**BOEING**

CASCADE
BOEING CASCADE CLIMATE IMPACT MODEL

Our goal is to put data front and center in the conversation on decarbonizing aviation.

Cascade is a data modeling tool that quantifies how aviation's sustainability solutions affect carbon emissions. Through its two modes, the Boeing Cascade Climate Impact Model, or Cascade allows the user to not only explore how aviation's decarbonization strategies can affect today's fleet, but also to build scenarios that show how each decarbonization strategy can impact emissions through 2050.
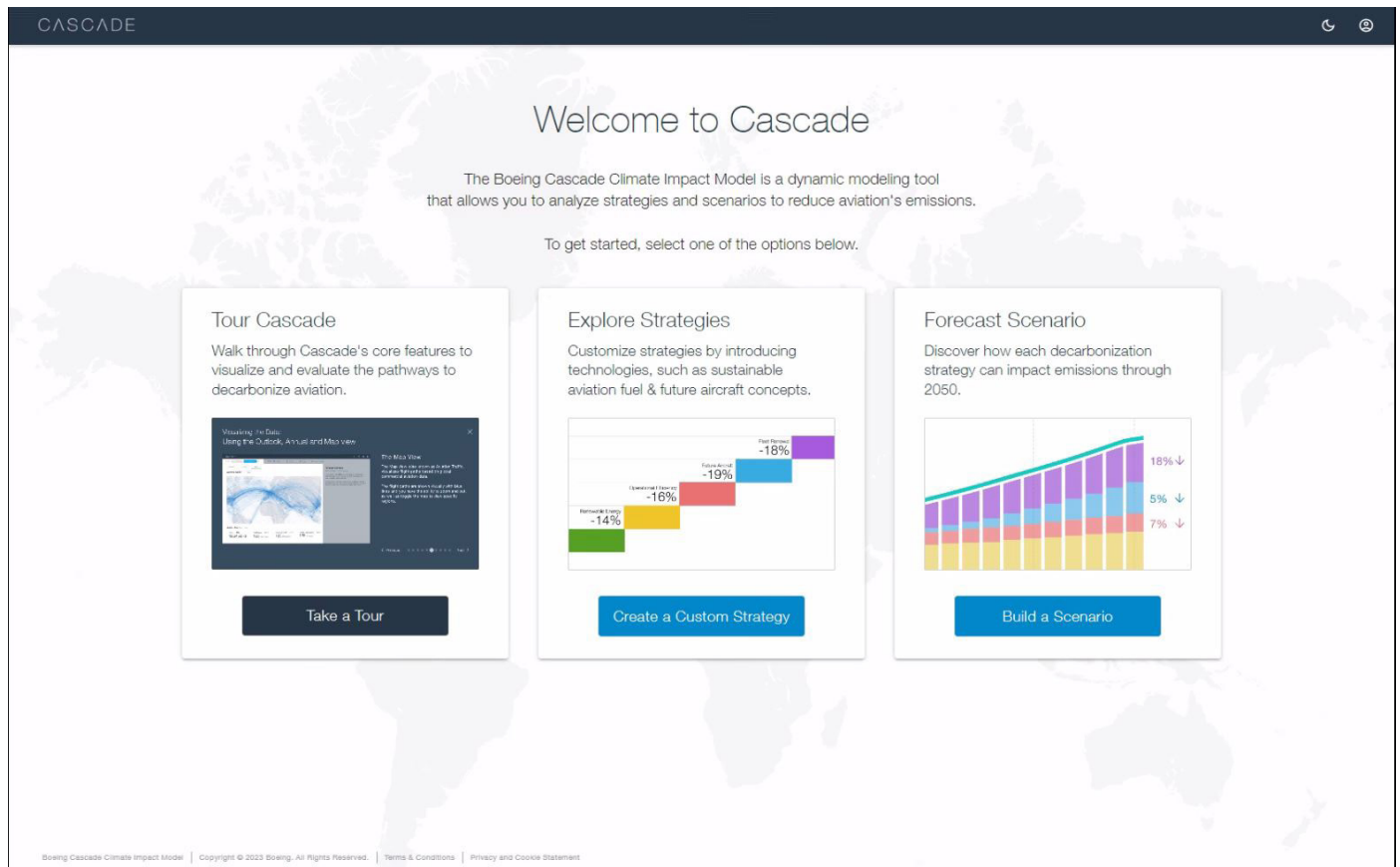
As we've built scenarios and explored aviation's decarbonization strategies through Cascade, we have learned the following

