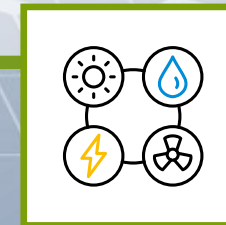
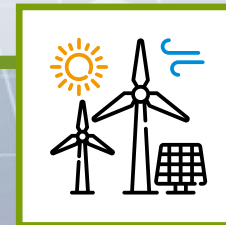


# Biofuels and SAF in Korea

KEEI, Department of Renewable Energy policy Research  
Hyunyoung Oh



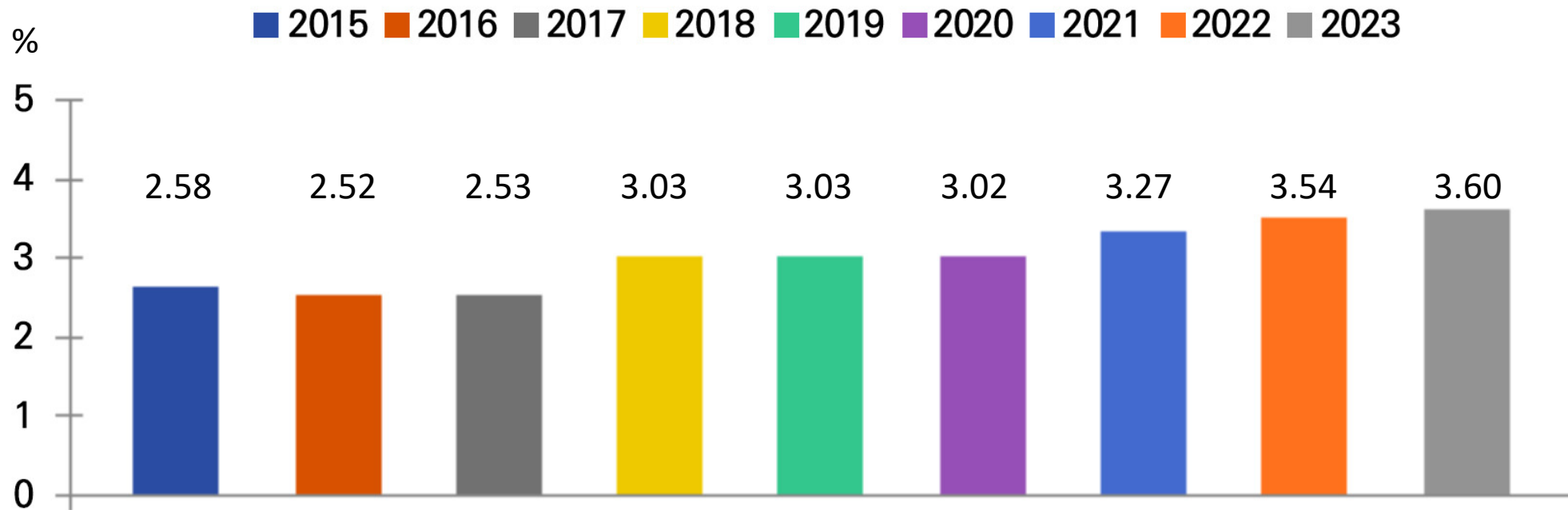
## Renewable Fuel Standard of Korea :

A policy requiring fuel producers or importers to supply **biodiesel** blends with diesel at ratios exceeding the mandatory minimum

### History

- **2002**: Pilot biodiesel supply project implemented in the Seoul metropolitan area
- **2006**: Economywide biodiesel supply project launched
- **2007**: Voluntary biodiesel blending encouraged
  - \* Blending ratios: (2007) 0.5% → (2008) 1.0% → (2009) 1.5% → (2010–2013) 2.0%
- **2012**: Mandatory biodiesel blending introduced (Blending ratio: 2.0%)
- **2013**: Legal obligation for Renewable Fuel Standard (RFS) specified
- **2015**: Mandatory biodiesel blending implemented (Blending ratio: 2.5%)
- **2018**: Blending ratio increased to 3.0%
- **2021**: Blending ratio set to gradually increase to 5.0% by 2030
  - \* Blending ratio: (2021.7–2023) 3.5%, (2024–2026) 4.0%, (2027–2029) 4.5%, (2030 onward) 5.0%

