Accelerating Corporate Renewable Electricity Procurement in Korea

Prepared By Solutions for Our Climate (SFOC)

28th June , 2022

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1. Background

In December 2021, South Korea updated its Nationally Determined Contribution (NDC), setting a target to reduce Green House Gas (GHG) emissions by 40% below 2018 levels by 2030 and to align with its long-term climate goal of carbon neutrality by 2050.[1] Korea's enhanced NDC also includes a target to achieve 30% new & renewable electricity (RE) in the power mix by 2030.[2] However, this target falls short of the required share of RE in the power mix to achieve carbon neutrality by 2050, which is at least 50% by 2030.[3] Furthermore, newly elected President Yoon included a reduced target of 20-25% RE in the power mix by 2030 in his election pledge.[4]

Globally, RE costs are falling rapidly[5] and RE continues to attract most of the investment in the energy sector[6] - **see figure 1**.

[1] UNFCCC, "The Republic of Korea's Enhanced Update of Its First Nationally Determined Contribution," UNFCCC, December 23, 2021, https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Republic%20of%20Korea%20First/201230_ROK's%20Update%20of%20its%20First%20NDC_editorial%20change.pdf.
[2] Ministry of Trade, Industry and Energy, "Notice No. 2020-741", December 28th, 2021.
[3] NEXT group et al., 2050 Climate Neutrality Roadmap for Korea: K-Map Scenario, February 9th, 2022
[4] E2News, "Yoon Administration's Climate-Energy Policy Direction," E2News, May 2, 2022, https://www.e2news.com/news/articleView.html?idxno=241725.
[5] International Renewable Energy Agency, "Renewable Power Generation Costs in 2020." IRENA International Renewable Energy Agency, 2021. https://www.irena.org/publications/2021/Jun/Renewable-Power-Costs-in-2020.
[6] IEA, "World Energy Investment 2021 - .NET Framework," International Energy Agency, 2021 https://iea.blob.core.windows.net/assets/5e6b3821-bb8f-4df4-a88b-e891cd8251e3/WorldEnergyInvestment2021.pdf.

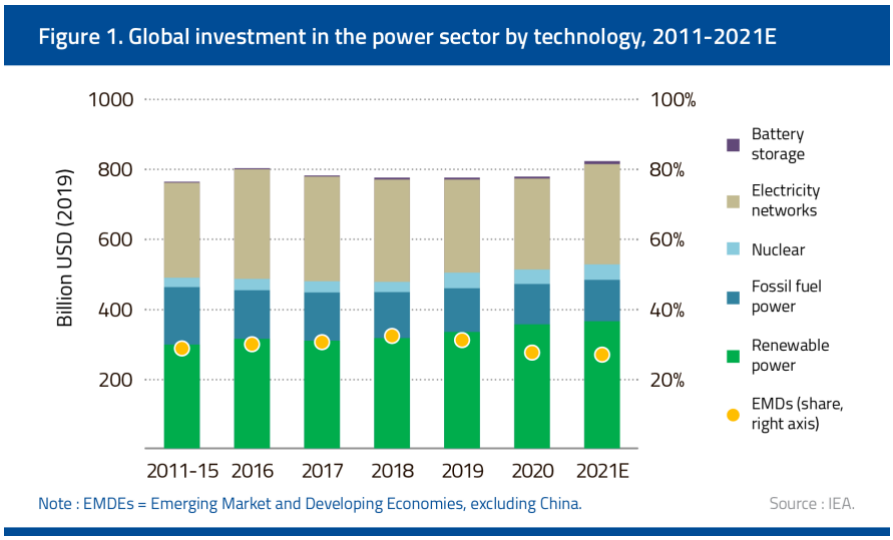

Figure 1. Global investment in the power sector by technology, 2011-2021E

Source: IEA[7]

Specifically, this trend has been accelerated by an exponential growth in corporate power purchase agreements (PPAs) which is the preferred option for corporations with high electricity demand and ambitious, global climate commitments to source 100% renewable energy[8] – **see figure 2**. PPA agreements signed with new RE generation units are also seen as one of the quickest ways to scale renewable electricity.[9]

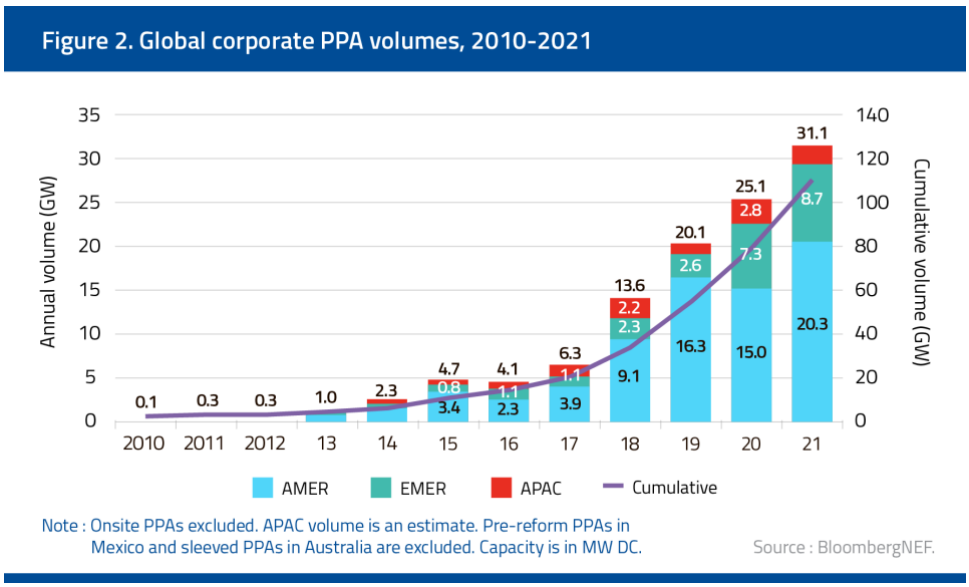

Figure 2. Global corporate PPA volumes, 2010-2021

Source: BloombergNEF[10]

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[7] Ibid.

[8] RE100, "RE100 Members," RE100 Members, n.d., https://www.there100.org/re100-members.

