



Demonstrating lower polluting solutions for sustainable airports across Europe

GRAND AGREEMENT NO. 101036996

START DATE 01.01.2022

END DATE 31.12.2025

D5.4

Final structure of the EU-CH

REVISION	ORGANIZATION & PERSON	DATE
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<i>Approved by</i>	SNBV – Fokko Kroesen	24/12/2024

Public

DUE DATE OF DELIVERABLE: 31/12/2024 (M36)

SUBMISSION DATE 11/07/2025

Submitting Partner: Politecnico di Torino, Italy



The project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement nr 101036996. Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Climate, Infrastructure and Environment Executive Agency (CINEA). Neither the European Union nor the granting authority can be held responsible for them.



I. DELIVERABLE INFORMATION

Deliverable Number	D5.4
Deliverable Title	Final Structure of the EU Clearing House
Work Package	WP 5
Date of Issue	11/07/2025
Version Number	V3
Nature of Deliverable	Report
Dissemination Level (Public / Confidential)	Public

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Keywords	Clearing House, ASTM certification, SAF

Abstract

In the framework of the TULIPs project, the partners involved in the Task 5.4 committed to investigate a potential draft structure for a European Clearing House (EU-CH). According to existing experiences, a fuel Clearing House is an organisational structure, already adopted in the US, and recently launched within the UK, to speed up the certification process for aviation alternative fuel producers, under the relevant ASTM standards.

This report summarise the findings of the work performed by studying the existing US-CH, and by engaging sector stakeholders.

The summary reports the TULIPs proposal for implementing an EU-CH, highlighting the main differences with the US-CH, and suggesting an organisation structure, tailored for the EU27 (+UK) region.

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II. DOCUMENT HISTORY

Date	Version	Modified by	Remarks
05/03/2024	v.1	M.Prussi and D.Chiaramonti	-
31/07/2024	v.2	M.Prussi and D.Chiaramonti	
5/11/2024	v.2	Revised by MMU: Simon Christie	
02/12/2024	v.2	Revised and approved by SkyNRG	
16/12/2024	V2.1	Finalised by POLITO	for Coord. Approval
24/12/2024	V2.2	Approved by SNBV – Fokko Kroesen	
09/07/2025	V3	M.Prussi and D.Chiaramonti	EU feedback processed .



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VI. LIST OF ACRONYMS

Acronym	Meaning
ASCENT	US Center of Excellence for Alternative Jet Fuels and Environment (ASCENT)
BETO	US Bioenergy Technologies Office
CAAFI	Commercial Aviation Alternative Fuels Initiative
CH	Clearing House
EASA	European Aviation Safety Agency
EU	European Union
EU-CH	European Clearing House
FAA	Federal Aviation Administration
GC x GC	2 Dimensional Gas Chromatography
HEFA	Hydroprocessed Esters and Fatty Acids
OEM	Original Equipment Manufacturer
RFNBO	Renewable Fuels of Non-Biological Origin
SAF	Sustainable Aviation Fuel
SWRI	Southwest Research Institute
UDRI	University of Dayton Research Institute
US	United States of America
US-CH	United States Clearing House
UK-SAF-CH	United Kingdom Sustainable Aviation Fuel Clearing House



1 Goal and scope of the TULIPs task 5.4

According to the signed Grant Agreement, the partners involved in task 5.4 committed to propose a draft structure for the implementation of a European Clearing House, by investigating existing experiences, named the US Clearing House initiative. The structure of the recently launched UK SAF Clearing House is also considered but with a reduced emphasis as the operations of this entity are less established. In particular, this task aims at:

- Draft a statute (if applicable) and an organisational structure for a EU-CH.
- To achieve the goal sets in the task, all relevant EU stakeholders must be involved in the preparatory discussions. Stakeholders engagement will be used to gather useful information about the need of the sector, other on-going initiatives, and draft harmonised strategies.
- Develop a TIER 0 methodology to support the certification process, largely building on the previous experiences and results of EU-founded initiatives (namely the JETSCREEN project).
- Develop a database to capture new developments in SAF, EU relevant facilities for ASTM certification, availability of consultant/experts in the domain of environmental sustainability of biofuel process, biofuels economics, policies, etc.
- Engaging with the US-CH, strengthening the contacts with CAAFI and US-CH.
- Cross-project cooperation on development of a EU-CH.

The main scope of the EU-CH is to develop a long-term (beyond current TULIPS project timeframe) strategy to establish the EU Clearing House.



2 Background

Commercial development stages and challenges vary among Sustainable Aviation Fuel (SAF) technologies, each following distinct timelines toward large-scale deployment. The HEFA, for instance, already has a significant commercial scale production capacity, while Advanced biofuels and Renewable Fuels of Non-Biological Origin (RFNBOs) are currently produced only at demonstration levels.

In 2020, the European Commission launched the ReFuelEU, aiming to boost the supply and demand for sustainable aviation fuels in the EU to reduce the environmental impact of aviation. Central to ReFuelEU is a SAF mandate requiring progressively higher blends, starting from a 2% blend in 2025 and increasing to a 63% blend by 2050. Despite ambitious plans to scale up production, concerns remain about the adequacy of current pathways and feedstock to meet escalating mandates and reduce lifecycle emissions over time. Therefore, there is a need to not only expand production from existing processes but also to introduce and certify novel production processes to ensure commercially viable SAF supplies

Both fuel producers and airlines recognize the absolute need to diversify production pathways and feedstock to develop a portfolio of several innovative, sustainable, and cost-effective solutions to effectively decarbonize aviation. Numerous pathways are currently undergoing approval processes, with more expected in the future. Nonetheless, fuel approval entails lengthy and costly procedures, posing a potential barrier for producers.

