



JIG MANAGER WORKSHOPS

KEY INSPECTION FINDINGS 2025

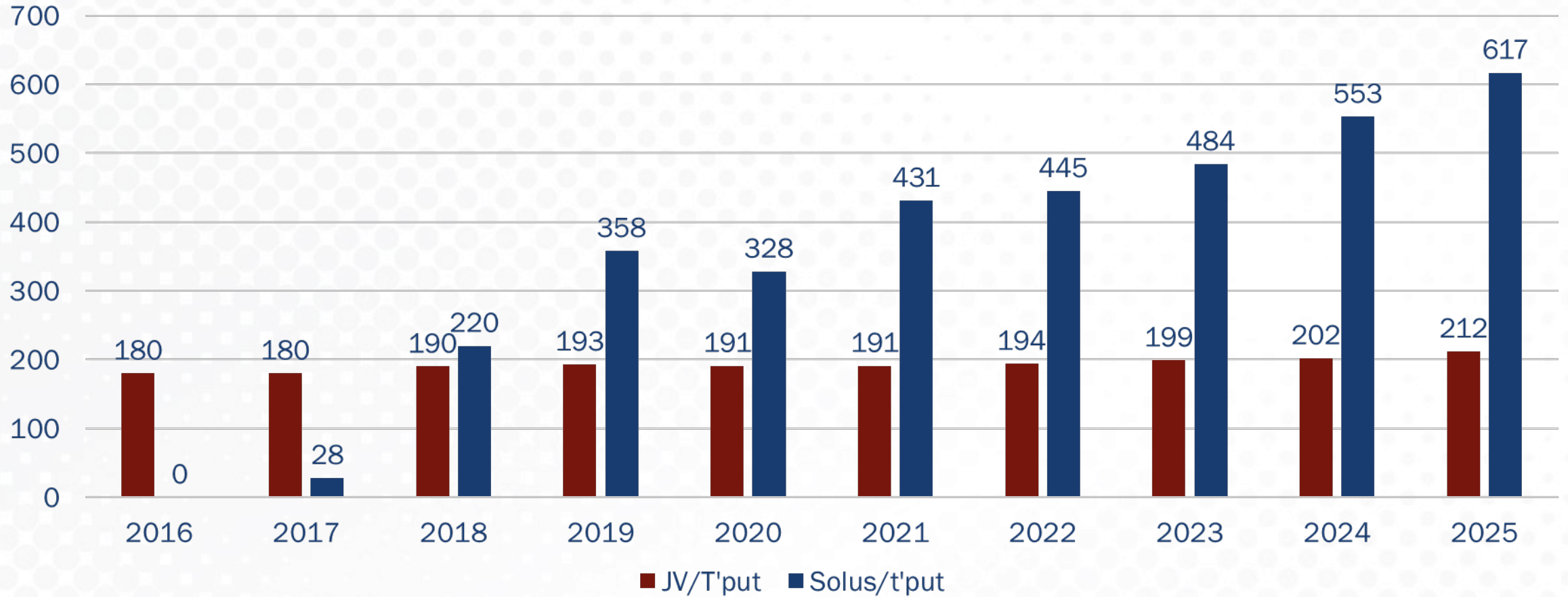
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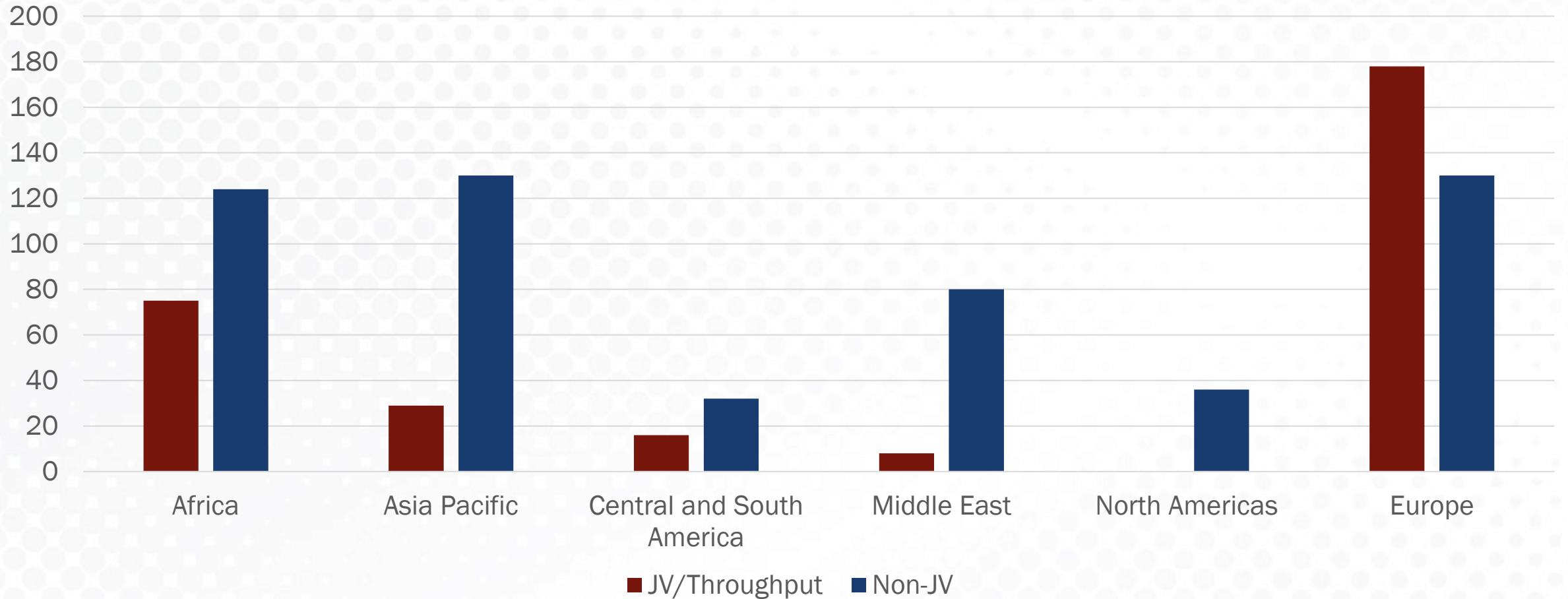
- 1. JITS Membership**
- 2. Assessment trends**
- 3. Recommendation priorities and trends**
- 4. Recommendation causes**



JITS Membership – Year on Year

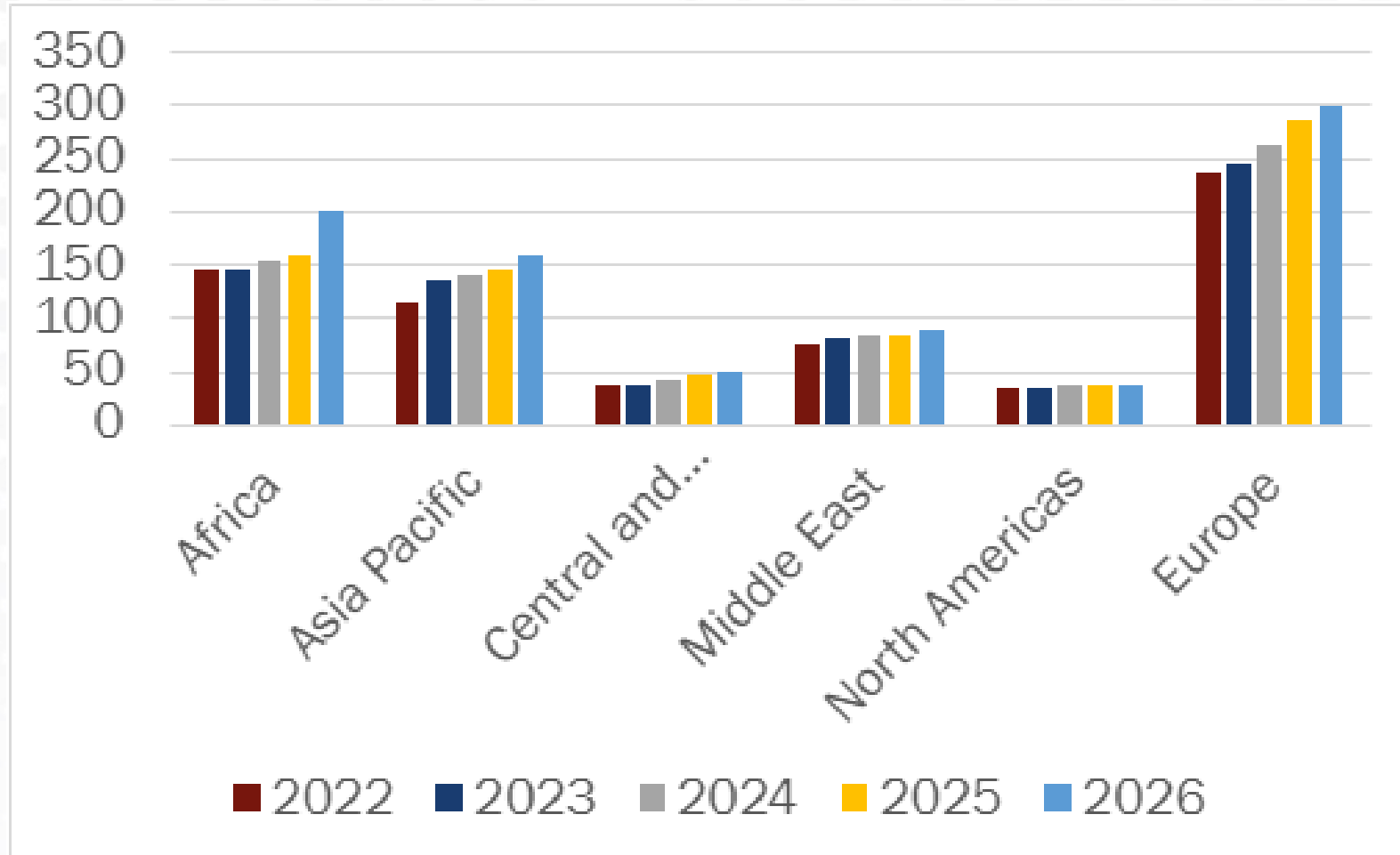


JITS Membership – By Region

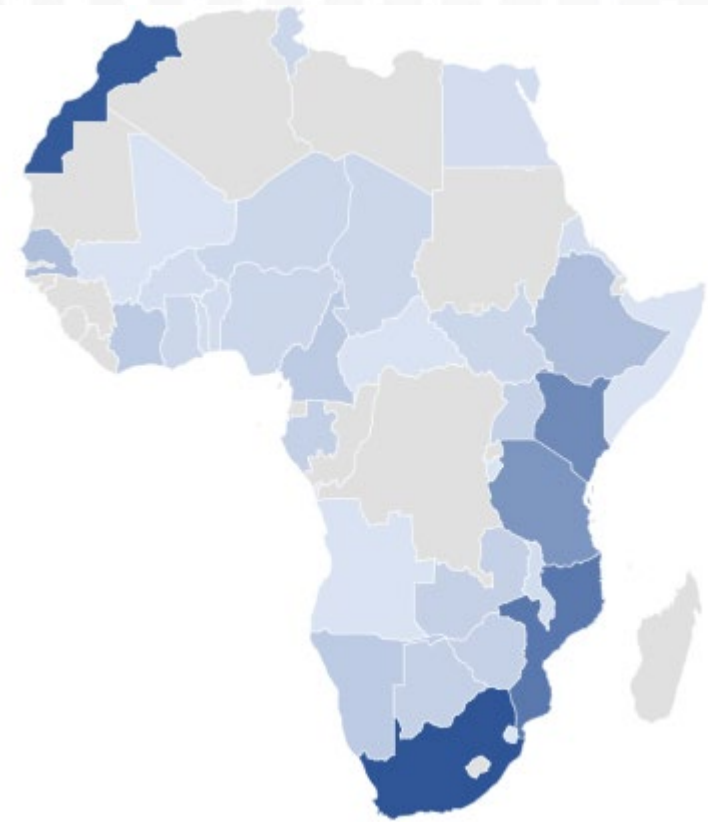
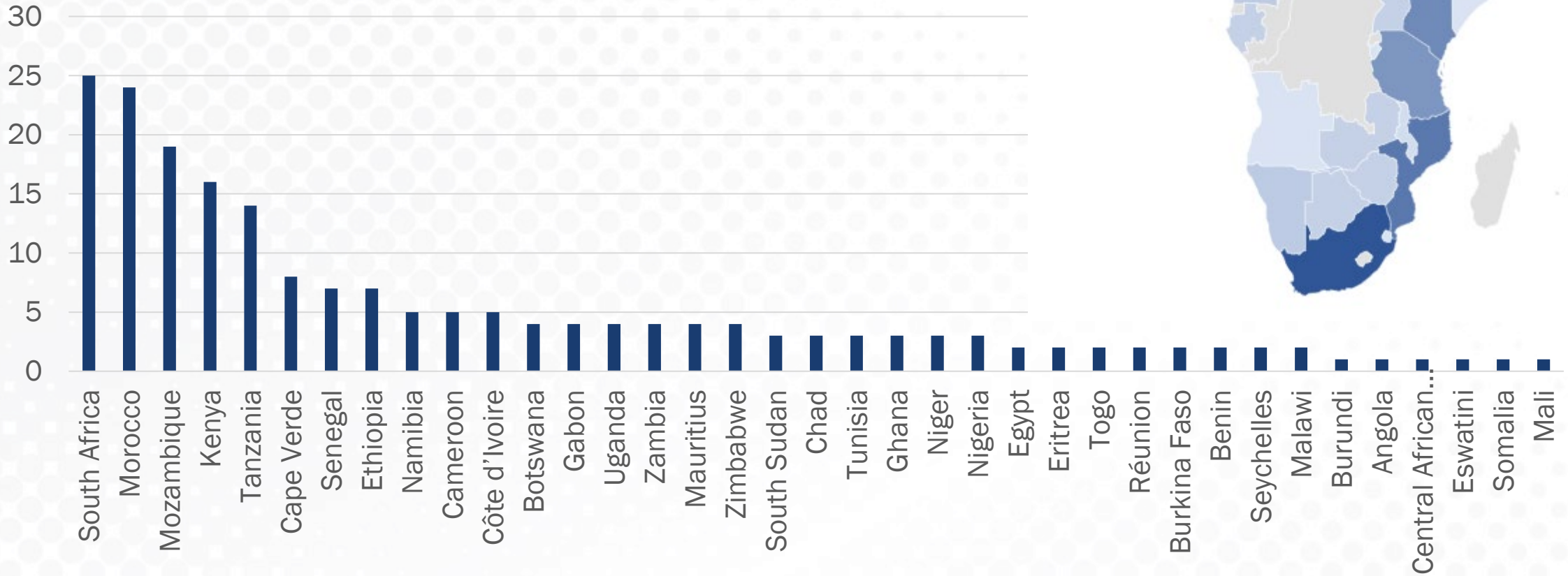


JITS Growth by region

Africa growth driven by new JIG members

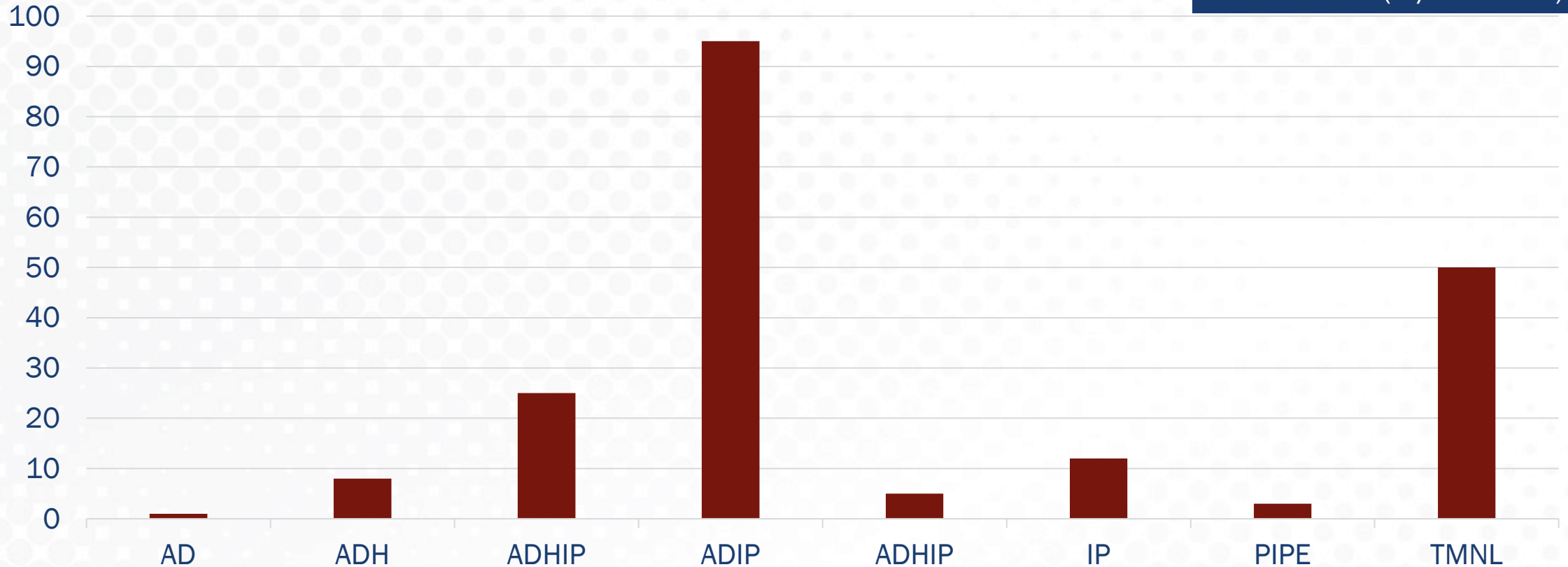


JITS Membership – Africa

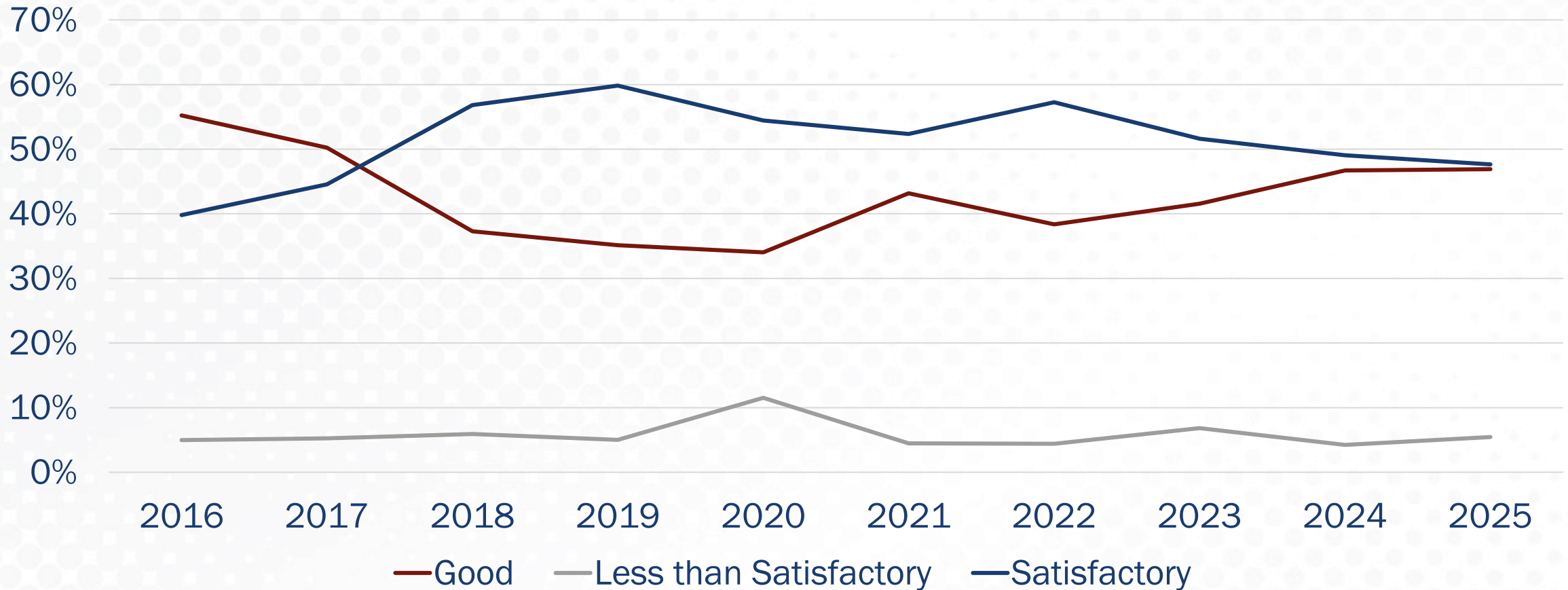


Africa Locations by Operation Profile

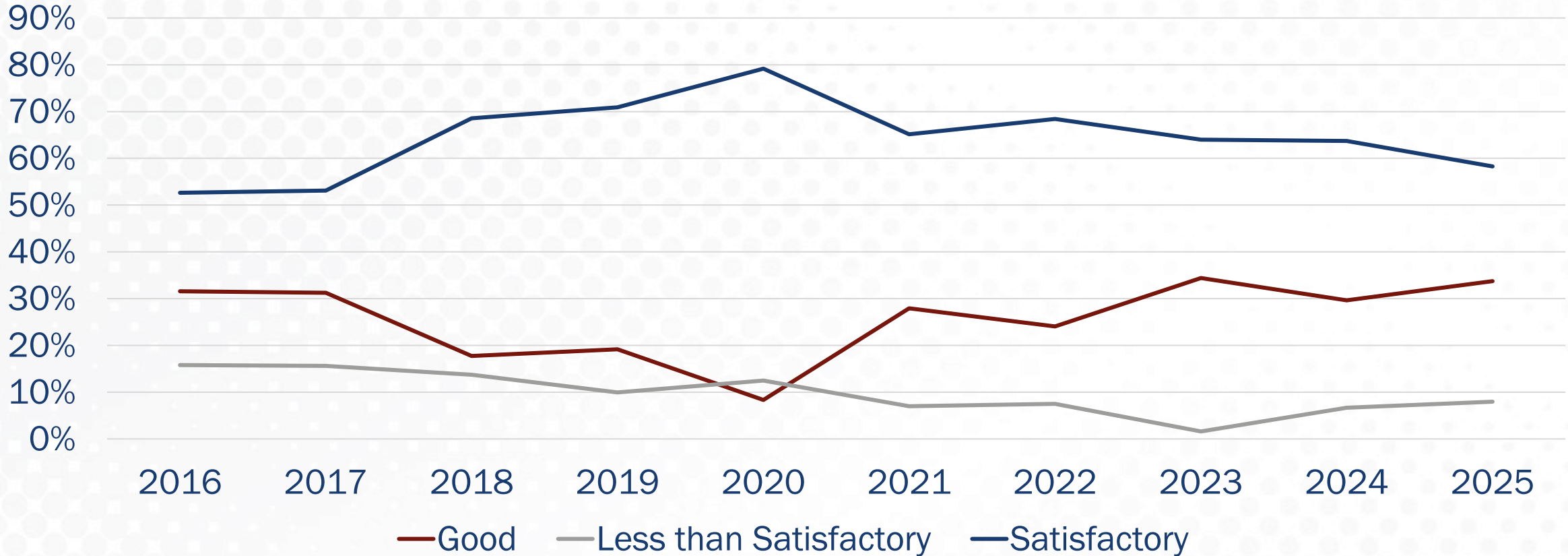
146 Airports (JIG 1/2/4)
53 S&D (EI/JIG1530)



Assessment Trends - Global



Assessment Trends - Africa



Key Learnings

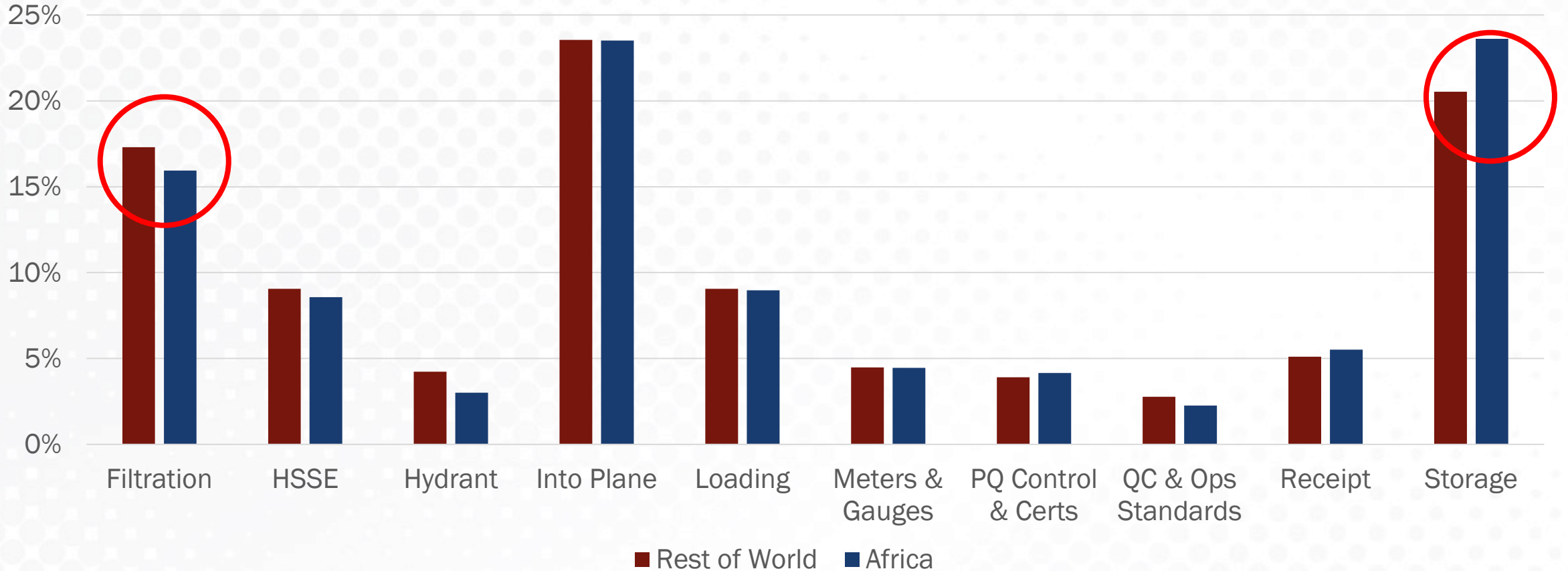
- 1. Sites active in the IJS programme for a long time tend to improve their performance.**
 - Africa assessment ratings appear to prove this
 - LTS locations trend down over a number of years activity in the programme
- 2. Inspection recommendations help identify weaknesses in staff knowledge, and adjust training programmes to drive improvement**



Recommendations

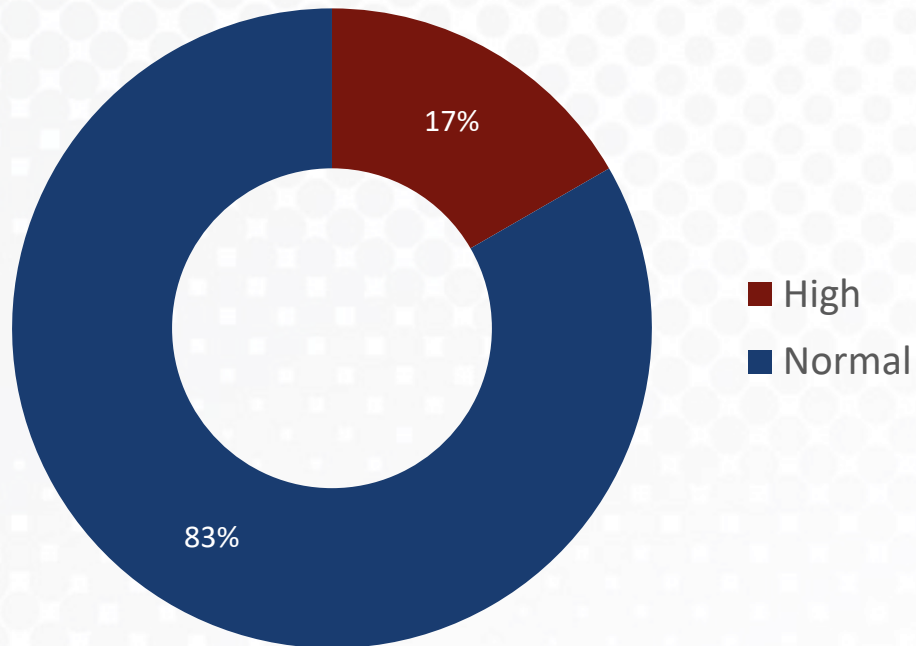


All Recommendations Overview 2025 – Africa vs ROW

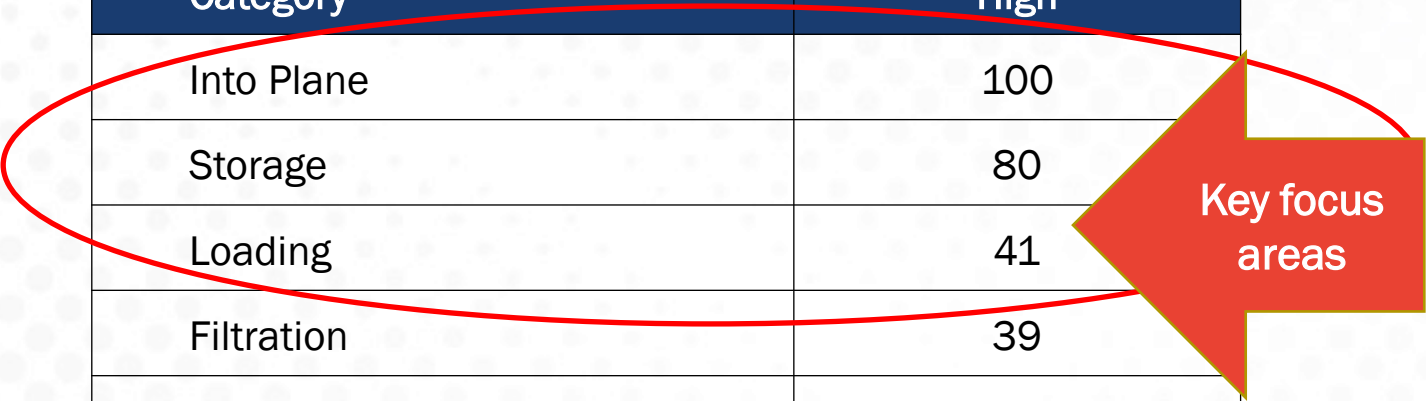


Africa - High Priority Recommendations 2025

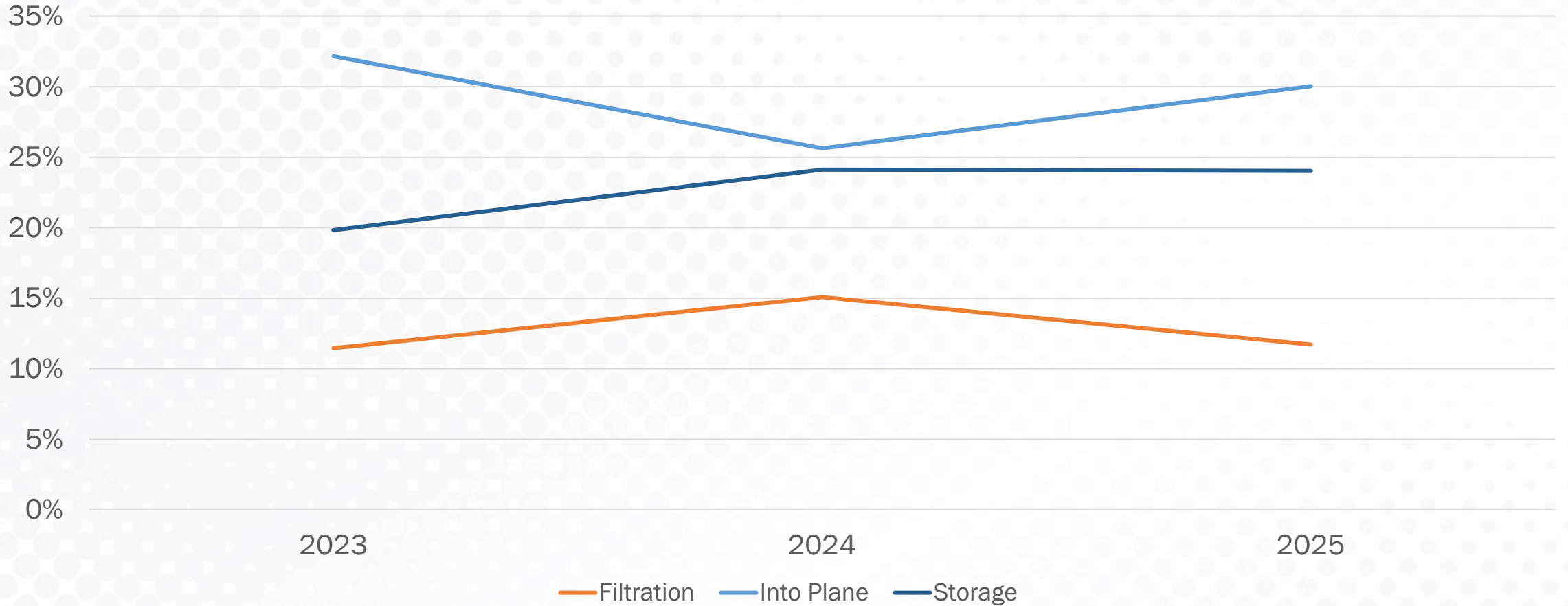
All Recommendations - Priority Distribution



Category	High
Into Plane	100
Storage	80
Loading	41
Filtration	39
Receipt	33
Meters & Gauges	13
HSSE	11
Hydrant	8
PQ Control & Certs	5
QC & Ops Standards	3



High Priority Recommendations (3 Year Africa View)

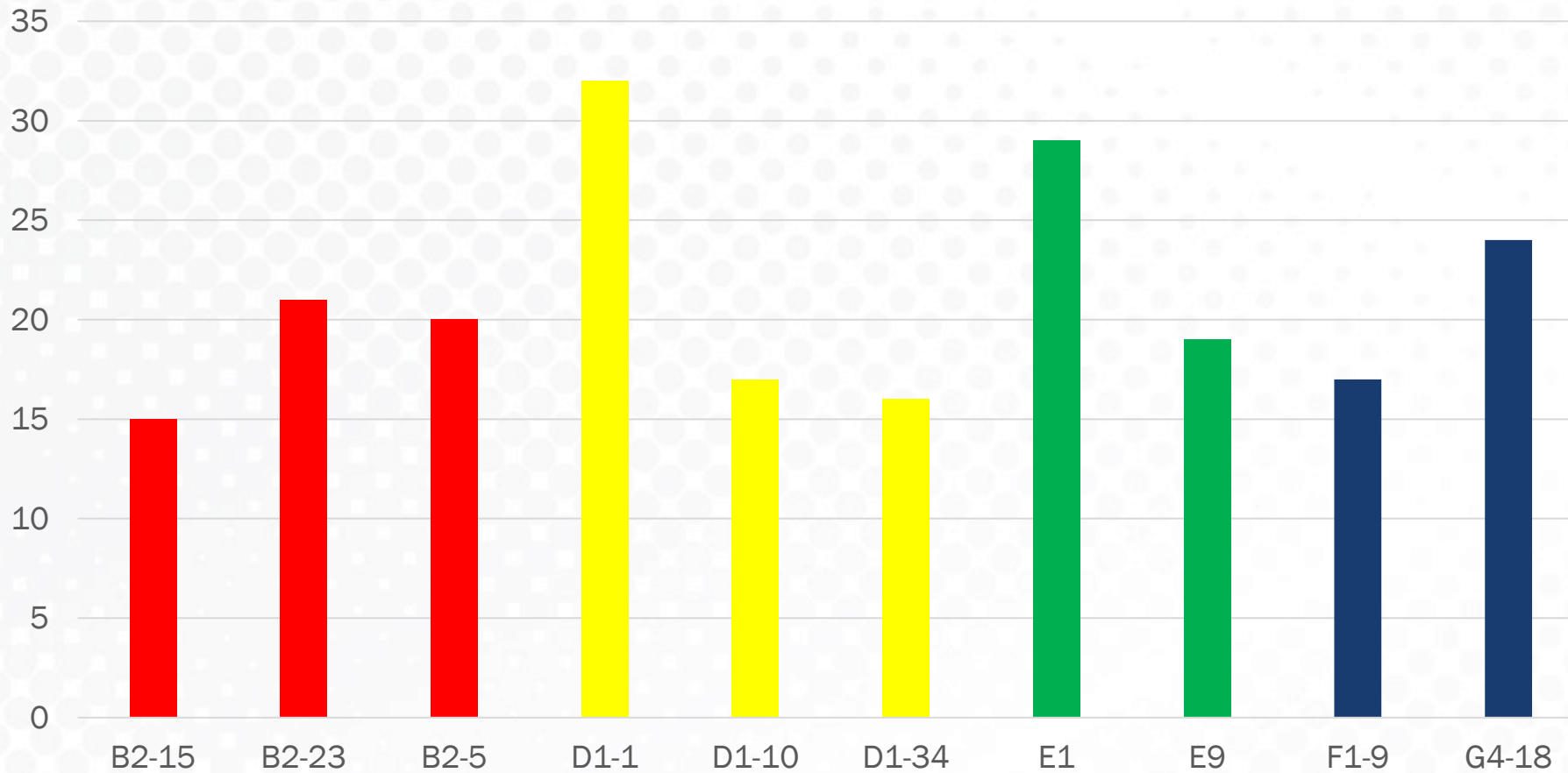


Top 5 High Priority Findings - Africa

2024	2025
<p>"Is general appearance (paintwork, signs of rust or leakage) satisfactory?Are handrails, ladders, pipe bridges and steps adequate and in good condition?Are valves in good condition and free of leaks?"</p>	<p>Does fuelling equipment appear to be maintained in sound condition?</p>
<p>"Do filter vessels manufactured after 2013 have a plate indicating they meet the requirements of EI 1596?For older vessels, has the design been reviewed against the requirements of EI 1596 and found suitable for its intended service?"</p>	<p>"Do filter vessels manufactured after 2013 have a plate indicating they meet the requirements of EI 1596?For older vessels, has the design been reviewed against the requirements of EI 1596 and found suitable for its intended service?"</p>
<p>"Are tanks fitted with overfill prevention systems in accordance with the minimum requirements set out in JIG 2 3.2.5? Are overfill prevention systems operated in accordance with established procedures and tested in accordance with JIG 2 10.16? "</p>	<p>"Is general appearance (paintwork, signs of rust or leakage) satisfactory?Are handrails, ladders, pipe bridges and steps adequate and in good condition?Are valves in good condition and free of leaks?"</p>
<p>Does fuelling equipment appear to be maintained in sound condition?</p>	<p>"All low points, including low points on pipework and on strainers, shall be identified and drained at least monthly to remove any water and sediment? Where dead-legs are present are they identified and drained at least quarterly to facilitate water and sediment removal?"</p>
<p>Are Pumps located in a sealed and bunded containment area or in an area which drains freely to suitable containment?</p>	<p>Annual pressure fuelling nozzle wear check, using the appropriate gauge(s) and/or testing instructions, provided or approved by the equipment manufacturer.</p>



Africa - Top 10 Normal Priority Findings



- B2 Depot**
 - Deadlegs & low points
 - General appearance
 - Pump containment
- D1 ITP Equipment**
 - Owing stowage
 - General condition
- E Filtration**
 - EI1596
 - Data plates

Recommendation Conclusions

- Some commonalities between findings globally and those specific to Africa
- High priority findings show that non-compliances become more critical the closer you get to an aircraft.
- Recurring subjects for 2 or 3 years may reveal lack of investment funds, lack of training or (possibly) inability of skilled technicians to reach airport locations.
 - Care should be taken to quickly close these gaps.
 - Inspectors should be vigilant on Capex-related subjects when doing inspections.
 - Danger that below-par facilities become too familiar and accepted as the norm.
- Whilst investment in assets can be challenging and take longer to close there are improvement available in training and procedural areas.



7 Lack of resources



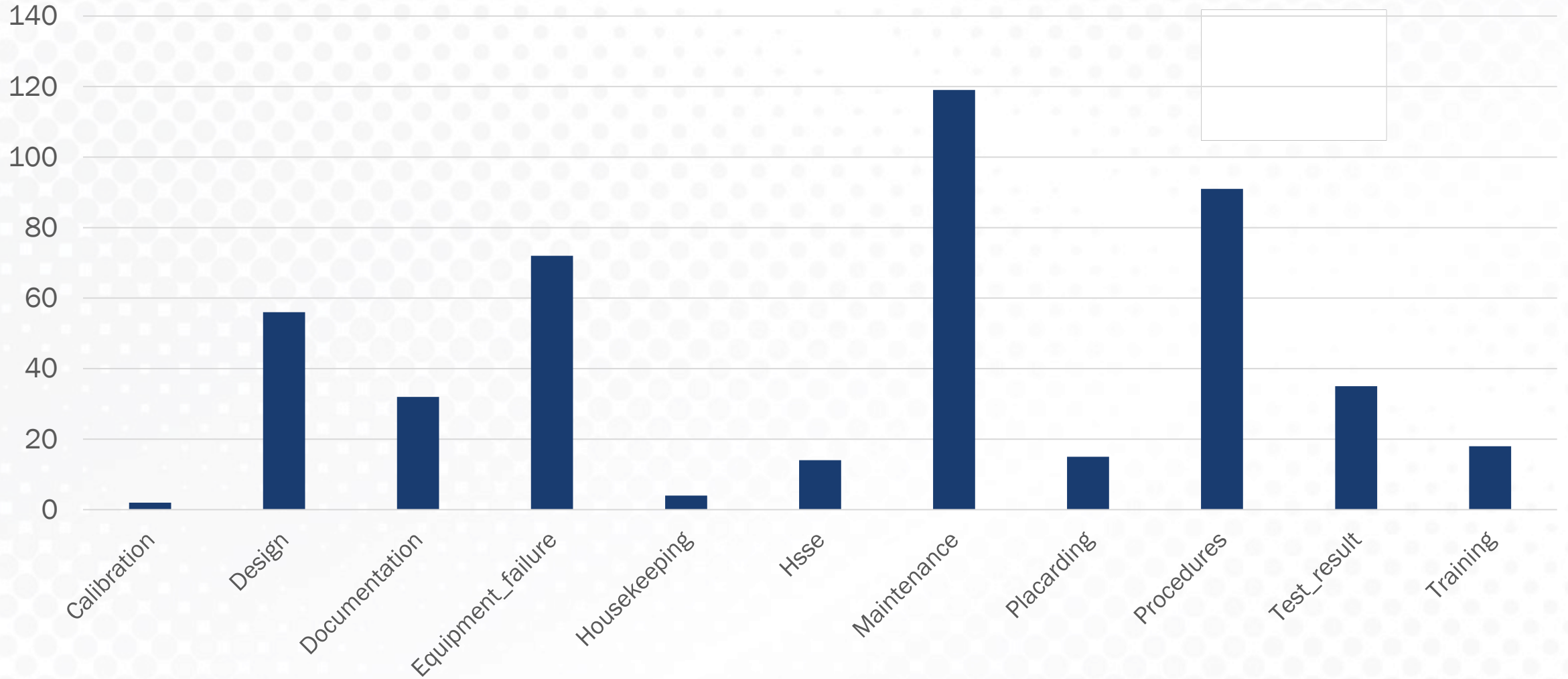
3 Lack of knowledge



Cause Analysis



Africa - Causes Identified 2025 – Into Plane



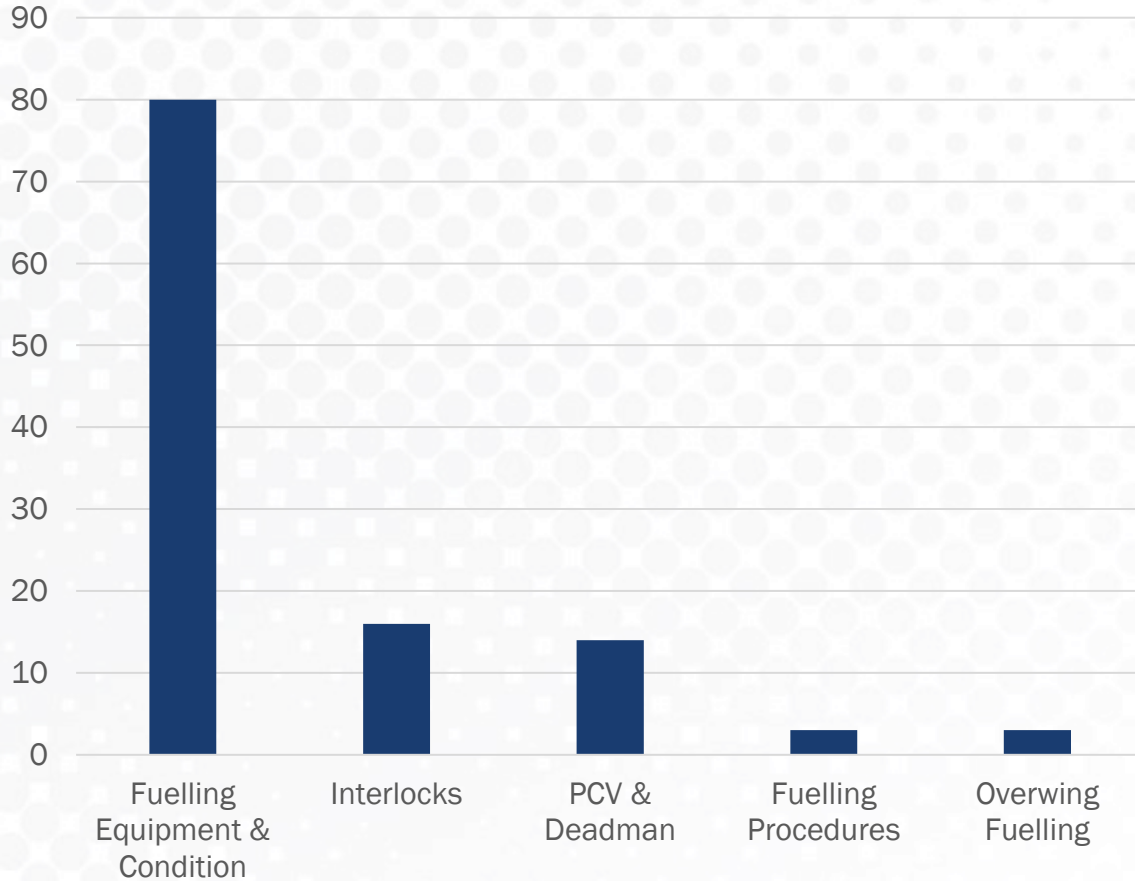
Africa - ITP – Procedures and Maintenance

Maintenance

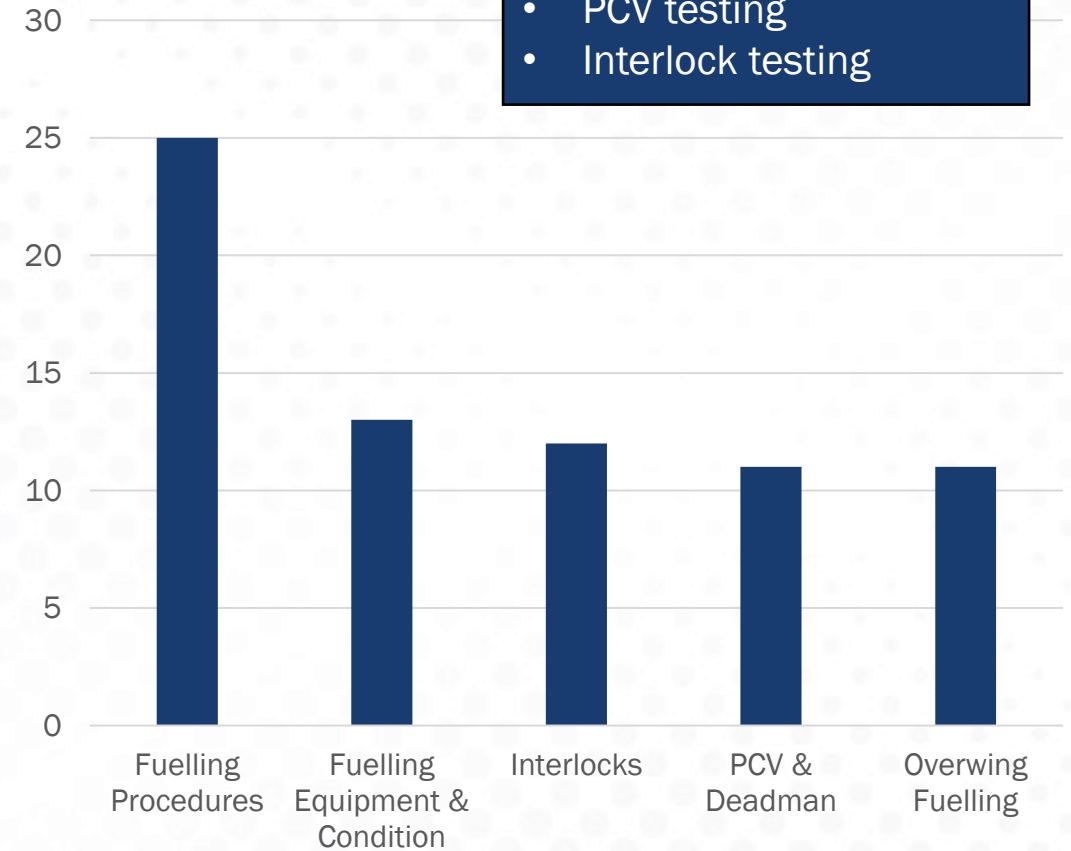
- Equipment condition
- Platform checks

Procedures

- Hose positioning
- PCV testing
- Interlock testing



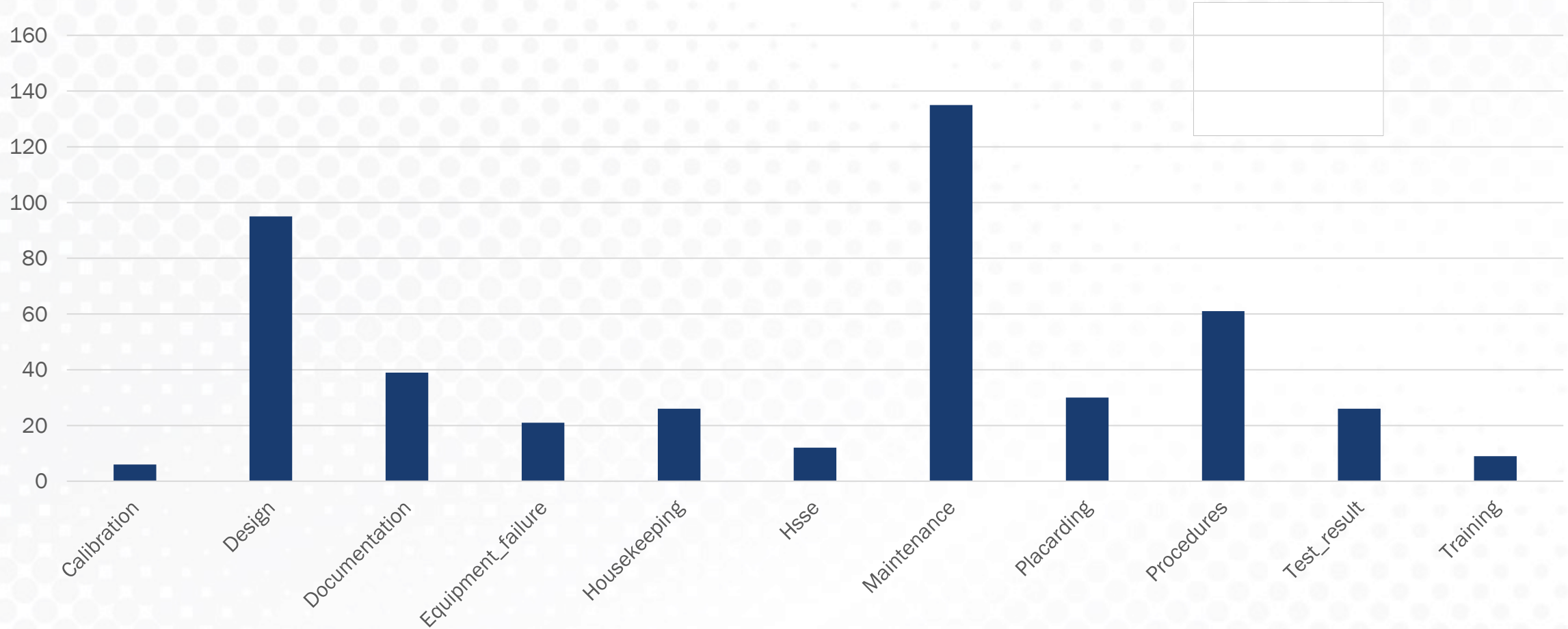
Maintenance



Procedures



Africa - Causes Identified 2025 - Storage



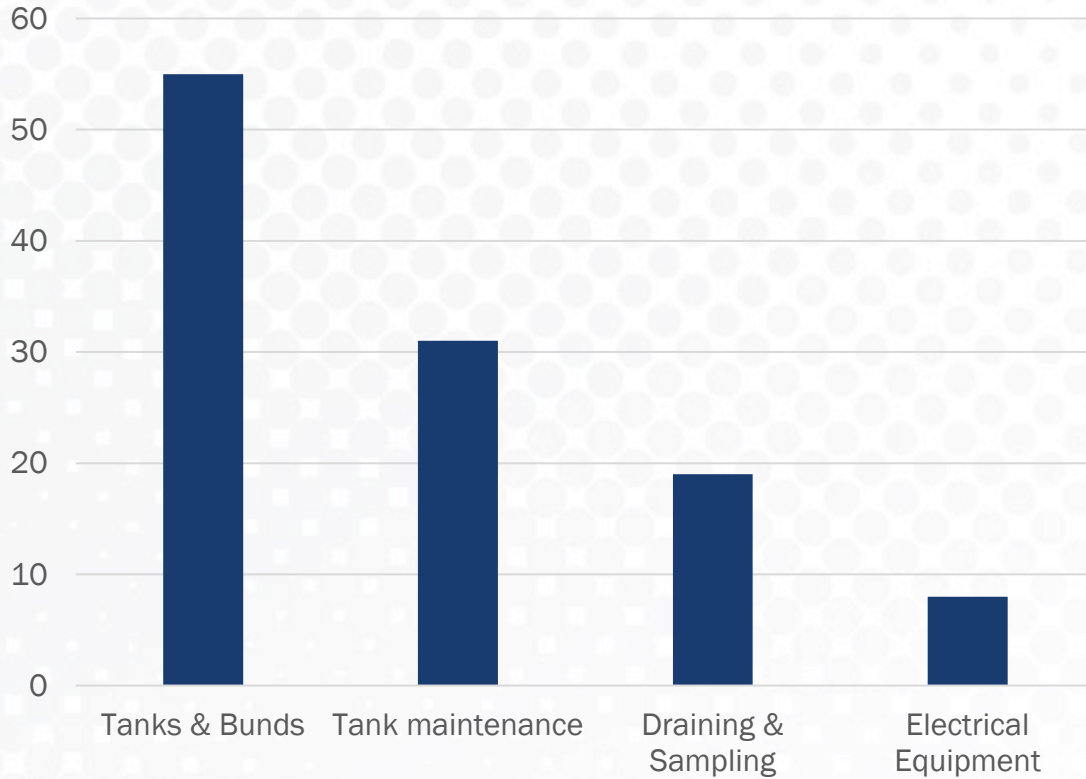
Africa - Storage - Design and Maintenance

Maintenance

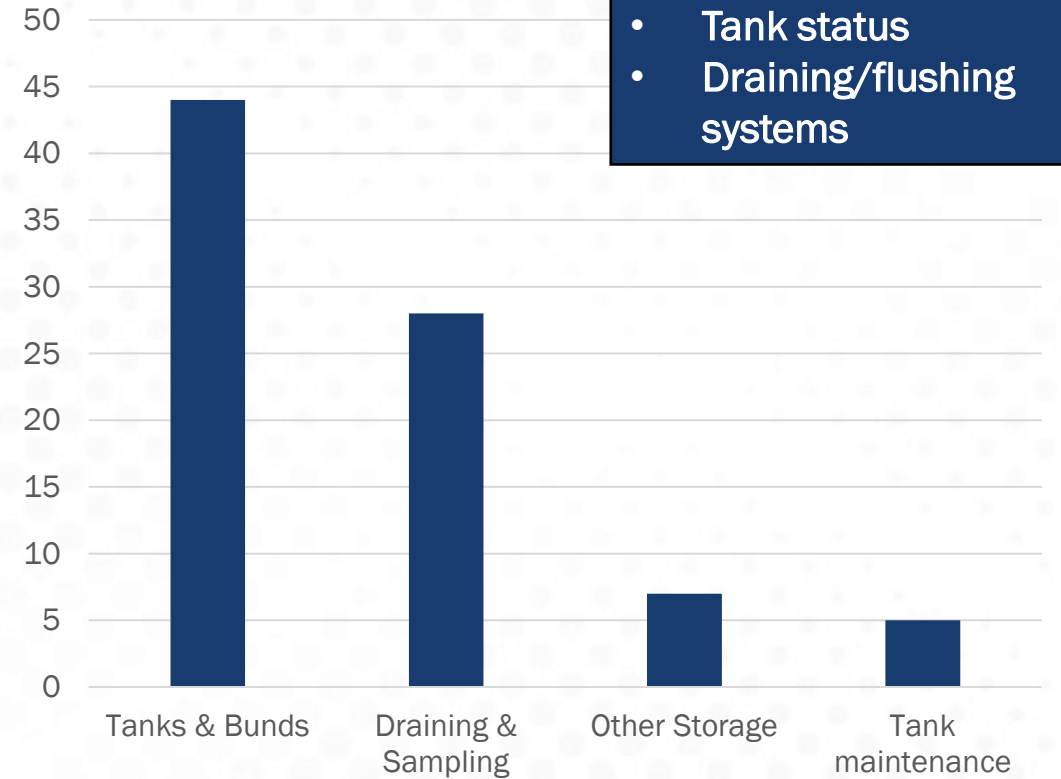
- Vents
- PRT tanks
- Tank condition

Design

- Tank overflow
- Tank status
- Draining/flushing systems



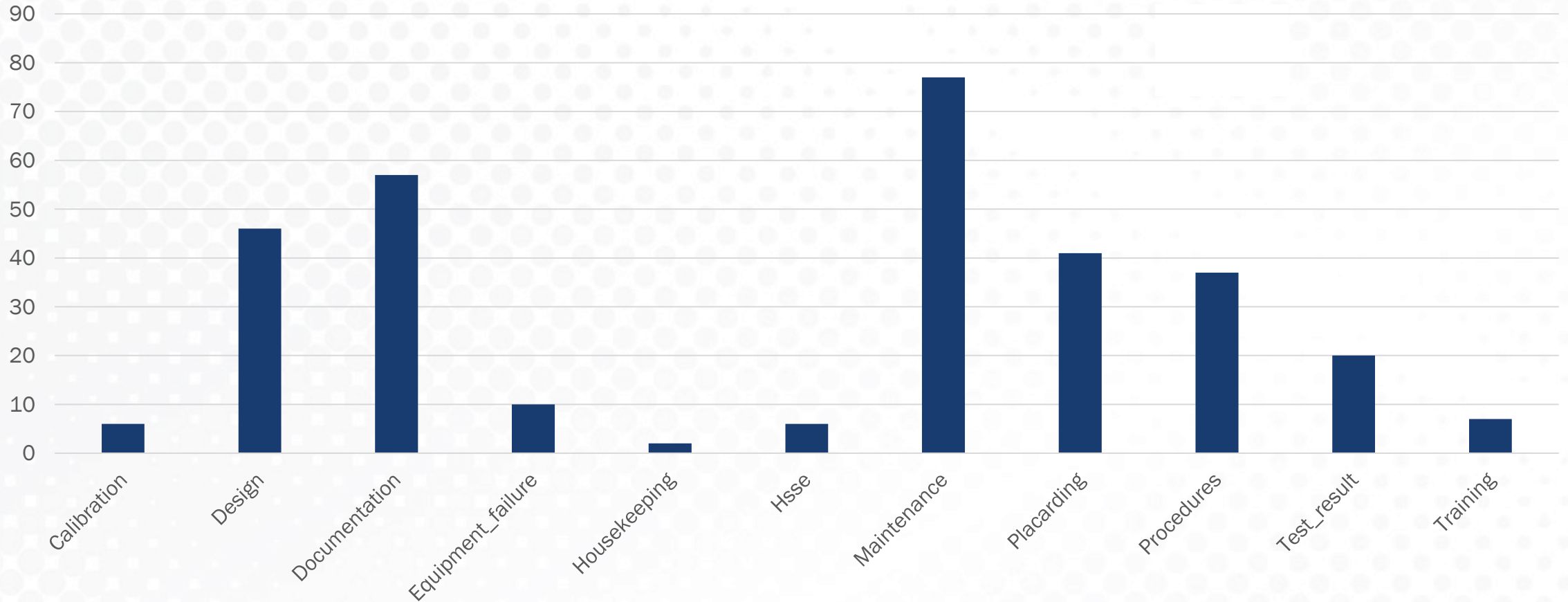
Maintenance



Design

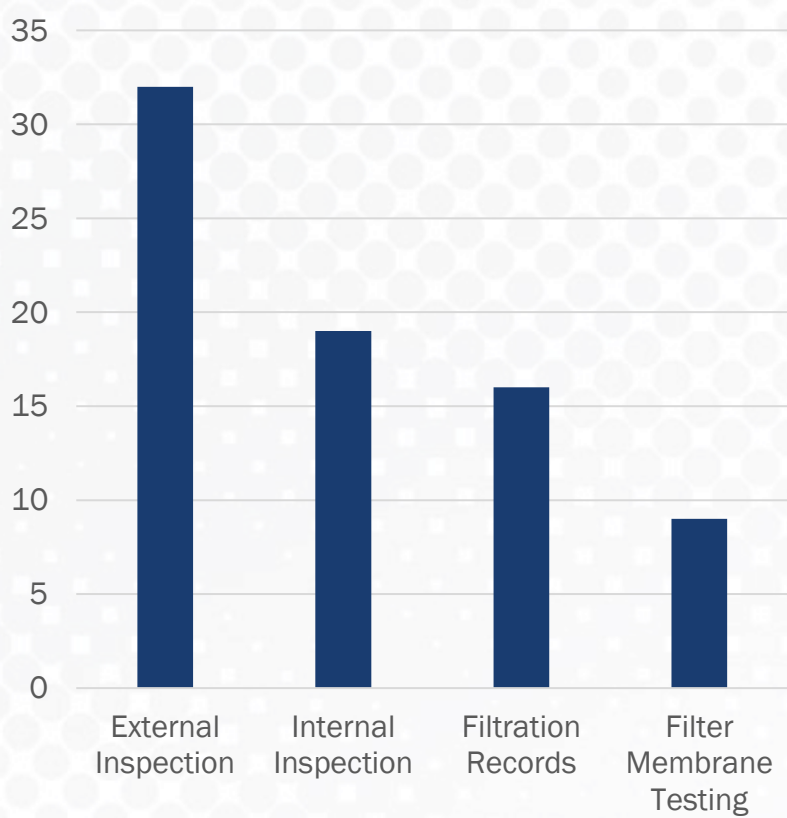


Africa - Causes Identified 2025 - Filtration

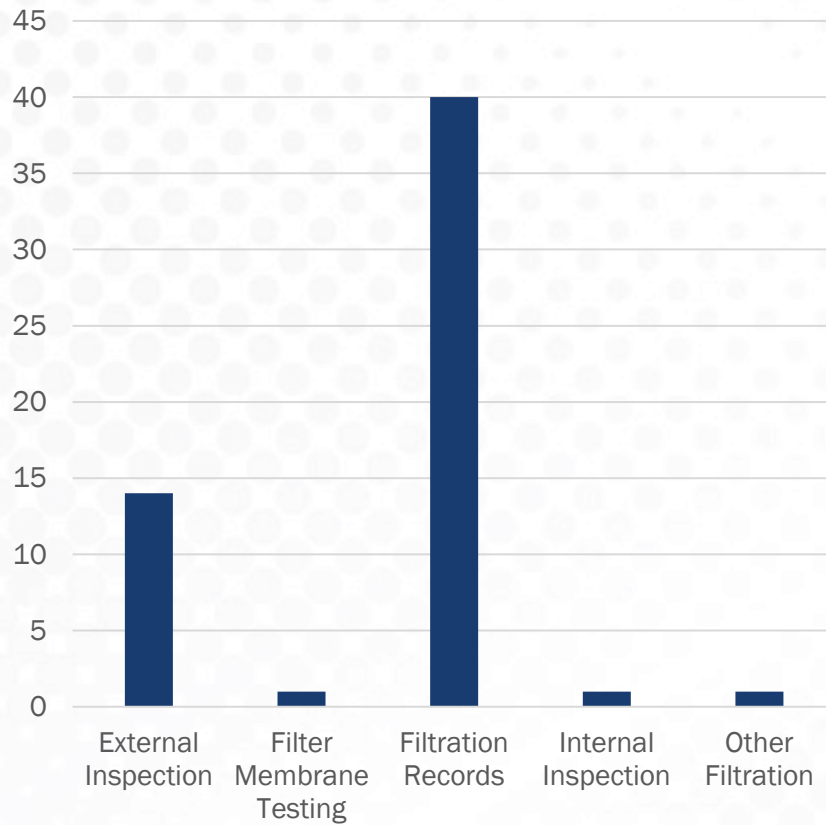


Africa - Causes Identified 2025 - Filtration

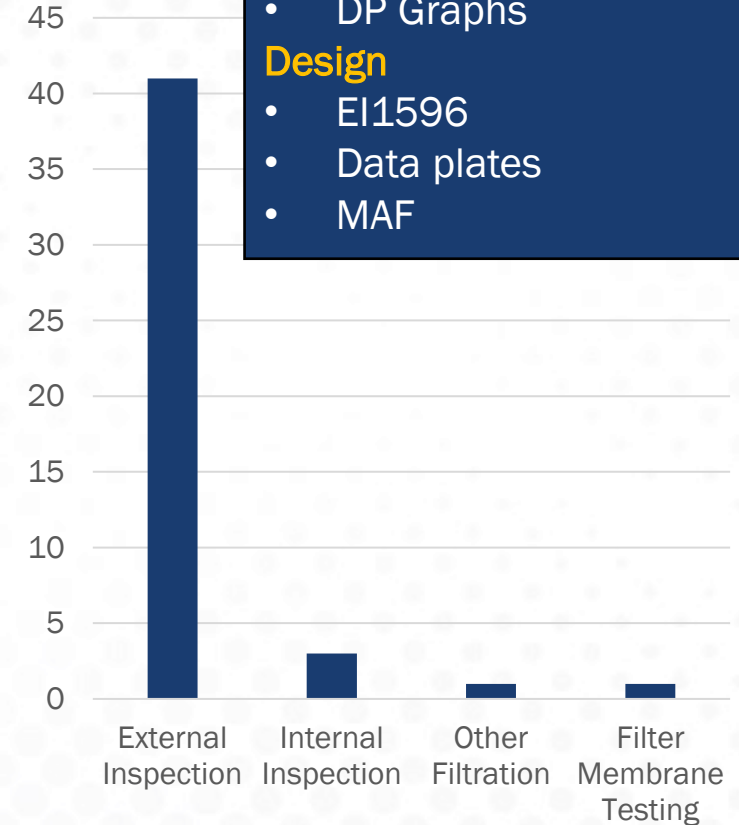
- Maintenance**
 - Element torquing
 - Element condition
- Documentation**
 - EI1596 Compance
 - Similarity certificates
 - DP Graphs
- Design**
 - EI1596
 - Data plates
 - MAF



Maintenance



Documentation



Design

Causes - Africa conclusions

Training and procedural

- PCV Testing
- Interlock testing
- Into-plane procedures
- Maintenance training
- Filter Inspections
- Overfill system checks
- DP measurement and graphs



Assets/Infrastructure

- Vehicle improvement/modification
- Facilities for draining and checking
- Overfill systems
- Filter compliance



The value of the **physical inspection process** remains clear in terms of observing operations and operators.



