved in the steel, cement and petrochemicals sectors if the 'best available technology' is adopted. We apply International Energy Agency estimates for long-term abatement potential to our 2020 emissions forecast for the cement, petrochemicals and steel sectors:

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- *F-gases*: the MoE forecasts that emissions of f-gases from semiconductor and display manufacture will increase to over 80Mt in 2020,<sup>16</sup> but that emissions could be reduced by 38% below this BAU projection. Therefore, we estimate that there is some 35Mt/yr of long-term abatement potential from the recovery and destruction of f-gases in the semiconductor and display industries.
- *Cement*: South Korean cement production in 2012 was 47Mt, according to the national cement association, and we forecast production will grow by 5% by 2020. The International Energy Agency estimates that the specific emission reduction potential per tonne of cement produced in South Korea is approximately 0.2tCO<sub>2</sub>e, mainly from fossil fuel savings and clinker substitution, meaning that the total long-term abatement potential in 2020 will be approximately 9.7MtCO<sub>2</sub>e/yr.
- *Petrochemicals*: the International Energy Agency identifies energy efficiency improvement potential of 11% for the South Korean petrochemicals sector. Assuming all of this efficiency improvement potential can be translated into emission reductions, the long-term abatement potential in 2020 will be approximately 4.2Mt, as we forecast emissions from the petrochemicals sector to grow to 38Mt in 2020.
- *Iron and steel*: South Korean steel production in 2011 was 69Mt, according to the national iron and steel association, and we forecast production will grow by over 20% by 2020. According to the International Energy Agency, the specific emission reduction potential per tonne of steel produced in South Korea is approximately 0.08tCO<sub>2</sub>e, mainly from blast furnace improvements. This means that the total long-term abatement potential in 2020 will be some 5.9MtCO<sub>2</sub>e/yr.

### Comparison with government abatement estimates

The MoE published its 'Low Carbon Roadmap' in July 2012, outlining the government's estimates for the level of abatement that can be achieved across each industry sector in order to reach the 2020 target.<sup>17</sup>

The MoE identifies 68Mt/yr of abatement potential across all industry sectors in 2020, which is 13Mt above our estimate of 55Mt/yr. Our analysis covers iron and steel, cement, petrochemicals and f-gases, as these four sources account for the majority of abatement potential across the ETS covered sectors. It is unclear how the government has made its assumptions for abatement potential in other sectors, such as automobile manufacture. But it is possible that demand-side efficiency measures and equipment upgrades in these sectors may yield emission reductions in line with the MoE's estimates.

Abatement potential provides a theoretical estimate for the level of emission reductions that can technically be achieved, though real emission reductions will be driven by the cost of abatement in each sector – the subject of the next section.

<sup>16</sup> Korea's Third National Communication under the UNFCCC, published March 2012

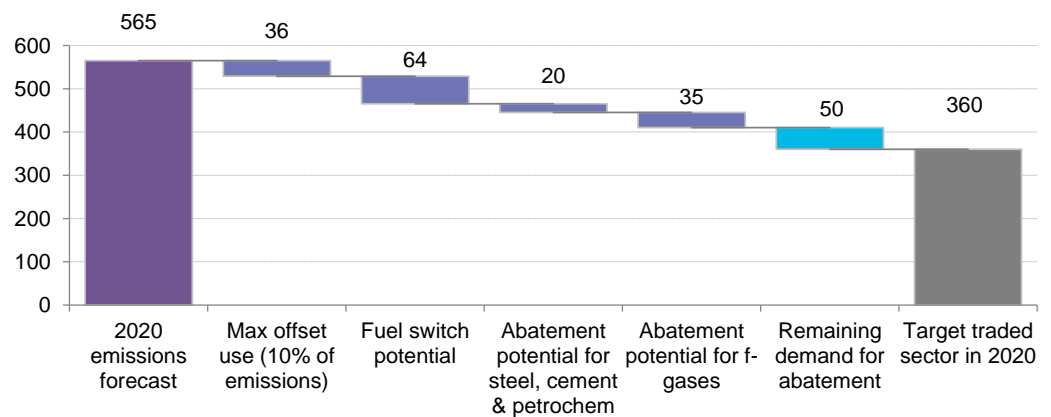
<sup>17</sup> <http://bit.ly/13WdmBU> (in Korean)