[9] BNEF, 1H 2021 Corporate Energy Market Outlook. 2021. https://about.bnef.com/blog/corporate-clean-energy-buying-grew-18-in-2020-despite-mountain-of-adversity/

[10] Veronika Henze, "Corporate Clean Energy Buying TOPS 30GW Mark in Record Year," BloombergNEF, January 30, 2022, https://about.bnef.com/blog/corporate-clean-energy-buying-tops-30gw-mark-in-record-year/.

However, South Korea has not kept pace with these global trends with its share of solar and wind remaining low at only 4.7%[11] of the total power mix in 2021 while 67% is still generated from fossil fuels such as coal and LNG.[12] There are numerous reasons for the low penetration of renewable electricity in Korea. The supply of RE has been limited due to various factors such as complex permitting procedures and arbitrary municipal siting regulations and an outdated and inflexible power market system, which resulted in the high RE cost.[13]

As a growing number of global companies set ambitious climate goals and targets to achieve 100% RE, Korean companies competing or collaborating with them also face an increasing need to source renewable energy as well as the threat of losing out on export business.[14] In 2021, under increasing pressure from RE100 companies – there are around 53 based in Korea or with operations in Korea[15] - the government introduced the K-RE100 scheme, which provides six procurement options that companies can use to receive a 'Confirmation of Renewable Energy Use' certificate that counts towards achieving RE100.[16] However, there are still only around 19 Korean companies that have joined the RE100 initiative[17] and, currently, a very low proportion of electricity is being sourced via the K-RE100 scheme as Korea remains a challenging RE market due to continuing market and regulatory barriers.[18]

In May 2022, the Yoon administration's energy policy direction was launched, with the aim of normalizing energy policy. It included a plan to change the current power market structure to 'gradually improve KEPCO's monopoly status by expanding the scope of Power Purchase Agreements (PPA)' and 'introduce more market-based competition based on market principles'.[19] This plan could have positive implications for corporate renewable energy procurement as under the current situation, companies' renewable energy needs are not being met due to a flawed power market system. However, the recent and rapid fossil fuel price hike caused by the Russia-Ukraine war has increased uncertainty as to how Yoon's energy policy direction will eventually be reflected in policy.

2. Purpose Of Document

This briefing analyzes the **current status of corporate RE procurement via the K-RE100 scheme and related issues** for corporations sourcing RE via one or more of the six available options. It also **summarizes the common barriers** that are preventing both global and domestic corporations from sourcing RE in Korea and concludes by highlighting **the way forward for corporate RE procurement** in the Korean market leading to rapid RE expansion.

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[11] Uni Lee, "South Korea's Lack of Wind and Solar May Hinder Exporters," Ember, May 10, 2022, https://ember-climate.org/insights/research/south-koreas-lack-of-wind-and-solar-hinders-exporters/.

[12] KEPCO, The 90th Statistics of Korea Electric Power 2021, May 2021.

[13] Solutions for Our Climate (B), "Nowhere to Go: How South Korea's Siting Regulations Are Strangling Solar." Solutions for Our Climate, 2020. http://www.forourclimate.org/sub/data/view.html?idx=29&curpage=1&search_txt=%EC%9D%B4%EA%B2%A9%EA%B1%B0%EB%A6%AC&search_field=subject.

[14] NEXT, "Climate Risk Faced by Korea's industry: Profit and Loss Analysis", January, 2022.

[15] RE100, "RE100 Annual Disclosure Report." RE100, January 2022.

[16] Jeonghwan Bae, et al., "Impacts of the RE100 initiative on Major Korean Export Industries.", 2021

[17] RE100, "RE100 Annual Disclosure Report", 2022

[18] Ibid.

[19] 20th Presidential Transition Committee, Basic Plan for Normalizing Energy Policy, April 2022.

3. The K-RE100 Scheme: current status & related issues

The K-RE100 scheme[20] was introduced in early 2021 to meet the increasing corporate demand for renewable electricity. It entails six different procurement options including Green Premium, Renewable Energy Certificates (RECs)[21], equity investment, self-generation, and trilateral PPAs.[22] Direct PPAs also became part of the scheme in June of the same year.[23] Industrial or public & service electricity consumers who procure their electricity via one or more of the K-RE100 options can receive a 'Confirmation of Renewable Energy Use', a certificate issued by the Korean Energy Agency (KEA).

One of the main characteristics of the K-RE100 scheme is that it is linked to GHG emission reduction[24] with Confirmation of Renewable Energy Use certificates that are based on solar PV, wind and hydro energy sources recognized as an emission reduction under the Korean Emission Trading System (K-ETS).[25] In the case of larger companies obliged to reduce their GHG emissions under the K-ETS, participating in the K-RE100 can be appealing as it allows participants to diversify GHG emission reduction methods and potentially achieve cost reduction.[26] However, the uptake of the K-RE100 scheme by corporations remains low, which indicates that the scheme is failing to accelerate corporate RE procurement in Korea at the required speed and scale to meet its climate goals – **see table 1**.

Table 1. Status of the K-RE100 scheme

Option	Number of Corporates	Consumption (MWh)	Cost per kWh
Green premium	59	1,440,393 (99%)	Electricity Price + Green Premium Bid Price (Avg. 10.9 KRW/kWh)
REC	20	10,114 (0.7%)	Electricity Price + REC Price (Avg. 47 KRW/kWh)
Trilateral PPAs	0	-	~180-190 KRW/kWh
Direct PPAs	1	-	~180-190 KRW/kWh
Self-generation	10	4,325 (0.3%)	Similar to LCOE (Solar ~146 KRW/kWh, Wind ~170 KRW/kWh)
Sum	84 (Excluding 6 firms who used multiple options)	1,454,832 (100%)	

Source : Own analysis based on Korea Energy Agency, April 2022

[20] KEA, "Introduction to K-RE100." KEA Renewable Energy Centre, n.d.. https://www.knrec.or.kr/biz/introduce/new_policy/intro_kre100.do?gubun=A.

[21] RECs issued by the Korea Energy Agency (KEA) certify that power generators produced and supplied power using new and renewable facilities in a spot market or contract market.