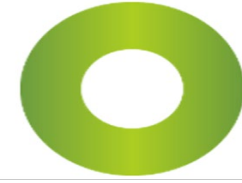
Questions

If you have any queries regarding JITS or the Inspection program, please contact:

- **JIG Admin:** sam.neal@jig.org
- **Technical or Policy:** lee.taylor@jig.org







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Staff Competency Assurance

JIG Managers' Workshop
Nairobi 14th – 16th April 2026



HSSE MS Element 5

Personnel Training and Competence

Aim

To ensure that employees and those working on behalf of the operation are appropriately trained and competent to carry out their work safely.

Minimum expectations

5.1 The safe working skills and competencies required for each job function (including trainers) **shall** be identified, documented, and periodically reviewed.

5.2 Systems **shall** be established and maintained to identify specific HSSE training needs based on their job function. Training (permanent and short term) **shall** be provided and refreshed at a frequency.

5.3 HSSE inductions **shall** be provided to all contractors and **shall** cover (Hazards, evacuation and emergency procedures).

5.4 Training records **shall** be maintained

5.5 Periodic HSSE competency evaluation **shall** be undertaken, including on-the-job observation. The dates and results of these evaluations **shall** be recorded.

5.6 Hazard communication and training program **shall** be implemented that meet local and national requirements.



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From Training to Operational Reality

Training systems could be well established and compliant. However, real-life execution does not always match training.

We had gaps in our system and training was treated as 'one of those' things that also needed to be done

Strategic Risk Perspective



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Fatal Fire During Fueling at
Denver Sept 2001

Fuelling operations = high
hazard, high consequence
Errors and or Violations are rare
but can be catastrophic

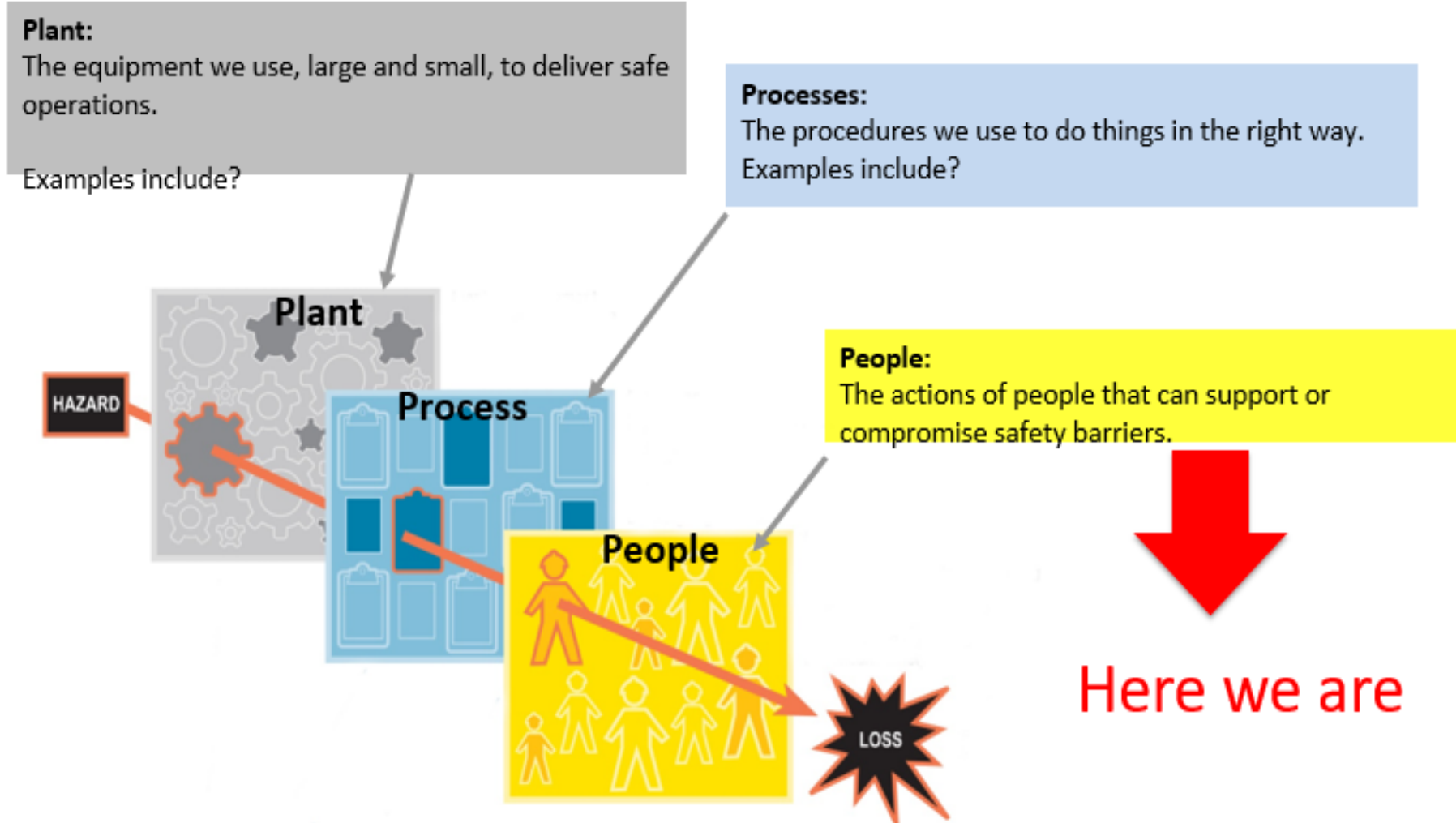
A/C adaptor check, Miss-fueling
and contamination can directly
impact aircraft safety,

Close Circuit Camera Image of Fire



- British Airways Boeing 777 arrived at Denver from London.
- Fuelling commenced shortly after arrival while passengers were deplaning.
- Two fuelling hoses attached.
- One nozzle broke away from aircraft adaptor spraying jet fuel.
- Fuel ignited; fuelling operator killed and aircraft severely damaged.

Swiss Cheese Model



Why Training Alone Is Not Enough



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Inspection finding - Example

In principle - Training ensures knowledge, awareness and know how (Who does the staff internal training?)

Behavior changes over time in real operations
Procedure drift develops gradually and Shortcuts become normalized if not detected

Focus: ensuring consistent behavior, not just knowledge
Biggest risk: deviation when staff operate unsupervised

Very little awareness of 'Why' we do things in a certain way and 'what if;' scenarios and no formal training on those

What would we do if dP reduces, what would you do if there is a coupling knock off ...

Very little formal discussions on emergency scenarios on the ramp – spill, fire ..

Staff not reminded / formally trained on areas like Aircraft specific risks / Bay specific risks

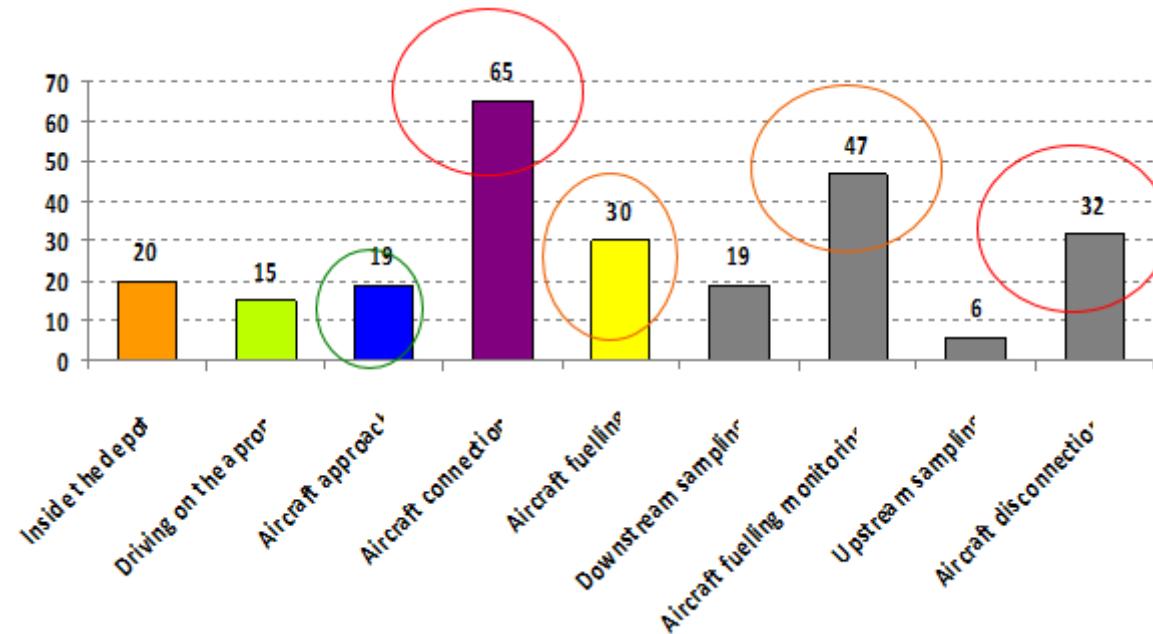
Poor recall of reasons for some basic control measures in the Operating procedure.

Procedures are copy of the JIG Standards.



Reality of Line Operations

Behavior improves when supervisors are present
Different behavior when staff are alone
Shortcuts are often hidden
True performance is not always visible



Observation finding - Summary

- A total of 87 task observations were conducted across selected airports.
- These observations resulted in 253 findings.
- Of the total findings, 99 were identified as critical errors, representing ~40% of all findings.
- This high proportion of critical errors is a key area of concern.

Primary Area of Critical errors

The majority of critical errors were concentrated in the following operational areas:

- Aircraft Approach
- Aircraft Connection & Disconnection (including adaptor checks before and after connection)
- Aircraft Fueling Monitoring (during fueling operations)

Case – Mis-fuelling



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Incorrect fuel type
to aircraft
Verification step
or rushed
Fuel Product Confirmation
Form???

Operator was trained
experienced

Root cause: behavioral
deviation, not lack of
knowledge

**EI 1597 3rd Edition
July 2025**
EI 1597

Aircraft misfuelling prevention
**JIG issue 14 will be
updated with
changes/updates on EI
document**

Operating Standards
for Into-Plane Fuelling Services (JIG 1)

Fuel product confirmation form

When one of the following applies:

...which clearly and without doubt corresponds with the product of fuel marked on the fuelling vehicle, trailer or fixed (kerbside) delivery equipment.

...do not correspond to the norm for the particular fuel product, i.e. for Jet Fuel, a wide selective nozzle spout and large aircraft orifice, and for Avgas, a small circular spout and narrow aircraft orifice.

Overwing fuelling during air-shows

TO BE COMPLETED BY AIRLINE/AIRCRAFT AUTHORISED REPRESENTATIVE

To: (Into-plane service)

At: (Airport)

Aircraft Registration Number:

The aviation fuel requirements for this aircraft are as follows:

	FUEL PRODUCT (*)	QUANTITY
JET FUEL (Set A-1 or A1A)	Jet A-1	700 L
AVGAS (AVGAS 100LL)		

(*) Write either Jet A-1, Jet A or Avgas 100LL in the appropriate box

Note: Where unleaded Avgas (UL 91) is available, the fuel product confirmation forms shall be modified to include Unleaded Avgas as a separate product.

I confirm that the above fuel product is suitable for use in the aircraft referred to above

Name: Signature:

Position: Pilot Date: 20/12/18 Time: 12:00

TO BE COMPLETED BY FUELLING OPERATOR IF JET FUEL WAS DELIVERED BY NON-SELECTIVE SPOUT

I confirm that the product-selective spout was reattached to the nozzle after completion of fuelling

Name: Signature:

Aviation Fuel Quality Controls and Operating Standards
for Into-Plane Fuelling Services (JIG 1)

Appendix A14: Example Fuel product confirmation form

This form shall be completed before each fuelling when one of the following applies:
(Tick the box which applies)

- a) The aircraft is not marked with a fuel product decal which clearly and without doubt corresponds with the product of fuel marked on the fuelling vehicle, trailer or fixed (kerbside) delivery equipment.
- b) The fuelling nozzle spout or the aircraft fuel tank orifice do not correspond to the norm for the particular fuel product, i.e. for Jet Fuel, a wide selective nozzle spout and large aircraft orifice, and for Avgas, a small circular spout and narrow aircraft orifice.
- c) Overwing fuelling during air-shows

TO BE COMPLETED BY AIRLINE/AIRCRAFT AUTHORISED REPRESENTATIVE

To: (Into-plane service)

At: (Airport)

Aircraft Registration Number:

The aviation fuel requirements for this aircraft are as follows:

	FUEL PRODUCT (*)	QUANTITY
JET FUEL (Set A-1 or A1A)	Jet A-1	700 L
AVGAS (AVGAS 100LL)		

(*) Write either Jet A-1, Jet A or Avgas 100LL in the appropriate box

Note: Where unleaded Avgas (UL 91) is available, the fuel product confirmation forms shall be modified to include Unleaded Avgas as a separate product.

I confirm that the above fuel product is suitable for use in the aircraft referred to above

Name: Signature:

Position: Pilot Date: 20/12/18 Time: 12:00

TO BE COMPLETED BY FUELLING OPERATOR IF JET FUEL WAS DELIVERED BY NON-SELECTIVE SPOUT

I confirm that the product-selective spout was reattached to the nozzle after completion of fuelling

Name: Signature:



“ Misfueling !!! - It can't happen to us”

Overwing Fuelling Updates, JIG Is 14



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Misfuel prevention controls need to evolve

1. Fuel Grade Decals to specify the Grade (not just the Product)
2. Secondary colour identification to match the fuel colour / EI 1542 banding
 - On Fuel Grade Decals
 - On fuelling equipment



3. Introduce the '3-way cross-check'

- Retain the product selective spout controls (for Jet fuelling equipment only)
- Retain the FGVF as a 'back-up' control



ANNEX E
EXAMPLE FUEL GRADE CONFIRMATION FORM

The form shall be completed before each fuelling when one of the following applies (tick the box that applies):

- 1 Fuel placards/fuel grade decals are either absent, or do not clearly identify the fuel grade, or in the case of fuel grade decals, are applied by the aircraft owner/operator during fuel grade confirmation.
- 2 The fuelling nozzle spout or the aircraft fuel tank port do not correspond to the norm for the particular product, i.e. for Jet fuel a wide selective nozzle spout and large aircraft port, and for Avgas a small circular spout and narrow aircraft port.
- 3 For overwing fuelling during an above.

TO BE COMPLETED BY AIRCRAFT AUTHORISED REPRESENTATIVE

To: _____ (Intra-plane services)
At: _____ (Airport)
Aircraft Registration Number: _____
The aviation fuel required for this aircraft is as follows:

JET FUEL	FUEL GRADE (1)	QUANTITY
Jet A1 or Jet A		
Fuel System (wing tank/booster/relucting/ additive required?)		
AVGAS		
AVGAS UL91		
AVGAS UL94		
AVGAS 100LL		
AVGAS 100		

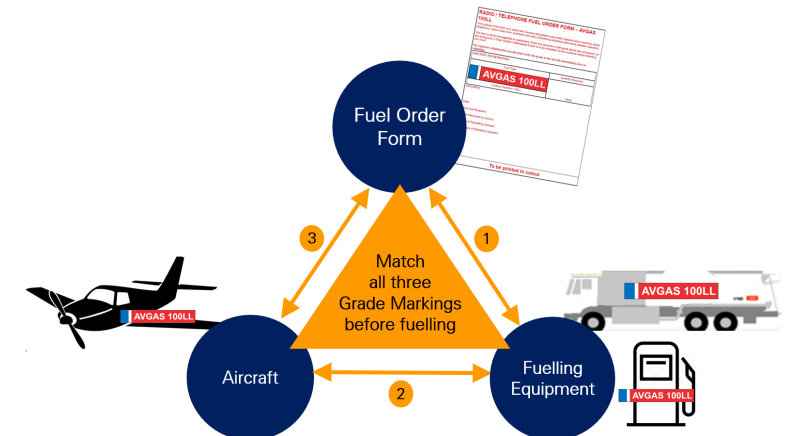
I confirm that the above fuel grade is suitable for use in the aircraft referred to above.

Name: _____ Signature: _____
Position: _____ Date: _____ Time: _____

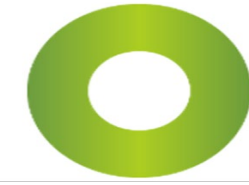
TO BE COMPLETED BY FUELLING OPERATOR IF JET FUEL WAS DELIVERED BY NON-SELECTIVE SPOUT

I confirm that the product selective spout was reattached to the nozzle after completion of fuelling.

Name: _____ Signature: _____



El misfuelling video



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Link to El video: <https://youtu.be/rrg--s48NrA?si=iS9JdOib0VK6aLTV>



Observation Strategy – Dual Approach

Face-to-face observation: coaching and reinforcement

Hidden observation: real behavior validation

Both methods are essential for full visibility

One without the other gives incomplete picture

“Should we formalize a combined approach of observed and unobserved behavior monitoring to ensure full safety visibility?”

HSSE MS Safety Walks Definition - A Safety Walk takes managers and supervisors into the work areas where they have oversight responsibilities, to observe the work and to talk with employees about the safety of their job and other aspects of HSSE.

HSSE MS - Element 1 (Leadership, Involvement and Responsibility)

1.9. Managers and supervisors shall undertake Facility Safety Walks and discussions with employees, or other information-gathering techniques, to identify desirable and undesirable behaviours and working conditions.

Trainers

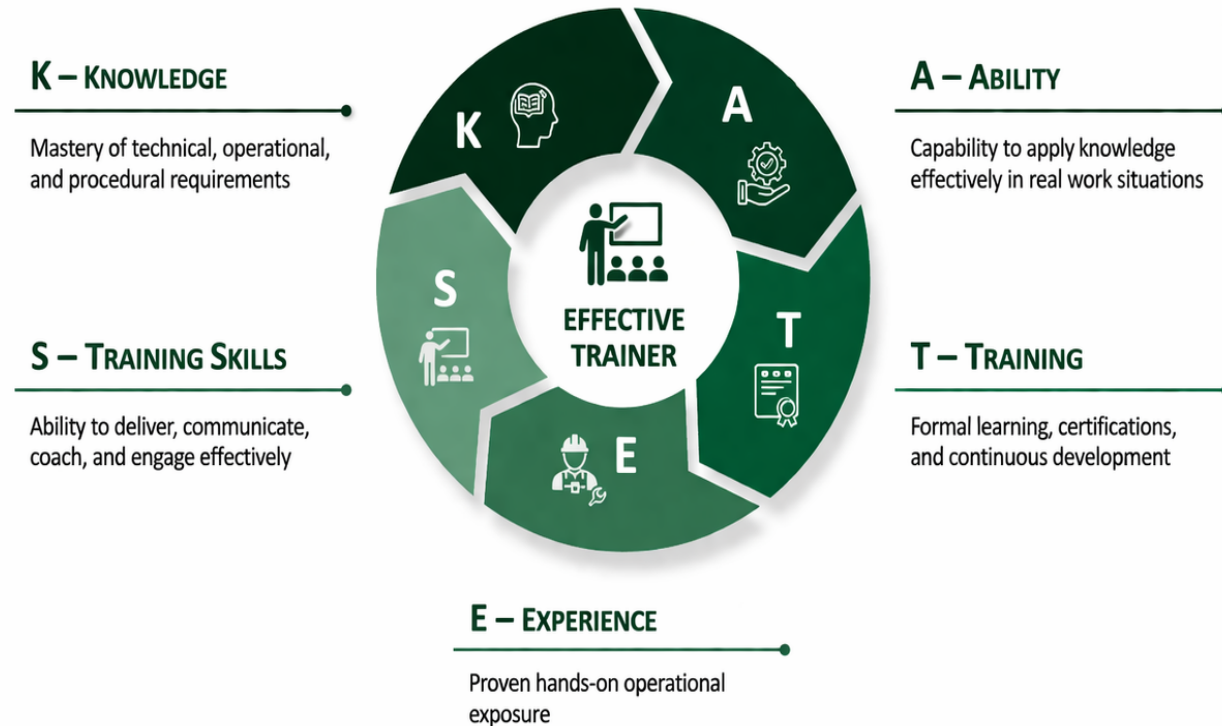


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KATES – Trainer Competency Model

A comprehensive framework to ensure trainer effectiveness and impact

Aviation fueling is a high-risk, safety-critical operation, making a **qualified and certified trainer** essential not only for technical accuracy and compliance, but also for developing strong **behavioral skills**—such as situational awareness, communication, and safety mindset—which are critical to preventing human error and ensuring safe, reliable operations.



Effective trainers are not only knowledgeable — they can apply, demonstrate, and transfer that knowledge effectively.

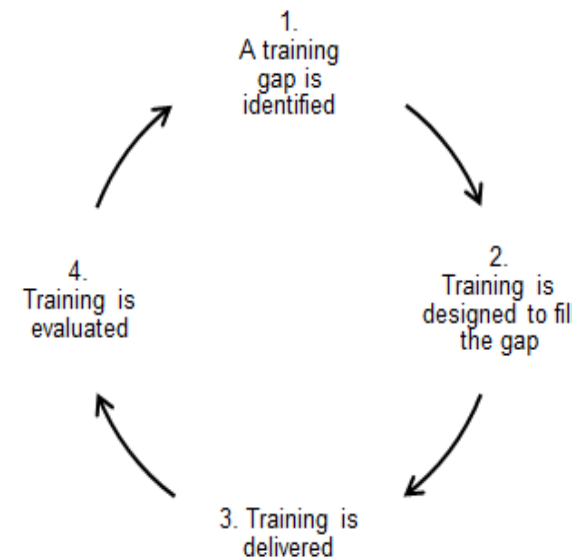


Trainers Roles and Responsibilities

- Apply L&D principles across the full training cycle
- Ensure effective delivery through strong technical and behavioural competencies
- Combine operational expertise with instructional excellence
- Provide timely, structured, and impactful feedback
- Maintain professionalism, objectivity, and impartiality in all interactions and assessments
- Ensure accurate recording of training and assessment outcomes
- Support governance through clear metrics and performance oversight

The Training Cycle is a generic process which describes how a training programme is created, evaluated and improved. The Cycle has 4 stages:

The Training Cycle





LEARNING HUB

Search ALL courses by Keyword:

Enter keyword Search

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Select a language

Filter by Category:

Select a Category

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GP8 - Introduction to Tarbox



Learn More

Free

Refuelling Safety



Learn More

Free

Refuelling Safety at Large Airports



Learn More

Free

IJS4 - HSSE FOR INSPECTORS



IJS1 - Core Principles for JIG Inspectors



IJS3 - Writing a JIG Inspection Report



corner

ently





The Quality Control Protocol for the Receipt of Aviation Products by Ship (JIG 2)

JIG Manager Workshop, Nairobi, 13–15 Aprilth

Agenda

Selection Criteria for Ships/Vessels for the Transport of Aviation Fuel (Jet A1 – Avgas 100LL) Ref: JIG2-4.5

Quality Control Procedure Prior to Unloading the Vessel. Ref: JIG2 4.5.1

Quality Control Procedure During Unloading of the Vessel. Ref: JIG2 4.5.2

Quality Control Procedure After Unloading the Vessel. Ref: JIG2 4.5.3

Selection Criteria for Ships/Vessels for the Transport of Aviation Fuel (Jet A1 – Avgas 100LL) Ref: JIG2- 4.5

Vessel compliance:

- ✓ It is recommended that the vessel be dedicated solely to aviation fuel during the voyage, including the last two voyages. **(should)**
- ✓ **Must** unload aviation fuel into a system where the products are completely segregated. **(Shall)**

NB:

- Vessels with a capacity exceeding 20,000 tonnes **shall** under no circumstances be considered dedicated vessels **(Shall)**.
- For non-dedicated (multi-product) vessels, the receiving depot **must** ensure that the supplier has provided clear documentation, including **a tank cleaning certificate** in accordance with the requirements of **HM50** regarding product changes.
- A vessel carrying a mixed cargo with other types of fuel **must not** be received at an airport depot, unless there are specific facilities for this type of reception; see 4.2.1 and 4.2.2 for further information.

The Quality Control Procedure Prior to Unloading the Vessel. Ref: JIG2 4.5.1

☐ Compliance of the vessel's cargo

• Cargo documents **must be available and verified**

✓ Regarding product quality:

- The Certificate of Release for Consumption from the loading depot
- The COQ, COA or Recertification if the vessel has loaded from another terminal
- Recertification of tanks after loading, if applicable (EI/JIG 1530 rev2 10.1.5)
- The sample inventory report with seal references

✓ Regarding quantity (volume/weight):

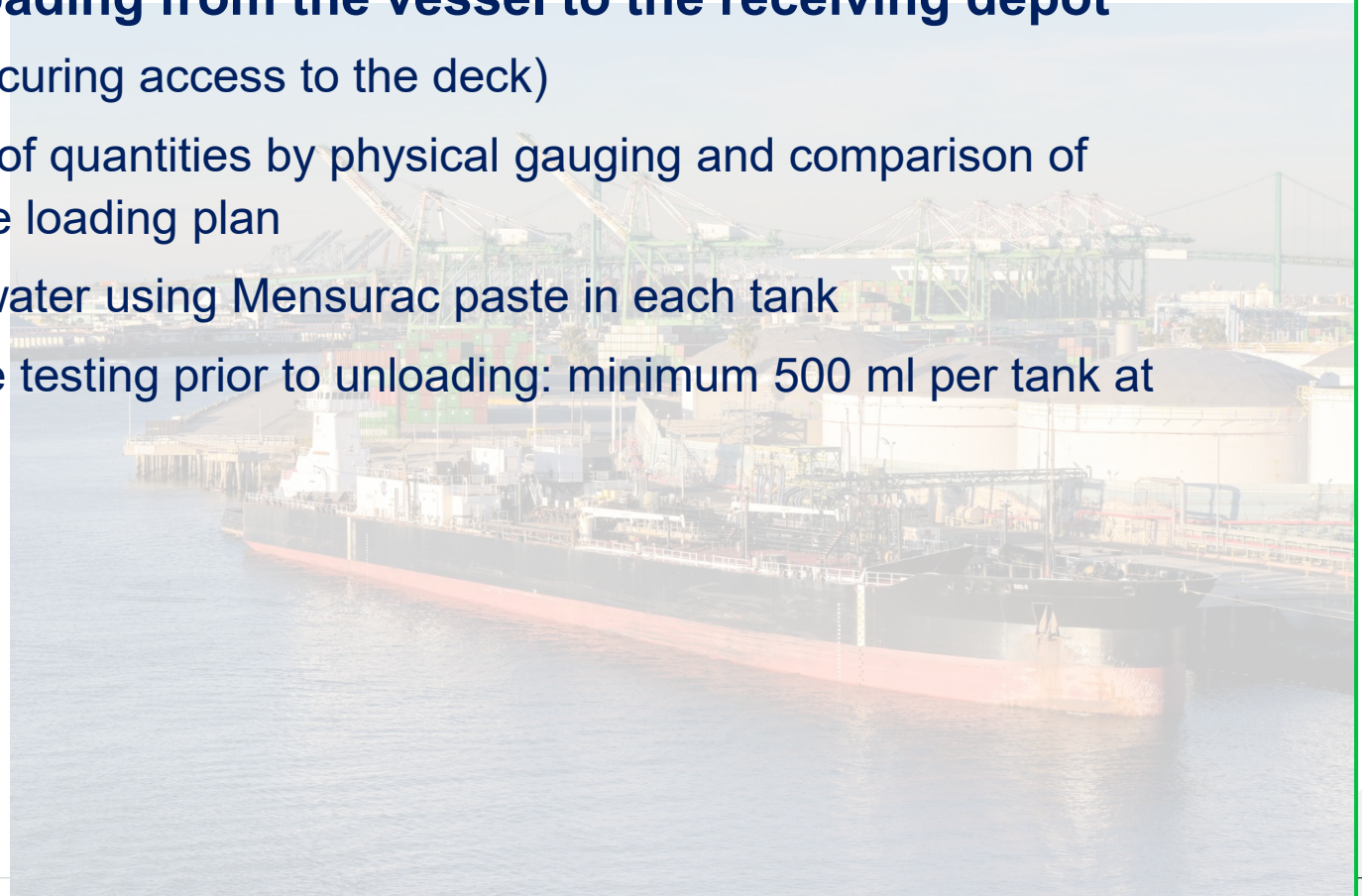
- The bill of lading
- The ship's tank gauge reports after loading
- The inspector's loading report
- The loading plan



Preparations prior to unloading — Ref: JIG2 4.5.1 (1/2)

☐ Preparations prior to unloading from the vessel to the receiving depot

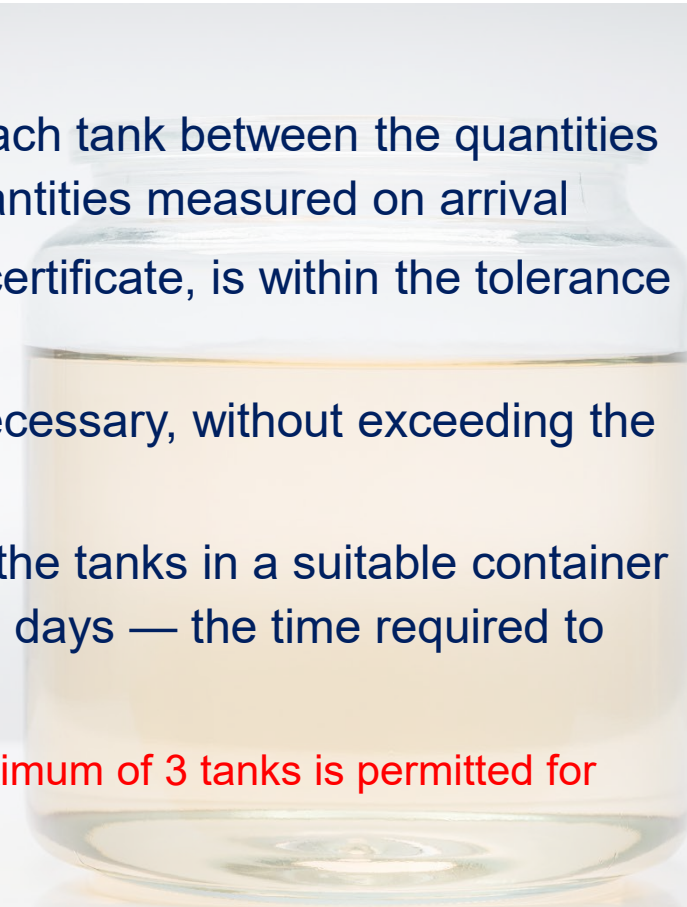
- ✓ Safety on board the vessel (securing access to the deck)
- ✓ Tank identification, calculation of quantities by physical gauging and comparison of quantities on arrival against the loading plan
- ✓ Checking for the presence of water using Mensurac paste in each tank
- ✓ Taking samples for acceptance testing prior to unloading: minimum 500 ml per tank at all levels for a **'control check'**



Sampling and checks — Ref: JIG2 4.5.1 (2/2)

□ Sampling and checks

- ✓ Ensure compliance with the tolerance ($\pm 0.3\%$) for each tank between the quantities stated on the loading plan/report and the physical quantities measured on arrival
- ✓ If the density at 15°C , as compared with the release certificate, is within the tolerance of $\pm 3.0 \text{ kg/m}^3$, the product may be accepted
- ✓ Check the product's conductivity; add Stadis 450 if necessary, without exceeding the maximum concentration limit
- ✓ Prepare a 5-litre composite sample representative of the tanks in a suitable container (section 2.2.3 a). To be kept at the depot for at least 2 days — the time required to clear the batch
- **NB:** For a dedicated barge, a composite sample from a maximum of 3 tanks is permitted for density verification



Monitoring During Unloading — Ref: JIG2 4.5.2 (1/2)

- ✓ During unloading immediately after start-up, take a sample from the receiving line/hose at the point **closest** to the vessel
- ✓ Carry out a **'Control Check'**
- ✓ For a **dedicated vessel**, take the sample 5 minutes after start-up and immediately before the end of unloading
- ✓ For **non-dedicated vessels**, continue taking samples at least every 2 hours
- ✓ An automatic system or equivalent allowing **continuous monitoring** of the receipt, including density checks, may be used

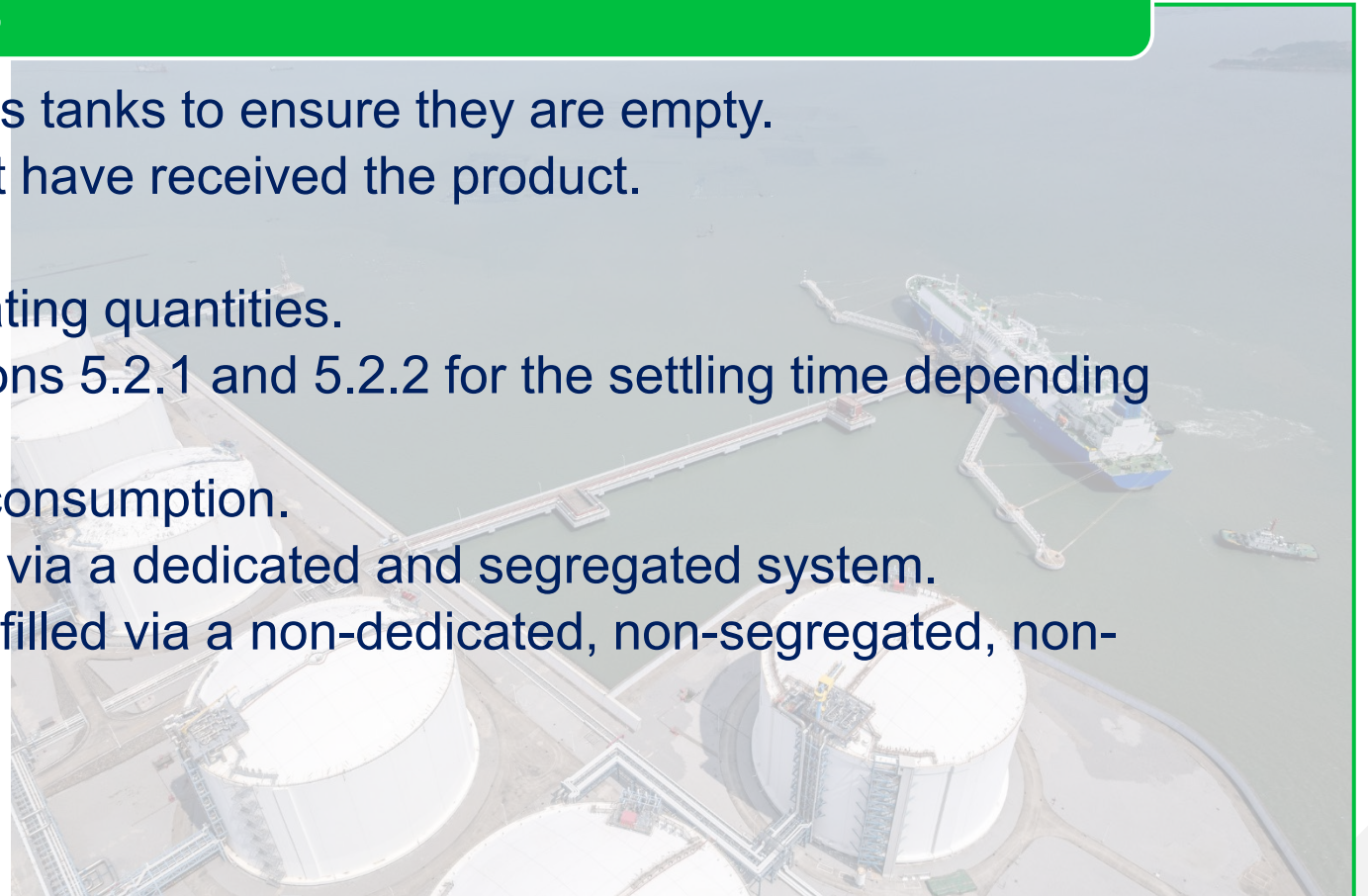
Interfaces and Contamination — Ref: JIG2 4.5.2 (2/2)

- ✓ Product interfaces must be directed towards other fuel tanks or slop tanks
- ✓ Any signs of contamination must be reported immediately to the vessel's captain or their representative
- ✓ If a large quantity of water and/or sediment is detected:
 - Stop unloading and carry out an investigation
 - Notify the supplier company to agree on a plan to manage the situation



The Quality Control Procedure Following Unloading of the Vessel/Boat. Ref: JIG2 4.5.3

- ✓ After unloading, check the vessel's tanks to ensure they are empty.
- ✓ Close the valves on the tanks that have received the product.
- ✓ Leave the tanks undisturbed.
- ✓ Proceed with gauging and calculating quantities.
- ✓ Allow the tank to settle; see sections 5.2.1 and 5.2.2 for the settling time depending on the configuration.
- ✓ Proceed to release the tanks for consumption.
 - See section 5.3.1 for tanks filled via a dedicated and segregated system.
 - See section 5.3.2 for containers filled via a non-dedicated, non-segregated, non-separated system



Q&A



Thank you





COFFEE BREAK



TITAN

Aero

INNOVATIVE REFUELLING SOLUTIONS & SERVICES

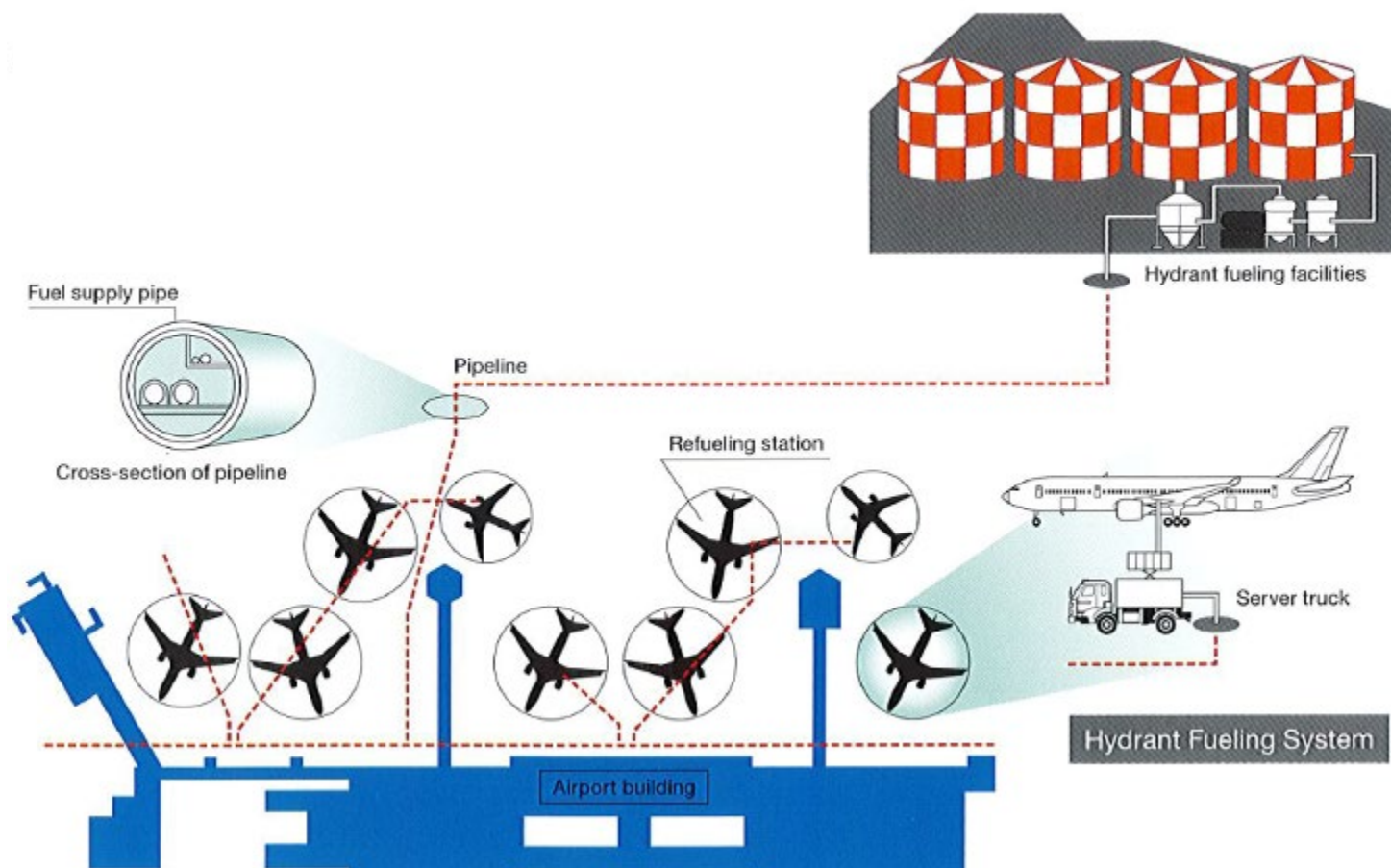
TITAN Aero

JIG Technical Managers Wksp Nairobi

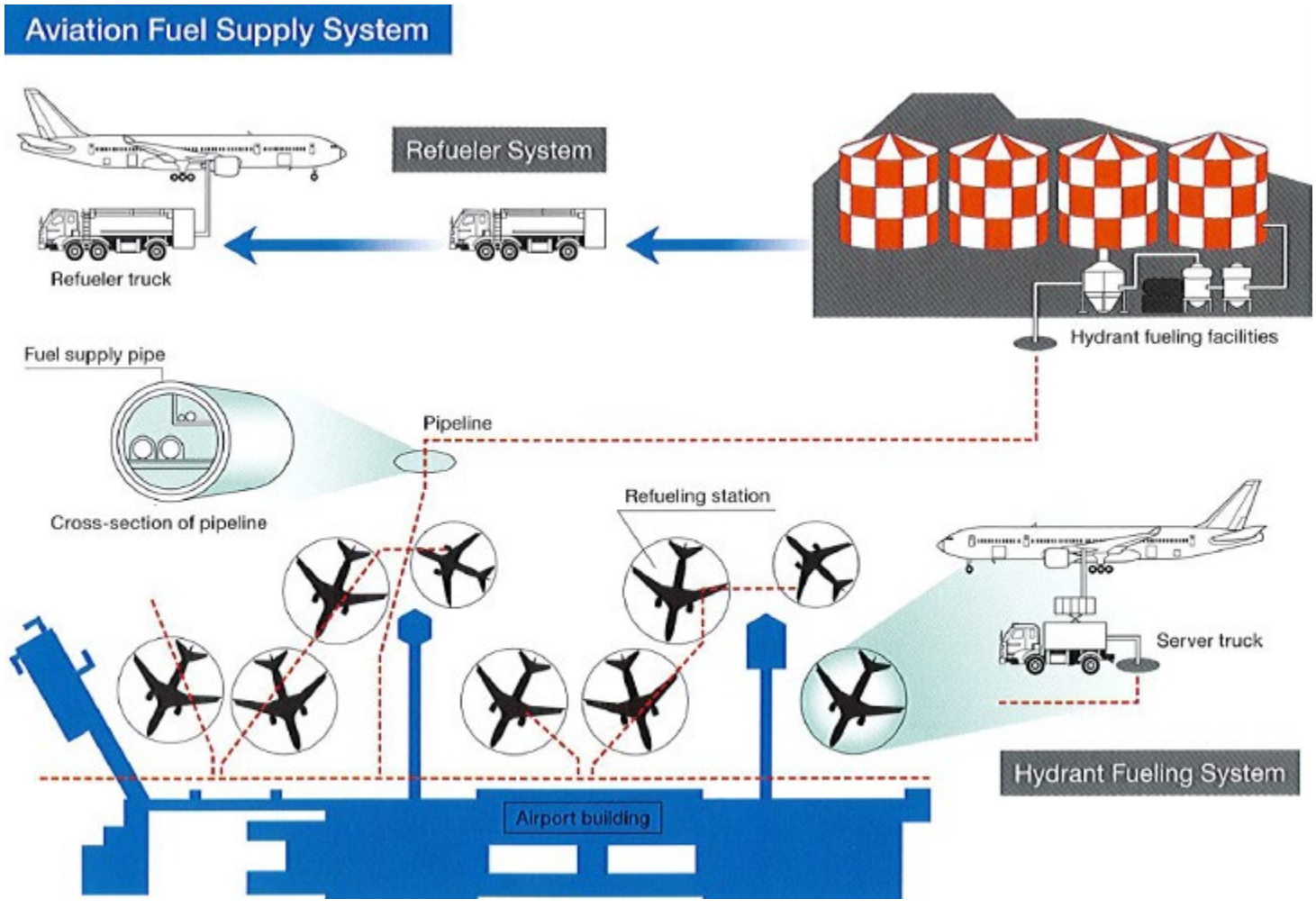
Typical Large Airport Fuel Operations

64

Aviation Fuel Supply System



Typical Large Airport Fuel Operations



Hydrant Dispenser

66



- Hi – Flow Refuelling.
- Large Widebody Aircraft.

18k Rigid Bowser

67

- Standard refuelling.
- Hydrant Maintenance Replacement Capability.



Electric Powered Refuelling

68

- Zero-Emission Refuelling.
- Reduce Maintenance & Fuel Consumption.
- Better Operator Experience



Combined Concept To A Solution!

69



Combined Concept To A Solution!

70



3-In-1 Refuel Solution

18k EZ-Flow Bowser / H-Dispenser

71

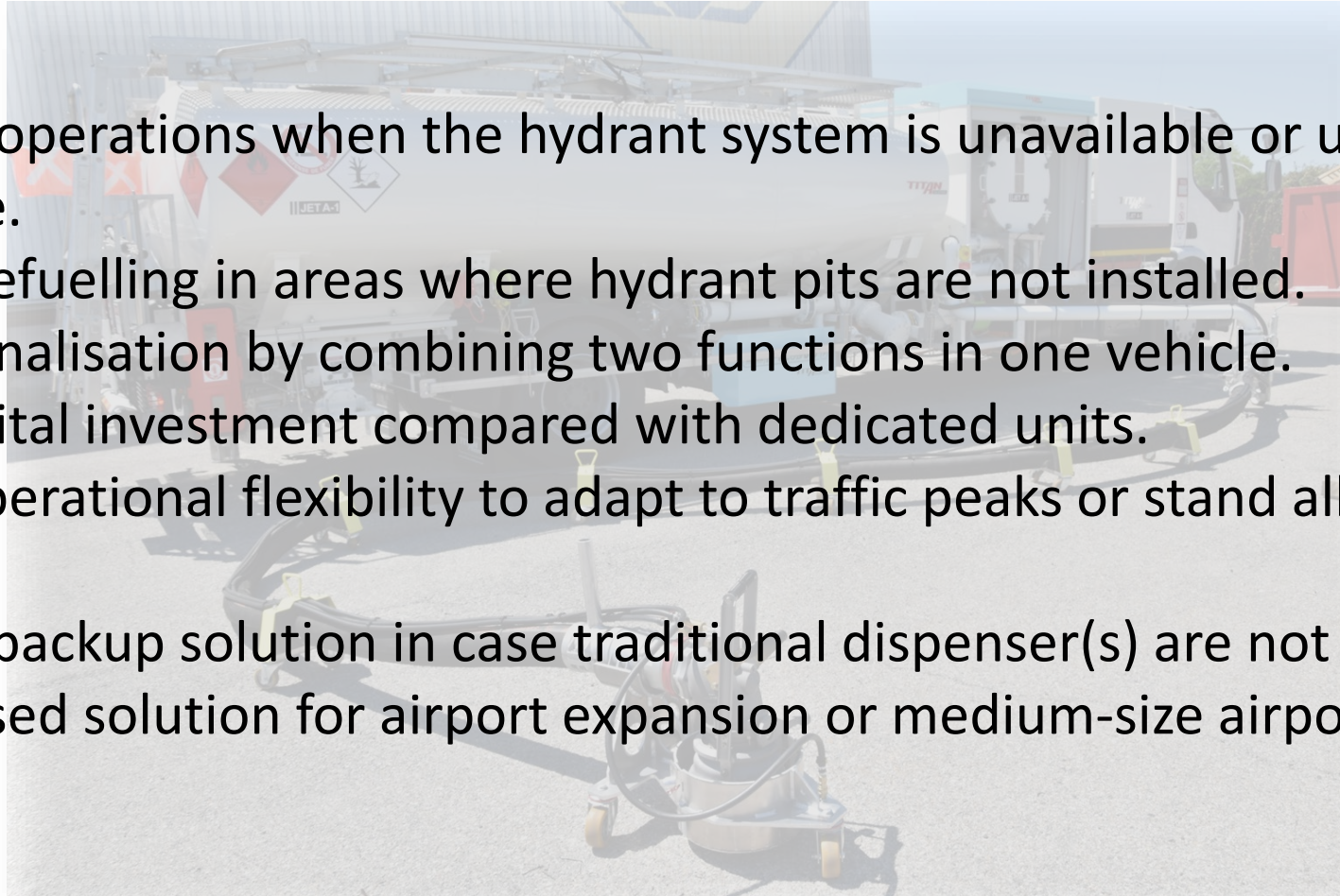


18k EZ-Flow Bowser / H-Dispenser

72

Maintaining operations when the hydrant system is unavailable or under maintenance.

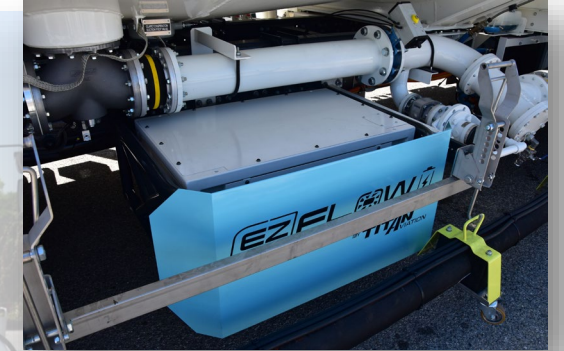
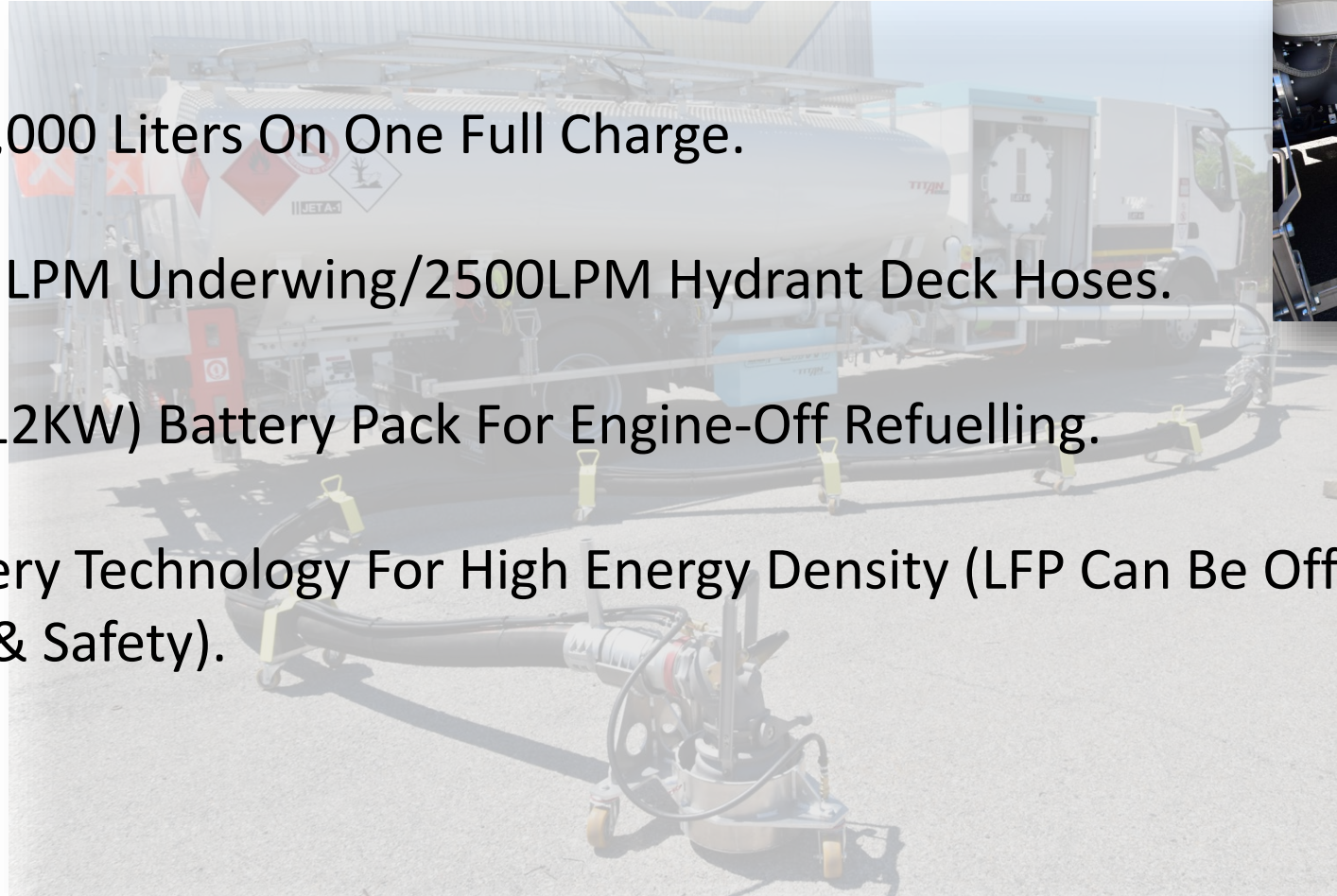
- Enabling refuelling in areas where hydrant pits are not installed.
- Fleet rationalisation by combining two functions in one vehicle.
- Lower capital investment compared with dedicated units.
- Greater operational flexibility to adapt to traffic peaks or stand allocation changes.
- A reliable backup solution in case traditional dispenser(s) are not available.
- An optimised solution for airport expansion or medium-size airports.



18k EZ-Flow Bowser / H-Dispenser

73

- Up To 200,000 Liters On One Full Charge.
- Up To 900 LPM Underwing/2500LPM Hydrant Deck Hoses.
- 48KW (4x12KW) Battery Pack For Engine-Off Refuelling.
- NMC Battery Technology For High Energy Density (LFP Can Be Offered For Long Cycle Life & Safety).



18k EZ-Flow Bowser / H-Dispenser

74



18k EZ-Flow Bowser / H-Dispenser

75



18k EZ-Flow Bowser / H-Dispenser

76



Questions.....

77

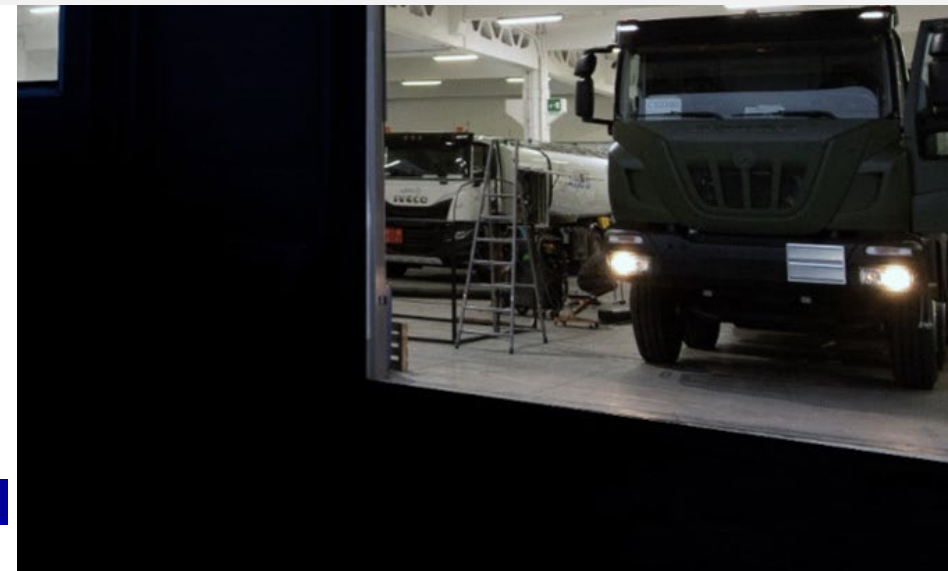


Sustainable Aviation Refuelling Equipment

DRIVING AVIATION FUELLING INNOVATION



managers workshop Nairobi, 14th-16th of April





OUR BACKGROUND

Providing high-quality innovative and customized solutions incorporating the latest state-of-the-art technology in design and manufacturing of:

- aircraft refuellers
- hydrant dispensers
- hydrant carts
- special vehicles (pit cleaners, pit flushers,...)
- special projects (skids,..)
- military refuellers (defense industry)

Leveraging over 40 years of experience

Stainless steel tanks focus

All built in-house / no outsourcing

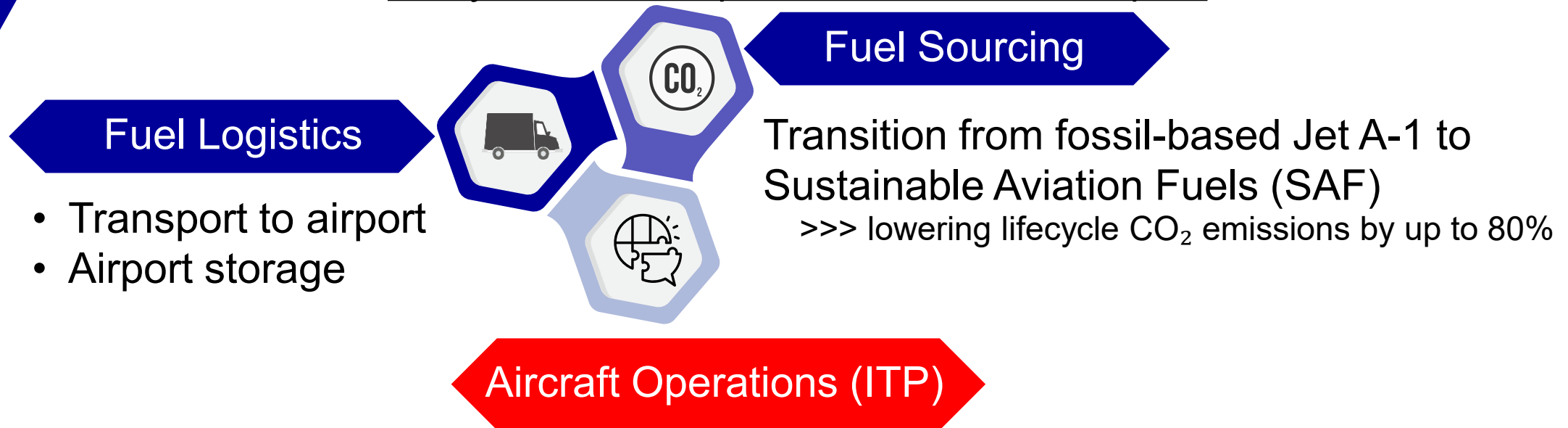
Backed by the main shareholder **UPLIFT INTERNATIONAL Holding BV**

Sustainable Refuelling Equipment in the Airline Supply Chain



Aircraft design, fuel sourcing, logistics, and aircraft operations

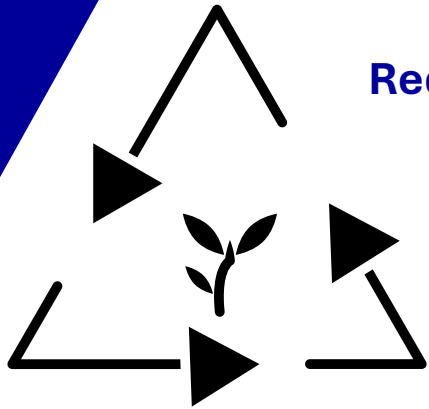
Every element shapes airlines carbon footprint



Equipment

- Component & materials selection & sourcing
- Design
- Production process

Equipment manufacturer's role in sustainable aviation

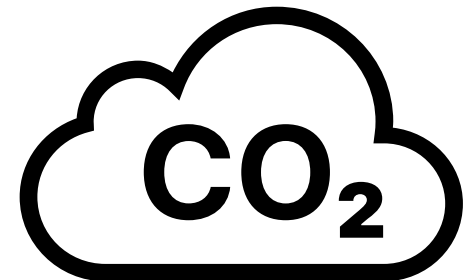


Reducing emissions in equipment design, technology, and materials

- Support a cleaner fuel supply chain
- Lower the carbon footprint for ITP operators, oil companies, and airlines
- This directly contributes a better Scope “x” performance across the industry (ESG & GHG Protocol)

JM's ESG roadmap

- Presently under implementation
- Aims to anticipate customer and regulatory expectations for low-carbon operations
- JM is in phase of reviewing sustainability performance of its suppliers



Sustainable Refuelling Equipment

Electrification

- Full electric chassis
- Electric PTO

Digitalisation

- Smart Digital Assistant (SDA)

Stainless Steel tanks

- “Tanks that last”
“ALU saves a few kilos. Stainless steel saves your reputation”

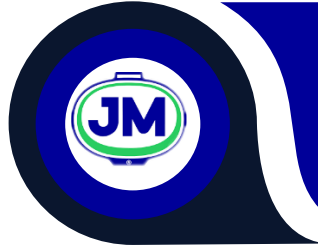
Quality works, components & material

- Limited or no repairs / total cost of ownership

Fit for purpose

- Built to be used - JM aims to be the ITP fuellers' preference...





