

International Workshop on Promoting SAF Scale-up

Summary Highlights

Innovation Center for Energy and Transportation,
Beijing, China
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Summary

On April 29, 2026, the Innovation Center for Energy and Transportation held an international workshop in Beijing on **Promoting SAF Scale-up**. The workshop brought together representatives from airlines, energy companies, certification bodies, industry associations, research institutions, and international organizations to discuss practical pathways for advancing the sustainable and scalable development of SAF.

The purpose of the workshop was not to produce formal conclusions, but to create a platform for industry representatives to share their first-hand experiences, practical challenges, and professional observations. Four industry representatives shared their views on key issues related to SAF scale-up, including technology pathways, sustainability certification, pricing mechanisms, market incentives, and the development of environmental attribute tracking systems.

Their remarks highlighted that SAF scale-up is not only a technology issue, but also a systems challenge involving feedstock availability, lifecycle carbon accounting, certification alignment, policy support, cost-sharing mechanisms, and market demand creation. Different SAF pathways — including HEFA, ATJ, FT, and PtL — face different opportunities and constraints under current certification and market frameworks.

The discussion also reflected growing industry interest in mechanisms that can better connect SAF use with corporate Scope 3 emissions reduction, green supply chain management, and credible environmental claims. In this context, China’s emerging exploration of a “Book and Claim” system, the Spark Project, was introduced as one example of how environmental attributes from SAF use may be tracked, valued, transferred, and claimed in a more transparent and market-oriented way.

Overall, the workshop provided a valuable opportunity for stakeholders across the SAF value chain to exchange views on the real-world barriers to SAF deployment and the enabling conditions needed for future scale-up. These discussions offer useful reference points for understanding how policy, certification, market mechanisms, and industry practices may work together to support SAF development in China and internationally.

Highlights

1. Feedstock supply and certification have become core challenges for the development of the HEFA pathway

The HEFA pathway is becoming a core pillar supporting the early scale-up of the global SAF industry. However, the structural tensions it reveals also reflect deeper governance and transition challenges in the current process of global aviation decarbonization.

One key issue is that sustainable feedstock is shifting from an “energy resource” issue to a “governance and credibility” issue. HEFA depends heavily on limited feedstocks such as waste oils and fats. Yet the real scarcity is not the base oils themselves, but compliant feedstocks that can meet international certification requirements and provide full traceability. As demand in European

and U.S. markets expands, global competition for resources such as used cooking oil (UCO) continues to intensify. At the same time, controversies over the definition of “waste” attributes, feedstock traceability, UCO fraud risks, and indirect land-use change (ILUC) continue to weaken market trust in sustainability claims. This indicates that the core competitiveness of the future SAF industry will depend not only on production capacity, but also on the ability to establish a credible, transparent, and internationally trusted feedstock-governance system.

At the same time, the global SAF rule system is creating new forms of market segmentation. Different countries and regions are building differentiated certification systems around dimensions such as carbon intensity, feedstock origin, biodiversity, and land use. As a result, SAF is gradually shifting from a standardized energy commodity into a “specific asset” jointly defined by policy and certification rules. Companies not only need to bear the costs of multiple certifications and repeated audits, but also face the possibility that the same product may have significantly different values in different markets. This fragmentation of rules increases transaction costs and may further exacerbate uneven development in the global green fuels market, creating higher institutional barriers for companies in developing countries and for small and medium-sized producers.

In addition, the HEFA pathway highlights a broader challenge in the global transition to green fuels. As one of the few SAF pathways with commercially available and scalable production today, HEFA remains essential for achieving near-term emissions reductions. At the same time, however, its economic viability relies heavily on policy instruments such as blending mandates, tax incentives, and carbon-credit schemes, making market value closely dependent on regulatory support. If capital and feedstock resources continue to flow disproportionately toward HEFA over the long term, investment in next-generation low-carbon pathways such as PtL and ATJ could be constrained, increasing the risk of technological lock-in and slowing broader innovation across the SAF sector.

