Searching for impact

Comparing transport and renewables from an impact perspective

Abstract

The energy transition has been the largest opportunity within the infrastructure sector over the past decade (~52% of transactions closed[1]), and we expect this trend to continue. Bloomberg New Energy Finance (BNEF) estimates that USD 175 trillion of investment is needed by 2050 under their Economic Transition Scenario[2], with USD ~10 trillion for renewables and USD 76 trillion required for transport. This makes the decarbonization of transport one of the largest investment opportunities within the infrastructure sector over the coming decades.

Investors have a well understood toolkit to assess the relative risk-return of the energy transition opportunity set. However, it is challenging to quantify which investments offer the most impact. In this paper, we present an Impact Return Metric that facilitates a comparison of energy transition opportunities by looking at the CO_2 equivalent ($CO_{2\text{-eq}}$) avoided per dollar invested. Our key conclusion is that transportation investments tend to offer a higher Impact Return than renewables where the grid is already clean, and therefore, can be attractive for investors looking to meet their carbon reduction impact outcomes.

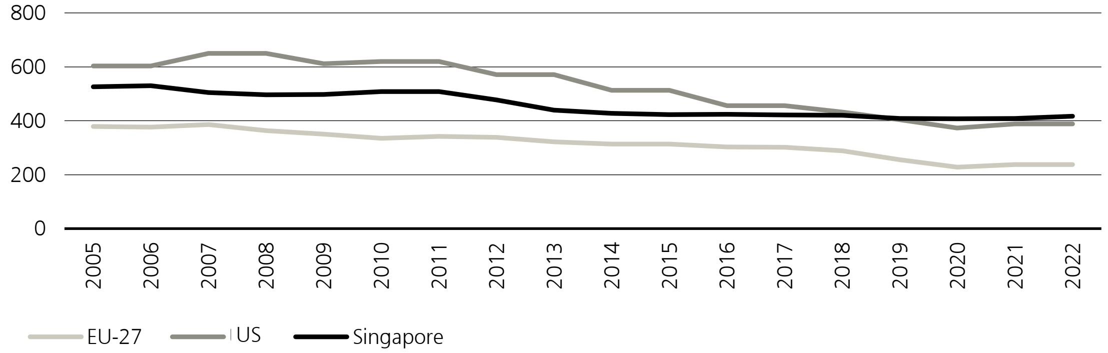
Clean grids driving electrification

Over the past decade, ~65%[3] of the investment in the energy transition has been into grid decarbonization, primarily renewables, with a smaller share in storage and grid infrastructure. This investment resulted in a significant fall in the carbon intensity of the grid (see Figure 1) in many developed markets, facilitating broader electrification programs. A key beneficiary of this electrification strategy is transport, which is now the largest investment sector of the energy transition according to BNEF.[3]

The steep change in transportation investment from 2015 coincides with the fall in grid emissions intensity, while also benefitting from tailwinds such as the falling cost of technology (batteries have fallen by ~90%[4] over past decade), policy support, regulation and stakeholder pressure to decarbonize.

The relationship between grid emissions and the Impact Return of the electrification of transport is intuitive. When investing into fleet transition, an investment in an electric vehicle which displaces a diesel vehicle will have a high carbon reduction impact in a country where the grid is clean, whereas if the grid is dirty, the impact will be lower. Therefore, as grids become cleaner over time, the impact return from the electrification of transport will increase.

Figure 1: Grid carbon intensity has been decreasing across EU-27, US and Singapore (gCO_2/kWh)



Source: US Environmental Protection Agency (EPA); European Environment Agency; Singapore Energy Market Authority (EMA), September 2024

A quantitative approach to measuring impact

Many investors grapple with where their investment can have the most impact. We present an Impact Return Metric which provides a quantitative assessment of the $CO_{2\text{-eq}}$ avoided per dollar invested (CO_2/USD).

