Preface

On a global scale the overall population as well as the average standards of living will increase rapidly in the years to come. In parallel or even more than proportional travelling activities and thus the mobility of the people increases; i.e. the wealthier the people in general the more they travel also supra-regional. Such a most likely development tends to result in a significantly growing energy demand and due to the fact that mainly fossil fuel energy is used so far also to strongly increasing greenhouse gas (GHG) emissions. The latter most likely has the consequence that the global climate might shift with accelerating speed. And the results of such a global climate shift could have and most likely has numerous unwanted and harmful impacts on human beings and nature. Thus the global community of states agreed to put a cap on GHG emissions released due to the use of fossil fuel energy. Thus all different sectors within our highly integrated society are called to develop GHG reduction options and strategies.

This is also true for the aviation sector characterized by a predicted global annual grow of roughly 5 to 6 % also in the years to come. But due to the special requirements within this sector with very high safety standards and very demanding requests of the transportation medium aircraft related to the fuel characteristics the technically possible GHG reduction measures are limited. For example, the average technical lifetime of a modern airplane with a commercial use is around 20 to 30 years. And these planes will most likely be fueled by liquid fuels, such as Jet A-1, also in the years to come due to the high energy density of these energy carrier and the good adaptation of this fuel to the harsh conditions some 10,000 m above ground. Thus one GHG reduction measure commonly discussed for the aviation sector is the provision and use of alternative, so-called “drop-in” fuels. Such fuels show the same fuel characteristics as Jet A-1 fuels from fossil fuel energy (i.e. kerosene) and thus have to meet the same fuel standards – but they are characterized by much lower GHG emissions. This is possible if they are produced e.g. from sustainable provided biomass. Also, such a switch from fossil based kerosene to biokerosene would allow to largely close the global carbon cycle; i.e. during growth biomass absorbs the CO_2 from the atmosphere and during combustion within the turbine of the airplane the CO_2 is released again into the environment. Therefore,

biokerosene could indeed contribute substantially towards a much more climatic sound air traffic.

In theory such a switch towards aviation fuels much more compatible to global climate compared to crude oil based kerosene seems to be simple. But in reality such a transition is quite demanding due to numerous challenges, difficulties, problems, and barriers. This includes aspects related to the overall aviation sector characterized by a clearly international structure with deeply settled structures and procedures as well as a globally existing infrastructure based on fossil fuel energy. Additionally, biomass is a limited resource demanded also within the food and fodder sector, as a raw material e.g. for building purposes and by the chemical industry as well as an energy carrier also e.g. heat and/or electricity provision. Based on the available biomass advanced conversion routes and thus innovative technical processes are needed to provide the desired "drop-in" fuel allowing for a continuous market development. The latter is important because the overarching goal from the airlines point of view is that there are no major changes for the customers. And last but not least market related aspects like an adjustment of the existing standards, emission trading schemes and questions related to the overall development of the aviation sector need to be tackled. Finally, the airplane producer, the fuel provider and the airlines together with the airports need to gain experiences with such new and carbon neutral fuels. All these and even more aspects have to be taken into consideration when transforming the civil aviation sector towards more climate protection. For this reason, these aspects are tackled within the following explanations to provide a broad overview on the various aspects resulting from such a necessary switch.

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