

ICTP JOINT SUMMER SCHOOL FOR SUSTAINABLE DEVELOPMENT | 2023

Exploring the Impact of E-Mobility Adoption on Energy Demand in Ghana

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1. Context

- 2021 demographic data indicates 30.8 million population with electricity access of 87% with 100% urban access and 72.9% rural access.
- The 2021 real GDP of Ghana was \$28.7 billion, reflecting the country's growing economy and development. Ghana has a diverse range of energy resources, including solar, wind, hydro, biomass, oil, and natural gas.

2. Aim

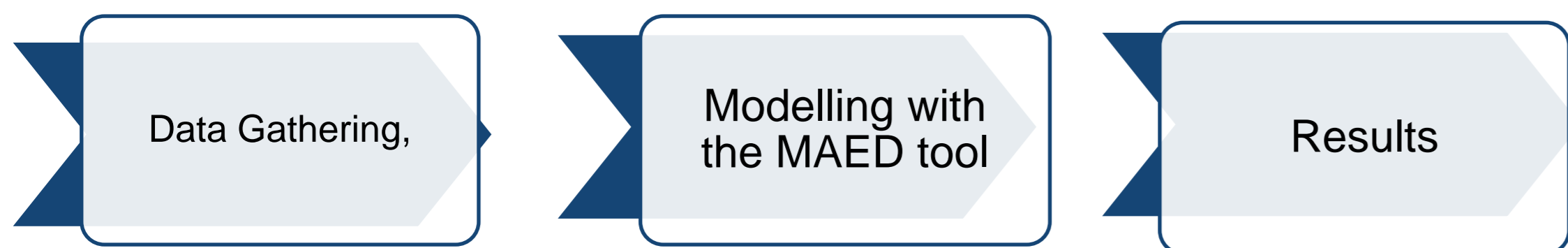
To understand how the advent of E-mobility affects overall energy consumption in order to enable informed decision-making regarding energy policy and planning, as well as to promote a more sustainable and efficient energy system.



Figure 1. Ghana's grid interconnection system

3. Methods & Scenarios

- Gathering data, Modelling using MAED tool and results/ scenario analysis



Scenarios & Assumption

BaU Scenario

Scenario Description

Analysis of Energy Demand based on current national trends, existing policies and programmes being implemented.

Key Assumptions

- Population is projected to increase from 30.8 million in 2021 to 70.1 million in 2068
- GDP to grow from 28.7 billion in 2021 to 178.8 billion in 2068
- Achieve 100% national electricity access by 2033 (in conformity with SDG 2030)



Alternative Scenario

Scenario Description

Analysis of energy demand through the implementation of government future policies to transition all rails and roads to electric.

