**For Attention:**

**Jacob Mbele**

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**Zero Carbon Charge (PTY) Ltd**

**Submission: Integrated Resource Plan 2023**

## 1. Background: Zero Carbon Charge

Zero Carbon Charge (PTY) Ltd is building a national network of green energy powered ultra-fast chargers, approximately 150 km apart, covering all the strategic highways and major routes in South Africa.

Zero Carbon Charge charging stations will generate electricity on-site using solar PV, with energy stored in lithium iron phosphate batteries. Generators fuelled by hydrotreated vegetable oil (which offers a reduction of carbon emissions of up to 90% compared to diesel) serve as a back-up power source.

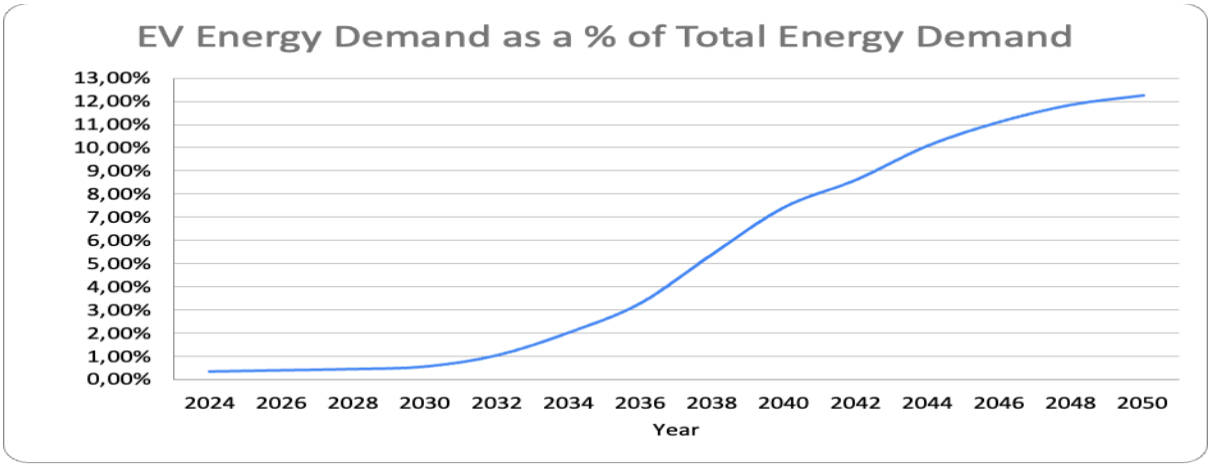
Zero Carbon Charge's total investment, worth R1,8bn will boost South Africa's rural economies by providing local jobs and an additional revenue stream for farmers. Landowners will earn 5% of the revenue generated from vehicle-charging on their land, whilst a percentage of revenue will also be reinvested in local socio-economic development initiatives.

It is envisaged that, pending various planning and land use approvals, Zero Carbon Charge will have its full network of solar-powered charging facilities operational by September 2025.

## 2. Comments on IRP2023 energy demand projections

The Zero Carbon Charge team has worked through the draft Integrated Resource Plan (IRP), supporting data and documentation released by the Department of Mineral Resources and Energy.

