VIRTUAL EDITION
INNOVATION WEEK 2020
Renewable solutions for transport and industry

IRENA INNOVATION WEEK 2020

SUMMARY OF KEY INSIGHTS FROM THE SESSION 6: TRANSFORMING TRANSPORT: INNOVATIVE RENEWABLE-BASED SOLUTIONS IN ROAD FREIGHT, SHIPPING AND AVIATION

ORGANISED IN PARTNERSHIP WITH:

International Transport Forum

SESSION OVERVIEW

The 3rd IRENA Innovation Week took place online between 5-8 October 2020 under the theme **'Renewable solutions for transport and industry". Electrification of end-use sectors with renewables** will be a major component of plans to decarbonize industry and transport. **Session 6: Transforming Transport: innovative renewable-based solutions in road freight, shipping and aviation**, co-organized with the International Transport Forum, explored renewable-based solutions to achieve net-zero emissions in road freight transport, shipping and aviation. Experts discussed the key innovations that can help decarbonize these sub-sectors. The discussion focused on what must be done to accelerate innovation across different dimensions (e.g. technical, political, regulatory, commercial) to accomplish the goal of transport decarbonisation by the mid-century.

4 Panels	24 Expert speakers	Participants from 91 countries

SUMMARY OF KEY INSIGHTS

From a 2020 perspective, the decarbonisation efforts in the transport sector look completely different than five years ago.

- The progress on the uptake, cost competitiveness, and performance of renewable energy options has triggered action in the sector and points toward significant additional demand for renewable energy.
- The biggest challenge to decarbonise the transport sector is scalability. A lot of technologies and renewable fuels are available and tested, however, more demonstrations and small-scale deployment is needed.
- Another challenge is economics. While there are technologies available, these are far too expensive. The market alone will not bring down the cost of sustainable transport solutions sufficiently. Policy innervations such as carbon pricing, which alone will not suffice, are needed.
- Infrastructure is a critical issue - though difficult to address. It needs to be placed ahead of the demand ramp-up, and some choices need to be made on fuel types to inform infrastructure decisions.
- A systemic view and cross-sector coordination – including a managed, planned, progressive approach – is key. The whole sector needs to move broadly at the same time. Whilst action is urgent, we can't do everything at once. We are making progress, but delivery will take time. It's a gradual transition.

Scene Setting

Opening the session, **Roland Roesch from IRENA** highlighted the Reaching Zero with Renewables report, that outlines the best available decarbonisation options for the key transport sectors, including reduced demand and improved efficiency, direct use of renewable energy, direct use of renewable heat and biomass, indirect use of clean electricity via hydrogen and synthetics fuels, and use of CO_2 removal measures.

Adding to this, **Jari Kauppila from ITF** presented the actions of the ITF to decarbonise the transport sector, including all modes of transport. The different sectors need to come together and find a common solution. For urban travelling, the zero pathway is clear. For short-distance travelling, innovative mobility solutions and electrification are key. For long-distance transport the picture is not so clear with various solutions (e.g. hydrogen, biofuels). Finding the right balance is key. Innovation is indispensable in these hard-to-abate sectors.

- **Roland Roesch**, Deputy Director of the IRENA Innovation and Technology Centre, IRENA
- **Jari Kauppila**, Head of Quantitative Policy Analysis and Foresight, International Transport Forum

Panel I: Decarbonising Shipping with Renewables

The diverse panel of experts discussed the most promising and innovative technological pathways, as well as regulatory and market solutions to achieve zero emissions in the shipping sector, including electrification, biofuels, green hydrogen, synthetic fuels and others. The panel was moderated by **Roland Roesch**, Deputy Director, IRENA Innovation and Technology Centre, IRENA and the following **panellists** joined the discussion:

- **Anne Sophie Vinther Hansen**, Investment Manager, Vækstfonden
- **Dirk Kronemeijer**, CEO, Goodfuels
- **Jakob Steffensen**, Head of Innovation and Technology, DFDS
- **Tristan Smith**, Lecturer, University College London
- **Tue Johannessen**, Senior Innovation Portfolio Manager, Maersk

