Feasibility study on carbon credit generation through e-mobility solutions in (rural) Western Kenya

Key messages

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Introduction

This report provides a feasibility analysis on the technical and organisational aspects of carbon credit generation from e-mobility activities in Kenya. Building on the report “A blueprint for carbon credit generation through E-mobility solutions in rural Western Kenya” (hereafter referred to as the Blueprint), this feasibility analysis looks at the key design features, the suitability of the proposed activity to follow a programmatic approach, the applicability of carbon crediting standards and methodologies available for e-mobility solutions, the application of the selected methodology including the estimation of mitigation outcomes, an analysis of costs and revenues of the crediting process, and an analysis of the time frame for the project registration under the selected crediting standards.

The study considers the crediting potential of various e-mobility solutions including e-bikes/e-cargo bikes, e-motorbikes/ e-bodas, e-buses and e-outboard engines, as well as batteries and charging stations from a number of start-up partners in Kenya. Key design features that influence the carbon credit generation potential and associated transaction costs of the proposed activity are assessed, including (i) choice of programmatic vs project-based approach; (ii) technological scope; (iii) geographical scope; (iv) choice of carbon crediting standard, and (v) the choice of baseline and monitoring methodology.

Building on the Blueprint’s recommendations, the study explores the feasibility of applying a Programme of Activities (PoA) to accommodate the scaling-up plans for the broad range of proposed e-mobility solutions, potentially also in other East African countries. Successfully navigating the carbon crediting cycle requires upfront funding and special expertise as well as time. The authors stress that a key success factor for PoA implementation is a capable Coordination and Managing Entity (CME) with the necessary financial and human resources over the lifetime of the PoA.

Methodologies

The analysis of applicable methodologies shows that no existing methodology covers such a broad scope of e-mobility technologies. The potentially high costs of developing a new methodology that covers all the e-mobility solutions covered by the start-up partners would undermine the PoA’s feasibility. Thus, instead of striving to incorporate all proposed technologies into the PoA, it is recommended that the PoA only includes those technologies for which an applicable methodology is already readily available.

In this case, the Clean Development Mechanism (CDM) methodology AMS-III.C offers a simpler additionality demonstration procedure over the Verified Carbon Standard (VCS) methodology VM0038 and thus, potentially lower transaction costs. However, it is also recommended to seek clarification on whether certain technologies, such as e-boats or the inclusion of retrofitted vehicles, could be included in existing methodologies with only a minor revision effort and relatively low transaction costs. For both the VM0038 and AMS-III.C, a request for clarification on the inclusion of e-boats and retrofits of existing

vehicles would need to be sought. If such an inclusion is successful, more technologies could be integrated in the PoA with a fraction of the cost of developing a new methodology and in a relatively short time. The CDM methodology AMS-III.S would cover retrofitted vehicles from the outset but requires a more complex approach for additionality testing, associated with higher transaction costs.

The selection of the appropriate methodology has to be taken in congruence with the choice of the crediting standard. As discussed in the Blueprint, it is not recommended to seek registration under the CDM at this point of time, in light of the anticipated wind-down of CDM operations and transition of CDM activities and methodologies to the new crediting mechanism to be established under Article 6.4 of the Paris Agreement. However, approved CDM methodologies are also applicable in voluntary carbon market (VCM) crediting standards such as the Gold Standard (GS) and VCS. The GS and VCS carbon crediting cycles are similar, with GS requiring additional review steps.

Mitigation potential

Under CDM methodology AMS-III.C, activities with a market share below 5% are deemed additional. Since the market share of electric vehicles is less than 5% in Kenya, the proposed PoA would most likely pass the additionality test. However, the market share would need to be proven separately for each e-mobility solution during the registration process.

We analysed the emission reduction potential associated with the scale-up plans of the Siemens Stiftung (Foundation) and its start-up partners. Specifically, activities introducing electric buses, where the mitigation potential per vehicle can reach up to 50 tCO_2e, or e-motorbikes where the potential number of vehicles to be introduced is massive, were found to be attractive e-mobility solutions for carbon credit generation. The successful deployment of 3,400 e-buses in five years could result in emission reductions of 140,000 to 200,000 tCO_2e, with the lower value associated with grid-connected and the higher value with renewable energy-based charging systems. Electric motorbikes were estimated to have a mitigation potential of 2.2-2.6 tCO_2e per vehicle, for grid-connected and renewable charging systems, respectively. The successful deployment of 68,000 e-motorbikes within a five-year period could reduce emission by 150,000-175,000 tCO_2e.