Presently, conventional fossil-based civil aviation Jet A-1 fuel respect the specifications of the UK's DEF STAN 91-91 and the American Society for Testing and Materials (ASTM) D1655. In June 2009, ASTM International released the ASTM D7566 Standard Specification for Aviation Turbine Fuel Containing Synthesized Hydrocarbons, serving as the primary reference for approving new alternative fuel pathways in aviation. This standard has evolved to address the challenge of incorporating new feedstocks, processing methods, and blend ratios compatible with airport fuel distribution systems and civil aircraft fleets. New pathways are evaluated according to the ASTM D4054 Standard Practice, with rigorous testing conducted on blendstocks and final blends to ensure compliance with established standards. Recognizing the obstacles posed by the fuel approval process, the United States established a D4054 "Clearing House" to provide guidance, facilitate and support emerging fuel technologies. The initiative involved the establishment of two new entities: an US Clearing House (established at Dayton University) and a stakeholder forum, which is the Commercial Aviation Alternative Fuels Initiative (CAAFI) in the US. The Clearing House would support and guide the new applicants through the ASTM qualification process and address approval barriers, while the stakeholder forum would tackle broader obstacles to increased SAF adoption, such as high costs during early commercialization stages of innovative paths.



In 2019, the European Aviation Safety Agency (EASA) recommended establishing a European Clearing House modeled after the US Clearing House to address similar functions. Following a Commission Decision in 2022, EASA was tasked with developing and evaluating the setup of a European Clearing House for SAF.

2.1 What is a Clearing House

A clearing house is an entity established to facilitate and streamline processes within a particular industry or sector. In the context of sustainable aviation fuels (SAF), a clearing house serves as a central hub responsible for coordinating and overseeing the approval and adoption of new alternative fuel pathways for aviation. It acts as a support system for fuel producers by providing guidance, conducting or coordinating necessary tests, and offering financial assistance for research and development efforts. Additionally, a clearing house collaborates closely with regulatory bodies and stakeholders to ensure compliance with established standards and addresses barriers to SAF adoption. Essentially, it helps to navigate across the complex approval process, thereby accelerating the commercialization and deployment of sustainable aviation fuels.

The Clearing House plays a crucial role in supporting the growth and development of the sustainable aviation fuels (SAF) market, particularly in the context of meeting ambitious mandates and demands for SAF. As the SAF market needs to significantly expand from its current state to meet projected demands, the Clearing House serves as a key entity in de-risking SAF supply.

Key roles of a Technical Facilitation Initiative (Clearing House) include:

- Providing expert advice to prospective SAF producers on the approval process, including pre-screening tests, and assessing compatibility with existing pathways.
- Funding and conducting early testing under approval standards, arranging tests with appropriate facilities, interpreting results, and assisting in research report production.
- Serving as a single point of contact with Original Equipment Manufacturers (OEMs) and providing funding for research report reviews.
- Facilitating increased stakeholder engagement among EU-based fuel producers, operators, specification authorities, and OEMs.

2.2 How the Clearinghouse is implemented in US

In the United States, two primary organizations play key roles in promoting and facilitating the increased adoption of Sustainable Aviation Fuels (SAFs): the Commercial Aviation Alternative



Fuels Initiative (CAAFI) and the US Clearing House. CAAFI serves primarily as a stakeholder forum, bringing together diverse parties such as fuel producers and airlines to advocate for and facilitate the expanded use of SAFs. It addresses a range of environmental, technical, and commercial issues related to SAF adoption. On the other hand, the US Clearing House focuses on supporting fuel producers through the rigorous technical approval process required for SAFs.

CAAFI was established in 2006 as a public-private partnership by four organizations representing various sectors of the aerospace industry: the Federal Aviation Administration (FAA), Airports Council International, North America (ACI-NA), Airlines for America (A4A), and the Aerospace Industries Association (AIA). At its inception, the FAA had programs addressing aircraft noise and emissions, but lacked a coordinated effort focused on energy sources and environmental impact. CAAFI was founded to fill this gap, concentrating initially on alternative jet fuels and promoting SAF development across the supply chain, from feedstock to end use.

Over time, CAAFI's membership has expanded significantly to include a broad spectrum of stakeholders, including feedstock producers, fuel producers, testing facilities, academic institutions, and public bodies. Initially organized into four workgroups, this structure remains in place today. While it's challenging to isolate direct benefits attributable solely to CAAFI, its role in fostering collaboration among stakeholders and presenting a unified message regarding SAF promotion and development has been clear.

Some notable advancements facilitated by CAAFI include:

- Spearheading efforts to establish cost-effective and rapid evaluation and approval processes for new sustainable blendstocks, in collaboration with FAA and ASTM stakeholders.
- Collaborating with the FAA and ASTM to establish the US Clearing House, which guides fuel producers through approval processes and provides funding for tests.
- Developing frameworks such as Fuel Readiness Level (FRL) and Feedstock Readiness Level (FSRL) to track SAF and feedstock development consistently.
- Establishing public-private partnerships with federal agencies like the US Department of Agriculture (USDA) and Department of Energy (DOE), leading to initiatives like Farm to Fly, which pool resources to develop SAFs.
- Facilitating SAF off-take agreements, such as the agreement between JetBlue and Neste, demonstrating commitments to purchasing SAF for use on domestic flights.