Highlights from the discussion:

- **In shipping, we need a full technology disconnect from the past.** We cannot decarbonise shipping with a stepwise approach to increase energy efficiency, but we need net zero emission fuels that must come into play by 2030.
- **Short distance vessels are the big exception.** For them, the way forward is clear with battery electric ships. Pilot projects already exist. The next challenge is ensuring charging infrastructure and power sector integration at the ports.
- **The lowest hanging fruits in long-distance shipping are biofuels, but their problem is availability and cost.** Some speakers highlighted the importance to implement biofuel solutions to show that there is a demand for green shipping and to achieve immediate results, while others stressed that investment in more scalable solutions is needed.
- **Synthetic fuels are the solution to decarbonise shipping at scale in the long term**. Especially, ammonia and methanol are promising. Ammonia demonstrations must still be made, but the far-future cost projections look most promising. Synthetic methanol is the next cheapest option, possibly 20-30% more expensive than ammonia; methanol is already in use – though not green.
- **The main challenges are cost (especially related to the fuel infrastructure), scalability, and customer demand.** More than ever, political courage is needed to put a significant price on carbon – e.g. 20-30 USD per ton rather than the proposed 0.6 USD per ton – though this is difficult due to the international nature of shipping. Policy incentives must especially tackle the supply side of fuels. The cost of green shipping cannot be borne by export-dependent developing nations. Overall, the

most essential prerequisite to decarbonise shipping might be growing customer demand for green shipping.

Panel II: Decarbonising Aviation with Renewables

A diverse panel of experts discussed the most promising and innovative technological pathways, as well as regulatory and market solutions to achieve zero emissions in the aviation sector, including electrification, biofuels, green hydrogen, synthetic fuels and others. Panellists evaluated the decarbonisation potential of different options, identified their deployment challenges, weighed their pros and cons, and closed with their vision on which solutions are most likely to succeed. The panel was moderated by **Jagoda Egeland**, Advisor to the Secretary-General, International Transport Forum, and the following **panellists** joined the discussion:

- **Glenn Llewellyn**, Vice President - Zero Emission Technologies, Airbus
- **Hassan El-Houjeri**, Climate and Sustainability Technology Strategist, Aramco
- **Jack Saddler**, Professor, University of British Columbia
- **Oskar Meijerink**, Project Lead - Future Fuels, SkyNRG
- **Valentin Batteiger**, Lead Alternative Fuels, Bauhaus Luftfahrt

Highlights from the discussion:

- **No silver bullet for eliminating the climate impact of aviation exists.** A series of solutions is needed. Fuel cell propulsion technology needs to be further developed. Hydrogen combustion is promising for short-distance aircrafts. For long-distance aircraft (i.e. over 2000-3000 nautical miles), synthetical fuels are most promising. New aircraft development is needed.
- **The lowest hanging fruits are drop-in biofuels, similar to shipping.** These can be used today, however, they are not scalable and will only play a marginal role in decarbonising aviation.
- **In the short term, the most important policy measures to decrease the emissions of aviation is to switch from short-distance flight to land transport**. Other measures revolve around efficiency gains.
- **Policymaking should be cross-sectoral. As aviation is the hardest sector to decarbonise, other sectors should be decarbonised first.** Policies must be technologically agnostic and build on diversity and optionality. The high cost is a huge barrier that will be difficult to overcome in times of low oil prices. Broad societal action is needed. An interesting approach is oblige airlines to grow only sustainably.
- **The impact of COVID on aviation has been tremendous.** COVID should be seen as a caesura and an opportunity to rethink and fundamentally change aviation.