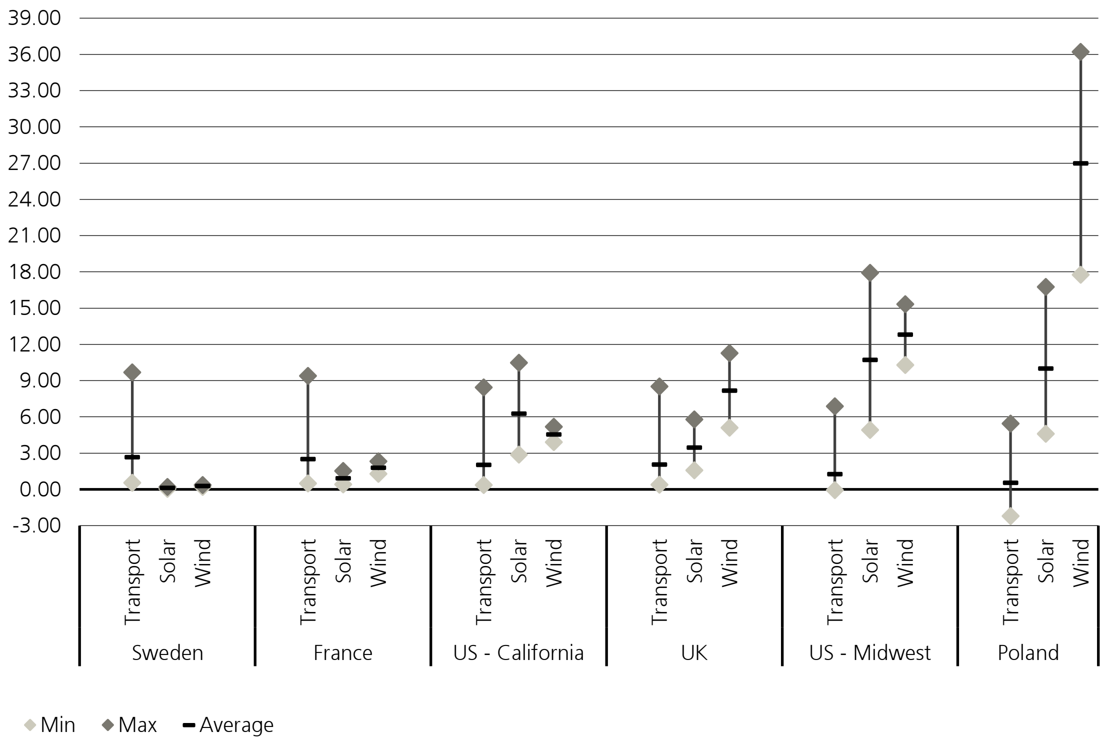
We have compared transport and renewables across different geographies. Our analysis shows that electrified transportation can have a higher impact return vs. renewables in countries where the grid is already relatively clean (see Figure 2).

For example, in countries with low grid emissions such as Sweden (~10 gCO_2 / kWh), the Impact Return for transport can be up to 25x[5] higher than for new investments in wind, while in Poland (~720 gCO_2/ kWh), investing in wind power can deliver 7x higher impact return than transport, illustrating the importance of considering grid emissions when assessing Impact Return for transport.

The continued growth in renewables is essential as an enabler for the decarbonization of the grid and wider electrification programs. As grids further decarbonize, the Impact Return for the electrification of transport will grow against renewables.

Figure 2: Transportation offers higher Impact Returns than renewables where the grid is already clean

The bars reflect the ranges of Impact Return (CO_2/USD) of different technologies within transport, solar and wind.[1] Kgs of CO_2 avoided per dollar invested.



Source: UBS Asset Management, Real Estate & Private Markets (REPM), proprietary data insight model created by UBS REPM, July 2024. Note: **1** The range for transport includes ~30 different types of vehicles. Kg of Co_2 emissions avoided for transport are calculated based on Scope 1 and 2 emissions of electric vehicle vs. diesel vehicle. The range for solar includes C&I , small scale and grid-scale applications. Wind includes onshore and offshore applications. The emissions avoided for solar and wind are calculated based on displacing the equivalent capacity (assuming average emissions intensity of the grid). **Past / expected performance is not a guarantee for future results**.

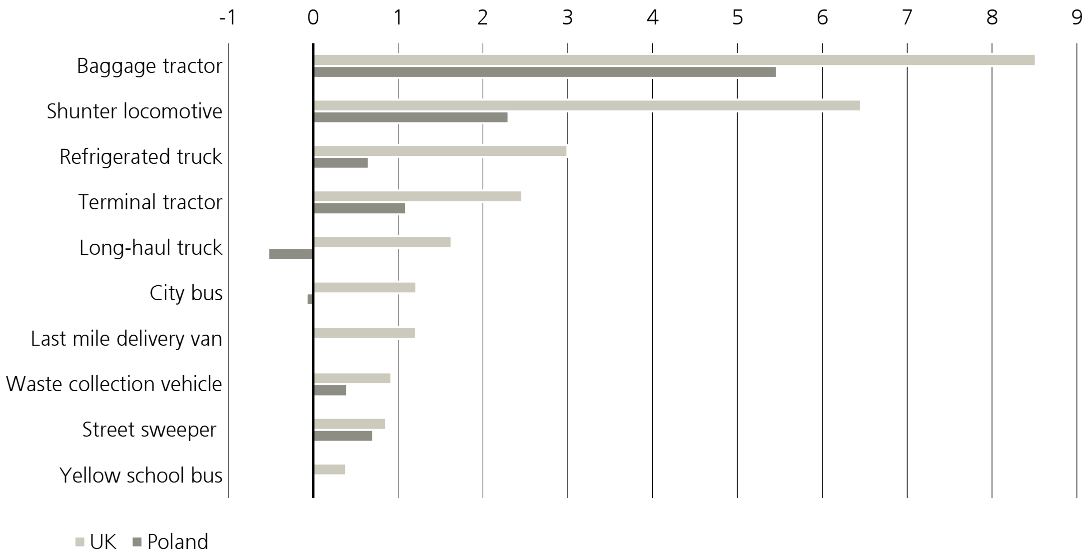
Not all transport opportunities are created equal