Experience with full electric chassis

2015, vision to build a full electric and digital dispenser
Built, but the technology was not yet ready

JM: 5 EV brands studied & offered / built & operational (*) / built & tested (**)

- Iveco (dispensers) (*)
- Man Quantron (refuellers 22kl) (*)
- Volvo (refuellers 22 and 45kl) (**)
- Mercedes (refuellers 22 and 45kl)
- Electra (dispensers + refuellers)

Substantial experience in this matter



Preliminary Observations

EV's in apron operations is ideal environment

- Limited area, private land, flat & smooth surface, availability of charging infrastructure

Push by airports who aim for zero carbon and impose transition towards electrification

ESG: OEM input, EV 90% carbon footprint reduction over life-time compared to diesel chassis

Constraints

- Risks related to use of EV in presence of fuel (hazardous area)

OEM's

- Slower to enter the market / risk to jeopardize their brand name / more stringent compliance due to internal policies

Others

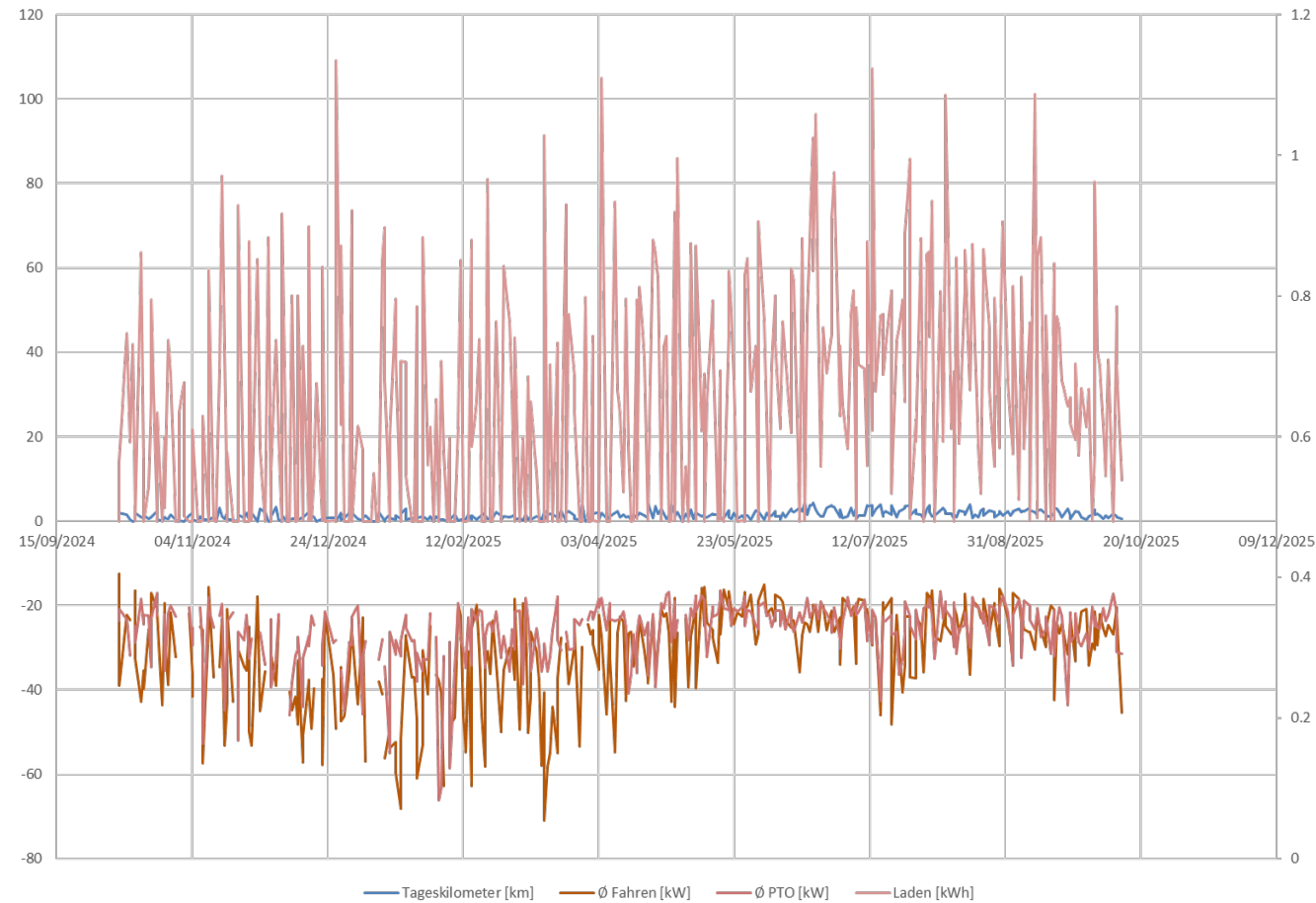
- 'Fast movers' are less risk adverse / take advantage of first experiences

Choice mainly by customer preferences / based on their needs

But refueller manufactures to provide support:

- Large ITP players spend time & effort to study and have strong ideas
- Smaller ITP players rely on refueller manufacturers





Basic specifications:

- Refueller Capacity 22.000 litres, GVW 32t
- Battery capacity 280kWh
- Charging 22kW AC

Performance data (per day):

- Distance traveled 5km / 28kWh
- PTO usage 26kWh
- Charging 28kWh
- Charging interval 4 days

JM Enterprise Quantron e-refueller 22M3 benchmark

	From 12/06/ 2025 to 17/10/2025	E-Refueller (22M3)	Thermic Refueller (22M3)
Global Data per type of Refueller	Total Traffic	1089	1089
	Total Volume L	3,468,547	3,468,547
	Total hour	283h59m 33s	283h59m 33s
	Average Volume per Ops	3,199	3,199
	Average time per Ops	15m38	15m38
Financial and Fuel Cons Electrical Versus Diesel	Price of Elec per KWh	0,18 euros	
	Price of Diesel par L		1,5 euros
	Total Electrical Cons (KWh) 130 KWh / 100Km	8320	
	Total Fuel Consumption (L) capacity of tank (450L)		9750
	Number of Energy Loading	64	21
	Total Energy cost per type of Refueller	1497 euros	14625 euros
	Total maintenance cost par chassis (Without Tires change)	250 euros	5300 euros
CO2 emission	0kg	1742 kg	





Dispensers

IVECO eDaily

- Payload 3,5t
- GVW 7,2t
- Motor power 140kW / 400Nm
- Battery 111kWh, chemistry NMC make FPT Microvast HnCO
- Up to 200 km range WLTP
- 20 min fast charge 115kW for 100 km range
- AC 22kW 4,5h full recharge
- DC 115kW 35 min from 20% to 80%
- ePTO 50KW
- ESG 50% operative cost reduction compared to the diesel model
- 8 years warranty / 250.000 km; warranty extensions package available with battery replacement after 80% of capacity is reached included;

ELECTRA eCargo

- GVW 9t
- Certification IP67, UN ECE R100.2
- Motor power 235kW / 1200Nm
- Battery 140kWh, chemistry LFP make CATL
- Up to 200 km range
- DC fast charge 150kW
- AC 25kW charge 6h (0-100%)
- ePTO 55kW
- 5 years warranty / 5000 cycles; warranty extensions package available;



VOLVO

- FM ELECTRIC 6x2
- AT ADR certified UN ECE R105
- GVW 32t
- GCW 50t+
- 3 electric motor power 500kW / 800Nm
- Battery nominal 490kWh, chemistry NCA make Volvo
- Operative window from -30 to +55 °C
- Up to 380 km range WLTP
- 2h DC fast charge @250kW, 0-80% 90 mins, 80-100% 30 mins
- AC 10h full recharge @43kW
- PTO DIN 5462/ISO753 plug-in pump 600Nm
- 5 years warranty; warranty extensions package available;

MERCEDES

- eEconic 300 L ENA 6x2
- Certification R100
- GVW 27t
- Electric motor power 350kW / 800 Nm
- Battery up to 336kWh, chemistry NMC
- Up to 300 km range
- DC fast charge 160kW;
- PTO ZF eWorX behind cab, flange SAE
- 3 years / 110000 km; warranty extensions package available;

QUANTRON/KINELL

- MAN TGS ELECTRIC 6x2
- Certification R100
- GVW 32t
- Electric motor power 375kW
- Battery nominal 280kWh, chemistry NMC make Kinell
- Up to 350 km range
- 2h DC fast charge @350kW, 20-80% 50 mins;
- AC 10h full recharge @43kW
- PTO direct gearbox
- 5 years warranty; warranty extensions package available;

ELECTRA

- eStar LEM27-350 6x2
- Certification IP67, R100.2
- GVW 30t
- Electric motor power 350kW
- Battery up to 420kWh, chemistry LFP make CATL
- Up to 350 km range
- DC fast charge 150kW;
- AC charge on board 25kW;
- ePTO 55kW
- 8 years / 5000 cycles warranty; warranty extensions package available;

Support of ITP operations / commissioning

Commissioning

JM support from OEM



Operating manuals are very detailed



HSSE / Risks

- 1. DC High Voltage
- 2. Battery Fire



How to mitigate?

- OEM system design
- Risk analysis
- By User/Operator to perform when using new technology / part of MOC
- JM to support: participate in Risk Analysis sessions; outcome to be shared with fire brigade; airport fire brigade to give blessing in use



Maintenance EV part

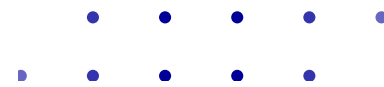
- Less maintenance
- Required different maintenance skills

Operations

More or less same of diesel driven
easier / smoother / less noise

!!! high torque @ start → accelerate fast / needs attention from drivers

- Integrated in operating procedure truck



THE PROJECT - SMART DIGITAL ASSISTANT (SDA)

The Refueller must become an extension of the human ability to operate

Developed from a very specific need:

transform our products - Aircraft Refuellers and Dispensers -
from a simple tool - used only to perform a function
to a virtual assistant

How?

By actively assisting the operator in carrying out the refuelling operations

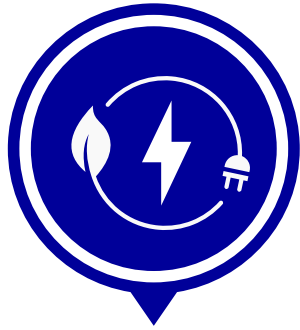
- monitors the operating conditions in real-time
- anticipates dangerous situations
- fast acting on the vehicle
- ensures very high levels of service and performance
- managing of power demand, consumption, emissions, and workload for the operator



Unique smart virtual assistant - SDA



SDA complies with sustainability goals:



Lower energy consumption



Lower noise



Less environmental pollution

The availability of **machine learning and AI services** - allow the processing of aggregated data to develop fault prevention strategies and predictive vehicle maintenance protocols:

- Less human influence/errors
- Less wear of critical components

Increased reliability
Longer lifespan



**CONNECTION OF VEHICLES AND
DATA EXCHANGE TO THE CLOUD**

Make the vehicles connected, allowing the reception of data from sensors or control units, so that they can be transferred to cloud systems to implement supervision and control activities.

SCALABLE SYSTEM

Introduce a modular, extensible system that allows to scale functions over time, enabling a continuous extension of the product's functions, through software updates.

**DATA CENTRALIZATION AND
CONTROL**

Allow the collection and complete management of all the information generated and managed by the system, in "raw" mode, so as to be able to have the necessary information, true added value of the ecosystem, also for subsequent development phases.

DATA-DRIVEN APPROACH

Analyse data in order to provide analytics and useful insights to support decision-making processes at all levels.

STAINLESS STEEL VS ALUMINIUM

Two primary materials are used for aviation refueller tanks:

- Stainless Steel (SS)
- Aluminium (ALU)

Both materials have long histories in fuel transport equipment.

However, the operational requirements of airport refuelling vehicles differ significantly from those of road fuel tankers, which affects the optimal material choice

While aluminium has become dominant in road tanker manufacturing, stainless steel remains a highly relevant solution in aviation refuelling applications

Historical Development Of Tank Materials



Originally, aviation refueller tanks were typically built from stainless steel, using relatively conservative wall thicknesses to ensure:

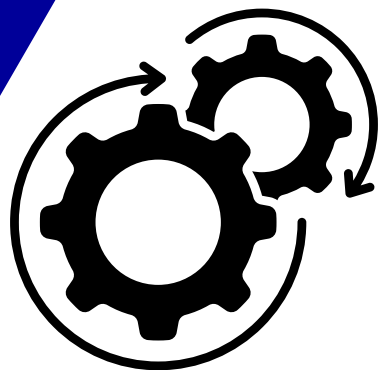
- high structural robustness
- long operational lifetime
- high safety margins

Over time, increasing market competition led many manufacturers to reduce material thickness in order to lower:

- manufacturing cost
- vehicle weight

This development particularly affected aluminium tanks, where thinner structures makes them more unreliable





OPERATIONAL ENVIRONMENT: ROAD TANKERS VS AVIATION REFUELLERS

Road tanker conditions

- strict vehicle weight limits
- long transport distances
- highway speeds
- focus on payload efficiency

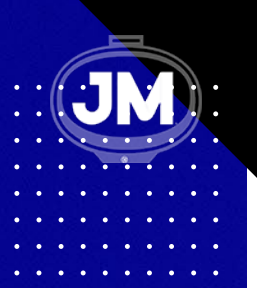
Aviation refueller conditions

- short driving distances on airport and a lot of manoeuvrings
- limited operating speeds (~30 km/h)
- minimal road weight restrictions
- larger tank capacities possible (up to ~85 m³)

Operational priorities in aviation

- reliability
- durability
- structural robustness
- fuel cleanliness
- long service life

BECAUSE OF THESE FACTORS, WEIGHT IS LESS CRITICAL IN AVIATION REFUELLING THAN IN ROAD TRANSPORT, WHILE LONG-TERM STRUCTURAL DURABILITY BECOMES MORE IMPORTANT



Structural design and material properties

The required wall thickness of a tank is strongly influenced by the mechanical properties of the material



Typical wall thickness used in aviation refueller tanks

The main reason aluminium tanks require greater thickness is the difference in mechanical stiffness and fatigue behaviour

Key mechanical properties

ELASTIC STIFFNESS AND TORSIONAL LOADS

Material	Young's modulus
Stainless steel	~200 GPa
Aluminium	~70 GPa

A CRITICAL PROPERTY FOR TANK STRUCTURES IS YOUNG'S MODULUS, WHICH DESCRIBES HOW MUCH A MATERIAL DEFORMS UNDER LOAD.

STAINLESS STEEL IS +/- 3 X STIFFER THAN ALUMINIUM



REFUELLER TANKS EXPERIENCE
TORSIONAL LOADS DURING OPERATION

TYPICAL SOURCES INCLUDE:

- CHASSIS TWISTING WHEN DRIVING OVER UNEVEN SURFACES
- BRAKING AND ACCELERATION FORCES
- VEHICLE CORNERING
- INTERNAL FUEL MOVEMENT (SLOSHING)
- VEHICLE MANOEUVRING (PARKING, LOADING, UNDERWING POSITIONING)

THESE FORCES CAUSE STRUCTURAL DEFORMATION OF THE TANK SHELL

STRUCTURAL RESPONSE TO TORSION

Because stainless steel is 3 x stiffer, the tank structure:

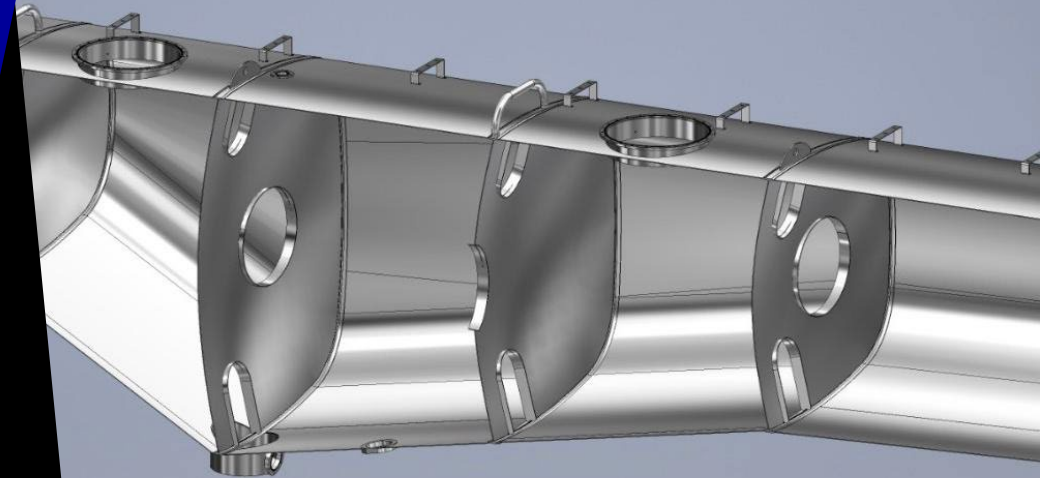
- deforms less under torsional loads
- distributes stress more evenly
- reduces strain in weld areas
- improves fatigue resistance

Aluminium structures, being less stiff:

- deform more under the same load
- experience higher cyclic strain
- are more sensitive to fatigue cracking

This is one of the key reasons aluminium tanks require:

- greater wall thickness
- careful stress design
- reinforcement of critical areas





EXAMPLE: STRUCTURAL WEIGHT COMPARISON (48 m³ TANK)

ASSUMPTIONS:

- ALUMINIUM THICKNESS: 6 MM
- STAINLESS STEEL THICKNESS: 4 MM

MATERIAL DENSITIES:

- ALUMINIUM: 2700 KG/M³
- STAINLESS STEEL: 8000 KG/M³

ALTHOUGH STAINLESS STEEL IS DENSER, **THE REAL TANK WEIGHT DIFFERENCE IS SMALLER THAN DENSITY ALONE WOULD SUGGEST**, BECAUSE ALUMINIUM REQUIRES THICKER WALLS

ESTIMATED TANK WEIGHT

ASSUMED RAW MATERIAL PRICES:

- ALUMINIUM: €4/KG
- STAINLESS STEEL: €3/KG

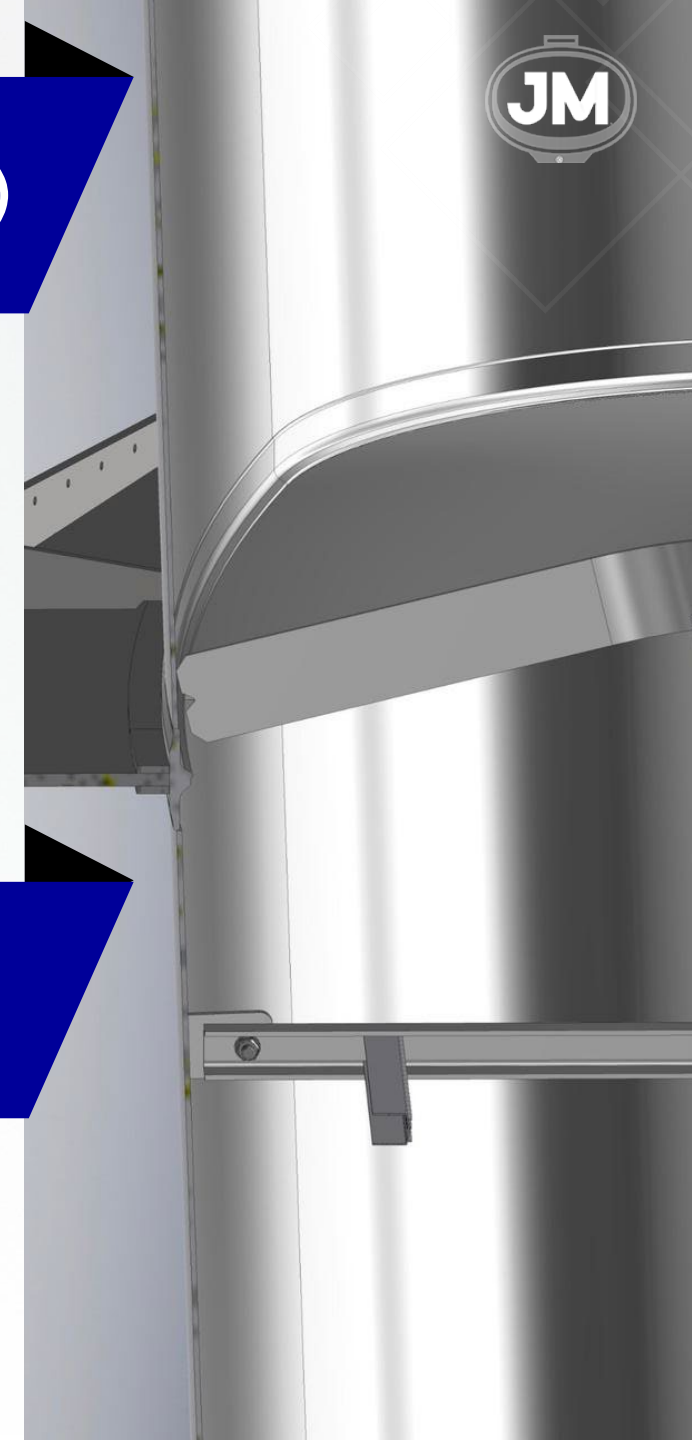
MATERIAL COST PER TANK

(ILLUSTRATIVE EXAMPLE)

MATERIAL-ONLY DIFFERENCE:

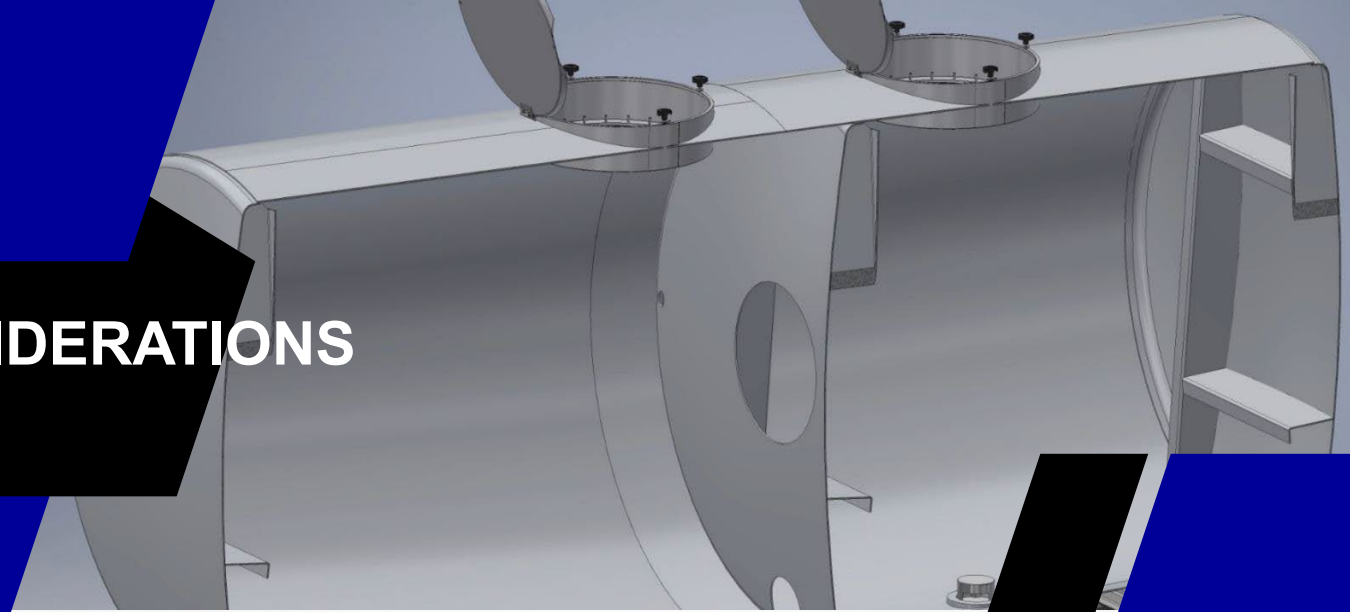
≈ €6000 PER TANK

HOWEVER, THIS COMPARISON DOES NOT YET INCLUDE FABRICATION COST





FABRICATION AND WELDING CONSIDERATIONS



FABRICATION COMPLEXITY DIFFERS BETWEEN ALUMINIUM AND STAINLESS STEEL

ALUMINIUM FABRICATION CHARACTERISTICS

- THICKER PLATES REQUIRED
- MORE DEMANDING WELDING CONDITIONS
- REDUCED STRENGTH IN HEAT-AFFECTED ZONES
- HIGHER CRACK SENSITIVITY NEAR WELDS

INDUSTRY EXPERIENCE OFTEN SHOWS THAT **ALUMINIUM TANK FABRICATION MAY REQUIRE ABOUT 20% MORE LABOUR**

WHEN FABRICATION COST IS INCLUDED, THE DIFFERENCE IN FINISHED TANK COST BECOMES SMALLER THAN THE RAW MATERIAL COMPARISON SUGGESTS

STRUCTURAL DURABILITY CONSIDERATIONS

THE DURABILITY OF ALUMINIUM TANKS DEPENDS STRONGLY ON THREE CRITICAL FACTORS:

1. STRUCTURAL DESIGN QUALITY

PROPER DESIGN MUST ENSURE:

- MINIMIZED STRESS CONCENTRATIONS
- OPTIMIZED REINFORCEMENT
- CONTROLLED TORSIONAL STRESS PATHS

2. WALL THICKNESS REDUCTION

MARKET PRICE PRESSURE:

- REDUCED ALUMINIUM WALL THICKNESSES
- REDUCED ALLOWANCES (SAFETY MARGIN TO PROTECT AGAINST PROBLEMS)

3. WELDING COMPLEXITY

ALUMINIUM WELD ZONES CAN EXHIBIT:

- REDUCED MECHANICAL STRENGTH
- HIGHER FATIGUE SENSITIVITY
- MORE COMPLEX REPAIR REQUIREMENTS

Product lifetime comparison

STAINLESS STEEL TANKS

TYPICAL OPERATIONAL LIFETIME: **50-60+ YEARS**

DURING THIS TIME:

- VEHICLE CHASSIS MAY BE REPLACED MULTIPLE TIMES
- THE STAINLESS STEEL TANK CAN OFTEN BE **REUSED ACROSS SEVERAL VEHICLE GENERATIONS**

THE TANK THEREFORE BECOMES THE **LONG-TERM STRUCTURAL ASSET**

ALUMINIUM TANKS

ALUMINIUM TANKS MAY EXPERIENCE:

- FATIGUE CRACKING
- WELD DEGRADATION
- INCREASING MAINTENANCE REQUIREMENTS

MAINTAINING AN ALUMINIUM TANK BEYOND THE **FIRST CHASSIS LIFECYCLE** MAY ALREADY BECOME DIFFICULT, AND REUSE ACROSS MULTIPLE VEHICLE GENERATIONS IS UNCOMMON



LIFECYCLE COST PERSPECTIVE

A MEANINGFUL COMPARISON MUST CONSIDER TOTAL LIFECYCLE COST, NOT ONLY THE INITIAL PURCHASE PRICE

ALTHOUGH STAINLESS STEEL TANKS MAY
HAVE A HIGHER INITIAL COST, THEIR
LONG SERVICE LIFE OFTEN RESULTS IN
LOWER TOTAL LIFECYCLE COST



MASTER COMPARISON TABLE

SUSTAINABILITY CONSIDERATIONS

THE LONG OPERATIONAL LIFETIME OF STAINLESS STEEL TANKS ALSO PROVIDES ENVIRONMENTAL BENEFITS

STAINLESS STEEL TANKS

- REUSED ACROSS MULTIPLE VEHICLE GENERATIONS
 - REDUCED NEED FOR REPLACEMENT TANKS
 - LOWER TOTAL MATERIAL CONSUMPTION
 - REDUCED WASTE GENERATION

ALUMINIUM TANKS

- SHORTER REPLACEMENT CYCLES
 - MORE FREQUENT MANUFACTURING
 - HIGHER LONG-TERM MATERIAL TURNOVER

LONGER SERVICE LIFE THEREFORE CONTRIBUTES TO MORE SUSTAINABLE EQUIPMENT UTILIZATION

ALUMINIUM TANKS ARE DESIGNED TO BE LIGHT STAINLESS STEEL TANKS ARE DESIGNED TO LAST

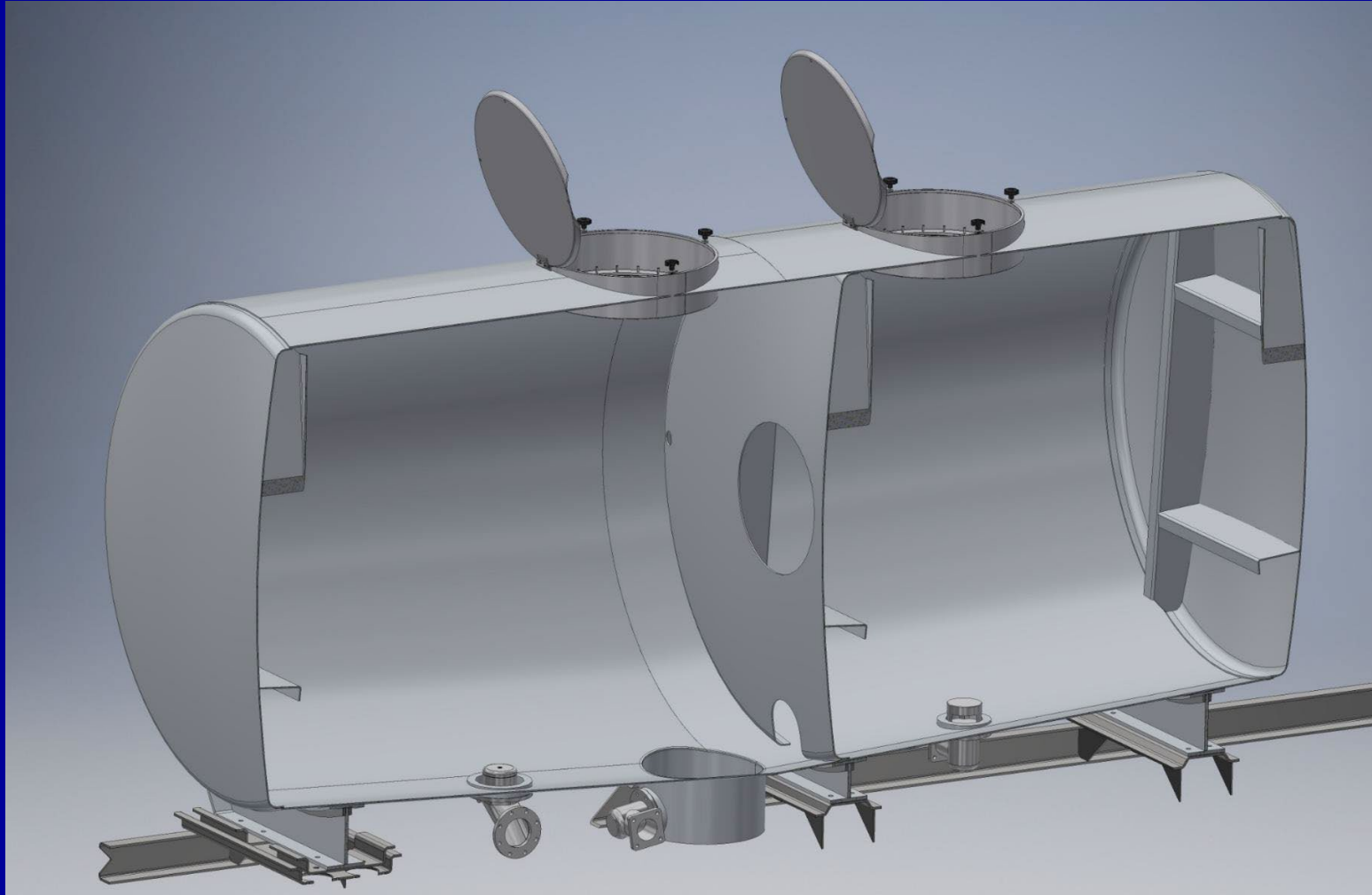
BECAUSE SS IS 3 X STIFFER THAN ALUMINIUM → SS

- BETTER WITHSTANDS TORSIONAL LOADS AND CYCLIC STRESSES EXPERIENCED DURING REFUELLING OPERATION
- CONTRIBUTES SIGNIFICANTLY TO THE EXCEPTIONAL DURABILITY AND LONG SERVICE LIFE OF SS AVIATION REFUELLER TANKS

WHEN EVALUATING AVIATION REFUELLER TANKS, THE KEY COMPARISON IS THEREFORE NOT ONLY THE INITIAL PURCHASE PRICE, BUT THE LONG-TERM VALUE DELIVERED OVER THE ENTIRE PRODUCT LIFECYCLE

IN PRACTICE, THE DIFFERENCE IN INITIAL PROCUREMENT PRICE BETWEEN STAINLESS STEEL AND ALUMINIUM TANKS TYPICALLY FALLS WITHIN THE NORMAL COMMERCIAL NEGOTIATION MARGINS OF A REFUELLER PROJECT

Use Stainless Steel to be considered...



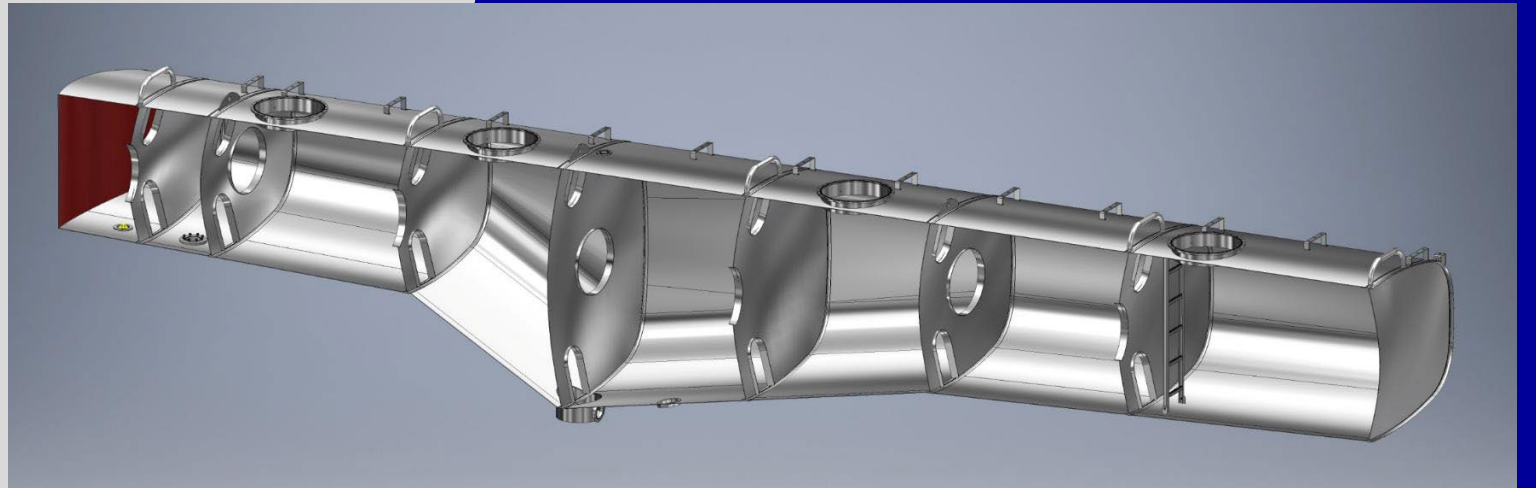
TYPICAL DESIGN ALUMINIUM TANK



35KL AL5182 5MM



STAINLESS STEEL ALTERNATIVE DESIGN

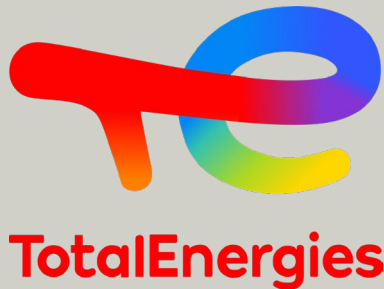




Presented by
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CEO

contact: sales@jmenterprise.it

JM ENTERPRISE DRIVING AVIATION FUELLING INNOVATION



A Sustainability Journey in Airport Operations

From Vision to Action: Real progress toward shaping a greener future for Egypt's Aviation



Our ambition is to make **sustainability** part of our culture, **at the heart** of our operational performance, just as safety has become today.”

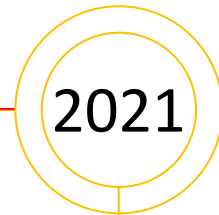
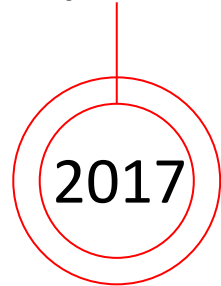
Patrick Pouyanné, Sustainability & Climate 2025 Progress Report



Our Journey in Aviation Sustainability

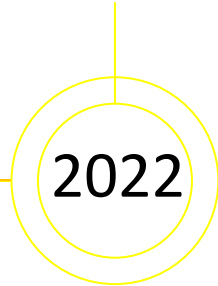
Our Journey in Aviation Sustainability

Energy efficiency initiative launched with **LED lighting implementation** “ about this airport on previous slides?.



RMF photovoltaic (PV) solar project completed, introducing renewable power to operations.

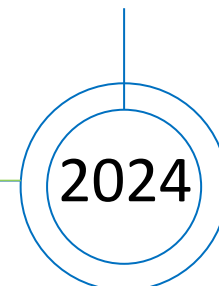
RMF pump replacement program initiated to improve asset integrity and energy efficiency.



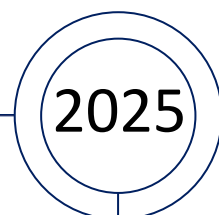
Operational sustainability improvements including **outdoor lighting upgrades and university collaboration initiatives**.



Energy efficiency projects launched: **AC inverter transition and RMF firefighting water reuse system**.

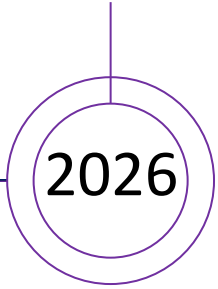


Electrification planning phase: **Study initiated for hybrid refuellers and a fully electric hydrant dispenser**.



Our Journey in Aviation Sustainability

Electrification & Retrofitting:
Deployment of **hybrid refueller and electric hydrant dispenser**
and **retrofitting of one refueller** initiating the transition to
low-emission airport refuelling operations.



2026

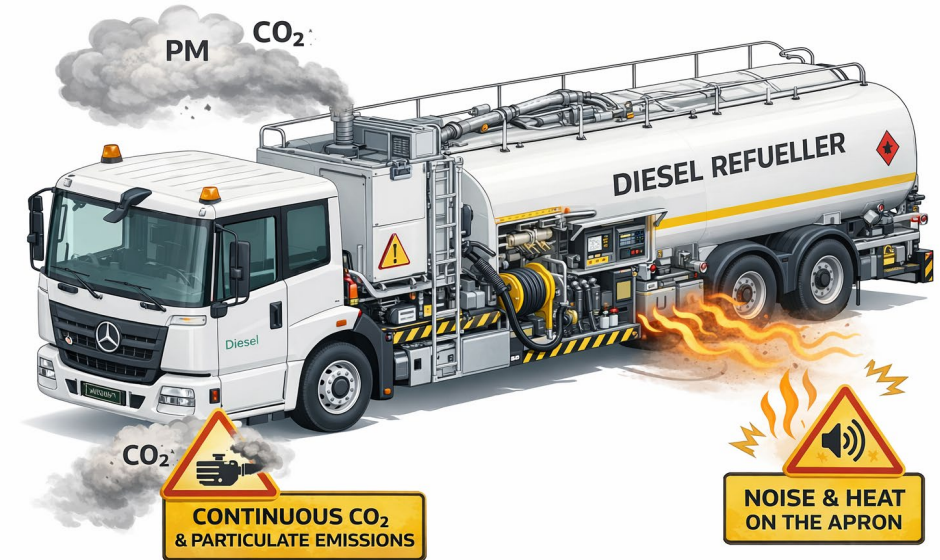
Electrification & Retrofitting

Fact

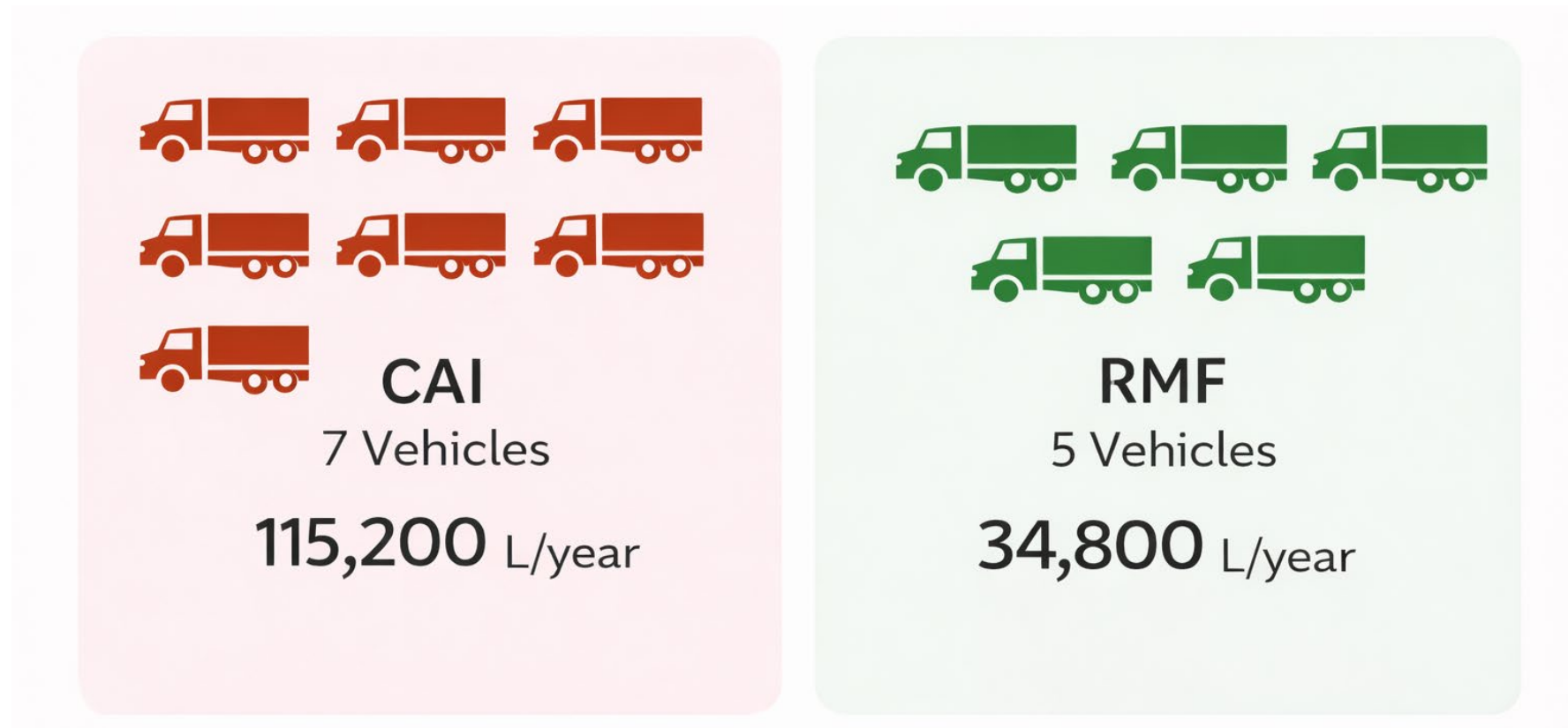
Traditional diesel refueling fleets typically:

- Operate **16–20 hours per day**
- Consume significant volumes of diesel fuel
- Produce **continuous CO₂ and particulate emissions**
- Generate **noise and heat on the apron**

Electrifying refuelling operations represents **one of the fastest and most impactful decarbonization opportunities in airport infrastructure.**



Sustainable Aviation fueling will reduce energy and thus emissions during Operations through saving:



Annual Diesel Consumption (CAI vs RMF)

Electrification & Retrofitting

Carbon Emissions Calculations

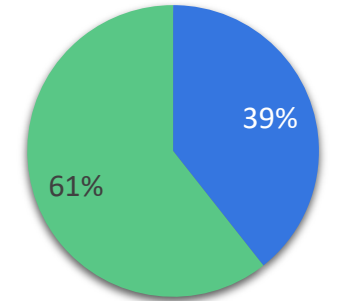
Total Emissions	
CAI	738,500 kgCO ₂ e
RMF	187,200 kgCO ₂ e

Vehicle Emissions Contribution

CAI **288,000** kgCO₂e

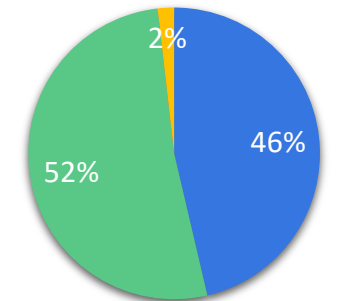
RMF **87,000** kgCO₂e

CAI

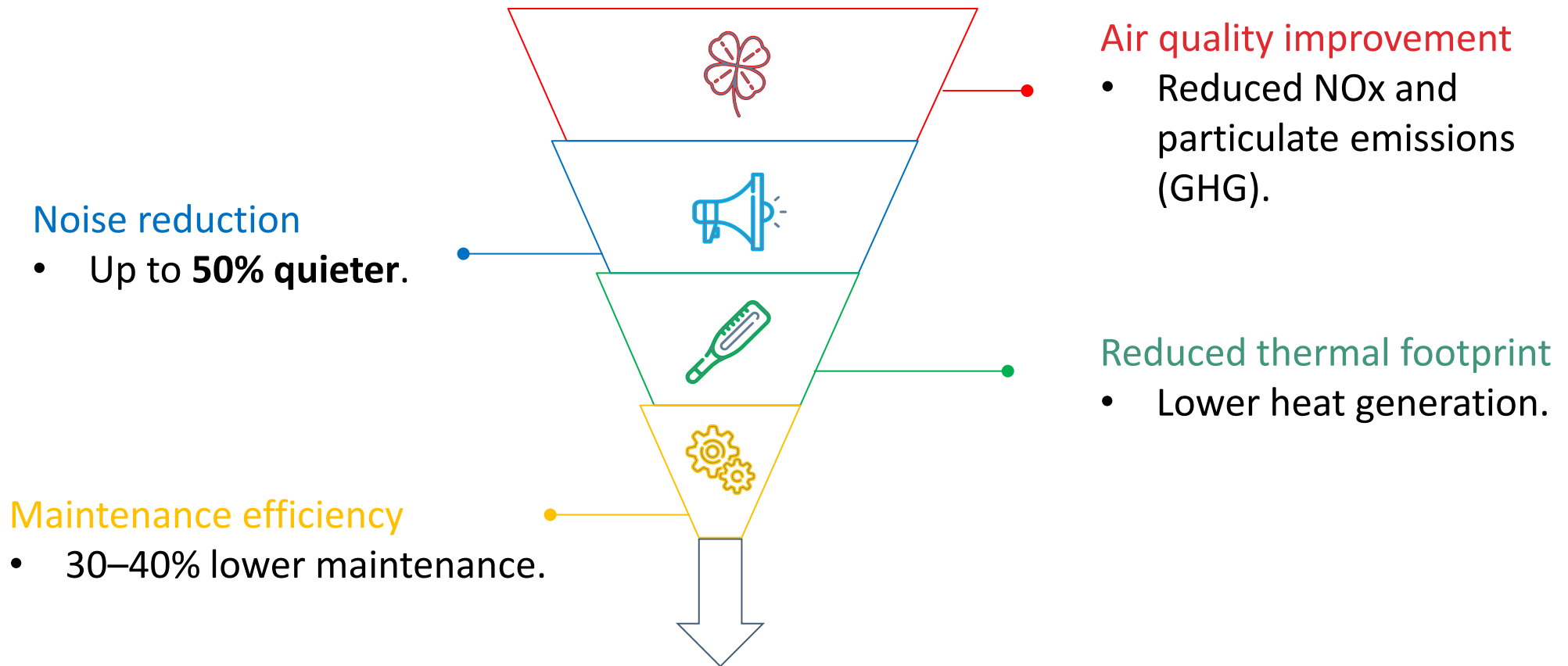


■ Vehicles ■ Electricity

RMF



■ Vehicles ■ Electricity ■ Fuels



Toward a Greener Future

A New Era of Sustainable Aviation Ground Operations

Supporting the transition toward **low-carbon airport operations**

Through two parallel initiatives:

- *Deployment of new hybrid and electric refuelling units*

- *Electrical retrofitting of existing vehicles*



Technical Evaluation of Fully Electric Refuellers

Under current operational conditions, fully electric refuellers introduce challenges:

Vehicle engineering constraints

- Fully electric refuellers require large batteries ($\approx 300\text{--}400$ kWh), adding significant mass ($\approx 2.5\text{--}3.5$ t)
- Increased weight impacts axle load, vehicle stability, and braking performance within ADR limits
- This reduces available fuel payload or may require tank size reduction or chassis modifications



Hybrid systems maintain **ADR-compliant payload and vehicle stability.**

Technical Evaluation of Fully Electric Refuellers

Under current operational conditions, fully electric refuellers introduce challenges:

Operational constraints

- **Charging downtime**

Large batteries require **multi-hour charging**

Risk of **vehicle unavailability during peak aircraft turnaround**

- **Multi-shift operations**

Refuellers operate **16–20 hours per day**

Battery-only vehicles depend entirely on **state of charge**



Hybrid systems ensure **continuous operational availability**.

Technical Evaluation of Fully Electric Refuellers

Under current operational conditions, fully electric refuellers introduce challenges:

Safety and regulatory compliance (ADR) constrains

Hazardous environment requirements

- Refuellers operate in **flammable fuel handling areas**
- ADR requires strict controls on **electrical systems and ignition sources** (specially for refuellers)

High-voltage integration

- Large battery systems increase certification scope:
 - **electrical safety**
 - **fire protection**
 - **hazardous area equipment classification**



Hybrid architectures **limit high-voltage exposure while maintaining ADR compliance.**

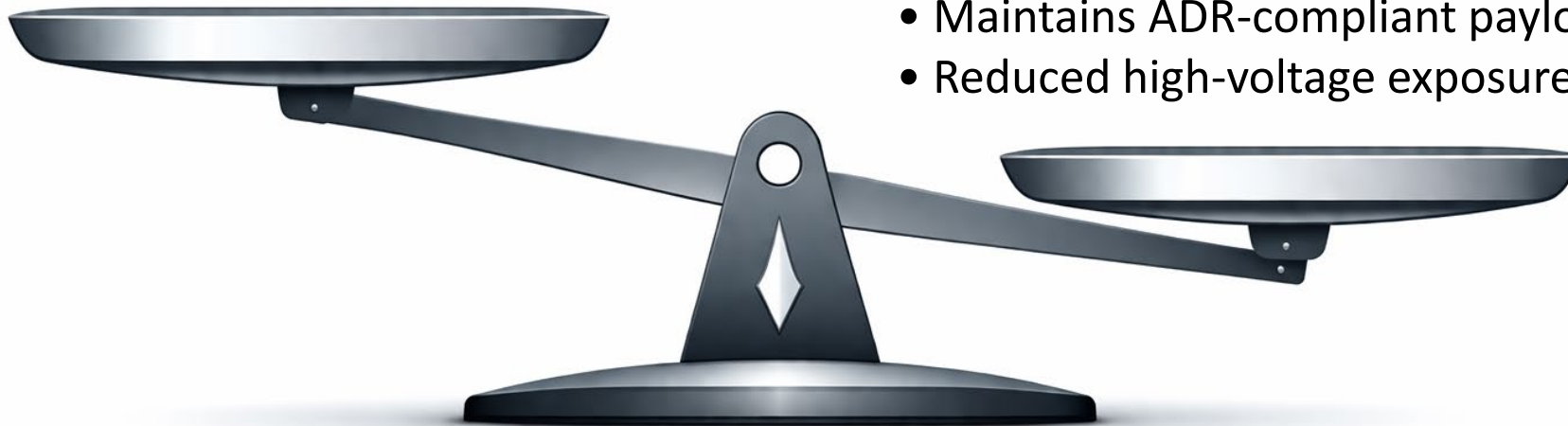
Comparison of Refuellers

Fully Electric

- High battery capacity required
- Multi-hour charging downtime
- Dependent on state of charge
- Increased weight constraints (ADR)
- Expanded safety & certification scope

Hybrid

- Optimized battery size
- Continuous operational availability
- Independent of charging constraints
- Maintains ADR-compliant payload
- Reduced high-voltage exposure



Selected strategy

Decision to work in both direction purchasing new ones and upgrading existing

Retrofitting of existing vehicles

- Electrified pumping system
- Diesel engine retained for mobility
- Reduced emissions

New electric & hybrid vehicles

- Reduced Maintenance
- Low noise & emissions
- Infrastructure compatible

Electric Hydrant Dispenser

- Fully electric mobility
- Hydrant-based refuelling

Hybrid Aircraft Refueller

- Electrified pumping
- Diesel retained for mobility

Vehicle Selection

Vehicle selection was shaped by the **balance between competing operational parameters**

Mechanical Parameters

- **Tank Capacity (Refuellers)**
Tank capacity versus average uplift demand
- **Flow Rate**
Flow versus continuous operating stability

Energy Parameters

- **Charging Time**
Time versus operational availability
- **Battery Selection**
Balance capacity and charging against duty cycle
- **Electrical Motor Power**
Motor Power affects the battery consumption with respect to time

Operational Parameters

- **Average Uplift**
Uplift per refuelling operation
- **Operating Time**
Average time per shift (hydrant duty)
- **Average Aircrafts Serviced**
Number of serviced Aircrafts/day
- **Range**
Driving range vs apron movement patterns

Vehicle Selection

Vehicle selection was shaped by the **balance between competing operational parameters**

Mechanical Parameters

On Average based on our fleet

- Tank Capacity (Refuellers)

35,000L – 45,000L

- Flow Rate

- Refuellers: 2500 LPM
- Dispenser: 3500 LPM

Vehicle Selection

Vehicle selection was shaped by the **balance between competing operational parameters**

Energy Parameters



- **Charging Time**

Balance capacity and charging against duty cycle

- **Battery Selection**

Comparing between the available battery technologies for EV's (**LFP vs NMC**) **based on risk reduction**

- **Electrical Motor Power (Fully Electric Vehicles)**

- Average motor power (PTO) used for these applications is **20-30 kW**
- Average Drivetrain motor power for a dispenser (small truck) is **300-400 kW**

Vehicle Selection

Vehicle selection was shaped by the **balance between competing operational parameters**

Energy Parameters



- **Battery Selection**

Safety & Thermal Stability

LFP (Lithium Iron Phosphate)

- Very high thermal stability
- Thermal runaway temperature **>270 °C**
- Extremely low fire risk
- Tolerant to abuse, overcharge, and high ambient temperatures



NMC (Nickel Manganese Cobalt)

- Lower thermal stability
- Thermal runaway can occur at **~210–230 °C**
- Higher fire risk if damaged or overheated
- Requires stricter thermal management systems

Vehicle Selection

Vehicle selection was shaped by the **balance between competing operational parameters**

Energy Parameters

- **Battery Selection**

Cycle Life & Degradation

LFP (Lithium Iron Phosphate)

- 3,000–5,000 full cycles
- Very low capacity fade over time
- Suitable for **daily charging and opportunity charging**



NMC (Nickel Manganese Cobalt)

- 1,500–2,500 full cycles
- Faster degradation under high load and heat
- Performance drops faster in heavy-duty applications

Vehicle Selection

Vehicle selection was shaped by the **balance between competing operational parameters**

Energy Parameters

- **Battery Selection**

Battery Selection Based on EI 3618 Risk Approach*

EI Risk Methodology

- Hazard identification (HAZID) required
- Severity + likelihood assessment
- Risk must be reduced to **acceptable level**
- Battery breather locations should be positioned away from potential spillage.

Application to Battery Selection

- Selection must:
- Reduce ignition likelihood
 - Limit escalation severity
 - Improve controllability of failure

Therefore, LFP battery is selected due safer failure behavior

*Source: EI 3618 – Section 2 (Hazard Analysis Process)

Vehicle Selection

Vehicle selection was shaped by the **balance between competing operational parameters**

Operational Parameters

- **Average Uplift (Refuellers)**
7000 Liters
- **Operating Time (Dispensers)**
0.5-0.6 hr
- **Average Number of Aircrafts**
 - Refuellers: 13 Aircrafts
 - Dispensers: 7 Aircrafts
- **Range (for fully Electric Vehicles)**
Range needs to cover the longest travel distance at the airport at least twice, in addition to time of refueling

Electrification & Retrofitting

Hybrid Refueller Sizing & Selection

Sizing

Operational Parameters

- **Average number of aircrafts serviced (n)**
13 Aircrafts
- **Average Uplift (Vuplift)**
7,000 Liters

$$V_{\text{charge}} = n \times V_{\text{uplift}}$$

Therefore, operational capability (Vcharge) required = **90,000 liters to be transferred per charge**

Selection

Energy Parameters

- **Charging Time**
1.5 hrs
- **Battery Capacity**
38 kWh

Mechanical Parameters

- **Tank Capacity**
45,000 L (**2 Cycles per charge**)
- **Flow Rate**
2,500 LPM

Electrification & Retrofitting

Electric Dispenser Sizing & Selection

Sizing

Operational Parameters

- **Average number of aircrafts (n)**
6 Aircrafts
- **Uplift Time (Tuplift)**
0.67 hr

Energy Parameters

- **Motor Power (Pmotor)**
30 kW

$$E_{\text{battery}} = n \times P_{\text{motor}} \times T_{\text{uplift}}$$

With a safety margin of 15%, the battery capacity (E_{battery}) required = **140 kWh**
Energy

Selection

Operational Parameters

- **Range**
150 Km

Energy Parameters

- **Charging time**
< 6 hrs
- **Battery Capacity**
140 kWh

Mechanical Parameters

- **Flow Rate**
3,750 LPM

Electrification & Retrofitting

Selected Electric Dispenser

Introduction

Project Scope
& Results

REX

Conclusion

Operational Parameters

- **Average number of aircrafts (n)**
6 Aircrafts
- **Range**
150 Km

Energy Parameters

- **Battery Capacity**
140 kWh

This would leave extra **20 kWh** in range in the vehicle

For consumption of 1 kWh/km could cover the longest distance from the station (5 Km), **4 times**



Combined Fleet Capabilities

Of One Dispenser & One Refueller

24-27

Aircrafts

Serviced Per day

9,000+

Aircrafts

Serviced Annually with
minimal emissions



Why retrofitting was selected

transforming existing vehicles allows:

- **Emission reduction** without full fleet replacement
- Supports **hybrid-electric** strategy
- Gradual **transition** toward electrification

Retrofitting acts as a controlled step toward a lower-emission fleet.



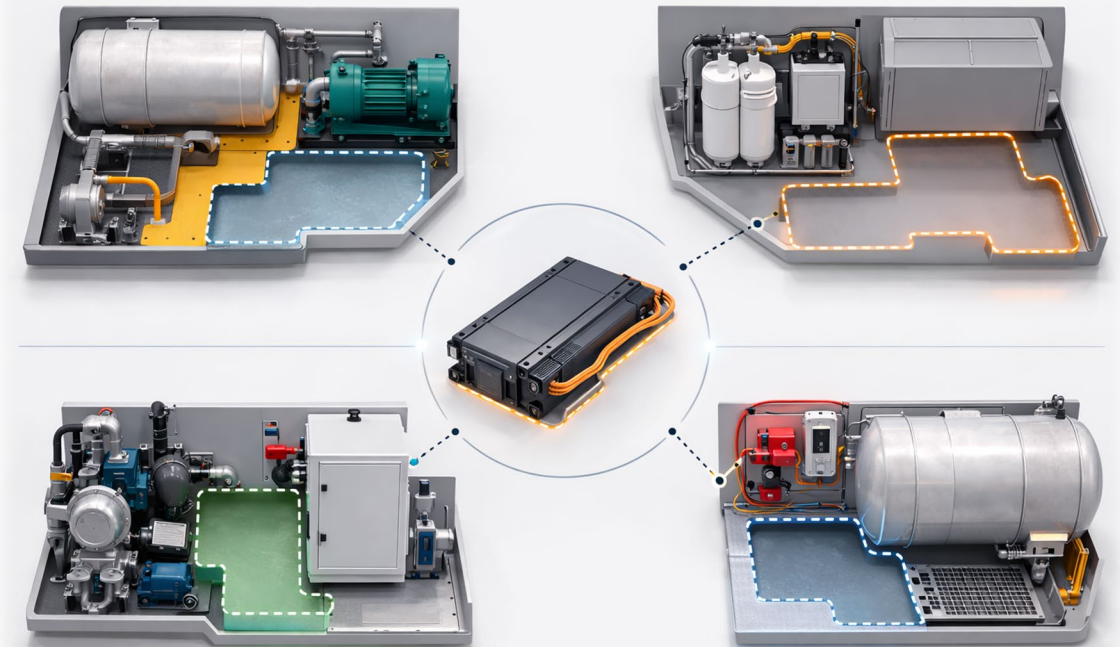
Customization Considerations

Vehicle retrofitting is **not a one-size-fits-all solution**.

Key limitations:

- Each vehicle has unique chassis layouts
- Space availability differs between models
- Weight distribution constraints vary
- Electrical and mechanical interfaces are not standardized

As a result, **each transformation requires tailored engineering**, design validation, and site-specific adaptation.



