Joel Nana
University of Cape Town / Sustainable Energy Africa
September 2021

How can West Africa prepare for the 'EV revolution'?

Today, 60% of light duty vehicles in circulation in West Africa are over-aged imported second-hand, primarily from Europe, Japan and the United States.[1] These vehicles often have poor emission ratings and are major contributors to urban air pollution. Their fuel economies are also generally inefficient, helping make road transport a significant portion (about 15%) of West Africa's greenhouse gas emissions (GHG). The region's high rate of urbanization and economic growth is driving increased demand for road transport, in turn increasing air pollutants. Unless West African leaders take proactive steps to accelerate a clean transition in the transport sector, this trend will likely intensify as Europe, Japan and the United States work to electrify their own transportation systems and phase out internal combustion engines (ICE), making West Africa a major dumping ground for their redundant ICE vehicles. Several European countries have already announced ICE phase-out dates, and the EU will likely make its transport electrification target more ambitious in order to attain climate-neutrality by 2050. A forward-looking electric vehicle (EV) agenda could be a major boon for West Africa, with benefits including emission reductions; improved air quality; lower energy costs per kilometer; and increased utility revenues from electricity sales, among others.[2] But what would an EV transition mean for the region's already struggling grid, and how can West African governments move forward?

A system in crisis: power supply in West Africa

The region already faces a multitude of challenges trying to bring power to its 412 million people. Just under half the region's population has access to electricity, and those that do suffer from an average 44 hours of outages per month and pay for some of the most expensive electricity in the world, with prices averaging about $0.20 per kilowatt-hour.[3]

An EV revolution would introduce new demand challenges

If West African governments put in place the right policies, incentives and regulatory mechanisms to progressively restrict the importation of ICE vehicles while incentivizing both domestic production and importation of EVs, the region could see a significant ramp-up of EV ownership by 2050.[4] In this scenario of proactive policy, about 30% of all public transport mode-share, 35% of all private transport mode-share, and 5-10% of all freight mode-share could be transitioned to EVs by 2050.

Under this scenario, about 9.9 million EVs could be in circulation in West Africa by 2050, with electric motorcycles making up 37% of the total (Figure 1). Charging these vehicles will require nearly 986,000 EV chargers — there are currently only 12.[5,6] Deploying a charging infrastructure of this scale will require significant investments, which in turn necessitates enabling policies, tax incentives and subsidies.

FIGURE 1: Projected EV fleet by vehicle type in West Africa in 2050

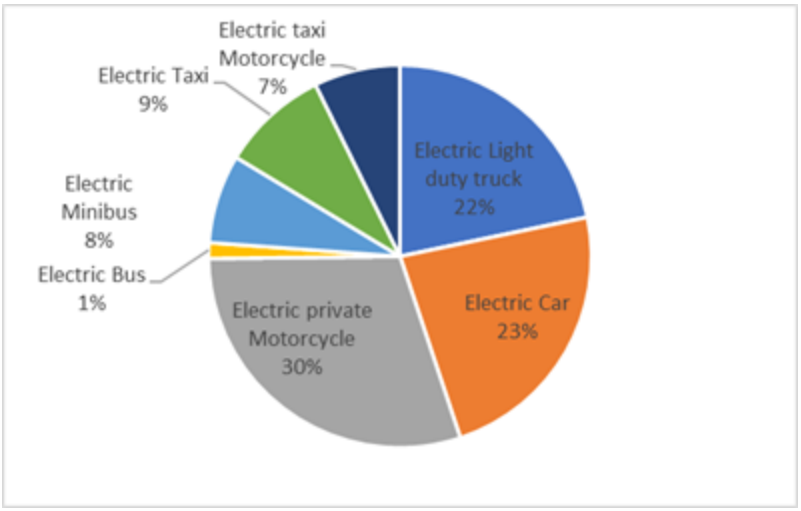
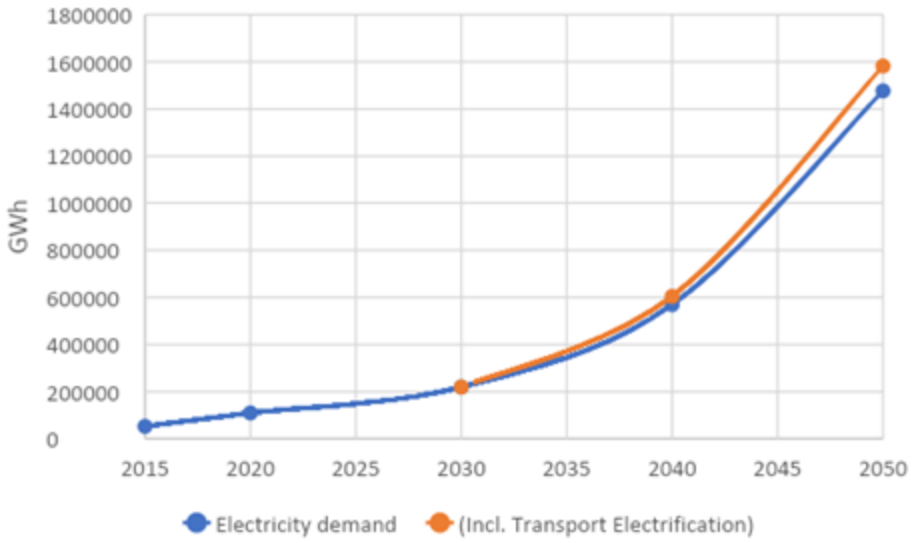


FIGURE 2: Final electricity demand projections for West Africa



Note: 2015 is the base case and all other years are estimated based on IRENA projections.[7] Data assumes the share of electricity also increases across buildings and in the industrial sector through 2050.