[22] Trilateral PPAs are 'trilateral' because Korea's national utility, Korea Electric Power Corporation (KEPCO) acts as a mediator between the PPA parties.

[23] Ministry of Trade, Industry and Energy, Notice No. 2021-108, June 21st, 2021.

[24] KEA, KEA Renewable Energy Center FAQ, https://www.knrec.or.kr/biz/faq/faq_list02.do?depth_1=A040000&depth_2=A040100.

[25] Launched in 2015, K-ETS currently covers 684 of Korea's largest emitters.

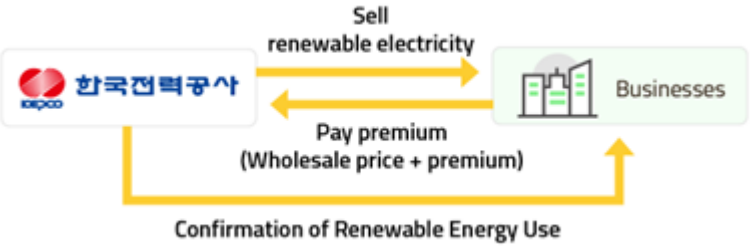
[26] According to the Network for Greening the Financial System, the price of carbon emissions per tonne under the carbon neutrality scenario of Korea by 2050 will reach 87USD (110,000KRW) by 2025 and 140USD (170,000KRW) by 2030 (NEXT group et al., February 9th, 2022).

Table 1. Status of the K-RE100 scheme

Source: Own analysis based on Korea Energy Agency, April 2022
Note: For Trilateral PPA, the first case was announced by Hyundai Elevator in April 2022, but it has not yet been reflected in the Korean Energy Agency System.

As of April 2022, a total of 84 corporations had chosen K-RE100 options, but their combined consumption via the scheme amounts to only around 1.5TWh or 0.3% of total commercial electricity consumption in Korea or 278TWh. Since total commercial electricity consumption in Korea accounts for up to 55%[27] of total national electricity consumption, the impact of the K-RE100 scheme has so far been minimal.[28] In addition, for those companies that have joined the global RE100 initiative, only 2-3% of their total electricity consumption has been procured via the K-RE100 scheme on average.[29] In terms of the most popular options, most companies have chosen Green Premium whilst one direct and one trilateral PPA have been signed to date with each representing a very low volume of renewable electricity generation at 5MW[30] and 3MW[31] respectively. RE procurement through equity investment[32] and self-generation also remains very low. **Table 2** below provides a detailed analysis of each of the K-RE100 options including their current status and related issues.

Table 2. K-RE100 Options, Current Status & Related Issues

Methods	Description	Related issues
Green Premium	 **Figure 3. Green Premium Mechanism under K-RE100 Scheme**	
	[Summary] - Electricity consumers voluntarily pay an additional premium on top of their electricity bill for the Green Premium option and then receive a 'Confirmation of Renewable Energy Use' i.e., Green Premium = normal electricity bill + premium fee which is paid each month or every quarter. - The price and the amount of Green Premium are decided by an auction held by KEPCO. The auction will	**<Additionality>** - Currently, the Green Premium option is the most widely used method as it is the cheapest and easiest to procure. However, Green Premium has low additionality as there is no direct link between the premium funds and investment in RE capacity as the financial resources derived from the scheme are not wholly being used to expand RE. The power mix of the company procuring via this option also does not change. This situation can lead to accusations of greenwashing and therefore heightened business risk for

27 KEPCO, "Korean Electricity Power's 90th Statistics," May, 2021.
28 Ibid.
29 Young-un Kim, 'K-RE100, Carbon Neutral in Name Only" Segye Daily. Segye Daily, October 3, 2021. https://m.segye.com/view/2211003503585.
30 Saeyoung Lee, "SK E&S, Aggressively Investing in Green Portfolio, Including Hydro·Renewable Energy," Goodkyung, May 26, 2022 http://www.goodkyung.com/news/articleView.html?idxno=177543.
31 Boram Youn, "'KEPCO and Hyundai Elevator Signs the First Renewable Energy Trilateral PPA'," Yonhap News, April 10, 2022, https://www.yna.co.kr/view/AKR20220411027900003.
32 Equity investment requires investment in renewable energy generation projects and signing a separate PPA or REC purchase contract with the relevant power plant. Since there is already low PPA or REC uptake based on Table 1, it is possible to see that the amount of money invested in self-generation is also low even though the performance data for equity investments are not disclosed.

	be held once a year, and if there is residual supply, one additional auction will be held. The contract based on the auction will last until the last day of the year it was signed. - The premium is paid to Korea Electric Power Corporation (KEPCO) which in turn invests the fund towards the expansion of renewable energy capacity and technologies. **[Current Status]** - During the auction held in the first half of 2021, 7% of the total supply or 1252GWh was auctioned off, at a premium of 14.6 KRW/kWh on average.[33] - During the auction held in the first half of 2022, about 28% of the total supply or 4670GWh was auctioned off, at a premium of 10.9 KRW/kWh on average.[34]	companies using this option. **<Cost Effectiveness>** -Despite the low cost of Green Premium, this option is not acknowledged as an emission reduction under the K-ETS. In the long run, this may not therefore be a cost-effective solution for companies that are highly likely to face an increasing carbon price. **<Transparency>** -It is stated that the fund accumulated from companies paying the Green Premium will be funneled towards future investments in RE capacity and technologies.[35] However, as previously stated, it is not clear how the fund is currently being used with reports indicating that it has been partially allocated to support the shortfalls of the current PPA options in the K-RE100 scheme (see below section on PPAs) such as subsidizing the high transmission network use fee for consumers who sign trilateral PPAs.[36]
Renewable energy certificates (RECs)	 **Figure 4. REC Mechanism under K-RE100 Scheme**	

[33] KEPCO, "Green Premium sales decreasing….", October 13, 2021.
[34] Ministry of Trade, Industry and Energy, '2022 Green Premium Auction Result', https://www.motie.go.kr/motie/ne/presse/press2/bbs/bbsView.do?bbs_seq_n=165350&bbs_cd_n=81
[35] Ministry of Trade, Industry and Energy, Notice No. 2021-66, Clause 71: On the Use of Financial Resources from Green Premium, April 16, 2021.
[36] Jin-Young Yang, "Financial support for Trilateral PPA Network Usage Fee… Worth 36 billion KRW." Elec Times, February 24, 2022. https://www.electimes.com/news/articleView.html?idxno=300991.