2. The ATJ pathway is emerging as an important pillar for SAF scale-up, but certification and trade systems require further coordination

The SAF industry is moving from an early industrialization stage represented by HEFA toward a phase that places greater emphasis on scalable supply and economic viability. In this process, the ATJ (Alcohol-to-Jet) pathway is regarded as one of the important routes for achieving large-scale SAF development in the future, given its strong feedstock-expansion potential and mature ethanol industrial base.

Compared with the HEFA pathway, which is constrained by waste-oil resources, ATJ relies on the global ethanol industry and therefore has greater long-term supply potential. The United States, Brazil, India, Japan, and other countries have successively advanced ATJ project development, and the industry is gradually entering a phase of commercial expansion. In particular, existing ethanol industries in the United States and Brazil have significant surplus capacity, providing a realistic feedstock base for SAF and giving ATJ the potential to balance scale and cost feasibility.

The core controversy surrounding the ATJ pathway centers mainly on the sustainability recognition of food-based feedstocks. In recent years, international certification systems have gradually shifted their focus from “feedstock category” toward “lifecycle emissions-reduction performance.”

Some international projects have significantly reduced the carbon intensity of ethanol production through CCUS, renewable energy substitution, and biomass-based heat supply, and have obtained relevant sustainability certifications. This suggests that, under some market and certification frameworks, lifecycle carbon intensity is becoming a more important evaluation criterion than whether the feedstock is food-based.

At the same time, balancing food security, land-use change, and deep decarbonization remains one of the most complex and contested issues in global SAF certification systems. Differences among markets in feedstock scope, certification rules, and emissions-accounting methods are also shaping the development of global SAF supply chains and trade systems.

In addition, the role of ethanol is expanding from a single feedstock for aviation fuel toward a broader set of low-carbon applications, including green marine fuels and green chemical materials. As low-carbon fuel supply chains become increasingly internationalized, cross-border feedstock trade, certification mutual recognition, and green supply-chain rules will continue to grow in importance.

3. The FT pathway places higher demands on the adaptability of existing sustainability certification systems

The FT (Fischer-Tropsch) pathway is regarded as one of the important technology routes for advancing deep SAF decarbonization in the future because of its high lifecycle emissions-reduction potential. Through biomass gasification, coupling with green hydrogen, and clean-power supply, this route can lower the carbon intensity of the fuel-production process and promote resource recycling. In theory, it can meet high emissions-reduction standards.

However, compared with the relatively mature HEFA pathway, the FT pathway involves multiple complex steps, including biomass pretreatment, gasification, synthesis, hydrogenation, and electricity-hydrogen integration. Its industrial chain is longer and its energy-system coupling is more intensive, which places higher requirements on whole-process data management, dynamic carbon accounting, and supply-chain traceability. In particular, with the broad integration of green electricity and green hydrogen, fluctuations in renewable power output create new challenges for production stability and the accuracy of carbon-emissions accounting. Existing certification systems remain limited in their ability to accommodate such dynamic operating conditions.

Current mainstream international sustainability certification rules are mainly built around relatively mature processes. They still lack unified and clear accounting methods for the multi-stage system coupling, real-time electricity-data management, and complex carbon-boundary definitions involved in the FT pathway. As a result, companies pursuing certification need to bear higher data-monitoring, third-party auditing, and compliance costs, while certification outcomes also become more uncertain.

At the same time, commercial practice and certification experience for the FT pathway remain relatively limited. Certification bodies still need to further improve their understanding of relevant processes, auditing resources, and methodological experience. In the absence of mature case experience, how to establish a certification mechanism that balances environmental integrity with industrial feasibility is becoming a key issue for SAF scale-up.

4. The key bottleneck for PtL scale-up is shifting from technology to international certification and rule alignment

The PtL (Power-to-Liquid) pathway is becoming one of the important directions for high-emissions-reduction SAF in the future. However, its industrialization challenges are no longer limited to technological maturity; they are increasingly reflected at the institutional level, including international certification, recognition of green attributes, and market access. Current mainstream international frameworks, especially the EU RFNBO system, impose systematic requirements on PtL fuels covering green electricity, green hydrogen, carbon sources, lifecycle emissions reductions, and traceability systems. This means projects must not only achieve low-carbon production, but also prove the authenticity and sustainability of their emissions reductions at the rule level.