These accomplishments highlight the significant contributions of CAAFI and the US Clearing House in advancing SAF adoption and development in the United States.



The US Clearing House was established in 2016 under the Federal Aviation Administration's (FAA) Center of Excellence for Alternative Jet Fuels and Environment (ASCENT) program. The US Clearing House operates from the University of Dayton Research Institute (UDRI).

According to the first meeting held between TULIPS WP5 team (in particular, Politecnico di Torino) in Washington in June 2022 (further reported in details in the next paragraphs), it resulted that the US-CH has no legal status, while this is the case of the ASCENT programme¹, under FAA funding.

The ASCENT is the Center of Excellence for Alternative Jet Fuels and Environment of the Federal Aviation Administration (FAA). The programme is coordinate by Washington State University is coordinating the Ascent programme. The ASCENT programme issues Calls to Universities that can participates to the Programme.

The US-CH has been assigned to Univ of Dayton Research Institute (UDRI), which run the programme in close link with CAAFI (a Public-Private Partnership (PPP)). The most of the actions carried out by UDRI-CAAFI cover:

- pre-screening, Tier 1 and possibly some selected Tier 2 verifications.
- OEMs carry out a large part of the work and evaluate Tier 1-2 and Tier 3-4 reports.

In the US-CH, industries do not pay for the ASTM process, but they deliver the fuel for testing in relevant amount.

Prior to the Clearing House's establishment, alternative jet fuel certification activities were conducted primarily at institutions such as the US Air Force Research Labs (ARFL), UDRI, and the Southwest Research Institute (SWRI), often on an ad-hoc basis. The Clearing House was formed to streamline the certification process and reduce barriers for new fuel certification.

UDRI was selected as the base for the Clearing House due to several factors, including its extensive experience and investment in SAF testing facilities, its proximity to Wright-Patterson Air Force Base for access to additional equipment, and its status as an academic institution, allowing FAA funds to flow through the ASCENT program.

The Clearing House has played a crucial role in reducing barriers to new fuel certification, as evidenced by the increasing number of fuel producers seeking to produce SAF. Key benefits include:

- Funding: With support from the FAA's ASCENT program, the Clearing House finances Tier 1 and Tier 2 testing of fuels and directly funds OEM reviews of research reports, alleviating financial burdens for fuel producers.

¹

https://www.faa.gov/about/office_org/headquarters_offices/ang/grants/coe#:~:text=FAA%20Air%20Transportation%20Centers%20of%20Excellence%201%20Background.,Funding%20Levels.%20...%206%20Self-Sufficient%20National%20Resources.%20



- Process simplification: Acting as a central hub, the Clearing House streamlines communication with stakeholders and provides access to testing facilities and skilled personnel, simplifying the certification process for fuel producers. Additionally, it is developing pre-screening tools to reduce early fuel evaluation costs and risks.
- Expert guidance: The Clearing House offers expert advice and guidance on the certification process, assisting producers in adjusting fuel compositions or production processes to align with existing ASTM standards.
- Time savings: By subcontracting OEMs to review research reports, the Clearing House helps manage delays caused by OEM resource availability, although fuel production volume remains a significant factor affecting testing timelines.
- Fuel savings: Through its experience and testing expertise, the Clearing House has generally reduced the fuel volume required for testing. However, varying fuel characteristics still dictate testing volumes, and producers must demonstrate plans to scale production to commercial volumes despite reduced testing fuel requirements.

With respect to the initiatives supporting the development of innovative feedstock to alternative fuel pathways, it has to be noted that in US the development of SAF is not limited to ASCENT, and facilitated by US-CH: there are other programmes (e.g. BETO, etc) supporting the industry to develop demos able to deliver the required amounts of fuels.

On a more practical ground, the US Clearing House is the recommended 1st contact for applicants, which wants to consider developing and qualifying a new Sustainable Aviation Fuel (SAF). The UDRI leads the pre-screening phase. The FAA funding supports both UDRI and SWRI work, in particular the FAA funding covers also the OEM work.

Besides these initiatives, it is worth mentioning that the CLEEN programme² provides significant funding to OEMs.

² https://www.faa.gov/about/office_org/headquarters_offices/apl/research/aircraft_technology/cleen



Table 1. Summary of the main elements of the US Clearing House

	US-CH	ASCENT
Status	No legal status	Legal status
Funding	FAA	FAA
Coordination	Dayton Research Institute (UDRI)	Washington State University and MIT
Key Partners	FAA, SWRI, CAAFI	
Main Actions	· Pre-screening, Tier 1 and Tier 2 verifications. Coordinating Tier 3 & Tier 4 testing with relevant OEM. · OEM carry out a large part of the work and evaluate Tier 1-2 and Tier 3-4 reports. => The US-CH is a recommended 1st contact for applicants, which wants to consider developing and qualifying a new Sustainable Aviation Fuel (SAF). => The UDRI leads the pre-screening phase. The FAA funding supports both UDRI SWRI work, in particular the FAA funding covers also the OEM work	Research program aiming at achieving net-zero emissions by 2050, enabling a dramatic expansion of sustainable aviation fuel (SAF) production, reducing the number of people exposed to significant noise around U.S. airports, and reducing significant air quality impacts attributable to aviation.
Notes	In the US-CH, the industries do not pay for the ASTM process, but they deliver the fuel for testing in relevant amount.	Not focusing only on SAF but also to other relevant environmental impacts from aviation (e.g. noise, etc.)
Reference		https://www.faa.gov/sites/faa.gov/files/2022-05/AJFE_Fact_Sheet_2022.pdf



2.3 The on-going EU initiatives

The initiative for establishing a European Clearing House for Sustainable Aviation Fuels (SAFs) has progressed significantly in the last years. Recognizing the challenges posed by the fuel approval process, the United States implemented a D4054 'Clearing House' to provide guidance, coordinate necessary tests, and fund OEMs' reviews of research reports, effectively streamlining the certification process. In alignment with this approach, the 2019 European Aviation Safety Agency (EASA) study recommended the creation of a European Clearing House modeled after its US counterpart. Subsequently, following a Commission Decision in July 2022, EASA was tasked with developing and evaluating the setup of a European Clearing House for SAFs.

