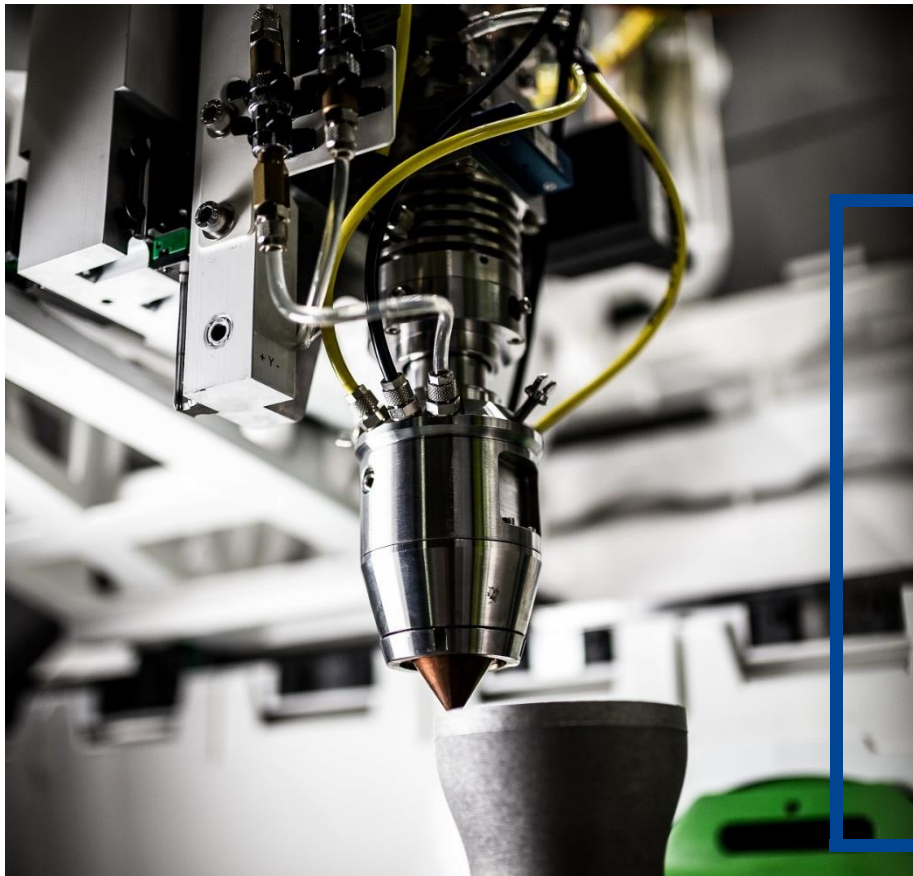




SAFRAN TECH PRESS VISIT

—
Paris-Saclay, December 3, 2019





1

R&T AND INNOVATION AT SAFRAN

SAFRAN R&T PLAN: TECHNOLOGY, THE KEY TO OUR COMPETITIVENESS



Safran's total R&T investment: €460M in 2018, €600M+ in 2022

SAFRAN R&T AND INNOVATION: STATE-OF-THE-ART ORGANIZATION AND PROCESSES

R&T roadmaps

40
roadmaps

Products

Innovation

Methods & Tools

Technologies

Shared resources

600
Corporate Scientists



SAFRAN TECH



SAFRAN
ANALYTICS

INTELLECTUAL PROPERTY
CENTER OF EXCELLENCE

Corporate initiatives

4
initiatives on going



HYBRID
PROPULSION



AUTONOMOUS
SYSTEMS



ADDITIVE
MANUFACTURING



DIGITAL

Ecosystem

30
strategic partnerships



SAFRAN
CORPORATE
VENTURES



SCIENTIFIC
PARTNERSHIPS



TECHNOLOGY
PARTNERSHIPS

Innovation & Acceleration



OPEN
INNOVATION

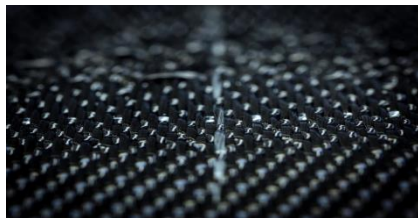


SHAPING THE
FUTURE



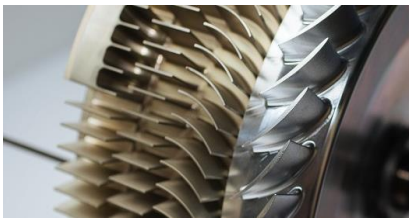
Intrapreneurs

SAFRAN TECH, A STATE-OF-THE-ART RESEARCH & TECHNOLOGY CENTER FOCUSING ON THREE MAIN AREAS



Materials & Processes

Identify and **apply innovative materials and processes** for Safran products, to increase **performance**, reduce **weight**, **simplify production** and **maintenance**.