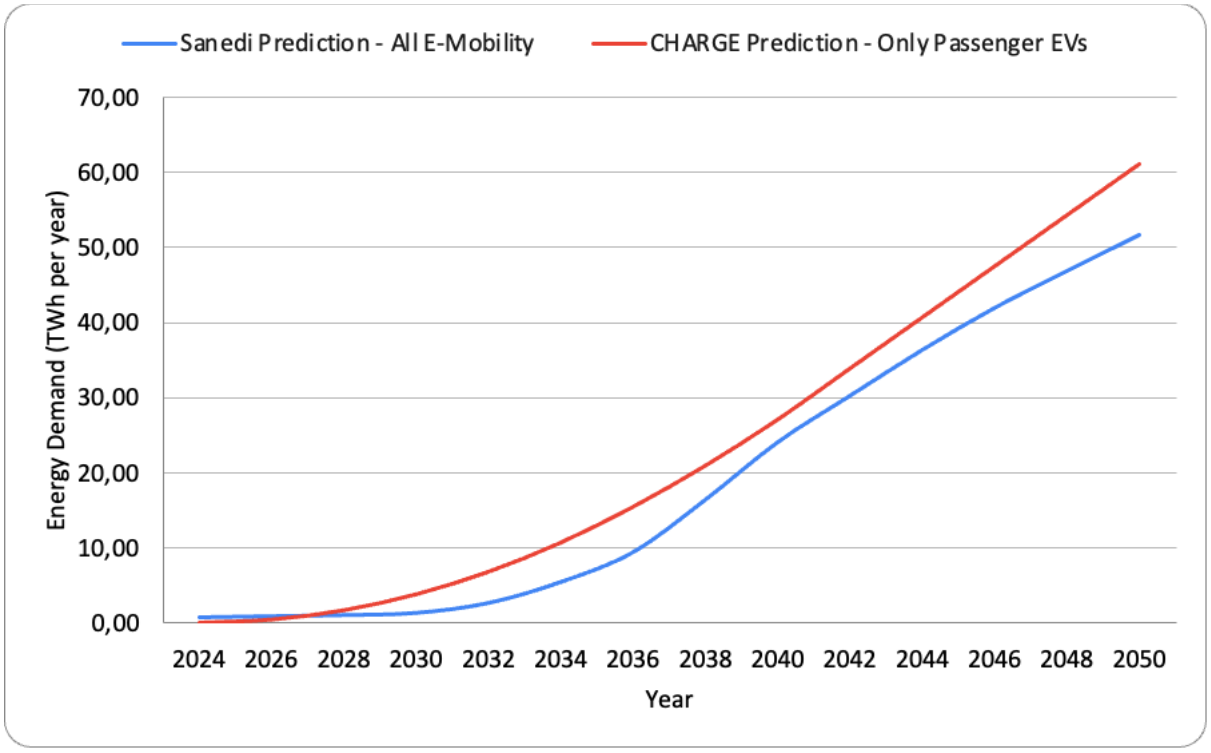
We are pleased that energy requirements of e-mobility have been considered in the report commissioned by Sanedi, which forms the basis of the energy demand projections contained in the IRP up to 2050. The forecasts, as per the IRP and Sanedi report, indicate that by 2050, more than 12% of the entire energy generation must be dedicated to supporting e-mobility.




We have compared draft IRP's forecast with our own research. We are of the view that the draft IRP's and Sanedi's e-mobility projections appear conservative. Our comparative analysis suggests that the draft IRP has not fully taken into account the increased demand that the transition to Electric Vehicles (EVs) will place on the national Eskom powered grid over the next 26 years, up to 2050.

Zero Carbon Charge conducted research based on projected EV sales, estimating the quantity of EVs in South Africa each year. Additional factors taken into consideration include the average South African driver covering 25,000 km annually, and EV energy efficiency at approximately 0.22 kWh/km. Notably, our analysis excludes potential impacts of electric trucks, with their influence expected to become significant around 2027.

Our projections for passenger EV energy requirements were then compared against the draft IRP's overall energy projections for e-mobility, and show that the demand will be far higher as indicated in the graph below. For example, by 2034, our projections predict the demand created by passenger EVs will have hit 10 Terawatt-hours (TWh), whereas the IRP predicts less than half that, at around 5 TWh for e-mobility in its entirety. In 2050, our projections show that the demand created by passenger EVs will be just over 60 TWh, while the IRP's projection is around 10 TWh less, at just over 50 TWh for all e-mobility.




Even if one uses the conservative figures presented in the draft IRP, it is clear that the growth of EVs over the next decade and up to 2050 is going to place increased demand on the grid.

When this increased demand is viewed against other matters raised in the draft IRP, most notably (a) that power outages are likely to continue until 2028 and (b) that there will be a delay in the decommissioning of coal-fired power stations until there is a stable supply of electricity in the country, two things become apparent:

1) Our national, coal fired grid, will not to be able to manage the demands imposed by the mass charging of EVs (this is not unique to South Africa, with the same question being raised about the grids in even the most developed countries).

2) Coal-powered EVs will not be the environmental game-changer helping our country to achieve a just energy transition and it's net zero targets by 2050. Research undertaken by Zero Carbon Charge shows that an EV charged with Eskom's coal-fired electricity emits 5.3 metric tonnes of carbon emissions in a year. This is significantly more than a petrol vehicle that, on average, emits 4.4 metric tonnes of carbon emissions in a year if driven over the same distance.

