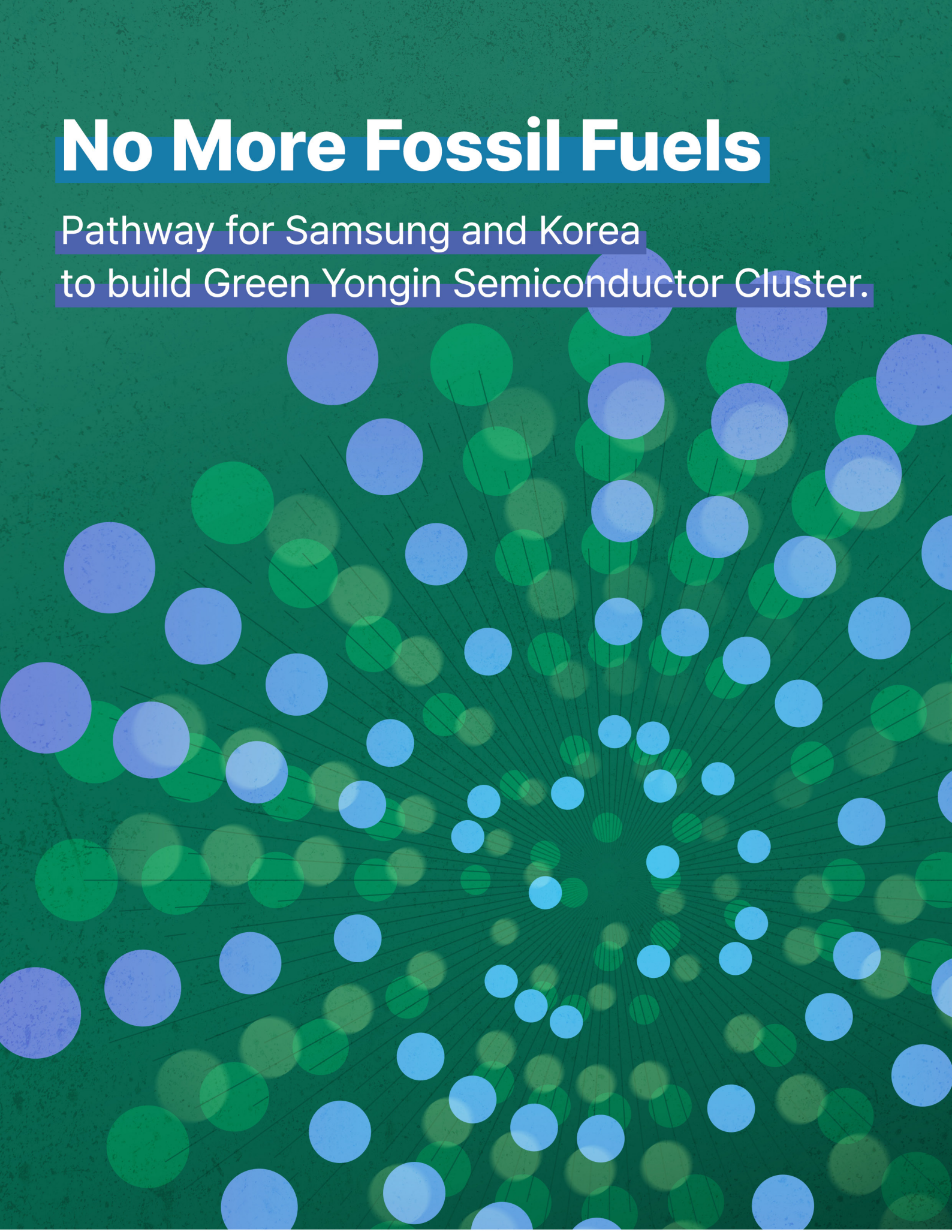
No More Fossil Fuels

Pathway for Samsung and Korea to build Green Yongin Semiconductor Cluster.



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Greenpeace raises environmental issues through peaceful protests and creative communication, while offering solutions for a clean and peaceful future. Since 1971, it has led environmental movements against political forces and corporations that threaten the planet. The organization is made up of scientists, lawyers, activists, policy experts, and communications professionals. Based on this foundation, Greenpeace carries out a wide range of campaigns, including research, policy advocacy, public education, lobbying, and legal action.

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Solutions for Our Climate(SFOC) is an independent policy research and advocacy group that aims to make emissions trajectories across Asia compatible with the Paris Agreement 1.5°C warming target.

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Design Nature Rhythm

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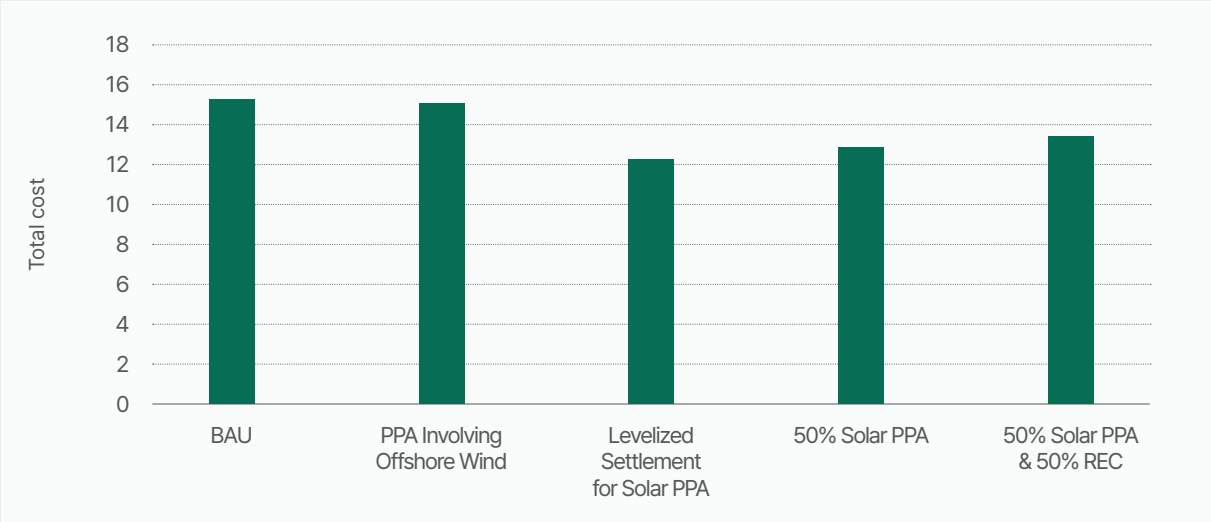
Background