## SECTION 5. PRICE OUTLOOK AND IMPLICATIONS

The South Korea ETS will create demand for 205Mt of abatement per year in 2020, according to our analysis. The current legislation proposes to restrict the use of offsets to 10% of total emissions – 36Mt/yr in 2020. Fuel-switching potential in the power sector and estimated industrial sector abatement potential (Section 4.4) can deliver some 120Mt/yr, meaning that a further 50Mt/yr of abatement is needed in the traded sectors to achieve the 2020 target of 360Mt. The remaining demand for abatement will be higher if the supply of eligible offsets is insufficient to meet demand.

After exploiting available abatement options, an additional 50Mt/yr will be needed to achieve the 2020 target of 360Mt

Figure 19: Estimated demand for abatement in the South Korea ETS, 2020 (MtCO<sub>2e</sub>)



Source: Bloomberg New Energy Finance

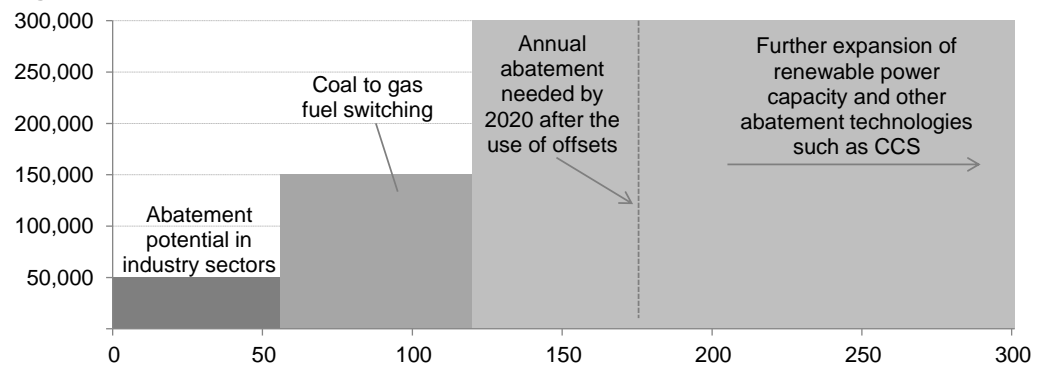
### 5.1. Price outlook

Our analysis indicates that the target of 30% below BAU in 2020 is ambitious and would create a significant demand for abatement in the ETS covered sectors. Without changes to the scheme design, the cost of compliance is likely to be high compared with other cap-and-trade programmes around the world.

The exact cost of abatement in South Korea's traded sectors is unclear, but we project that available fuel-switching and industrial abatement measures are insufficient to reach the level required by the 2020 target. Figure 20 illustrates the costs of the various abatement measures under the ETS. The costs that are shown are indicative only.

The target of 30% below BAU in 2020 is ambitious, and without price containment measures the cost of compliance within the ETS is likely to be high

Figure 20: Illustration of abatement costs for South Korea (KRW/tCO<sub>2e</sub>)



Source: Bloomberg New Energy Finance

The cost of fuel switching from coal to gas is estimated to be on average KRW 150,000/tCO<sub>2e</sub> (\$130/tCO<sub>2e</sub>) assuming a coal price of KRW 100,000/t (\$90/t) and a natural gas price of KRW 18,000/MMBTU (\$16/MMBTU). If coal or LNG prices change, this will directly affect the cost of fuel switching. According to Bloomberg New Energy Finance analysis, the average cost of achieving abatement from further expansion of renewable energy generation is KRW 230,000-680,000/tCO<sub>2e</sub> (\$200-600/t). The estimated cost of implementing CCS for power generation is KRW 300,000-440,000/tCO<sub>2e</sub> (\$250-385/t).<sup>18</sup>

As the level of the target creates demand for abatement that is greater than our estimates for abatement potential from industry sectors and fuel switching, our analysis implies that the price of carbon in the ETS would rise towards the long-run cost of new natural gas and renewable capacity, or the implementation of CCS technology.

