Movement Matters is a series of inspirational thought leadership events exploring new ideas about places, people and economies. Drawing on experience from leaders from around the globe, these sessions provide a burst of fresh thinking. To attend any of our events register at: www.steergroup.com/events

Event summary

SESSION 4: Adoption

One of the sectors where Net Zero adoption has been keenly felt is in Zero Emission Vehicles (ZEVs). The need for existing facilities such as airports, campuses or hospitals to adapt to include ZEV infrastructure, such as charging stations and microgrids presents both an operational and a technological challenge.

Our final webinar in the 2022 Movement Matters series introduced speakers from the UK, Italy, and the US. Over the course of the session they shared their experiences and lessons learned from solving these problems creatively and commercially including practical insights and recommendations.

Stephen van Beek, Steer's Head of Aviation North America, led the discussion, exploring the similarities and differences in approach between asset owners across different transport sectors in adapting to their Net Zero targets. **Katherine Ward**, Commercial Director, Beacon Rail explained that the rail sector has long been an energy efficient mode of transport but is focusing on making its vehicles more efficient.

Alessio Tizzanini, Head of Global Business Development and Sales – Public Transport Electrification, Enel X, spoke about the additional value to grid resilience that electrifying public transport (such as buses) can create. **Ivar Satero, Airport Director, San Francisco International Airport**, encouraged us to consider the impact of the built environment on which transport services rely – such as airport terminal buildings.

Summary

The panel identified that the rail sector has a pre-existing advantage, as train systems are energy-efficient by design and have been a long history of converting from diesel to electric or hybrid-power locomotion. By contrast, many other commercial vehicle fleets are only beginning to decarbonize. For airports, the large building footprints pose challenges regarding energy use by buildings and customer expectations regarding heating and cooling in terminals. The panel noted that fast-moving technology developments require a flexibility of approach, such as building utility corridors which can be adapted for changing needs.

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There are a number of new opportunities as transportation electrifies, including reusing older bus batteries as static battery storage. These second-life batteries can be used to supplement grid requirements, in addition to serving as a resilient power alternative to ensure EVs can recharge in an emergency.

Overall, the primary issues remain around culture change, from both service decision-makers and passengers. Public agencies and fleet operators need confidence and political will to act. In aviation, there is friendly rivalry between airports to reduce waste and be more energy efficient, as well as a growing demand for sustainable fueling alternatives from airlines. For public transit operators the confidence in transiting to Zero Emission Vehicles can be increased when suppliers provide a full-service offer, rather than solely focusing on provision of buses. Ultimately, the decision to move from internal combustion engines to new technologies requires a willingness to invest in the long-term benefits of decarbonisation.

The panellists agreed that COP 27 produced a lack of commitments to deep decarbonisation of transport, among other sectors. However, both rail and aviation are striving ahead regardless. Whilst the incentive of policy direction would improve the uptake of public transport electrification, the additional benefits are beginning to make the case increasingly tempting. Currently, the most effective structure for vendors is offering fleet electrification as an end-to-end service with industry partners, rather than competing on selling individual components.

Q&A

SvB: As a leader in your respective modes, please describe what you consider to be the challenge of Net Zero and how have you and your organisations been leading with initiatives?

KW: There are lots of live projects to decarbonise rail, but the industry is less effective at communicating these successes. As an industry, rail is ahead of the game and has long been an environmentally friendly industry. The challenge is to develop more energy efficient vehicles rather than rely solely on energy suppliers to reduce their emissions. Over the last five years, investors have demanded low and zero emission rail projects, they are not interested in investing in projects which rely on diesel traction. Beacon Rail was the first rolling stock provider to bring dual mode locomotives into the UK. These are effective at reducing emissions on lines which are not fully electrified. Beacon has also begun to decarbonise its fleet of around 500 vehicles through processes including hybridisation (converting a diesel locomotive into a hybrid using a battery and a smaller diesel engine).

IS: Airports are large, complicated facilities, with many buildings that require significant energy throughout the day. A key challenge has been to bring older buildings up to modern standards of energy efficiency. San Francisco International Airport (SFO) has rebuilt 90% of airport in last 30 years. One of the major energy efficiency savings has been running terminal buildings at fractionally higher temperatures to reduce the energy consumption of air conditioning infrastructure. Other buildings on the airport campus have been assessed for retrofitting with modern heating and cooling systems so that they are fully electric. The renovations to SFO's main terminal have achieved a reduction in energy usage of two-thirds. Another challenge for airports is being sufficiently flexible to adapt to, and incorporate, emerging technological innovations. A state-wide restriction on power

usage during the summer saw SFO having to reduce its consumption by 6%, therefore scenario planning should include power consumption resilience to enable this flexibility.

AT: We have identified three main challenges we are trying to address globally in public transport electrification. The first is regulatory frameworks. We must educate public authorities to help understand the benefits of decarbonisation beyond pure economics. The second is operator culture. Operators are familiar with conventional vehicles and require more case studies and evidence of reliability before making the switch to lower carbon vehicles. The third is gaining value from batteries throughout their useful life. Batteries can add resilience to the energy supply for charging vehicles, especially against outages caused by extreme weather events. The solution in Latin America has been to sell an end-to-end electrification service through industry partnerships rather than to seek to sell the individual components separately. Re-using batteries from vehicles in static applications is a key area of opportunity, with a pilot scheme coming online in 2024.