Energy

Develop innovative energy technologies and systems to address **environmental challenges** and for **new uses**.



Information

Capture, process and model information to improve our **productivity** and develop **competitive and high-performance products and services**.

1/4

of the Group's
R&T



Nearly **500**
researchers



> 80

Experts, including
12 distinguished ones



> 20

nationalities

SAFRAN TECH FACILITIES

6 RESEARCH GROUPS (TRL* 1 to 3)



* Technology Readiness Level

4 TECHNOLOGY PLATFORMS (up to TRL* 6)



January 2015

Inauguration

44,000 m²

On 17 hectares (42 acres)

1,300

Employees

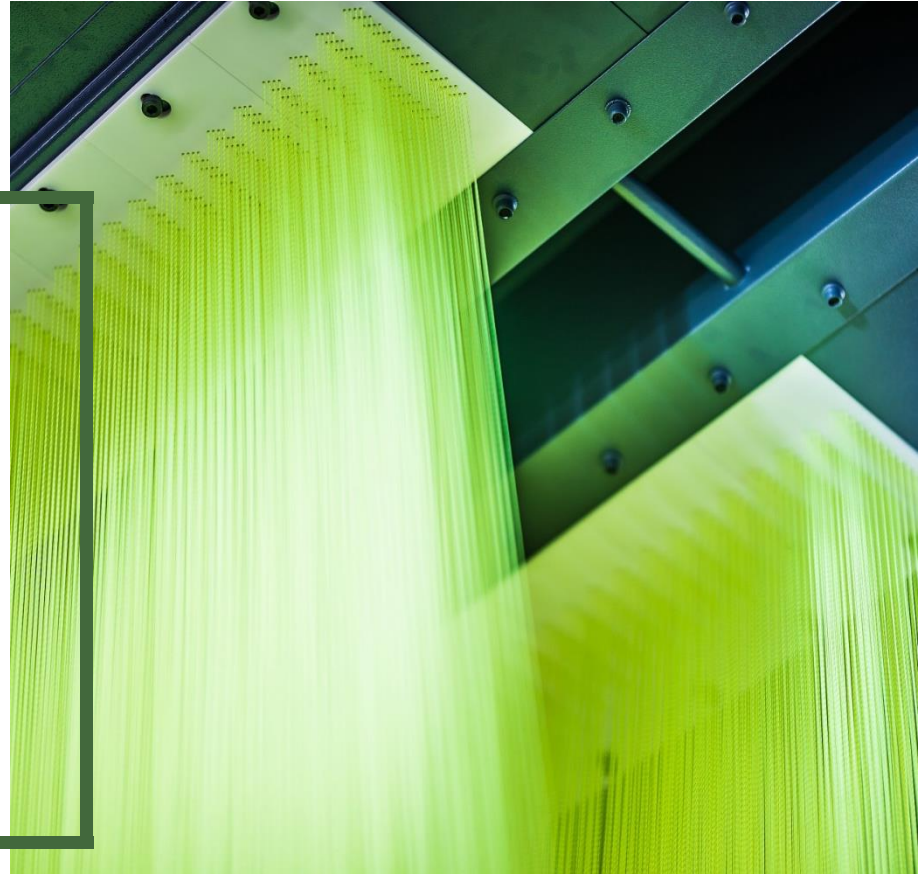
1st

Group multi-entity site



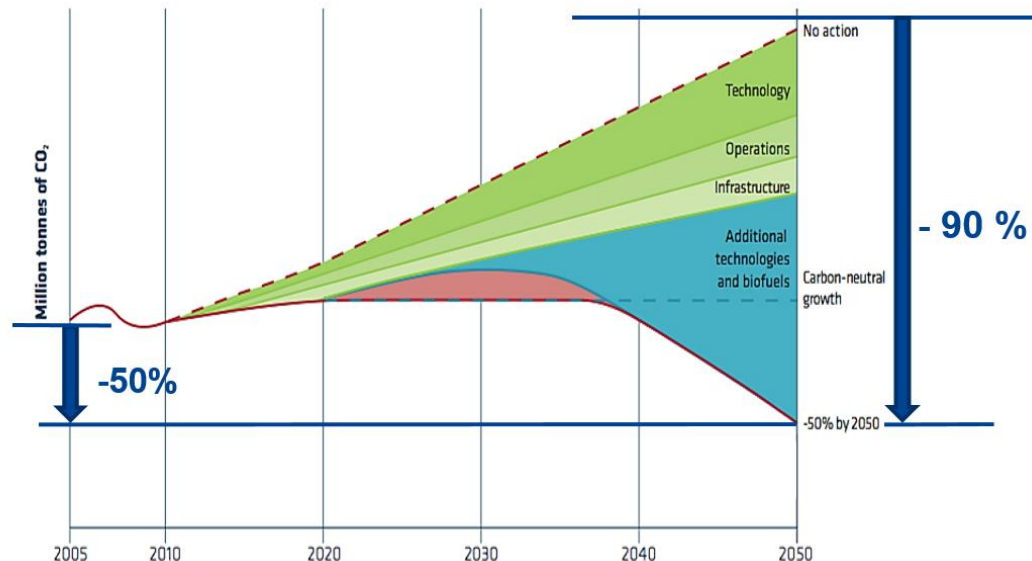