As part of this initiative, established testing facilities across Europe, including the UK, were identified to assess their capabilities for conducting tests required for SAF certification, based on ASTM standards D1655, D7566 and D4054.

In 2023 the EASA launched a tender for "EASA.2023.HVP.15: European Clearing House for Sustainable Aviation Fuels (SAF)", won by RICARDO (www.ricardo.com/en). The scope of the EASA study, titled "European Clearing House for Sustainable Aviation Fuels (SAF)", involves the development, implementation, and evaluation of a European Clearing House concept aimed at supporting the approval of new Sustainable Aviation Fuels (SAF) within the ASTM process. The main activities include pre-screening of new fuel and production process projects, navigating producers through the fuel approval process, assisting producers in product development stages, contributing to streamlining the existing fuel approval process, and evaluating the effectiveness of the Clearing House. Specific services required include establishing an efficient EU test coordination mechanism, engaging with other Clearing Houses, coordinating testing activity, evaluating the Clearing House's effectiveness, and supporting targeted outreach campaigns.

2.4 The UK initiative

In parallel to the EU initiative, the UK Government has made substantial progresses in establishing an initiative focused on Sustainable Aviation Fuels (SAF), particularly with the creation of a Clearing House. In November 2020, the government announced an £18 million investment to support SAF production and deployment, allocating £3 million specifically for the Clearing House.

The primary objective of the UK SAF Clearing House is to provide support to UK stakeholders and producers involved in the SAF sector.

Currently, the Department for Transport is in the process of conducting further due diligence and finalizing the operational framework of the Clearing House before its formal launch.



There is a clear understanding of the benefits of cooperation with other stakeholders, including the US Clearing House and potentially an EU Clearing House in the future. Significant collaboration has already taken place during the early stages of the UK Clearing House's development, and this cooperative approach is expected to continue. As both the UK and EU counterparts evolve, dialogue and coordination are anticipated to ensure cooperation, prevent duplication, and capitalize on each entity's strengths. Ultimately, these Clearing Houses aim to collectively enhance the global capacity to approve new SAFs, playing a vital role in decarbonizing the aviation industry.

The agenda of the UK clearing house can be found at <https://www.safclearinghouse.uk/>



3 Specific activities carried out under the TULIPs project

Within the framework of the TULIPs project, various activities have been undertaken to advance the understanding and collaboration in the field of Sustainable Aviation Fuels (SAF). Among these activities, relevant meetings and stakeholder interactions have played a pivotal role in fostering dialogue, exchanging insights, and identifying opportunities for collaboration.

Following preliminary calls with CAAFI and EASA, one of the most significant step in TULIPS was the participation of the POLITO team in the bi-annual CAAFI meeting on SAF held in Washington, USA, from 1st to 3rd June 2022. The primary objective of this mission was to establish connections with key entities such as the US Federal Aviation Administration (FAA), CAAFI, and to gain updates on policy, programs, and the operational aspects of the US Clearing House (US-CH). As reported in the previous paragraphs, the outcomes of this engagement provided valuable insights into various aspects, including the organizational structure of the Presidential Gran Challenge Programme, the status of US-CH activities, and ongoing industrial initiatives in the United States related to the supply chain and sustainability assessment.

Additionally, participation in an international panel with representatives from Canada, the UK, Australia, and Germany facilitated a broader perspective on global SAF initiatives. Importantly, it became evident during the meeting that the governance structure and socio-economic organization in the EU region significantly differ from those in the US, necessitating adaptation and re-thinking for the transferability of US approaches to the European context.

Furthermore, extensive calls and meetings were conducted by partners involved in task 5.4, engaging with various stakeholders to discuss collaboration opportunities and gather feedback. Notable interactions include discussions with SkyNRG and the European Commission's MOVE and RTD directorates, aimed at outlining the project's approach, reporting initial contacts with regulatory bodies such as EASA and CAAFI, and seeking feedback. Similarly, engagements with CAAFI, EASA, Trinity College Dublin, and other project partners served to exchange information, coordinate actions, and explore potential avenues for cooperation in advancing SAF initiatives.

These activities collectively underscore the commitment of the TULIPS project consortium to advancing the SAF agenda through proactive engagement, collaboration, and knowledge sharing with relevant stakeholders and organizations at both national and international levels.



3.1 Relevant meetings

3.1.1 The 2022 CAAFI meeting (Washington, USA, 1-3/6/2022)

The scope of this mission, carried out by POLITO team, was to participate to the bi-annual CAAFI meeting on SAF. To initiate liaisons with US Federal Aviation Administration (FAA), CAAFI, and the get updates on policy, programmes, industrial status, info on the US-CH.