< Yearly Achieved Biodiesel Blend Ratios >

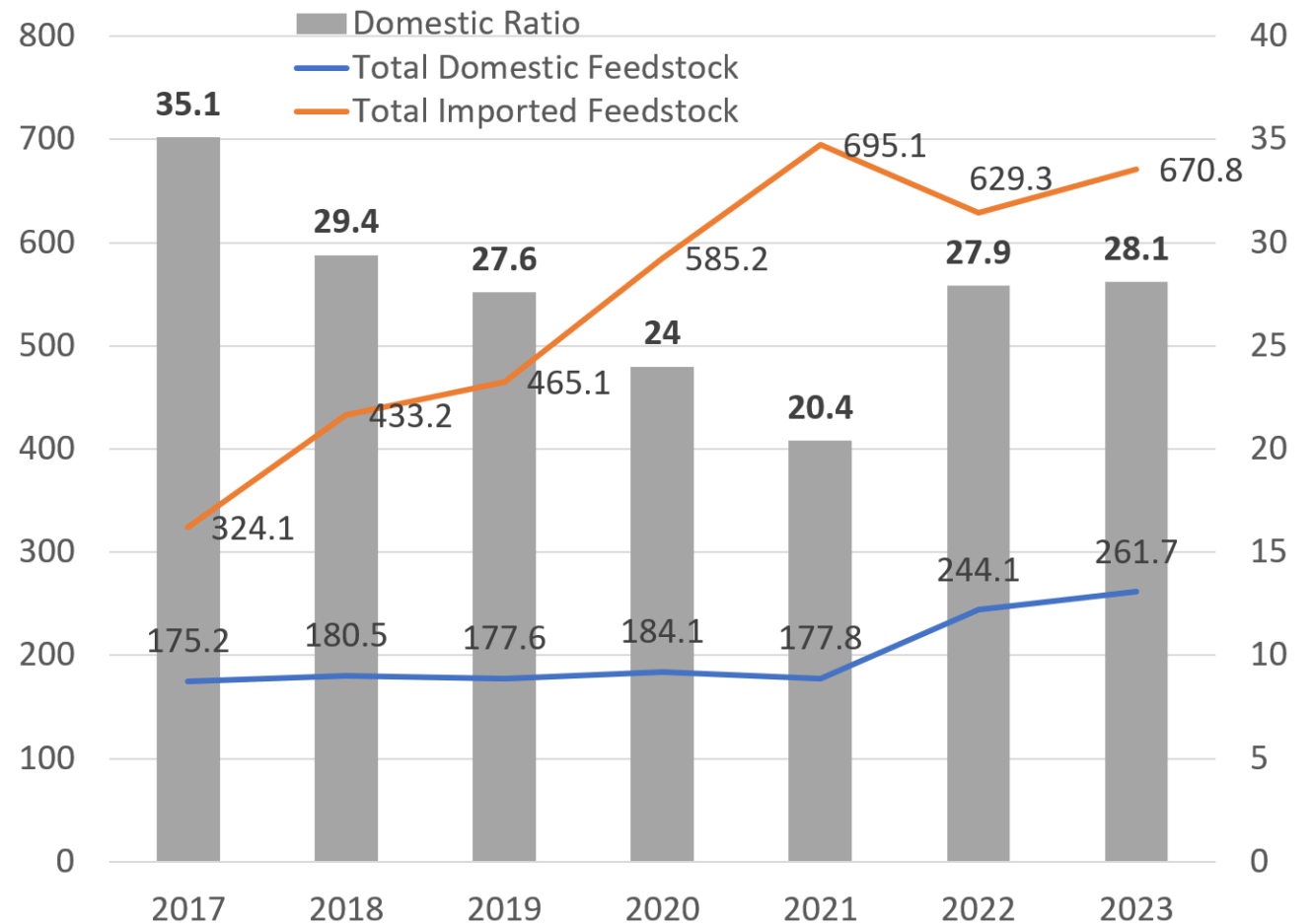


	2023	2024	2025	2026	2027	2028	2029	2030~
<b>Obligation</b>	3.5%	4%	4%	4%	4.5%	4.5%	4.5%	5%
<b>Achieved</b>	3.60%	-	-	-	-	-	-	-