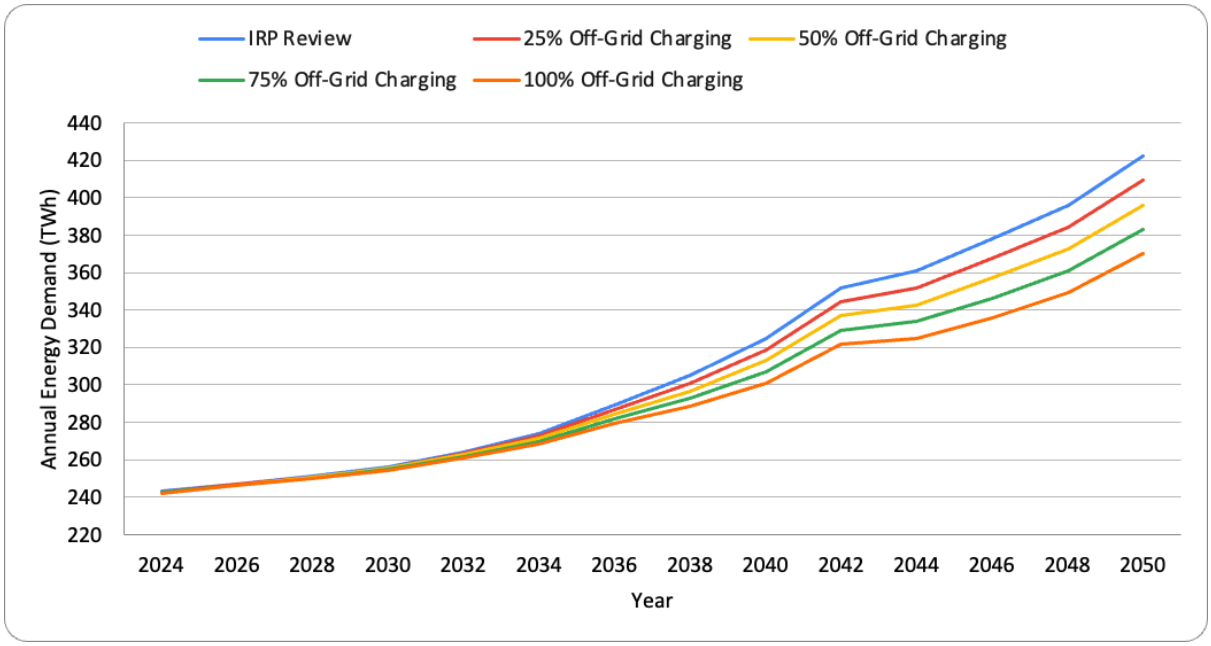
## 3. Zero Carbon Charge's Solution

The increased demand that EVs will place on the grid, and the problem of EVs powered by coal, highlights the critical need for the roll-out of EV charging stations that are powered by off-grid renewable energy. This is the only way to avoid further strain on the national grid and for South Africa to achieve its net-zero targets.

In this regard, we have used figures presented in draft IRP on the projected e-mobility demand on the grid (despite these being conservative in our view) and plotted four scenarios to assess the impact of off-grid EV charging. We explored the effects of charging 25%, 50%, 75%, and 100% of vehicles off-grid – in particular how much the burden on the grid would be alleviated for each of these scenarios.

The graph below shows that as EV adoption increases, off-grid charging has the potential to substantially alleviate the burden on the grid, with the benefits of off-grid charging increasing substantially each year from 2040 up to 2050. For example, if only 25% of EV's are powered

by off-grid charging, around 13 TWh of demand could be removed from the grid, while this figure increases to around 26 TWh if 50% of EVs are powered by off-grid charging in 2050.




It is clear that, even when using the conservative e-mobility demand figures in the draft IRP, to ensure energy security in the future and achieve a just energy transition, any plan rolled out by government to encourage the transition to EVs must include a focus on the development of an off-grid charging network that is based on renewables.

Thank you for considering our comments and recommendations. We hope to continue engaging with the DMRE on our solution to reduce reliance on the grid and, in so doing, position South Africa at a frontrunner in the move to cleaner EV energy sources.

Kind Regards

Andries Malherbe

Co-founder of Zero Carbon Charge