On March 15th, 2023, the Korean government announced a plan to establish the Yongin Semiconductor National Industrial Complex, which is expected to require approximately 10GW of additional electricity supply upon completion. To meet the early-stage demand of 3GW, the government plans to construct gas-fired power plants. However, this would result in 9.77 million tons[1] of greenhouse gas emissions along with fine particulate matter that threatens the air quality of nearby residents and puts their right to a safe and healthy environment at risk.

In 2022, Samsung Electronics announced its RE100 target of using 100% renewable energy by 2050. However, as clients of its semiconductor business have committed to decarbonizing their supply chains on a faster timeline, Samsung may find it difficult to meet their demands if the government proceeds with its plan to power the industrial complex with fossil fuels—putting both the company and the broader Korean economy at risk.

This report analyzes the approach of utilizing locally generated renewable energy instead of constructing gas-fired power plants to supply 3GW of electricity to the Yongin National Industrial Complex. The analysis indicates that this alternative could save up to KRW 30 trillion in energy costs by 2050, with the actual benefits likely to be even greater when factoring in increased revenues driven by Samsung's enhanced competitiveness, as well as the avoided social costs associated with gas power plant construction.

[Figure 1] Power Costs for Samsung Electronics by Scenario



1 Korea Land and Housing Corporation. *Environmental Impact Assessment for the Development Project of the Yongin Advanced System Semiconductor Cluster National Industrial Complex*. July 2024.

1. Yongin Semiconductor National Industrial Complex and Its Power Supply Plan

◦ Project Overview

At the 14th Emergency Economic Meeting for People's Livelihood, held on March 15th, 2023, the government announced the designation of Yongin as the site of a new Semiconductor National Industrial Complex, which will span 7,280,863m². Specifics of the project are as follows[2]:

» Project Details

At the 14th Emergency Economic Meeting for People's Livelihood, held on March 15th, 2023, the government announced the designation of Yongin as the site of a new Semiconductor National Industrial Complex, which will span 7,280,863m². Specifics of the project are as follows:

- Project Name: Yongin Semiconductor National Industrial Complex
- Land Location & Area: Idong-eup, Namsa-eup of Cheoin-gu, Yongin-si, Gyeonggi-do
- Higher-level Plan: control area (37.1%), urban area (22.9%), agricultural and forestry area (40.0%)
- Project Implementer: Korea Land and Housing Corporation
- Project Cost: KRW 9,063.7 billion (excluding indirect costs)
- Project Period: 2024-2031
- Target Industries: Electronic components, telecommunications equipment, chemical products, etc.

Source: Korea Land and Housing Corporation. Data adapted by Solutions for Our Climate

2 Korea Land and Housing Corporation. *Application for Approval of the Development Plan of the Yongin Advanced System Semiconductor Cluster National Industrial Complex (Summary)*. April 2024.

◦ Construction and Operation Plan for Gas-Fired Power Plants

According to the 11th Basic Plan on Electricity Supply and Demand (the "11th Basic Plan"), the government plans to construct gas power plants within the Yongin National Industrial Complex to meet short-term demand. A total of six plants with a combined capacity of 3 GW will be developed by Korea East-West Power (EWP), Korea Southern Power (KOSPO), and Korea Western Power (KOWEPO), with each responsible for building 1 GW plants.[3] However, under the current development plan for the Yongin National Industrial Complex, only 19.87 MW of power is planned to be sourced from renewable energy, which is just 0.67% of the amount planned to be supplied by the gas-fired power plants.[4]

Yongin Semiconductor National Industrial Complex Power Procurement Plan

Phases		Details
National Industrial Complex	Phase 1 (2030-2038) Phase 2 (2039-2043) Phase 3 (2044-2053)	• EWP, KOSPO, KOWEPO to construct 1 GW gas-fired power plants (starting in Dec. 2027) and establish foundation for clean hydrogen co-firing. • Connect an in-land transmission line (N.Cheonan to Yongin) for additional power supply and reinforce system equipment of the existing electrical substation. • Explore options considering power grid and technology advancements after the 11th Transmission and Substation Plan (1H 2025)

Source: 11th Basic Plan on Electricity Supply and Demand

3 NewsPim. "Development in Motion: Yongin Semiconductor Cluster to Be Powered by Three New 1 GW Power Plants." November 27, 2024.

4 Korea Land and Housing Corporation. *Environmental Impact Assessment for the Development Project of the Yongin Advanced System Semiconductor Cluster National Industrial Complex, pg. 169*. July 2024. Lower when considering effective capacity.