Key Assumptions

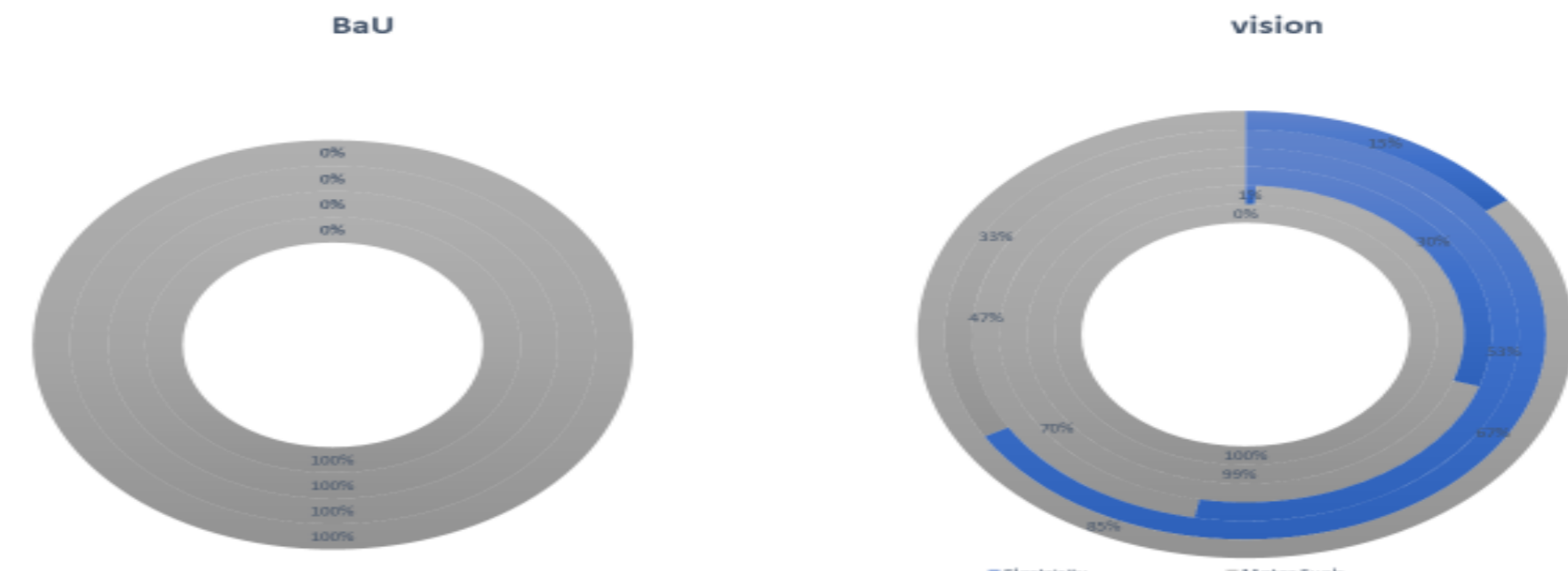
- By 2040, 40% of all road and rail mobility would be transitioned to electric by 2040.
- More than 70% of all road and rail mobility be transition to electric by 2070



Figure 2. Model methodology scenarios.