China has a strong resource base for PtL development, including abundant renewable energy resources, concentrated industrial sources of carbon dioxide, and potential large-scale green hydrogen supply capacity. However, resource advantages do not automatically translate into green attributes recognized by international markets. Whether carbon sources such as industrial off-gas and biogenic fermentation gas can be consistently incorporated into international low-carbon fuel systems still faces inconsistencies in definitions, boundaries, and audit standards. At the same time, EU rules around “temporal correlation,” “geographical correlation,” and “bidding zones” differ significantly from China’s current power-market structure, making green-electricity recognition and GHG accounting important sources of uncertainty for Chinese projects.

The complexity of PtL certification also lies in the fact that it is essentially a chain-based certification system covering carbon sources, electricity, hydrogen, transportation, and product flows. Future competition in international markets will depend not only on fuel-production capacity, but also on whether projects have complete, stable, and auditable traceability systems, and whether green attributes can be mutually recognized across different markets.

5. China’s Book & Claim System— the Spark Project

The “Spark Project” is a full-chain, multi-scenario SAF demonstration initiative jointly launched by the Second Research Institute of the Civil Aviation Administration of China (CAAC) and China National Aviation Fuel, together with China Southern Airlines, Sichuan Airlines, China Cargo Airlines, SHEIN, Huarong Chemical, EcoCeres, and other stakeholders across the SAF value chain.

In March 2026, the project completed the fueling of 30 tonnes of SAF across 27 flights at Chengdu Shuangliu International Airport, and for the first time in China established a closed-loop mechanism for SAF environmental attributes, covering the full process from fuel supply and attribute certification to value allocation and circulation.

The core logic of the project is to connect the aviation sector’s decarbonization needs with corporate Scope 3 emissions-reduction needs. At present, SAF prices remain significantly higher than conventional jet fuel, and relying solely on airlines to bear the green premium makes it difficult to establish a sustainable business model. At the same time, more companies are being driven by SBTi targets, ESG regulation, and supply-chain emissions-reduction requirements, and are seeking Scope 3 reduction solutions that cover business travel and air logistics. Against this backdrop, SAF

is not only viewed as a fuel for aviation decarbonization, but is also gradually becoming an important tool for corporate supply-chain decarbonization and sustainability disclosure.

The AnchorTrace platform was developed in response to this need, establishing an integrated system that spans physical fueling, environmental-attribute registration, transaction transfers, retirement claims, and ESG disclosure. By linking SAF environmental attributes directly to actual fuel use, the platform helps ensure that emissions-reduction claims are traceable, unique, and verifiable. It also applies blockchain technology, digital accounting, and online management tools to reduce the risks of paper-based tracking, double counting, and greenwashing that have challenged traditional certification systems.

The project also verified the operational capacity of China's independent sustainability certification system (CSCS). This system benchmarks against CORSIA methodologies while incorporating China's local databases and industrial characteristics, seeking to establish a SAF certification framework that is both internationally compatible and locally applicable. For feedstocks such as waste oils, the project is also advancing a full-chain traceability system "from table to wing" to improve feedstock authenticity and supply-chain transparency.

The Spark Project demonstrates a potential model for distributing the green premium associated with SAF. Corporate users can absorb part of the additional cost to support their own Scope 3 emissions-reduction targets, while airlines gain stronger incentives to increase SAF uptake, and fuel producers and suppliers benefit from more stable demand signals. In this sense, the project represents an important institutional experiment for the future development of China's voluntary SAF market, green supply-chain initiatives, and possible integration with broader carbon-market mechanisms.