The mitigation potential of other e-mobility technologies was found to be subject to high levels of uncertainty, in particular for electric bikes where the demonstration that they can replace existing fossil fuel vehicles is not documented. The benefits of developing the mitigation activity using a programmatic approach are higher the greater the scaling-up potential of the eligible activities. The current scaling-up plans have the potential to generate just below 70,000 tCO_2e per year, which is not significantly above the cap of 60,000 tCO_2e per year that small-scale stand-alone projects are allowed to generate. Small-scale stand-alone projects have lower fixed transaction costs and shorter timeframes due to their simplified and streamlined requirements. On the downside, implementing the programme as a small-

scale stand-alone project would offer no room for upscaling. Thus, if there is credible potential for upscaling beyond the start-up partners' current scale-up plans, the programmatic approach is likely to be worth pursuing for its added flexibility, despite the additional costs and efforts associated with its added complexity.

Based on the scaling-up plans communicated by start-up partners, the cumulative carbon crediting potential is estimated to be between 290,000 and 350,000 tonnes of carbon dioxide equivalent (tCO_2e) during a five-year crediting period, for fully grid-based and renewable-based charging scenarios, respectively.

Regarding the monitoring, reporting and verification (MRV) process, options that include individual/residential charging may face challenges in conventional data collection processes to assure the current measurement of the electricity consumed by the e-mobility solution. In case of central charging points and stations, the data collection process can be simplified decisively through the digitalisation and automatisation of the data collection process. This shows the close link between the determination of appropriate MRV procedures, the underlying business model and planned charging options.

Alignment with Paris Agreement

GS and VCS are currently undertaking efforts to enable the generation of carbon credits that comply with the requirements of Article 6 of the Paris Agreement and the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA). Such carbon credits would attract a broader set of buyers, including emerging Article 6 procurement programmes, airlines and voluntary buyers striving for best-practice carbon neutrality claims. A key requirement is the avoidance of double counting with the host country's mitigation targets. To avoid double counting, the host country needs to implement corresponding adjustments (CAs) to 'uncount' mitigation outcomes associated with the carbon credits from the national emissions balance under the Paris Agreement. It is thus recommended that the CME engages with the Kenyan government (and other East African governments, as applicable) on the potential implementation of CAs.

Costs and revenues

The analysis of costs and revenue for carbon crediting under GS and VCS indicates that carbon crediting is feasible under both standards, based on the underlying assumptions regarding scale-up plans and charging scenarios. Transaction costs under the GS are generally higher and timelines longer compared with VCS, due to GS's additional requirements relating to the programme's sustainable development impacts. On the other hand, carbon credits issued under GS tend to fetch a higher unit price and attract a broader range of potential buyers compared with carbon credits issued under VCS, potentially offsetting GS's higher transaction costs. Obtaining host country approvals, potentially including commitments by the host country to implement corresponding adjustments, may result in additional

transaction costs and time lags. Carbon credits with corresponding adjustments are, however, likely to fetch a price premium and provide access to a broader range of demand sources. Also, there will be costs associated with the management of the PoA which have to be considered.

The study explores the feasibility of carbon crediting under three price scenarios, with the low-price scenario reflecting current VCS average prices, medium-price scenario reflecting current GS average prices and high-price scenario representing the doubling of current average GS prices. Under the low-price scenario, the net revenues from the sale of the carbon credits (net of transaction costs) would be very limited. In general, the upfront transaction costs are relatively high compared to the expected revenues at least for the low-price scenario (~40-50%). Generating sufficient net revenue from the PoA will decisively depend on the successful scaling up of the e-mobility solutions. This underscores the importance of a robust underlying business model and realistic scaling up plans. There are two options to enhance the current PoA's feasibility: minimise (fixed) transaction costs and/or maximise scaling up. Transaction costs can be minimised by avoiding methodology development costs (i.e. including only activities that are eligible under existing methodologies) and utilising cost-effective MRV (e.g. smart batteries). Some buyers, especially early Article 6 procurement programmes, may provide funding for certain upfront transaction costs. However, Article 6 procurement programmes are highly competitive and potentially time-consuming undertakings.