2. Issues with the Gas-Fired Power Supply Plan

◦ Higher Greenhouse Gas Emissions

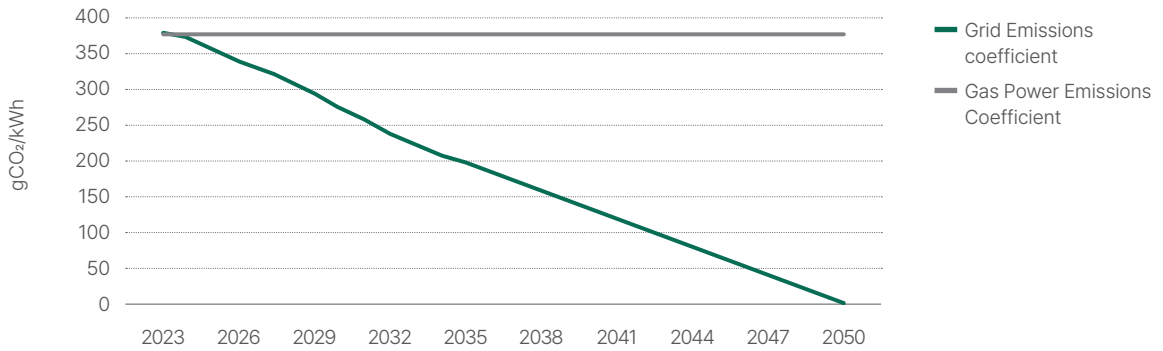
As of 2025, the emission factor—greenhouse gas emissions per kilowatt-hour (kWh) of electricity consumed—for gas-fired power plants is higher than that of the national power grid, which already sources over 60% of its electricity from fossil fuels.[5] As the share of renewable energy in the national grid increases over time, the gap between these two emission factors is expected to widen further. In fact, projections indicate that by 2038, the emission factor of gas power plants will be 2.4 times higher than that of the national grid. This suggests that building gas-fired power plants will raise national carbon emissions and run counter to Korea's 2050 net-zero goal.

◦ Limited Impact of Hydrogen Co-Firing Plan

According to the Climate Change Impact Assessment Report for the Yongin Industrial Complex project, the government plans to achieve a 21.4% reduction in emissions from its proposed gas-fired power plants by 2032 through 50% hydrogen co-firing, and fully switch to 100% hydrogen combustion to reach carbon neutrality by 2050.

5 Emission factors from the 10th Basic Plan on Electricity Supply and Demand (coal: 0.8362 tCO_2/MWh; LNG: 0.3779 tCO_2/MWh) were adopted, assuming new and other energy sources have the same factor as LNG. Based on this, the 2021 grid emission factor is calculated as 0.43, close to the national GHG factor of 0.44. The gas-fired power generation factor assumes 100% LNG use, excluding hydrogen co-firing.

Emission Factor Comparison Based on the 10th Basic Plan



Projected GHG Emission Reductions for the Yongin Industrial Complex Gas Power Plant at Various Hydrogen Co-Firing Ratios

Category		Target Hydrogen Co-Firing Ratio (%)	GHG Emissions (tCO_2eq/year)	GHG Emission Reductions (tCO_2eq/year)	Notes
GHG Emissions (tCO_2eq/year)	2032	50	9,773,483.57	2.092,811.45	21.4% Reduction
	2050	100	9,773,483.57	9,773,483.57	100% Reduction

Source: Environmental Impact Assessment Supporting System (EIASS), Korea Land and Housing Corporation

The impact of utilizing hydrogen co-firing in reducing GHG emissions is limited. A 50% hydrogen co-firing rate achieves only a 21.4% reduction in emissions—an estimate that would be even lower when accounting for the emissions generated during hydrogen production and transportation. Given that the government classifies blue hydrogen—produced through LNG reforming—as a form of clean hydrogen,[6] blending 50% hydrogen into gas-fired power generation has minimal effect on overall emissions, particularly when the full lifecycle of hydrogen production is taken into account.[7]

In addition, there is a significant shortcoming in the hydrogen co-firing plan itself. The Climate Change Impact Assessment Report for the project notes that "the hydrogen co-firing and emissions reduction rate may vary depending on internal and external conditions, such as the commercial readiness of hydrogen-fueled gas turbines, hydrogen availability, progress in pipeline infrastructure construction, and the Clean Hydrogen Portfolio Standard (CHPS).[8] If the necessary infrastructure is not in place or the government fails to secure hydrogen supply through bidding, reliance on LNG would be unavoidable—representing a significant setback in meeting the 2050 carbon neutrality target.

◦ Health Risks to Nearby Residents

Gas-fired power plants pose a serious threat to nearby residents due to their emissions of nitrogen oxides, which are classified as Group 1 carcinogens.[9] According to a report by SFOC, *Bridge to Death:*

6 The Clean Hydrogen Certification System was implemented in April 2024 to provide administrative and financial support for hydrogen certified as clean, based on greenhouse gas emissions below a specified threshold during production or import.

7 Solutions for Our Climate. *Three Unseen Flaws of the Boryeong Blue Hydrogen Project in South Korea*. May 2024. For further details, refer to appendix 1-1.

8 Korea Land and Housing Corporation. *Environmental Impact Assessment for the Development Project of the Yongin Advanced System Semiconductor Cluster National Industrial Complex, pg. 169*. July 2024.

9 Segye Times. "[The Lost Right to Breathe by the Roadside] Fine Particulate Matter in the Spotlight, NOx Risks in the Dark", https://www.segye.com/newsView/20180422002992#:~:text=%EC%84%B8%EA%B3%84%EB%B3%B4%EA%B1%B4%EA%B8%B0%EA%B5%AC(WHO)%EA%B0%80,%EB%8A%94%20%EC%97%B0%EA%B5%AC%20%EA%B2%B0%E-A%B3%BC%EB%8F%84%20%EC%9E%88%EB%8B%A4., April 23, 2018.