Such ambitious levels of abatement will come at a high price, so further decisions on the design of the South Korea ETS will therefore be crucial.

## 5.2. Implications for market design

Policy-makers are yet to finalise the design of the ETS. Decisions still need to be taken over the cap, offset use and direct price containment measures, all of which will affect the level of abatement demand and prevailing price within the scheme. The crucial design components that will either directly or indirectly impact the carbon price are summarised below:

- *Cap/target*: the ETS cap has not yet been set, and – contrary to the assumptions made in this White Paper – the government may decide to place a greater burden of emission reductions onto the non-traded sectors such as transport fuels. The overall target also remains unclear as the government may revise its 2020 BAU projection later this year, although a revision that relaxes the overall target has been reportedly ruled out by the deputy environment minister, according to press reports. An increase in the BAU level would decrease the overall ambition and therefore the level of abatement needed to reach the 2020 target.
- *Flexible auctions*: prices can be influenced by increasing or decreasing the volume of allowances made available by the market regulator through auctions. However, this only changes the timing of supply – not the overall abatement required.
- *Price floor/ceiling*: the market price can be capped or supported within a prescribed price range. The impact of enforcing a price floor or ceiling is effectively to adjust the cap over time. The penalty charge proposed in the ETS decree (three times the average market price during the compliance year up to a maximum of KRW 100,000/tCO<sub>2e</sub> (approx. \$90/t)) will act as a price ceiling if participants subject to the penalty are not also required to submit allowances to cover their emissions.
- *Reserve allowance holding requirement*: participants can be required to hold a minimum or maximum number of allowances, and the limit can be adjusted to affect the supply and demand for allowances in the market.
- *Restrictions on banking and borrowing*: restrictions on banking and borrowing of allowances between phases can be used to limit the impact of price movements.
- *Offset use*: one option available to policy-makers is to increase the offset import limit and relax the proposed eligibility restrictions, effectively reducing the compliance costs for covered entities that will be able to use a greater number of cheap offsets to cover their emissions.
- *Linkages*: the price of allowances within an ETS is determined by the coverage and cost of abatement within a scheme. By linking markets together, the prevailing price of allowances

<sup>18</sup> Full details of LCOE estimates for renewables and CCS can be accessed by Bloomberg New Energy Finance Insight subscribers at [www.bnef.com/renewables/](http://www.bnef.com/renewables/) and [www.bnef.com/ccs](http://www.bnef.com/ccs).

The ETS design is not yet finalised and decisions over the cap, offset use and price containment will be crucial

will change, depending on the abatement opportunities that can be achieved under the cap. Linkages can also increase liquidity, improving the efficiency of the market.

Table 3 summarises which of the measures explained above have been employed by other emissions trading schemes around the world.

**Table 3: Price influencing measures adopted by other trading schemes around the world**

Measure	EU ETS	Australian CPM	New Zealand ETS	California cap-and-trade
<b>Flexible auctions</b>	Under consideration	✓ (timing but not volume)	✗	✓
<b>Price floor/ceiling</b>	✗	✓ (fixed-price phase and price ceiling)	✓ (fixed-price option acts as ceiling)	✓
<b>Reserve allowance holding requirement</b>	✗	✗	✗	✗
<b>Restrictions on banking and borrowing</b>	✓	✓	✓	✓
<b>Offset use</b>	✓	✓	✓	✓ (excludes UN offsets)
<b>Linkages</b>	✓ (CPM-EU one-way linkage from 2015)	✓ (CPM-EU one-way linkage from 2015)	✗	✓ (with Quebec from 2014)

Source: Bloomberg New Energy Finance

## SECTION 6. COMMENT

Bloomberg New Energy Finance has been researching carbon markets around the world for over 10 years, and has witnessed the relative successes and failures made by policy-makers in designing these markets. As South Korea embarks on the final phase of its ETS design process, we provide our comments on the various design options under consideration.