	[Summary] - Electricity consumers purchase RECs from the K-RE100 trading platform then receive a 'Confirmation of Renewable Energy Use. RECs that are used to fulfill Renewable Energy Portfolio Standard (RPS) [37] cannot be traded for K-RE100 purposes. -It is possible to trade outside the platform through mutual agreement between the buyer and seller and or trade on the bi-monthly trading market that takes place on the K-RE100 trading platform. - The consumer submits their REC to the K-RE100 management system run by KEA, which then issues a 'Confirmation of Renewable Energy Use' certificate. **[Current Status]** - The number of RECs that have been traded in 2021 = 20 times / Total supply: 10.1 GWh / Average price: 47 KRW/kWh[38]	**<Accessibility >** - RE generators generally prefer RECs for the RPS that guarantee them relative long-term stable profit. Since the mandatory percentage of RE use under the RPS will increase gradually to 25% in 2026 based on the government plan, REC supply for K-RE100 is projected to decline unless RE supply increases greatly.[39] Since RECs for the K-RE100 scheme are not granted a separate weighting system as is the case under the RPS, generators that have high weighting under RPS, such as off-shore wind and Solar PV generation for buildings, will prefer the higher price under the RPS. -Conversely, large-scale Solar PV that has higher than 3000kW capacity has a low weighting under the RPS and will be incentivized to trade under the K-RE100 scheme. Hence, RECs for the K-RE100 scheme will mainly be procured by large-scale Solar PV facilities. However, due to complex siting and permitting rules, it is difficult for RE generators to find enough locations for their solar PV generation. This imposes severe limitations on RE supply and makes it even more difficult for corporations to access RE via RECs.[40] **<Additionality>** -As most RECs are issued based on existing renewable energy generating units, additionality is low. Additionality from RECs occur only when RECs are issued through contracts with new RE generators. -In addition, the current K-RE100 scheme acknowledges RECs under the RPS which includes energy sources like biomass which does not contribute to the spread of new and renewable energy since biomass is not a sustainable option in Korea.[41]. Consumers can exclude the source by choosing a specific energy source when purchasing RECs, however, considering that biomass RECs account for 30% of the total REC market,[42] it is difficult for consumers to completely exclude this option.

[37] Fulfilling RPS requires that power generators that have a capacity of 500W or above supply a certain percentage of energy from RE.
[38] Korea Energy Agency, "K-RE100 Certificate Trading Platform Trading Record." https://nr.energy.or.kr/RE/comm/mainpop1_defpop.do
[39] Choi, Insick. "RE100 Discussion Group on Ways to Expand K-RE100 ." Kharn. Accessed June 24, 2022. http://www.kharn.kr/mobile/article.html?no=18947.
[40] Solutions for Our Climate (B), 2020
[41] Solutions for Our Climate, "Importing Deforestation," SFOC, 2022, http://www.forourclimate.org/sub/data/view.html?idx=74&curpage=1.
[42] Choi, Unjeong. "Biomass Debate, 'Renewable Energy vs Perfectly Masked Fossil Fuels'." Jonghabsisa Magazine, 22 Aug. 2021, http://www.sisanewszine.co.kr/news/articleView.html?idxno=11797.

		<Cost effectiveness> -The cost of RECs under the K-RE100 scheme is expected to be at a similar level as the cost of RECs for RPS as they are run in parallel. However, significant fluctuations in the REC price that result from its pricing trend reduces predictability for corporations planning to purchase RECs and increases the financial risk. -Furthermore, as buying RECs based on Solar PV, Wind and Hydro power sources are acknowledged as emissions reductions under the K-ETS, companies can mitigate the projected risk of a rapidly increasing carbon price[43] by investing in new generation facilities of these sources and secure the supply of RECs. However, most SMEs are not assigned carbon credits so not benefit from using K-RE100, meaning there is little incentive for them to join.
Trilateral PPA	 **Figure 5. Trilateral PPA Mechanism under K-RE100 Scheme**	
	[Summary] - With KEPCO acting as an intermediary, the electricity consumer and generator sign a 'Trilateral' PPA. Upon purchase, the consumer will receive a 'Confirmation of Renewable Energy Use' to fulfill RE100. - RE generators who want to sign Trilateral PPAs are required to own a facility that has a generation capacity of more than 1MW, and the consumer can purchase both commercial and public & service electricity.	**<Accessibility>** - Only RE generators and consumers of over 1MW capacity can participate, so the program does not support Small and Medium Enterprises (SMEs), startups with lower electricity demand, or large corporations that have committed to reducing scope 3 emissions relating to their supply chain. Furthermore, consumers under the Trilateral PPA agreement must purchase all the power generated by the RE generator which reduces the flexibility of the

[43] Korea Photovoltaic Society, 'Curent Status of RE100 Campaign and Implementation of Carbon Credits,' https://www.koreascience.or.kr/article/JAKO202030060641497.pdf