1 THINK BEYOND THE WAKE.

The emissions in the exhaust are only part of the story. To really understand how different aviation decarbonization strategies affect the climate, one needs to consider the full life cycle of the fuel considering emissions created all the way from where the fuel feedstock is grown or gathered through to the engine exhaust in the wake behind the aircraft.
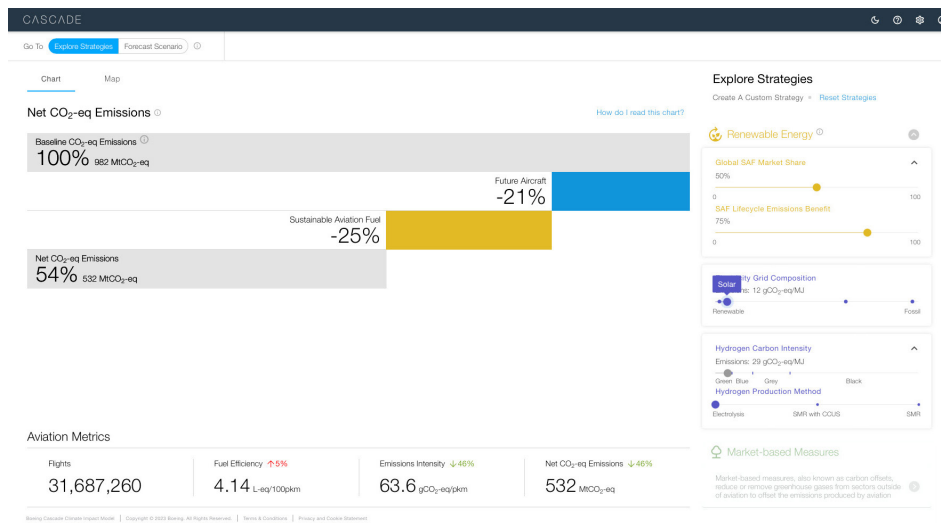
Cumulative emissions across the whole value stream must be considered to determine how we are affecting atmospheric concentrations of greenhouse gases like carbon dioxide, which is what really matters to the climate. This is why Cascade includes the full life cycle emissions of each fuel from "well-to-wake" as an integral part of the model, Further, future versions of Cascade will also consider the non-CO2 combustion emissions and affects from aviation, such as aviation induced cloudiness, to provide the total climate impact.

2 SAF IS ESSENTIAL.

The journey to net-zero is critically dependent on the overall energy transition to a low carbon future, and especially the speed with which this transition occurs.
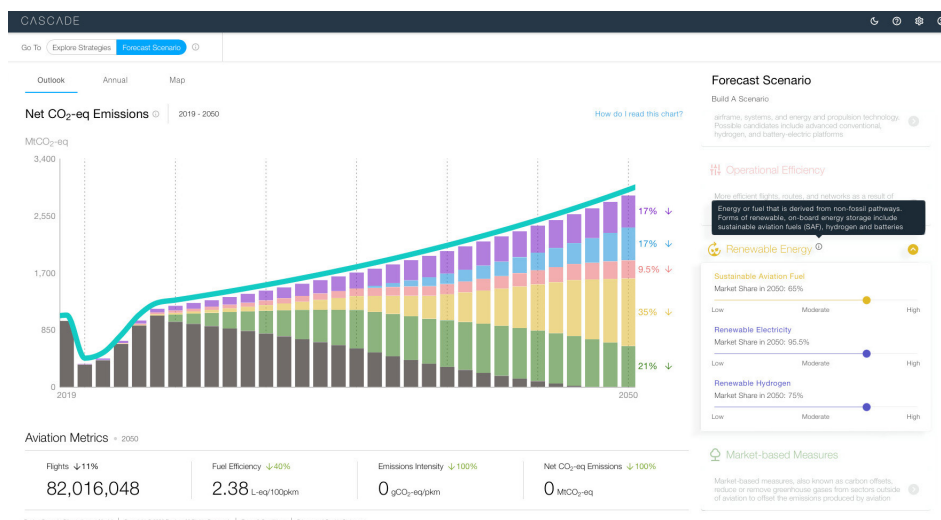
Aircraft are generally used by airlines for over twenty years and the aircraft, airport, and pipeline infrastructure our aviation system relies on took many decades to build. This is why SAF is essential — it is a low carbon fuel that can drop into the system today to improve the overall aviation emissions footprint. However, over time there will also be contributions coming from electric aircraft, and potentially from hydrogen-powered aircraft, as that infrastructure comes online. This is why it is SAF& and not a matter of SAF or something else.