# Biodiesel Feedstock Supply Status

## Limitations in Domestic Feedstock Supply

	2017	2018	2019	2020	2021	2022	2023
Domestic UCO	151.3	162.8	160.9	175.4	174	171.9	165.9
Domestic Animal Fat	21.2	17.1	16	8.7	3.8	45.5	58.5
Other Domestic Feedstock	2.7	0.6	0.7			26.7	37.3
<b>Total Domestic Feedstock</b>	<b>175.2</b>	<b>180.5</b>	<b>177.6</b>	<b>184.1</b>	<b>177.8</b>	<b>244.1</b>	<b>261.7</b>
Imported Soybean Oil	8.2	4.9	1	16	47.9	14.1	12.6
Imported Palm By-products	241.7	250.1	336.7	337	333	398	408.3
Imported Refined Palm Oil	43.7	158.7	97.1	151.3	143.2	140.6	177.7
Imported UCO	14.3	11.4	5.4	65.2	132.8	58.9	40.2
Imported Animal Fat				3.1	6.7	0.9	0.7
Other Imported Feedstock	16.2	8.1	24.9	12.6	31.5	16.8	31.3
<b>Total Imported Feedstock</b>	<b>324.1</b>	<b>433.2</b>	<b>465.1</b>	<b>585.2</b>	<b>695.1</b>	<b>629.3</b>	<b>670.8</b>
<b>Total Feedstock</b>	<b>499.3</b>	<b>613.7</b>	<b>642.7</b>	<b>769.3</b>	<b>872.9</b>	<b>873.4</b>	<b>932.5</b>
<b>Domestic Ratio</b>	<b>35.1</b>	<b>29.4</b>	<b>27.6</b>	<b>24</b>	<b>20.4</b>	<b>27.9</b>	<b>28.1</b>



In early 2024, the law was amended to update the list of alternative fuels to replace petroleum products.

This list under the law indicates the products that Korea aims to promote.

- Biofuels
  - Biodiesel
  - Bio-Heavy Fuel Oil(Bio-HFO)
  - Biojet fuel(Bio-SAF)
  - Biomethanol
  - Bioethanol
- e-Fuels (Renewable Synthetic Fuels)
  - e-Diesel
  - e-SAF
  - e-Methanol
  - e-Gasoline
- Others : Dimethyl Ether (DME), etc.

Land



Sea



Marine Pilot Study of Bio-Heavy Oil and Biodiesel :  
Seven Test Fuels, 40 Hours Each, Total 280 Hours

Type	hours
Marine Gas Oil (MGO)	40
BD 5%	40
BD 10%	40
BD 20%	40
Heavy Fuel Oil (HFO)	40
Bio-HFO 10%	40
Bio-HFO 20%	40

## Marine Pilot Study of Biofuel for International Ships: HFO(70%) + BD(30%)

- Supply of 5,100 MT of Marine Biofuel Meeting ISO 8217 RMG380 Standards
- Completion of 6 Voyages with No Abnormalities Observed in Applied Ships.
- Comprehensive Data Collected on 32 Performance Metrics, Including Main Engine and Generator Safety, Performance, and Defect Analysis.

## Direction for Establishing Quality Standards

- Extensive Data Secured on Biodiesel Quality and Performance. Proposed to Apply Automotive Biodiesel Standards if No Significant Changes in Feedstock or Manufacturing Processes Occur.
- Due to the Characteristics of Bio-Heavy Oil, High Acid Number and Metal Content May Cause Fuel System Corrosion, Filter Blockages, and Reduced Engine Performance. Currently Reviewing Draft Quality Standards Based on ISO 8217.
- Plans to Establish Performance Evaluation Standards for Marine Bio-Heavy Oil, Including 100% Bio-Heavy Oil and Blended Fuels (e.g., 30%), Through Performance and Emission Tests.

In October 2022, the 'Green Biofuel Expansion Plan' introduced the first strategy for SAF supply.

"Bio-jet fuel and bio-marine fuel, not yet commercialized domestically, are undergoing demonstration projects to enable swift adoption in Korea (targeting 2026 for bio-jet fuel and 2025 for bio-marine fuel). To establish a legal framework for new biofuels, research studies will be completed this year, followed by legislative amendments starting next year."

Announced in July 2023 : "Demonstration studies on bio-jet fuel and bio-marine fuel, involving both production and demand sectors, to commence in the second half of 2023."



## Policy Announcement Dedicated to SAF(2024.8.30.)

The Ministry of Trade, Industry and Energy (MOTIE) and the Ministry of Land, Infrastructure, and Transport (MOLIT) jointly announced the "Sustainable Aviation Fuel (SAF) Expansion Strategy" to reduce carbon emissions from international aviation and create new industries at Incheon International Airport Terminal 2 on Friday, August 30, with officials from the oil and aviation industries in attendance.