### 6.1. For policy-makers

#### Target

The target is ambitious and may need to be revised

The target currently proposed by the government – a 30% reduction below BAU emissions of 776Mt in 2020<sup>19</sup> – is ambitious, and will likely lead to a high carbon price in the ETS. If the target is retained, it may place a high cost burden on South Korea relative to other countries. The government may choose to alter the target, to make it conditional on actions taken by other countries under the UNFCCC or change the structure of the ETS to place a greater burden of emission cuts onto the non-traded sectors.

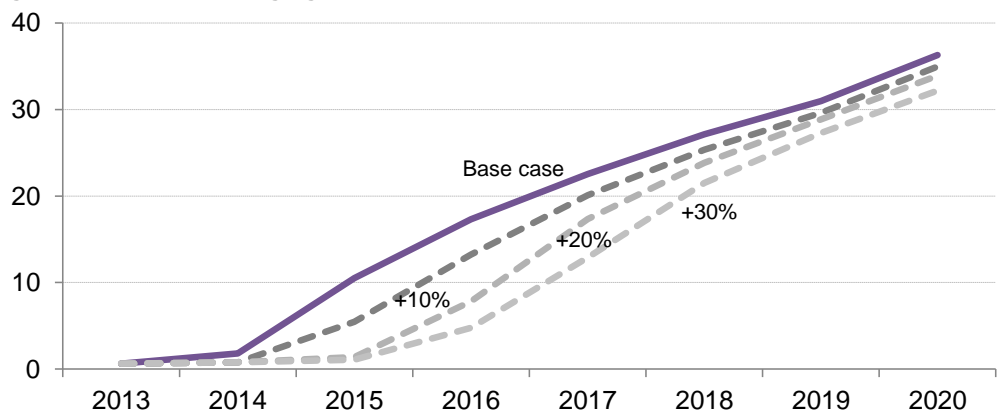
In addition, the cap must consider the impact of overlapping regulations that may affect the future growth in emissions. It is unclear if the BAU forecast assumes the impact of policies, such as energy efficiency or renewable energy capacity expansion, that are being pursued by the government in addition to the ETS. This has been a problem in Europe where energy efficiency and renewable energy regulations are likely to reduce emissions and therefore affect the carbon price under the EU ETS.

#### Offsets

Relaxation of the restrictions on the use of offsets will reduce the cost of compliance

Offsets are a convenient way to reduce the cost of compliance in the scheme without relaxing the target. Thus, easing the restrictions on the use of both domestic and international offsets will reduce the price of allowances. This should be strongly considered given the outlook for abatement demand and the supply of domestic offsets to 2020. However, altering the limit on offset use could have an uneven impact on the market price over time. For example, Figure 21 shows the impact that altering the offset import limit for the carbon prices in the EU ETS.

Figure 21: Effect of changing the EU ETS offset limit on forecast EUA prices (€/t)



Source: Bloomberg New Energy Finance. Note: Percentage increase in offset limit is expressed as an increase from the base case estimate of 1.64Gt over 2008-20.

19 Ministry of Environment – Third national communication to the UNFCCC pg92– <http://bit.ly/Z1MIP8>



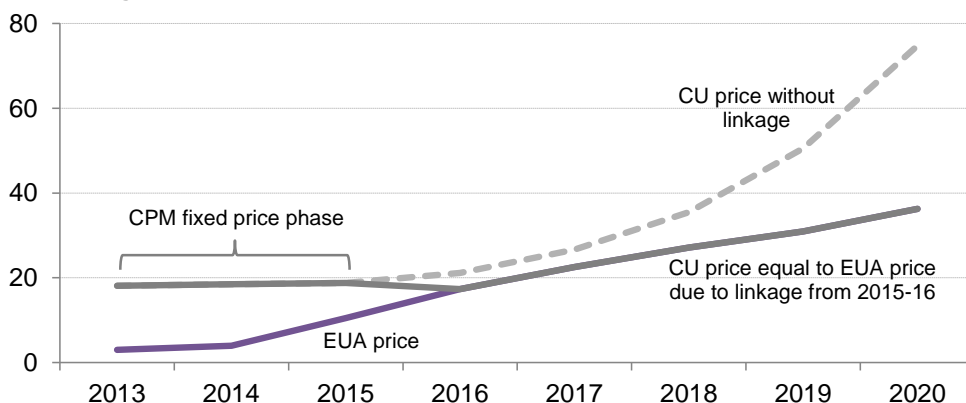
Linkages with other emissions trading markets should be considered