More >

3 — NEWER PLANES REDUCE EMISSIONS, BOTH NOW AND WELL INTO THE FUTURE.

Improving the efficiency of aircraft is critical as this leads to less fuel being used and fewer emissions per flight. Renewing fleets with new best-in-class aircraft will significantly reduce the amount of SAF required in the coming years.
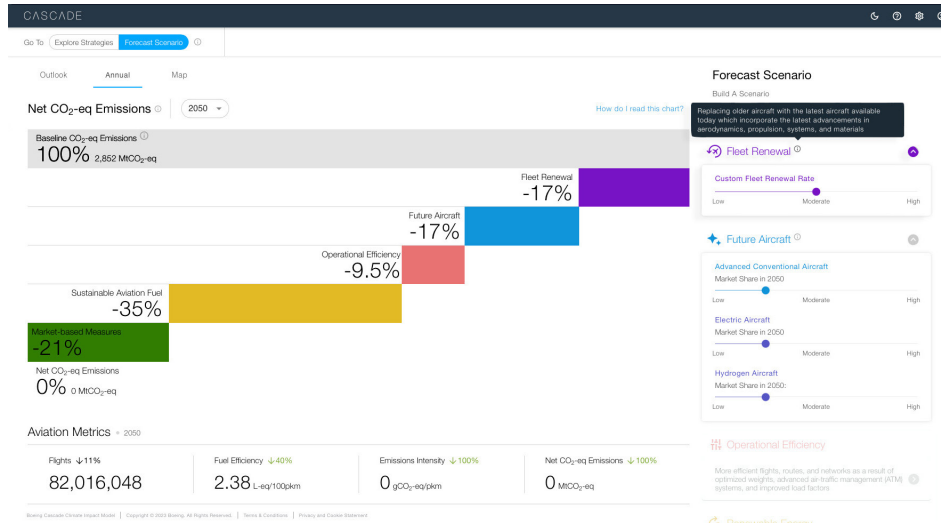
In addition, future aircraft will enter into service in the coming decades providing further improvements in efficiency through advancements in aerodynamics, weights, and propulsion. Increased production rates and reduced developmentntime-lines can help enable these benefits sooner. Cascade is able to examine a range of fleet renewal scenarios and future aircraft concepts and how quickly they enter into the fleet and increase share.

4 — DATA IS OUR COMMON GROUND. COLLABORATION ESSENTIAL.

Mapping a path to net zero is complicated. One needs to consider future growth in aviation demand alongside advancements in technology, energy, and aircraft operations while also considering the opportunities associated with out of sector emissions offsets and carbon removals. Cascade brings all of this together to help us all understand what will be required to get to net zero. By putting data first in the conversation on aviation decarbonization, we hope parties from aviation, policy, energy and finance can better understand the path toward net zero and the role each can play in the journey.

5 — THIS IS JUST THE START.

This is Cascade version 1. While we are excited about the tool and its capabilities, we are equally excited about its future development as we learn from the Cascade User Community and work together to improve this collaborative modeling tool.