Flow rate Optimization Considerations

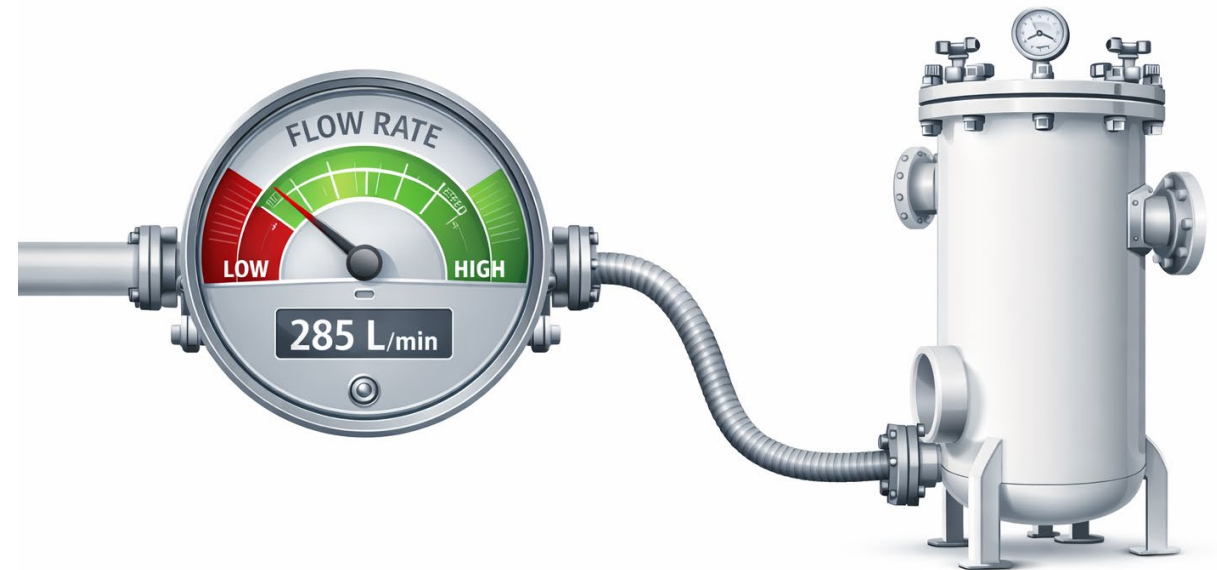
Electric pumping performance is influenced by:

- Available motor power
- Battery discharge capability
- Thermal operating limits

Filtration performance is directly linked to:

- Flow rate (might need filter derating)

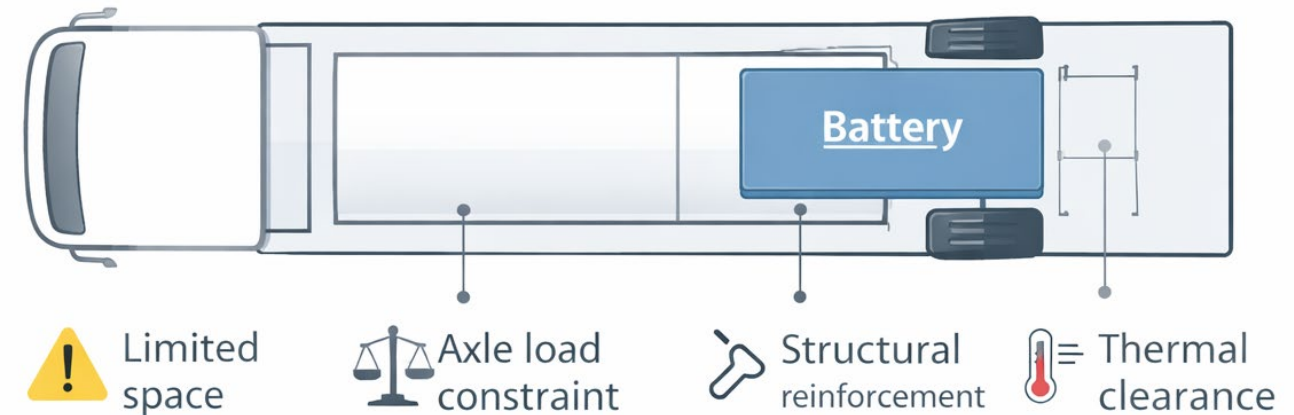
Therefore, flow rates are carefully optimized to ensure **reliable, continuous, and safe operation**.



Battery Integration Considerations

Key constraints when integrating batteries:

- Limited chassis space
- Axle load limitations
- Structural reinforcement requirements
- Thermal management considerations



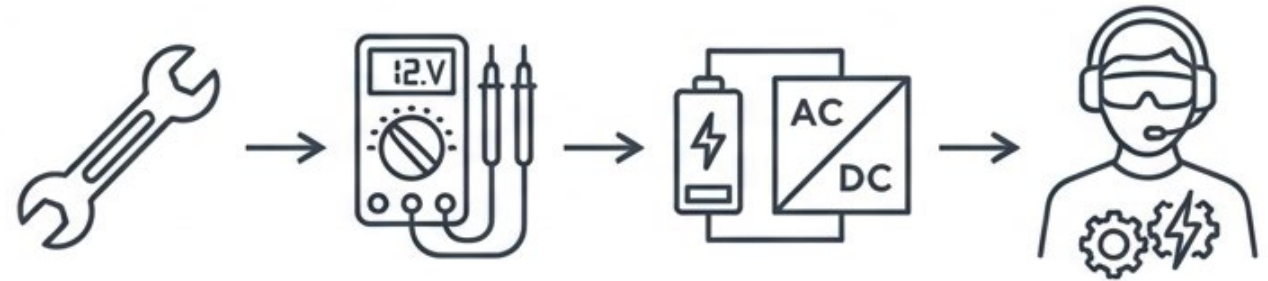
Battery positioning affects **vehicle stability and payload**.

Technical Skills and Readiness

Electrified systems require **new technical competencies**.

Key gaps to address:

- High-voltage electrical safety
- Battery diagnostics and handling
- Power electronics troubleshooting
- Software-based fault analysis



Successful retrofitting therefore requires:

- Technician upskilling
- Targeted training programs
- Updated maintenance procedures



LEARNING FROM EVENTS

Operational Performance

01

Fleet uptime, turnaround efficiency, refuelling throughput, and day-to-day reliability across live operations

Energy & Charging Behavior

02

Charging patterns, energy consumption per cycle, battery state-of-charge management, and grid interaction

Engineering & Integration Constraints

03

Drivetrain packaging, weight distribution, thermal management, and retrofit compatibility challenges

People, Training & Operations

04

Operator adoption, training requirements, safety procedures, and workflow adaptation for electrified fleets

REX

Operational Performance

Introduction

Project Scope
& Results

REX

Conclusion

Fleet Overview

Operational fleet status

19

Fully Electric Refuellers

17

Hybrid Refuellers

X

Electric Dispensers

19

Operating Sites

2021

Since

80K L

Largest Tank Capacity

Fully electric refuellers deliver strong performance at small tank capacities (up to ~25,000 L)

- Beyond this threshold, scaling fully electric drives trade-offs:
- Battery pack size and mass grow disproportionately
- Charging windows extend beyond operational turnaround targets



Hybridization resolves the **payload–availability–energy trilemma** at scale.

REX

Energy & Charging Behavior

Observed performance

fully electric refuellers

- Battery capacity: **~100 kWh**
- Typical driving: **15–20 km/day**
- Autonomy: **~3 days without charging**
- Fuel delivered: **≈80,000 L per charge**
- Performance **very accurate** to manufacturer specs

Energy consumption is driven far more by pumping operation than by vehicle movement

Charging Strategy & HSE Discipline

- Charging performed **only during daytime**
- SOC monitored with **personnel always present**
- Vehicles charged **whenever idle**, not only at low SOC
- AC (slow) charging preferred** to limit degradation

while disciplined daytime AC charging strengthens both safety control and battery longevity

E-PTO vs PTO: retrofitting Complexity

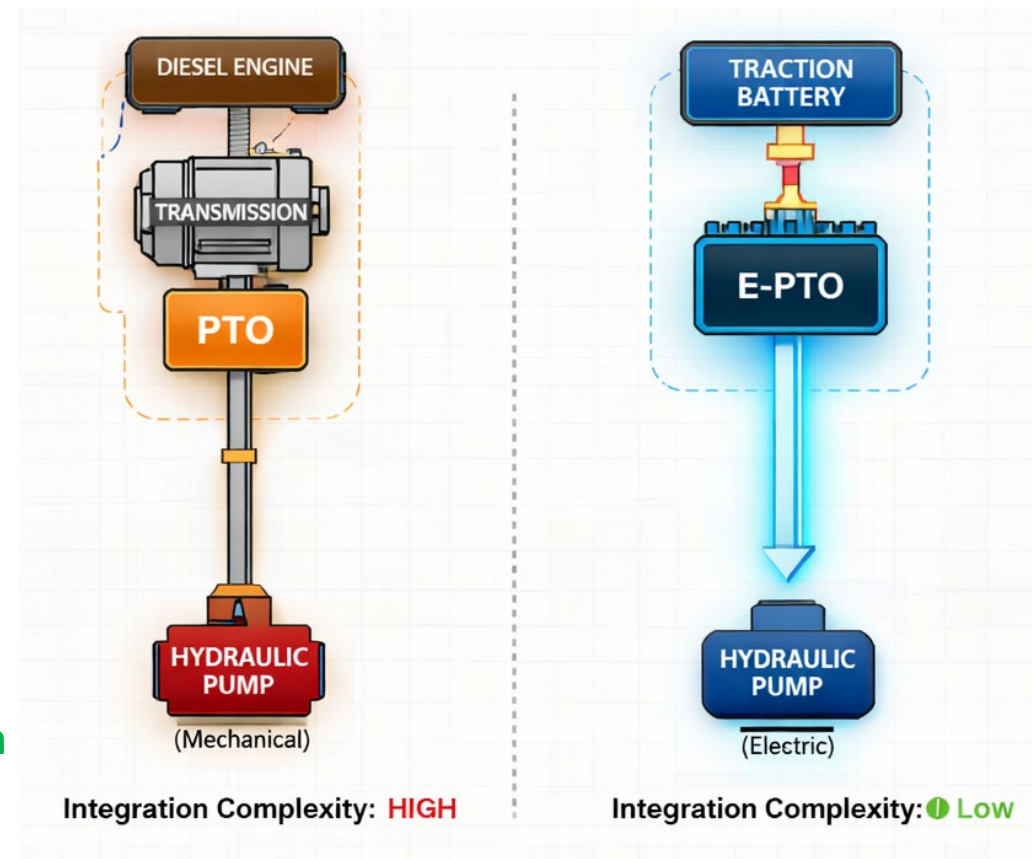
Operational insight:

- Fully electric refuellers use **E-PTO**
 - Direct electric motor to pump
 - No gearbox or transmission dependency

retrofitting challenge:

- Hybrid conversions must integrate electric systems with:
 - Existing transmission
 - Mechanical PTO interfaces

This makes **hybrid retrofitting more complex than full EV conversion**



Operators, Training & Key Takeaways

Operator feedback highlights:

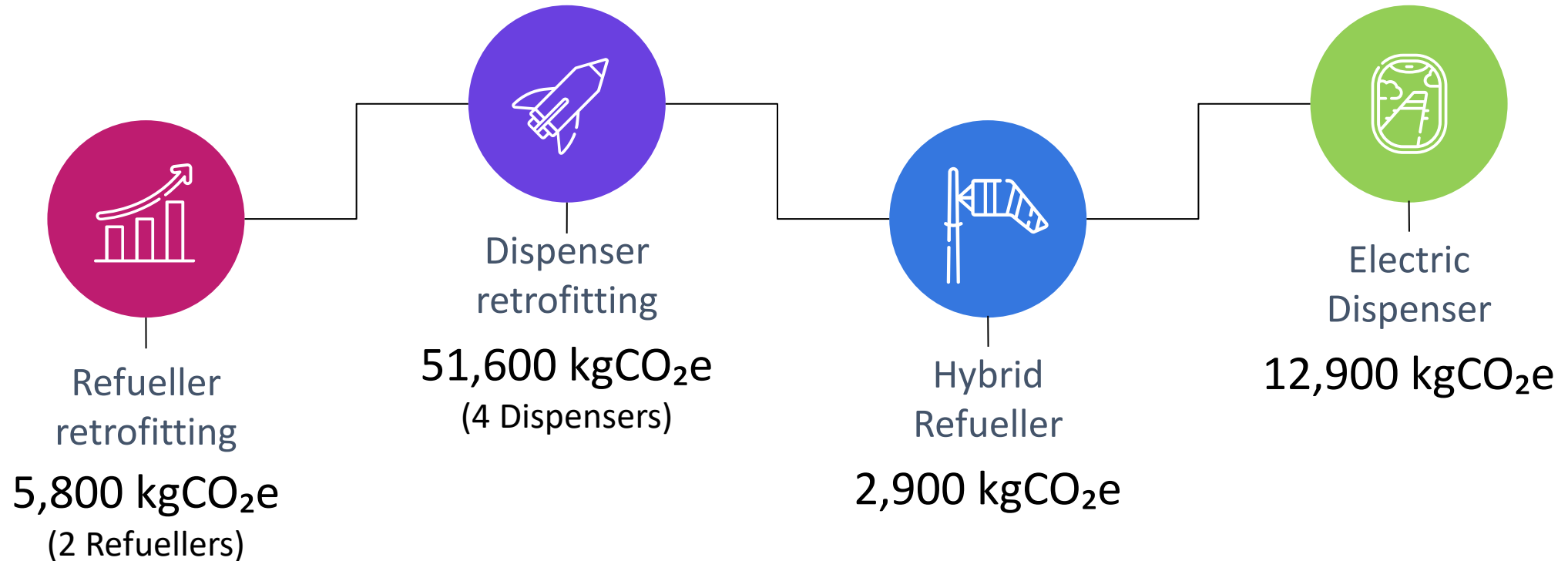
- EV refuellers are easier to use due to:
 - Smooth torque delivery
 - No gear shifting
 - Lower noise
 - Almost no maintenance
- Training remains essential:
 - Understand BEV-specific features
 - Recognition of early signs of battery failure
 - Fire response and training on the new updated procedure.



Total Impact

73,200 kgCO₂e / Year

Equivalent to planting 3,328 trees



Conclusion

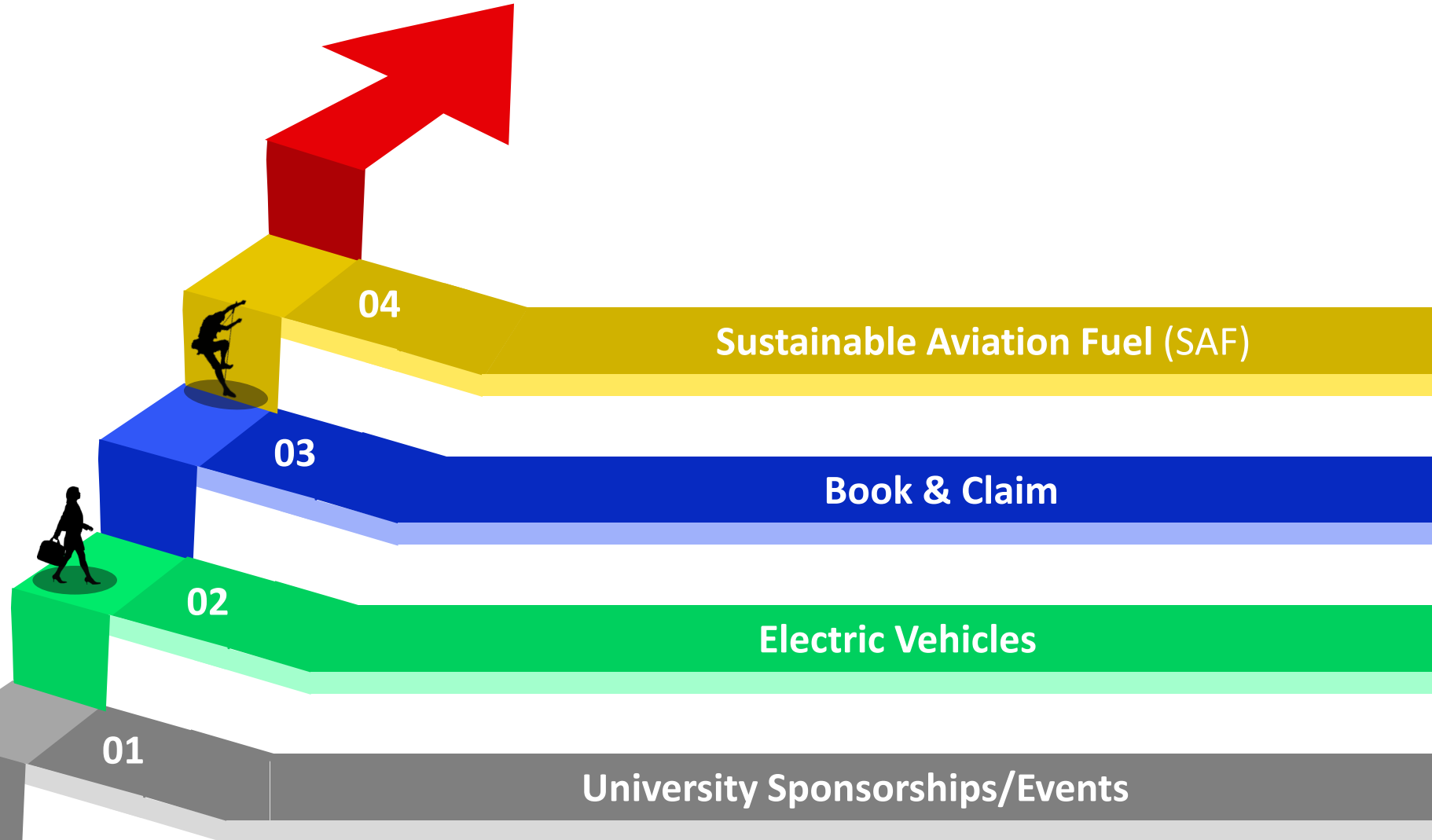
Way Forward

Introduction

Project Scope
& Results

REX

Conclusion



謝謝

Vielen Dank

Bedankt

Спасибо

Thank you

Obrigado

شكراً

Teşekkür ederim

Grazie

Merci

Gracias

ありがとうございます





Atelier pour les responsables JIG au HYATT PLACE NAIROBI, Nairobi, du 14 au 16 avril 2026

Situation et progrès de l'aviation au Kenya et des forces armées

Par

Francis Mwangi

Responsable principal de la planification, KCAA et membre kenyan du CAEP de l'OACI

&

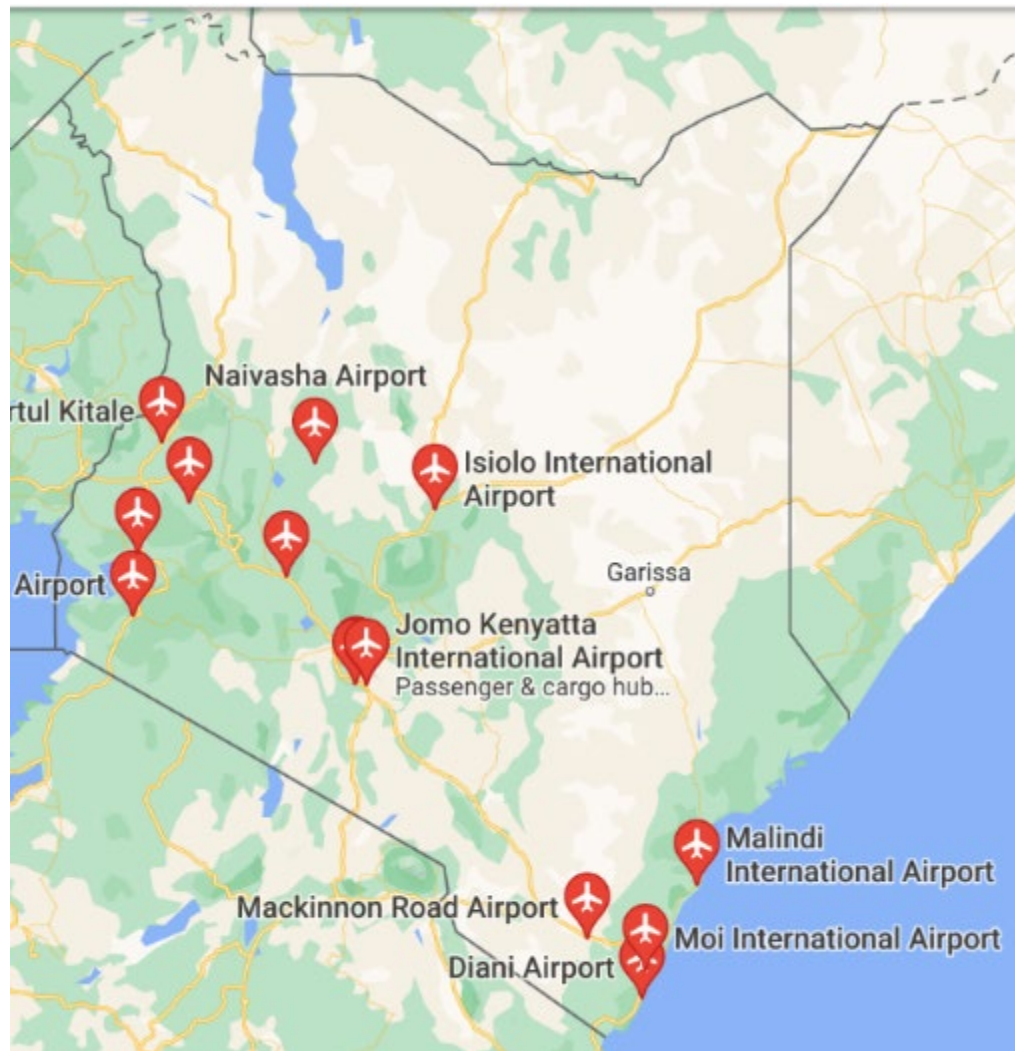
Naomi Gitau

Responsable de l'environnement, KAA

2026

INTRODUCTION

Situation de l'aviation



Le Kenya est desservi par plus de 50 compagnies aériennes régulières et charter, tant internationales que nationales.

Les principaux aéroports qui accueillent le trafic international sont :

Aéroport international Jomo Kenyatta - HKJK

Aéroport international Moi - HKMO

Aéroport international d'Eldoret - HKEL

Aéroport de Kisumu - HKKI

Aéroport Wilson – HKNW

Aéroport de Malindi - HKML

INTRODUCTION (suite)

Rôles dans le secteur de l'aviation civile



Politique nationale intégrée
des transports



Politique de l'aviation civile
(en attente de soumission
au Conseil des ministres)



Plan à moyen terme IV



Plan stratégique 2023-2028
du ministère des Routes et
des Transports



Plan stratégique 2023-2028
de la KCAA



Programme national de
sécurité

INTRODUCTION (suite)

Mandat clé dans le domaine de l'aviation

Assurance de la
surveillance de la
sécurité aérienne

Contrôle de la
sûreté aérienne

Réglementation du
transport aérien et
de l'économie

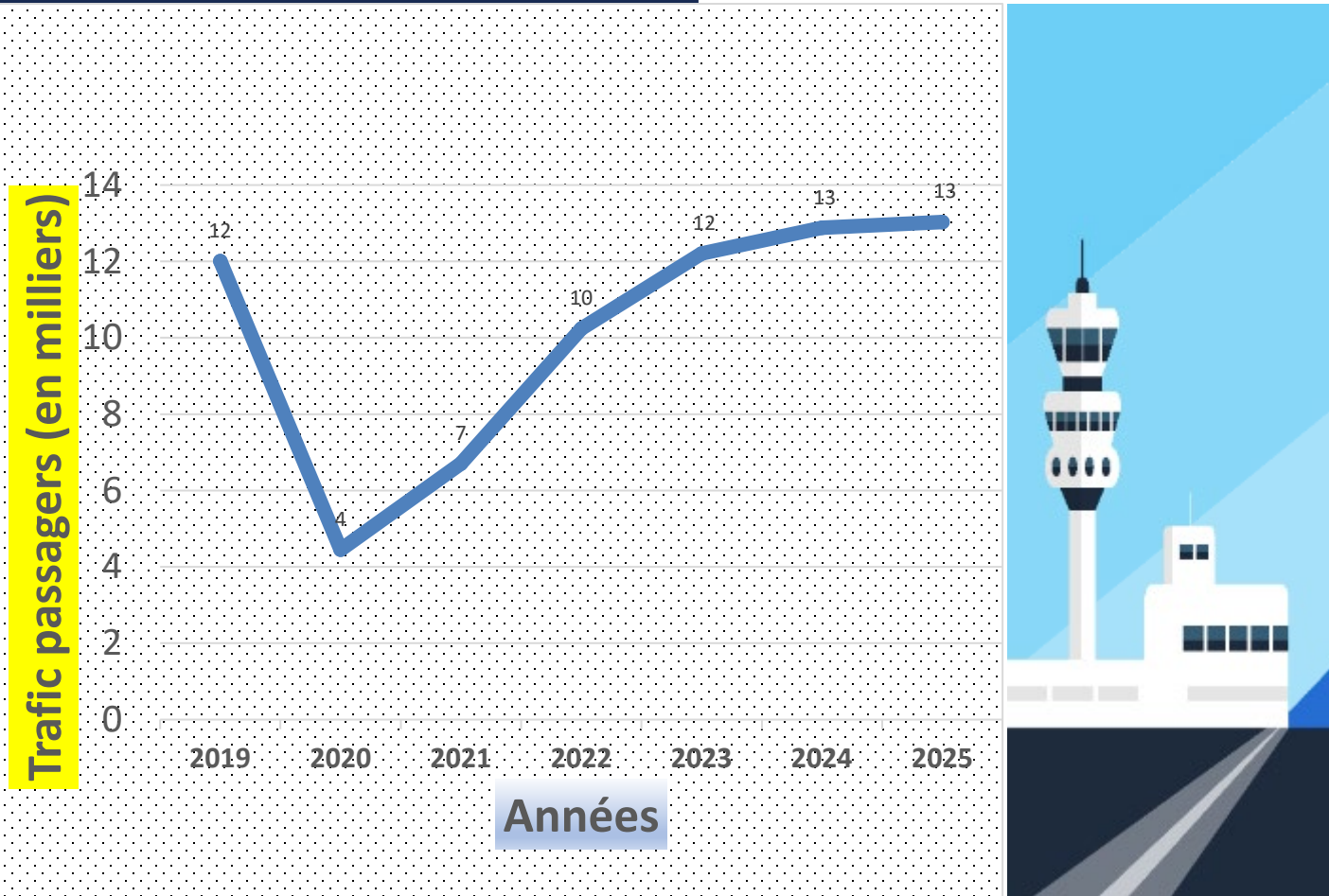
Prestation de
services de
navigation
aérienne

Prestation de
services de
recherche et de
sauvetage

Prestation de
services de
formation
aéronautique

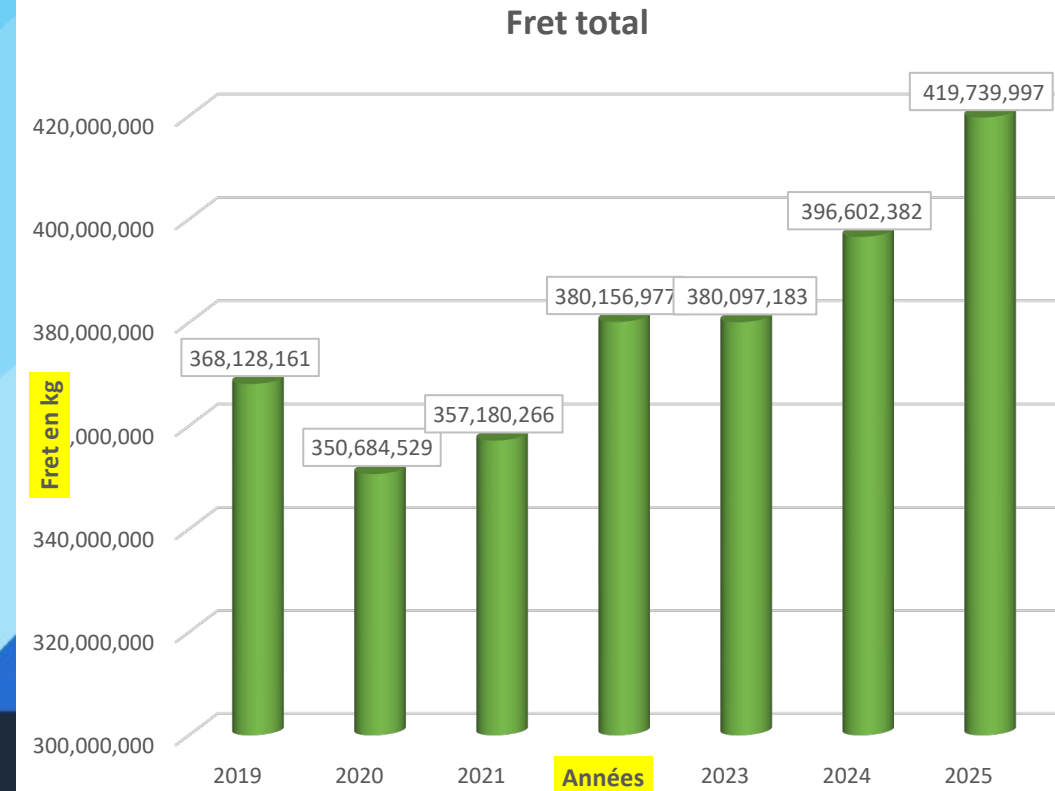
INTRODUCTION (suite)

Tendance du trafic passagers au Kenya



Le trafic aérien de passagers au Kenya a connu une forte reprise après la COVID

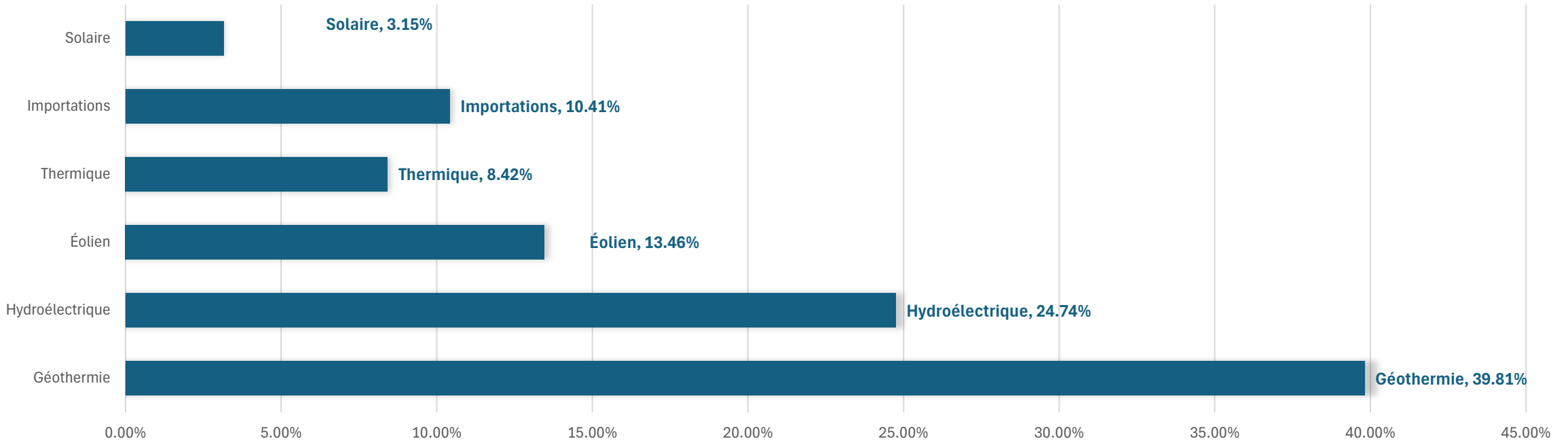
TENDANCE DU TRAFIC DE MARFRAIS TOTAL AU KENYA



Le Kenya est une plaque tournante majeure du fret aérien, en particulier pour les denrées périssables et le commerce électronique : plus de 420 000 tonnes de fret ont été traitées en 2025

Mix énergétique du Kenya

Répartition de la production d'électricité par source au 31st décembre 2024



La transition énergétique du Kenya démontre la faisabilité de l'intégration d'une part importante d'électricité renouvelable dans le réseau national, ce qui représente également un potentiel pour l'industrie verte

Plans d'action du Kenya pour la réduction des émissions de CO₂ dans le secteur de l'aviation



Création du Groupe de travail sur l'environnement dans l'aviation (AEWG) en **janvier 2012**

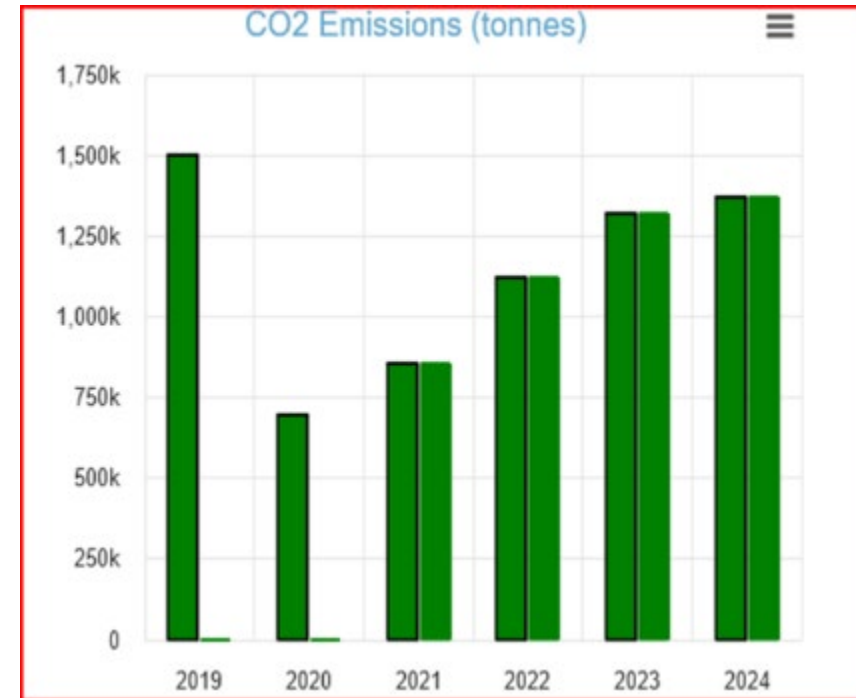
1 Plan d'action de l¹st soumis | 2012



Projet d'assistance OACI-UE | **2014**

2 Plan d'action de lnd soumis | 2015

3e plan d'action de lrd soumis | 2022



Émissions internationales déclarées dans le cadre du CORSIA

Objectifs du 3e plan d'action du Kenya (2022-2028)



ACTION PLAN FOR CO₂ EMISSIONS REDUCTION IN THE AVIATION SECTOR 2022-2028

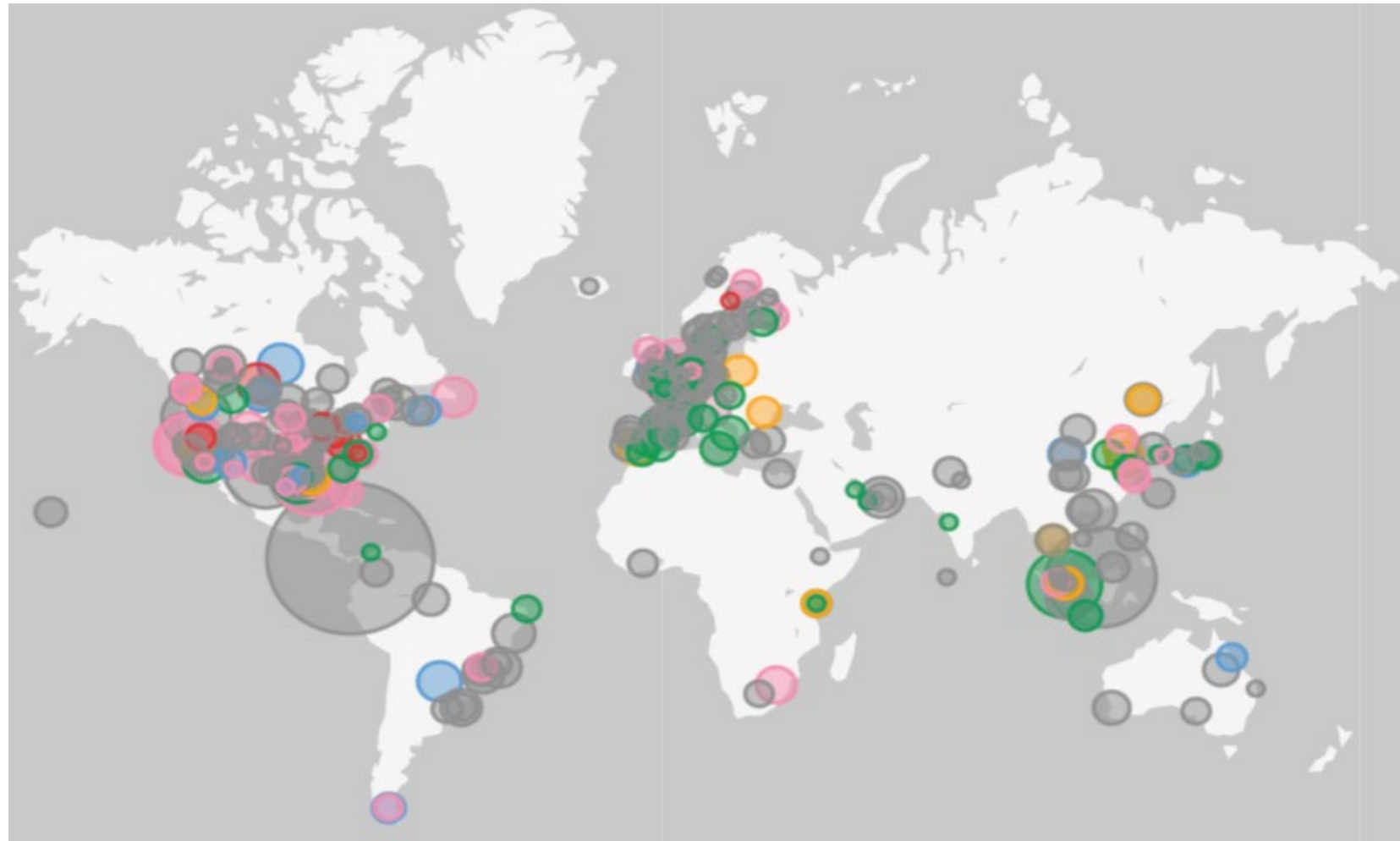
KENYA CIVIL AVIATION AUTHORITY



SEPTEMBER 2022

- θ Conformément à la résolution A40-18 de l'OACI, le plan d'action fixe un objectif ambitieux visant à améliorer le rendement énergétique par rapport à un niveau de référence de 2020, à raison d'un taux annuel moyen de 2 % entre 2021 et 2050.
- θ Le plan d'action a retenu les cinq catégories de mesures/objectifs qui devraient avoir les plus grands avantages environnementaux, à savoir :
 - a) Technologie et normes ;
 - b) Carburants aviation durables ;**
 - c) Améliorations opérationnelles ;
 - d) Mesures fondées sur le marché ; et
 - e) Améliorations aéroportuaires

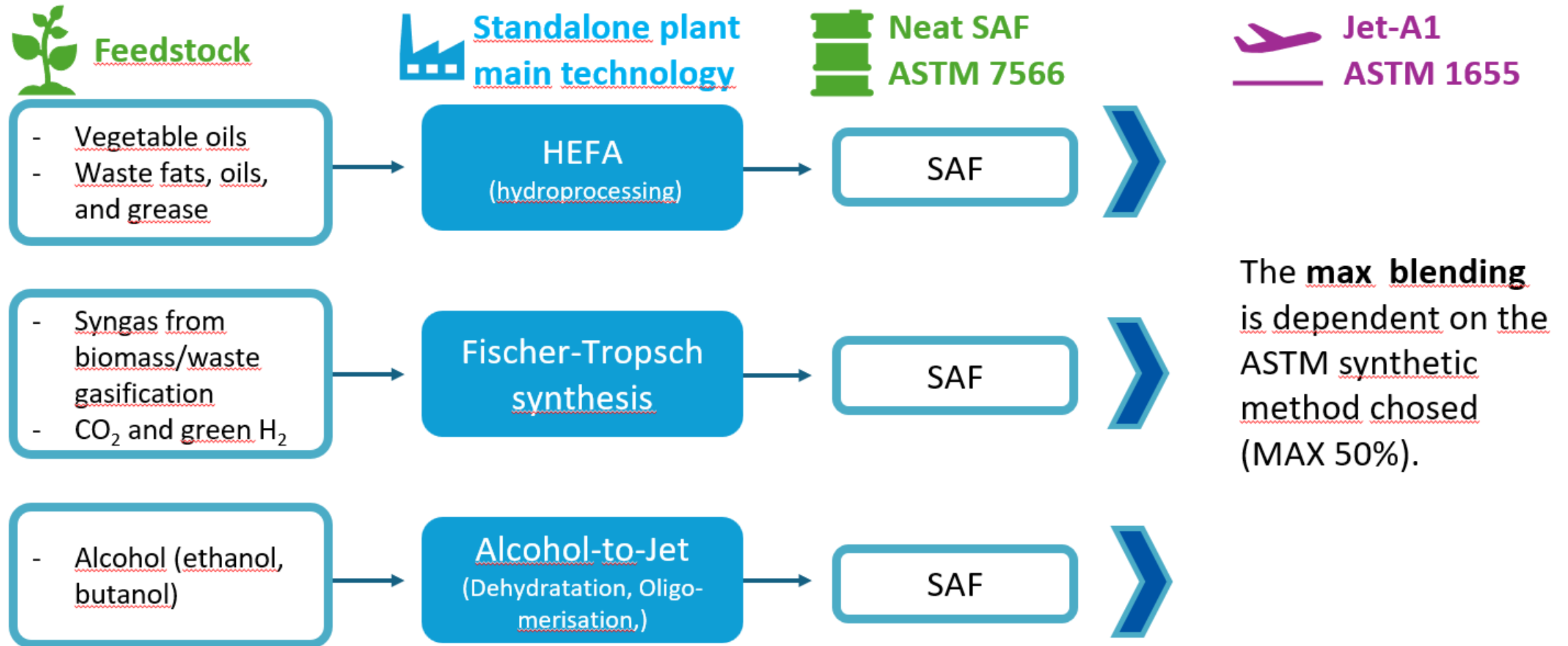
La production de SAF est principalement concentrée dans l'Union européenne et en Amérique du Nord, où les politiques sont principalement élaborées.



0,0 - ● 9,8 k ● 1 - Annonce initiale ● 4 - En service - produisant d'autres carburants ● 5 - En service - production de carburants durables
● 0 - Projet annulé/en suspens ● 3 - En construction ● 2 - Étude technique préliminaire (FEED)

Bien que certaines de ces **politiques** soient encore **en cours d'élaboration** (et non encore en vigueur), cela suffit à **stimuler la production de carburants durables** et l'émergence de **nouveaux projets** dans ce domaine.

Voies de production de l'acide salicylique

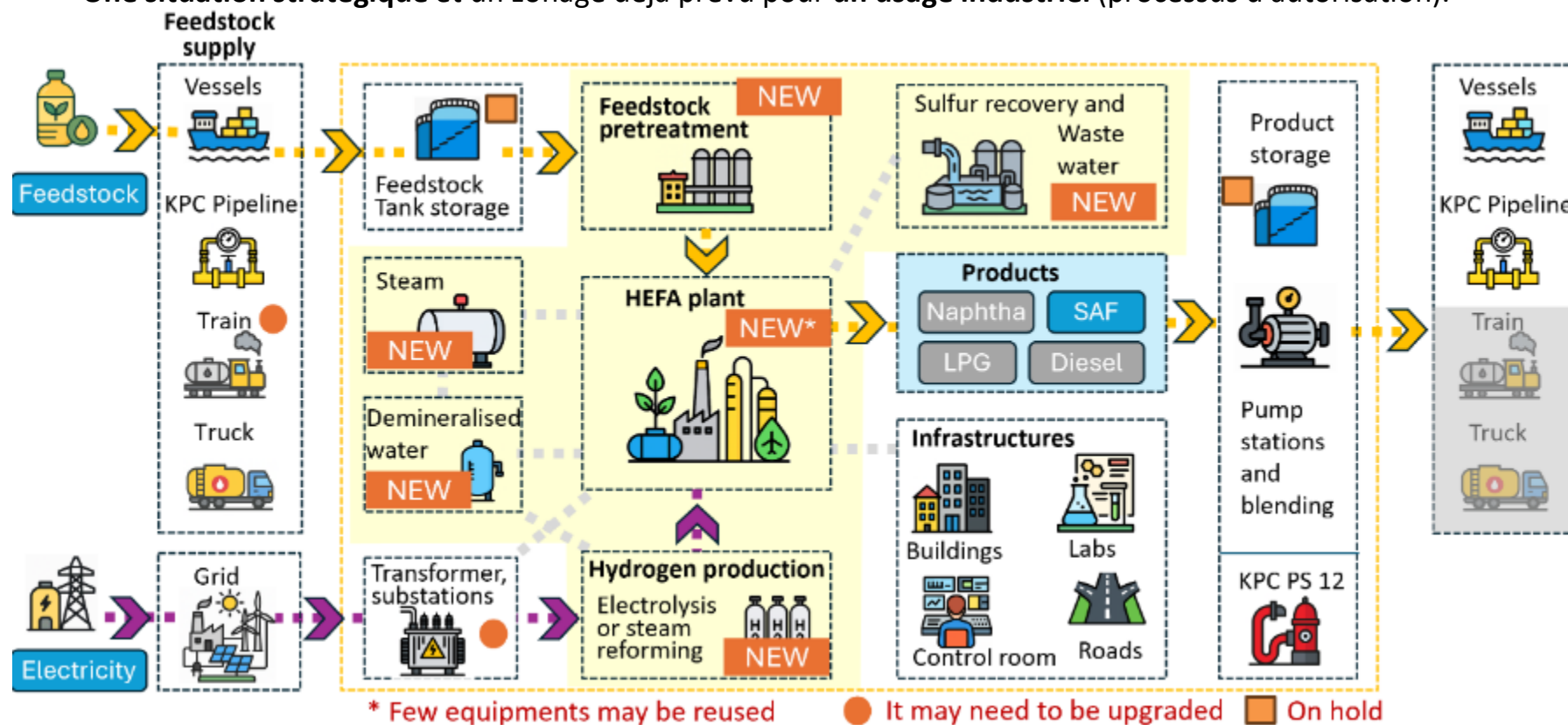


Évaluation des actifs de Mombasa KPC/KPRL

La plupart des actifs de la raffinerie **ne sont pas facilement réutilisables** et l'avantage financier global est limité par rapport à d'autres cas de modernisation.

Le site présente néanmoins **plusieurs avantages par rapport à un projet de construction sur site vierge** :

- **Une infrastructure de distribution et de logistique** bien établie, apportant une valeur économique.
- **Une situation stratégique** et un zonage déjà prévu pour **un usage industriel** (processus d'autorisation).

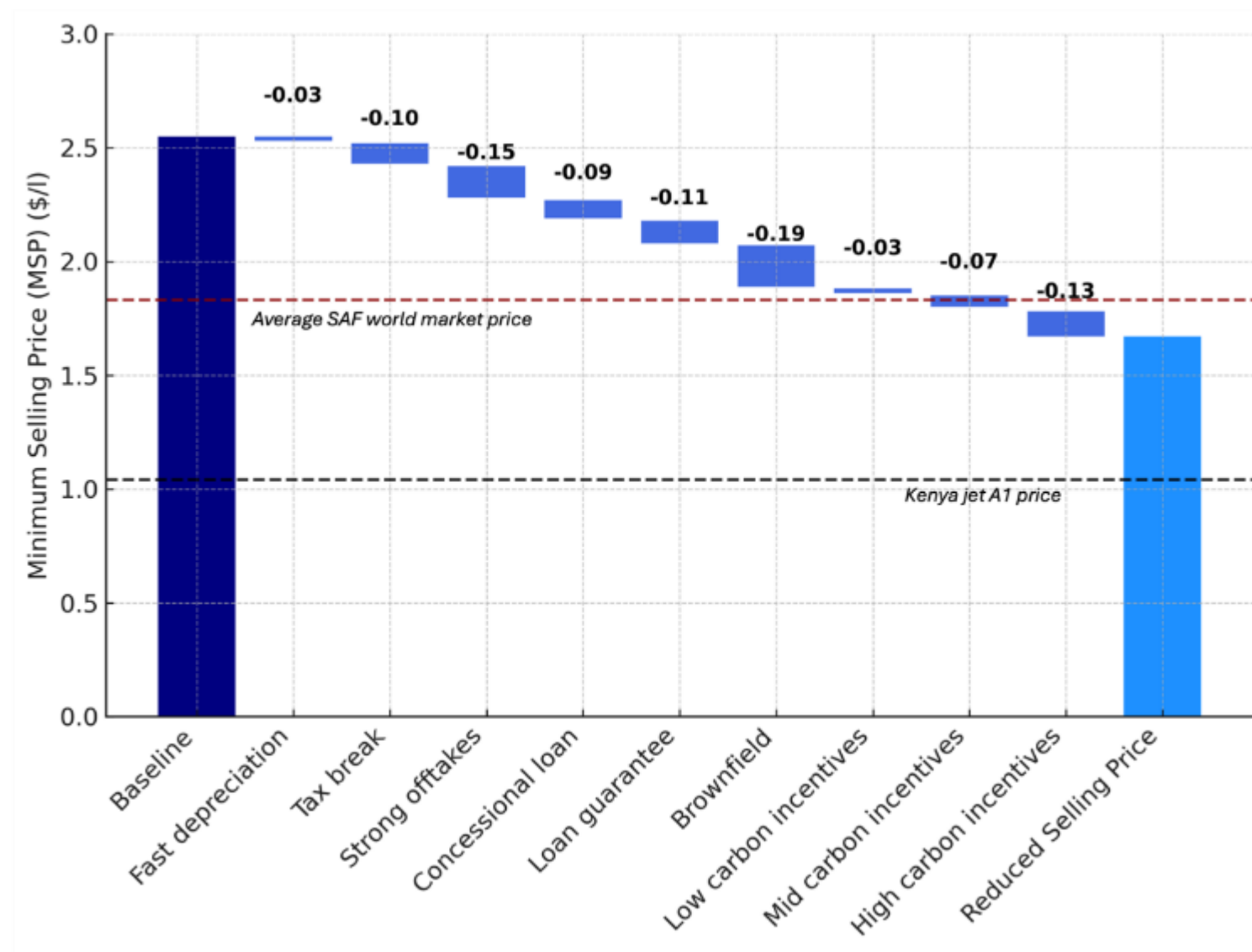


Nouveaux actifs à installer :

- Prétraitement des matières premières
- Usine HEFA
- Production d'hydrogène
- Une partie des réseaux
- Certains bacs (en attente)

Le mélange de Jet A-1 et de carburant durable (SAF) au sein de la raffinerie permet d'utiliser le réseau de distribution actuel.

Impact de différents scénarios politiques sur le prix de vente minimum au Kenya de l'huile végétale à usage alimentaire produite à partir d'huile de ricin



Progrès du SAF au Kenya

2018



- ◆ Réalisation de l'étude de faisabilité sur les carburants durables dans le cadre du projet d'assistance de l'OACI et de l'UE

L'étude a mis en évidence le potentiel du HEFA à partir d'huile de colza, de ricin, de croton, etc.

2022



- ◆ Organisé en août : premier atelier sur les carburants durables et réunion au niveau haut

Différentes parties prenantes ont participé à l'atelier

2023



- ❖ Organisation du deuxième atelier SAF et de la réunion au niveau haut en septembre

Première réunion du comité de pilotage du SAF

- ❖ Présentation d'études technico-économiques et sur la prime verte.
- ❖ KQ a effectué un volume chargé de SAF de JKIA à AMS

2024



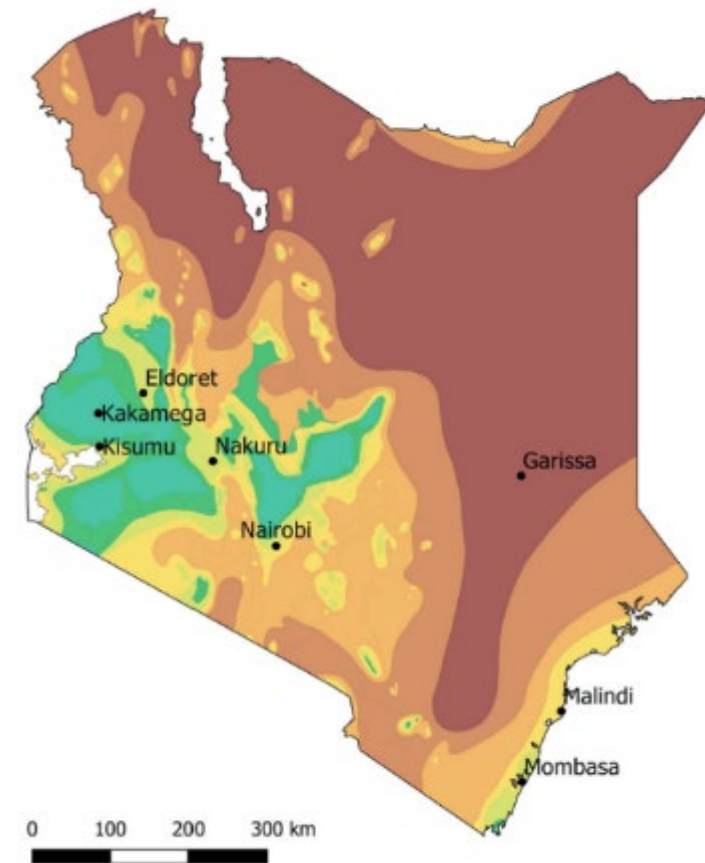
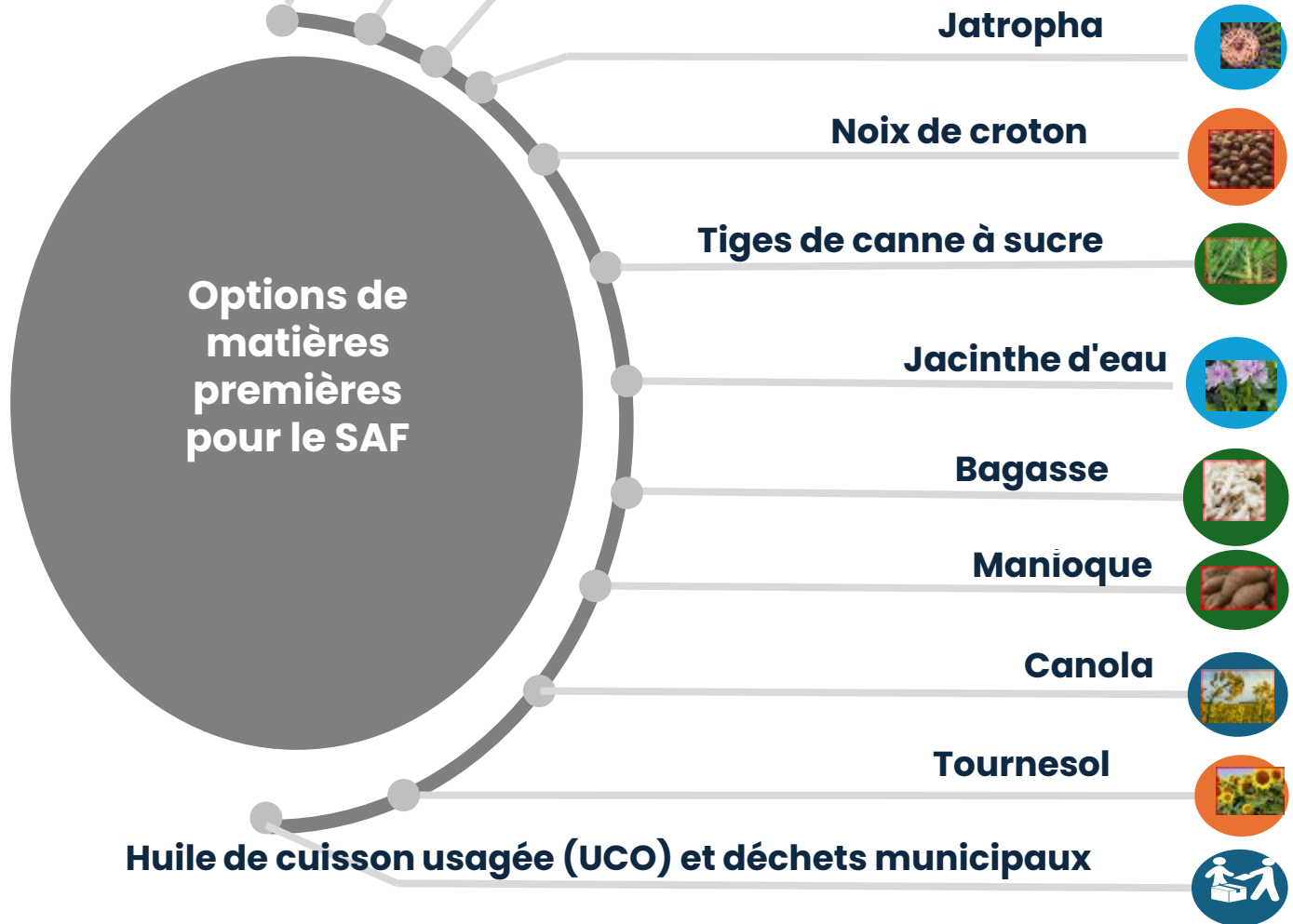
- ◆ Le comité de pilotage SAF du Kenya a été constitué en février/mars, regroupant différentes institutions
- ◆ 1ère réunion du comité directeur SAF de l'1st, tenue en mai
- ◆ En octobre, deuxième réunion du comité de pilotage SAF
- ◆ 1st Organisation en octobre du premier atelier régional EASA-UE sur les carburants durables (SAF) à Mombasa

2025



- ❖ Réunion du groupe de travail technique sur les carburants durables (SAF) organisée en avril en collaboration avec l'EASA ACT-SAF
- ❖ Réunion du comité directeur SAF en mai
- ❖ Lancement de l'étude sur l'ancienne raffinerie de Mombasa en mars, avec le soutien des Pays-Bas par l'intermédiaire de l'OACI ACT-SAF
- ❖ Organisation de l'atelier SAF « 4th » et de la réunion de niveau haut en novembre (25-27) et publication du rapport

RÉSULTATS DU RAPPORT 2018 SUR LES ÉTUDES DE FAISABILITÉ DES BIOCARBURANTS



Progrès du programme SAF au Kenya et collaborations avec les partenaires



Deuxième atelier et réunion au niveau haut sur les carburants durables (SAF) en septembre 2023



Le Kenya a procédé à la livraison d'un lot SAF avec KQ en 2023

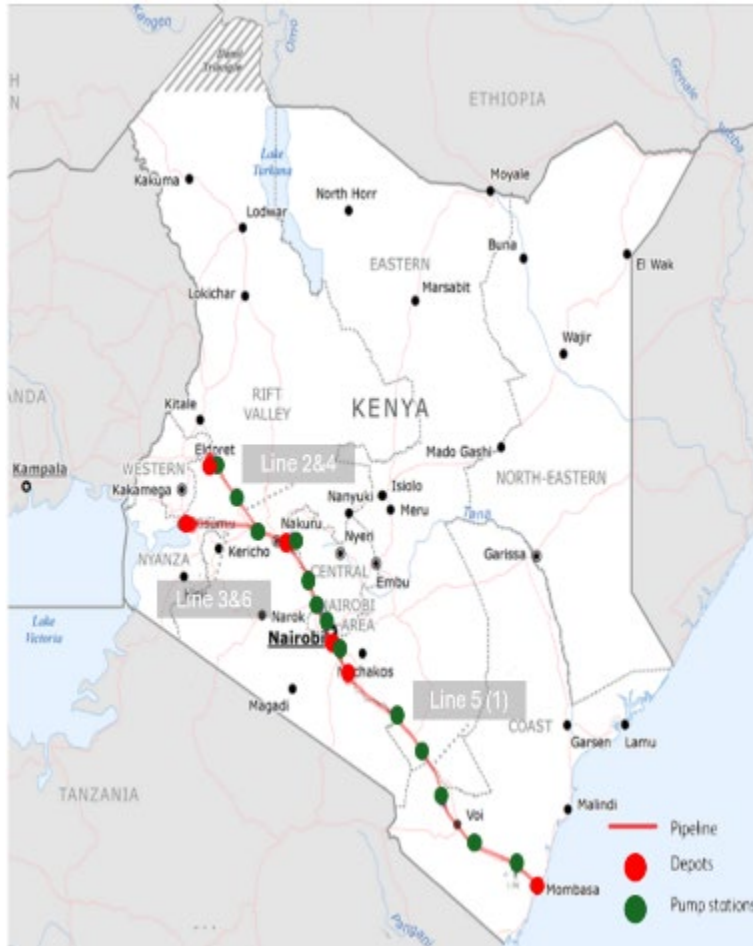


COMITÉ DE PILOTAGE SAF DU KENYA

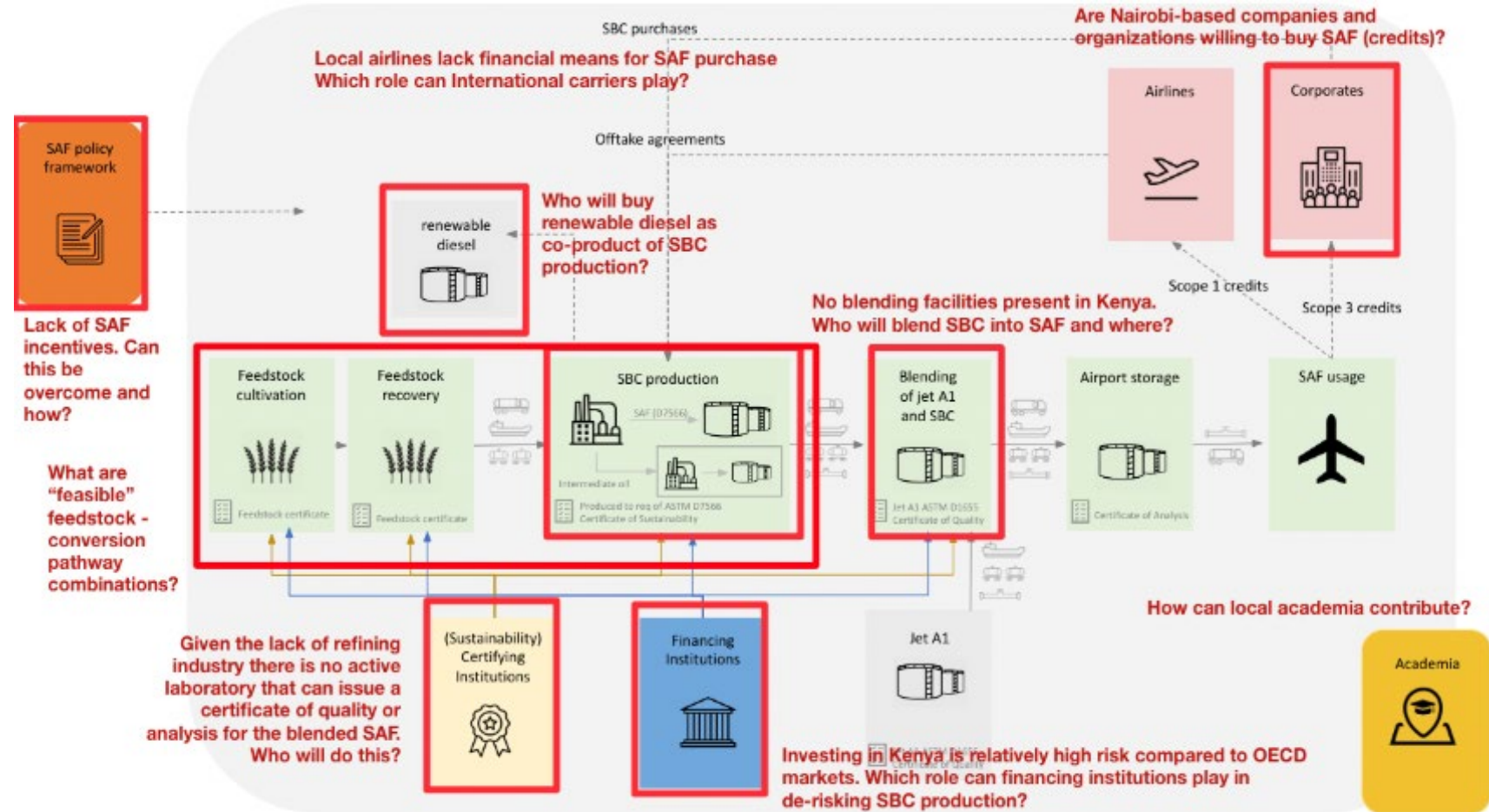


1st Réunion du comité de pilotage du SAF le 29 mai 2024

PRINCIPAUX DÉFIS LIÉS AUX CARBURANTS DURABLES AU KENYA



Oléoduc de carburant



RÈGLEMENT CORSIA



INTERNATIONAL CIVIL AVIATION ORGANIZATION



ICAO COMMITTEE ON AVIATION ENVIRONMENTAL PROTECTION
OCTOBER/2024

SPECIAL ISSUE

611

Kenya Gazette Supplement No. 35

3rd March, 2026

(Legislative Supplement No. 20)

LEGAL NOTICE NO. 24

THE CIVIL AVIATION ACT

(Cap. 394)

THE CIVIL AVIATION (CARBON OFFSETTING AND REDUCTION SCHEME FOR INTERNATIONAL AVIATION) REGULATIONS, 2025

ARRANGEMENT OF REGULATIONS

PART I— PRELIMINARY PROVISIONS

- 1—Citation.
- 2—Interpretation.
- 3—Application.