Air Quality and Health Impacts of Fossil Gas Power, air pollution from gas power plants—both existing and planned under the 9th Basic Plan on Electricity Supply and Demand—could cause up to 462 premature deaths annually in Gyeonggi-do by 2035.[10] The addition of new plants within the Yongin Industrial Complex would further endanger nearby communities whose health is already at risk.

◦ Undermining Samsung Electronics' Competitiveness

Annual GHG emissions from the 3 GW gas-fired power plants planned for the Yongin Industrial Complex are expected to reach approximately 9.77 million tCO_2e, exceeding the 9.46 million tCO_2e in Scope 2 emissions reported in 2023 by Samsung Electronics' DS Division, which oversees its global semiconductor operations.[11] This suggests that the addition of new gas power plants could pose a serious risk to Samsung's efforts to achieve its net-zero and RE100 targets, while also undermining its competitiveness on the global stage.

A report by NEXT group notes that RE100 member companies aim to achieve 100% renewable energy usage by 2028 on average. The report also projects that Samsung could lose approximately 19% of its semiconductor sales if its clients choose to exclude non-RE100 suppliers by 2025.[12]

Carbon Neutrality Status of Samsung's Key Chip Clients

Company	Apple	Microsoft	Dell Technologies	Qualcomm
RE100 Member	○	○	○	X
RE100 Target Year	Reached in 2018	Reached in 2014	2040	N/A
Scope 3 Target	100% by 2030	100% by 2030	45% by 2030[13]	100% by 2040

Source: Company websites and ESG reports. Data adapted by Solutions for Our Climate

10 Solutions for Our Climate. *Bridge to Death: Air Quality and Health Impacts of Fossil Gas Power*. 2021. For further details, refer to appendix 1-2.

11 Samsung Electronics. *Sustainability Report 2024*. March 2024.

12 NEXT Group. *Costs of Climate Inaction of Emission-intensive Companies in Korea*. January 28, 2022.

13 Based on the emissions from purchased products and services

Samsung Electronics' key semiconductor clients have all set earlier timelines for their RE100 and Scope 3 targets. Since Scope 3 emissions reductions depend on decarbonizing the entire supply chain, Samsung's delay in procuring renewable energy increases the risk of losing clients—and, as a result, sales.

TSMC, the current leader in the global foundry market,[14] is making faster progress in securing renewable energy. In September 2023, the company revised its 100% renewable energy target to 2040—ten years earlier than its original goal.[15] TSMC is moving swiftly to procure renewable energy, one example being its direct purchase deal with a 920 MW offshore wind power project.[16] Given that the Yongin National Industrial Complex project aims to strengthen Korea's system semiconductor industry, relying on gas-fired power plants may further widen the competitiveness gap between Samsung Electronics and TSMC.

14 Kim Soo-young. "TSMC-Samsung Gap Widens as Global Q4 Sales Rise by 26%." *No Cut News*, https://www.nocutnews.co.kr/news/6309961?utm_source=naver&utm_medium=article&utm_campaign=20250318050905, March 18, 2025.

15 TSMC, "TSMC Accelerates Renewable Energy Adoption and Moves RE100 Target Forward to 2040", September 15, 2023.

16 Ørsted. "Ørsted takes final investment decision and is ready to build Greater Changhua 2b and 4 offshore wind farms" https://orsted.kr/ko/news/2023/03/changhua2band4_fid. March 31, 2023.

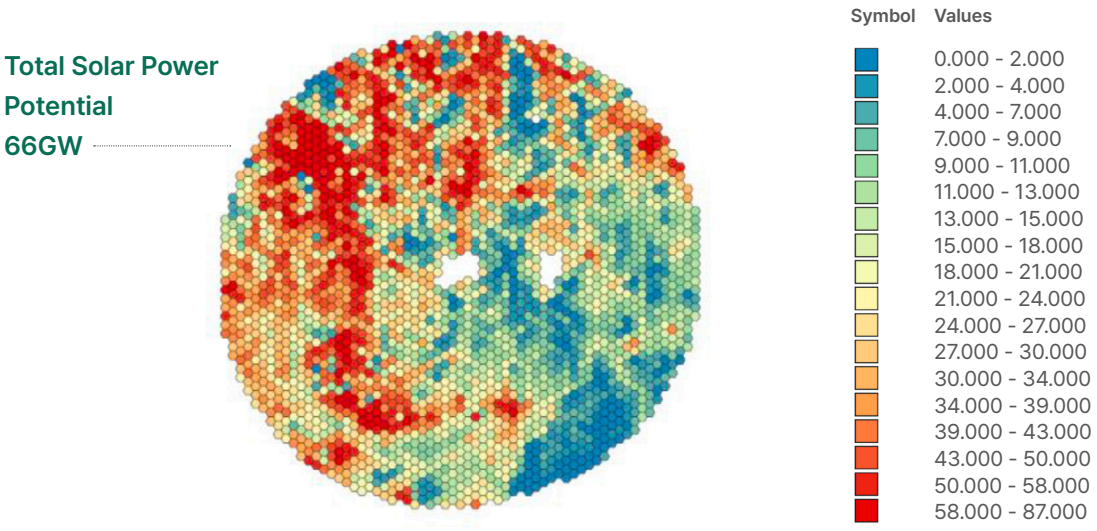
3. Analysis of Renewable Energy Supply Options

Joint research by SFOC and Greenpeace was conducted to explore options to replace six LNG power plants located in the National Industrial Cluster with renewable energy. The study found that it would be possible to meet power needs using 100% renewables by tapping into solar and wind power potential within the 25 km radius of the site. Furthermore, if Samsung Electronics were to meet renewables by signing Power Purchase Agreements (PPAs)—which are more effective in slashing greenhouse emissions—rather than through green premiums or the purchase of Renewable Energy Certificates (REC), the resulting economic benefits would exceed those of purchasing electricity from the LNG plants.