### Linkage with other markets

If the South Korea ETS were to link with a market with a large amount of low-cost abatement – potentially the regional pilots or a future national scheme in China – it is likely to reduce the cost of compliance for participants in the South Korea ETS in the short to medium term.

An example of the impact of a market linkage on price is the Australian CPM-EU ETS linkage that will enable entities covered by the CPM to use EU ETS allowances for compliance from the start of the CPM trading phase in 2015-2016 (Figure 22). The linkage changes the outlook for the Australian allowance price, due to the influence of the price of carbon in the EU. In this case, the result is a decrease in the forecast CU price, which is expected to be equal to the EUA price out to 2020, as the cost of abatement in the EU ETS is expected to be lower relative to the cost of abatement under the CPM.

**Figure 22: EUA price forecast and Australian carbon unit (CU) price forecast with and without linkage between CPM and EU ETS from 2015-16 (€/t)**



Source: Bloomberg New Energy Finance

Coverage of all non-CO2 GHGs and indirect emissions will complicate the scheme

### Coverage

We recommend that the ETS cover only emissions that can be directly and accurately monitored. The decree currently proposes that all six Kyoto greenhouse gases are covered – CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, HFCs, PFCs, SF<sub>6</sub>. The EU ETS covers only CO<sub>2</sub>, N<sub>2</sub>O and PFCs from aluminium production. The Australian CPM also covers methane emissions (excluding agriculture).

We also recommend that the scheme covers only direct emissions. It is unclear from the Enforcement Decree if ETS participants must submit allowances to cover both direct and indirect emissions.<sup>20</sup> Companies currently covered by the Target Management System must report both their direct and indirect emissions. Although including indirect emissions in the ETS could provide an incentive for covered sectors to improve their energy efficiency for power as well as primary energy use, it could lead to a misallocation of allowances, while also complicating the reporting and compliance process.

### Allocation

Based on the experience of other trading schemes, Bloomberg New Energy Finance recommends that South Korea should move towards a high share of auctioning as soon as possible. Firstly, auctioning ensures that the ETS itself does not turn into a subsidy to companies by removing the opportunity to earn 'windfall profits'; and secondly, price discovery within the ETS

20 Indirect (or 'scope 2') emissions refer to emissions resulting from power or heat purchased from a utility.

is likely to be more efficient if participants need to purchase a greater volume of their allowances instead of receiving them for free.

Participation of third parties should not be restricted

### Third-party participation and trading

The decree suggests that restrictions will be placed on third-party participation in the ETS. This may be counterproductive for the following reasons:

- Participants in the carbon market with a compliance obligation need to be able to easily trade with each other. Third-party actors are required to develop the trading channels to create an efficient market as this is often a function of the quantity and quality of sales channels available.
- Even if a market has a large number of channels and products available, it needs liquidity to function smoothly. Markets will gain liquidity by opening up to companies that do not have a compliance obligation themselves but either provide financial services to existing participants or speculate on future price movements.

South Korea's regulated power sector will impede the efficiency and effectiveness of the ETS

### Liberalisation of the power sector

In order for a carbon price to effectively achieve emission reductions within the power sector, utilities need to be able to pass through the cost of carbon to consumers. If the retail price for power is controlled, as it is in South Korea, generators will need to receive an additional subsidy from the government in order to cover their increased costs. The country's power markets need to be liberalised to allow power prices to rise in line with operating costs, otherwise placing a price on carbon may effectively increase KEPCO's losses.<sup>21</sup>

### Compliance and reporting

Information regarding the level of emissions within the ETS is important for the efficiency of the market and the earlier such information arrives, the better. Consequently we argue that the timelines for reporting and compliance are brought forward from the currently proposed three and six months by as much as possible. For instance, entities under the EU ETS must complete their compliance submissions within four months of the end of each compliance year.