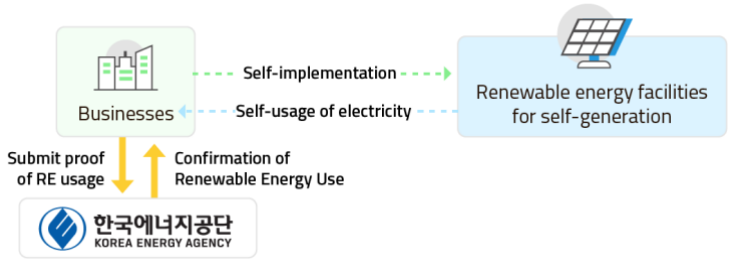
	- Pricing is decided between the RE generator and the consumer, following the standard price determined by the System Marginal Price (SMP) +REC. * Money received by the generator: Mediated Price - Intermediary fee * Price paid by the consumer: Meditated Price + Network Usage Fee + Network Repair Fee + Additional Settlement Fee + Welfare Cost + Intermediary Fee - If the RE generator already has a contract with KEPCO or the market regarding electricity supply, it should terminate the existing contract to sign a Trilateral PPA. **[Current Status]** - One Trilateral PPA has been signed totaling 3MW between Hyundai Elevator and HD Cheongju Solar PV No.1.[44]	contract for both RE generators and consumers.[45] -In addition, with KEPCO acting as mediator, the lack of technical guidance on contracting for Trilateral PPAs has increased the uncertainty faced by corporations when entering into a long-term contract. - Due to complex siting and permitting rules, it is also difficult for RE generators to find enough locations for their solar or wind energy facilities thereby imposing severe limitations on RE supply and making it difficult for corporations to sign trilateral PPA agreements.[46] **<Additionality>** -Trilateral PPAs are direct and long-term electricity purchase agreements between companies and RE generators with KEPCO acting as the mediator. This can contribute substantially to the additionality of RE if made with new RE facilities. **<Cost Effectiveness>** -Besides the PPA price, additional incidental and network use fees of 50KRW/kWh are incurred.[47] This cost amounts to 45% of the industrial electricity price, which is significant. In addition, transmission and distribution costs are double charged both for the existing electricity supply and the supply from the newly signed PPA. Therefore, corporations who want to sign Trilateral PPA contracts must bear the unfair burden of double charging. -Electricity market system operator - Korea Power Exchange (KPX) – also has the authority to control transmission from a trilateral PPA with the aim of limiting overall power output and ensuring the stability of the overall grid. However, there are no existing regulations that state how RE generators and consumers will be compensated in case this occurs. Such clauses that increase uncertainty can also prevent companies from participating in PPAs.[48]

[44] Boram Youn, 2022.
[45] Solutions for Our Climate, "RE100 Scheme Left Stranded, with Focus on High Network Cost and Unreasonable Guidance on Trilateral PPAs", 2021.
[46] Solutions for Our Climate (B), 2020.
[47] Incidental costs include network cost (base rate), network cost (usage rate), cost of network loss, uplift cost, welfare/special discount, and electric power industry base fund fee. (KEPCO, "KEPCO Trilateral PPA Cost Simulation," TER, 0AD, https://en-ter.co.kr/ft/ppa/thpty/fee/simulation.do).

[48] Solutions for Our Climate, 2021.
http://www.forourclimate.org/sub/data/view.html?idx=66&curpage=1&search_txt=re100&search_field=subject.

		-The current LCOE of solar and wind energy in Korea is high and currently acts as a deterrent to companies to enter a PPA agreement. Furthermore, even if the LCOE follows global trends as predicted and eventually becomes lower than the industrial electricity price, the power market system in Korea fails to reflect the cost of electricity production. This is because pricing for RE is centred on the SMP+REC pricing, and hence PPA deals also follow that price level. Hence, PPAs would remain high thereby continuing to act as a deterrent. **<Transparency>** The lack of disclosure from KEPCO regarding how incidental costs associated with trilateral PPAs are calculated, including the network use fee, is problematic. There is also a need to increase transparency on how KEPCO sets fees that are charged when oversupply or undersupply of electricity occurs from the trilateral PPA.
Direct PPA	**[Summary]** - The RE electricity generator and consumer can form direct contracts without the mediation of KEPCO then receive a 'Confirmation of Renewable Energy Use. - Consumers can form a contract with a RE generator for a fixed period and at a fixed price, which reduces the risk of price fluctuations over a longer time. **[Current Status]** - Initiated in 2021 through the amendment to the Electricity Enterprises Act, details are still being finalized and were due to be published in April 2022 but have been delayed. - On 22nd March, SK E&S and Amore Pacific formed the first-ever direct PPA. *Scale of 5MW per year for 20 years.[49]	**<Accessibility>** -Updated regulations on direct PPAs have yet to be finalized by the government and this uncertainty has prevented corporations from joining the scheme. -Such lack of rules on contracting for Direct PPAs has increased the uncertainty faced by corporations when entering into a long-term contract. -As mentioned above for trilateral PPAs, due to complex siting and permitting rules, it is also difficult for RE generators to find enough locations for their solar or wind energy facilities. This imposes severe limitations on RE supply and makes it difficult for corporations to sign direct PPAs.[50] **<Additionality>** -As with trilateral PPAs, direct PPAs are long-term electricity purchase agreements between companies and RE generators. This can contribute substantially to the additionality of RE if made with new RE facilities.[51] - Direct PPA signed with a controversial renewable energy source for the environment such as biomass, cannot be considered to have a sustainable renewable energy additionality effect. effective in contributing to

[49] Saeyoung Lee, 2022
[50] Solutions for Our Climate (B), 2020.
[51] Greenpeace, Race to Green, December 2021. https://www.greenpeace.org/static/planet4-eastasia-stateless/2021/12/a29b3a1d-race-to-green-report.pdf

		additionality. **<Cost effectiveness>** - Although direct PPAs are not mediated by KEPCO and hence mediation fees are saved compared to trilateral PPAs, incidental costs are expected to be at a similar level to that of trilateral PPAs. - Like trilateral PPAs, LCOE in Korea is high and acts as a deterrent to companies entering into direct PPA agreements and is also likely to remain high as the current power market system fails to reflect the cost of electricity production. **<Transparency>** As the announcement of Direct PPA rules is being delayed, there are concerns that KEPCO will not be disclosing how it calculates incidental costs associated with Direct PPAs, including the high network use fee. Furthermore, there is a need to increase transparency on how KEPCO sets fees that are charged when oversupply or undersupply of electricity occurs.
Self-Generation	 **Figure 6. Self-generation Mechanism under K-RE100 Scheme**	
	[Summary] -Consumer self-generates RE by constructing necessary facilities then receive a 'Confirmation of Renewable Energy Use.	**<Accessibility>** - The need to find the right site, buy equipment and manage the facility imposes a heavy burden on corporations that want to self-generate renewable energy. This is made worse by arbitrary and complex siting and permitting rules which means finding the right site for RE generation is difficult.[52] Even when companies want to install facilities within their factory complex, they may be limited by local regulations. Together these are severe limitations for RE self-generation. **<Cost effectiveness>** - Due to the high LCOE for both wind and solar energy in Korea, there is little financial incentive to self-generate in the short term. For companies that are obliged to reduce emissions in the medium to long-term, these costs

[52] Solutions for Our Climate (B), 2020.