PART II — CARBON OFFSETTING AND REDUCTION SCHEME FOR INTERNATIONAL AVIATION

- 4—Attribution of international flights to an aeroplane operator
- 5—Attribution of an aeroplane operator
- 6—Approval of Compliance
- 7—Record keeping
- 8—Compliance periods and timeline
- 9—Equivalent procedures

PART III — MONITORING, REPORTING AND VERIFICATION OF EMISSIONS

Monitoring, reporting and verification of aeroplane operator annual CO₂ emissions.

- 10—Applicability of MRV requirements

Monitoring of CO₂ Emissions

- 11—Eligibility of Monitoring Methods
- 12—Baseline phase
- 13—Implementation
- 14—Emissions monitoring plan
- 15—Calculation of CO₂ emissions from aeroplane fuel use
- 16—Monitoring of CORSIA eligible fuels claims

16. (1) The aeroplane operator that intends to claim for emissions reductions from the use of CORSIA eligible fuels shall use a CORSIA eligible fuel that meets the ICAO document “CORSIA Sustainability Criteria for CORSIA Eligible Fuels”.

Monitoring of CORSIA eligible fuels claims.

(2) The aeroplane operator that intends to claim for emissions reductions from the use of CORSIA eligible fuels shall only use CORSIA eligible fuels from fuel producers that are certified by an approved Sustainability Certification Scheme.

(3) Subject to sub-regulation (2), such certification schemes shall meet the requirements prescribed by the Authority.

(4) The CORSIA eligible fuel shall not be accounted for if the aeroplane operator cannot demonstrate compliance with the CORSIA Sustainability Criteria.

ORGANISATION DE L'ATELIER RÉGIONAL SAF 1ST PAR L'EASA ET 2ND RÉUNION DU COMITÉ DE PILOTAGE NATIONAL SAF



Co-organisation de l'atelier régional SAF de l'AESA dans le cadre de l'ACT-SAF pour l'Inde et l'Afrique
Du 30th septembre au 2nd octobre 2024

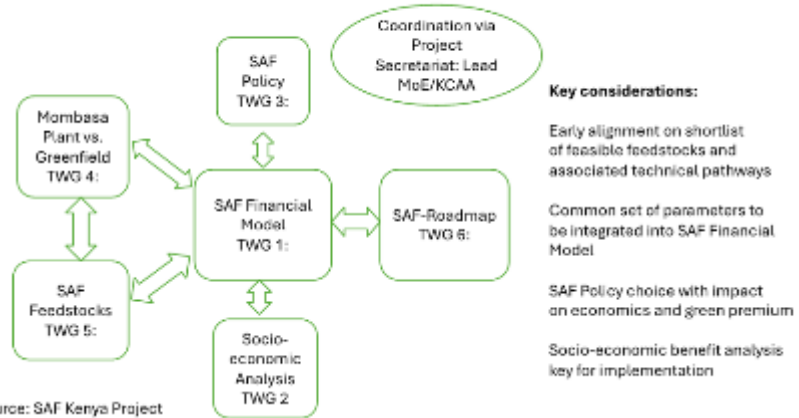


Organisation de la réunion du comité de pilotage SAF les 3 et 4 octobre 2024

Résultat : l'atelier a abouti à l'élaboration d'un document de travail destiné au cabinet et a permis de définir les prochaines étapes au sein des groupes de travail techniques

TROISIÈME RÉUNION DU COMITÉ NATIONAL SAF SUR L'ACCÉLÉRATION DU DÉVELOPPEMENT ET DU DÉPLOIEMENT DES Carburants aviation durables (SAF) au KENYA 19th - 21st mai 2025

Technical Working Groups 1-6 are highly interdependent and require close coordination and alignment



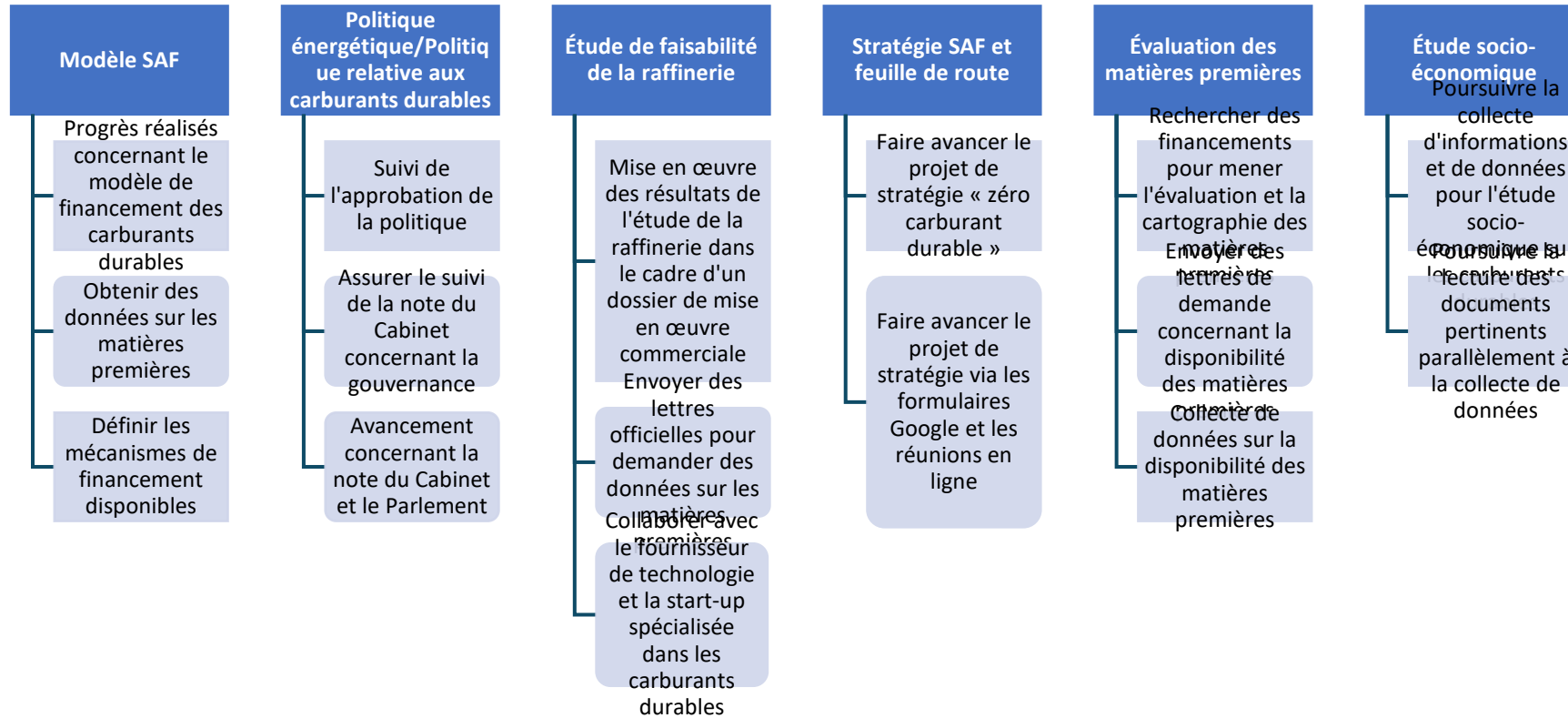
Organisée à Naivasha, au Kenya, du 19 au 21 mai
2025 au SOPA Lodge Resort



AU COURS DE LA RÉUNION, DIFFÉRENTS GROUPES DE TRAVAIL ONT FAIT
PART DE L'AVANCEMENT DE LEURS TRAVAUX

PROCHAINE ÉTAPE

Coordination par le comité directeur de la SAF



KENYA



Organiser le prochain atelier SAF et la réunion au niveau haut de 1th en 2026

Principales opportunités SAF



POLITIQUE

Il existe une bonne volonté politique pour développer les carburants durables pour l'aviation (SAF/ESAF) et l'hydrogène



TECHNOLOGIQUE

Cela favorisera le progrès technologique et le transfert de connaissances



ÉCONOMIQUE

Les SAF soutiendront l'économie grâce à une réduction des factures d'importation et apporteront des avantages socio-économiques.



ENVIRONNEMENT

Cela favorisera la réalisation des CND et la conformité au CORSIA et présente un fort potentiel pour les énergies renouvelables



SOCIOCULTUREL

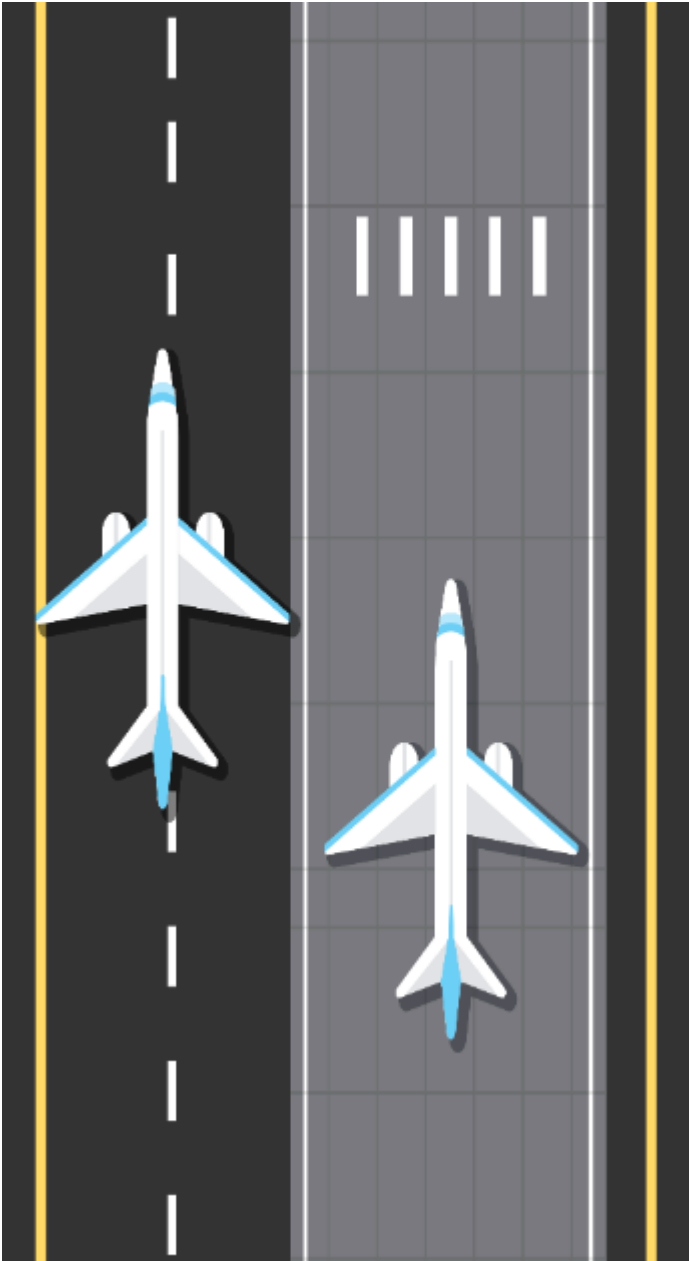
Le SAF apportera des avantages socio-économiques aux agriculteurs et à l'économie locale, et soutiendra les communautés autochtones

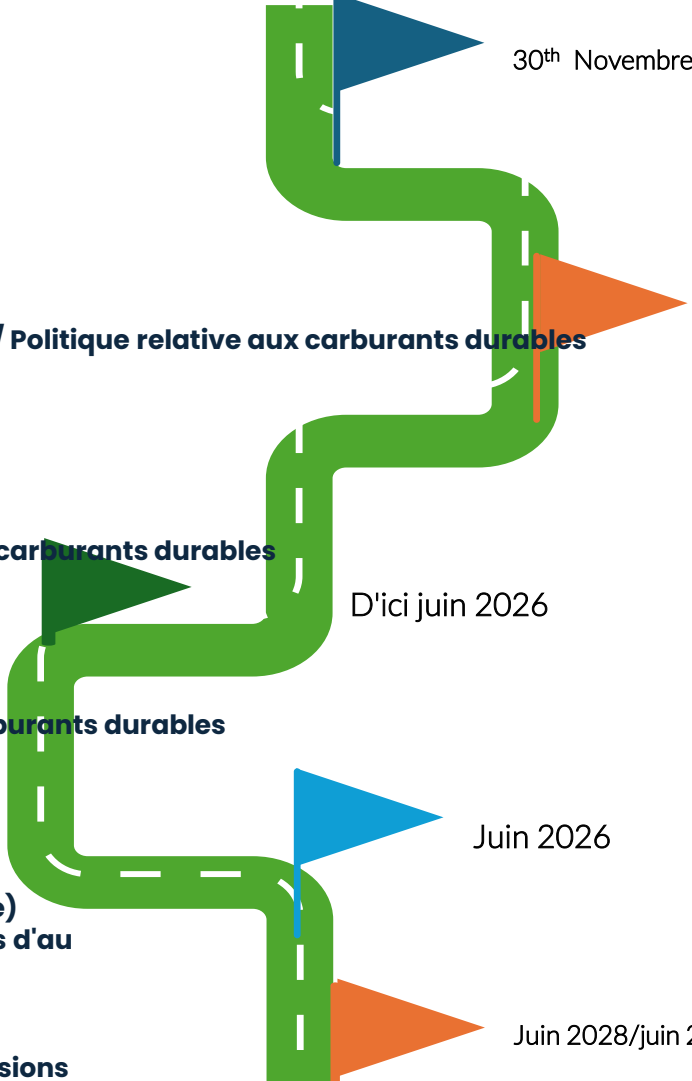


JURIDIQUE

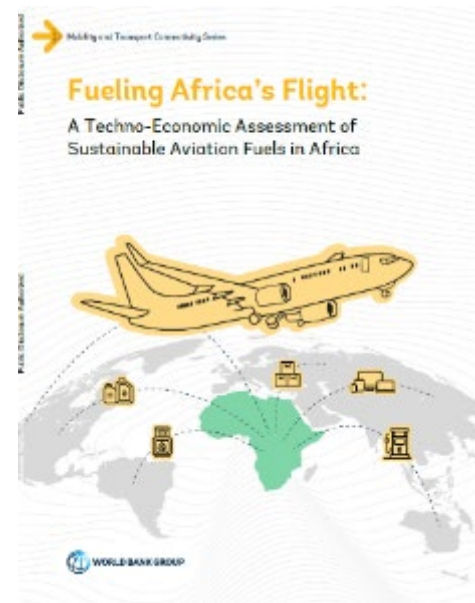
Contribuera au respect du CORSIA et des crédits carbone
Il existe un cadre juridique adéquat et une politique énergétique pour 2025

Principaux résultats / Résultats attendus



- **Étude de faisabilité et rapport de mise en œuvre commerciale concernant l'ancienne raffinerie**
 - **Politique énergétique approuvée 2025-2035 / Politique relative aux carburants durables**
 - **Modèle de financement et stratégie pour les carburants durables**
 - **Rapport sur les matières premières pour les carburants durables (SAF) et étude socio-économique**
 - **Raffinerie de carburants durables (bioraffinerie) avec un volume chargé de carburants durables d'au moins 10 % de la production de Jet A1**
 - **Autres : création d'emplois, réduction des émissions**
- 
- 30th Novembre 2025
- D'ici le 31 décembre 2025/juin 2026
- D'ici juin 2026
- Juin 2026
- Juin 2028/juin 2029

Études clés de la SAF concernant le Kenya



Outils de suivi des énergies plus propres de l'OACI

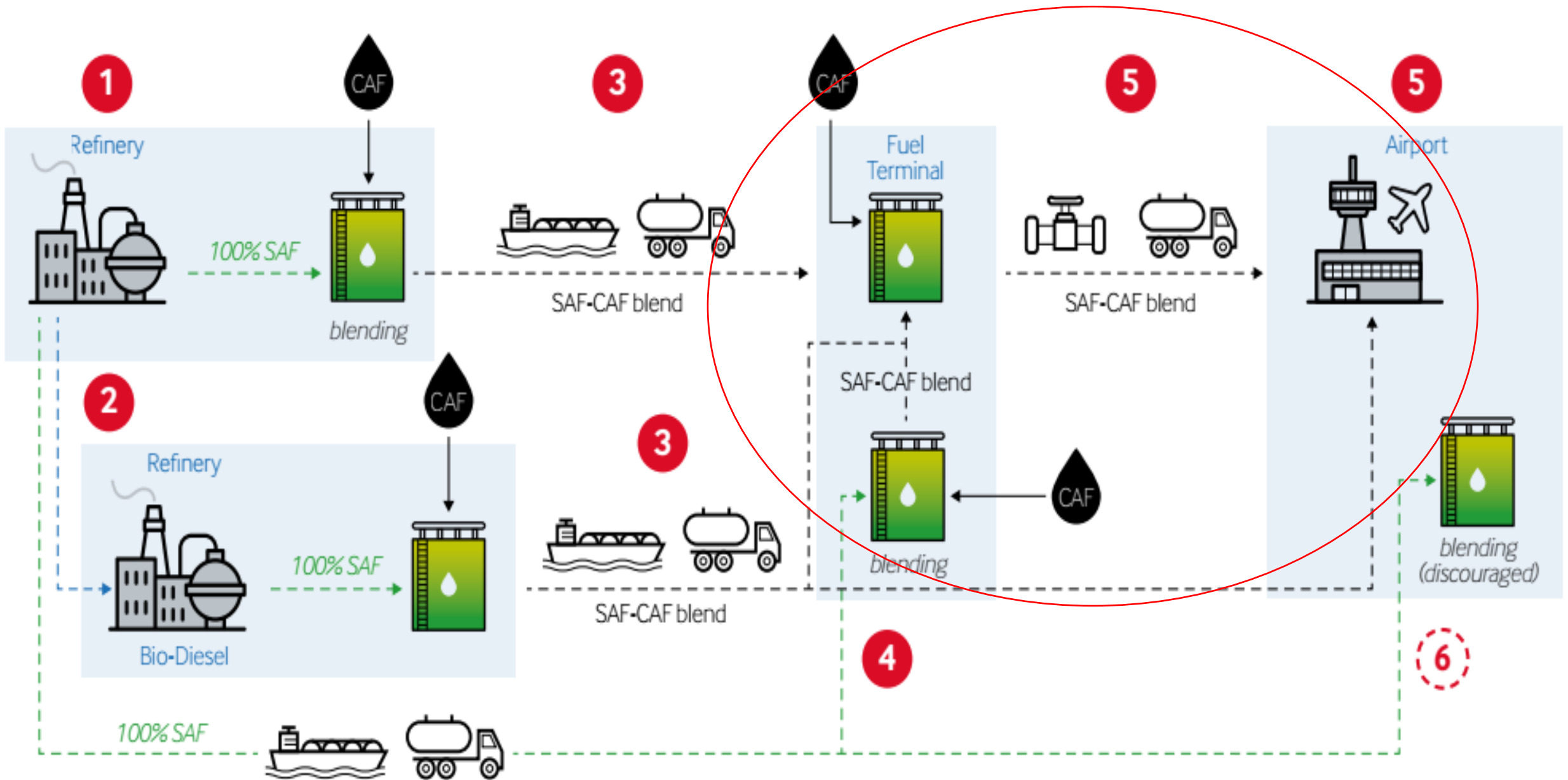
ICAO Cleaner Energy Tracker Tools

- Layout to reflect four building blocks of the Global Framework
- SAF-related indicators in airports distributing SAF, policies adopted/under development, SAF volumes/offtake agreements, approved conversion processes, etc.
- **Specific indicators on CORSIA – feedstocks, certified batches**



<https://www.icao.int/SAF>

D'APPROVISIONNEMENT CHAÎNE D'APPROVISIONNEMENT



Roles clés des aéroports dans la mise en œuvre des carburants durables pour l'aviation

Les autorités aéroportuaires occupent une position privilégiée et stratégique pour promouvoir la mise en œuvre et le développement à grande échelle des carburants aériens durables (SAF)

1. Développement des infrastructures et des installations de stockage

- Établir des partenariats avec les fournisseurs de carburant afin de développer des infrastructures sur site pour le stockage, le mélange et la distribution des SAF.
- Mise en place d'une logistique pour la distribution des SAF depuis les installations de stockage jusqu'aux avions, par exemple des oléoducs dédiés, des camions d'avitaillement ou des

2. Partenariats avec les compagnies aériennes et les fournisseurs de carburant

- Collaborer avec les compagnies aériennes pour aligner l'offre de carburants durables sur la demande, en concluant des accords d'achat conjoints et en nouant des partenariats avec les fournisseurs de carburant afin de garantir l'approvisionnement en carburants durables.

3. Mesures incitatives et plaidoyer politique

- Des mesures incitatives telles que la réduction des redevances d'atterrissage pour les compagnies aériennes utilisant des carburants durables (SAF), ce qui rend l'option des carburants durables (SAF) financièrement attractive pour les compagnies aériennes.
- Collaboration avec les agences gouvernementales et les organismes sectoriels pour soutenir les politiques en faveur des carburants durables, par exemple les subventions et les aides

4. Suivi et reporting de l'impact environnemental

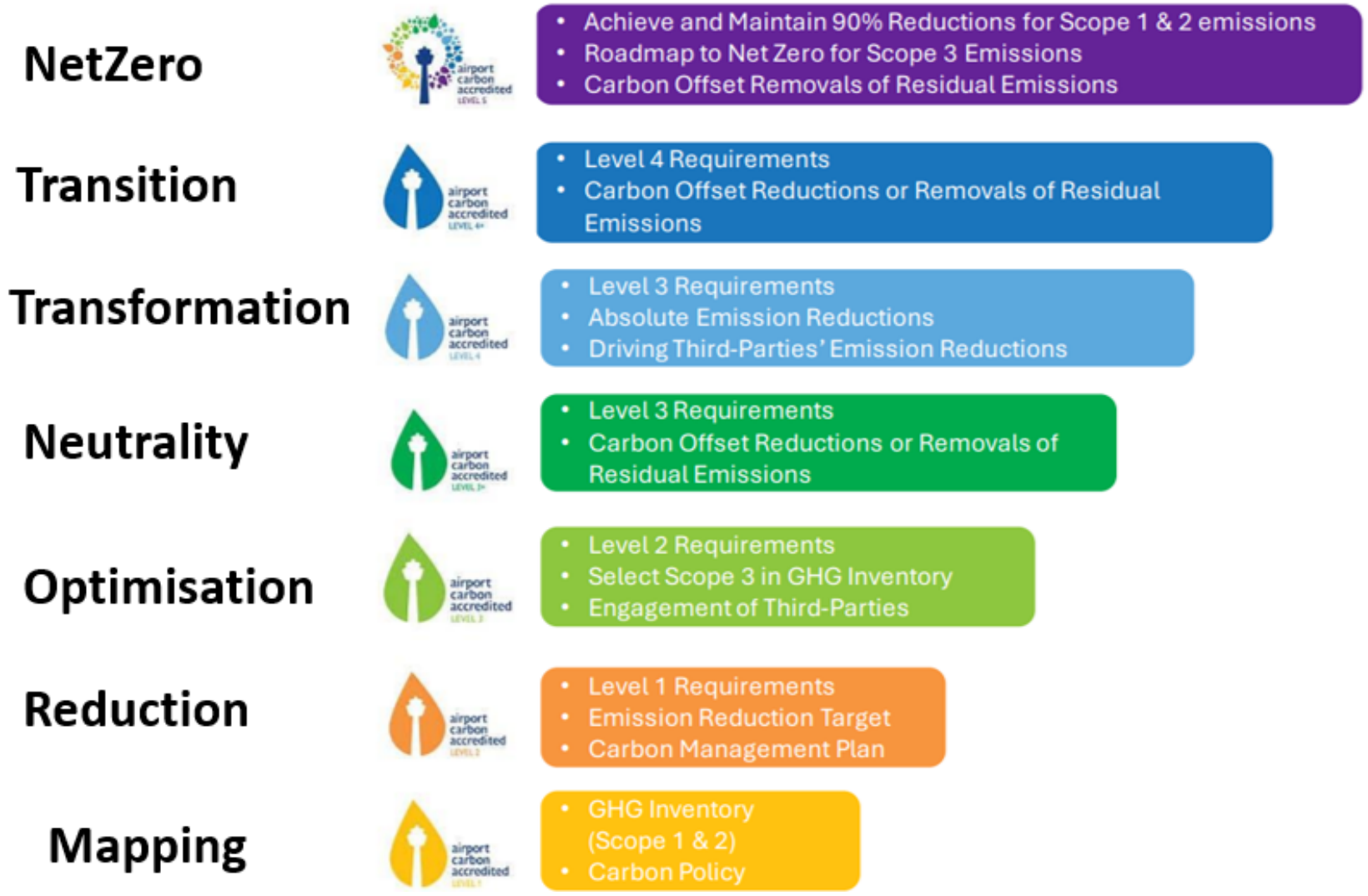
- Suivi et reporting de leurs émissions de carbone, y compris celles des vols utilisant des carburants durables.

5. Sensibilisation et mobilisation des parties prenantes

- Organisation de réunions avec les parties prenantes pour discuter des innovations, des défis et des meilleures pratiques en matière de carburants durables.

NIVEAUX DE CERTIFICATION CARBONE DES AÉROPORTS

Figure 1 Airport Carbon Accreditation Levels and Requirements



POINT DE VUE KÉNYAN



Le dépôt de carburéacteur existant offre actuellement une capacité de stockage totale d'environ 52 000 tonnes. Le carburéacteur est stocké dans des bacs spécialement conçus à cet effet, comprenant trois grands bacs de 12 000 m³ chacun et deux bacs plus petits de 8 000 m³ chacun.

Conformément au nouveau plan directeur de l'aéroport JKIA, la capacité du système de lutte contre l'incendie existant devra être validée lors de la conception afin de garantir que le stockage d'eau, le débit d'eau et le refoulement de mousse soient suffisants pour éteindre un incendie et refroidir les bacs de stockage.



Un système de détection des fuites, appelé système de surveillance de l'étanchéité (TMS), sera mis en place pour surveiller toute fuite.



La configuration actuelle comprend huit pompes à entraînement électrique et deux pompes de secours à moteur diesel, d'une capacité nominale de 280 m³/h chacune. La capacité de pompage totale disponible est donc de 2 240 m³/h.



Les vannes motorisées seront équipées de transmetteurs de pression et de température pour la détection des fuites.



Des véhicules d'oléoserveur seront mis à disposition pour les opérations d'avitaillement sur les aires de stationnement.



Des filtres Séparateurs d'eau sont déjà installés au refoulement de chaque pompe d'incendie.



Toutes les aires de stationnement des avions seront équipées de boutons d'Arrêt d'urgence (ESD).

Avantages et opportunités

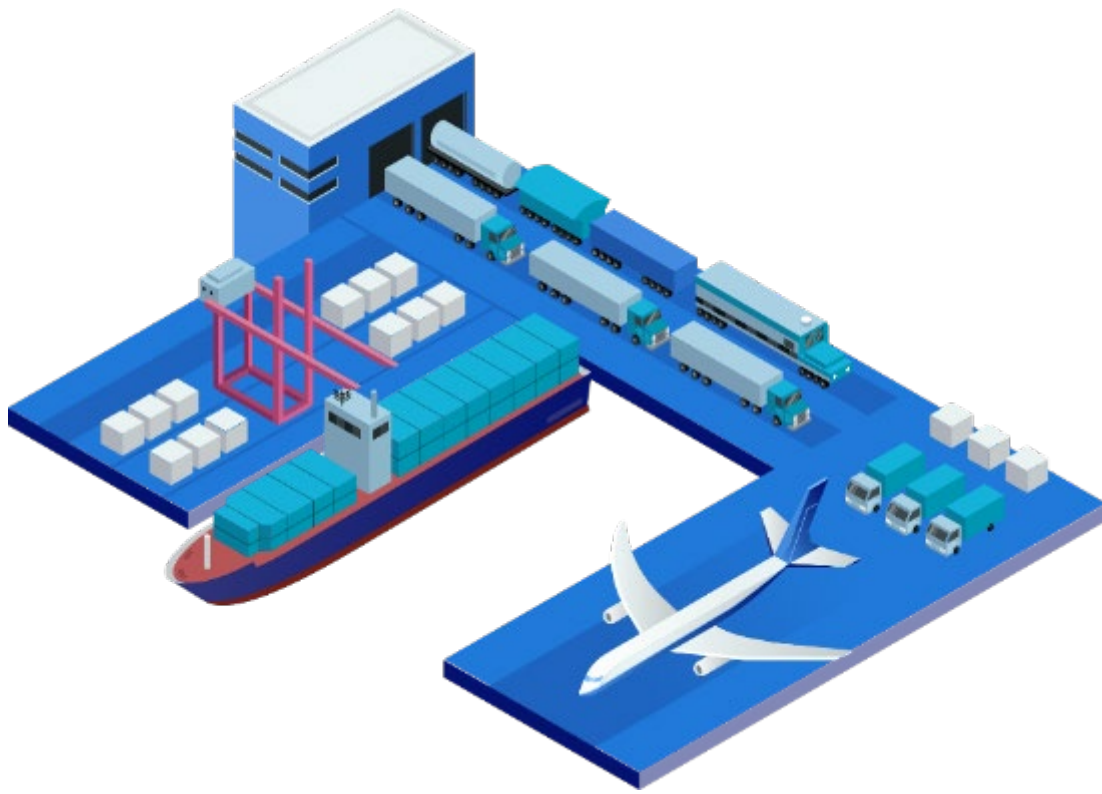
- 1 Environmental benefits in terms of GHG reductions
- 2 Job creation and rural development through feedstock supply chains and in the refinery
- 3 Reducing reliance on fossil fuel imports and improve energy security
- 4 Potentially stimulating economic growth through SAF exports
- 5 First mover advantage in Africa and positioning Kenya as a regional SAF hub in East Africa.
Growing global and regional demand for SAF
- 6 Access to international climate finance and carbon markets
- 7 Skills development and knowledge transfer in refinery operations, logistics, and certification
- 8 Potential co-benefits: waste management, soil improvement, circular economy
- 9 Serve both biodiesel and SAF market keeping production flexibility
- 10 Finding potential partner(s) contributing to project financing

Domaines de collaboration et besoins en matière de soutien

Les domaines clés de collaboration sont les suivants :

- **Élaboration d'une feuille de route pour les carburants durables (SAF)** au Kenya, destinés aux marchés régionaux et mondiaux
- **Amélioration technologique** grâce à l'innovation, à la recherche et au développement en collaboration avec **les universités locales**
- **Renforcement des capacités** par la formation technique et le transfert de connaissances
- **Développement d'une raffinerie de carburants durables (SAF)** au Kenya
- Promotion de l'égalité des sexes dans le secteur des carburants durables et la transition énergétique par le biais de partenariats
- Inspection et certification conjointes des carburants durables
- **Possibilités de financement par différentes institutions et partenaires internationaux pour faire avancer ce travail.**

Grâce à **des actions coordonnées visant à mettre en place une chaîne d'approvisionnement en carburants durables, à des politiques claires** et à un engagement soutenu, **le Kenya a le potentiel de devenir un leader régional dans la production de carburants durables**, stimulant à la fois la croissance économique et les progrès en



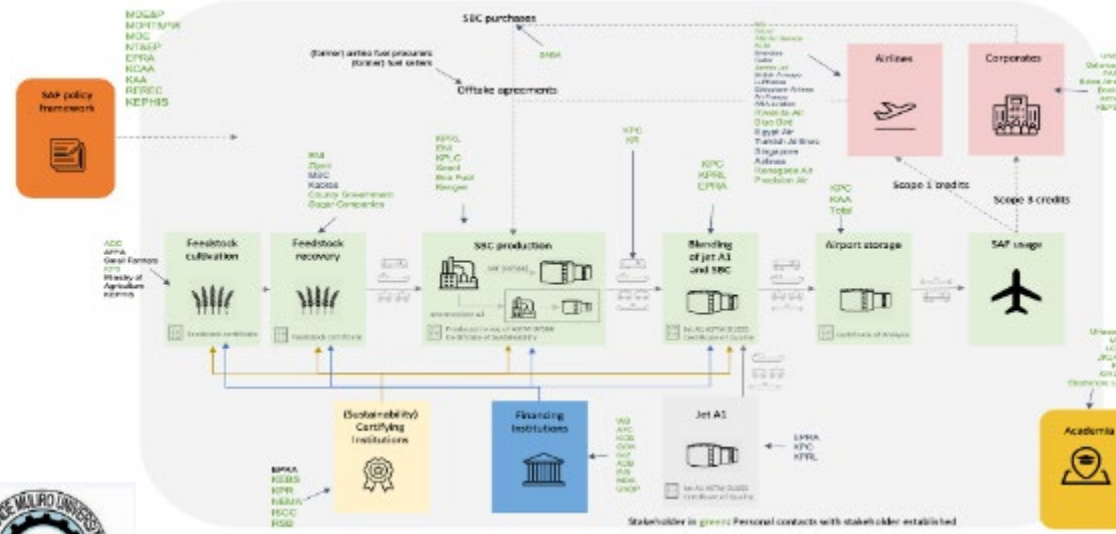
Cartographie des parties prenantes du SAF



Project Funded by the EU



Fahari Innovation Hub
Pushing Boundaries



Action : la cartographie des parties prenantes et la collaboration sont essentielles à la mise en œuvre de la SAF



**Merci de votre attention
!**

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&

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LUNCH





JIG Manager Workshop HYATT PLACE NAIROBI, Nairobi, 14-16th April 2026

Kenya Aviation and SAF Status and Progress

By

Francis Mwangi

Principal Planning Officer, KCAA & Kenya ICAO CAEP Member

&

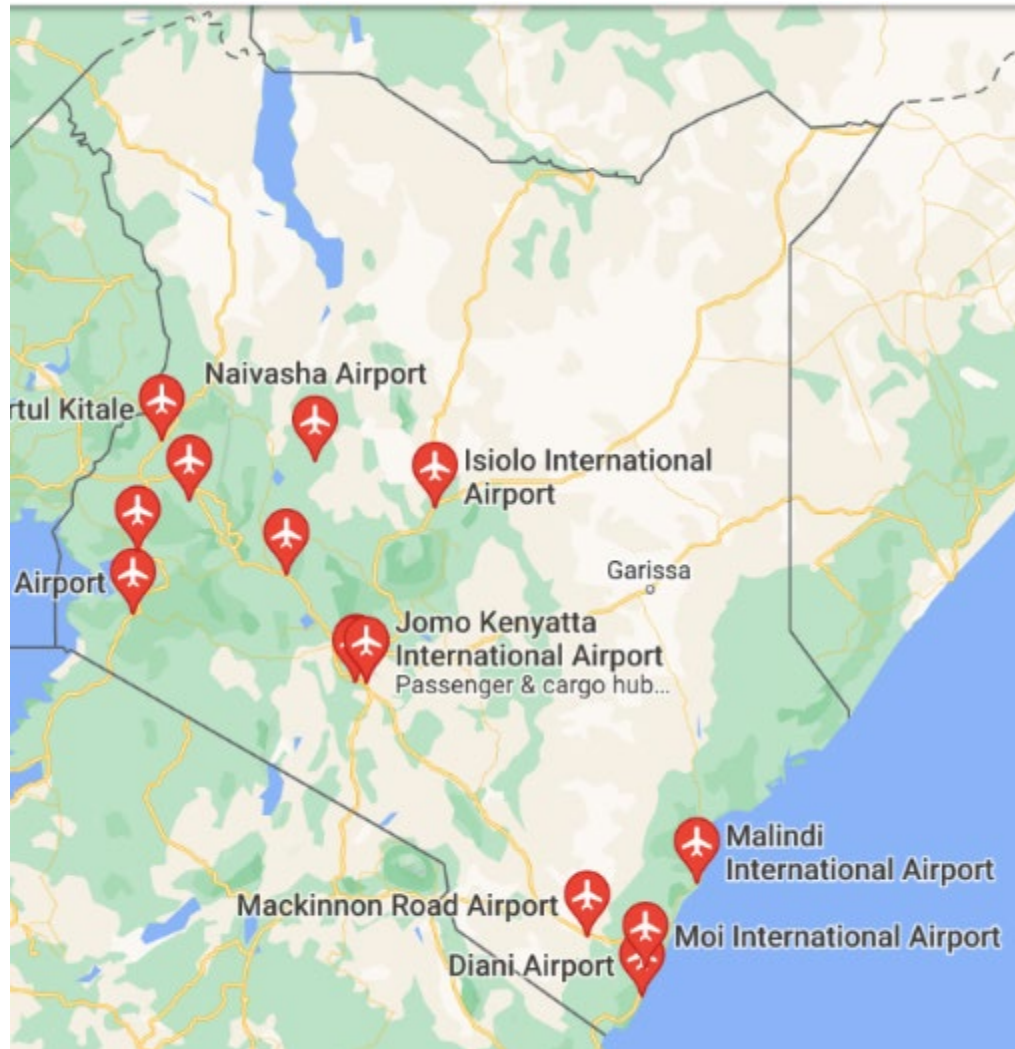
Naomi Gitau

Manager Environment, KAA

2026

INTRODUCTION

Aviation Status



Kenya is served by over 50 scheduled and charter air carriers, both international and domestic.

Key airports that handle international traffic are:

Jomo Kenyatta International Airport-HKJK

Moi International Airport- HKMO

Eldoret International Airport- HKEL

Kisumu Airport- HKKI

Wilson Airport –HKNW

Malindi Airport- HKML

INTRODUCTION Cont..

Civil Aviation Sector Roles



Integrated National
Transport Policy



Civil Aviation Policy
(Awaiting submission
to Cabinet)



Medium Term Plan IV



Ministry of Roads and
Transport Strategic Plan
2023- 2028



KCAA Strategic Plan
2023-2028



State Safety
Programme

INTRODUCTION Cont..

KEY Aviation Mandate

Provision of
Aviation safety
oversight

Aviation
security
oversight

Air transport
and economic
regulation

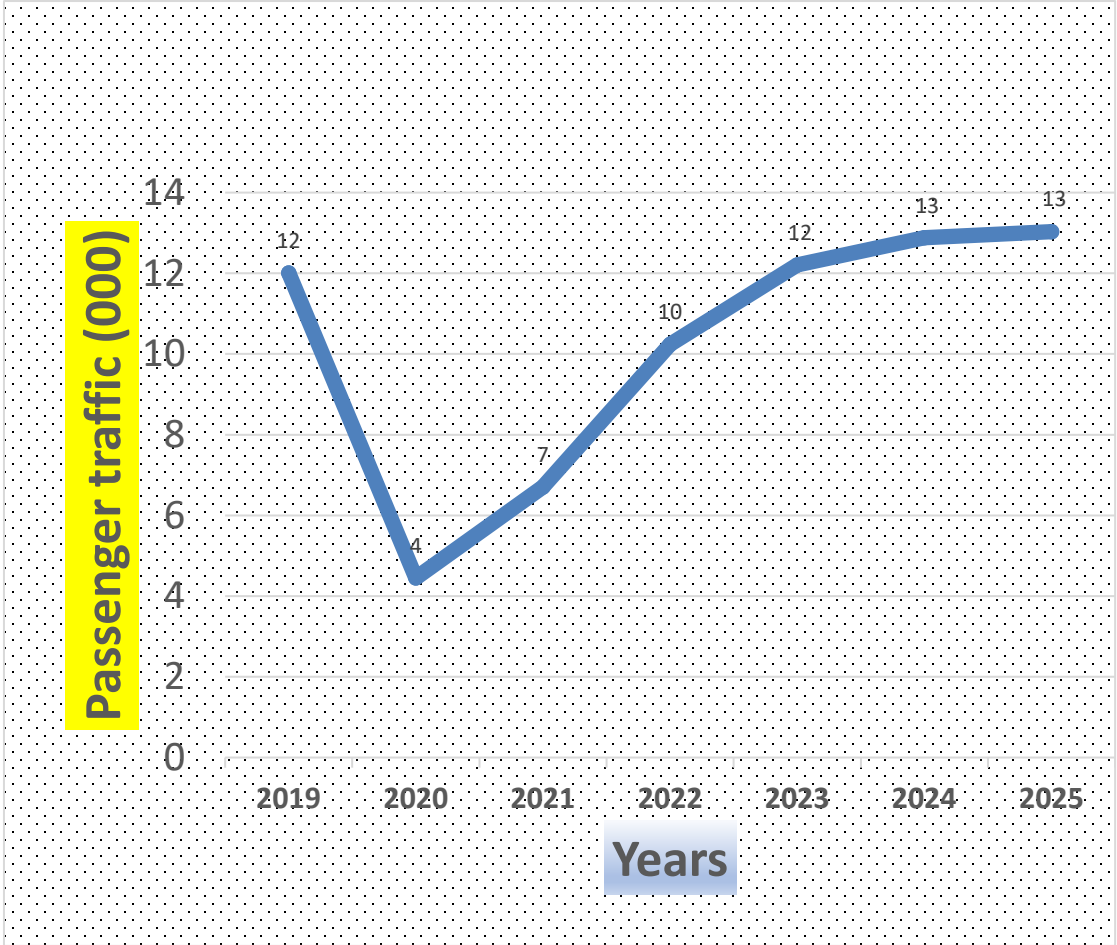
Provision of air
navigation
services

Provision of
Search and
Rescue services

Provision of
aviation training
services

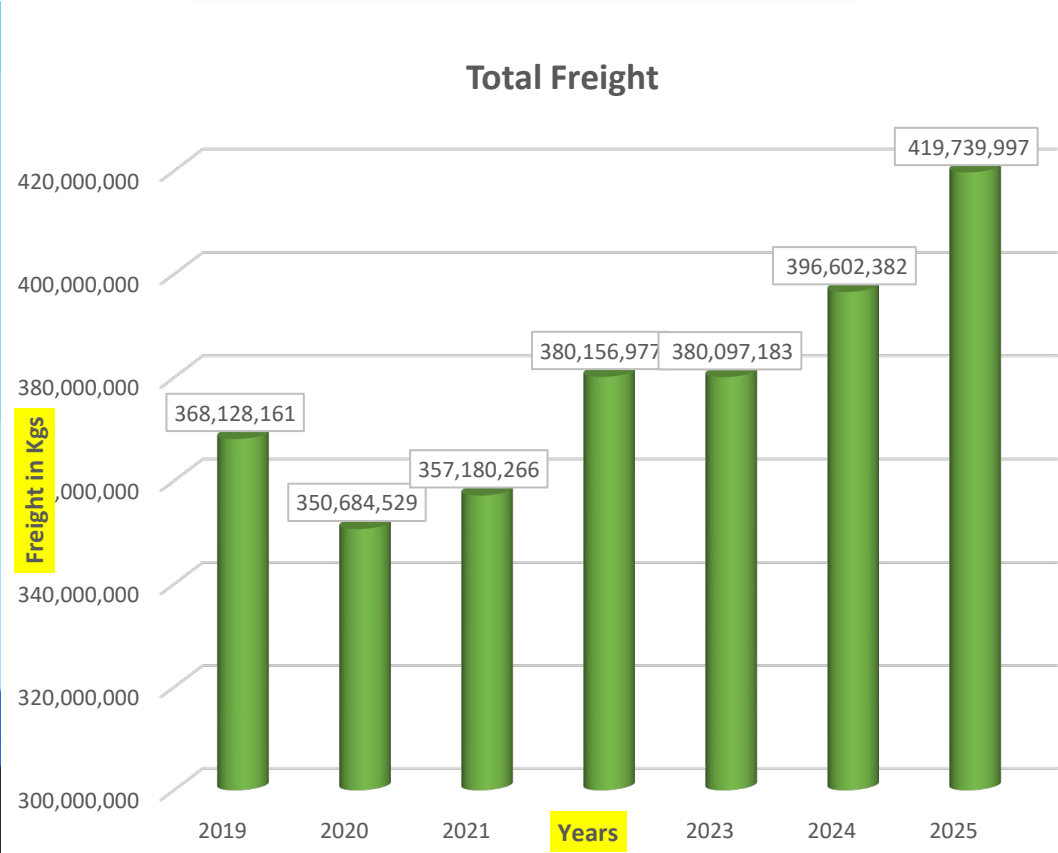
INTRODUCTION Cont..

Kenya's Passenger Traffic Trend



Kenya's air passenger traffic has demonstrated a strong recovery post-COVID

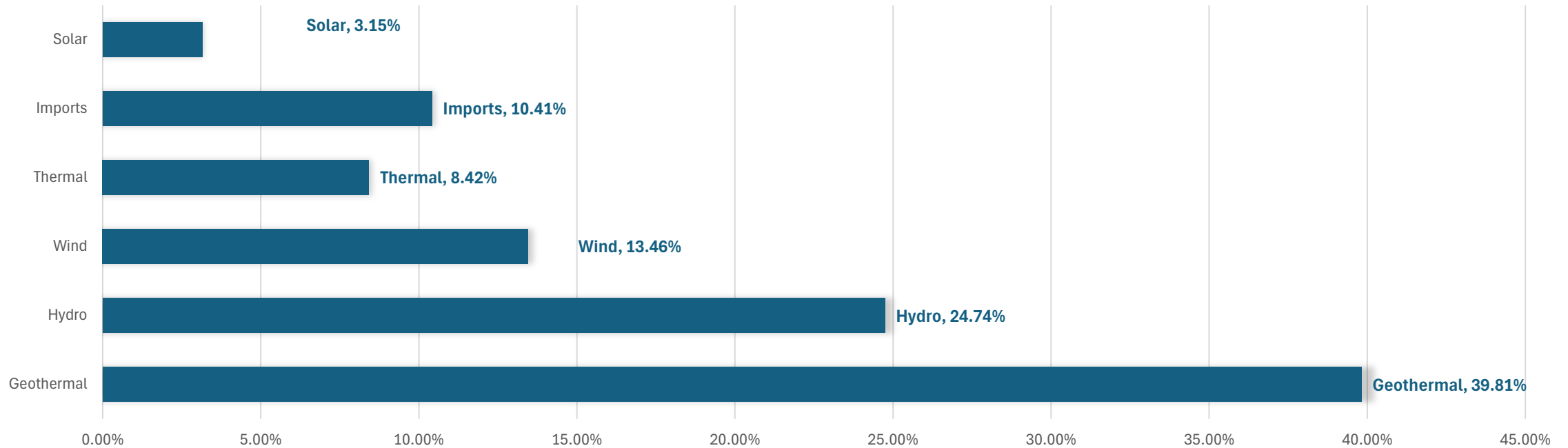
KENYA'S TOTAL FREIGHT TREND



Kenya is a key air cargo hub, particularly for perishables and e-commerce: Over 420,000 metric tonnes of cargo were processed in 2025

Kenya Energy MIX

Electricity generation mix by source as at 31st December 2024



Kenya's energy transition demonstrates the feasibility of integrating high shares of renewable electricity into the national grid, being also a potential for green industry

Kenya's Action Plans for CO₂ Reduction for Aviation



Aviation Environmental Working Group (AEWG) created in **January | 2012**

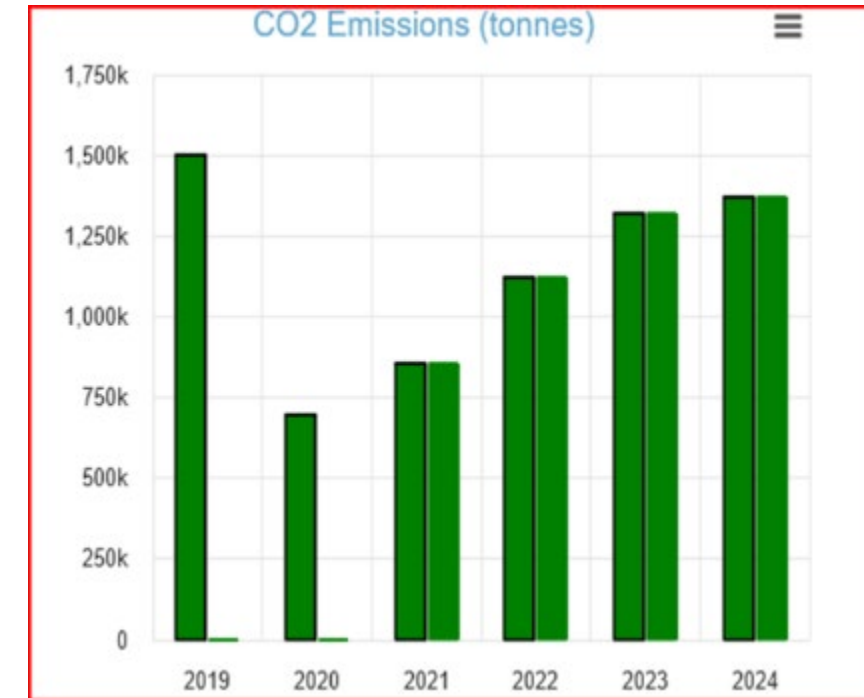
1st Action Plan submitted | 2012



ICAO - EU Assistance Project | **2014**

2nd Action Plan Submitted | 2015

3rd Action Plan Submitted | 2022



International Emission reported in the
CORSIA

KENYA'S 3RD ACTION PLAN Goals (2022-2028)



ACTION PLAN FOR CO₂ EMISSIONS REDUCTION IN THE AVIATION SECTOR 2022-2028

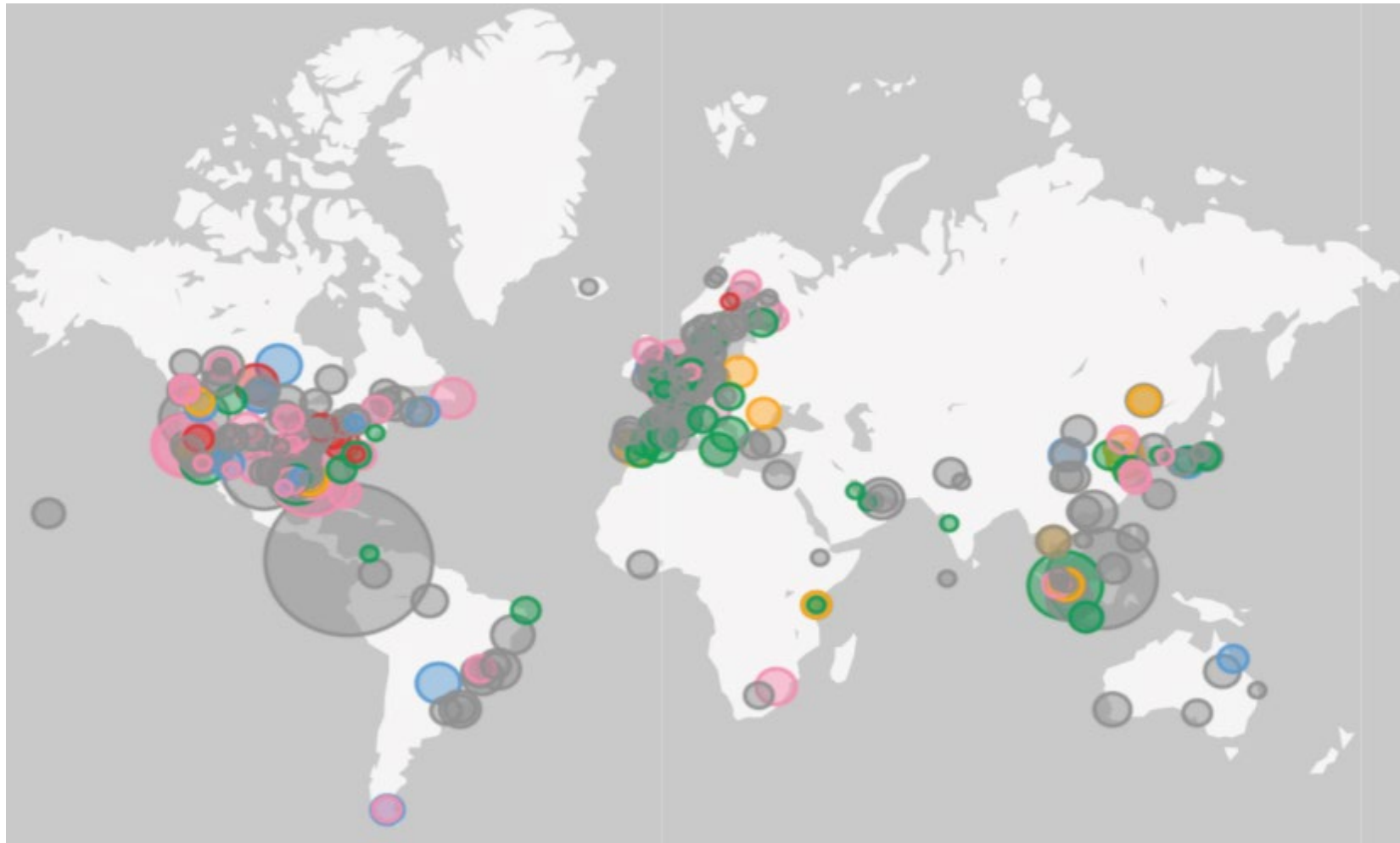
KENYA CIVIL AVIATION AUTHORITY



SEPTEMBER 2022

- θ In line with ICAO Resolution A40-18, the Action Plan sets an aspirational goal to improve fuel efficiency from a 2020 baseline by an average annual rate of 2 percent from 2021 to 2050.
- θ The Action Plan has adopted the five categories of measures/Goals that are expected to have the greatest environmental benefits namely:
 - a) Technology and standards;
 - b) **Sustainable aviation fuels;**
 - c) Operational improvements;
 - d) Market-based measures; and
 - e) Airport improvements

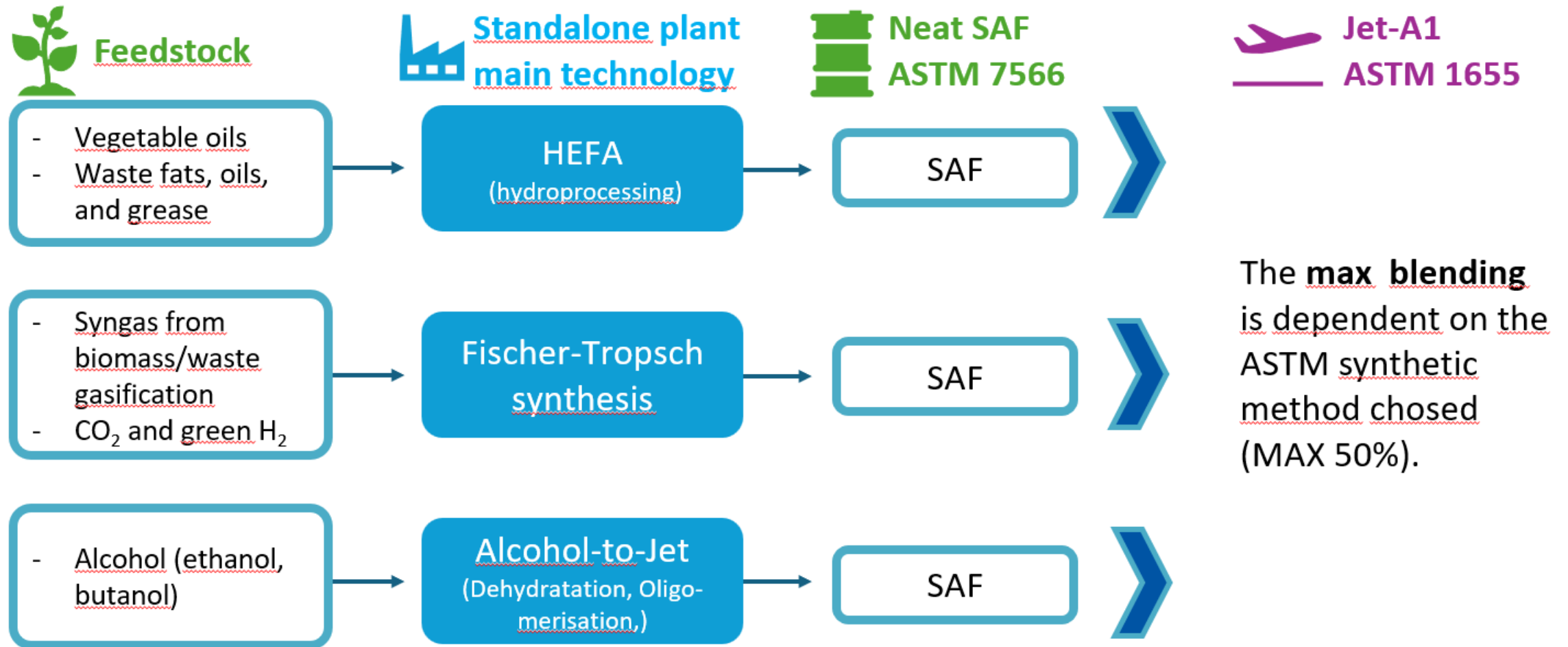
SAF production is mainly localized in EU and North America, where policies are mainly developed.



0.0 - ● 9.8k ● 1 - Initial Announcement ● 4 - In service-producing other renewable fuel ● 5 - In service-producing SAF
● 0 - cancelled/dormant project ● 3 - Under construction ● 2 - Front End Engineering Design (FEED)

Despite some of the **policies** are only **under development** (not in force), this is enough to **stimulate SAF production** and the appearance of **new SAF projects**.

SAF production pathways

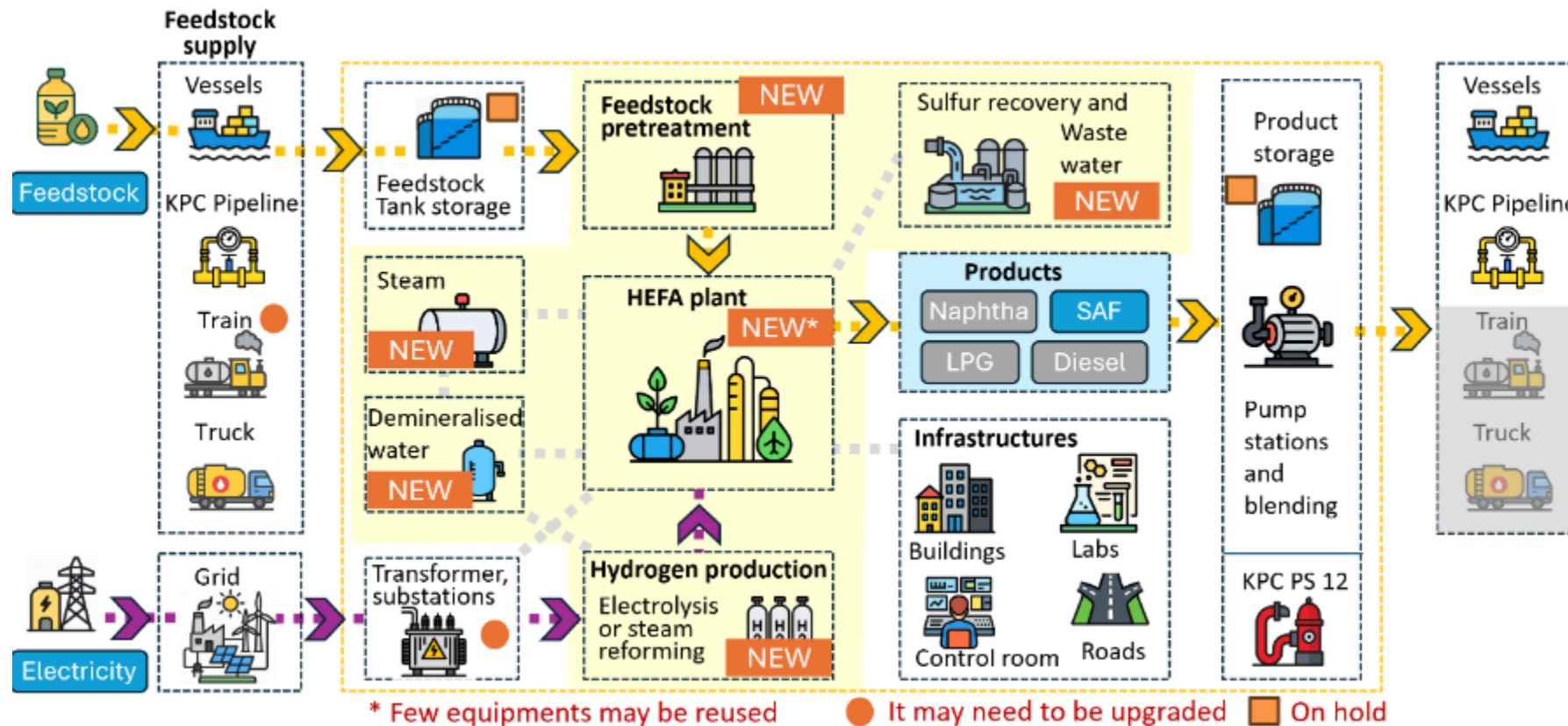


Evaluation of the assets in Mombasa KPC/KPRL

Most of the refinery's assets are **no easily reusable** and the overall cost advantage is limited compared to other revamping cases.

The site still offers **several advantages over a greenfield development**:

- Established **distribution and logistics infrastructure**, providing economic value.
- **Strategic location** and already zoned for **industrial use** (permitting process).