Conclusions

Based on the available information, it is not possible to unequivocally confirm the feasibility of the proposed programme to successful achieve registration under VCS of GS. Key challenges for carbon credits generation include uncertainties relating to the scale and pace of e-mobility activities and the lack of existing methodologies covering the full range of potential e-vehicle types (i.e., new and retrofit, e-boats and road e-vehicles, e-bicycles) considered by the start-up partners. In an ideal case, a new methodology (or a major revision of one of the existing options) would be developed to consistently cover different types of vehicles. However, this has significant implications in terms of time and budget required. In case of budget and/or time constraints, it is thus recommended that the programme would, at least initially, focus on including e-mobility solutions that are explicitly eligible under existing methodologies and that have credible scaling-up plans.

Since emission reductions are directly related to the number of e-vehicle that are introduced, the emission reduction estimates are only as realistic as the scaling-up plan (and underlying business models) that underpin them. Regarding technologies which are not explicitly included in existing methodologies, e.g., e-boats, their inclusion could be sought through clarification request or minor revisions to an existing methodology, which may, at best, be a prompt and straightforward process. Furthermore, it is recommended to consider the expansion of the PoA also to other existing activities targeting the selected e-vehicle type(s) covered in the final version of the PoA, as well as to other East African countries. This would require realistic scale-up plans, underpinned by robust business models, as well as

an efficient programmatic structure that can efficiently manage the scale-up. The benefits are related to the larger mitigation potential of the programme, as well as to the provision of an option for other technology providers to access the carbon market. This would accelerate dissemination of e-vehicles and the transformation of the entire transport sector in Kenya, and potentially beyond. Also in this case, contractual agreements can be signed to ensure unambiguous ownership of the resulting mitigation outcomes.

It is important to stress that the final design of the PoA should be considered in light of the contribution of each technology to the total mitigation potential, the robustness of their roll-out and scaling up plans and the solidity of the business model to ensure prompt and steadily growing implementation over several years. It is important to have a clear plan on key elements, such as the recharging options that will be proposed to the users (i.e. centralised charging, residential/individual charging, combination of both) as this is crucial for the feasibility of the entire programme and also provides an indication on how to design the MRV system. Two existing methodologies (AMS-III.C. and VM0038) cover new e-motorbikes, while another existing methodology (AMS-III.S.) could cover both e-buses and hybrid cars (retrofitted vehicles) as well as e-motorbikes. A clarification request could be sent to the CDM Methodology Panel for clarifying in a relatively quick manner the opportunities to explicitly include additional e-mobility solutions under these methodologies and understand whether that would require minor or major revisions. A combination of existing methodologies is possible but not recommended.

The programme's net carbon credit revenue (net of carbon credit transaction costs) is directly dependent on the carbon credit price that can be agreed with a buyer. Given the relatively high transaction costs associated with carbon crediting and uncertainties relating to the scale and pace of implementation, a medium to high (5-10 USD) price would need to be sought for the full volume to safeguard the feasibility of carbon crediting, based on current scale-up plans provided by the start-up partners. The likelihood of achieving such carbon credit prices is lower under the VCS than under GS. This would point towards registering the programme under GS, which is associated with higher carbon credit prices than VCS. However, it is important to bear in mind that, besides higher unit prices, GS is also associated with high transaction costs. Furthermore, in the VCM, high prices are often associated with low volumes, implying the need for a larger number of buyers/transactions to sell the full credit volume in the VCM. Higher prices are also associated with carbon credits with CAs, which are required for post-2020 vintages of carbon credits issued by GS for CORSIA as well as voluntary use for carbon neutrality claims, as well as by Article 6 compliance buyers, such as Sweden and the Swiss KliK Foundation. These Article 6 compliance buyers may be willing to purchase higher volumes of carbon credits (with CAs) at higher prices at an earlier stage than VCM buyers. Furthermore, they could provide support for pre-implementation transaction costs and potentially even provide some advance payments for carbon credits. However, these initiatives are highly competitive and calls are open only periodically.

It is recommended that, if a positive decision is taken on seeking carbon crediting to support credible scaling-up plans for e-mobility solutions, registration is sought under the GS, a CDM methodology is applied, a clarification and minor revision is sought to expand its scope to e-boats and/or retrofits, engagement with the host country is undertaken to obtain approval and authorisation, including for CAs, and buyers are sought in parallel from the VCM and Article 6 initiatives, with the aim to identify a buyer or buyers willing to commit to buying a significant share of the programme's estimated total volume of carbon credits at a sufficiently high price at an early stage of development. If scaling-up potential beyond the current scale-up plans is identified, a programmatic approach is recommended. Otherwise, it may be more cost-effective to opt for a small-scale stand-alone project approach.

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