As main outcomes of this mission can be reported:

- A better insight on the US-CH operative aspects
- The better understanding of the Presidential Gran Challenge Programme: organizational structure (MOU among USDA-DOE-DOT), status and next steps.
- The status of the US-CH activities.
- The on-going industrial initiatives in the US: from supply chain to new industrial projects to resource and sustainability assessment.

The POLITO team also participated to the International panel with Canada, UK, Australia (reported by CAAFI) and Germany.

Among the main take-home from this meeting, it is worth stressing that clearly emerged that the EU region significantly differs from the US, in particular regarding governance structure, socio-economic organization, funding programmes, etc. In particular, the MOU signed by USDA-DOE-DOT to address the SAF issue under the implementation of FAA is paradigmatic³. This makes the US approach not directly transferable to EU: some re-thinking and adaptation will be needed.

An agreement with US counterpart would definitely help to accelerate the deployment of the EU-CH.

3.1.2 Other calls and stakeholder interactions

The partners involved in the task 5.4 engaged in many calls and meeting with relevant stakeholder, among others, it worth to be reported:

- SkyNRG+EC RTD - 31/01/22: To discuss with RTD the overall approach, explain the first steps, report the first contacts with EASA and CAAFI, get a first RTD feedback;
- CAAFI - 20/01/22: To understand the US-CH structure and (legal) organization, main activities, supporting programmes, and how the US-CH concept could be adapted to EU conditions;
- EASA - 19/01/22, 8/3/22: To get mutual information on ongoing actions (EASA & TULIPS), identify possible opportunities for collaboration.

³ https://www.energy.gov/sites/default/files/2021-09/S1-Signed-SAF-MOU-9-08-21_0.pdf



- Trinity College Dublin & SkyNRG - 5/4/22: Interested to join the initiative
- Partners of the task - 28/4/22, 17/6/22: Inform about the action take, and first outcome. Coordinate future steps.
- SkyNRG participates in the bi-annual ASTM D02 meeting week held at different locations throughout the US in June and December.
- Staff at MMU and POLITO contribute to ASTM D02 committee activity and the development of fuel standards. In addition, MMU maintains close links with the UK-SAF-CH and has a position on their advisory board.

MMU has worked as part of the UK Jet Zero Council mandate and technology groups to pursue the wider EU+1 regional push for the adoption of SAF.



4 The TULIPs proposal for an EU-CH

The TULIPs project recommend an European Clearing House (EU-CH) structure tailored to the specific needs and specific characteristics of the European region, building upon insights gathered from ongoing initiatives and stakeholder exchanges. Recognizing the key differences between the European and US contexts, the proposal outlines a network-based structure, leveraging the coordination of laboratories and competences across EU member states and the UK.

Similar to the US-CH model, the EU-CH would not necessarily need to adopt a legal status, while a Consortium Agreement-like framework could be envisioned for members' engagement and data management.

Key aspects of the proposed EU-CH include its role in providing technical support, facilitating access to pre-screening tools, experimental testing and process technologies, knowledge transfer, and industrial status updates to EU policymakers (a fundamental add-on characteristics of the EU-CH, with a special focus on Sustainability and the impact of sustainability policies and regulations on sector development), potentially working in collaboration with regulatory bodies such as the European Aviation Safety Agency (EASA).

The EU-CH should also support the development of a database to ensure the smooth, effective and proactive operations of the EU-CH to cover the new developments in SAF, the EU fuel test facilities relevant for ASTM certification, and to hold a list of consultants/experts in the domain of environmental sustainability of biofuel processes, biofuel economics, policies and its market.

This introductory framework sets the stage for further discussions and developments in establishing a robust EU-CH structure to advance sustainable aviation fuels within the European region.

4.1 First approach towards the development of a TULIPs proposal

On the basis of the collected information about on-going initiatives, stakeholder exchanges, etc., the **main elements** that emerged for **drafting** a potential **structure** for an **EU-CH** are:

- Given the peculiarities of the EU region, the **US-CH approach cannot be simply replicated, but needs to be adjusted to EU specificities.**
- The **EU-CH could be a kind of EU Network**, which coordinate a group of:
 - **laboratories and**
 - **competences;**
- The suggested **funding scheme** for the EU-CH **should combine in a coherent and coordinated manner the many different EU programmes**, such as (among others):



Horizon Europe, Innovation Funds, InnoFin, European Innovation Council, EU regional funds, BEI funding, etc

- A **key point** would be to provide suggestions and recommendations on how to **organize and harmonise these programmes**, which requires coordination, roles definition, and implementation **among several EC Directorates**, such as (at least) **RTD, ENER, MOVE, CLIMA and AGRI**. Other Directorates could also be part of the possible funding programme, given the International dimension of the aviation sector and the commodity characteristic of the jet fuel market.
- In addition to providing guidance and technical support to stakeholders engaged in the certification process, the **EU-CH** could aim at **providing a third-party technical support, knowledge transfer, update of industrial status to EU policy makers**, drafting and revise/update programmes and implementation plans.
- **PoliTO** would be **available to participate and/or coordinate the EU Network**, being already heavily involved into ICAO-FTG (CORSIA and LTAG), ECAC, and IT ministries support: PoliTO has been hosting in Turin several aviation and aerospace industries, and other related activities.

4.2 Proposal for a EU-CH structure

The core idea of this first attempt to propose a EU-CH structure is based on the idea to **create a EU+UK Network**, with coordinator and partners, **deploying laboratories and competences**. Similarly to the US-CH, **no legal Status has to be adopted** for the scope.