◦ Calculating the Potential of Renewable Resources

To develop a renewable energy supply plan, the study first calculated the renewable energy potential in the surrounding area. For solar power, it was confirmed that after adjusting the local government's recommended separation distance regulations of 100 m from buildings,[17] the solar power potential within the 25 km radius of the Industrial Complex would total 66 GW.[18] In the map below, areas marked in red indicate regions with higher solar power potential.

Solar Power Potential of Areas near the Yongin Semiconductor Cluster[19] (Unit: MW)



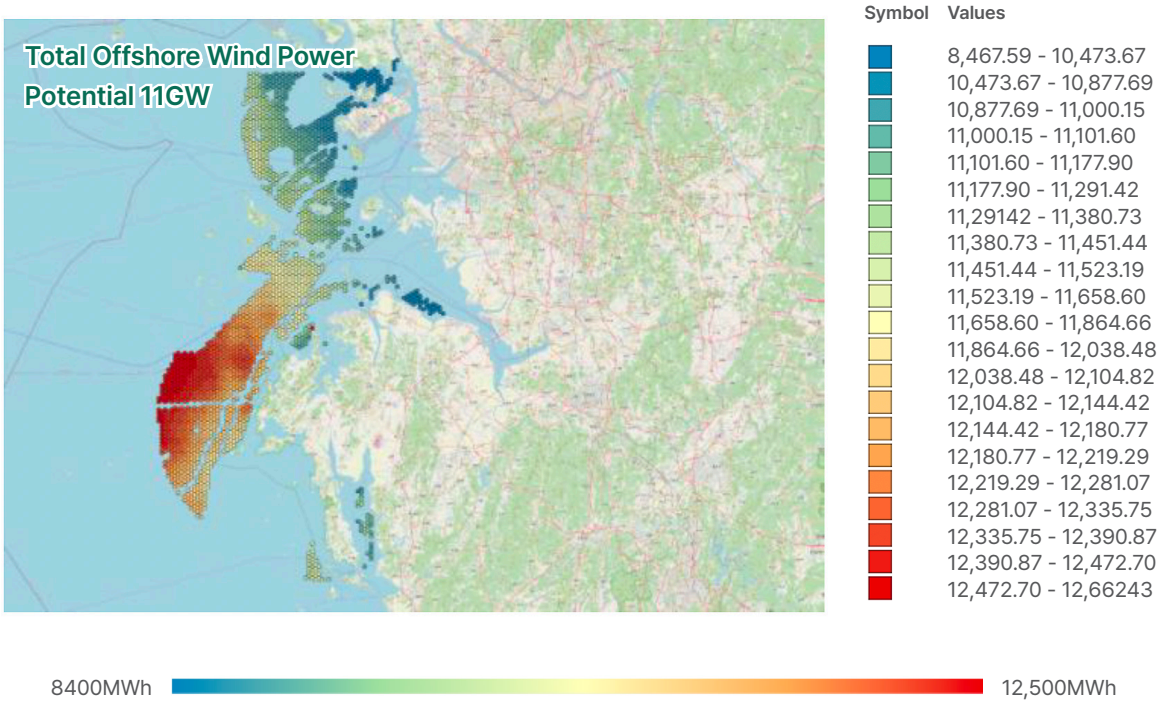
17 In the absence of separation distance, it is excluded in the calculation.

18 For further details, refer to appendix 2-1.

19 The white area in white on the left represents the Yongin Semiconductor National Industrial Complex, and the right indicates the Yongin Semiconductor General Industrial Complex.

For wind power, the offshore wind power potential was estimated at 11 GW within 20 km offshore radius from coastal areas of Gyeonggi, Incheon and Chungnam.[20]

Offshore Wind Power Potential of Areas in Gyeonggi, Incheon and Chungnam (Unit: MWh)



◦ Business-As-Usual Scenario

Samsung Electronics is currently planning to establish operations in the Yongin Semiconductor National Industrial Complex and meet its additional power demand through KEPCO starting in 2030. To this end, KEPCO's subsidiaries, GENCOs, are planning to construct six gas-fired power plants with a total installed capacity of 3 GW within the Industrial Complex. It is difficult to accurately estimate Samsung's maximum power demand and its annual power consumption due to lack of publicly available data on how much of the 3 GW would be allocated to reserve margin, as well as uncertainties regarding the company's actual demand patterns.

In this study, it is assumed that Samsung Electronics' additional power demand as of 2030 would be 3 GW, and that its electricity demand patterns are to follow the load profile of Korea's manufacturing sector in 2023. Although the official plan schedules the construction of 1 GW of gas-fired plant

20 For further details, refer to appendix 2-1.

capacity each year from 2030 to 2032, in line with the phased completion of Samsung's new fabrication plants, for the sake of simplifying the power supply scenarios, it is assumed that the full 3 GW would be required starting in 2030.