2

R&T AND THE ENVIRONMENT

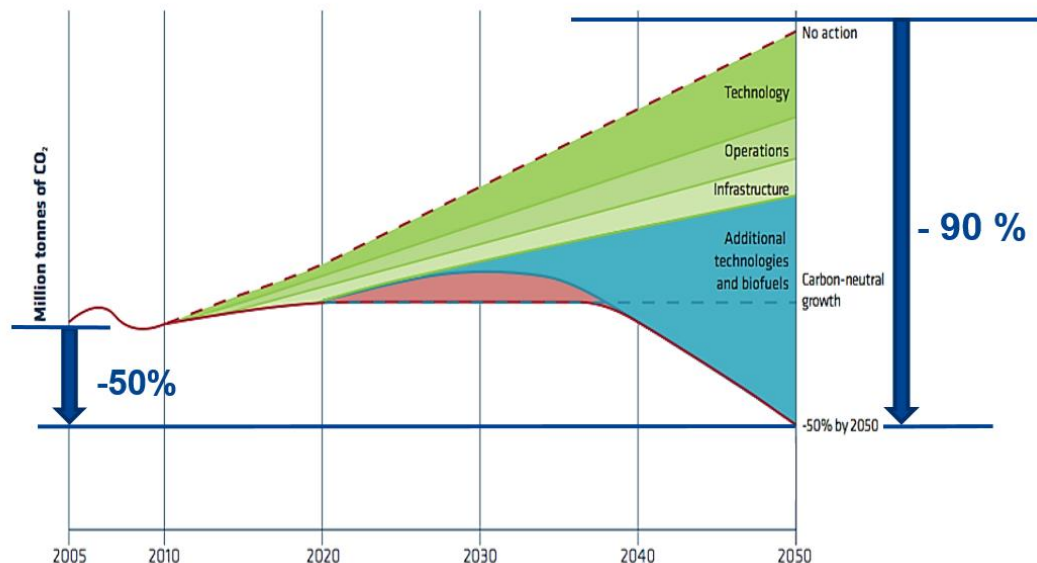


TOP PRIORITY: REDUCE AVIATION'S CARBON FOOTPRINT

- Aviation today accounts for 2% to 3% of CO₂ emissions
- In 2008, the Air Transport Action Group (ATAG) set an ambitious objective of reducing CO₂ emissions by **50%** in 2050 in relation to 2005
- With forecast air traffic growth of 5%/year (= a 3.5-fold increase by 2050), meeting this goal means a **90%** improvement in average emissions per passenger/kilometer (2015 fleet)



SEVERAL DRIVERS NEEDED TO REACH THIS GOAL



1. Renew global fleet with new-generation aircraft and achieve incremental improvements

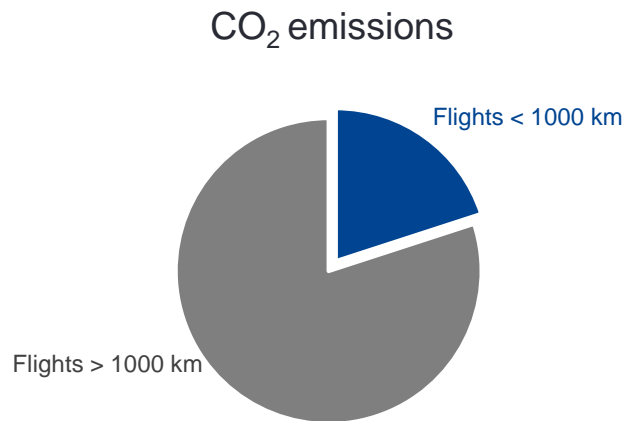
2. Improve air traffic operations and management