A **Consortium Agreement-like approach** could be **sufficient** for binding members and ensuring non-disclosure, confidentiality, and data/info management, an essential condition given the fact that the EU-CH will operate on market-sensitive information, as developed by the industrial stakeholders.

The first proposed structure for the EU-CH is drafted in Figure 4.1 .

Possible **funding mechanisms** (after the conclusion/beyond TULIPS and EASA initiative) will have **to be investigated to ensure a long-term, reliable running** of the initiative.

However, TULIPS proposal on this long-term financial sustainability is defined across two main funding sources: the stakeholders interested in having a new SAF pathway approved and thus engaged in the certification process, and the EU funds related to the development of European SAF production. On this side, the **EU could combine** in a coherent and coordinated manner the many **different EU programmes**, such as (not exhaustive) Horizon Europe, Innovation Funds, European Innovation Council funds, EU regional funds, etc. A **quota of these programmes** could



be – by **coordinating the EU different programmes - reserved to the Aviation sector needs**⁴. Indeed, the implementation of this approach would require a strong coordination at EC level, inspired from what is being done in the US by the DOE-DOT-USDA (beyond DOD) in the Presidential Grand Challenge, which signed a MOU defining role and tasks of each Department.

Table 2. US support programmes on SAF technologies, and possible correspondence with EU programmes

EU	US	Funding scope
H2020-CSA	US-CH (UDRI)	Set-up and running of the CH structure: coordination of laboratory network and competence center, studies, events and meetings with stakeholders and Institutions
H2020.RIA/IA, EIC Pathfinder/Transitions)	BETO (BioEnergy Technology Office)	R&D&D on SAF routes
Innovation Fund	US Presidential Grand Challenge	Demonstration and First of a kind in SAF
LIFE	(some of the above)	Set up and operation of complete value chains
EIC Accelerator, Innovation fund, private capitals	Other US programmes, Private capitals	Start-up and commercialisation of innovation

⁴ If from one hand a CSA or a tender could cover the limited costs for the EU-CH coordination, networking, studies and events (corresponding to US funding of Dayton/CAAFI), on the other a dedicated, significant budget is needed for Research-lower TRL and Demonstration-higher TRL (e.g. corresponding to US BETO programme), LIFE and Innovation Fund covering deployment of pre-commercial industrial installations (corresponding to US Presidential Grand Challenge funding), EIC and InnovFund to fund start-up and equity.



PoliTO draft view (coherent with the H2020 TULIPS workprogramme): **Possible scheme of an EU CH**

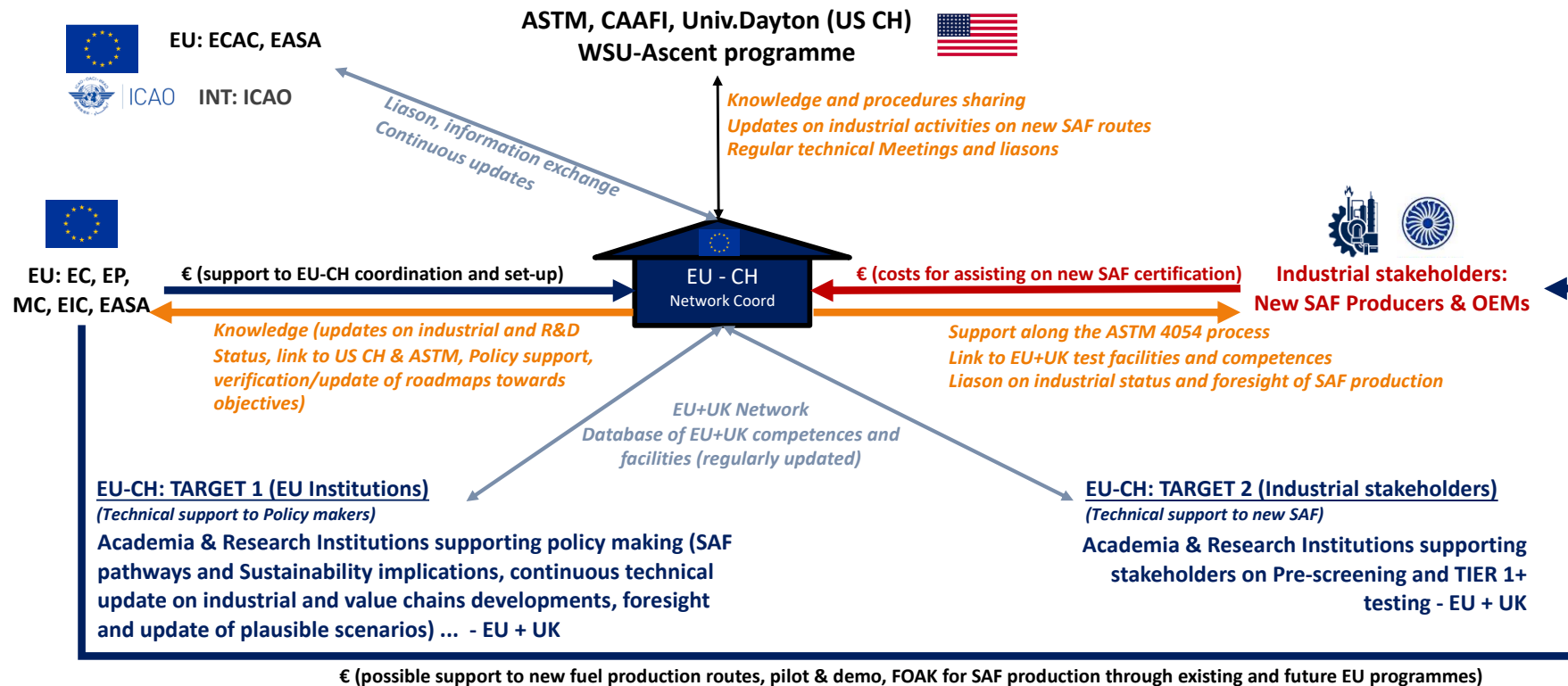


Figure 4.1: PoliTO proposal for the EU ClearingHouse.