## 6.2. For companies

### Readiness

Companies need to be prepared to participate in the scheme, and will need to reshuffle their resources to meet the additional administrative burden of ETS compliance.

### Opportunity and risks

Some companies may benefit financially from the ETS, either through compensation mechanisms or from trading activity in the market. At the same time, the scheme will create financial risks for many companies by increasing their costs as a result of the exposure to the carbon price.

Therefore, it is necessary for companies to fully understand the impact of the programme on their business and establish the strategies that can maximise any opportunities and minimise risk. A solid understanding of the programme's demand and supply fundamentals, possible price scenarios and how this may impact the company's business is essential.

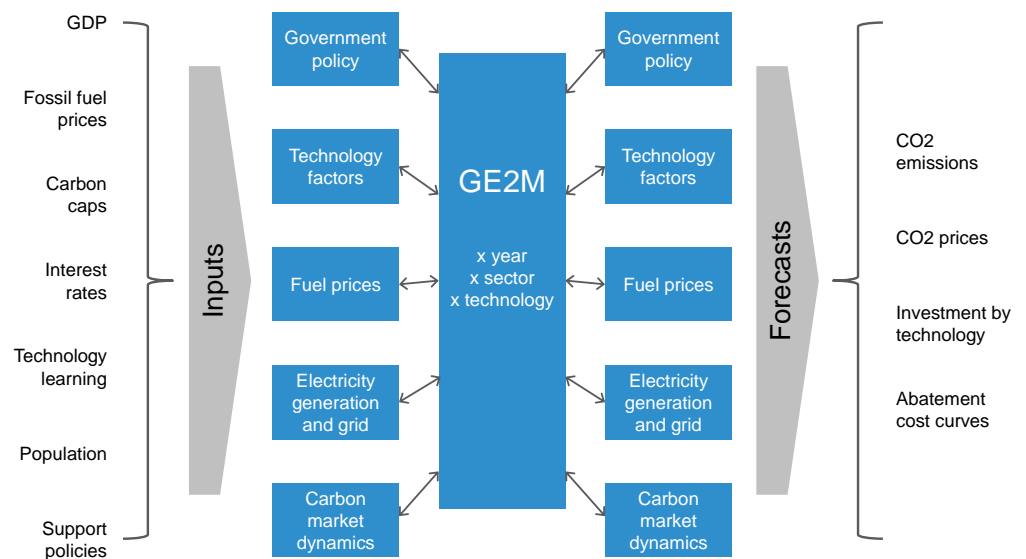
21 KEPCO has posted four straight annual losses since 2008 as the government has capped increases in power prices to limit the impact on inflation – <http://bloom.bg/13hVsWq>

# APPENDICES

## Appendix A: Bloomberg New Energy Finance carbon modelling

The Bloomberg New Energy Finance Global Energy and Emissions Model (GE2M) is a partial equilibrium investment model based on energy and carbon market fundamentals. GE2M has been under development since 2005 and has consistently been updated and validated through the modelling of the world's operational carbon markets. GE2M produces scenario forecasts for various regions, zones and sectors that are covered by a specific market, over a desired period in time out to 2050. This is done by modelling the power sector, industrials and other sectors, and of course carbon markets – and by linking relevant schemes. There is a strong emphasis on transparency, so all inputs are visible and the assumptions that are used can be changed.

**Figure 23: Schematic of GE<sup>2</sup>M inputs and outputs**



Source: Bloomberg New Energy Finance

GE<sup>2</sup>M is able to produce outputs in the form of:

- Carbon prices
- Forecast emissions
- Banking and borrowing of credits between years
- Caps
- Imported and exported credits
- Marginal abatement cost curves (MACCs).