3. Introduce disruptive technologies

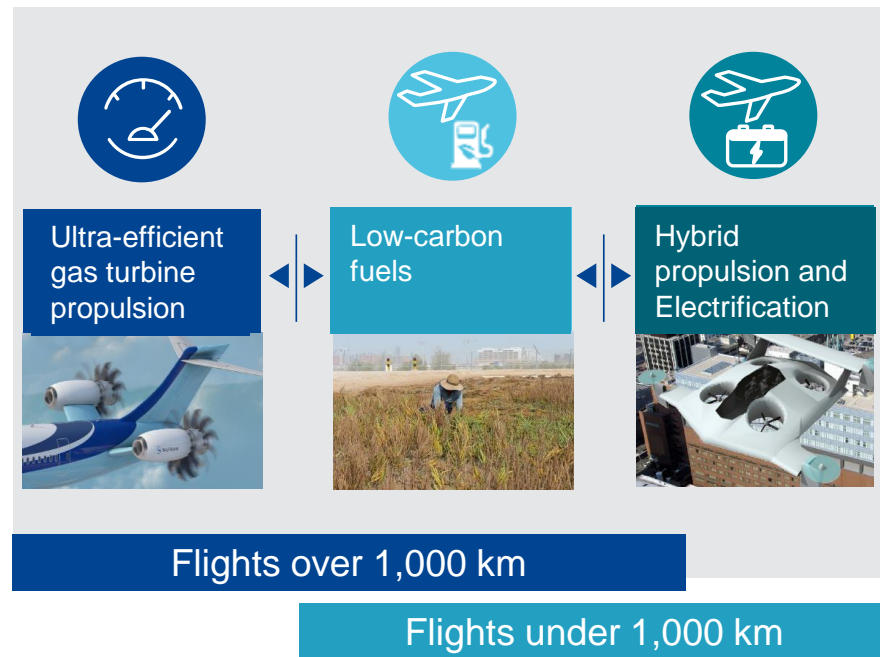
4. Replace existing jet fuel

... while also reducing other pollution (noise, NO_x, particles, etc.)