SvB: What are the implications for adoption given the recent announcements / discussions / decisions at COP 27? I would just add for aviation the "aspirational goal" of NetZero by 2050 as agreed to at International Civil Aviation Organization (ICAO).

IS: There were disappointing outcomes from COP 27, especially the lack of commitment to phasing down of fossil fuels. Therefore, the aviation industry must take the initiative. It is responsible for 3% of global GHG emissions, but in 30 years' time that could be 40% of global GHG emissions. Airlines have set aspirational goals for emission reductions. These have seen mini competitions develop over who can set achieve the most ambitious reductions. For California, which has regulatory incentives in place through their Low Carbon Fuel Standard, switching to Sustainable Aviation Fuel (SAF) represents 'low hanging fruit'. California also requires all-electric shuttle buses for all airports by 2035 and all rideshare vehicles to be EVs by 2030 through their Clean Miles Standard.

AT: I agree, the level of commitment from COP 27 was disappointing. However, the type of industrial revolution we are promoting is well aligned with guidelines for implementation that arose from COP. Our electric transit fleets in operation have saved over 100,000 tonnes in CO_2 emissions. Moreover, we only draw on electricity from renewable sources for our projects. The global energy crisis underlines the need to increase system resiliency. The back-up system batteries are significantly bigger than the bus batteries, and therefore could offer some grid resilience as well as recharging EV bus fleets if organised properly.

KW: Yes, the COP 27 targets were disappointing. At least in rail the culture change has already happened. If we continue to deliver more of the programmes we've already started as an industry, we'll continue to make good progress, almost regardless of policy indecision. The Total Cost of Operation (TCO) of an electric unit is very nearly the same as for a diesel equivalent and may even be lower given reduced maintenance costs. Both environmental and commercial cases point to electric over diesel.

SvB: Is hydrogen a realistic alternative vehicle power source alongside electric?

KW: There are real, working hydrogen trains in Germany. There is also another project due to start operating from the next timetable change. Hydrogen was hailed as the future but, following numerous studies into the lifetime carbon emissions, it has a similar emissions profile to diesel. This is because of the challenges in sourcing and storing hydrogen. For rail, electrification of the whole network is the goal, with battery or hydrogen to fill gaps in the network. It can be a viable, if minority solution for rail when the hydrogen is produced locally from renewable energy sources ("green hydrogen"), or produced as a waste product, as is the case in some German factories.

SvB: Because of the infrastructure required for charging electric buses, how important is to discuss with operators/owners of the power grid early in the process of electric bus implementation?

AT: It's a challenge and an opportunity at same time. Bringing power to new sites in historic cities such as London or New York is a challenge because there is not as much space available, especially underground for cables. However, electrified bus depots create opportunities to provide resilience to the grid. In the US, many utilities that own their distribution equipment are avoiding huge grid investments using battery storage to offer supply resilience. Software can make a substantial difference in grids today and in the future. For example, our smart charging software developed internally can reduce the power demand at the charging site by more than 40%.

SvB: To what degree do you feel the regional leaders in your area are recognising that we have to be thinking about the enabling infrastructure that will put us on a path to Net Zero? Is this a subject of discussion between you and other leaders in the Bay Area?

IS: It is a topic of conversation with transit is a huge issue for us. Schemes like the Google bus reduce the strain on popular transit routes. The grid represents a whole different set of challenges and discussion is more siloed in that respect. The big agencies think about it independently and then talk to power providers. We need to help drive a more cohesive engagement process. We can upgrade fuel sources as much as we like but without offsetting efficiencies on site, grid capacity will remain oversubscribed. Hydrogen only works where you can take advantage of its creation as a waste product from another process – all other methods currently are cost heavy.

SvB: What would you like the audience to take away about the Net Zero Challenge?

KW: Use more trains! The European network is expanding. In the US, we need to fight to get a high-speed rail network. More energy efficient travel, using less energy is the path to Net Zero.

AT: Electrifying public transportation is about much more than the electric bus itself. The rider may only see the electric bus, but that bus implies much wider positive environmental impacts on the overall energy system, including greater demand for renewable energy generation and improved grid resilience.

IS: Sessions like this are so important. Big power consumers need to reframe their thinking to become protectors of the environment. We may be traditionally risk averse, but we have to take big steps and take the initiative by meeting with new technology providers.

Conclusion

To sum up, the hard work already undertaken across industries and in different local contexts must not be lost and we need to make sure that incremental advances don't become disjointed. We need a few well-coordinated paths to Net Zero, rather than thousands of diverging solutions and approaches. Coordination should allow for differing socio-economic groups and different stages of national development to benefit, while the making best use of the technology advances.

On behalf of all at Steer, we would like to thank our panellists, chairs, people who asked questions and all those who listened in to our Net Zero series over the last four days. We hope that you have found the sessions informative and though provoking.