GE2M was built with the capacity to model a number of different types of carbon schemes, both linked and unlinked. Links can be modelled between offset markets and cap-and-trade markets (such as the EU ETS-CDM linkage) as well as directly between domestic cap-and-trade markets (such as the EU ETS-AU CPM linkage).

## Appendix B: Bloomberg New Energy Finance Research for Korea's emissions trading market

Building on the initial analysis set out in this White Paper Bloomberg New Energy Finance will conduct continuous further research into the Korean emissions trading market.

### Regular Research

This will constitute a series of regular reports for our clients specifically looking at the Korean market including:

- **Deep Dives;** these will highlight policy developments, update supply and demand fundamentals, and provide revised projections for the market
- **Research Notes;** these will look at specific topics in the market such as the available abatement potential in the power sector or in industry
- **Analyst Reactions;** these will be quick analyses that get to the detail of policy decisions and calculate what these decisions really mean for the market fundamentals

These reports sit alongside the regular analysis Bloomberg New Energy Finance produces for other carbon markets around the globe including China (pilot and possible national programme), the EU ETS, CDM/JI, Australia's Carbon Pricing Mechanism (CPM) and North America, including California and Quebec.

### Consulting

In addition to our regular reports we also undertake numerous consulting assignments. For Korea these can consist of:

1. Production of a flexible fundamentals-based trading model
2. Produce a detailed Marginal Abatement Cost (MAC) curve for Korea's covered sectors as well as the potential supply of offset credits, domestically and internationally
3. Create a set of realistic scenarios for Korea's carbon price development
4. Strategic advice on how different companies are currently dealing with carbon pricing around the world and how this can be implemented in Korea

These studies will build on analyses that Bloomberg New Energy Finance has conducted for government and major companies in other carbon markets such as the EU, Australia and the US.

## **Appendix C: Glossary of government departments and agencies**

Several government departments are involved in the design and governance of the ETS. The governance structure is proposed in the enforcement decree, which outlines the responsibilities of each body. The TMS has again been used as a template, with government departments maintaining oversight of sectors within their purview, and the Ministry of Environment taking overall responsibility for the implementation and regulation of the ETS.

### **ETS taskforce**

The taskforce is an interdepartmental agency set up to lead work on the design and implementation of the ETS. Operating under the MoE, the taskforce is coordinating the detailed legislative design process for the ETS including monitoring and reporting procedures, setting the cap and allocation framework, and establishing a trading platform and laws regarding the operation of the market.

### **Greenhouse Gas Inventory and Research Center of Korea**

The GIR is a central information hub for greenhouse-gas analysis and data evaluation in South Korea. It manages the emissions registry set up under the Target Management System, which will play a key role in the operation of the ETS.

### **Korea Environment Corporation**

Korea Environment Corporation is a quasi-governmental agency operating under the Ministry of Environment. It is responsible for the planned ETS simulation and will provide information and education services to scheme participants.

### **Ministry of Environment**

The MoE is the principal government department responsible for the Target Management System and ETS programmes. Although other departments are involved in the policy-making process and have responsibility for sectors within their purview, the MoE is responsible for overseeing the implementation and operation of the ETS as a whole.

### **Ministry of Strategy and Finance**

The Ministry of Strategy and Finance is involved in overarching decisions regarding the target, cap, level of free allocation and penalties as it will seek to ensure that the ETS plans are economically viable. However, the ministry is expected to take a background role behind the MoE, only acting to approve decisions taken by the environment ministry.

### **Ministry of Trade, Industry and Energy**

Ministry of Trade, Industry and Energy (formally the Ministry of Knowledge Economy) is the responsible for power sector and industrial planning in Korea. MOTIE will play an important role in facilitating consultations with industry regarding the design of the ETS. It will also play a part in devising the allocation plan for the power and industry sectors, as it is currently responsible for setting targets for power and industry under the TMS.

### **Presidential Committee on Green Growth – abolished as of March 2013**

The committee was set up in late 2008 to promote and coordinate the low carbon, green growth agenda put forward in the Framework Act on Low Carbon, Green Growth, including the establishment of greenhouse gas monitoring and reporting systems and design of an emission trading scheme.

## ABOUT US

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