Panel III: Decarbonising Road Freight Transport with Renewables

A diverse panel of experts will discussed the most promising and innovative technological pathways, as well as regulatory and market solutions to achieve zero emissions in the road freight transport sector, including electrification, biofuels, green hydrogen, synthetic fuels and others. Panellists evaluated the decarbonisation potential of different options, identified their deployment challenges, weighed their pros and cons, and closed with their vision on which solution is most likely to succeed. The panel was moderated by **Francisco Boshell**, Analyst, IRENA Innovation and Technology Centre, and the following **panellists** joined the discussion:

- **Angie Farrag-Thibault**, Project Lead for Clean Trucking, World Economic Forum
- **Elisabeth Fretheim**, Head of Business Development, Nikola Motor
- **Henrik Engdahl**, Chief Engineer Charging, Volvo
- **Steven Nadel**, Executive Director, American Council for an Energy Efficient Economy

Highlights from the discussion:

- For trucks, the technology options are not clear yet, and all options are needed and must coexist. Regulation and policy measures must trigger demand for green freight traffic.
- The two competing options for green freight vehicles are batteries with renewable energy and green hydrogen. The three distinctions depending on the application case are range, off-time, and efficiency. Short-distance freight vehicles will likely use batteries, unless their use case does not allow for enough off-time for charging (hydrogen fuel times 15 minutes). Long-distance will likely be based on hydrogen. Hydrogen will especially take up after we have 100% renewable energy in the power sector – then efficiency of renewable energy will no longer be a crucial advantage of battery technology.
- Both technologies could co-exist for a long time with different markets favouring different solutions. Battery solutions for freight transport could dominate in Europe, while hydrogen solutions could dominate in North America. Road electrification could be the decisive distinction.
- Policymakers should commit to lighthouse emission goals that enable all stakeholders – not just vehicle producers but also utilities and drivers – to plan and prepare.
- The expansion of the power sector and smart charging play a crucial role. The bottleneck is not primarily peak generation, as most vehicles will charge during off-peak times at night and there is plenty of generation capacity. The bottleneck will be the distribution system. Industry needs to understand that, if a company needs to charge approx. 20 vehicles simultaneously – as a common example, - they will need to coordinate this with utility and expect a waiting time of five to ten years.
- Policymakers must engage in a collaborative effort to harmonise policies to help the market take off. The private sector cannot solve the remaining problems alone. This is especially true for providing the charging infrastructure.

Panel IV: Identifying Cross-sectorial Synergies in Shipping, Aviation and Road Freight Transport

A panel of experts from different transport sub-sectors brought their own perspectives to discuss the necessary actions to enable the deployment of key renewable-based solutions in road freight, aviation and shipping, and to reach zero carbon emissions by mid-century. Among others, speakers from these sectors explored and discussed options including innovative policy, technology, regulatory and market measures, as well as the potential of cross-sectoral cooperation as a means to build synergies, economies of scale and enable the complete decarbonisation of the transport. Pierpaolo Cazzola, Advisor on Energy, Technology and Environmental Sustainability, International Transport Forum, moderated this panel with the following panellists:

- Axel Volkery, Team Leader Clean Transport, European Commission (DG MOVE)
- Christoph Wolff, Head of Mobility, World Economic Forum
- Jane Hupe, Deputy Director, Environment, Air Transport Bureau, ICAO (Prerecorded)
- Mariette van Empel, Director Sustainable Mobility, Ministry of Infrastructure and Water management of the Netherlands
- Randall Krantz, Senior Project Advisor, Getting to Zero Coalition, Global Maritime Forum (GMF)

Highlights from the discussion:

- Decarbonising transport requires improvements in three areas: legislation, regulation, and market. In these areas, we need action, cooperation, and innovation.

- **A systemic view is key. Policy interventions must recognise the different sector preconditions for decarbonisation.** Policies must limit cannibalisation effects between sectors and use resources where they exert the greatest impact.
- **The COVID pandemic may trigger a lasting behavioural change and has reinforced the joint convication that system resilience is important.** COVID impacted aviation strongly, but not so much heavy-duty trucks and shipping.
- **There must be a policy mix of measures at the demand and supply side.** Aviation and shipping inherently call for a global policy approach, while regional solutions can coexist for freight traffic.