## Commencement of SAF Commercial Refueling Operations (from 2024)

Starting August 30, 2024, domestic airlines will begin regularly scheduled international flights refueled with domestically produced SAF certified by the ICAO at Korean airports.

Airlines will independently determine the routes, duration, and SAF blending ratios, while refueling will proceed through purchase agreements with domestic refiners.

### < Domestic Airlines Participating in SAF Commercial Refueling Operations in 2024 >

- **Korean Air (from Aug. 30, 2024):** Incheon → Haneda, refueling once weekly with 1% SAF blend.
- **T'way Air (from Sep. 2, 2024):** Incheon → Kumamoto, refueling once weekly with 1% SAF blend.
- **Asiana Airlines (from Sep. 7, 2024):** Incheon → Haneda, refueling once weekly with 1% SAF blend.
- **Eastar Jet (from Oct. 2024):** Incheon → Kansai, refueling once weekly with 1% SAF blend.
- **Jeju Air (from Q4 2024):** Incheon → Fukuoka, refueling once weekly with 1% SAF blend.
- **Jin Air (from Q4 2024):** Incheon → Kitakyushu, refueling once weekly with 1% SAF blend.

With this initiative for commercial refueling operations using SAF, Korea will be listed on the ICAO website as the 20th economy worldwide to implement SAF refueling.

## Promoting Voluntary SAF Utilization through Public-Private Collaboration (~2026)

To expand the use of SAF domestically, an "MOU for the Commercial Use of SAF" was signed on August 30 between the Ministry of Trade, Industry and Energy (MOTIE), the Ministry of Land, Infrastructure and Transport (MOLIT), Korean domestic airlines, domestic oil refiners, Incheon International Airport Corporation, and Korea Airports Corporation.

Participating domestic airlines include nine companies: Korean Air, Asiana Airlines, Jeju Air, Jin Air, Eastar Jet, T'way Air, Air Busan, Air Premia, and Aero K. Participating domestic oil refiners include five companies: SK Energy, GS Caltex, S-Oil, HD Hyundai Oilbank, and Hanwha TotalEnergies.

MOLIT and Incheon International Airport Corporation plan to provide various incentives to promote SAF usage and establish an eco-friendly aviation hub. Proposed measures include "increasing allocation points for international air traffic rights" and "supporting SAF-powered flights at Incheon Airport."

## Mandatory SAF Blending for International Flights from 2027

The Ministry of Trade, Industry and Energy (MOTIE) and the Ministry of Land, Infrastructure and Transport (MOLIT) plan to mandate the blending of SAF at approximately 1% for all international flights departing from Korea starting in 2027.

This initiative follows the International Civil Aviation Organization (ICAO)'s enforcement of the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) as a mandatory regulation for all 193 member economies, signaling strengthened carbon regulations in international aviation.

To minimize the impact of SAF usage mandates on airlines' carbon reduction costs and ticket prices, MOLIT is considering several measures, including improving the allocation method for international air traffic rights, introducing a tentative "Aviation Carbon Mileage System"(to be studied in 2025), and reducing airport facility fees. These efforts aim to support airlines in adapting to the mandatory SAF requirements while promoting eco-friendly aviation.

## Investment Support for Expanding Domestic SAF Production

The government is actively promoting initiatives to expand domestic SAF production. Key measures include:

### Designation as New Growth and Core Technology

- Incentives are being planned to alleviate the burden of high SAF production costs in the future.

## Regulatory Reforms to Broaden Feedstock Range

- Active regulatory reforms are underway to expand the range of SAF feedstocks.
- Upon confirmation of new domestic SAF production facility investments, a dedicated task force (TF) will be established with the participation of relevant ministries, local governments, and industries to provide concentrated support for permits and approvals.

## Advancing SAF Production Technologies with Diverse Feedstocks

- In addition to used cooking oil, the primary SAF feedstock, the government will:
  - Collaborate on investigating overseas bioresources such as animal fats and palm byproducts, which can be utilized with current technologies.
  - Support domestic companies in conducting SAF production demonstrations and quality verifications for desired feedstocks.
- Develop next-generation feedstock technologies, such as:
  - Microalgae.
  - Green hydrogen.
- Strengthen the capability to supply raw materials for SAF production.