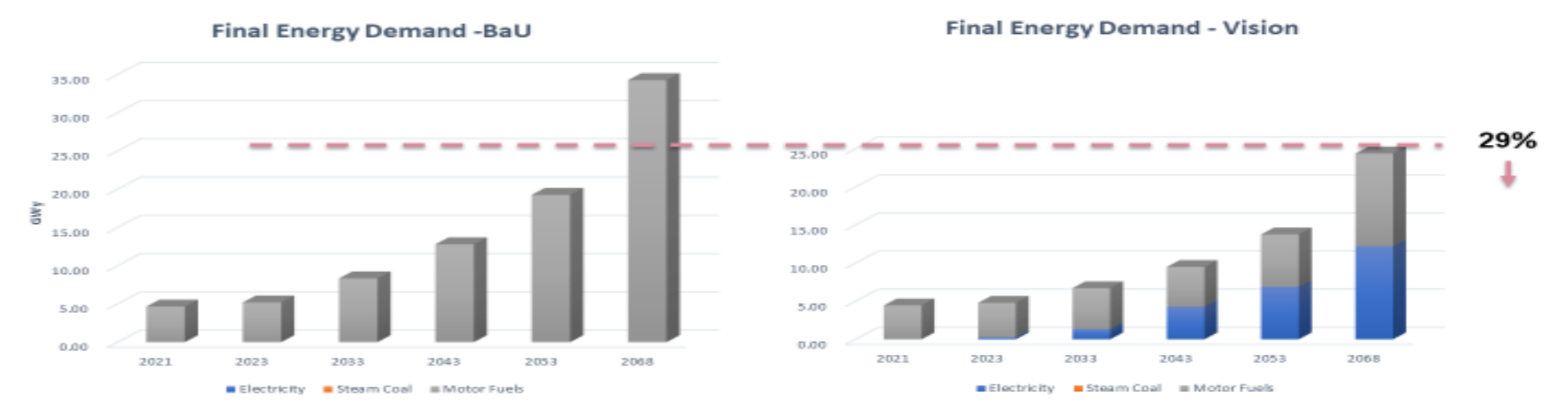
4. Results

Result-Energy Demand by Fuel

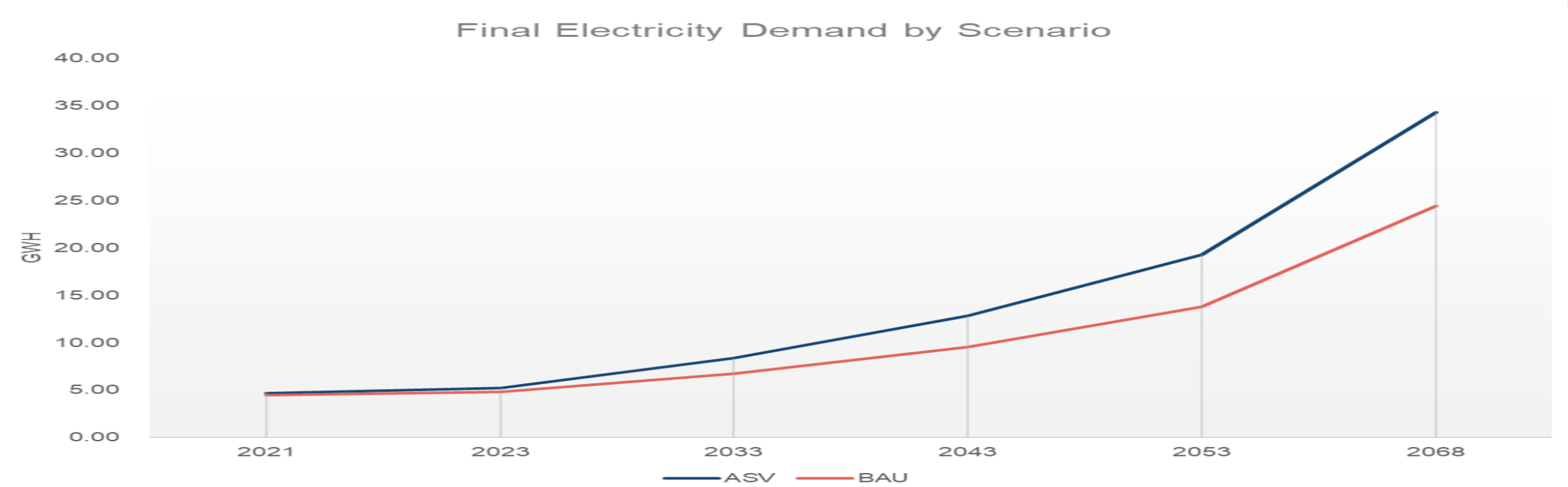


penetration of passenger electric vehicles begins to dominate the transport market

Results by Scenarios



Displacement of motor fuels due to the penetration of passenger electric vehicles



5. Policy insights, conclusions and future work

POLICY INSIGHT

- Clear legal framework on EV charging, to open the market for charging infrastructure and facilitate third parties' investment in charging infrastructure
- Government should facilitate (provide infrastructure) deployment of electric vehicles for mass transportation and private use.
- Offer financial incentives scheme at lower borrowing rates for EV buyers.
- Skill Development for EV Servicing and Maintenance by establishing training programs and collaborating with EV manufacturers, industry experts and educational institutions. These programs should cover technical skills, safety procedures, and EV-specific knowledge.
- support EV research to inform policy and decision-making.

FUTURE WORK

- Further analysis should be undertaken to assess the cost implication of meeting the demand.
- Further analysis on hydrogen fuel for road and rail mobility

6. References

- [1] NETC. National Energy Transition Framework. 2022 [cited 2022 20th November]; Available from: <https://www.energymin.gov.gh/sites/default/files/2022-11/National%20Energy%20Transition%20Framework%20Abridged%20Version.pdf>.
- [2] Energy Statistics. 2022. <https://energycom.gov.gh/files/2022%20Energy%20Statistics.pdf>

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A Cost-benefit analysis of Policy, Programs and Projects (C3PO) that is Retrievable, Reusable, Repeatable, Reconstructible, Interoperable and Auditable (u4RIA)