ENERGY SOLUTIONS FOR DIFFERENT TYPES OF AIRCRAFT

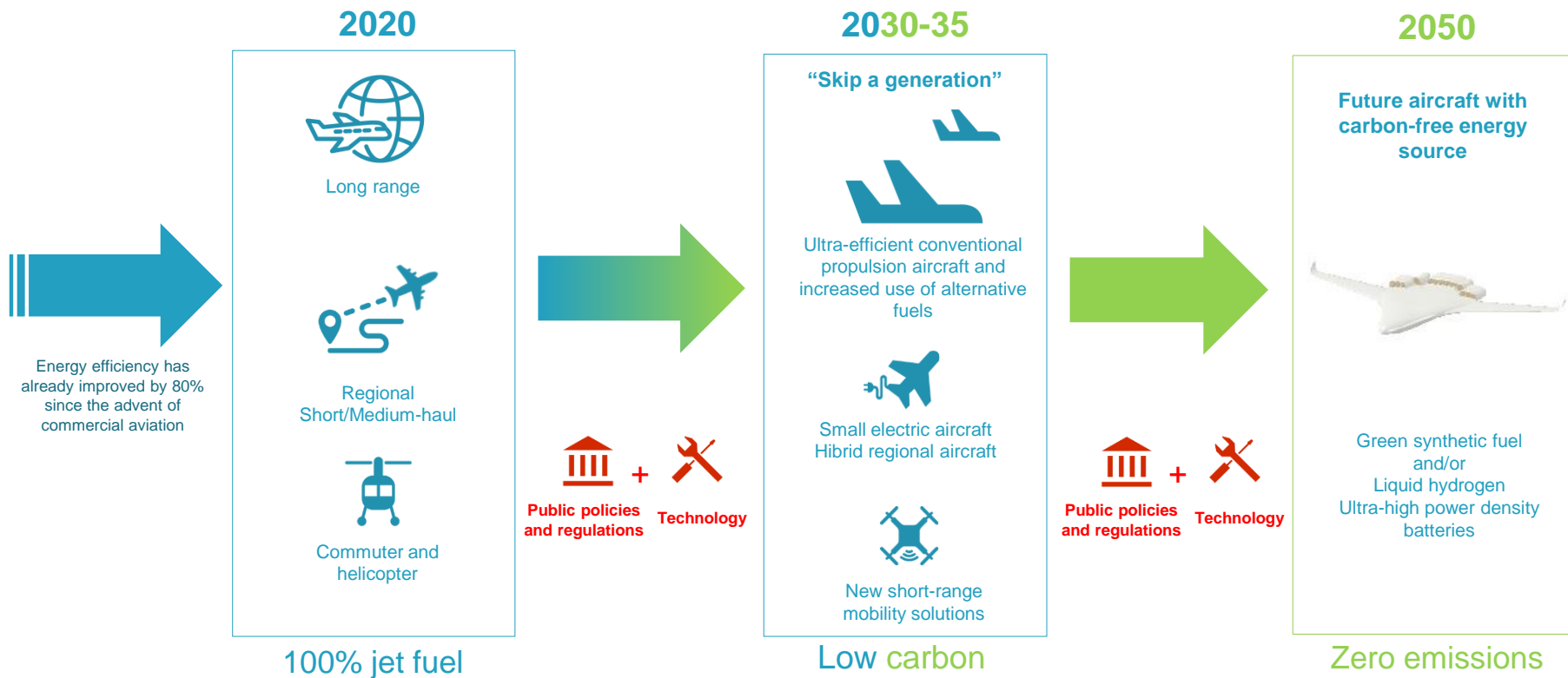


Source : DLR/ Sabre 2014



Flights accounting for 80% of CO₂ emissions will largely continue to use combustion propulsion systems until at least 2040.

SUCCESSFUL TRANSITION TO DECARBONIZATION



LOW-CARBON FUELS



Biofuels

Using conventional resources
(biomass, waste, algae, etc.)