## Key Considerations for SAF Mandate Policy

### • Fines for Non-Compliance

- Evaluate new fines or adopt an RFS level
- *Example: The EU imposes fines equivalent to at least twice the cost difference between SAF and fossil fuels.*

### • Flexibility Regulations

- Consider mechanisms such as depositing excess SAF quantities or deferring shortfalls.
- *Example: Norway allows fuel suppliers with SAF quantities exceeding the mandate to transfer the surplus to other suppliers.*
- *Example: The UK permits fuel suppliers to trade compliance certificates and use surplus certificates to meet up to 25% of the following year's requirements.*

### • Price Stabilization Measures

- Explore the need for public sector strategic SAF procurement to stabilize prices.

### • Feedstock Supply Measures

- Analyze the current distribution of HEFA SAF feedstocks used for biodiesel production.
- Develop strategies to secure additional SAF feedstocks domestically and internationally.
- Assess and establish feedstock allocation strategies between SAF and biodiesel production.

## **S-OIL : First Korean Refinery with ISCC CORSIA Certification**

- Certified to produce SAF under the CORSIA scheme (2024.04).
- Additional certifications:
  - **ISCC EU**: Complies with EU Renewable Energy Directive (RED) for low-carbon fuels.
  - **ISCC PLUS**: Recognizes eco-friendly products for voluntary markets.
- Production Highlights
  - Processing bio-feedstocks (e.g., used cooking oil, palm fatty acid distillates)
  - SAF reduces greenhouse gas emissions by up to **90%** compared to traditional jet fuel.
  - Supports decarbonization efforts in the global aviation industry.

## **SK Energy Establishes Korea's First Dedicated Production Line for SAF**

SK Energy has set up the first dedicated production line for SAF in Korea, utilizing the co-processing method.

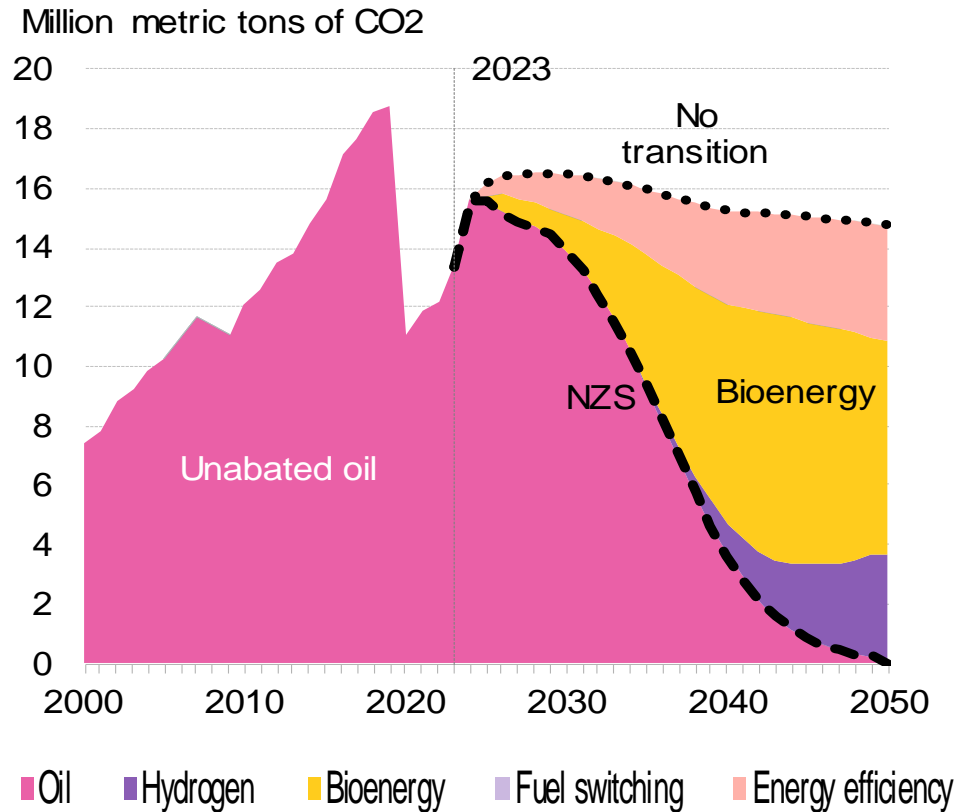
The company is set to begin commercial production in October 2024.

The facility processes bio-based feedstocks such as used cooking oil and animal fats to continuously produce SAF and other low-carbon products.

