Energy Footprint

The South African Automotive Sector

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sanedi
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PROJECT SUMMARY

1. INTRODUCTION

Catalyst Verification Solutions (Pty) Ltd (Catalyst) was tasked with determining the Current Average Energy Consumption (CAEC) of the automotive subsector in South Africa.

For the purposes of determining the CAEC, the focus has been placed on the seven local automotive manufacturing Original Equipment Manufacturers (OEMs) in South Africa. These would be the manufacturers/fabricators of Light Duty Vehicles (LDVs) such as passenger coupes, Sports Utility Vehicles (SUV's), hatchbacks and station wagons.

Company-specific information was gathered in standardised information collection template that was circulated to key OEMs. Three companies provided information. The information has been anonymised for reasons of confidentiality. No company-specific information was received from the other four LDV manufacturers. To ensure that these companies were included, publicly available information was obtained from a combination of sources. This enabled energy consumption profiles to be established for select years. To establish a historical time series, proportional consumption of electricity purchased was calculated based on known years. Fossil fuel consumption was estimated based on a calculated average energy split.

2. CURRENT AVERAGE ENERGY CONSUMPTION

According to the information provided by participant companies and publicly available information, the energy consumption of the local manufacturing OEMs in South Africa was 2 475 763 GJ over the 2021 calendar year.

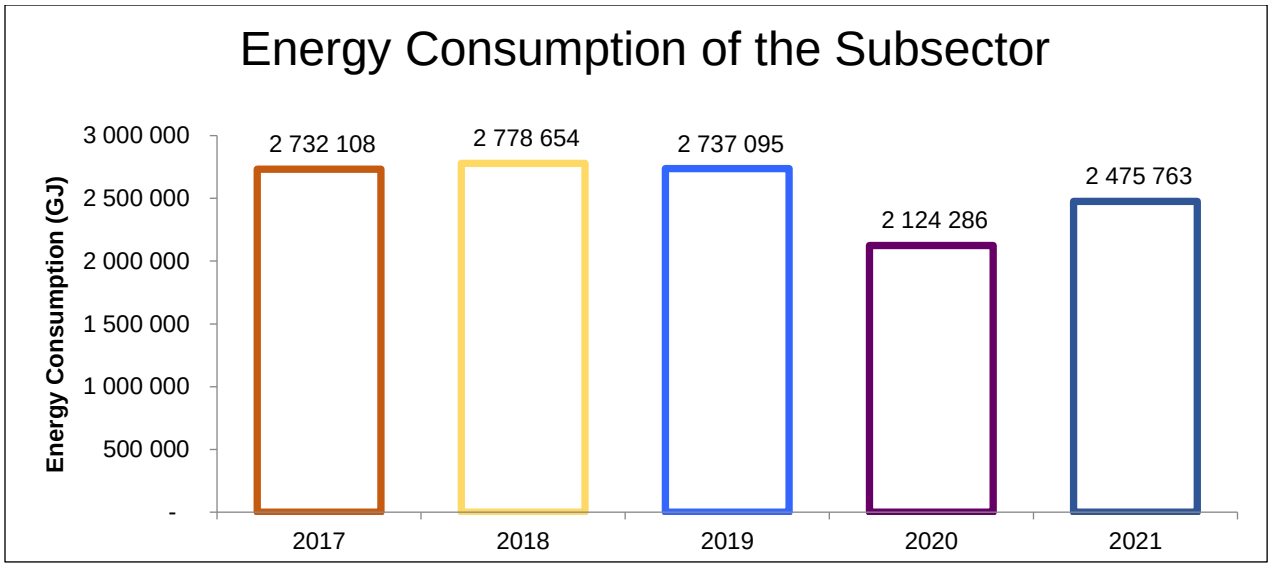

Figure 1: *Energy Consumption of 7 Key LDV Manufacturers in South Africa*

The energy intensity of the manufacturing OEM subsector was 4.531 GJ/unit for the 2021 calendar year. Due to limited information provided by the companies operating in this sector, the energy intensity consists of the aggregated energy intensities of three major manufacturers, covering the premium and midrange market segment. It must be noted that these manufacturers have actively invested in both energy efficiency and renewable energy opportunities to reduce energy consumption and Greenhouse Gas (GHG) emissions. As such, it is worth considering that the energy intensity of the subsector of 4.531 GJ/unit represents a 'lower range' estimate. The energy intensity of the subsector may actually be somewhere between 4.531 to 6 GJ/unit. Energy intensities over 2017 to 2021 are presented below:

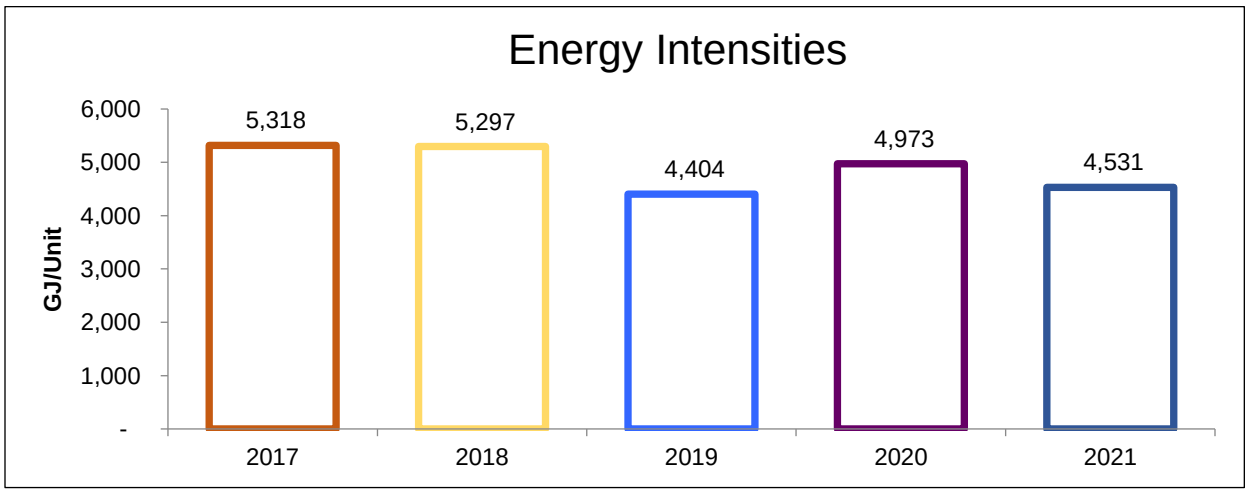

Figure 2: *Energy Intensities of the 7 Key LDV Manufacturers*

3. PRACTICAL MINIMUM ENERGY CONSUMPTION

The PMEC is the least amount of energy consumption required to produce LDVs that can be practically achieved. It is achieved through the implementation of energy savings opportunities that are both currently financially and technically feasible.

The following was done to determine the PMEC:

- For each step in the production process, identify energy savings opportunities;
- Identify whether the LDV manufacturers in South Africa have implemented the energy savings opportunities;
- Quantify the energy savings that could result from the implementation of the remaining energy savings opportunities; and
- Unpack whether the energy savings opportunities are financially and technically feasible.

To complete the above, the following was done:

- Information was requested from the LDV manufacturers in South Africa;
- Site visits were conducted to some of the LDV manufacturers in South Africa; and
- A literature review was conducted.

A number of energy savings opportunities exist for the automotive subsector in South Africa. These are tabulated below:

Table 1: *Energy Savings Opportunities in the South African Automotive Subsector – Savings Potential*

Initiative	Energy Source	Savings %	Savings Adjustment/ Rationale	Ease of Implementation	Savings (GJ)
Combined Heat and Power (CHP)	Electricity and Fuel	15%	Electricity savings are offset by an increase in fossil fuel consumption, although this is tempered by useable heat gains	Complex	371 364

Use of Variable Speed Drives (VSDs)	Electricity	4%	Estimate of motor power in paint shop used as a proxy for entire plant, adjusted down to 4% because opportunity has been identified and implemented to a degree already	Simple	62 470
Conveyor optimisation	Electricity	5%	Estimate of conveyor power in paint shop used as a proxy for entire plant +2% (conveyors are more significant consumers in other plant areas)	Simple	78 087
Lighting optimisation strategies	Electricity	3%	Not calculated. Assumed this is being done	Simple	
Chiller optimisation	Electricity	10%		Simple	156 174
Compressed air supply and demand	Electricity	10%		Moderate	156 174
Steam and hot water boiler optimisation	Fuel (Natural Gas or Coal)	4%	Adjusted down to 4% because boilers are not present at all South African automotive manufacturers. There is also uncertainty around the fuel mix used between operations	Moderate	36 561
Welding process optimisation	Electricity	10%	Adjusted minimum in range because it is assumed that this has	Simple	15 617

			largely been implemented		
Paint reformulations and paint process change	Fuel and Electricity	30%		Complex	267 382
Curing process optimisation	Fuel and Electricity		Not quantified - no data available	Complex	
Dry scrubbing versus wet scrubbing	Electricity		Not quantified - no data available	Complex	
Pre-treatment process optimisation	Electricity	15%		Complex	84 334
Oven modifications	Fuel	10%		Moderate	32 905
High efficiency burners	Fuel	5%		Moderate	16 452
Heat Recovery	Fuel and Electricity	5%	Adjusted down to 5% because bulk of heat is available in the paint shop	Complex	123 788

To determine PMEC, the energy savings opportunities were grouped into categories and the following scenarios were defined:

- **All Opportunities:** This scenario assumes full implementation of all opportunities, including all those defined as complex. It does not consider the interrelationships or take account of any potential mutually exclusivity. It should be noted that this scenario is entirely unrealistic and is included to provide an idea of the total quantum of savings.

- **Simple and Moderate:** This scenario should be regarded as highly optimistic and represents a concerted industry-wide push to optimize and prioritise energy efficiency.

- **Simple Only:** This savings scenario is a likely approximation of true savings potential for the sector at present. Note also that several opportunities falling into this category are well understood by manufacturers and are at least partially implemented.

The possible energy savings under each scenario are tabulated below:

Table 2: *Possible Energy Savings for the Scenarios*

Scenario	**Total Savings (GJ)**	**% Total Annual Consumption (2021 data)**
All Opportunities	1 401 309	57%
Simple and Moderate	554 441	22%
Simple Only	312 348	13%

From the above, assuming it is only the simple energy savings opportunities that are currently financially and technically feasible, the energy savings are 13%. The PMEC under this scenario is then 2 163 415 GJ. This may reduce over time as more energy savings opportunities become financially and technically feasible.

4. CONCLUSION

The assessment has shown that the CAEC of the LDV manufacturers in South Africa was 2 475 763 GJ over the 2021 calendar year. This can be reduced by an estimated 13%, if the financially and technically feasible energy savings opportunities are implemented. The resulting PMEC would be 2 163 415 GJ.

For further information, kindly contact:

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