While gas-fired power plants of 3 GW are expected to be built to meet Samsung's power demand, the company will not directly enter into PPAs but procure electricity through KEPCO and pay corresponding electricity rates. For estimating electricity prices that the company would have to pay, this study assumes that the electricity rate will continue to rise at an average annual growth rate of 4%, consistent with the historical trend over the past decade.[21]

Power Demand and Electricity Price Assumptions

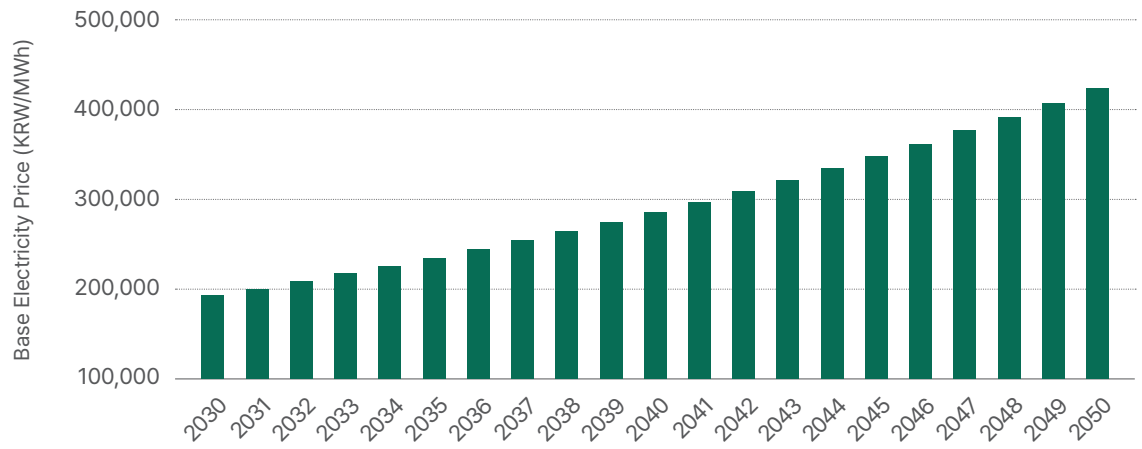
Types	Key Assumptions
Power Demand	Maximum power demand of 3 GW
	Hourly power demand pattern in the manufacturing sector in 2023
	Total annual electricity demand: 24,699 GWh
Electricity Prices	Industrial Rate: Type III Contract Pricing
	Based on the rise in electricity fares in the past decade, the annual increase rate has been assumed to be 4%.

Based on the assumptions described above, the modeling results show that total electricity prices that Samsung Electronics would incur between 2030 and 2050 to meet its additional power demand of 3 GW are estimated to be approximately KRW 153.23 trillion.

Electricity Prices	Total Cost of Power (2030-2050)
193,791/MWh (2030) — 424,621/MWh (2050)	KRW 153.23 trillion

21 Assuming KEPCO's severe debt and deficit situation

Projected Industrial Electricity Prices (2030-2050)



◦ PPA Scenario Involving Offshore Wind

This scenario assumes not only the deployment of solar PV and offshore wind, but also the inclusion of Energy Storage System (ESS), to mitigate intermittency of renewables.[22]

Generation Portfolio of PPA Scenario Involving Offshore Wind

Solar PV		Offshore Wind		ESS	
Installed Capacity	Total Generation	Installed Capacity	Total Generation	Installed Capacity	Discharge Time
21,166 MW	22,013 GWh	6,036 MW	4516 GWh	5934 MW	4 hours

Given the variability of renewables, a substantial amount of installed capacity would be required to ensure stable power supply around the clock. Nighttime power demand primarily relies on offshore wind, while daytime demand would be met by solar PV, a relatively more affordable option. Under this scenario, it is assumed that Samsung Electronics will procure 24.4%[23] of its power generated from offshore wind facilities and 62.5%[24] from solar PV.[25]

22 In this study, it is assumed that the costs of ESS will be equally shared between Samsung Electronics, the electricity consumer, and KEPCO, the grid operator. Further discussion on the allocation of ESS costs is necessary, considering the low share of renewables in the national energy mix, the 2050 carbon neutrality target, and the increased burden on the power grid caused by large-scale renewable energy projects.

23 Based on a 35% capacity factor for offshore wind

24 Based on a 19% capacity factor for solar PV

25 The remaining surplus electricity will be sold to the grid by renewable energy operators, further contributing to grid decarbonization.

As offshore wind projects take approximately 6-7 years to be completed, it may be unrealistic for Samsung to rely on the new offshore wind projects alone to meet its electricity needs in the Industrial Complex by 2030. However, given that the offshore wind projects exceeding a total of 7 GW are under development in Incheon, it may be feasible to secure power supply by leveraging these projects.

Economic Feasibility of PPA Scenario Involving Offshore Wind

PPA Price	Total Cost of Power (2023-2050)	Benefits Relative to the BAU Scenario (2030–2050)
KRW 270,761/MWh	KRW 150.741 trillion	KRW 2.282 trillion

Under this scenario, the estimated price of PPA amounts to KRW 270,761/MWh. By opting for this method, Samsung can save roughly KRW 2.282 trillion compared to the BAU scenario. The results highlight that even though this scenario involves offshore wind power, typically a higher-cost renewable resource, it nevertheless demonstrates the potential for Samsung Electronics to save overall procurement costs.

◦ Levelized Settlement Scenario for Solar PPA

Levelized settlement is a metric for gauging the average cost of generating one unit of electricity per hour by distributing the total monthly renewable power generation evenly across all hours. The levelized settlement mechanism is currently applied to the third-party PPAs and according to the Korean government's administrative notice, it will be applied to direct PPAs in the future.[26] This approach puts the burden of overcoming the intermittency issues of renewable power generation on grid operators and offers favorable conditions for large-scale renewable energy consumers, such as Samsung Electronics.