In addition to the grid intensity, the level of impact that can be generated from transport is determined by the characteristics of the vehicle and its use case. In Figure 3, we show the Impact Return across a range of commercial vehicle applications in a country with high grid emissions (Poland) and a low one (UK). The key differences between commercial transport use cases are driven by their duty cycle characteristics, such as the utilization rate, operating speed, idling time and operating load of different vehicles.

For example, baggage tractors and terminal tractors are representative cases of vehicles with the highest impact as the use case involves high utilization, and these vehicles also benefit from high idling time and low operating speed. These characteristics contribute to material energy savings for an electric vehicle vs. an internal combustion vehicle. On the other end of the spectrum is the school bus, which has a lower Impact Return due to the high upfront cost, low distances travelled (i.e., only used to transport children to and from school), and seasonality.

Therefore, to maximize your Impact Return from transport, investors should consider applications with favorable duty cycle characteristics in countries with low grid emissions.

Figure 3: Impact Return can vary largely across transport use cases (Kilograms of Co_2 avoided per dollar invested, in UK and Poland)



Source: UBS Asset Management, Real Estate & Private Markets (REPM), proprietary data insight model created by UBS REPM, July 2024. Non-exhaustive list of potential transport use cases. Baggage tractor is the vehicle used in airports to transport luggage, goods and mail during the handling process of aircraft. Shunter locomotive is a locomotive used for maneuvering railway vehicles over short distances. Terminal tractor is the vehicle primarily used for transporting containers in ports. **Past / expected performance is not a guarantee for future results**.

[1] InfraLogic data, September 2024

[2] BNEF has modeled multiple scenarios for how the energy transition may unfold over the next three decades. Energy transition scenario relies only on historical efficiency trends and economically competitive, commercially at-scale clean energy technologies, and results in a 27% fall in emission vs. current levels by 2050.

[3] BNEF, Energy Transition Investment Trends, January 2024

[4] Source: Lazard's Levelized Cost of Energy Analysis 16.0, April 2023

[5] In Sweden, the max for transport application is 9.7kg Co_2/USD (baggage tractor) and max for wind is 0.38kg Co_2/USD (onshore wind). In Poland, max for transport application is 5.47kg Co_2/USD (baggage tractor) and max for wind is 36.2kg Co_2/USD (onshore wind).

Key takeaways

The Impact Return Metric can help investors to evaluate between opportunities to maximize impact through emissions reductions.

In countries where low carbon power and renewables make up a large share of electricity generation, the Impact Return from transport electrification investment is typically higher than for renewables.

Transportation presents the largest opportunity for energy transition investments up to 2050, and therefore, can offer an attractive opportunity for investors to generate impact at scale.

Risk Disclaimer
The Impact Return Metric is designed to provide a quantitative assessment of the CO2 equivalent (CO2-eq) avoided per dollar invested. The Impact Return Metric discussed is a simple measure that looks at the CO2 equivalent (CO2-eq) avoided per dollar invested. The capex and Co2 avoided data are generated from our databases which track Scope 1 and 2 emissions for renewables and transport. Our lifecycle model was deemed to be aligned with ISO14000:44 by a leading ESG consultant in September 2023. The range for transport includes ~30 different types of vehicles. Kg of Co2 emissions avoided for transport are calculated based on Scope 1 and 2 emissions of electric vehicle vs. diesel vehicle. The range for solar includes commercial and industrial (C&I), small scale and grid-scale applications. Wind includes onshore and offshore applications. The emissions avoided for solar and wind are calculated based on displacing the equivalent capacity (assuming average emissions intensity of the grid). While this metric can be a useful tool for evaluating the potential emission reductions, it is important to recognize its limitations. The Impact Return Metric is based on certain assumptions and data inputs, such as the average carbon intensity of the grid, that may not fully capture the complexities and variabilities of real-world scenarios when **additional generation capacity is added. As such, the metric should not be relied upon as the sole basis for investment decisions.**

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