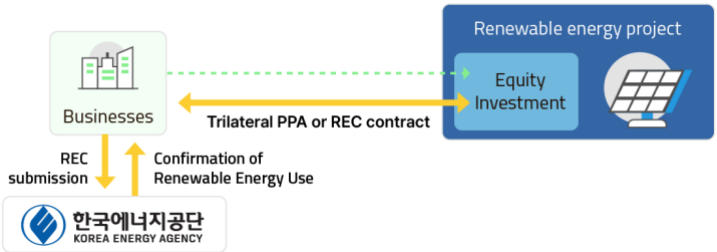
		can be balanced out through saving of GHG emission cost and income from electricity sales.
Equity investment	 **Figure 7. Equity Investment Mechanism under K-RE100 Scheme**	
	[Summary] -Investors can purchase stakes in RE generation projects for RECs or trilateral PPA then receive a 'Confirmation of Renewable Energy Use. This will give the investors the contractual priority to purchase RECs from the project.	**<Accessibility>** - As with many of the K-RE100 options, due to complex siting and permitting rules, it is difficult for RE generators to find areas to locate their solar or wind energy facilities. This is a substantial risk for equity investors since RE projects can get derailed by local opposition or failure to satisfy complex permit regulations. This imposes severe limitations on RE supply and makes it difficult for corporations to access RE.[53] **<Cost effectiveness>** -In addition to the initial investment cost, companies need to pay for PPA or REC. These costs can be balanced out through saving of GHG emission cost and income from dividends. However, due to the high LCOE of wind and solar energy, it is not cost effective in the short term.

Table 2. K-RE100 options, Current Status and Related Issues

Source: Korea Energy Agency and Solutions for Our Climate.

[53] Ibid.

4. Common Barriers To Corporate RE Procurement in Korea

- **Additionality**

Currently, the most popular option for sourcing RE in Korea is the Green Premium, which is the cheapest at only 10KRW/kWh above the electricity price. Green Premium has inherently low additionality, but this is exacerbated because the additional expense from Green Premium is not being wholly invested in creating RE generation facilities. Therefore, companies using this option to fulfill their renewable electricity targets risk being accused of greenwashing. Likewise, when purchasing RECs, they are often based on existing RE projects and hence would have low additionality. Furthermore, there are concerns that fulfilling RE targets through RECs can incentivize energy sources that are not sustainable, such as biomass energy.[54] In the case of trilateral and direct PPAs, contracts that are not based on existing electricity sources contribute significantly to the additionality of RE capacity whilst self-generation and equity investments are the options that best conform to the additionality standard.

- **Accessibility**

When entering a trilateral PPA with KEPCO as the mediator, only RE producers with over 1MW capacity can participate and the consumer has to purchas all the electricity resulting from the PPA deal, meaning that companies with lower energy needs but want to enter into a PPA cannot do so. Conversely, direct PPAs do not require KEPCO to act as a third party and MOTIE is also considering lowering the requirement for participation[55] so it is hoped that this option will be more flexible for SMEs. However, the announcement of detailed regulations regarding direct PPAs has been delayed since March 2022 and has not been finalized at the time of writing. As a result, there is currently a high level of uncertainty and regulatory risk which makes it difficult for corporations - especially those with high electricity use - to choose this option.

As outlined in table 2 above, it is also difficult for companies to install RE facilities because of inconsistent, pervasive, and complex permitting and siting regulations. For example, companies must get multiple development permits from the municipal government and 129 out of 226 municipalities in Korea also mandate minimum 'separation distances' of between 300m and 1000m between solar PV equipment and specific roads, facilities, and sites.[56] Regarding siting regulations - and excluding forestry conservation zones - the area available for the installation of solar PV is limited to 1% in some municipalities in Korea – see figure 3. Therefore, the current status of both siting and permitting regulations has continuously delayed RE facilities from being built thereby making not just self-generation and equity investment in RE facilities difficult, but also negatively affecting the uptake of other options within the K-RE100 scheme including RECs and PPAs due to limited RE supply.

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[54] Although biomass power generation is rapidly expanding into the second-largest renewable energy source in Korea, the issue of high carbon emissions from biomass power generation and the sustainability of raw materials imported indiscriminately from abroad have been repeatedly raised (SFOC, 2022). Consumers can selectively trade solar and wind RECs, but in the current situation where biomass REC accounts for 30% of the total REC volume, there is much room for biomass REC to be used as a means of implementing RE100 for practical companies. Companies cannot contribute to sustainable renewable energy additionality if they use biomass REC means (SFOC, 2022).

[55] RE 100 in Korea, Roadblocks for Discussion on the Roadblocks to the Direct Procurement of Renewable Energy and Possible Solutions*, YouTube,* 2022*, https://www.youtube.com/watch?v=eSetwd5MOI*

[56] Byun, Sang Geun, "129 Local Governments with Solar PV Siting Rule despite the Guideline Published by the Central Government." ET News, October 4, 2021. https://m.etnews.com/20211004000024.