Generation Portfolio of Levelized Settlement Scenario for Solar PPA

Solar PV		Offshore Wind Power	ESS
Installed Capacity	Total Generation	N/A	N/A
14,992 MW	24,700GWh		

26 Ministry of Trade, Industry, and Energy. Announcement of a Proposed Complete Amendment to the *Notice on Direct Power Transactions with Renewable Energy Power Suppliers*. February 28, 2025.

Under the levelized settlement scenario, the additional power demand can be fully met with 14.9 GW of newly installed solar PV facilities additional power demand, allowing a swift and affordable renewable energy procurement in the Industrial Complex. According to the 11th Basic Plan, Korea's solar PV capacity will increase from 28.1 GW in 204 to 61.7 GW in 2032, highlighting that such capacity expansion is an achievable goal.

Economic Feasibility of Levelized Settlement Scenario for Solar PPA

PPA Price	Total Electricity Cost	Benefits Relative to the BAU Scenario (2030–2050)
236,243/MWh	KRW 122.537 trillion	KRW 30.486 trillion

The findings from the levelized settlement scenario reveal that Samsung Electronics has to pay an estimated total of KRW 116.7023 trillion to procure power between 2030 and 2050 with the projected PPA price of KRW 236,243/MWh. Compared to the BAU scenario, Samsung could save approximately KRW 30.486 trillion, indicating significant economic benefits.

◦ 50% Solar PV PPA Scenario

The PPA scenario including offshore wind consists of large-scale wind farms, solar PV and ESS, resulting in a relatively higher cost burden for Samsung. Given the lengthy permitting process of offshore wind power projects, it would be realistically challenging to procure sufficient offshore wind power through PPA by 2032. While the levelized settlement scenario allows Samsung to maximize its economic benefits, this would increase operational burden on KEPCO for grid stability, requiring policy discussion is required between KEPCO and the Ministry of Trade, Industry and Energy (MOTIE). As an alternative, a third scenario was designed: a 50% Solar PV PPA Scenario.

Generation Portfolio of 50% Solar PPA Scenario

Solar PV		Grid Capacity	ESS	
Installed Capacity	Total Generation	Total Generation	Installed Capacity	Discharge Time
9948 MW	12,349.5 GWh	12,349.5 GWh	3 GW	4 hours

Under the 50% solar PPA scenario, 50% of the power demand is sourced from 9.9 GW of solar paired with 3 GW of storage.

Economic Feasibility of 50% Solar PPA Scenario

PPA Prices	Total Cost of Power (PPAs + market prices)	Benefits Relative to the BAU Scenario (2030-2050)
229,380/MWh (2030) — 302,023/MWh (2050)	KRW 128.6572 trillion	KRW 24.3658 trillion

Costs of 50% REC Purchases

REC Costs	Benefits Relative to the BAU Scenario Involving REC purchases (2030-2050)
KRW 5.3230 trillion	KRW 19.428 trillion

Since the remaining 50% of the power demand is sourced at KEPCO's electricity prices, the economic benefits will be limited relative to the levelized settlement scenario for solar PPA. Compared to the BAU scenario, however, the economic benefits are projected to exceed KRW 24 trillion. In addition, the required total capacity is lower than in the levelized settlement scenario, thereby enhancing overall feasibility.

To achieve its RE100 targets, Samsung must offset the remaining 50% of its power demand through RECs, which will incur an additional cost of KRW 5.323 trillion. An alternative way to procure renewable power is through equity investments, which may result in greater GHG emissions reductions than REC purchases.

4. Conclusion

The Yongin Semiconductor National Industrial Complex powered by six gas-fired power plants would generate significant GHG emissions, thereby jeopardizing Korea's ability to meet its 2050 carbon neutrality targets. Semiconductors produced with fossil fuels will come with a carbon price tag attached to them and undermine the global competitiveness of Korea's chip industry amid increasingly stringent green trade barriers.

A carbon-neutral semiconductor cluster is achievable if the MOTIE implements policies to accelerate the development of solar and wind resources in nearby regions, facilitate the integration of ongoing renewable power projects with the National Industrial Complex, and support the installation of ESS.

Samsung could procure 3 GW of renewable power to meet its initial power demand, potentially realizing cost savings ranging from KRW 2.282 trillion to KRW 30.486 trillion, depending on the renewable energy ratio and procurement method.

Scenario Comparison

Scenario	Samsung's Benefits Relative to the BAU Scenario	Carbon Emissions Reductions	Necessary Policy Improvements
PPA Scenario Involving Offshore Wind	★	★★★★	1. Streamline offshore wind permitting processes 2. Build transmission infrastructure for offshore wind 3. Ease the separation distance regulations 4. Reform the PPA framework 5. Redesign ESS incentive programs
Levelized Settlement Scenario for Solar PPA	★★★★	★★★	1. Support the adoption of the levelized settlement mechanism 2. Ease the separation distance regulations 3. Reform the PPA regulation
50% Solar PPA Scenario	★★★	★	1. Ease the separation distance regulations 2. Reform the PPA framework 3. Redesign ESS incentive programs
50% Solar PPA & 50% REC Scenario	★★	★★	1. Ease the separation distance regulations 2. Reform the PPA framework 3. Redesign ESS incentive programs

This paper's cost-benefit analysis is based on conservative assumptions and does not account for external social costs arising from the construction and operation of gas-fired power plants, such as carbon emissions and public health risks. A renewable-powered national industrial complex can help reduce these costs while supporting the DS Division of Samsung Electronics in its strategic objective of enhancing competitiveness, making this the most reasonable path forward.