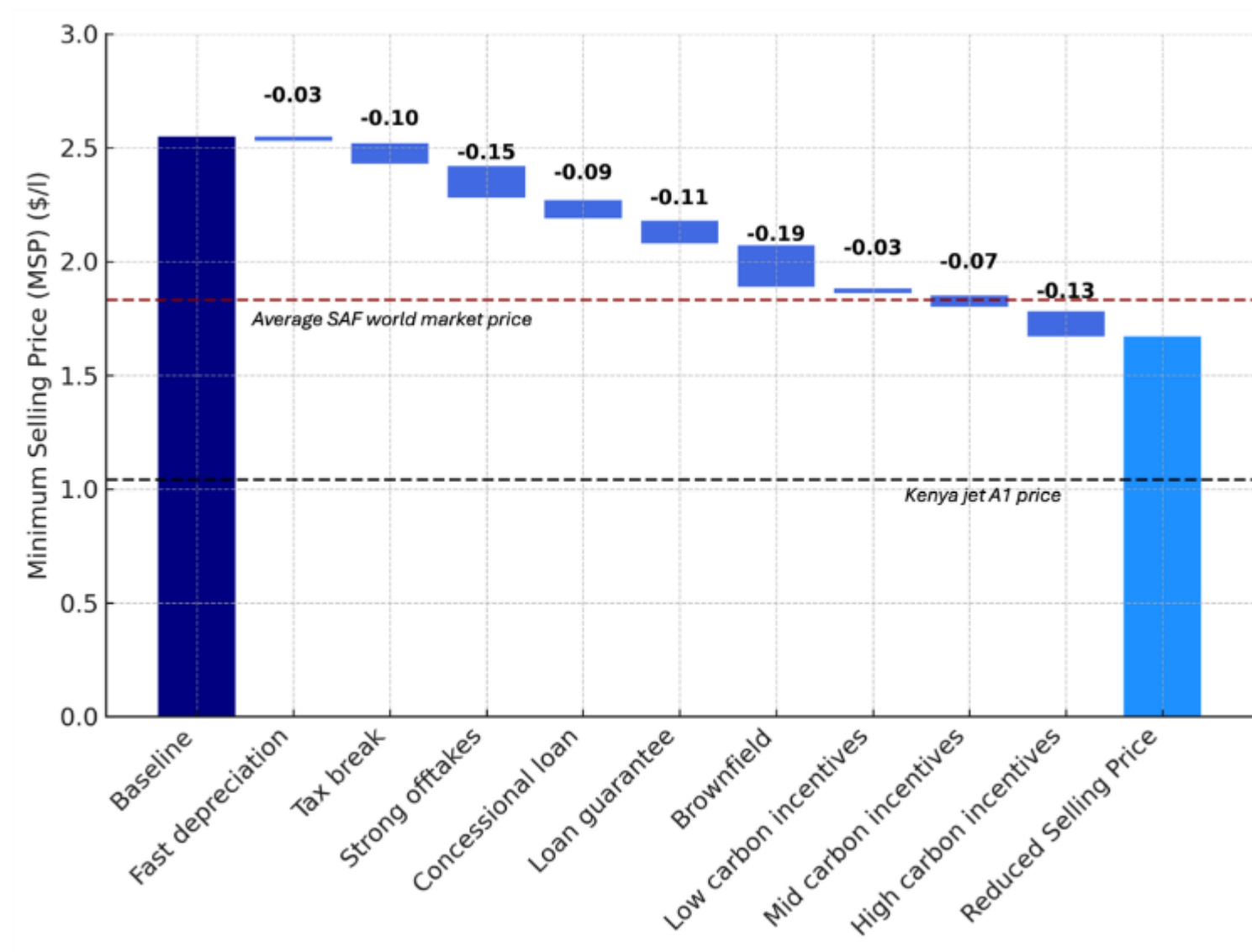


New assets to be installed:

- Feedstock pretreatment
- HEFA plant
- Hydrogen production
- Part of the utilities
- Some tanks (on hold)

Blending Jet A-1 with SAF inside the refinery allows the use of the current distribution system.

Impact of policy scenarios on the minimum selling price in Kenya of SAF produced using castor oil



Kenya SAF Progress

2018



- ◆ Conducted the **SAF feasibility** study under ICAO EU assistant Project
- ◆ The study showed potential for **HEFA using UCO, Castor, Croton, etc**

2022



- ◆ Held in Aug. First SAF Workshop and High-Level Meeting
- ◆ Different stakeholders participated in the Workshop

2023



- ❖ Held 2nd SAF Workshop and High-Level Meeting in Sept.
- ◆ First SAF Steering Committee meeting
- ❖ Techno-economic and green premium studies presented.
- ❖ KQ conducted Batch SAF uplift from **JKIA to AMS**

2024



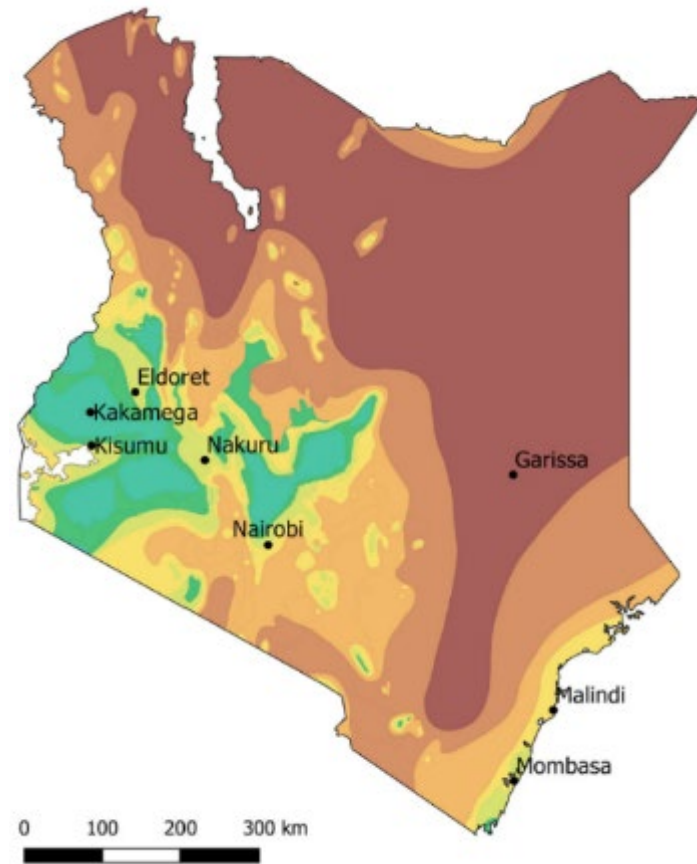
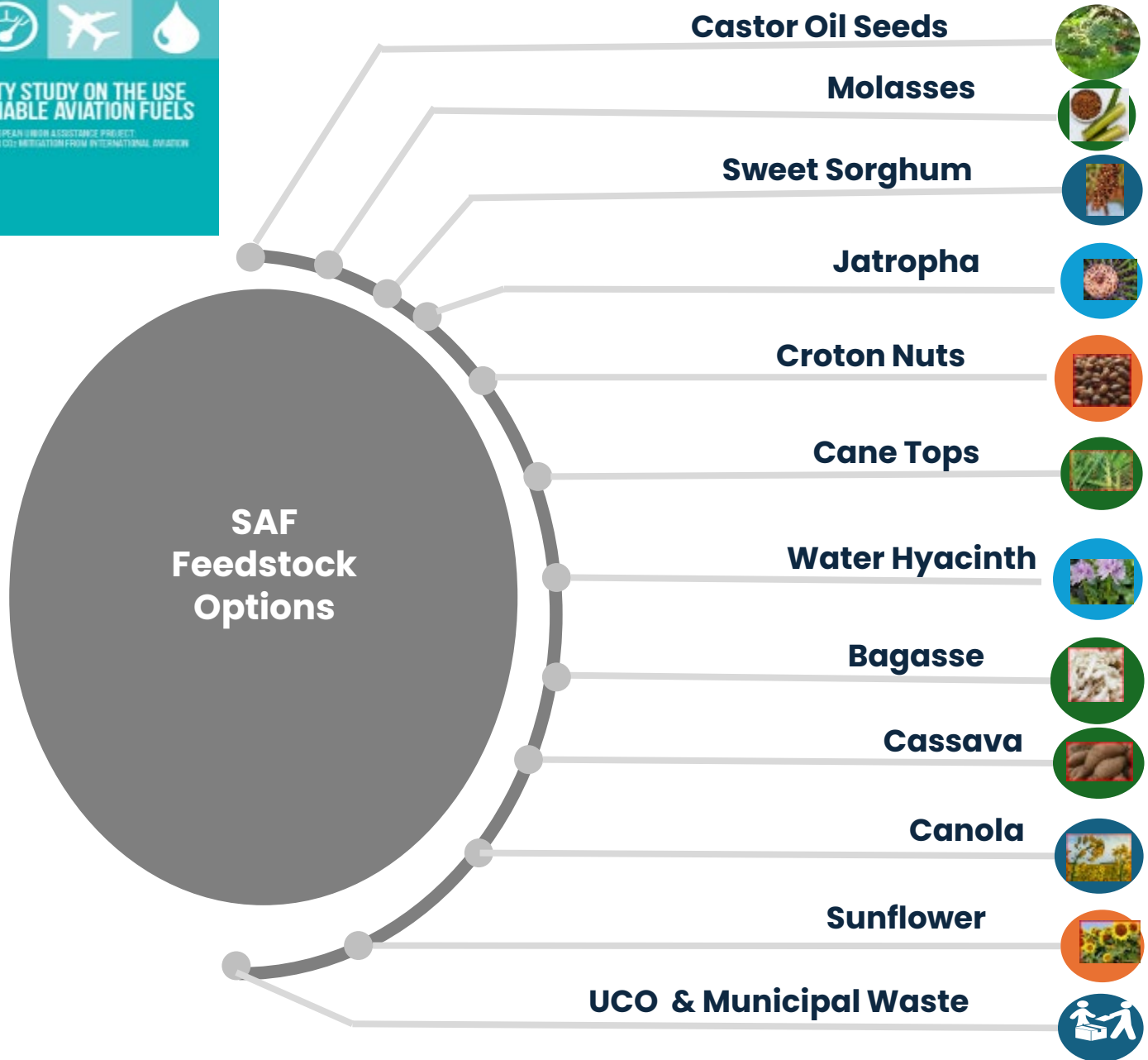
- ◆ Formed Kenya SAF Steering committee in Feb/March different institutions
- ◆ 1st SAF Steering Committee meeting held in May
- ◆ Held in Oct. 2nd SAF Steering Committee meeting
- ◆ Held in Oct. the 1st EASA-EU Regional Workshop on SAF in Mombasa

2025



- ❖ Held in April SAF Technical Working Group Meeting in collaboration with EASA ACT-SAF
- ❖ Held in the May SAF Steering Committee meeting
- ❖ Started the **Study on Old Mombasa Refinery in March, supported by Netherlands through ICAO ACT-SAF**
- ❖ **Held 4th SAF Workshop and High-Level Meeting in Nov (25-27) and Launched the Study report**

RESULTS FROM SAF FEASIBILITY STUDIES REPORT 2018



Kenya SAF progress and collaborations with partners



Second workshop and high-level meeting on SAF in Sept 2023



Kenya Conducted SAF Batch delivery with KQ in 2023

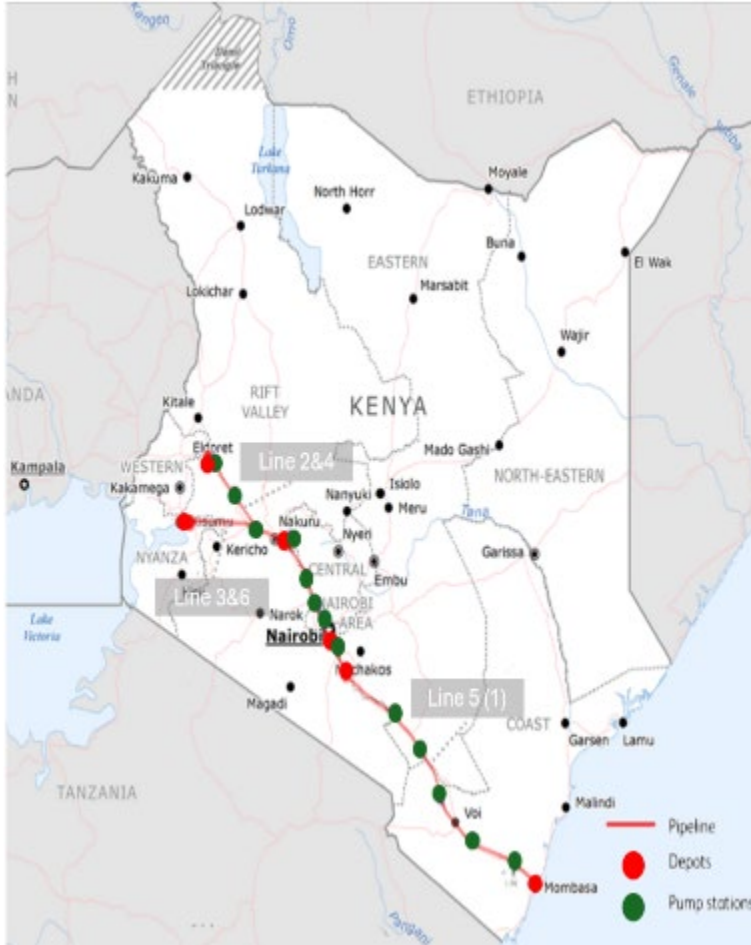


KENYA SAF STEERING COMMITTEE

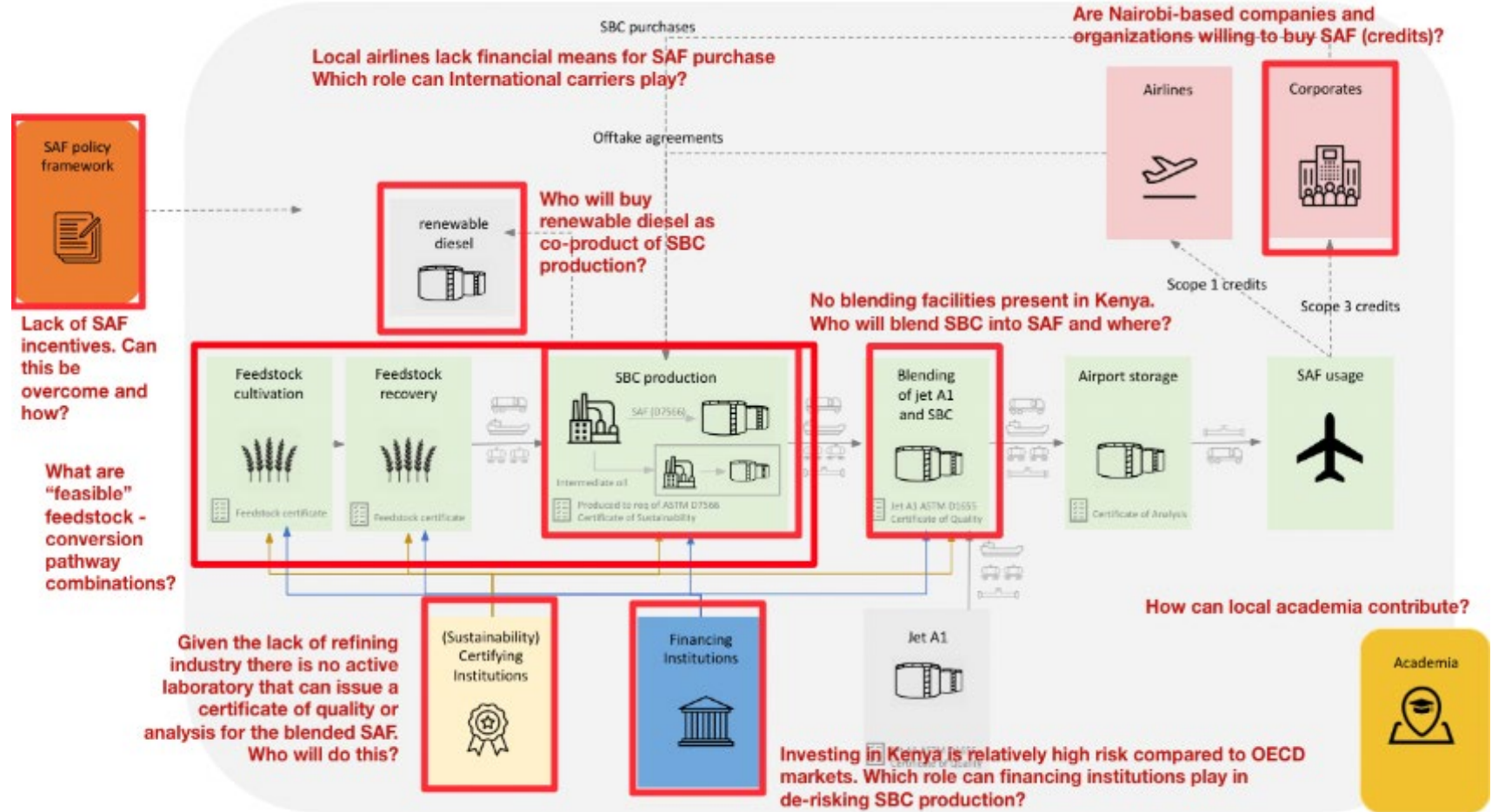


1st SAF Steering Committee meeting on 29th May 2024

KEY SAF CHALLENGES IN KENYA



Fuel Pipeline



CORSIA REGULATION



INTERNATIONAL CIVIL AVIATION ORGANIZATION



ICAO COMMITTEE ON AVIATION ENVIRONMENTAL PROTECTION
OCTOBER/2024

SPECIAL ISSUE

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- 7—Record keeping
- 8—Compliance periods and timeline
- 9—Equivalent procedures

PART III — MONITORING, REPORTING AND VERIFICATION OF EMISSIONS

Monitoring, reporting and verification of aeroplane operator annual CO₂ emissions.

- 10—Applicability of MRV requirements

Monitoring of CO₂ Emissions

- 11—Eligibility of Monitoring Methods
- 12—Baseline phase
- 13—Implementation
- 14—Emissions monitoring plan
- 15—Calculation of CO₂ emissions from aeroplane fuel use
- 16—Monitoring of CORSIA eligible fuels claims

16. (1) The aeroplane operator that intends to claim for emissions reductions from the use of CORSIA eligible fuels shall use a CORSIA eligible fuel that meets the ICAO document “CORSIA *Sustainability Criteria for CORSIA Eligible Fuels*”.

Monitoring of CORSIA eligible fuels claims.

(2) The aeroplane operator that intends to claim for emissions reductions from the use of CORSIA eligible fuels shall only use CORSIA eligible fuels from fuel producers that are certified by an approved Sustainability Certification Scheme.

(3) Subject to sub-regulation (2), such certification schemes shall meet the requirements prescribed by the Authority.

(4) The CORSIA eligible fuel shall not be accounted for if the aeroplane operator cannot demonstrate compliance with the CORSIA Sustainability Criteria.

HOSTING 1ST SAF REGIONAL WORKSHOP BY EASA & 2ND SAF NATIONAL STEERING COMMITTEE MEETING



Co-hosted EASA SAF Regional workshop for Under ACT-SAF for India and Africa
On 30th Sept. -2nd October 2024

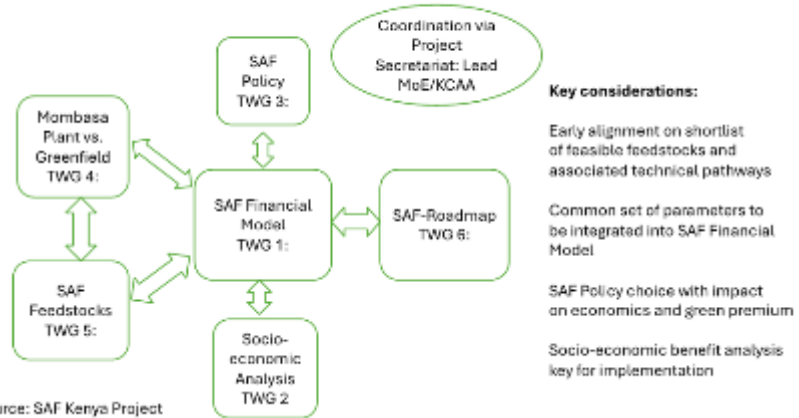


Held SAF 2nd SAF Steering Committee Meeting on 3rd and 4th October 2024

Outcome: Workshop led to the development of a policy cabinet paper and further informed next steps in Technical Working Groups

THIRD NATIONAL SAF COMMITTEE MEETING ON THE ACCELERATION OF DEVELOPMENT AND DEPLOYMENT OF SAF (SUSTAINABLE AVIATION FUELS) IN KENYA 19th-21st May 2025

Technical Working Groups 1-6 are highly interdependent and require close coordination and alignment



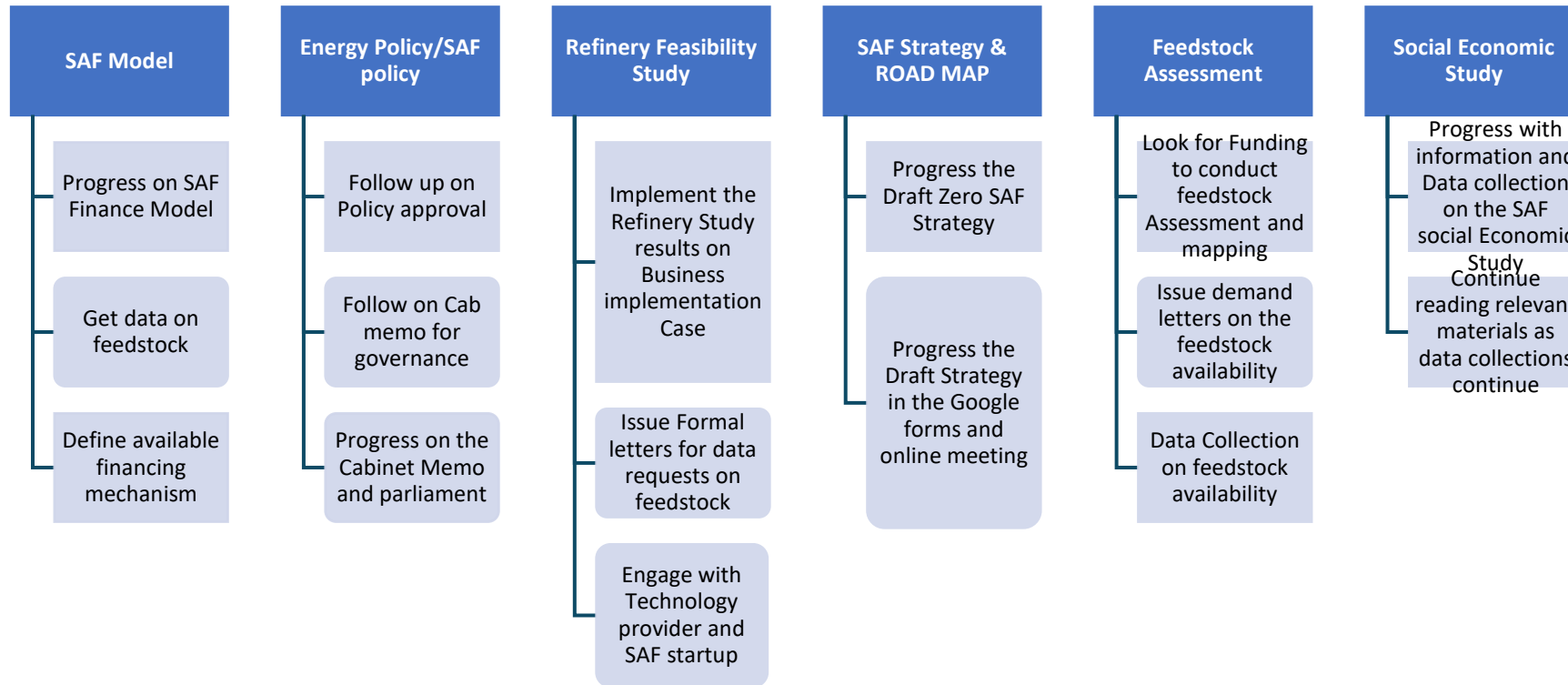
Held in Naivasha, Kenya 19 - 21 May 2025 at SOPA Lodge Resort



DIFFERENT WORKING GROUPS SHARED THEIR PROGRESS DURING THE MEETING

NEXT ACTION

Coordination through the SAF Steering Committee



KENYA



Host the next 5th SAF Workshop and High-Level Meeting in 2026

Key SAF Opportunities



POLITICAL

There is good political will to develop SAF/ESAF and Hydrogen



ECONOMIC

SAF will support the Economy in reduced Export bills and Social Economic benefits



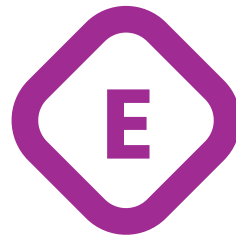
SOCIOCULTURAL

SAF will lead to socio economic benefits to farmers and local economy and support for indigenous communities



TECHNOLOGICAL

It will support Technological advancement & Knowledge transfer



ENVIRONMENTAL

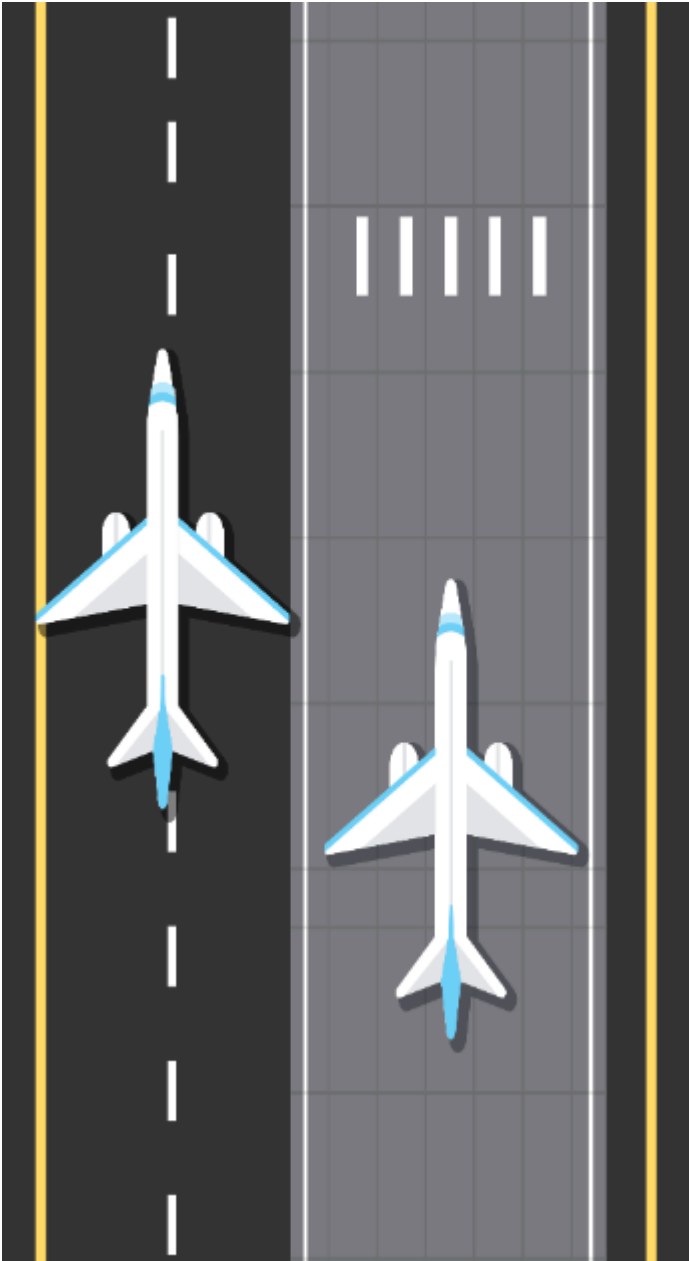
It will support the achievement of NDC and CORSIA compliance and has great potential for renewable energy



LEGAL

Will support Compliance with CORSIA and carbon credits
There is adequate legal support and an energy policy for 2025

KEY outputs/ Expected outputs



● **Old Refinery Feasibility Study and Business Implementation Report**

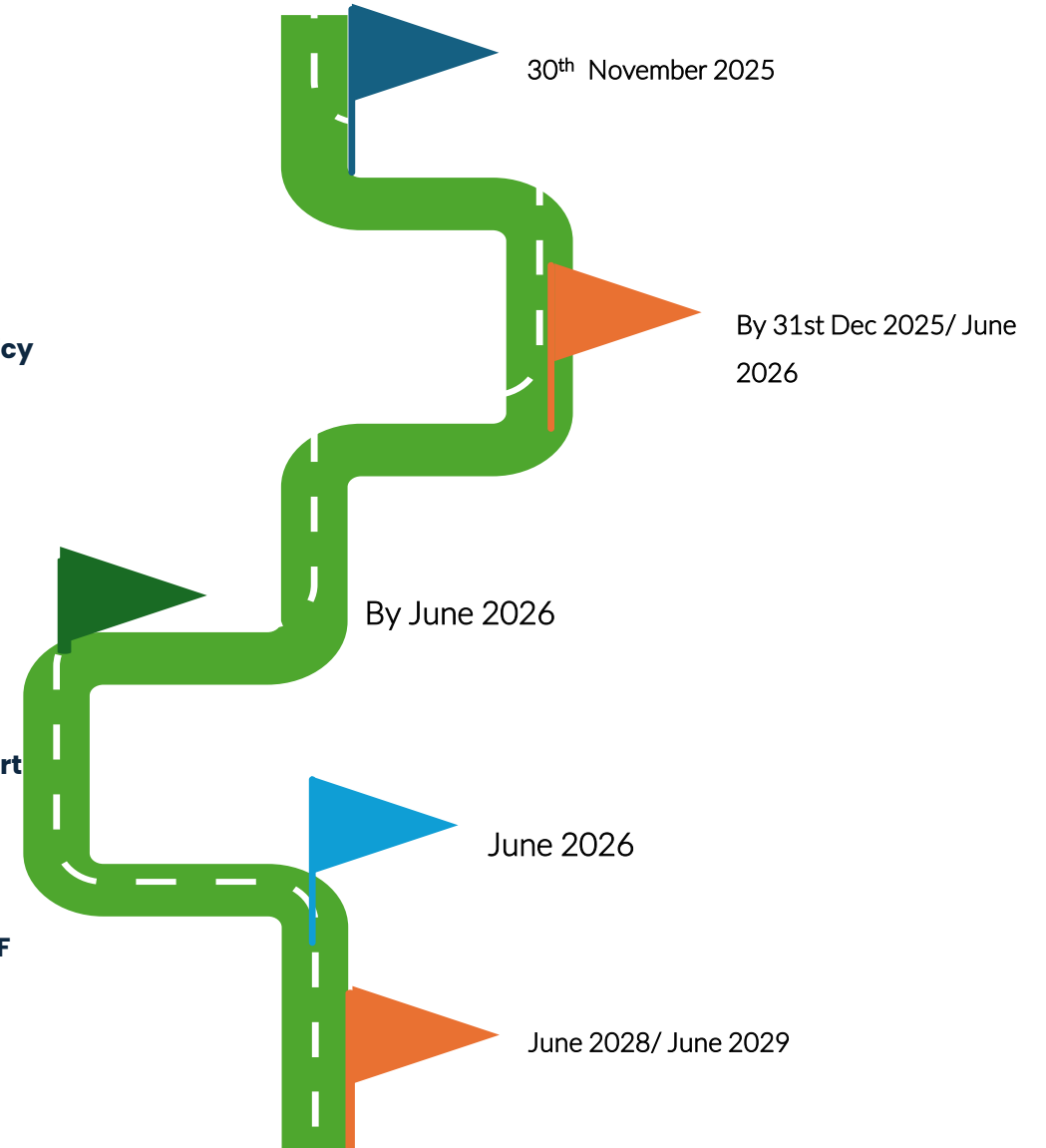
● **Approved Energy Policy 2025–2035/ SAF Policy**

● **SAF Finance Model and Strategy**

● **SAF Feedstock and Socio-economic Study report**

● **SAF Refinery (Biorefinery) with at least 10% SAF production capacity of Jet A1 uplift**

Others: Job creation, emission reduction



30th November 2025

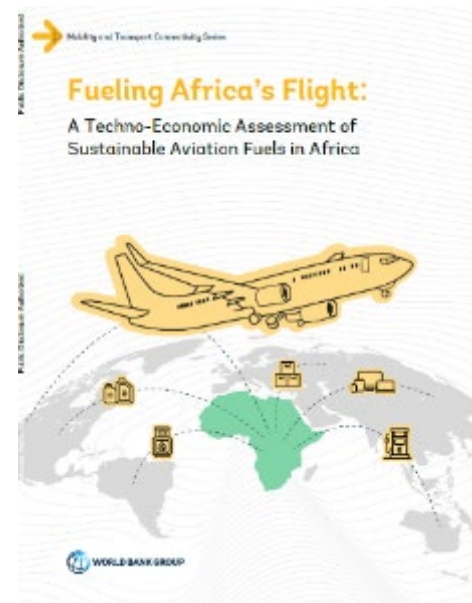
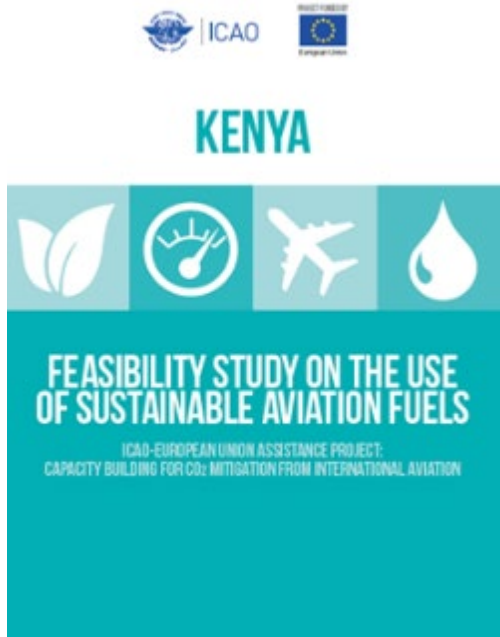
By 31st Dec 2025/ June 2026

By June 2026

June 2026

June 2028/ June 2029

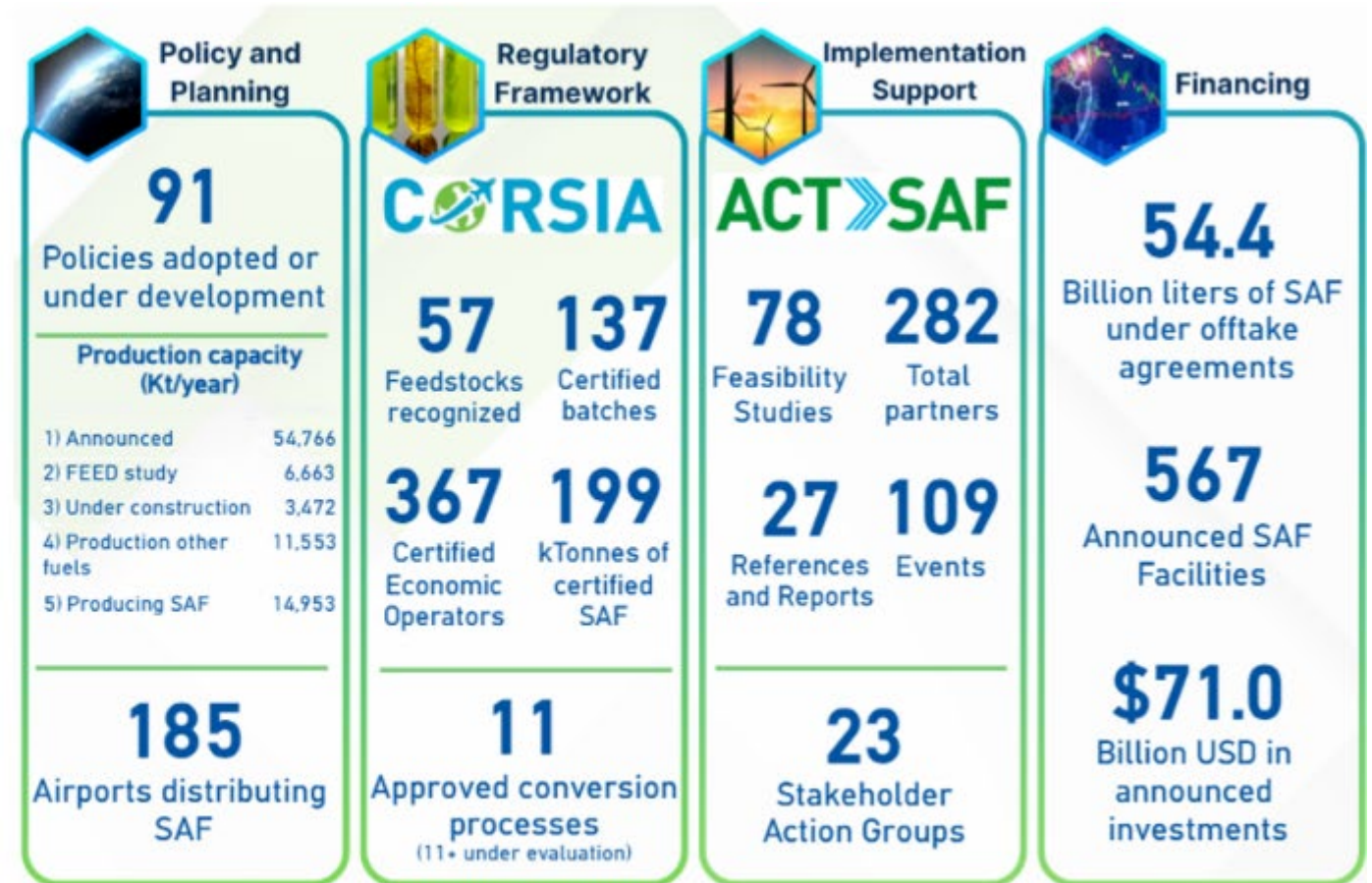
Key SAF Studies For Kenya



ICAO Cleaner Energy Tracker Tools

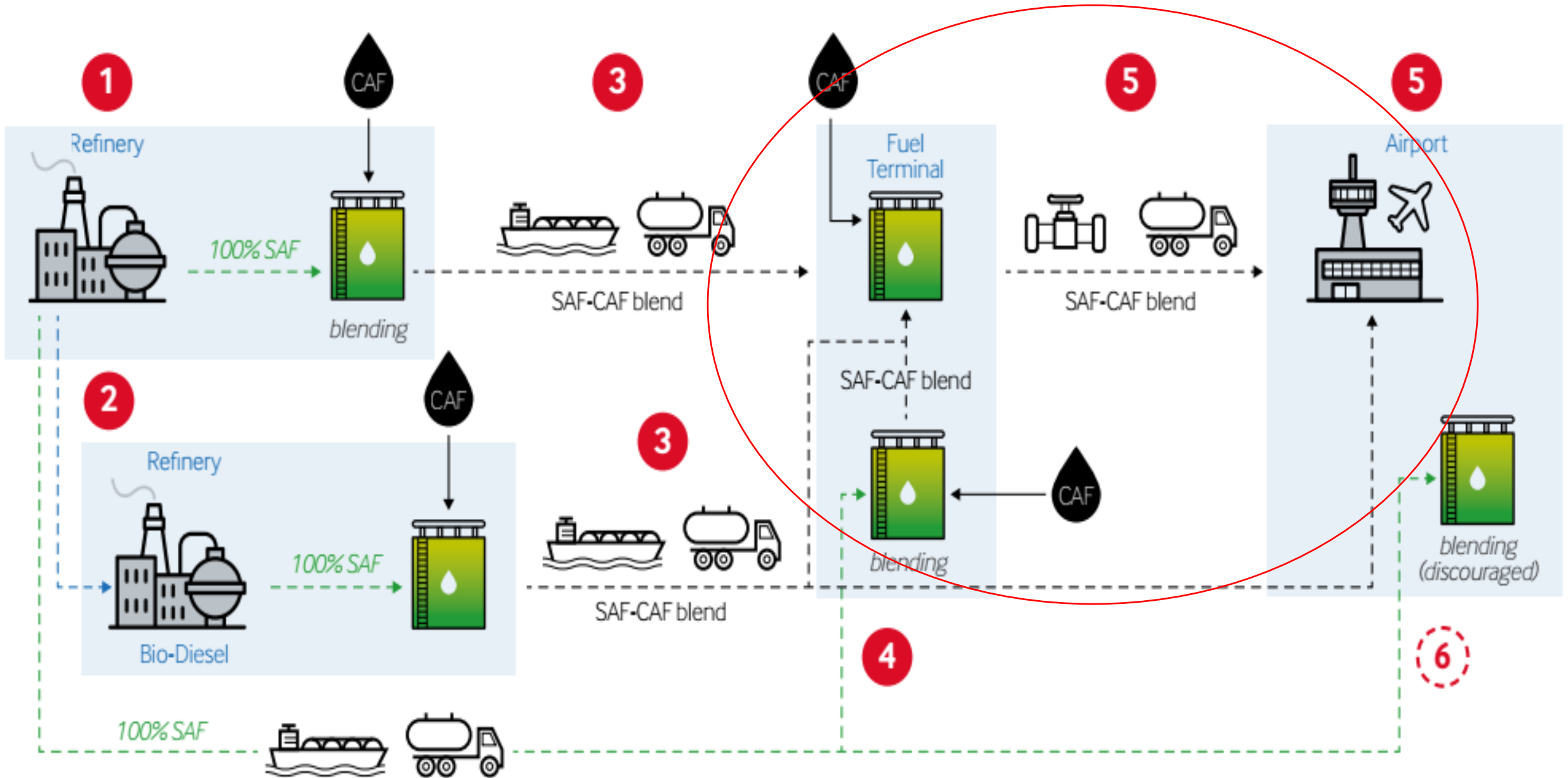
ICAO Cleaner Energy Tracker Tools

- Layout to reflect four building blocks of the Global Framework
- SAF-related indicators in airports distributing SAF, policies adopted/under development, SAF volumes/offtake agreements, approved conversion processes, etc.
- **Specific indicators on CORSIA – feedstocks, certified batches**



<https://www.icao.int/SAF>

AIRPORT SAF SUPPLY CHAIN SAF SUPPLY CHAIN PPLY CHAIN



Key roles airports play in SAF implementation

Airport authorities occupy an enviable and strategic space in advocating for the implementation and scaling of Sustainable Aviation Fuel (SAF)

1. Infrastructure Development and Storage Facilities

- Partnering with fuel suppliers to develop on-site infrastructure for SAF storage, blending, and distribution.
- Establishing logistics for SAF distribution from storage to aircraft, e.g. dedicated pipelines, refueling trucks, or blending facilities.

2. Partnerships with Airlines and Fuel Suppliers

- Working with airlines to align SAF supply with demand, establishing joint purchasing agreements and partnering with fuel producers to secure SAF supplies.

3. Incentives and Policy Advocacy

- Incentives such as landing fee reduction for airlines using SAF, this makes it financially attractive for airlines to opt for SAF.
- Collaboration with government agencies and industry bodies to support policies favoring SAF e.g. subsidies and grants

4. Environmental Impact Tracking and Reporting

- Tracking and report on their carbon emissions, including those from flights using SAF.

5. Awareness and Stakeholder Engagement

- Conveners of stakeholders to discuss SAF innovations, challenges, and best practices.
- Educating passengers on the role of SAF in reducing aviation's carbon footprint, enhancing public support.

AIRPORT CARBON ACCREDITATION LEVELS

Figure 1 Airport Carbon Accreditation Levels and Requirements

NetZero



- Achieve and Maintain 90% Reductions for Scope 1 & 2 emissions
- Roadmap to Net Zero for Scope 3 Emissions
- Carbon Offset Removals of Residual Emissions

Transition



- Level 4 Requirements
- Carbon Offset Reductions or Removals of Residual Emissions

Transformation



- Level 3 Requirements
- Absolute Emission Reductions
- Driving Third-Parties' Emission Reductions

Neutrality



- Level 3 Requirements
- Carbon Offset Reductions or Removals of Residual Emissions

Optimisation



- Level 2 Requirements
- Select Scope 3 in GHG Inventory
- Engagement of Third-Parties

Reduction



- Level 1 Requirements
- Emission Reduction Target
- Carbon Management Plan

Mapping



- GHG Inventory (Scope 1 & 2)
- Carbon Policy

KENYAN PERSPECTIVE



The existing jet fuel depot currently provides a total storage capacity of approximately 52,000 tons. Jet fuel is stored in purpose-built tanks comprising three large tanks of 12,000 m³ each and two smaller tanks of 8,000 m³ each



According to the new JKIA master plan, The capacity of the existing firefighting system shall be validated during the design to ensure that enough water storage, water flow, and foam discharge are available to extinguish and fire event and cool the tanks



A leak detection system, known as tightness monitoring system (TMS), will be provided to monitor any leakage.



The current configuration comprises eight electrically driven pumps and two diesel-driven standby pumps, each rated at 280 m³/hr. Thus, the total available pumping capacity is 2,240 m³/hr



The motorized valves will house pressure and temperature transmitter instrumentation for leak detection.



Dispenser vehicles shall be provided for fuelling operations on the aprons.



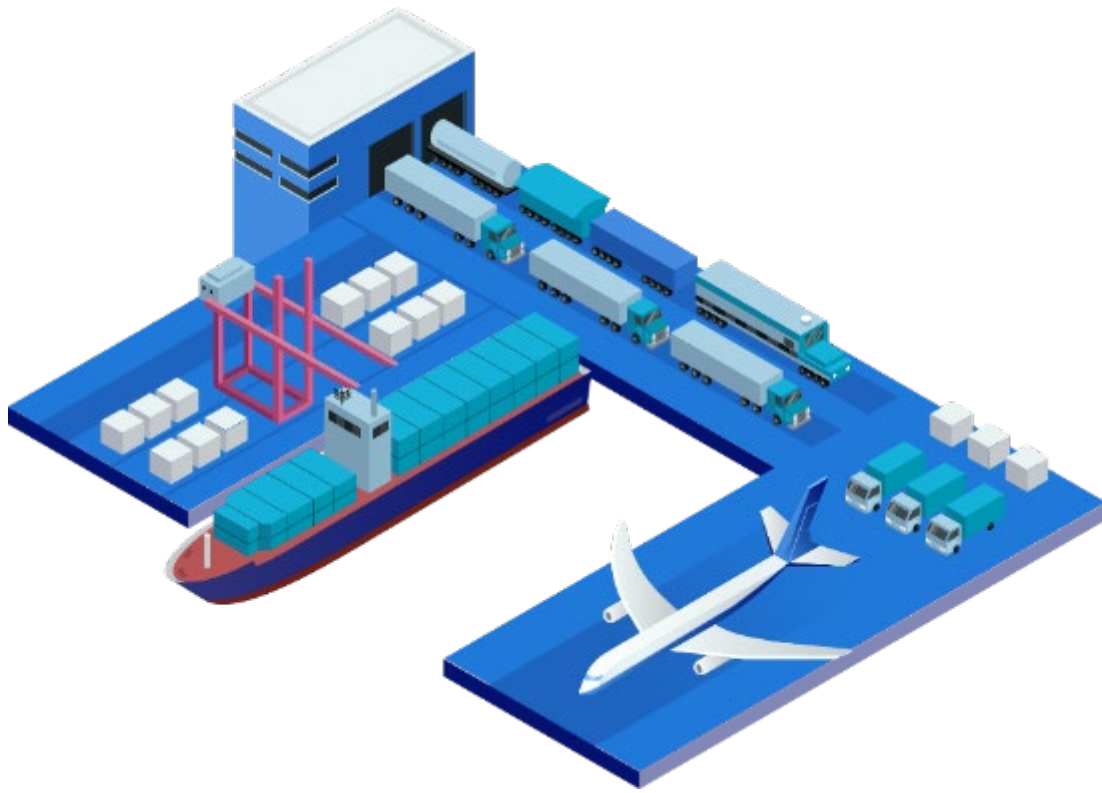
Filter/water separators are already installed at the discharge of each hydrant pump.



All aircraft stands will be supplied with emergency shutdown (ESD) buttons.

Benefits & Opportunities

- 1 Environmental benefits in terms of GHG reductions
- 2 Job creation and rural development through feedstock supply chains and in the refinery
- 3 Reducing reliance on fossil fuel imports and improve energy security
- 4 Potentially stimulating economic growth through SAF exports
- 5 First mover advantage in Africa and positioning Kenya as a regional SAF hub in East Africa.
Growing global and regional demand for SAF
- 6 Access to international climate finance and carbon markets
- 7 Skills development and knowledge transfer in refinery operations, logistics, and certification
- 8 Potential co-benefits: waste management, soil improvement, circular economy
- 9 Serve both biodiesel and SAF market keeping production flexibility
- 10 Finding potential partner(s) contributing to project financing



Area of collaborations & Support Needed

The following are the Key areas for collaboration:

- **Development of SAF Roadmap** in Kenya for regional and global markets
- **Technology improvement** through Innovation, research and development in collaboration with **Local Universities**
- **Capacity building** through technical training and Knowledge transfer.
- **Development of SAF Refinery** in Kenya
- Promote Gender equality in SAF and energy transition through partnership.
- Joint Inspection and certification of SAF
- **Potential Funding opportunities to progress this work from different institutions and international partners.**

With **coordinated actions to build a SAF supply chain, clear policies**, and sustained commitment, **Kenya has the potential to become a regional leader in SAF production**, driving both economic growth and climate progress.

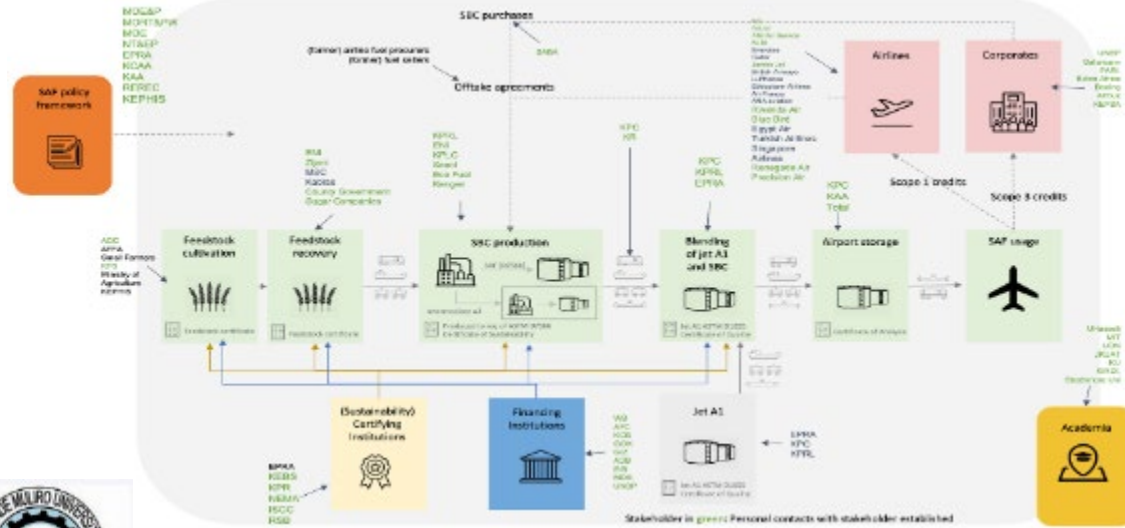
SAF STAKEHOLDER MAPPING



Project Funded by the EU



Fahari Innovation Hub
Pushing Boundaries



MIT LABORATORY FOR AVIATION AND THE ENVIRONMENT



Action: Stakeholder mapping and collaboration is Key for SAF Implementation



**Thank you for your
attention!**

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&

naomi.gitau@kaa.go.ke



Filtration Updates & Most Common Weaknesses

Ibon Ibarrola-Armendariz, JIG Technical Manager
JIG Managers Workshop, Nairobi – April 2026

Note: The procedures and practices presented in this document are best practice recommendations only. JOINT INSPECTION GROUP Ltd and/or the JIG Member presenting this document makes no claim or warranty whatsoever as to their completeness or suitability. JOINT INSPECTION GROUP Ltd and its Members shall have no liability to third parties in relation to following, or not following the recommendations contained herein.





01

Filter Monitors Phase Out

Relevance of data from JIG Inspections

02

Filter Qualification and References

Different EI Specifications and how Qualification works

03

JIG Filtration Updates

Latest JIG Bulletins related to Filtration

04

Filtration Working Group Activities

FWG Activities Overview

05

Most Common Filtration Weaknesses

Review of common findings from JIG Inspections (filtration)

06

Conclusions

Summary of all items and conclusions





Did you know that JIG/A4A/IATA did a worldwide "Filtration Survey" in 2025 to gather relevant information about filtration?

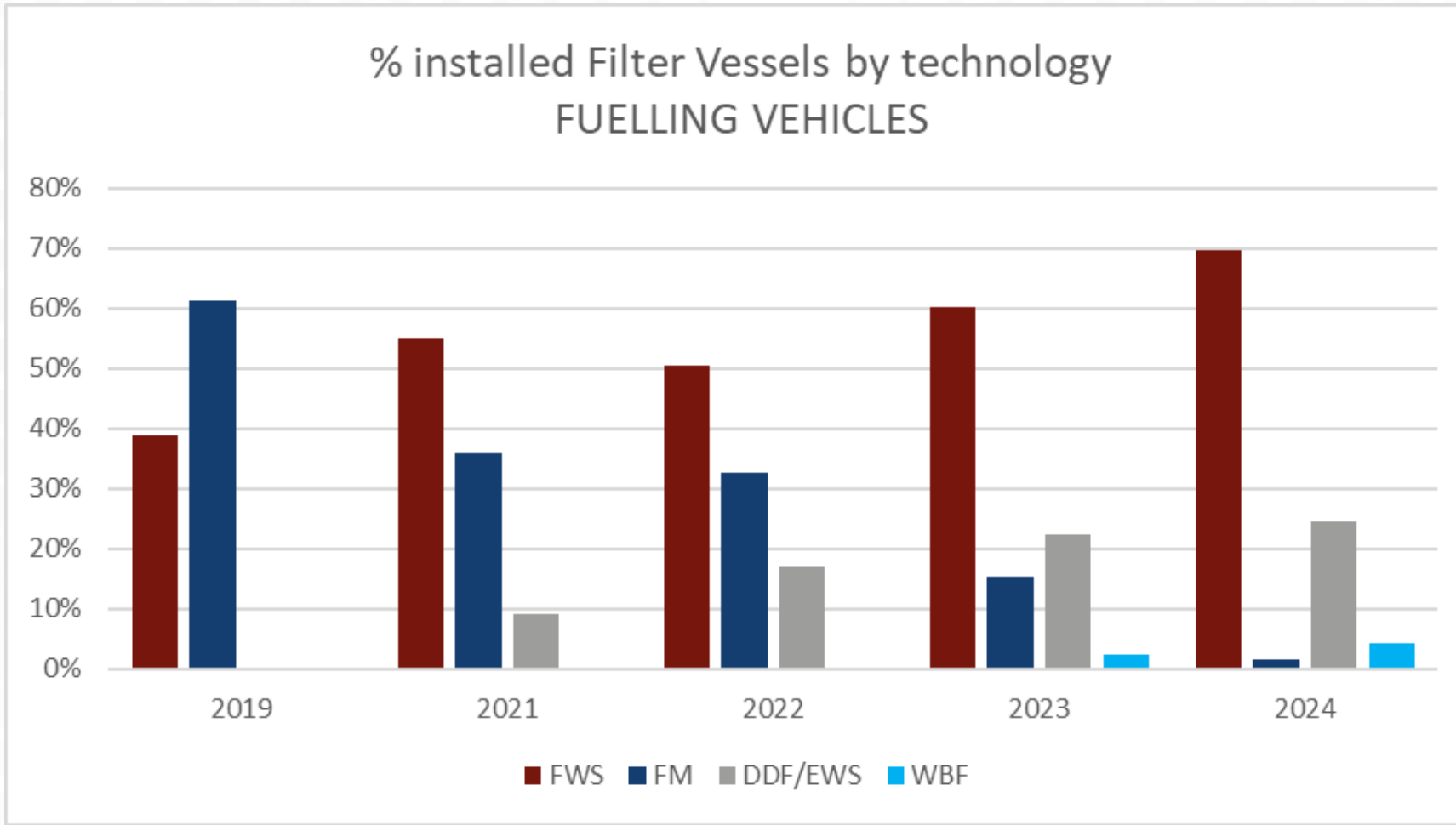


From your operational experience following JIG Standards, in which areas do you need further help or guidance?