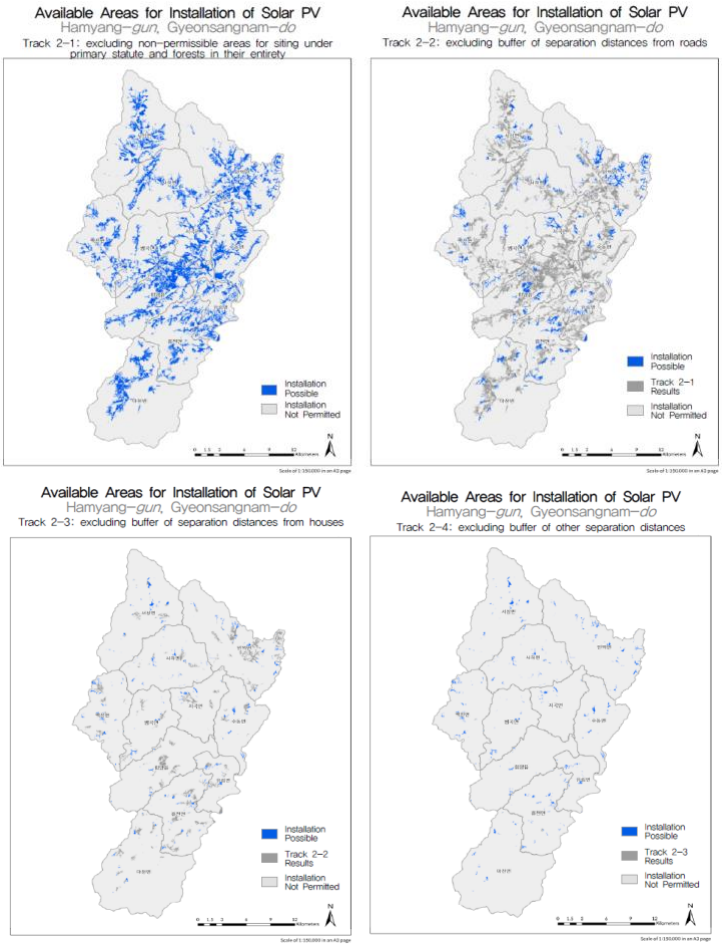

Figure 8. Results of Analysis of Impact Flowing from Separation Distance Regulations (Hamyang-gun, Gyeongnam)

Source: Solutions for Our Climate[57]

○ Cost Effectiveness

Both domestic and multinational companies cite the high cost of procuring RE in Korea as the biggest roadblock in their efforts to achieve 100% RE use in their operations and supply chain. Although the Green Premium option is relatively cheaper and allows companies to, in theory, state that they are meeting their RE targets, it is not a viable option for businesses wishing to take meaningful climate action and avoid accusations of greenwashing due to a lack of additionality and transparency.

For RECs, the price has been increasing due to limited supply, as most of them are being used for the RPS program, as stated above. Further, as REC demand increases due to the government's mandated RE share for energy generators under RPS increasing to 25 % by 2026,[58] the REC price is projected to increase even more. With such volatility in pricing (the price was less than 30KRW/kWh in July 2021 but increased to reach 55KRW/kWh[59]), relying on REC for RE procurement is considered a financial risk for companies, which makes them reluctant to use the REC option.

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[57] Solutions for Our Climate (B), 2020.

[58] Byun, Gookyoung, "'RPS Percentage Expected to Increase to 25 Percent by 2026.'," Energy Daily, December 28, 2021, http://www.energydaily.co.kr/news/articleView.html?idxno=124622.

[59] KPX, "Rec spot market." KPX electricity information, 2021. https://www.kpx.or.kr/mobile/sub04_1.do.

With regards to PPAs, prices are expected to be even higher than the price of purchasing RECs. There are several factors that make PPAs expensive in Korea including the following:

- KEPCO charges high incidental and network costs for PPAs, which amounts to 45% (50KRW) of the current commercial electricity price.[60] Furthermore, network costs are doubly charged for companies who have both the PPA supply and the existing electricity supply, which is unfair as companies' electricity uptake does not increase from signing PPAs, it is simply replaced by RE sources.
- The current LCOE in Korea for on-land solar PV of over 3MW (129KRW/kWh) and onshore wind of over 20MW (164KRW/kWh)[61] remains very high compared to the commercial electricity price of approximately 110KRW/kWh.[62] This is due to various factors such as permitting and siting regulations, and an outdated power market structure and regulations. Even in Korea, LCOE prices are projected to fall to 80~90KRW/kWh for solar energy, and 150KRW/kWh for wind energy,[63] but this would not have any impact on PPA prices in Korea. This is because the RE price level in Korea is affected by the RPS that compensates RE based on the System Marginal Price (SMP).

  Globally, the price of PPAs is coming down quickly: IRENA's database[64] shows that for Solar generation, the global procurement price has fallen by 77 percent between 2010 and 2021 to reach 0.039USD/kWh (50.13KRW/kWh) and for onshore wind energy, the price has fallen by 47 percent between 2010 and 2021 and reached 0.043USD/kWh (55.27KRW/kWh).[65] This is because global PPA prices reflect the falling LCOE. In Korea, however, the RE price is linked to fossil fuel price. This explains why the recent increase in SMP due to the Russian-Ukrainian war has driven up the RE price as well. In the long term, the volatility of the fossil fuel price prevents RE generators from ensuring a stable profit and increases the financial risk for RE buyers.

- **Transparency**

Lack of transparency around how the finance from the Green Premium is being used undermines the credibility of the K-RE100 scheme and increases the reputational risk that companies face when buying Green Premium. Likewise, lack of transparency around how costs, such as the network use fee and under/over supply fee for PPA agreements, are calculated by KEPCO makes it impossible for the public to discuss what measures can be taken to reduce the costs. Disclosing the rationale behind incidental costs would enable solutions to be devised on how to reduce the costs through measures such as infrastructure investments.[66]

- **Power Market Structure and Regulations**

In addition to the specific barriers outlined above relating to the K-RE100 options such as accessibility, additionality, cost-effectiveness, and transparency, in Korea, there are underlying issues related to the power market structure and regulations, which restricts renewables from accessing the grid and continues to prioritize fossil fuel-based assets over renewable electricity including:

- KEPCO's power generation subsidiaries or 'GENCOs', responsible for 73% of total national electricity

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[60] Solutions for our climate, 2021

[61] Korea Energy Economics Institute, "Creating a system to predict the medium to long-term LCOE projection in Korea with the aim of expanding renewable energy", December, 2021.

[62] KEPCO, Monthly Statistics Update (522nd), April 2022.

[63] Korea Energy Economics Institute, December, 2021.

[64] International Renewable Energy Agency, "Global LCOE and Auction Values," IRENA International Renewable Energy Agency, n.d., https://www.irena.org/Statistics/View-Data-by-Topic/Costs/Global-LCOE-and-Auction-values.