In June, SK Energy obtained multiple certifications to enable SAF sales, including ISCC CORSIA, ISCC EU, and ISCC PLUS. These certifications ensure compliance with international standards for sustainability and carbon reduction in the aviation sector.

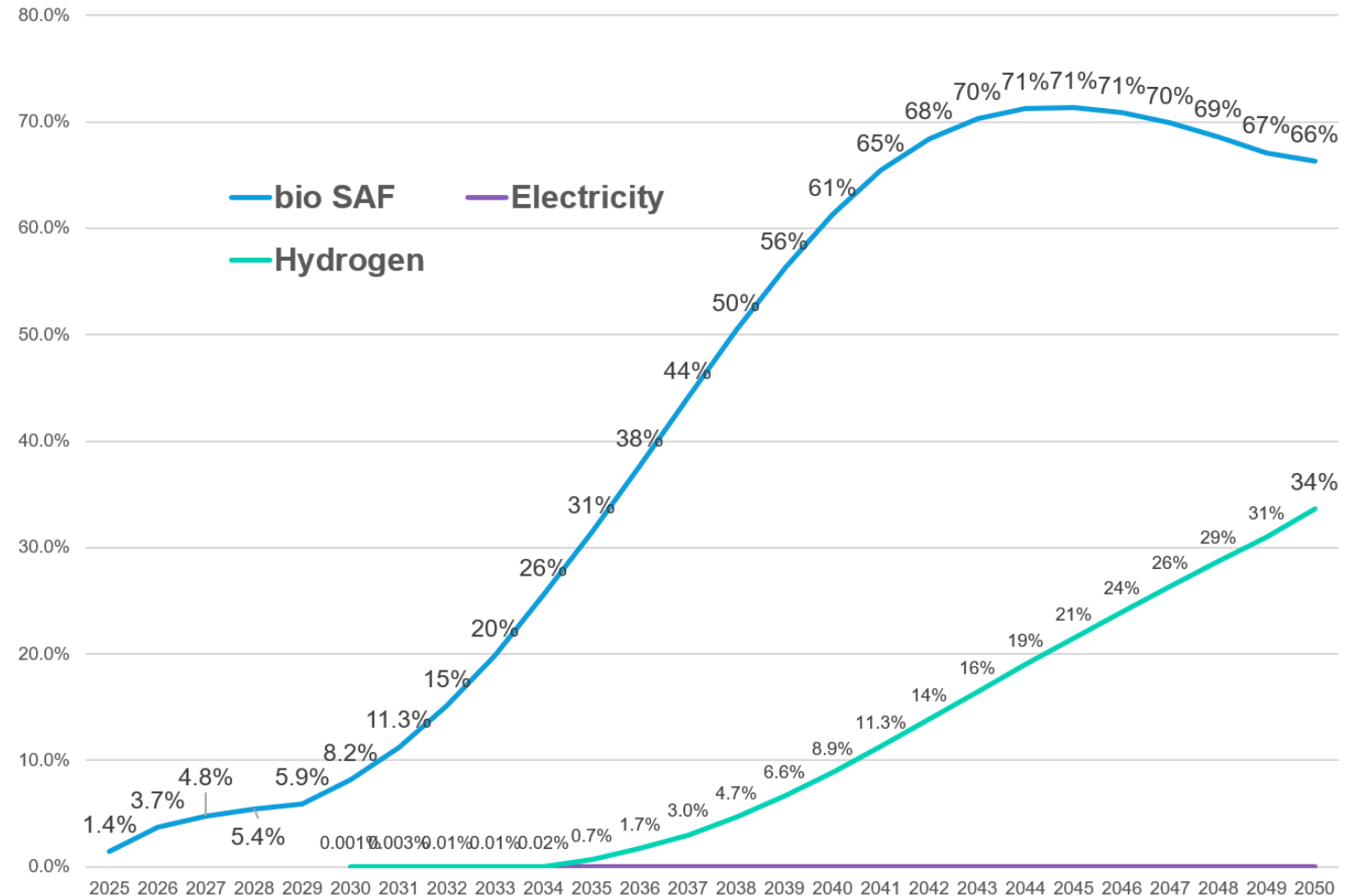
# SAF share for carbon neutrality in Korea

Carbon dioxide emissions abatement in Korea's aviation sector, by technology – Net Zero Scenario versus 'no transition' scenario



Source : BNEF

SAF share for carbon neutrality in the Korean aviation sector





Thank you!