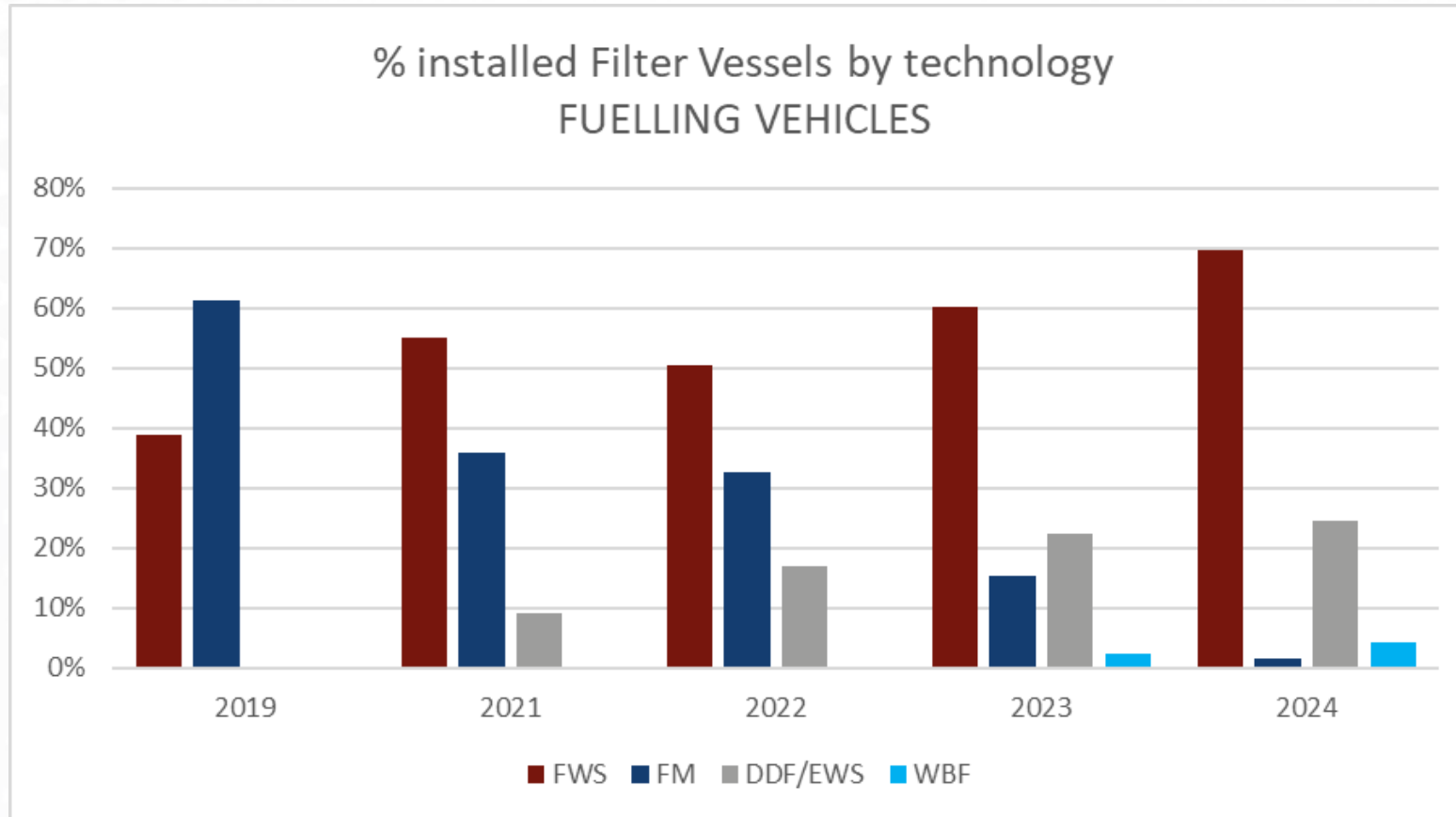
Filter monitor Phase Out



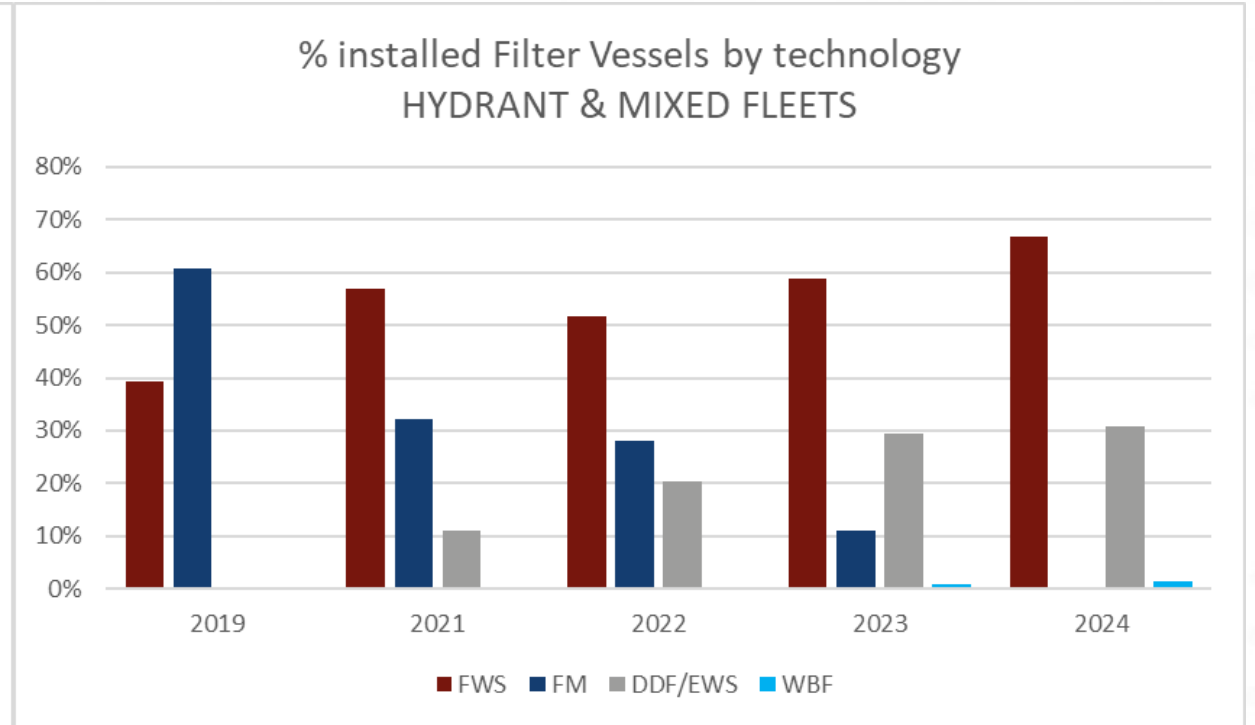
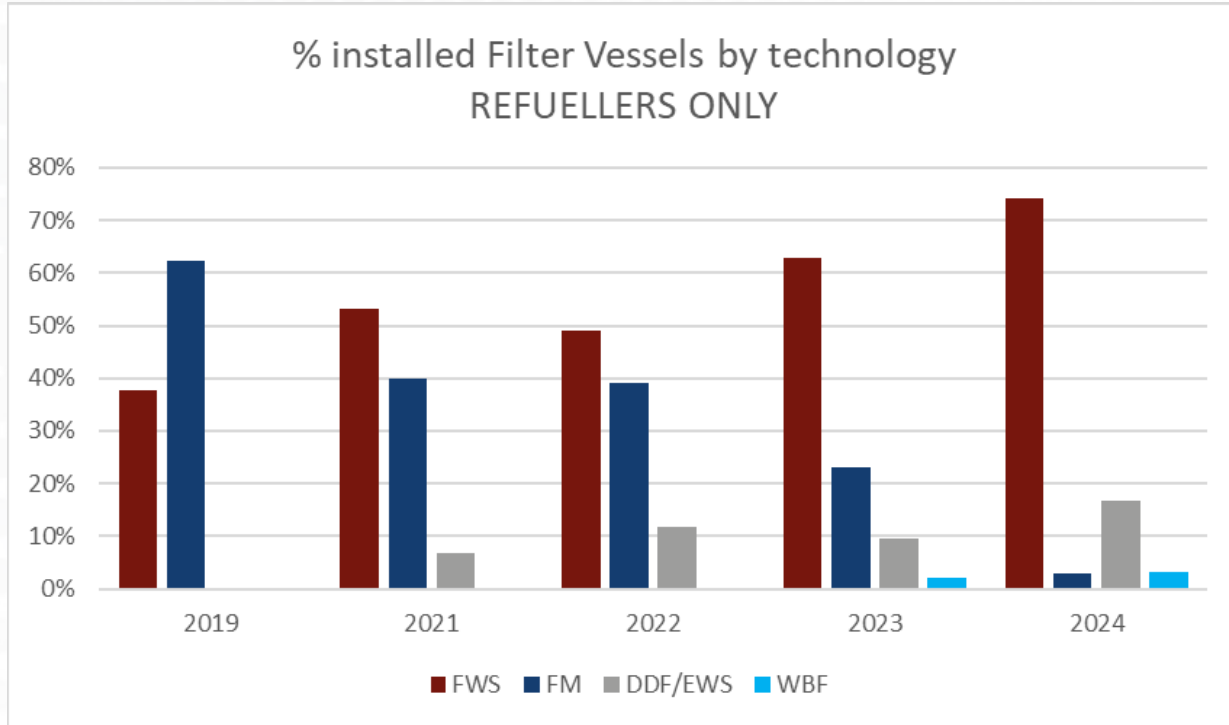
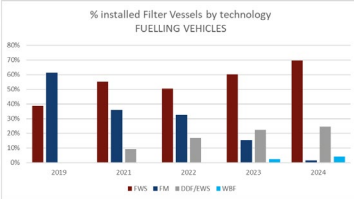
Data collected from Inspections (2024)



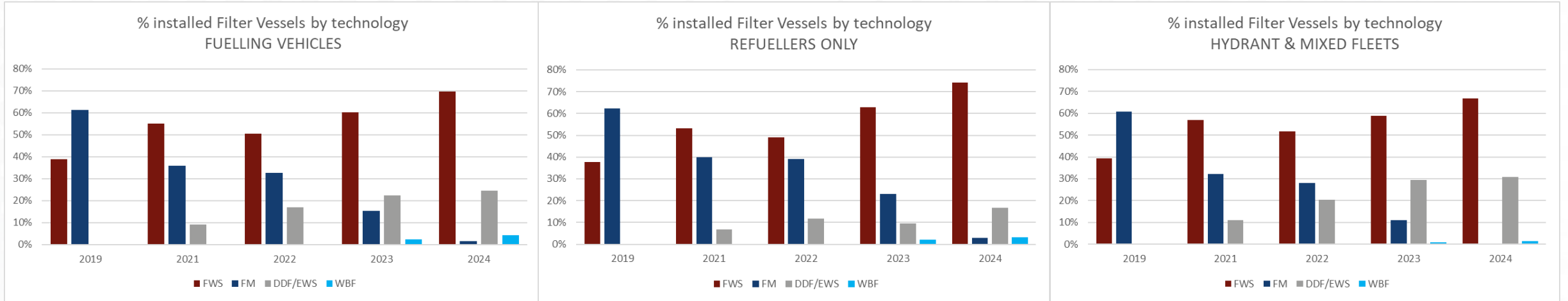
Data collected from Inspections (2024)



Data collected from Inspections (2024)



Data collected from Inspections (2024)



ACTIVE INSPECTIONS' SCHEDULE METRICS

Total view Quarter view

Distributed / Unscheduled

ALL	JIG 1/2	SD	JIG4
7%	6%	9%	6%

Scheduled

ALL	JIG 1/2	SD	JIG4
2%	3%	2%	1%

Inspected

ALL	JIG 1/2	SD	JIG4
2%	2%	2%	2%

Submitted

ALL	JIG 1/2	SD	JIG4
89%	89%	86%	91%

SUBMITTED REPORTS STATISTICS

This Year Previous Year

ALL JIG1/2 SD JIG4

AVG time for report submissions

16 days

AVG number of recommendations per report

13.6

Checklist sections with most recommendations



Most frequent Causes Identified



REGISTERED ENTITIES

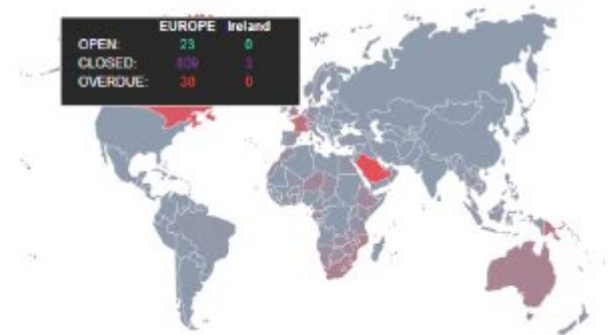
+ Number of Site Managers:	869
+ Number of Area Managers:	113
+ Number of Company Admins:	184
+ Number of Company Coordinators:	82
+ Number of JIG Inspectors:	133
+ Number of SD locations:	98
+ Number of Airport locations:	600
+ Number of JIG 4 locations:	167
+ Number of JVs-Throughput locations:	214
+ Number of Solus locations:	484

ALL TIME RECOMMENDATIONS MAP

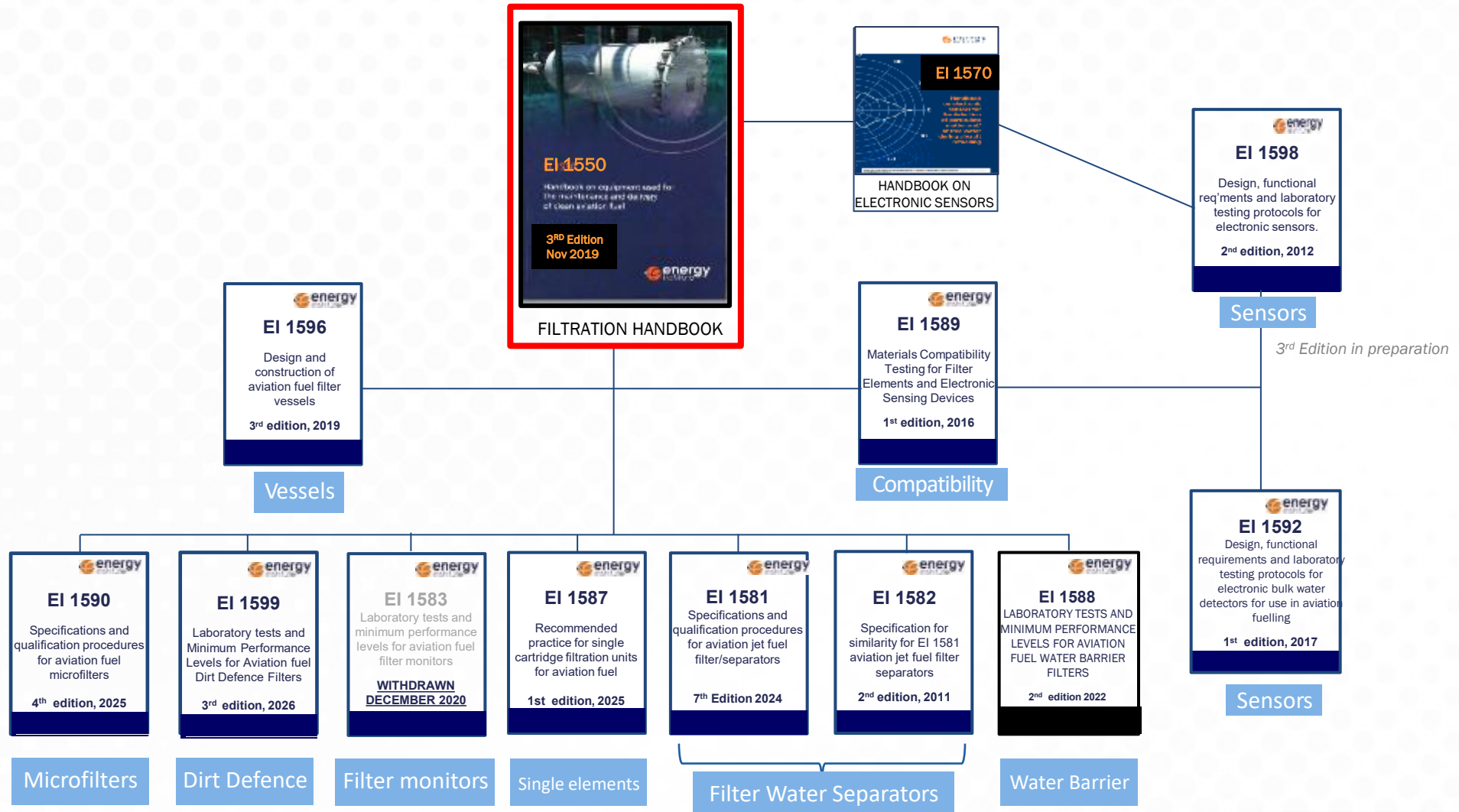
HP ND

+ -

	EUROPE	Ireland
OPEN:	23	0
CLOSED:	609	1
OVERDUE:	30	0



Aviation Fuel Filtration



From qualification to field application



QUALIFIED

Robustness (EI Process)

- Additional testing for new technologies (2 phases)

Field Evaluation

- Users should evaluate the field performance of a newly qualified filtration system
- This should be controlled under MOC





Please identify which of the following are JIG Bulletins related to "Filtration"?



JIG Filtration Updates - Bulletins



OPERATIONS BULLETIN

www.jig.org



BULLETIN NO. 160 UPDATES ON JIG FILTRATION REQUIREMENTS 17 October 2025

This Bulletin is intended for all sites Operating to **JIG Standards** with updates on **JIG Filtration requirements**.

JIG Standards adopted DDF (Dirt Defence Filtration) and EWS (Electronic Water Sensor) technology in 2020 with JIG Bulletin 130. In addition, JIG adopted WBF (Water Barrier Filtration) in 2023 with JIG Bulletin 147. Since then, both technologies have been in use by into-plane service providers and aviation fuel suppliers around the globe, generating operational knowledge and experience.

With the aim of understanding how these recently introduced technologies are performing in the field, in different environments, JIG recently launched a survey to gather information about these technologies, as well as FWS (Filter Water Separator), in collaboration with IATA and AEA.

Furthermore, JIG is committed to improve Sustainability in our industry, and we are now on a journey to introduce operational efficiencies, and waste reduction, always prioritising aviation safety, so that all aircraft fuelled by Operators following JIG Standards can receive "on-specification" fuel on board.

The JIG Filtration Working Group analysed the operational data provided by the Filtration Survey, with 163 organisations responding to it, representing a total of 2,540 selling vehicles in Asia-Pacific, Middle East, Africa, Europe and Central & South America. The Working Group has approved the proposed changes to update JIG Filtration requirements as detailed in this Bulletin.

The changes introduced in this Bulletin are based on extensive testing performed at various locations and environments worldwide, specifically designed to ensure accurate data collection. End users shall ensure that the adoption of these changes are managed appropriately.

CHANGES TO THE STANDARDS

1. Water Barrier Filtration

JIG Filtration Survey data confirmed that all 6-monthly inspections performed on WBF elements by users, were consistent on reporting no issues when opening the vessels and with the structural integrity of the elements. In addition, the Aviation Fuel Industry has worked closely with the OEM monitoring their manufacturing process and final elements quality controls, which results in the following changes:

WBF Service Life: WBF elements have a maximum service life of 12 months, and the procedure detailed in Bulletin 147, Appendix 4 – Procedure for WBF 6 monthly Inspection is now withdrawn from JIG Standards.

Note that when installing new elements JIG Bulletin 155 (soaking protocol) shall continue to be followed until further notice.



Page 1 of 3

OPERATIONS BULLETIN

www.jig.org



BULLETIN NO. 162 Reduction in Scope for Mandatory Requirements for Soak Testing of Water Barrier Filter Elements 27 February 2026

THIS BULLETIN PROVIDES AN UPDATE ON THE ADDITIONAL TESTING REQUIREMENTS FOR WATER BARRIER FILTERS (WBF) WHICH WERE PREVIOUSLY COMMUNICATED IN JIG BULLETIN 155. APPLICABLE TO ALL JIG MEMBERS USING WATER BARRIER FILTRATION

BACKGROUND:

JIG Bulletin 155 (issued December 2024) addressed a manufacturing defect with Water Barrier Filter (WBF) elements, including CDFX models. The Bulletin required mandatory actions, including quarantine protocols, restrictions on all Water Barrier elements, and implementation of a soak test procedure prior to installation and use. These measures were introduced to mitigate risks of fuel discoloration due to dye leaching from the black outer sleeve.

The manufacturer has since provided formal feedback, including a root cause analysis, confirming resolution of the issue for all WBF elements manufactured from 1st January 2025.

This JIG Bulletin supersedes Bulletin 155, and the additional soak testing protocol (from Bulletin 155) has been included as Appendix 1 of this Bulletin.

UPDATE TO SOAK TESTING REQUIREMENTS FOR OPERATIONS WITH WATER BARRIER FILTERS

All organisations operating to JIG Standards using Water Barrier Filter elements may remove the additional soak testing mitigations for all WBF elements manufactured from 1st January 2025.

- For WBF elements manufactured from 1st January 2025, the additional soak testing protocol (see Appendix 1) shall continue to be applied.
- For WBF elements manufactured from 1st January 2025, the additional soak testing protocol is no longer mandatory.
 - Where the additional soak testing protocol is not required (WBF elements manufactured from 1st January 2025), these elements may be used in Avgas applications.

MONITORING OF ISSUES WITH FILTRATION

Operators should share with JIG any incident, performance concern or other issue they have with filtration (any type). This helps JIG to work with the OEMs and other industry bodies to identify root causes, so mitigation actions are defined and implemented promptly. JIG shall manage information confidentially, and the JIG Team shall anonymise organisation name/site before sharing with JIG Filtration Working Group and manufacturer (unless JIG receives a different instruction from the organisation).

Notification email: filtration@jig.org



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Water Barrier Filtration

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Dirt Defence Filtration with Electronic Water Sensor

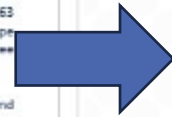
DDF Service Life: DDF elements when used in conjunction with EWS have a **maximum service life of 7 years** and shall be subject to annual inspection.

EWS "Check Level": Check Level Activation becomes **"optional"** and not mandatory in JIG Standards. (JIG 1, 3.1.5.1 c) and (JIG 2, 3.4.3.1 c).

EWS Data Review: Monthly EWS data review **is not mandatory** in JIG Standards (JIG 1, A6.1.5).

Note: Obligation to investigate Alarm Level activation remains.

B160



BULLETIN NO. 162 Reduction in Scope for Mandatory Requirements for Soak Testing of Water Barrier Filter Elements 27 February 2026

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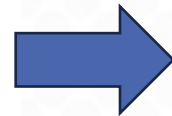
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Notification email: filtration@jig.org

Endorsed by IATA Technical Fuel Group

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B162

B155 Soak Test Protocol for WBF (Dec. 2024)

Withdrawn of the Soak Test Protocol to all WBF WBF Elements manufactured from 1 January 2025: Do NOT need to follow the B155 soak test protocol.

Use in Avgas: All WBF can be use in Avgas Service.

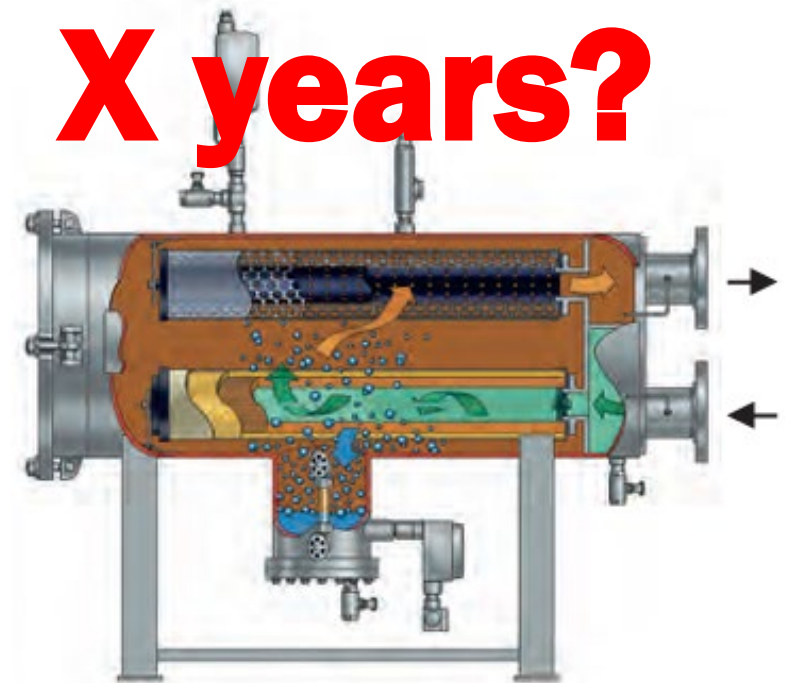


Filter Elements Service Life

WBF
24 months?



Coalescer
X years?



JIG Inspection Checklist & Filtration

JIG Inspection Checklist:

- (ADHIP) **390**
- (ADH) **306**
- (ITP) **268**

Filtration Questions:

- (ADHIP) **52**
- (ADH) **40**
- (ITP) **52**



13.3%

13.1%

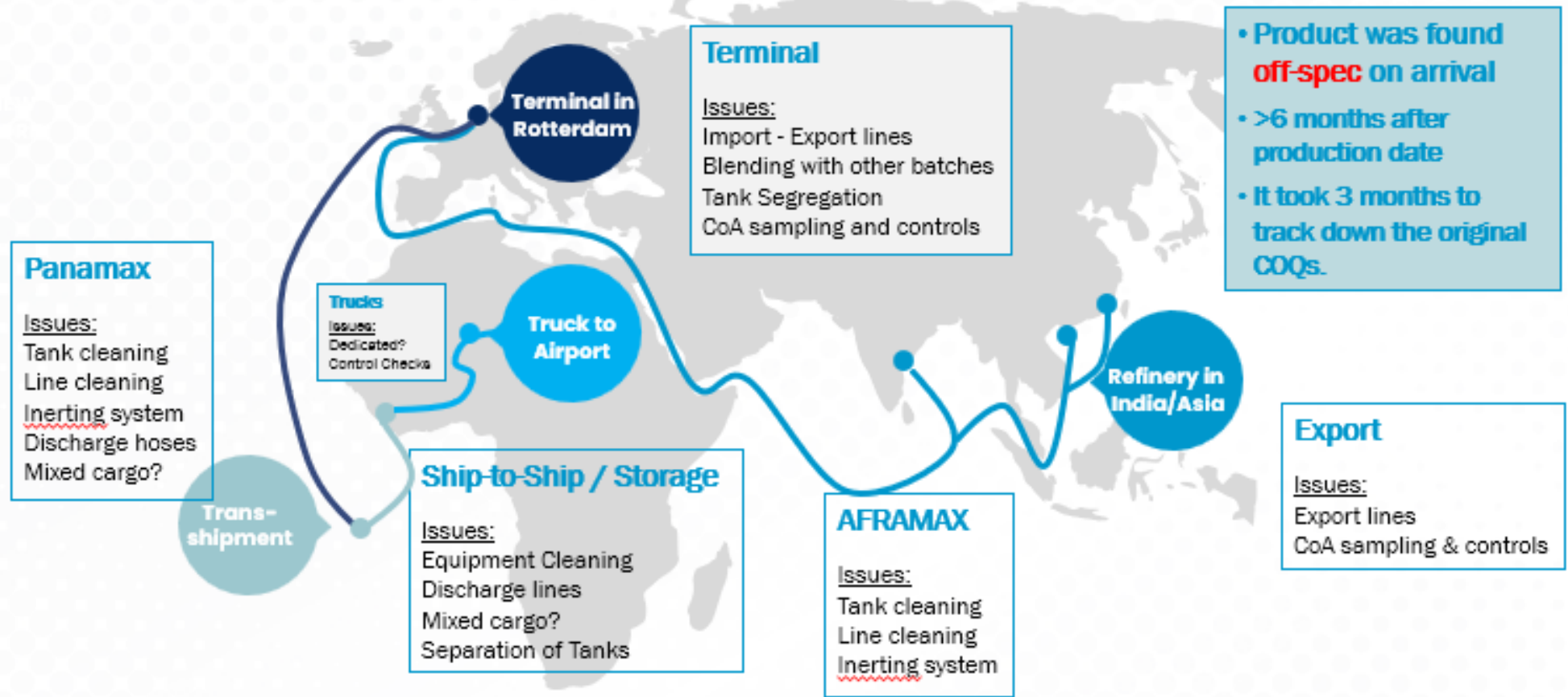
19.4%



Why we have so many filtration questions?



A Jet Fuel journey from Refinery to West Africa



Filtration most common weaknesses

E1: FILTRATION AND SENSING EQUIPMENT		
At least one filter vessel shall be drained under pressure. An external filter inspection shall be carried out before at least one filter is opened for internal inspection. Additionally, a filter membrane test shall be witnessed downstream of a filter vessel.		
	General/external inspection	Reference
E1	Do filter vessels manufactured after 2013 have a plate indicating they meet the requirements of EI 1596? For older vessels, has the design been reviewed against the requirements of EI 1596 and found suitable for its intended service?	3.1.4.1 (JIG1) 3.4.2 (JIG2) A5.1
E2	Are filter vessels in good condition with no excessive corrosion and paint satisfactory?	
E3	Do filter water separator vessel and element combinations meet the latest edition?	3.1.4 (JIG1) 3.4.2 (JIG2)
E4	Do water barrier filters meet the requirements of EI 1583 latest edition and is there a phase out plan in place to complete by no later than 1 st June 2023?	3.1.4 (JIG1) 3.4.2 (JIG2)
E5	Do water barrier filters meet the requirements of EI 1588, latest edition?	3.1.4 (JIG1)
E6	Do microfilters meet the requirements of EI 1590, latest edition?	3.1.4 (JIG1) 3.4.2 (JIG2)
E7	Do dirt defence filters meet the requirements of EI 1599 latest edition? Are DDF used in conjunction with a suitable EWS fitted downstream of the equipment and fueller loading gantries? Are they operated in accordance with JIG standards and actions/instructions carried out where required e.g., after Check or Alarms?	Bulletin 130 3.1.4.1 3.4.2 & 3.4.3 (JIG 2)
E8	Do EWS conform to the requirements of EI 1598 latest edition and accepted in JIG standards? Do they utilise the latest firm version required by the sensor manufacturer?	Bulletin 110 Bulletin 130 3.1.5.1(e)
E9	Are the required plates, a minimum of two, attached to each vessel stating that they meet the above standards and giving the correct designation, type and number of the elements installed?	3.1.4.1 (JIG 1) 3.4.1 (JIG 2) A5.1
E10	Is the maximum achievable flow rate marked on the body of each vessel or suitable area close to the vessel, and is it less than the rated flow for the vessel?	3.1.4.1 (JIG1) 3.4.1 (JIG2)
E11	Does the filter operate within the required flowrate range? Is the vessel de-rated (for relevant filtration types) where it is routinely operated at less than 50% of its rated flow? For filters fed by a common manifold, are flow control measures in place to prevent excessive flow through the filter?	3.1.4.1 (JIG1) 3.4.1 (JIG2)
E12	Are dates of inspection and element changes displayed on the body of the vessels (or suitable area close to the vessel)?	A5.1
E13	Are filter elements stored and used in accordance with manufacturers requirements?	A5.1
E14	Are controls in place to ensure effective segregation of stocks of DDF elements from existing filter monitor element stocks (where filter monitors are still in use)? Are appropriate controls in place to ensure DDF elements are not	Bulletin 130 3.1.4.2(d)



Filtration most common weaknesses (2)

1 - Filter Vessel and Operational Data Plates

Vessel Data Plate and Operational Data Plate (and a vessel conversion plate)

JIG 1 3.1.4.1

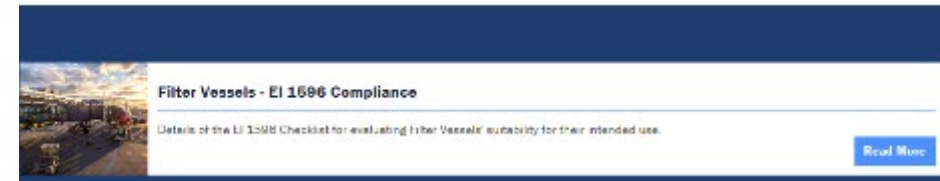
All filter vessels put into service since 2013 shall meet the requirements of the then current edition of EI 1596. New vessels shall be procured to the latest edition of EI 1596. For filter vessels manufactured before 2013 a **documented review of the filter design shall be conducted against the requirements of EI 1596** to confirm that it remains suitable for its intended service or establish if it requires upgrading.



Filtration, to remove free water from jet fuel, is an important part of the jet fuel handling process to ensure that fuel is delivered on specification.

This section contains several related pages, with accessible links available below, giving further details on work undertaken by JIG Committees and guidance on specific topics within the area of Filtration.

If you have any questions about how to interpret or apply the Filtration sections in the JIG Standards, you can write to filtration@jig.org



Filtration most common weaknesses (2)

2 – Filter Inspection

Elements Torque (Tested OK, wrench in units to be set, displayed in plates, etc.)

The electrical continuity between all metallic components and a reference point

Appropriate blanks/dummies with the right torque

Elements to close to each other or to the vessel

Filter flowrates (maximum achievable flow rate vs rated flow rate)

Elements with MBG and not appropriate remediation actions (TID#1 for guidance)

Seals and gaskets – JIB Bulletin 158 (PV gasket issues)

Special conditions – JIG B155 (soak test to WBF before installation)



Filtration most common weaknesses (3)

3 – dp monitoring and weekly dp graph



dp gauge in good condition and functioning properly

Differential pressure for aviation fuel filters (EI): <https://youtu.be/zONVKXbmV70>

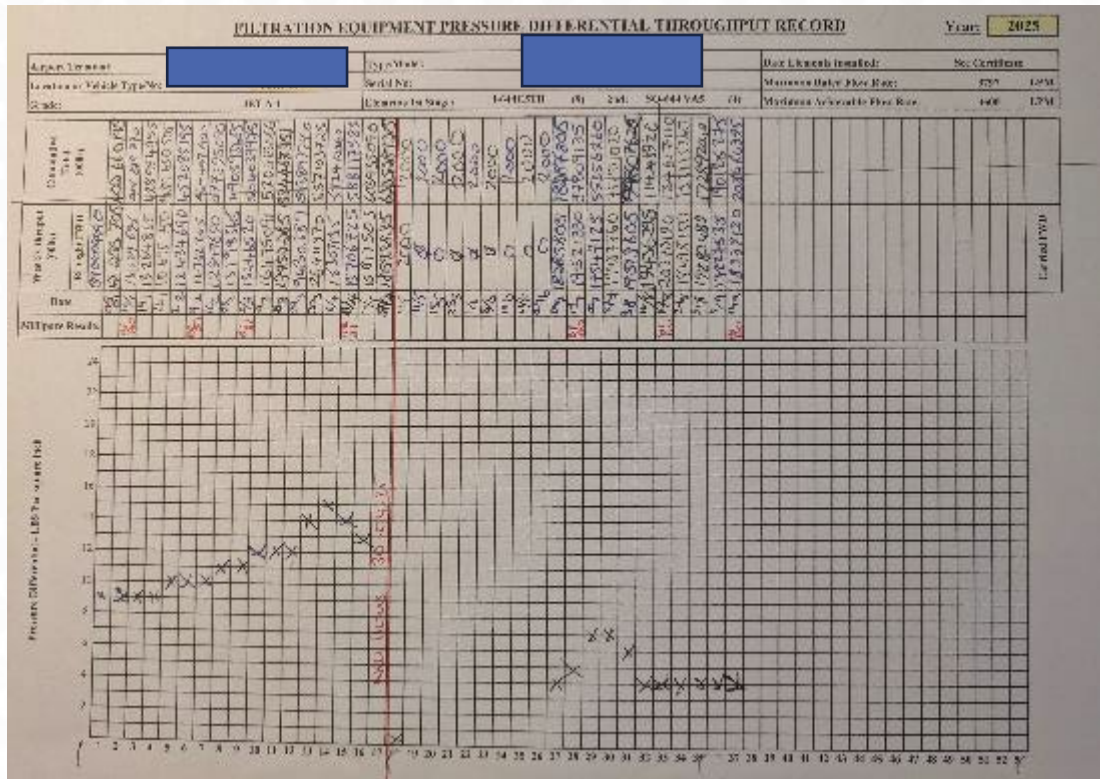
When to check the dp? And how to do it?



Filtration most common weaknesses (4)

3 – dp monitoring and weekly dp graph

Records to that helps us to identify potential issues... (one option to measure/record)



Differential Pressure Calculator

Calculate Differential Pressure

Applied Pressure 1 (psi) (AP1):

Applied Pressure 2 (psi) (AP2):

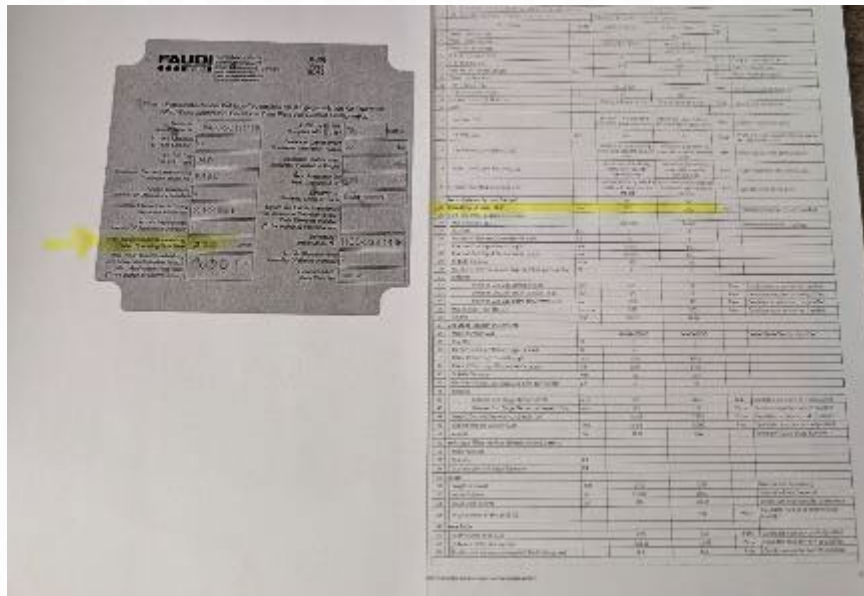


Filtration most common weaknesses (5)

4 – Similarity Certificates (EI 1582)

JIG 1 3.1.4.1 (J2, J4)

All filter water separators shall have similarity certificates in accordance with EI 1582 to confirm that the vessel and element combination comply with the mechanical and performance requirements of EI 1581 latest edition.



2	EI 1582 2nd edition Similarity Sheet Reference Number/ID Code:		Insert ID here			
3	1581 Qualification Report Number:	Insert report number here	Prepared for	Insert customer name here		
4	Parameter	Select Units	Qualified Vessel	Candidate Vessel	Pass/Fail	Notes
5	Vessel Manufacturer					
6	Vessel Model Number					
7	Vessel Serial Number					
8	EI 1581 Category (2.6)				Fail	Category must be the same
9	EI 1581 Type (2.6)				Fail	Type must be the same or Qualified = S
10	Number of Element Stages	EA			Fail	Stages must be the same
11	Vessel configuration					
12	Orientation (2.2a)				Fail	Orientation must be the same
13	Vessel Inside Diameter					
14	Element Layout (2.2b & 2.4)				Fail	Layout must be the same
15	Sump					
16	Location (2.2c)				Fail	Location must be the same
17	Volume (2.2c)					* Pass, but requires water defence system per 1581 5th ed. 3.2.4.5
18	Inlet Connection Position (2.2d)				Fail	Inlets must be in the same location
19	Outlet Connection Position (2.2e)				Fail	Outlet must be in the same location
20	Element mounting positions (2.2f)				Fail	Location must be the same
21	Water Defence System Present?					
22	Rated flow of vessel (2.5)				Fail	Candidate must be < or = to Qualified or when qualified is at max (9464 litres, 2500 USG) candidate must be <= 2 times
23	1st Stage (filter/coalescer element)					
24	Model Number (2.6)					Model/Series/Family = Qualified
25	Quantity	EA				
26	Number of Elements/Cartridges in Stack	EA				
27	Element/Cartridge Overall Length					
28	Element/Cartridge Effective Media Length					
29	Outside Diameter					
30	Number of filter/coalescer plugs and their part number	EA				
31	Spacing					
32	Between 1st Stage Elements (2.3a)				Fail	Candidate must be > or = to Qualified
33	Between 1st & 2nd Stage Elements (2.3c)				Fail	Candidate must be > or = to Qualified
34	Between 1st Stage Elements & Vessel (2.3e)				Fail	Candidate must be > or = to Qualified
35	Mean Linear Filtrate (2.7)				Fail	Candidate must be < or = to Qualified
36	Volume					
37	2nd Stage (separator element)					
38	Model Number (2.6)					Model/Series/Family = Qualified
39	Quantity	EA				
40	Number of Elements/Cartridges in Stack	EA				
41	Element/Cartridge Overall Length					
42	Element/Cartridge Effective Media Length					
43	Outside Diameter					
44	Number of separator plugs and their part number	EA				
45	Spacing					
46	Between 2nd Stage Elements (2.3b)				Fail	Candidate must be > or = to Qualified
47	Between 2nd Stage Elements & Vessel (2.3d)				Fail	Candidate must be > or = to Qualified
48	Length/Outside Diameter (L/D) Ratio (2.6)				Fail	Candidate must be < or = to Qualified
49	Liquid Entrance Velocity (2.8)				Fail	Candidate must be < or = to Qualified
50	Volume					Volume of all 2nd Stage Elements
51	3rd Stage (filter monitor elements in separator)					
52	Model Number					
53	Quantity	EA				
54	Quantity per 2nd Stage Separator	EA				
55	Vessel					
56	Length of Vessel					Deck plate to lid opening
57	Vessel Volume					Volume inside of the vessel
58	Vessel Void Volume					Empty space not occupied by elements
59	Positive water drainage (2.10)				Fail	Candidate must have positive water drainage
60	Area Ratio					
61	Void Volume Ratio (2.9)				Fail	Candidate must be > or = to Qualified
62	Z_{side}/A_{side} (2.9a) Side-by-side		N/A	N/A		Candidate must be < or = to Qualified
63	Z_{end}/A_{end} (2.9b) End opposed		N/A	N/A		Candidate must be < or = to Qualified

For the candidate system to meet EI 1581 by similarity, each entry is required to produce a pass in the pass/fail column. Data are not required in any cells shaded grey.

The passes above confirm that the candidate vessel meets all requirements of EI 1582 2nd edition, and therefore is qualified to EI 1581 5th edition

Name: _____ Company: _____
Signed: _____ Date: _____





5 – Electronic Water Sensor Testing

Maintenance requirements for Sensors A5.2.8

Loop Testing

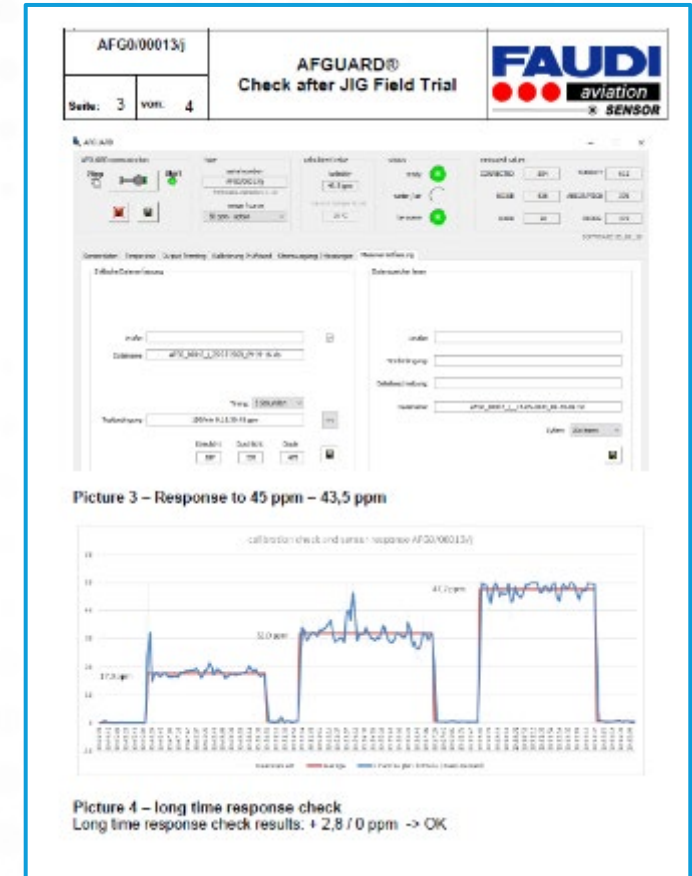
- Checks system electronics are configured correctly and operating reliably.
- Carried out every 3 months
- **During fuel circulation on the test rig or by recirculation through fuellers**
- Using testing equipment supplied by the sensor manufacturer, in accordance with the manufacturer's instructions (next slide).
- For difficult to access sensors a short cable extension can be used to allow easier connection/disconnection to the loop tester.

Link to loop test protocol record sheet by Faudi
https://www.faudi-aviation.com/fileadmin/user_upload/Loop_Test_Protocol_FAU_DI_Aviation_GmbH_Rev.03.pdf



Date	Test Protocol	FAUDI
Page: 1 of 1	Operational Qualification	aviation
AFGUARD® installation with _____		
Location: _____		
Test protocol for AFGUARD® installation with _____		
Requirements: System must be switched on, loop tester installed instead of AFGUARD®		
Pre-test (no button pressed): Function test for 4 mA base signal of AFGUARD® sensor Output: 4 mA or 0 ppm		
Test 1: Fail safe test AFGUARD® → signal output ↔ 4 mA – blue lamp off Function test for NAMUR 1 Press F1: Output: Immediate reply (LED F1 constantly on) – blue lamp should be off (no blinking)		
Test 2: Warning level → signal output representing > 15 ppm – slow blinking blue lamp Function test for warning level Press F2 for warning level (15 ppm < water level < 30 ppm) Output: LED blinking → after 10_ seconds LED constantly on – blue lamp blinking slowly		
Test 3: Alarm level → signal output representing > 30 ppm – fast blinking blue lamp Function test for alarm level Press F3 for alarm level (water level > 30 ppm) Output: LED blinking → after 10_ seconds LED constantly on		
Test 4: Water slug indication → signal output ↔ 20 mA – fast blinking blue lamp Function test for water slug indication Press F4 for water slug (water level > 50 ppm) Output: LED blinking → after 5_ seconds LED constantly on		
Test 5: AFGUARD® broken wire → no mA signal – blue lamp off Disconnect the AFGUARD® cable – blue lamp should be off (no blinking)		
Remarks: _____		
Operation Manager		Inspector
Name	Name	

FAUDI Aviation GmbH Loop Test Protocol Rev.03



Filtration most common weaknesses (or strengths?)





- Get out there with your team!
- Check how things are done
- Help them to understand the relevance of all checks we do
- Explain the impact of not doing them
- Implement an action plan to remove weaknesses!



The JIG Team Support



The JIG Team



- Engage with us with your questions (**don't miss this opportunity!**)
- Your challenges and considerations always discussed and reviewed by FWG and other JIG Committees
- Your contributions help us with the development of the JIG Standards
- We are here to help you

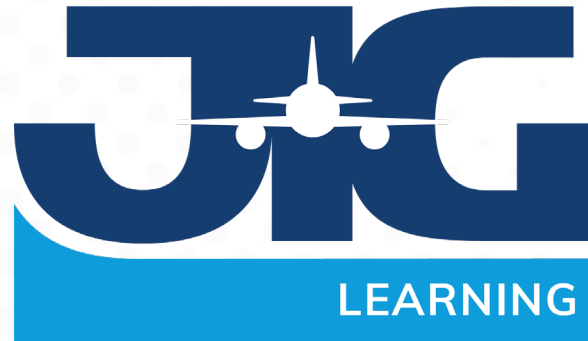




JIG Technical Team - FWG

technical@jig.org _____ filtration@jig.org





Aviation Fuelling Hoses

(Incidents related, Testing and inspection required)

Raed Youssef

JIG Managers' Workshop - Nairobi, April 2026

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Hose Incidents During Refuelling

BACKGROUND:

JIG has been made aware of four incidents in recent months involving loss of fuel containment from 4-inch hydrant intake hoses (types C and CT). The root causes of these incidents are still being investigated and field data have revealed that hoses under certain operational conditions may experience a premature fatigue. For this reason, this Bulletin is being issued to remind operators of the correct procedures and precautions when using fuelling hoses and concludes with some actions one of the hose manufacturers is taking.



REMINDER OF GOOD HOSE HANDLING PRACTICES:

Initial evidence from the investigation reveals that the hose in the above pictures shows evidence of severe kinking where it is fixed to the vehicle. This could be due to vehicle design or repeated use in a manner that created a kink in the hose and ultimately led to the failure.

Though all fuelling hoses are qualified according to the E11529 Specification that includes resistance to kinks, this does not mean that operating with a kinked or deformed hose is acceptable practice.

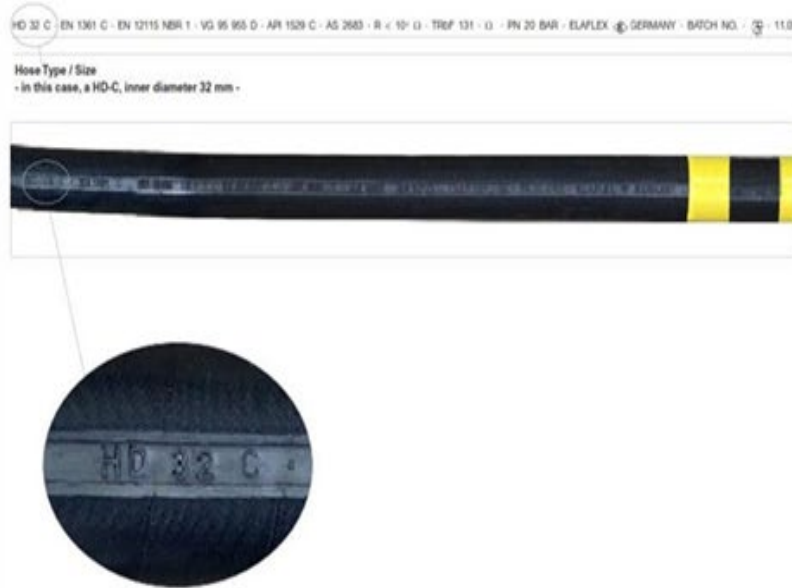
As noted throughout JIG standards, users are reminded that repeated kinking of any hose will damage the structure of the hose and may result in a loss of containment:

- JIG 1 6.6.1 (e) – “Kinking and twisting of hoses shall be avoided”
- JIG 1 A7.3 “Any of the following abnormalities noticed during daily operations or monthly or 6 monthly tests requires immediate hose replacement:
 - soft spots, kinks/deformities, bulges or blisters, excessive abrasion or cracking exposing the



Hose Identification (Example)

Hose type identification (as an example):



Hose batch-no & manufacture date identification (as an example):



Hose Accessories

Hose accessories must not trap debris (e.g., grit, sand, stones) against the hose, as this can damage the outer cover during use.

- Hose accessories must not pinch or deform the hose, and solid materials must have no sharp edges.
- Hose accessories must be easily removable and reinstallable to allow inspection without excessive force.
- Each hose accessory should be marked with 'EI 1522'. For wraps, coverings, spirals, etc. this should be repeated every 30 cm (12 in.).
- **JIG Bulletin 120** (May 2019) -EI 1522 Fuelling Hose attachments alerted Users to the potential issues with Hose Accessories



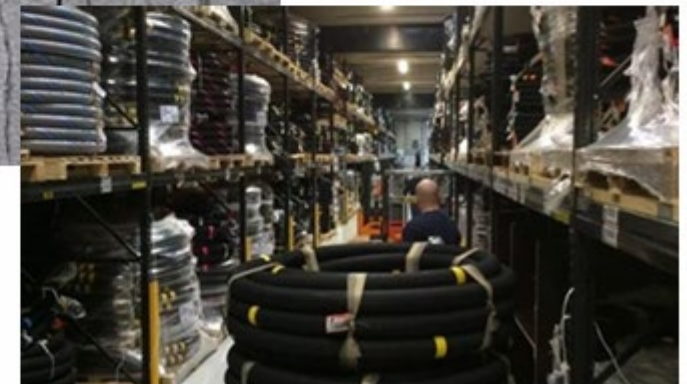
Ozone Impact on Refuelling hoses

Always close hose-ends or hose couplings with caps or plugs to protect the hose inner lining to protect couplings during storage:

- To ensure maximum life, hoses should be stored in a dry, cool, dust free, ventilated room with solid walls.
- Permissible ambient temperature range -30°C to $+30^{\circ}\text{C}$.
- Hoses should be placed on studded racks or pallets to permit free air circulation.
- Open ends must be plugged to protect the lining from ozone contaminants!
- **Reminder:** Maximum hose storage time is 2 years and maximum in service lifetime is 10 years! Both timelines are from its date of manufacture



O₃



How to proceed with refuelling hoses showing ozone cracks?

Bend the hose and if you can see any signs of the first inner layer (e.g. reinforcement material) the hose shall be removed immediately from service

- «Pressure testing is no guarantee»
- If no first layer can be detected perform a pressure test and a seriously visual check
- **If there are still any doubts, remove and destroy the hose for safety reason or contact the manufacture**



Kinked Hoses

Kinking of the hose (especially repeated kinking) may damage the internal structure of the hose. When internal lining in the hose becomes damaged, the fuel may travel along the carcass and appear some distance from the source of the damage.



Damaged Hoses

Any of the following abnormalities noticed during daily operations or monthly or 6 monthly tests requires immediate hose replacement:

- **soft spots, kinks/deformities, bulges or blisters**, excessive abrasion or cracking exposing the carcass textile reinforcement, or
- any cut in the hose structure which has damaged the carcass textile fabric, or
- if the hose has been **run over by any vehicle**.
- However, small cuts do not justify replacement unless the rubber in the immediate area is loose and could allow liquid to enter between the cover and carcass. If the defect is close to the hose end, the damaged section may be cut and the couplings re-attached (see section 4.8.6). A hydrostatic pressure test is required before the hose is returned to service



Hose Pressure Test Requirements

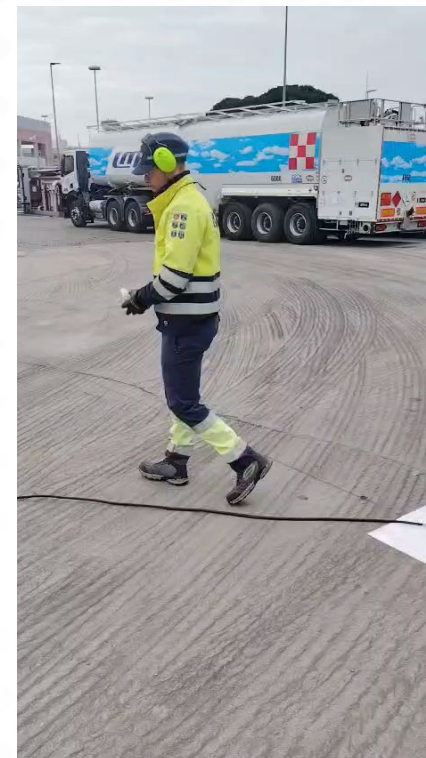
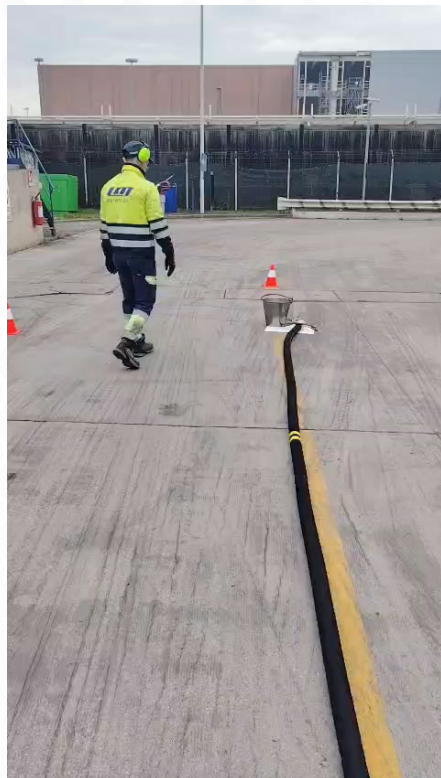
Application	Acceptable hose types	Monthly test	6-monthly Pressure Testing ¹	Commissioning new hoses with factory fixed couplings	Attaching / reattaching couplings
Aircraft fuelling/defuelling	EI 1529 grade 2, Type C ISO 1825, Type C	Normal operating pressure	225 psi (15 bar)	225 psi (15 bar)	300 psi (20 bar)
High flow rate defuelling	EI 1529 grade 2, Type F ISO 1825, Type F				
Fuelling equipment hoses between fixed pipework & fuelling platforms and trailer connection hoses	EI 1529 grade 2, Type E or Type F ISO 1825, Type E or Type F				
Hydrant dispenser inlet hoses	EI 1529 grade 2, Type C ISO 1825, Type C				
Fueller loading	EI 1529 grade 2, Type C or Type F ISO 1825, Type C or Type F				
Hydrant Low Point flushing or Hydrant pit flushing	EI 1529 grade 2, Type C or Type F ISO 1825, Type C or Type F				
Railcar & road tanker discharge	Suction hose meeting recognised industry standard compatible with aviation fuels ²				



Hose Inspection – Monthly Inspection



Monthly Inspection (video)



6 Monthly Hose Pressure Hydrostatic Test

Hydrostatic Pressure Test Procedure

Perform a precautionary visual inspection of the hose at operating pressure to identify any visible cuts or other damage.

If such defects are found, then the hydrostatic test shall not be performed and the hose shall be removed from service.

- Fully extend hose (avoid bends / kinks)
- Isolate hose from vehicle (valve or remove)
- Remove spiral wraps & hose beads /
- If pressure applied from nozzle end, block out HEPCV
- Gradually apply test pressure, bleed any air and pressure to 225 psi (15bar)
- Wait for 1 minute before inspecting
- Inspect & check for slippage of fittings
- Release pressure (test pressure shall be maintained for a minimum of 3 r
- Re-pressurise to 50 psi / 3.5 bar
- Complete Visual Inspection Procedure
- Flush hose (remove unfiltered material)



6 - Monthly Inspection (video)



OPERATIONS BULLETIN

www.jig.org



BULLETIN NO. 161

HOSE STOP OF USE NOTICE

24 October 2025

SAFETY AWARENESS BULLETIN WITH URGENT STOP OF USE ACTION FOR ALL JIG MEMBERS WITH 4-INCH TRELLEBORG AEROKLER C & CT DN100 IN THEIR OPERATIONS

BACKGROUND:

JIG has been made aware of several incidents in recent months involving loss of fuel containment from 4-inch hoses, including the release of fuel at high pressure during aircraft refuelling operations. For this reason, this Bulletin produced in collaboration with Trelleborg, is being issued to bring awareness to all the industry using these hoses and to introduce the immediate actions as per this JIG Bulletin 161 and accompanying Stop of Use notice from Trelleborg to its customers.

IMMEDIATE ACTIONS FOR OPERATIONS WITH 4-INCH TRELLEBORG AEROKLER C & CT DN100 HOSES MANUFACTURED BEFORE 4TH QUARTER 2025.

All organisations Operating to JIG Standards using 4-inch TRELLEBORG AEROKLER DN100 hoses (types C and CT) manufactured before Q4 2025, **shall implement the following additional actions immediately:**

1. All hoses affected by this communication shall be withdrawn from service as soon as practicable and no later than 31/12/2025⁽¹⁾. Further details are included in the attached **Stop of Use** letter from Trelleborg to its customers.
2. Until the hoses have been replaced, the monthly check on hoses shall be conducted at a **weekly frequency**, in accordance with the JIG Standard (JIG 1 Appendix A7.1 and JIG 2 Appendix A6.1)

(1) Users please note that immediate removal is advised but that it is acknowledged that most operators will require some time to obtain, soak test and install new hoses, and therefore the final *implementation date* for removal is set as 31/12/2025.



Friday October 24, 2025

Subject: Important Safety Directive – Immediate Stop of Use for AEROKLER C & CT DN100 4" Hoses

Dear Customer,

We are writing to issue an important safety directive regarding the AEROKLER C & CT DN100 4" hoses, manufactured before Q4 2025. In our commitment to the highest standards of safety and operational integrity, we are instructing all users to immediately stop the use of these specific hoses.

Following recent evaluations, we have observed that certain conditions may influence the performance and lifespan of the AEROKLER C & CT DN100 4" hose. While the product continues to meet all industry standards, we are committed to ensuring the highest levels of safety and quality, prompting us to take this precautionary step.

In response to these findings, our engineering teams have successfully developed and qualified a redesigned, reinforced version of the DN100 hose 4". This enhanced product is engineered for improved durability and resistance to fatigue, ensuring it meets the rigorous demands of your operations.

To facilitate a seamless transition and uphold your operational safety, we have initiated a replacement program. We ask that you contact your regional Trelleborg representative at your earliest convenience to arrange for a replacement with the new, reinforced hose. Our representatives are prepared to guide you through the process and ensure a swift resolution.

Please be aware that this directive applies to the following hose types:

- AEROKLER C DN100 // 4"
- AEROKLER CT DN100 // 4"

This matter only applies to the aforementioned product. All other Trelleborg hoses remain unaffected and can be used as normal.

We understand the critical nature of your operations and are dedicated to supporting you through this transition. We are liaising closely with JIG with a view to ensuring compliance with all safety regulations. We appreciate your immediate cooperation and your continued partnership.

If you have any questions, please do not hesitate to contact your designated Trelleborg representative.

Sincerely,

Jean-Noël Vincent
Quality, Health & Safety Manager
Trelleborg Clermont-Ferrand SAS



JIG Bulletin 161 - Recommended Actions

Done 

The word 'Done' is written in large, 3D green block letters. To its right is a black square frame containing a large, 3D green checkmark, indicating that the recommended actions have been completed.

Questions?





COFFEE BREAK



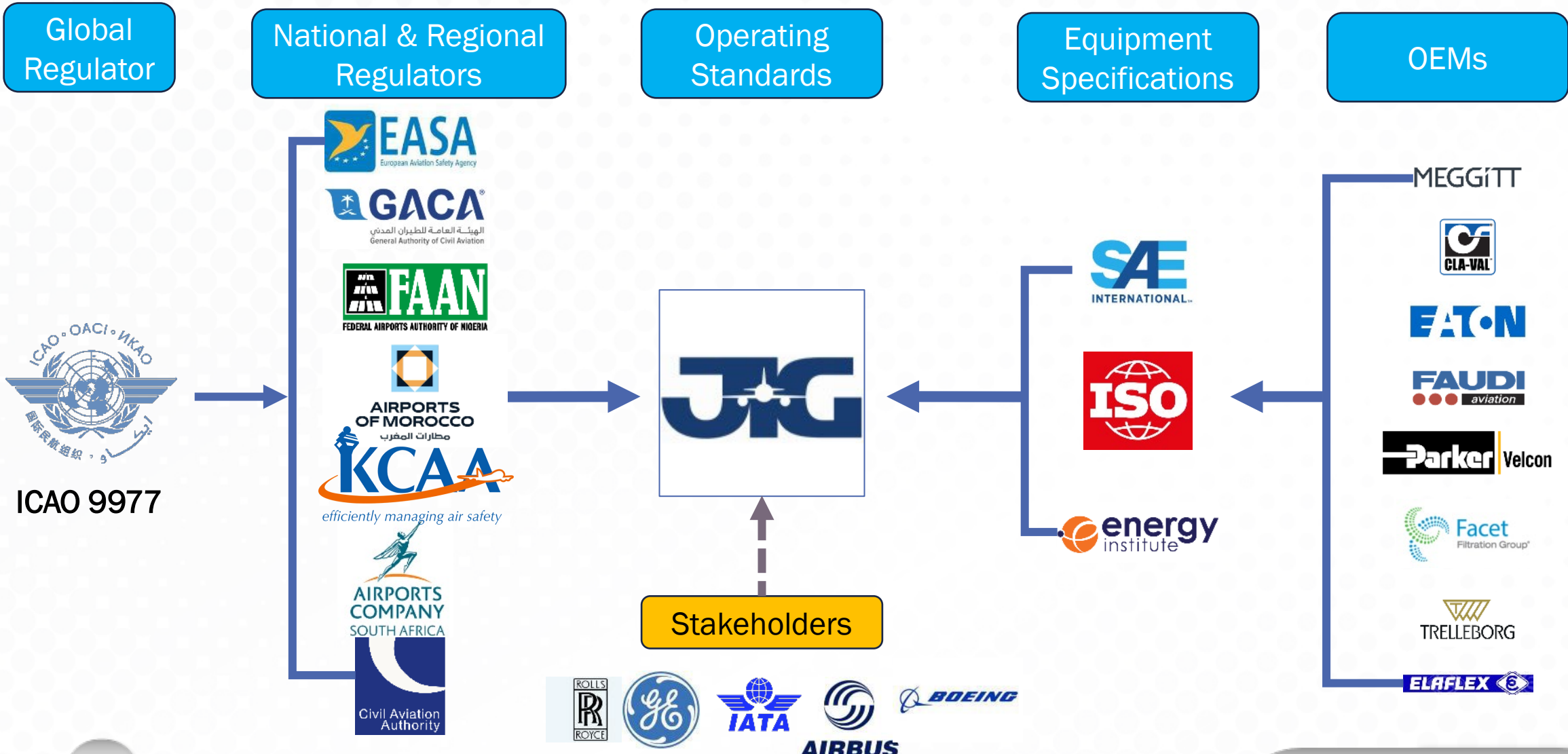
JIG Industry Relations

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1

JIG in Context



2

Relations with Regulators

Global Regulator

National & Regional Regulators

Operating Standards



ICAO 9977



Will endorse JIG in 2027

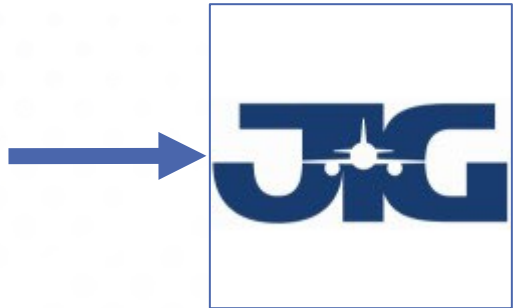
Requires membership & Inspection

Requires membership

Requires membership & Inspection

Requires membership

Uses JIG Standards for compliance



A growing number of Regulators endorse JIG

Operating Standards



Regular contact about subjects in common & OEMs

Joint Participation in several industry Committees

Stakeholders



Operating Standards



Regular contact to understand new technology and products. Close contact and investigation of operational issues

OEMs

- MEGGITT
- 
- 
- 
- 
- 
- 
- 



Equipment Specifications

Operating Standards

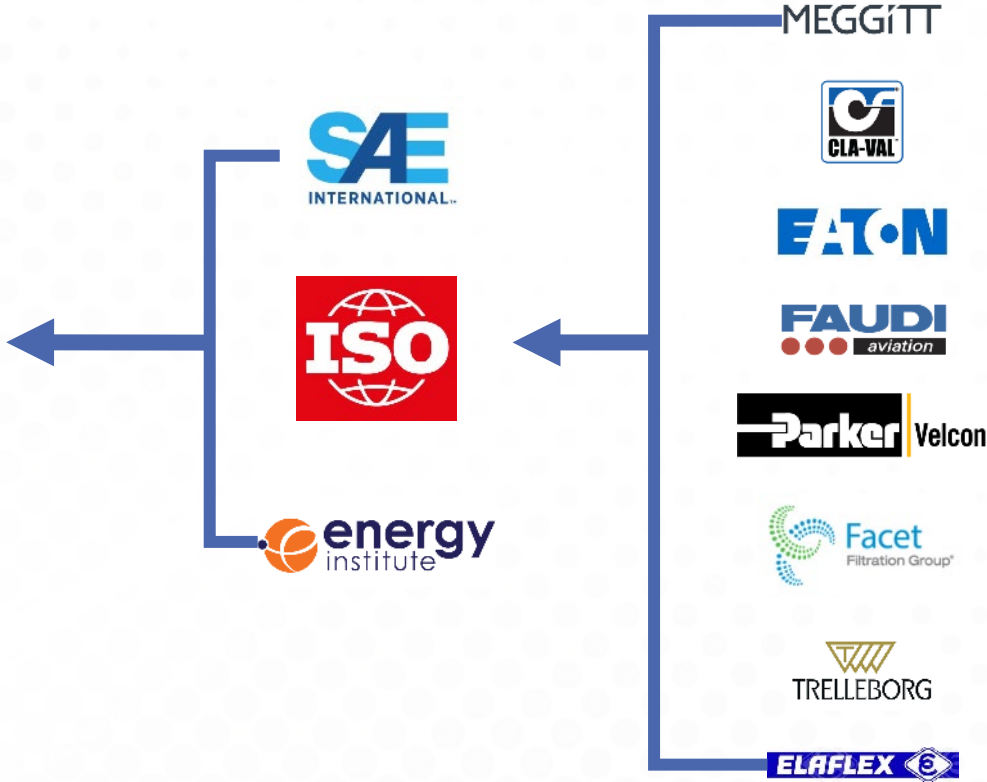


JIG & EI have permanent presence on each other's Committees

Common word to coordinate Specification impact on the Standards

Equipment Specifications

OEMs



What do Equipment Specifications mean?

Operating Standards

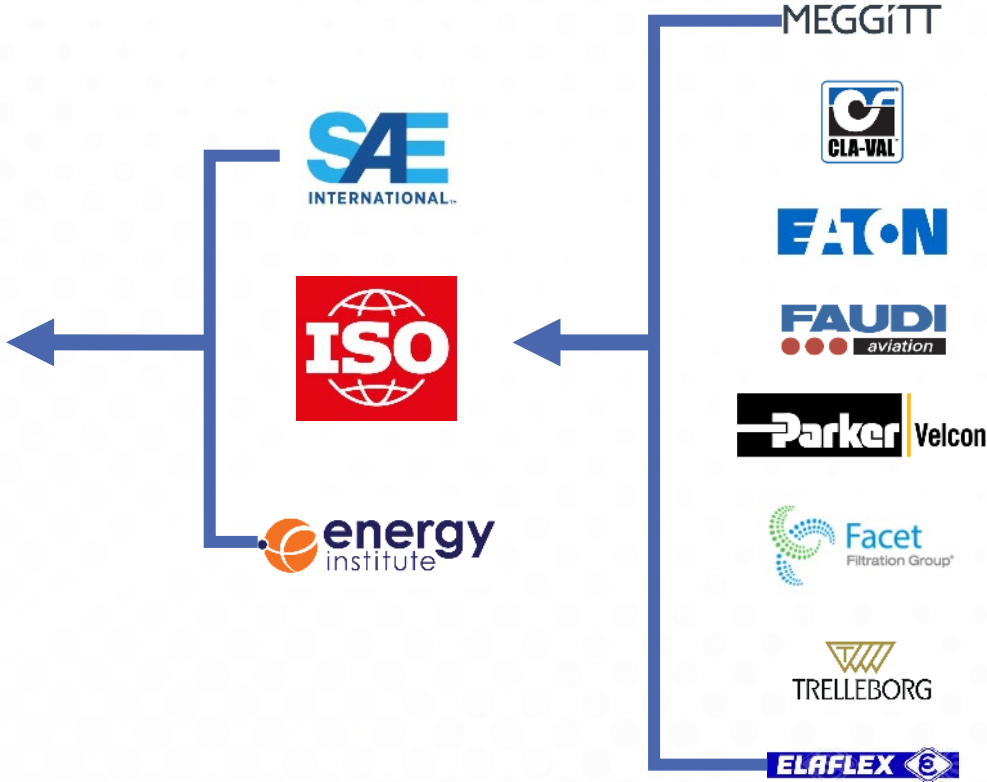


Assurance that Equipment met a Specification at the time it was tested

User responsibility to ensure it remains compliant and fit for use in their operations

Equipment Specifications

OEMs



Equipment : What verification is done ?