Appendix 1. Workshop Agenda

Time	Content
14:00-14:10	Welcome and Opening Remark, An Feng
Session I: Certification Challenges of Major SAF Technology Pathways	
14:10-14:25	Remarks I: Global SAF sustainability certification frameworks: key differences, coordination needs, and technology pathway applicability Qin Lanzhi , Senior Research Fellow, Innovation Center for Energy and Transportation (iCET)
14:25-14:35	Remarks II: Key challenges facing the HEFA pathway under current sustainability certification frameworks Lou Yifang , Head of Overseas Business, Henan Junheng Industrial Group Biotechnology Co., Ltd.
14:35-14:45	Remarks III: Key challenges facing the ATJ pathway under current sustainability certification frameworks Wang Shen , Chief Executive Officer, SAFPAC Ltd.
14:45-14:55	Remarks IV: Key challenges facing the FT pathway under current sustainability certification frameworks Wang Zeshi , Senior Expert, China Power Engineering Consulting Group Co., Ltd.
14:55-15:05	Remarks V: Key challenges facing the PtL pathway under current sustainability certification frameworks Wu Lanting , Director Analyst for SAF Strategy and Commercialization, Envision Energy
Session II: SAF Pricing Support Mechanisms	
15:05-15:20	Remarks I: China's SAF Industry Development under the Dual-Carbon Strategy: Breaking Through and Moving Up Zou Lin , Executive Dean / Professor, Institute of Data Engineering and Behavioral Science, Civil Aviation Flight University of China
15:20-15:35	Remarks II: China's SAF Book&Claim Practice: Introduction to the "Spark Project" Chen Yu , Operations Director, Sustainable Aviation Fuel Development Research Center, The Second Research Institute of CAAC
15:35-15:50	Remarks III: Bridging the SAF cost gap: lessons from the EU ETS and ReFuelEU Camille Mutrelle , Aviation Policy Officer, Transport & Environment
15:50-16:05	Remarks IV: Tax credits and LCFS credit policies: U.S. practices for reducing the SAF green premium Liu Qiyu , Department Head, Rocky Mountain Institute
16:05-16:35	Remarks V: Development of China's civil aviation carbon market Li Jin , Deputy General Manager, Shanghai Environment and Energy Exchange
Roundtable Discussion	

16:35-17:25	From sustainability certification to market - coordinated pathways for scaling up SAF development <i>Moderator: An Feng</i>
17:25-17:30	Closing Summary

Participating Organizations

Chinese name	English translation
中国民用航空总局第二研究所	Second Research Institute of CAAC
中国石油和化学工业联合会	China Petroleum and Chemical Industry Federation
中国质量认证中心	China Quality Certification Centre
中国国际航空公司	Air China
中国电力工程顾问集团有限公司	China Power Engineering Consulting Group Co., Ltd.
中国民用航空飞行学院	Civil Aviation Flight University of China
中石化石油化工科学研究院有限公司	Sinopec Research Institute of Petroleum Processing Co., Ltd.
中国科学院广州能源研究所	Guangzhou Institute of Energy Conversion, Chinese Academy of Sciences
中国信息协会低空分会	Low-Altitude Branch, China Information Industry Association
中粮营养健康研究院	COFCO Nutrition and Health Research Institute
中粮生物科技股份有限公司	COFCO Biotechnology Co., Ltd.
上海环境能源交易所	Shanghai Environment and Energy Exchange
道兰环能	MotionECO
远景能源	Envision Energy
怡斯莱	EcoCeres
亚绿航油有限公司	SAFPAC Ltd.
全球绿色燃料中心	Global Center for Green Fuels
南方航空	China Southern Airlines
落基山研究所	Rocky Mountain Institute
空客中国	Airbus China
河南君恒实业集团生物科技有限公司	Henan Junheng Industrial Group Biotechnology Co., Ltd.
国泰航空	Cathay Pacific
国际清洁交通委员会	International Council on Clean Transportation

波音中国	Boeing China
北京中碳众和认证服务有限公司	Beijing Ecological Quality Certification Co.,Ltd.
北京首钢朗泽科技股份有限公司	Beijing Shougang LanzaTech Technology Co., Ltd.
北京大学能源研究院	Institute of Energy, Peking University
北京商务航空协会	Beijing Business Aviation Association
北京绿色交易所	Beijing Green Exchange
海德氢能	Hyde Hydrogen Energy
深圳易阳投资	Shenzhen Yiyang Investment Co., Ltd.
万空智联	Wankong Zhilian
天风证券	Tianfeng Securities Co., Ltd.
气候工作基金会	ClimateWorks Foundation
能源基金会	Energy Foundation
Transport & Environment	Transport & Environment
SCS Global Services	SCS Global Services
PAC 公司	PAC
DHL	DHL

Note: English organization names are translated for readability. Where an official English name is commonly used, that version has been retained.