5 Conclusion

Clearing houses, as central entities within industries or sectors, play a vital role in facilitating and streamlining processes for new alternative SAF to enter the market. In US this entity already serves as crucial intermediaries, coordinating the approval and adoption of alternative fuel pathways for aviation. By providing guidance, conducting tests, and fostering collaboration, clearing houses accelerate the commercialization and deployment of sustainable aviation fuels.

The establishment of the US Clearing House in 2016 under the Federal Aviation Administration's ASCENT program marked a significant milestone in SAF certification. Operating from the University of Dayton Research Institute, this initiative has guided fuel producers through the certification process, streamlining procedures and reducing barriers.

Specific challenges persist in achieving widespread SAF uptake and technical certification. Cost, feedstock availability, production infrastructure, and sustainability concerns remain barriers to adoption, necessitating holistic approaches to address these challenges. Additionally, bottlenecks in technical certification processes, such as limited OEM resources and stringent testing requirements, pose ongoing challenges that clearing houses must navigate.

Recognizing the need for similar initiatives in Europe, the European Aviation Safety Agency (EASA) embarked on the development of a European Clearing House for SAFs. Modeled after its US counterpart, this initiative aims to centralize certification processes, leveraging existing testing capabilities dispersed across Europe. To ensure optimal engagement and cooperation, coordination with existing initiatives such as CAAFI and potential partnerships with regulatory bodies like EASA are essential. By fostering dialogue and knowledge sharing, clearing houses can address technical challenges, streamline certification processes, and advance sustainable aviation fuels' adoption globally.

In the European context, the TULIPs project proposes a tailored EU Clearing House structure, leveraging a network-based approach to coordinate laboratories and competences across member states. This framework emphasizes the importance of technical support, pre-screening, knowledge transfer, and funding mechanisms to ensure the long-term sustainability and effectiveness of the initiative.

The proposal also highlights the need for coordinated funding mechanisms, drawing upon various EU programs such as Horizon Europe and the European Innovation Council funds, to ensure the long-term sustainability and effectiveness of the initiative. Without adequate funding, prospective fuel producers may opt to use the US Clearing House, potentially disadvantaging EU-based producers in terms of priority and access to resources. Securing funding for the EU Clearing House



is essential for its effectiveness and competitiveness in supporting the growth of the SAF market within the European Union.

By addressing certification challenges, fostering coordinated collaboration beyond existing contacts and regular meeting, and aligning with global counterparts, these entities play a central role in accelerating the transition towards a more sustainable aviation industry. Continued engagement, cooperation, and investment are essential to realizing the full potential of clearing house initiatives in driving sustainable aviation fuel adoption and mitigating climate impact in the aviation sector.



Appendix A: LIST OF REFERENCES

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Appendix B: ASTM D4054 & CANDIDATE FUEL PRE-SCREENING

Within the current ASTM D4054 standard, new candidate fuels are experimentally screened through a four Tier process to assess their characteristics and suitability as fuel blend components. Each Tier brackets together a number of empirical tests, and the four Tiers become progressively more relatable to the final application of combustion within a aviation gas turbine.

- Tier 1: Specification properties
- Tier 2: Fit-for-purpose properties
- Tier 3: Component/rig testing
- Tier 4: Engine and auxiliary power unit testing

These Tiers are further grouped into Phase 1 (Tiers 1 & 2) and Phase 2 (Tiers 3 & 4). In this stepped process, the results of Phase 1 testing are submitted to the OEMs for review, and the OEMs determine if the fuel is fit for use, and also identify the requirements for Tier 3 and Tier 4 testing. A schematic of the ASTM D4054 process for the evaluation of candidate fuel blend components is shown in Figure B.1.