OEMs

MEGGITT



EATON

FAUDI
aviation

Parker | Velcon



TRELLEBORG

ELAFLEX

Type	Initial Compliance Testing	Manufacturing Changes	Ongoing Production
<p>Couplers</p>	Self Certification by OEM	Self declaration by OEM	Self Declaration periodic reports by OEM
<p>Filtration</p>	Testing witnessed by EI Expert	Self declaration by OEM	Can pay for annual witnessing of compliance testing
<p>Hoses</p>	Self certification Some external verification or EI witnessing	Self declaration by OEM	Self declaration by OEM
<p>Electrical</p>	Self Certification by OEM	Self Certification by OEM	Self Certification by OEM

Operating Standards



Reminds Users to verify with OEMs



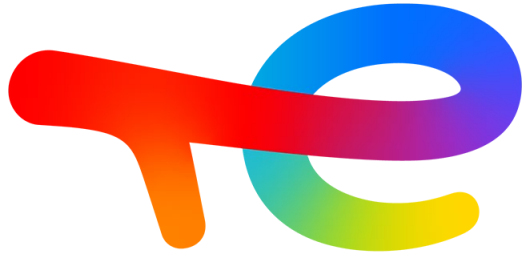
1. Always buy qualified equipment
2. Never modify it yourself
3. Make sure you are aware of any changes
4. Follow OEM use and maintenance manuals
5. Ask for manufacturing QC documents



MEGGITT







TotalEnergies

TARBOX AGREEMENTS AND INSURANCE



2026 JIG Managers' Workshop – Nairobi

April 2026

Antoine SALOMON - Africa Aviation Technical & Operations Support Manager





Join at
slido.com
#7629 338



PLANE CRASHES HAPPEN...



... THE AVIATION BUSINESS HAS RISKS; WE MUST MANAGE THEM BUT ALSO TAKE OUT INSURANCE

CALENDAR

- **Responsibilities in aviation**

- Airlines
- Aviation fuel suppliers

- **TARBOX agreements**

- Background
- Principles
- Revision of the agreements in 2012 & 2025
- When should the TARBOX Agreements be used?
- Special case of third parties
- Key points to remember

- **Aviation insurance**

- TotalEnergies company programme

- **Key points to remember**

+ QUIZ!



LIABILITY IN AVIATION:

Airlines

- Under the Warsaw Convention (1929), the Hague Protocol (1955)⁽¹⁾ and the Montreal Convention (1999), the airline's liability is limited.
- Framework for the airline's liability:
 - Strict liability of the airline up to USD 135,000 per passenger
 - **Above this amount, the airline is not liable, provided it can prove that it was not at fault ('negligence'), or that the accident was caused by the fault of a third party.**

⁽¹⁾ Not ratified by the USA

LIABILITY IN AVIATION:

Airlines

- In order to circumvent this cap on compensation in the event of death, the claimants are seeking to:
 - To prove the airline's negligence,
 - To take legal action against:
 - The aircraft manufacturer,
 - One or more of its subcontractors,
 - As they are not protected by the \$135,000 limit under the Warsaw Convention.
 - **And, of course, the aviation fuel supplier...**
- Furthermore, incidents or accidents may occur during the refuelling of aircraft.
- And the distribution of aviation fuel is often organised through joint facilities used by aviation fuel suppliers.

LIABILITY IN AVIATION:

Aviation fuel suppliers

The standard contract between the fuel supplier and the airlines (AFSA = Aviation Fuel Supply Agreement) stipulates that the supplier is responsible for all matters relating to refuelling:

- the airline does not have to conduct an investigation to prove negligence.
- the airline documents the damage and claims compensation from its aviation fuel supplier.

The fuel supplier undertakes to compensate the airline in the event of damage occurring during refuelling and/or if it is demonstrated that the damage results from off-specification product.

Under the AFSA contract, the fuel supplier is liable in the event of damage occurring during refuelling or if the damage is linked to the quality of the product.

But who is liable when damage is caused by a fuel ‘pool’?

THE TARBOX AGREEMENTS

HISTORY



Santa Barbara Oil Spill 1969

THE TARBOX AGREEMENTS:

BACKGROUND

1960s/1970s: creation of the first oil companies' joint ventures or organisation of aviation fuel distribution through a 'pool' of distributors: **a context in which oil companies shared facilities and resources at airports – pipelines, storage, fuel distribution networks, refuelling operations, etc. – and the first issues regarding the sharing of responsibilities arose.**

1969: Santa Barbara: explosion at an oil rig in Santa Barbara, California; significant environmental impact and major legal exposure for oil companies.

1971: introduction of the 'endorsement clause' for joint ventures: insurers realised they faced cumulative exposure; led by Lloyd's, they did not wish to cover a joint venture member beyond its percentage of ownership.

1974: Oil companies set up a commission chaired by F. TARBOX – a lawyer at Mobil Oil – which drew up indemnity agreements; he then proposed a specific rule to govern the apportionment of liability between fuel suppliers; **the aircraft's fuel supplier would be liable for any damage, including that arising from the quality of the product.** This rule allowed for no exceptions, not even in cases of gross negligence or wilful misconduct by one of the parties (until 2012). **THE BIRTH OF THE TARBOX AGREEMENTS**

2012: revision in cases of gross negligence or wilful misconduct on the part of one of the parties.

TARBOX AGREEMENTS (or INDEMNITY AGREEMENTS): PRINCIPLES

Definition:

- A group of contracts, governed by English law, establishing, between aviation fuel suppliers, the rules for allocating liability relating to refuelling within the framework of shared facilities for the storage, distribution and loading of aviation fuel.

The fundamental principle of TARBOX agreements is to designate the fuel supplier as liable for any damage that may occur during refuelling, including damage resulting from the quality of the aviation fuel.

Consequently, within a ‘pool’ (joint venture, economic interest group, etc.), each member:

- Agrees to bear full liability arising from the refuelling of their customer,
- Waives any right of recourse against the ‘pool’, the other members or its operator,
- Must provide financial guarantees,

All members of the ‘pool’ must take out insurance to the same extent.

English law (Common Law) defines the concepts of gross negligence and wilful misconduct very clearly.

THE TARBOX AGREEMENTS – PRINCIPLES: SCOPE

- Relates to ‘refuelling’, a term covering:

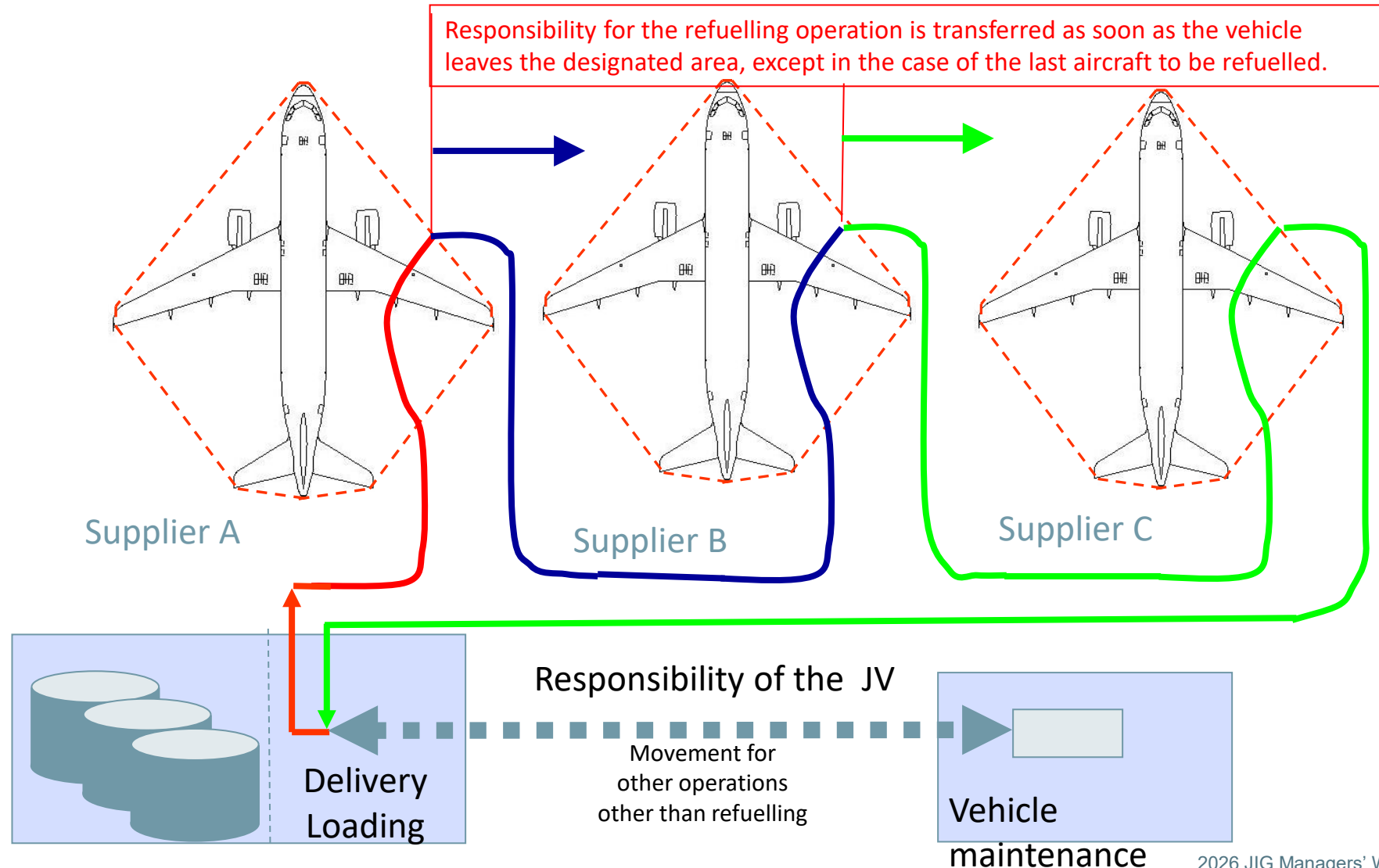
“The supply, loading and unloading, via shared airport facilities, of fuel, lubricants and related products, as well as related operations and services.”

- ➔ Examples: refuelling, offloading operations, aviation fuels, lubricants, boosters, de-icing fluids, additional services...



THE TARBOX AGREEMENTS – PRINCIPLES:

RESPONSIBILITIES IN THE EVENT OF CONSECUTIVE REFUELLINGS – CASE OF A REFUELLING POOL



REVISION OF THE TARBOX AGREEMENTS – 2012

2012 - Gross negligence / Willful misconduct and allocation of liability

- Due to changes in the practical conditions of the aviation fuel supply business, the industry undertook a review of the TARBOX agreements, which was completed in 2012. The 'Industry Tarbox Review 2012' concluded that the time had come to revise the terms of the agreements to include an appropriate allocation of risk for gross negligence and wilful misconduct.
- **The new 2012 TARBOX agreements place the burden of liability arising from gross negligence or wilful misconduct on the party responsible for such misconduct.**
- However, suppliers will continue to indemnify and hold harmless the other parties in respect of liabilities arising from claims related to bunkering operations **for simple negligence** on the part of those other parties to the agreement.

REVISION OF THE TARBOX AGREEMENTS – 2025

2025 – Clarification of Refuelling Activities and applicability of contracts

- Due to high level of changes in Joint Venture activities and the émergence of independantly operated airports, more clarifications were needed.
- The 2025 Tarbox makes a clear difference between a « Tarbox » incident caused by refuelling/fuel, and simple damage caused by the into-plane provider (which is not covered by Tarbox).
- Since 2025, new Tarbox Agreements remain valid even if the organisation structure has changed. (e.g. a JV becomes a « throughput » location).

WHEN SHOULD TARBOX AGREEMENTS BE USED?

TARBOX agreements are used when it is necessary to establish liability between at least two suppliers during a refuelling operation at an airport site. This situation arises when:

- A supplier refuels customers of the other supplier(s) on behalf of the other supplier(s) (e.g. fuel card) or on behalf of the other supplier(s) with whom a pass-through contract has been signed.
- An aviation fuel supplier provides a refuelling service using its own resources on behalf of another supplier as a mere intermediary, or several suppliers use the shared facilities of an independent third party.
- At least two suppliers use a common depot (and/or hydrant) or refuelling facilities, owned by a joint venture (or pool) and operated by the latter or by a third party.
- Two companies operating their own independent facilities at the same airport agree to assist each other occasionally by refuelling each other's customers' aircraft (e.g. a reciprocal agreement in the case of night-time standby duties).

TARBOX website



TARBOX - AVIATION REFUELLING INDEMNITY PORTAL

This Free Portal is available for use by anyone in the Aviation Fuel handling industry who want to learn more about the principles of TARBOX, or manage their existing Agreements. Aircraft Refuelling Indemnification Agreements ("Tarbox") are a key element to ensure that you are fully covered by your Aviation Refuelling Liability Insurance cover when using joint facilities.

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Tarbox Resources

Tarbox Agreements have been successful used since the 1970's to ensure compliance with the sole liability conditions of most Aircraft Refuelling Insurance Policies.

They have been regularly reviewed to ensure that they remain effective in the operating scenarios they have been created for.

You will find below the download links to all the various Exhibits.

These document are provided by the Industry for voluntary use and adoption at users' sole risk and responsibility.

In this section you can find details of, and download, the different models of Tarbox Agreement. There are different models according to the type of operations structure of the joint facility, from traditional Joint Ventures to Throughput locations operated by Service Providers or Airport Companies.

TARBOX EXHIBIT 1A

Aviaton Fuel Card Indemnification Agreement

AVIATION FUEL CARD INDEMNIFICATION AGREEMENT - For use when one supplier is conducting a fuelling against another company's carnet or credit card

DOWNLOAD

TARBOX EXHIBIT 1B

Performance Assignment Indemnificaton Agreement

<https://www.jig.org/tarbox/?view=resources&subpage=tarbox-resources>

<https://www.jig.org/governance-processes/tarbox-2/tarbox-resources/>



JIG website

POLICY-GOVERNANCE

TARBOX EXHIBIT 2A

Public

THROUGHPUT INDEMNIFICATION AGREEMENT - For use when several fuel supplying companies use shared facilities as "throughputters", and one of the fuel suppliers is also the Operator who owns, leases or has a concession to operate the facilities..

View

POLICY-GOVERNANCE

TARBOX EXHIBIT 2B

Public

THROUGHPUT INDEMNIFICATION AGREEMENT - 3RD PARTY OPERATOR NOT INCLUDED - For use where several fuel suppliers use shared facilities as "throughputters", and the Operator is a 3rd party independent non-fuel supplying company, who owns, leases or has a concession to operate the facilities. 3rd party independent operator/owner not a party to this Agreement, as it is an agreement between Fuel Suppliers only.

View

POLICY-GOVERNANCE

TARBOX EXHIBIT 3A

Public

INCORPORATED JV INDEMNIFICATION AGREEMENT - For use when joint facilities (such as hydrant, storage or into-plane) are owned and operated by a separate corporate entity (Incorporated JV) the shares in which are held by fuel-supplying companies (the Participants). This agreement also covers any fuel suppliers who have a throughput agreement to use the JV shared facilities.

View

POLICY-GOVERNANCE

TARBOX EXHIBIT 3B

Public

INCORPORATED JV INDEMNIFICATION AGREEMENT - THIRD PARTY OPERATOR NOT INCLUDED - For use when joint facilities (such as hydrant, storage or into-plane) are owned by a separate corporate entity (Incorporated JV), but are managed and operated by an independent 3rd party Service Provider. The shareholders of the JV and any throughputters have a direct contractual relationship for the services with the Service Provider. The Service provider is not a signatory to the agreement..

View



TARBOX EXHIBIT 3A

INDEMNIFICATION AGREEMENT FOR INCORPORATED JOINT VENTURES

INCORPORATED JV INDEMNIFICATION AGREEMENT – For use when joint facilities (such as hydrant, storage or into-plane) are owned and operated by a separate corporate entity (Incorporated JV) the shares in which are held by fuel-supplying companies (the Participants). This agreement also covers any fuel suppliers who have a throughput agreement to use the JV shared facilities.





Category: Tarbox Agreements **Tags:** Public, Still Live **Publication Date:** 1st October 2025

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TARBOX EXHIBIT 3A - INCORPORATED JV INDEMNIFICATION AGREEMENT

[Exhibit 3A is also to be used for unincorporated JVs which could be sued such as Danish /s/ and German /gbr/ type JVs. See incorporated JV definition.]

AN AGREEMENT dated as of the [[.....]] day of [[.....]] 20[[...]] among:

PARTIES

[List all shareholder/partner and non-shareholder/partner Users of the Facilities

1. ABC Limited, a company duly incorporated under the laws of [France] (registered company number [1234567]) and having its registered office at [1 Kings Road, London, UK] ("ABC") and

2. DEF Limited, a company duly incorporated under the laws of [France] (registered company number [777777]) and having its registered office at [1 Oxford Street, London, UK] ("DEF");

(hereinafter sometimes referred to as the "Users") and

[full name of joint venture company]

JVCO Limited, a company duly incorporated under the laws of [France] (registered company number [777777]) and having its registered office at [1 Oxford Street, London, UK] ("JVCO") (the "JV Company").

Each of the JV Company and the Users may be referred to as a "Party" or collectively as "Parties" herein.

WHEREAS:

(1) Certain of the Users (namely, [[.....]]) are [shareholders/partners] in the JV Company which [owns] and/or [is the operator of facilities] or [provides staff to the operator of] facilities for [aviation fuel storage and distribution and into-plane service] (the "Facilities") at [[.....]] (the "Airport"); and

(2) All Users whether or not [shareholders/partners] in the JV Company have entered into arrangements with the JV Company whereby the latter has agreed to accept into the Facilities quantities of aviation fuel and deliver it therefrom to the Users for delivery to the Users' Customers as the Users may arrange; and

(3) The Users and the JV Company desire to provide for liabilities which may arise out of Aircraft Refuelling (as defined in Clause 1 below) at the Facilities; and

[4] The Users' Signatory Companies have signed up to or adhered to an Agreement on Conduct and Control of Litigation and to an Agreement on Applicable Law dated [insert date(s)] . [Delete entire clause if not all Users' have signed up to or adhered to an Agreement on Conduct and Control of Litigation and to an Agreement on Applicable Law.]]

NOW THEREFORE, the Parties hereby agree as follows:

- For the purposes of this Agreement:

- (a) "Affiliate" of a User shall mean the ultimate holding company of that User and any company (other than that User) which is from time to time directly or indirectly controlled by such ultimate holding company, direct control being through the holding or beneficial ownership of shares or stock carrying a majority of the votes exercisable at a general meeting (or its equivalent) and indirect control being through a series of companies, each being directly controlled by one or (by aggregating shareholdings) more of the previous companies in the series and/or any company designated by such Party in writing lodged with the Secretariat.

[As used in this Agreement, "ultimate holding company" shall mean in respect of each User the respective companies set out in Attachment I hereto. In the event that the ultimate holding company of a User as shown in Attachment I hereto ceases for any reason to be that User's ultimate holding company, that User shall by notice in writing to the Secretariat nominate its new ultimate holding company in substitution therefor and Attachment I shall be deemed to be amended accordingly with effect from the date of such notice. [Delete entire clause if not all Users' have signed up to or adhered to an Agreement on Conduct and Control of Litigation and to an Agreement on Applicable Law.]]

- (b) "Aircraft Refuelling" shall mean the supply and delivery, via the Facilities, of fuels, lubricants and related products, and defuelling, and related operations and services.
- (c) "Customer" in respect of any User shall be construed as referring to any user or buyer of aviation products including that User or its Affiliate or any party contracted to such User or Affiliate in respect of whom such User performs or procures the performance of the Aircraft Refuelling in question.
- (d) "Dispute" means as defined in clause 11(a).
- (e) "Effective Date" means the date when this Agreement has been executed by all of the Parties.
- (f) "Gross Negligence" means any act or omission which constitutes a marked and absolutely flagrant departure from the standard of conduct of any reasonably competent person acting in the same circumstances at the time of the alleged Aircraft Refuelling incident(s). Gross Negligence does not include any act or omission insofar as it constitutes mere ordinary negligence.
- (g) "Incorporated Joint Venture" means any joint venture which is either incorporated in the country of its main place of business or can be sued in court in the country of its main place of business.
- (h) "Secretariat" shall mean a body, currently [[Joint Inspection Group Limited (known as JIG)]], as may be selected by the Tarbox Legal Committee with advice from each committee member's operational contact, from time to time.
- (i) "Signatory Companies" means those parties who have signed the Agreements referred to in Recital 4, and as listed in Attachment I to those

Agreements respectively. [Delete entire clause if Recital 4 on page 1 has been deleted.]

- (i) "Wilful Misconduct" means an intentional or reckless disregard of the operational standards, applicable at the relevant time, to the particular activity giving rise to the alleged Aircraft Refuelling incident(s) but shall not include any mere error of judgment or mistake.

Words in the singular shall include the plural and vice versa.

- This Agreement shall come into force only in relation to all the signatory Parties to it, on the Effective Date and shall thereupon supersede all other agreements previously entered into by the signatory Parties to this Agreement (or their predecessors) or some of them on their own behalf and on behalf of their respective Affiliates relating to the subject matter hereof, provided that it shall not apply to, nor affect the application of any, such other agreement in relation to any Aircraft Refuelling occurring before the Effective Date or relating to parties, who have not signed up to this Agreement.

- Liabilities in respect of claims arising out of Aircraft Refuelling shall be borne by the User whose Customer was the recipient of that Aircraft Refuelling and such User shall indemnify and hold the other Users and the JV Company, their Affiliates and the [directors, officers,] employees, agents and representatives of any of them harmless from any and all proceedings, claims, liabilities, damages, costs, expenses and settlements (including but not limited to those related to the quality of the product supplied and those related to the transit to and from aircraft of any vehicle in use for Aircraft Refuelling), arising out of or in connection with such Aircraft Refuelling.

In the case of a Customer receiving Aircraft Refuelling of the same type of product from more than one Party during a visit by that aircraft to the Airport, as between those Parties, the relevant indemnifying Party is the one to whom the Customer is contracted and: (a) was the last Party on whose behalf Aircraft Refuelling was or is being undertaken for the Customer during the visit by that aircraft to the Airport; and/or (b) in the case of an error in allocating an aircraft as a Customer of a Party, the Party to whom the Aircraft Refuelling should have been correctly allocated.

- Where different products are being supplied, via the Facilities, by a single vehicle on the same sortie to one aircraft, the relevant indemnifying User is the one to whom the Customer is contracted for the supply of aviation fuel.
- For the purposes of this Clause 3:-
 - Each User shall be deemed to be acting as agent or trustee for and on behalf of its Affiliates and its and their [directors, officers,] employees, agents and representatives and the benefit of the provisions of this Clause 3 shall extend to all such Affiliates, [directors, officers,] employees, agents and representatives; but nothing in this Clause 3 shall require or oblige any such Affiliates, [directors, officers,] employees, agents or representatives to give any indemnity to any person or company pursuant to this Clause 3 or to undertake any contractual duties under this Agreement;

ATTACHMENT II - Deed of Adherence

This Deed is made and delivered on [Click or tap to enter a date.](#) by:

[Enter Company name of NEW Signatory \(Click or tap here to enter text.\)](#), a company duly incorporated under the laws of [Enter Country of Registration \(Click or tap here to enter text.\)](#) (registered company number [Enter Company Registration Number \(Click or tap here to enter text.\)](#)) and having its registered office at [Enter Street, #, City, Country \(Click or tap here to enter text.\)](#) ("[Enter Company Short name \(e.g. "JIG" etc\) \(Click or tap here to enter text.\)](#)") (the "Joining Signatory").

WHEREAS:

- A. Pursuant to an Indemnification Agreement dated [Date of original agreement \(Click or tap to enter a date.\)](#) between [List of Short Names of original parties to the local Tarbox agreement](#) (the "Founding Signatories") (full details of which are found within the Agreement);

as subsequently adhered to by

- a. [Name of Additional Signatory 1](#) pursuant to a Deed of Adherence dated [Date of Deed of Adherence 1](#);
- b. [Name of Additional Signatory 2](#) pursuant to a Deed of Adherence dated [Date of Deed of Adherence 2](#);
- c. [Name of Additional Signatory 3](#) pursuant to a Deed of Adherence dated [Date of Deed of Adherence 3](#); [and]
- d. [Name of Additional Signatory 4](#) pursuant to a Deed of Adherence dated [Date of Deed of Adherence 4](#), (together the "Additional Signatories").

(collectively the Founding Signatories and Additional Signatories being the "Continuing Signatories")

(collectively the "Agreement"), the Continuing Signatories agreed between them as to how to provide for liabilities that may arise out of Aircraft Refuelling at the Facilities located at [Enter Name of City or Airport \(Click or tap here to enter text.\)](#) (which terms are defined in the Agreement).

- B. Pursuant to clause [17] of the Agreement, the Continuing Signatories have each confirmed their agreement to the Joining Signatory becoming a party to the Agreement on the terms set out in this Deed.

NOW IT IS HEREBY AGREED AS FOLLOWS:

1. The Joining Signatory, hereby shall adhere to the Agreement and agrees to be bound by all terms and conditions contained therein.
2. The Joining Signatory hereby warrants that the Joining Signatory has the authority to adhere to the Agreement by this Deed.
3. The Joining Signatory shall provide a copy of this Deed of Adherence to each of the Continuing Signatories within 15 business days (meaning any day other than a Saturday, Sunday, or public holiday in England and Wales on which banks are open for general business) of the execution of this Deed and prior to the Joining Signatory commencing Aircraft Refuelling activities at the Facilities.

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Tarbox Resources

Tarbox Agreements have been successful used since the 1970's to ensure compliance with the sole liability conditions of most Aircraft Refuelling Insurance Policies.

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These document are provided by the Industry for voluntary use and adoption at users' sole risk and responsibility.

In this section you can find details of, and download, the different models of Tarbox Agreement. There are different models according to the type of operations structure of the joint facility, from traditional Joint Ventures to Throughput locations operated by Service Providers or Airport Companies.

↓ TARBOX EXHIBIT 1A

Aviation Fuel Card Indemnification Agreement

AVIATION FUEL CARD INDEMNIFICATION AGREEMENT – For use when one supplier is conducting a fuelling against another company's carnet or credit card

DOWNLOAD

↓ TARBOX EXHIBIT 1B

Performance Assignment Indemnification Agreement

PERFORMANCE ASSIGNMENT INDEMNIFICATION AGREEMENT – For use when, based on contractual arrangements, Company A* undertakes delivery obligations for Company B* where the latter is not represented at the relevant airports (* includes affiliates & subsidiaries)

DOWNLOAD

↓ TARBOX EXHIBIT 2A

Throughput Indemnification Agreement

THROUGHPUT INDEMNIFICATION AGREEMENT – For use when several fuel supplying companies use shared facilities as "throughputters", and one of the fuel suppliers is also the Operator who owns, leases or has a concession to operate the facilities..

DOWNLOAD

↓ TARBOX EXHIBIT 2B

Indemnification Agreement for Users of independantly owned and operated facilities

THROUGHPUT INDEMNIFICATION AGREEMENT – 3RD PARTY OPERATOR NOT INCLUDED – For use where several fuel suppliers use shared facilities as "throughputters", and the Operator is a 3rd party independent non-fuel supplying company, who owns, leases or has a concession to operate the facilities. 3rd party independent operator/owner not a party to this Agreement, as it is an agreement between Fuel Suppliers only.

DOWNLOAD

↓ TARBOX EXHIBIT 3A

Indemnification Agreement for Incorporated Joint Ventures

INCORPORATED JV INDEMNIFICATION AGREEMENT – For use when joint facilities (such as hydrant, storage or into-plane) are owned and operated by a separate corporate entity (Incorporated JV) the shares in which are held by fuel-supplying companies (the Participants). This agreement also covers any fuel suppliers who have a throughput agreement to use the JV shared facilities.

DOWNLOAD

TARBOX EXHIBIT 2A - THROUGHPUT INDEMNIFICATION AGREEMENT
where the Host, as well as the Throughputter(s), is an aviation fuel supplier.

[Multilateral Agreement between the Host and Throughputters]

AN AGREEMENT dated as of the [] day of [] [] and made between:

[] insert name of owner/operator of the Facilities, registered number and registered address

1. ABC Limited, a company duly incorporated under the laws of [England] (registered company number [1234567]) and having its registered office at [1 Kings Road, London, UK] ("ABC") and [] hereinafter referred to as the "Host"; and

(A) [] insert name of throughputter(s), registered number and registered address

2. DEF Limited, a company duly incorporated under the laws of [England] (registered company number [777777]) and having its registered office at [1 Oxford Street, London, UK] ("DEF").

(B) 3. GHI Limited, a company duly incorporated under the laws of [England] (registered company number [888888]) and having its registered office at [1 Regent Street, London, UK] ("GHI"). [] hereinafter referred to as the "Throughputter(s)".

Each of the Host and the Throughputter(s) may be referred to as a "Party" or collectively as "Parties" herein;

WHEREAS:

(1) The Host is the [] of a [] [] and/or hydrant and/or into-plane service [] (hereinafter called the "Facilities") located at [] ("Airport").

(2) The Host has agreed pursuant to one or more separate throughput agreements (the "Throughput Agreement(s)") to accept into the Facilities quantities of aviation fuel from the Throughputter(s) [] and to deliver it from there into the Throughputter(s)'s equipment [] and/or into the Throughputter(s)'s Customers' aircraft [] as the Throughputter(s) may direct.

(3) The Parties desire to provide for liabilities which may arise out of Aircraft Refuelling at the Facilities.

[4] The Parties' Signatory Companies have signed up to or adhered to an Agreement on Conduct and Control of Litigation and to an Agreement on Applicable Law dated [] . [Delete entire clause if not all Users' have signed up to or adhered to an Agreement on Conduct and Control of Litigation and to an Agreement on Applicable Law.]

NOW THEREFORE, the Parties hereby agree as follows:

1. For the purposes of this Agreement:

(a) "Affiliate" of a Party hereto shall mean the ultimate holding company of that Party and any company (other than that Party) which is, from time

to time, directly or indirectly controlled by such ultimate holding company, direct control being through the holding or beneficial ownership of shares or stock carrying a majority of the votes exercisable at a general meeting (or its equivalent) and indirect control being through a series of companies, each being directly controlled by one or (by aggregating shareholdings) more of the previous companies in the series and/or any company designated by such Party in writing lodged with the Secretariat.

[] As used in this Agreement, "ultimate holding company" shall mean in respect of each Party the respective companies set out in Attachment I hereto. In the event that the ultimate holding company of a Party as shown in Attachment I hereto ceases for any reason to be that Party's ultimate holding company, that Party shall by notice in writing to the Secretariat nominate its new ultimate holding company in substitution therefor and Attachment I shall be deemed to be amended accordingly with effect from the date of such notice. [Delete entire clause if not all Users' have signed up to or adhered to an Agreement on Conduct and Control of Litigation and to an Agreement on Applicable Law.]

(b) "Aircraft Refuelling" shall mean the supply and delivery, via the Facilities, of fuels, lubricants and related products, and defuelling, and related operations and services.

(c) "Customer" in respect of any Party shall be construed as referring to any user or buyer of aviation products, including that Party or its Affiliates or any party contracted to such Party or Affiliate, in respect of whom such Party performs or procures the performance of the Aircraft Refuelling in question.

(d) "Dispute" means as defined in clause 11(a).

(e) "Effective Date" means the date when this Agreement has been executed by all of the Parties.

(f) "Gross Negligence" means any act or omission which constitutes a marked and absolutely flagrant departure from the standard of conduct of any reasonably competent person acting in the same circumstances at the time of the alleged Aircraft Refuelling incident(s). Gross Negligence does not include any act or omission insofar as it constitutes mere ordinary negligence.

(g) "Secretariat" shall mean a body, currently [] Joint Inspection Group Limited (known as JIG) [] as may be selected by the Tarbox Legal Committee with advice from each committee member's operational contact, from time to time..

(h) "Signatory Companies" shall mean those parties who have signed the Agreements referred to in Recital 4, and as listed in Attachment I to those Agreements respectively. [Delete entire clause if Recital 4 on page 1 has been deleted.]

(i) "Willful Misconduct" means an intentional or reckless disregard of the operational standards, applicable at the relevant time, to the particular

activity giving rise to the alleged Aircraft Refuelling incident(s) but shall not include any mere error of judgment or mistake.

Words in the singular shall include the plural and vice versa.

2. This Agreement shall come into force only in relation to all the signatory Parties to it, on the Effective Date and shall thereupon supersede all other agreements previously entered into by the signatory Parties to this Agreement (or their predecessors) or some of them on their own behalf and on behalf of their respective Affiliates relating to the subject matter hereof, provided that it shall not apply to, nor affect the application of any such other agreement in relation to, any Aircraft Refuelling occurring before the Effective Date or relating to parties, who have not signed up to this Agreement.

3. (a) Any and all liabilities arising out of Aircraft Refuelling of aircraft for Customers of a particular Throughputter shall be for that particular Throughputter's account and that Throughputter shall indemnify and hold the Host, the other Throughputters and its/their Affiliates and the [] directors, officers, [] employees, agents and representatives of any of the same harmless from any and all proceedings, claims, liabilities, damages, costs, expenses and settlements (including but not limited to those related to the quality of the product supplied and those related to the transit to and from aircraft of any vehicle in use for Aircraft Refuelling), arising out of or in connection with such Aircraft Refuelling.

(b) (i) Any and all liabilities arising out of Aircraft Refuelling of aircraft for Customers of the Host shall not be for the Throughputter(s)'s account and the Host shall indemnify and hold the Throughputter(s) and its/their Affiliates and the [] directors, officers, [] employees, agents and representatives of any of the same harmless from any and all proceedings, claims, liabilities, damages, costs, expenses and settlements (including but not limited to those related to the quality of the product supplied and those related to the transit to and from aircraft of any vehicle in use for Aircraft Refuelling), arising out of or in connection with such Aircraft Refuelling.

(ii) In the case of a Customer receiving Aircraft Refuelling of the same type of product from more than one Party during a visit by that aircraft to the Airport, as between those Parties, the relevant indemnifying Party is the one to whom the Customer is contracted and: (a) was the last Party on whose behalf Aircraft Refuelling was or is being undertaken for the Customer during the visit by that aircraft to the Airport; and/or (b) in the case of an error in allocating an aircraft as a Customer of a Party, the Party to whom the Aircraft Refuelling should have been correctly allocated.

(c) The Host shall notify the Throughputter(s) in writing of the identity of all third parties undertaking Aircraft Refuelling activities via throughput arrangement through the Facilities.

(c) If on any occasion any vehicle in use for Aircraft Refuelling is in transit to and from more than one aircraft which are aircraft of Customers of different sellers of aviation fuel, liabilities for all purposes of 3(a) and 3(b) above shall only be for a Party's account if the vehicle was at the

ATTACHMENT II - Deed of Adherence

This Deed is made and delivered on [Click or tap to enter a date.](#) by:

[Enter Company name of NEW Signatory \(Click or tap here to enter text.\)](#), a company duly incorporated under the laws of [Enter Country of Registration \(Click or tap here to enter text.\)](#) (registered company number [Enter Company Registration Number \(Click or tap here to enter text.\)](#)) and having its registered office at [Enter Street, #, City, Country \(Click or tap here to enter text.\)](#) ("[Enter Company Short name \(e.g. 'JIG' etc\) \(Click or tap here to enter text.\)](#)") (the "Joining Signatory").

WHEREAS:

- A. Pursuant to an Indemnification Agreement dated [Date of original agreement \(Click or tap to enter a date.\)](#) between [List of Short Names of original parties to the local Tarbox agreement](#) (the "Founding Signatories") (full details of which are found within the Agreement);

as subsequently adhered to by

- a. [Name of Additional Signatory 1](#) pursuant to a Deed of Adherence dated [Date of Deed of Adherence 1](#);
- b. [Name of Additional Signatory 2](#) pursuant to a Deed of Adherence dated [Date of Deed of Adherence 2](#);
- c. [Name of Additional Signatory 3](#) pursuant to a Deed of Adherence dated [Date of Deed of Adherence 3](#); [and]
- d. [Name of Additional Signatory 4](#) pursuant to a Deed of Adherence dated [Date of Deed of Adherence 4](#), (together the "Additional Signatories").

(collectively the Founding Signatories and Additional Signatories being the "Continuing Signatories")

(collectively the "Agreement"), the Continuing Signatories agreed between them as to how to provide for liabilities that may arise out of Aircraft Refuelling at the Facilities located at [Enter Name of City or Airport \(Click or tap here to enter text.\)](#) (which terms are defined in the Agreement).

- B. Pursuant to clause [17] of the Agreement, the Continuing Signatories have each confirmed their agreement to the Joining Signatory becoming a party to the Agreement on the terms set out in this Deed.

NOW IT IS HEREBY AGREED AS FOLLOWS:

1. The Joining Signatory, hereby shall adhere to the Agreement and agrees to be bound by all terms and conditions contained therein.
2. The Joining Signatory hereby warrants that the Joining Signatory has the authority to adhere to the Agreement by this Deed.
3. The Joining Signatory shall provide a copy of this Deed of Adherence to each of the Continuing Signatories within 15 business days (meaning any day other than a Saturday, Sunday, or public holiday in England and Wales on which banks are open for general business) of the execution of this Deed and prior to the Joining Signatory commencing Aircraft Refuelling activities at the Facilities.

THE TARBOX AGREEMENTS

SPECIFIC CASE OF THIRD PARTIES

- The market for storage and refuelling has changed significantly in recent years:
 - The arrival of operators offering only storage and/or refuelling services (e.g. Skytanking, Levorato, Swissport, XPO...)
- These independent third-party operators, who do not supply fuel, also benefit from a Tarbox agreement.

It is therefore necessary to negotiate liability and insurance terms on a case-by-case basis in contracts with these third parties.

AVIATION INSURANCE

TARBOX Agreements vs Insurance:

- TARBOX agreements are a compensation scheme, not an ‘insurance clause’;
- **Insurance is a tool to enhance the financial standing of those who are liable for contractually accepted responsibilities;**
- **A JV or operator bearing liabilities as defined in the 2012 version of the TARBOX agreements must hold ‘gross negligence/wilful misconduct’ insurance (‘Willis vehicle’);**
- If a subsidiary of the Company bears liabilities as defined in the 2012 version of the TARBOX agreements, these are covered by the Company’s programme,
- Check the insurance levels of partners in joint ventures annually by requesting their certificates (insurance limits as per the contract/risks, security provided by the insurer, etc.).

- In general, for TotalEnergies subsidiaries:
 - always ensure that you inform DARA of any specific or unusual issues in your operations,
 - do not hesitate to contact DARA with any questions (new contractual provisions, new volumes, etc.)

KEY POINTS TO REMEMBER (1/2)

- A TARBOX agreement must be signed whenever products are comingled and/or services are provided on behalf of several fuel suppliers at the same airport facility, even if no other formal contractual provision exists.
- TARBOX agreements must always be governed by English law (on the assumption that English law and jurisdiction will best preserve the principles of compensation and give full effect to the provisions of the agreements).
- TARBOX agreements must not be used if there is only one fuel supplier and one operator. In such cases, liability must be negotiated within the framework of the agreements or the transit contract.
- TARBOX agreements must not be used to indemnify third parties (for example, airport authorities).

KEY POINTS TO REMEMBER (2/2)

The indemnity clauses in TARBOX agreements **apply only to acts of negligence** – they do not indemnify fuel suppliers or the operator for:

- **Gross negligence or wilful misconduct;** the operator (JV or third party) of the storage or loading facilities must therefore take out insurance to cover this (e.g. Willis for JVs)
- Acts of hostility or acts of war.

Financial resources

- TARBOX agreements must not be used if any of the parties is unable to comply with the provisions regarding financial resources.
- The parties to the TARBOX agreements must ensure that the required financial resources are in place for all parties at a frequency defined in the local TARBOX agreement (*generally, an annual check of insurance certificates to be carried out by the JV manager*).
- Failure by one of the parties to a TARBOX agreement to comply with the provisions regarding financial resources should lead to the suspension of that party's indemnity scheme. The provisions of the JV's shareholders' agreement should then be enforced, which could ultimately lead to the exclusion of the party in breach from the JV.



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Thank you for your attention!



TARBOX AGREEMENTS

2025 Updates and New Website

Note: The procedures and practices presented in this document are best practice recommendations only. JOINT INSPECTION GROUP Ltd and/or the JIG Member presenting this document makes no claim or warranty whatsoever as to their completeness or suitability. JOINT INSPECTION GROUP Ltd and its Members shall have no liability to third parties in relation to following, or not following the recommendations contained herein.



Updated Tarbox Website / Database

TARBOX - AVIATION REFUELLING INDEMNITY PORTAL

This Free Portal is available for use by anyone in the Aviation Fuel handling industry who want to learn more about the principles of TARBOX, or manage their existing Agreements. Aircraft Refuelling Indemnification Agreements ("Tarbox") are a key element to ensure that you are fully covered by your Aviation Refuelling Liability Insurance cover when using joint facilities.

www.jig.org/tarbox

AT A GLANCE

<p>81 / 311</p> <p>Of the 311 locations that need agreements, 81 are up to date</p>	<p>230</p> <p>Locations are not fully signed</p>	<p>195</p> <p>Locations are using the wrong template</p>	<p>33</p> <p>Central Agreements in operations</p>
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LOCAL AGREEMENTS

The LOCAL AGREEMENT database, managed by JIG on behalf of the industry, catalogues Agreements that operators have signed and submitted to JIG for secure and confidential storage. Signatories to Tarbox can use this database to view and manage their agreements as appropriate, and check there are no gaps in their coverage on the airports where they operate. [If you do not see a "View Local Agreements" button below, please sign in to access this feature].

[View Local Agreements](#)

CENTRAL AGREEMENTS

The Tarbox CENTRAL AGREEMENT database, managed by JIG on behalf of the industry, catalogues Agreements that Fuel Suppliers have signed and submitted to JIG for secure and confidential storage. The Central Agreements commit a company worldwide to the Application Law (English) and Litigation Agreements that all Tarbox Agreements should be subject to. [If you do not see a "View Central Agreements" button below, please sign in to access this feature].

[View Central Agreements](#)



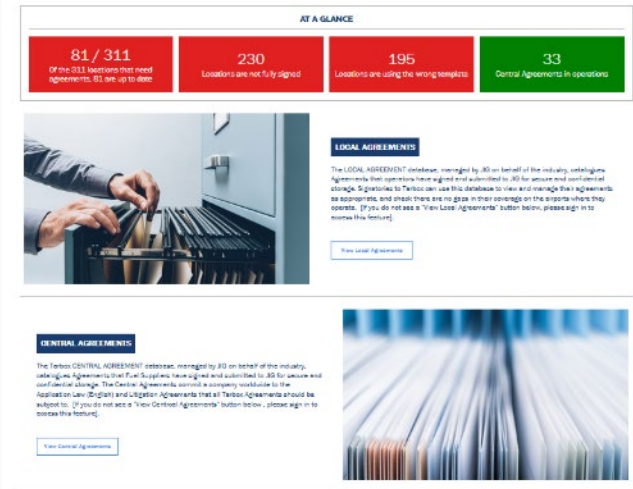
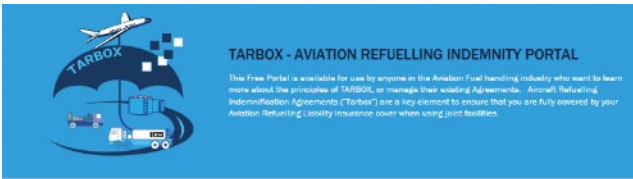
Free for use by any company active in aviation fuel handling or sales at joint facilities.

Offers:

- General information about Tarbox
- Copies of blank Tarbox Exhibits
- Secure database of registered Local Tarbox Agreements.
- Public database of Tarbox Central Agreement signatories.
- Training materials



How to get access to the Database



- ✓ Register your Company with JIG.
 - ✓ Register your Company Users with JIG.
 - ✓ Register the sites you would like to manage in the database.
-
- ✓ If you are a JIG Member, you may need to register additional sites if they are not all on the database.

New Tarbox Website access



Not Logged in or no Access



Logged in User



TARBOX AGREEMENTS EXPLAINED

This is a brief explanation of what Tarbox Agreements are, and how they help to manage potential liabilities related to aircraft refuelling activities.

[Find out more](#)

Information Pages

HISTORY OF TARBOX

This section provides a detailed explanation of how Tarbox Agreements were created and developed over time. Starting in the 1980s, the growth of Civil Aviation prompted the construction of jointly-owned hydrant systems to meet demand. The insured risks consequently changed, leading the insurance and Aviation industries to agree on the principle of Single Liability. These are captured in the 'Aircraft Refuelling Endorsement (SRTA)' clause, that governs most Refuelling Insurance Policies and require Fuel Suppliers to indemnify the other users or joint facilities should there be an incident with one of their customer's aircraft. The indemnification Agreements - called "Tarbox" by the industry - are the good practice mechanism to ensure that the requirements of insurance policies are being met.

[Find out more](#)

History



TARBOX RESOURCES

In this section you can find details of, and download, the different models of Tarbox Agreement. There are different models according to the type of operational structure of the joint facility, from traditional Joint Ventures to Throughout locations operated by Service Providers or Airport Companies.

[Find out more](#)

Download Exhibits

Your company status AT A GLANCE

81 / 311 Of the 311 locations that need agreements, 81 are up to date	230 Locations are not fully signed	195 Locations are using the wrong template	33 Central Agreements in operations
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LOCAL AGREEMENTS

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[View Local Agreements](#)

Local Agreement Database

CENTRAL AGREEMENTS

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[View Central Agreements](#)

Central Agreement Database



2

Tarbox Local Agreement Database

ⓘ You have some incorrect Tarbox Agreement Types

Showing Tarbox Agreements for: All your locations

Location	Structure	Agreements	Version	Date	Signed	Managed by
Site Names	IncJV	Exhibit 2A			0/4	Site Manager
	NonIncJV	Exhibit 4A	-	-	0/4	Site Manager
	NonIncJV	Exhibit 4A	-	-	0/4	Site Manager
	Throughput	Exhibit 2B	Post 2015	14/10/2025	3/3	Site Manager
	IncJV	Exhibit 3A	-	-	0/4	Site Manager
	IncJV	Exhibit 3A	-	-	0/4	Site Manager
	IncJV	Exhibit 3A	Post 2015	25/08/2016	5/5	Site Manager
	IncJV	Exhibit 3A	-	-	0/2	Site Manager
	Throughput	Exhibit 2B	-	-	0/4	Site Manager
	IncJV	Exhibit 3A	Post 2015	01/01/2020	1/6	Site Manager
	IncJV	Exhibit 3A	-	-	0/8	Site Manager
	IncJV	Exhibit 3A	Post 2015	01/11/2024	3/3	Site Manager
	NonIncJV	Exhibit 4A	-	-	0/2	Site Manager
	Throughput	Exhibit 3A	Pre 2015	05/12/2014	6/6	Site Manager

JIG's Tarbox Database:

1. Are you using the right Exhibit?

2. Who is coordinating signing of Tarbox Agreements? status per location.

3. Have all Fuel Suppliers signed? be JIG Admin.

List of your Company's sites



2

Database : Site detail

Using the right Exhibit

List of active suppliers

Location	Structure	Agreements	Version	Date	Signed	Managed by
London AB... TEST SITE:ADHIP	Throughput	Exhibit 2B	Post 2015	29/07/2025	3/4	Site Manager

REGION: Europe
 COUNTRY: United Kingdom
 STRUCTURE: Throughput
 OPERATOR: Test Company 2
 THROUGHPUTTERS: Yes

Based on this information, the type of agreement you

Registered organisation and structure

Associated Companies	Company Role	Agreement Type	Signed	Date Signed/Sent
HB Test company	Throughputter	DoA	Signed	29/07/2025
Test company 4	Throughputter	M-Supp	Signed	29/07/2025
Test company 5	Throughputter	Main	Signed	29/07/2025
test Company 3	Throughputter	This company needs to sign an agreement		

This supplier has not signed

This Company also signed Central Agreements

Download signed agreement (PDF)

2

Menu Options

Central Agreements list



Information and Download Exhibits



Export status and details of your locations to Excel



MENU -

- TARBOX HOMEPAGE
- CENTRAL AGREEMENTS
- LOCAL AGREEMENTS
- View
- Add
- Resources & Information
- FILTER +
- EXPORT +
- HELP +

Advise JIG of Errors

Information pages



Add Agreements (if you have rights)



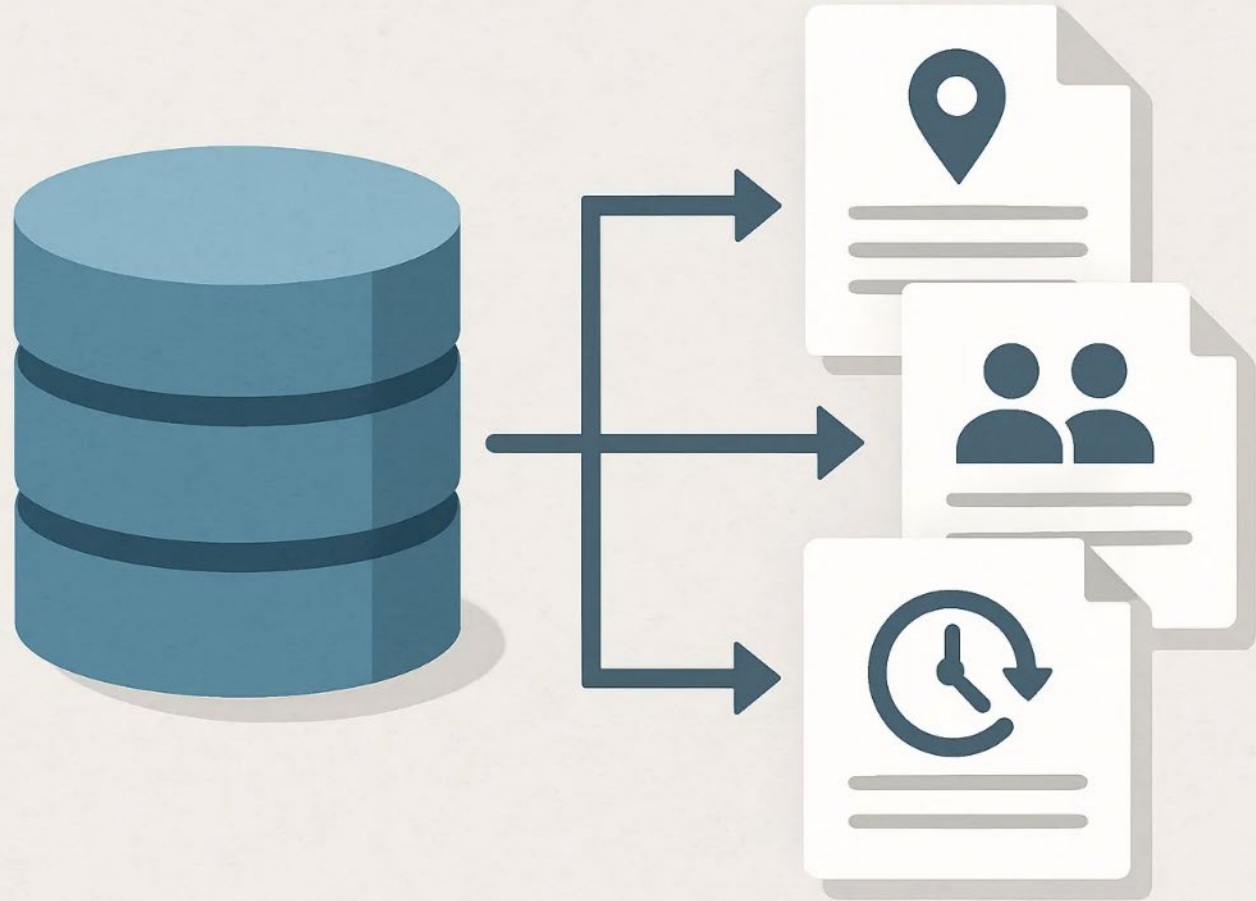
Use filters to find your locations



User Guide & FAQ



New Tarbox Roles



3

Tarbox Roles



SITE MANAGER

- View Managed Sites
- Upload contracts for the site (all suppliers)
- Ensure all suppliers sign agreements
- Request JIG for Structure & Supplier updates



TARBOX COORDINATOR

- View Company Sites
- Upload contracts at sites for own company
- Request access for own company Users
- Request JIG to review Site Structure & active suppliers



TARBOX VIEWER

- View Company Sites
- Advise Tarbox Coordinator of any changes.

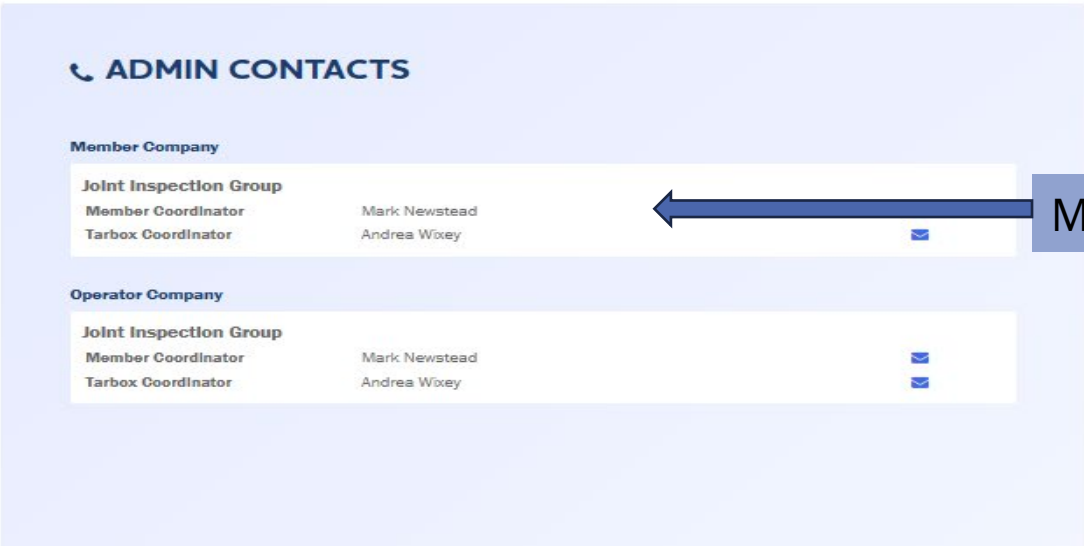
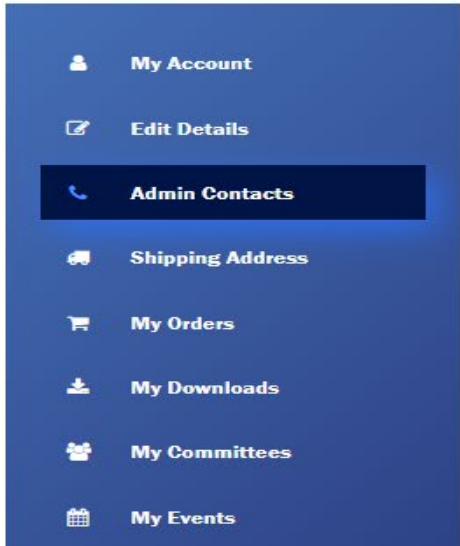
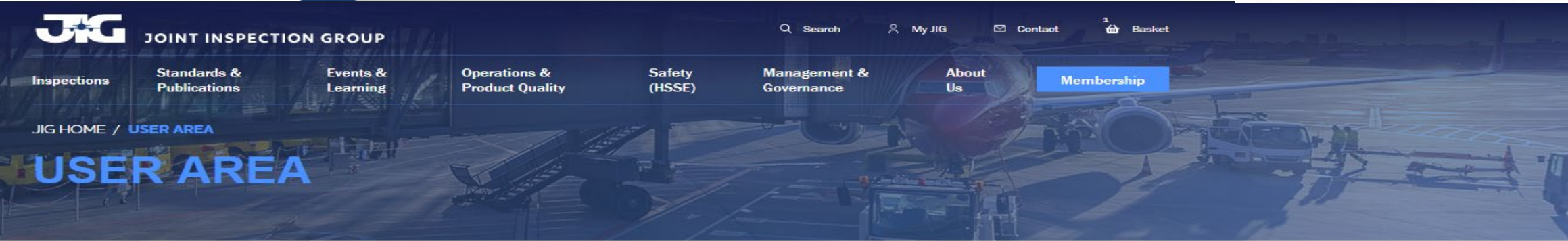


JIG ADMIN

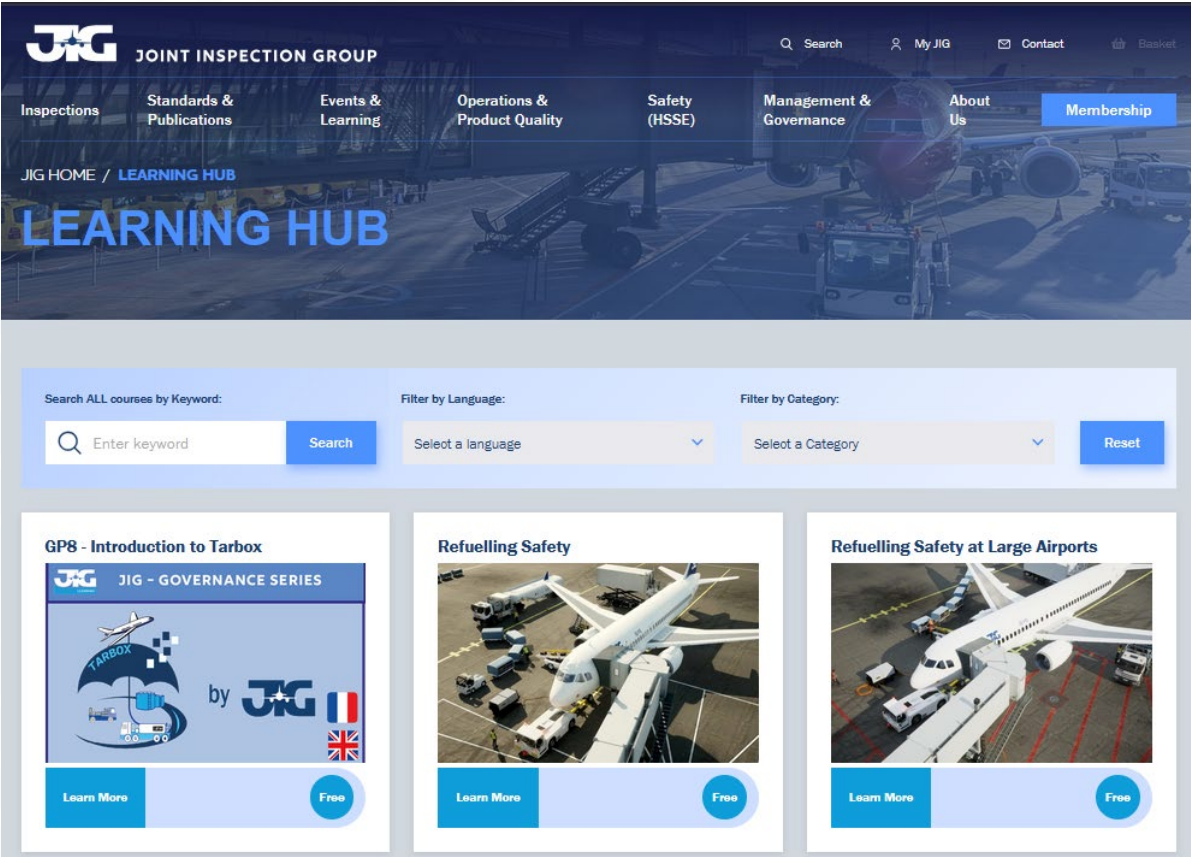
- Manage User Access
- Update Company, Site and User records on Request.
- View All Sites
- Upload documents upon request.



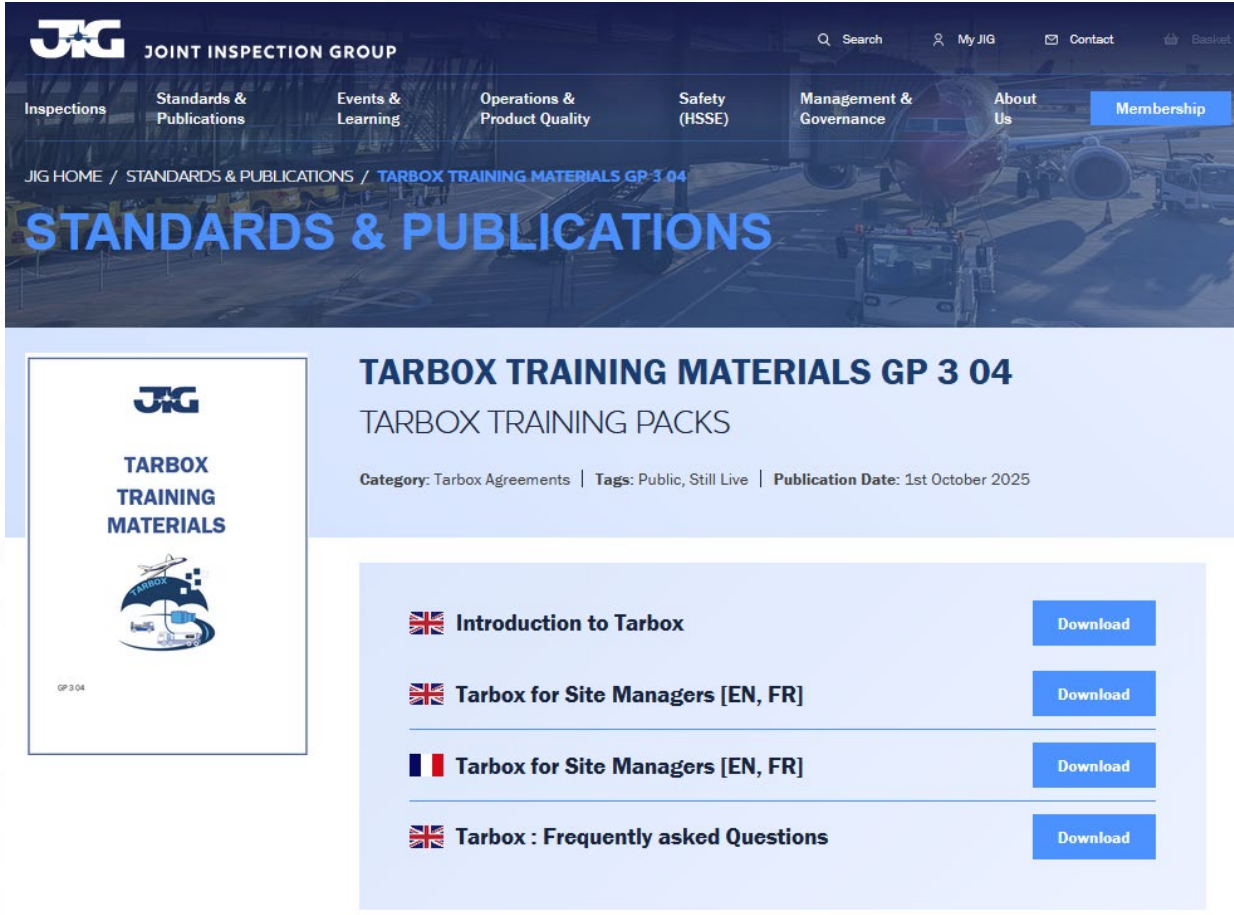
Who do I contact in my Company ?



My Account/Admin Contacts



<https://www.jig.org/training-hub/>



<https://www.jig.org/standards-publications/>

[Policies & Governance – Filter “Tarbox”]



Comment
Thoughts
Observation
Question



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