The decision by the Korean government and Samsung Electronics regarding how to power the world's largest semiconductor cluster is not merely a matter of power supply but a pivotal choice that will shape the future of Korea's semiconductor industry and broader economy.

5. Recommendations

To support a renewable-powered Yongin National Industrial Complex, this paper proposes the following policy recommendations:

- The government, power producers, and semiconductor suppliers should establish a task force to repeal the plan to build 3 GW of gas-fired power plants and identify alternative strategies for renewable power procurement.

- The Ministry of Land, Infrastructure and Transport, in collaboration with adjacent local governments, should relax the separation distance regulations and secure suitable sites near the complex for solar development.

- The Ministry of Trade, Industry and Energy should reform the current PPA framework, and KEPCO, as the grid operator, should add flexible assets such as ESS, to actively encourage companies to participate in PPAs.

- Samsung Electronics should expand its use of renewable PPAs and develop a long-term renewable power procurement strategy to meet its 2050 RE100 commitment.

- All relevant stakeholders should reassess the economic and environmental impact of the long-term 7 GW procurement plan and present detailed measures to ensure this capacity is sourced from renewable energy.

6. Appendices

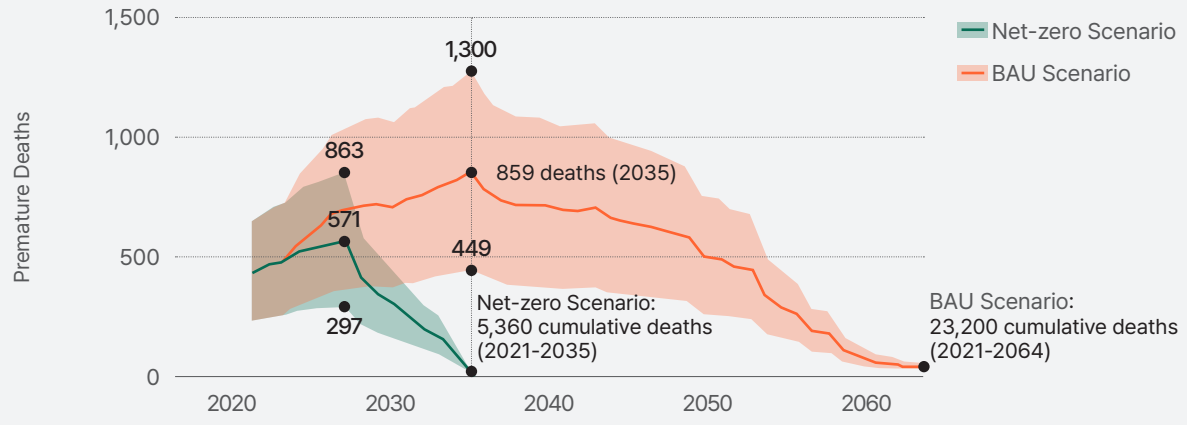
1-1 Annual GHG emissions projections under blue hydrogen co-firing

Total GHG Emissions (10,000 tons)				
Gas Generator Emissions*	Emissions at 50% Co-firing Ratio (A)	Blue Hydrogen Carbon Intensity ($kgCO_2e/kgH_2$)	Blue Hydrogen Emissions (B)	Total (A+B) (Gas vs. Hydrogen Cofiring %)
163.3 (100%)	127.3 (78%)	3.4	11.0	138.3(85%)
		5.2	16.9	144.2(88%)
		7	22.7	150.0(92%)
		5.5	17.8	145.1(89%)
		10.5	34.1	161.4(99%)
		15.4	50.0	177.3(109%)

* Calculations based on GHG emissions detailed in the environmental impact assessment for the construction of Boryeong new combined generator #1
Source: Solutions for Our Climate

Total GHG emissions may increase, as the carbon intensity of blue hydrogen depends on the actual emissions from its production, thereby altering the extent of emissions reductions achieved through hydrogen co-firing.

1-2 Estimated premature deaths attributable to gas power generation



Premature Deaths	medium	minimum	maximum
BAU Scenario	23,200	12,100	35,000
Net-zero Scenario	5,360	2,800	8,070

The number of premature deaths attributable to gas power generation is estimated at 859 for 2035, with the cumulative total projected to reach 23,200 by 2064.

2-1 Assumptions and criteria for solar and wind potential assessment and economic viability analysis

- **Solar PV generation**

Regarding	Key Assumptions
Eligible Sites	Areas located within 25 km radius of the Yongin Semiconductor National Industrial Complex
Separation Distance	For local governments with zoning guidelines: minimum 100 m from a residential property; for those without guidelines: N/A
Legal Constraints	Based on the Korea Energy Agency's *2020 New & Renewable Energy White Paper*
Economic Viability Analysis	Based on the Korea Energy Economics Institute's report, *Establishment and Operation of Long-Term LCOE Forecast System for Expansion of Renewable Energy*
	REC prices are excluded
PPA Returns	7.5% p.a.
Land Costs	Official land price data (area-weighted average by grid cell)
Total Resource Estimate	66 GW

- **Offshore wind generation**

Regarding	Key Assumptions
Eligible Sites	Offshore waters located within 20 km radius of Gyeonggi, Incheon and Chungnam
Legal Constraints	Based on the Korea Energy Agency's *2020 New & Renewable Energy White Paper*
Economic Viability Analysis	The LCOE of offshore wind is assumed to be 50% higher than that of onshore wind, based on the Korea Energy Economics Institute's report, *Establishment and Operation of Long-Term LCOE Forecast System for Expansion of Renewable Energy*
	REC prices are excluded
PPA Returns	7.5% p.a.
Total Resource Estimate	11 GW

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No More Fossil Fuels

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