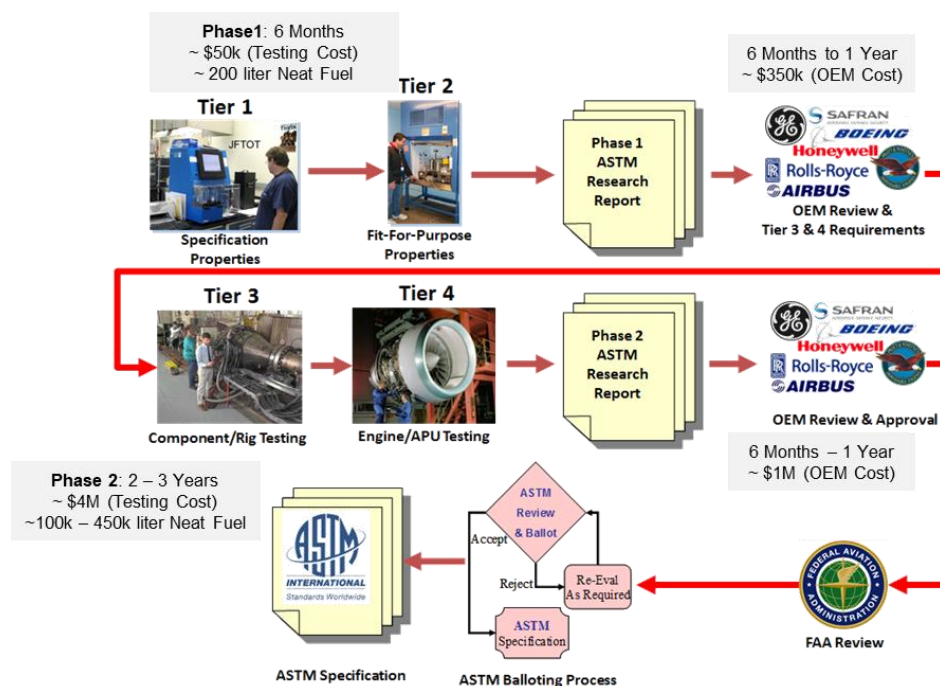


Figure B.1: Schematic representation of the ASTM D4054 process for the evaluation of new candidate fuels and fuel blend components (Source: Mark Rumizen, FAA)

The ASTM D4054 process is robust and thorough. However, it is often protracted, costly, and can require significant volumes of candidate fuel.

In recent years, concepts to address some of the inefficiencies within the D4054 process that utilise and exploit existing knowledge and experience with a diversity of fuel chemistries have been developed. The methodology is based on deriving predictive tools which capture fuel composition effects on properties and sub-processes, which have a direct impact on the performance of the fuel systems as well as the performance and emissions of the combustion system. These model-based pre-screening tools are constructed from a detailed knowledge of fuel chemistry derived from a relatively low cost / small sample GC x GC analysis, and were to a large extent consolidated in the Horizon 2020 JETSCREEN project (2017 – 2020; <https://cordis.europa.eu/project/id/723525>), although the project was by no means exhaustive or complete.

Model-based pre-screening tools that support the D4054 process are desirable for both fuel producers and OEMs, as they provide an early indication of the likely properties and positioning of the candidate fuel within the existing fuel physiochemical landscape, thereby de-risking the process, which subsequently helps to reduce costs and time burdens by highlighting areas of potential concern.

A schematic of how the pre-screening tools support the ASTM D4054 process as a Tier α and Tier β (or collectively as Tier 0) assessments is shown in Figure B.2.

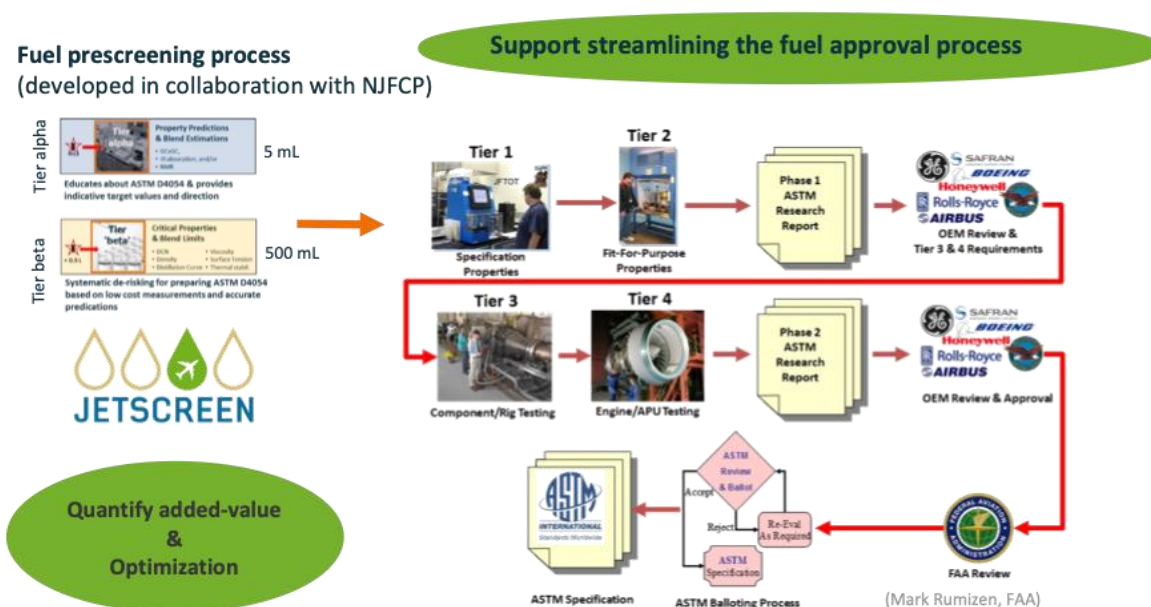


Figure B.2: Schematic representation of how model-based pre-screening tools support the ASTM D4054 process for the evaluation of new candidate fuels and fuel blend components

Existing model-based pre-screening and optimisation tools include those for the prediction of fuel density, cetane number, specific energy content, lean blow out, material compatability (e.g. seals),



water solubility, autooxidation, thermal stability, pump and valve durability, and sooting propensity, amongst others. These tools are readily available for registered users through DLR and other former members of the JETSCREEN consortium.

The draft structure for the implementation of a European Clearing House proposed within this deliverable, includes access to a Tier 0 pre-screening assessment platform. Access to the pre-screening toolkit would be facilitated to support the certification of EU candidate fuels. Access to the pre-screening toolkit would be via EU-CH and limited to registered users so that progression of candidate fuels within the certification process can be properly managed.

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