Under this scenario, West Africa's electricity demand from EVs is expected to reach about 105 000 GWh in 2050, a 7% increase from a 'no transport electrification' scenario, representing twice the region's total final electricity demand in 2015 (Figure 2). Meeting this additional demand would require about US$20 billion investment in generation and grid infrastructure alone – excluding investment in charging infrastructure.[8] Because EV penetration tends to concentrate in urban – most often wealthier – areas, this additional electricity demand will

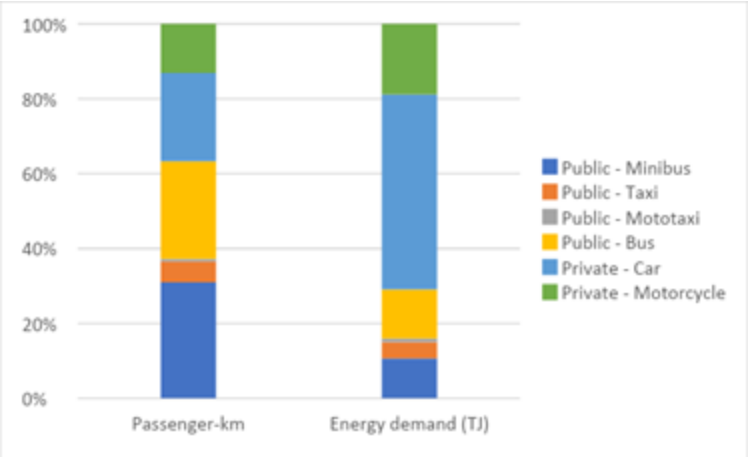
create additional pressure points on urban grid infrastructure and further stress the already constrained electricity grid.

How West Africa can forge its own path

West African governments, with support from local jurisdictions, can drive their own EV agenda through a comprehensive policy package:

1. **Introduce incentives for electrification of public transport.** Over 60% of all passenger travel in West Africa – and even more in cities – is done with public transport (Figure 3). This creates a unique opportunity to keep the public share of passenger travel high and transport energy intensity relatively low, while encouraging less polluting electric vehicles. Targeting the electrification of public transport also ensures that the benefits go to communities that really need them, rather than disproportionately benefiting more affluent households.
2. **Attract investment in EV-ready grid infrastructure through enabling policies.** While most utilities around the world will likely be caught off-guard by electric mobility, this need not be the case for the West African Power Pool (WAPP). The shift to electric transport needs to be considered alongside the investments being mobilized for implementation of the WAPP Master Plan, and integrated with planned grid upgrades at an early stage.
3. **Stimulate local sectors.** To avoid perpetuating and intensifying West Africa's dependence on foreign goods and manufactured products, West African governments should encourage the establishment of local EV assembly and manufacturing facilities like Kiira Motors in Uganda, which already manufactures electric buses.

FIGURE 3: West Africa - Passenger-km and energy consumption by vehicle mode.



Note: Transport final energy demand was obtained from the ECOWAS Energy Information System and IEA country energy balance.[9,10] The bottom-up modelling was developed with inputs and assumptions from SEA's Africa wide urban regional model.[11]

Endnotes

1. UNEP, 2020. Used Vehicles and the Environment. United Nations Environment Programme. Nairobi. https://wedocs.unep.org/bitstream/handle/20.500.11822/34175/UVE.pdf?sequence=1&isAllowed=y
2. Collett, K.A., Hirmer, S.A. Data needed to decarbonize paratransit in Sub-Saharan Africa. Nat Sustain 4, 562–564 (2021). https://doi.org/10.1038/s41893-021-00721-7
3. Regional electricity trade, key to unleashing West Africa's power: https://blogs.worldbank.org/energy/regional-electricity-trade-key-unleashing-west-africas-power
4. Vision 2050 | A strategy to decarbonize the global transport sector by mid-century: https://theicct.org/sites/default/files/publications/ICCT_Vision2050_sept2020.pdf
5. Based on the Alternative Fuel Infrastructure Directive (AFID), with a target of 1 EVSE per 10 vehicles: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32014L0094
6. EV charging station map for West Africa: https://www.plugshare.com/
7. IRENA (2018), IRENA Planning and prospects for renewable power: West Africa, International Renewable Energy Agency, Abu Dhabi.
8. Simple estimates based on the West Africa Power Pool Master Plan investment requirements. https://www.energynet.co.uk/sites/default/files/www_energynet_co_uk/pdfs/bernard_hessou_west_african_power_pool_wapp.pdf
9. SIE-UEMOA 2021. Available at: http://sie.uemoa.int/accueil/tbordconsofintotale
10. IEA 2021. Energy Balances Sankey. IEA, Paris. Available at: https://www.iea.org/sankey/#?c=World&s=Balance
11. Stone A. and Borchers M, 2020. Modelling the Urban Energy Future of Sub-Saharan Africa – Exploring Strategies for Sustainability. Supporting African Municipalities in Sustainable Energy Transitions (SAMSET). Working Paper. Retrieved from http://samsetproject.net/outputs/