[65] IRENA, 2020

[66] Ibid.

production, are heavily reliant on fossil fuel assets[67] and the current system does not allow for equal access and compensation for renewable energy sources compared to fossil fuel-based energy sources. For example, GENCOs are guaranteed to recover cost-plus markup while private RE generators are exposed to risks incurred from the limitations of the power market.

- The Korea Power Exchange (KPX), which is the electricity system operator that manages the transmission and distribution of electricity, is also heavily influenced by KEPCO.[68] In its current decision-making process, KPX also prioritizes reliability and efficiency over sustainability, which puts RE sources at a disadvantage.[69]

- The infrastructure needed to increase RE on the grid and improve grid flexibility has been slow to develop. This is due to a failure to compensate flexibility resources such as Energy Storage System (ESS) and Virtual Power Plant (VPP), which are vital for rapidly increasing RE uptake on the grid. This is shown clearly in Korea by the RE curtailment issues being experienced on Jeju Island.[70]

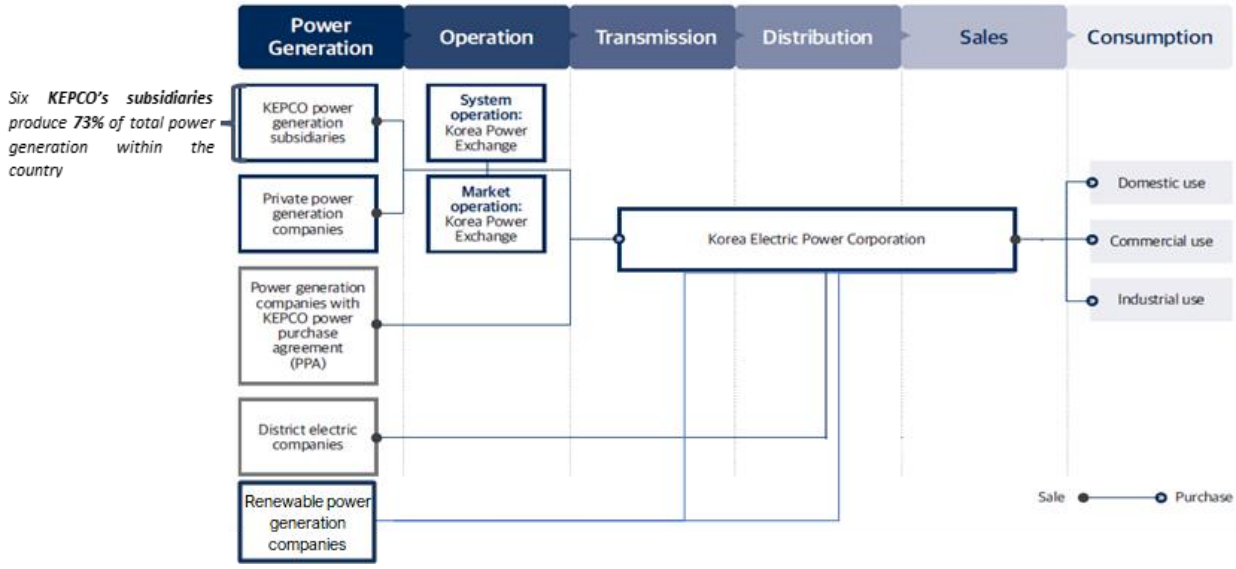

Figure 9. Structure of the Korean Power Industry

Source: Solutions for Our Climate[71]

5. Way Forward

To rapidly decarbonize its power sector, Korea must significantly increase its share of RE in the power mix to around 50% by 2030. This will mean fostering the rapid uptake of RE by corporations through improvements to the current set of K-RE100 options, particularly focusing on options that are directly linked with high additionality, such as PPAs, self-generation and equity investment. This will include removing existing barriers relating to accessibility, additionality, cost effectiveness and transparency. More fundamentally,

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[67] KEPCO, "90th Statics of Electric Power in Korea, May 2021.

[68] KEPCO and GENCOs hold over 99% of KPX member meeting voting rights and have a substantial presence in the KPX board room and three out of the eight non-standing board members of KPX are from KEPCO or GENCO.

[69] Sanghoon Bae, "IEA 'Korea has to improve its power market to achieve carbon neutrality,'" Electric Power Journal, 2021, http://www.epj.co.kr/news/articleView.html?idxno=29448.

[70] Jeju Ilbo, "The third HVDC and ESS construction… solution to RE curtailment" https://www.jejunews.com/news/articleView.html?idxno=2189056

[71] Solutions for Our Climate (A), "Renewables 'Go to Jail' in Monopoly," Solutions for Our Climate, 2020, http://www.forourclimate.org/sub/data/view.html?idx=28.

underlying issues relating to the power market structure and regulations must be resolved for consumers to procure RE at an affordable cost and via fair, sustainable and transparent sourcing options. The following policy suggestions highlight key steps that would accelerate corporate RE procurement in Korea and can be used as a basis for discussing the reform of the K-RE100 scheme and the power market system.

	Policy Suggestions
Accessibility	• Simplify and streamline siting and permitting regulations to facilitate a rapid increase in RE supply. • Increase the flexibility of PPA contracts by removing unfair contractual obligations, for example where PPA deals can only have a single corporate taker and where only RE generators and consumers with over 1MW capacity can participate in PPAs. • Support corporates in signing PPA contracts by providing regulatory and technical guidance to reduce uncertainty and widen participation.
Additionality	• Invest financial resources from the Green Premium directly into additional RE capacity and technologies. • Exclude biomass energy that does not have a sustainability guarantee from the K-RE100 scheme. • Implement a system where the additionality of each K-RE100 option is reviewed and rated.
Cost Effectiveness	• Reduce incidental costs and remove the double charging of distribution and transmission costs for PPAs. • Reform the compensation scheme so that the true cost of RE can be reflected by decoupling the RE price from SMP.
Transparency	• Disclose how financial resources from the Green Premium scheme are being used and how incidental costs and network costs associated with PPAs are set. • Regularly disclose data relating to the uptake of K-RE100 options including equity investment and self-generation.
Power Market Governance	• Enable equal grid access, ensure fair compensation for RE and flexibility resources • Ensure transparent and independent governance of KPX and strengthen its sustainability mandate.

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