Green synthetic fuels
from decarbonated hydrogen

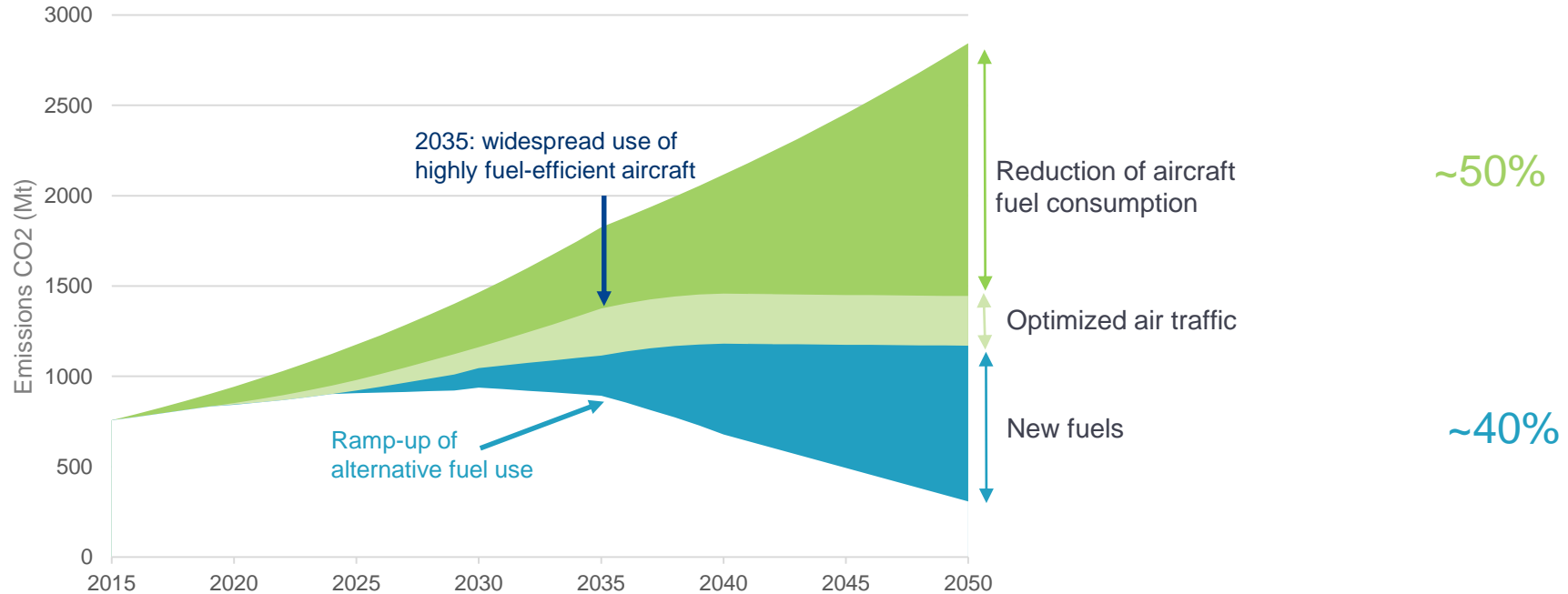


Liquid hydrogen

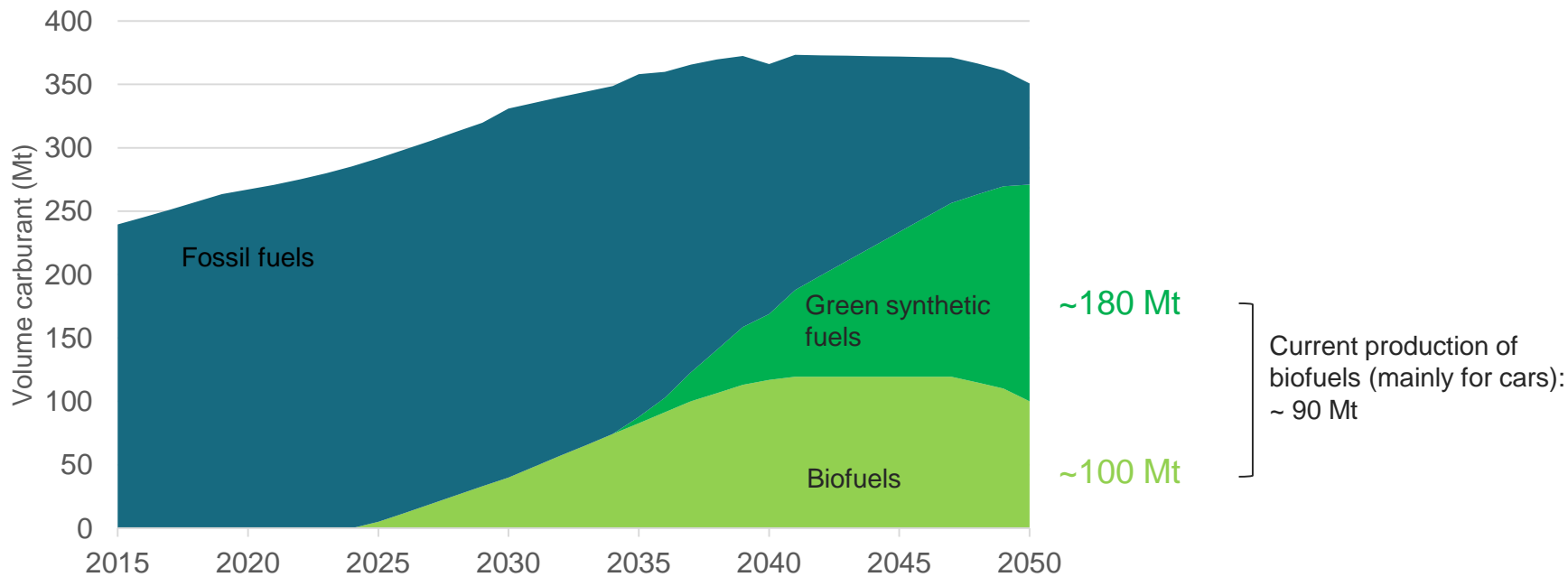
Existing aircraft and
infrastructures

Disruptive aircraft, new
infrastructures
→ Higher risk and longer term option

SAFRAN'S VISION OF A POSSIBLE DECARBONIZATION STRATEGY



REASONABLE AMOUNTS OF GREEN FUELS



SAFRAN'S COMMITMENT TO CARBON-FREE AVIATION

75%

of R&T spending on
the environment





SAFRAN'S VISION FOR CARBON-FREE AVIATION

- The goal for 2050 **can be reached**, solutions exist
- Meeting this objective demands a **shared vision** by all stakeholders worldwide (industry, airlines, public authorities, energy experts) and a **strong commitment** within their respective fields
- **Safran is a key player in any change**, because of its role in most aircraft systems, especially those involving energy
- **Safran's technology roadmap** specifies contributing to a disruptive aircraft towards 2030-35 that would reduce fuel consumption by **30 to 40%**, to move towards "zero emissions" in flight in 2050





**POWERED
BY TRUST**
