Executive Summary

The feasibility study assesses the viability of the commercialization of the Aluminium Smelting Furnace (ASF) for the recycling and recovery of aluminium materials from used aluminium products. The proposed project objectives are targeted at leveraging on the rising demand for aluminium due increase in the establishment of small- and large-scale industries in Ogun State in particular and Nigeria as a whole. The Sustainable Development Goals (SDGs) 9 and 13 drive for Innovation, Industry and Infrastructure and Climate Action and these are achievable through innovation and cost-effective production process, efficient material recycling process and green technology initiative.

The ASF will be engaged in processing and recycling used aluminium materials and industrial scrap into ingots of high-quality that can be used in the industries to produce other products that are useful in homes, offices, markets and other places. The recycling process will be viable due to the proximity of many industries that are located in Ogun State.

The key highlights of the feasibility study include:

i. Technical Report: Rotary furnace provides vigorous and efficient mixing of scrap and fluxes. It is effective for dirty and mixed scrap. It has a high throughout; it can be effectively used for handling varied scrap and adaptable to local scrap.

ii. Market Potential: There is a great demand for aluminium ingots in Ogun State and the neighbouring states particularly Lagos State. Aluminium products are in high demands.

iii. Environmental Impact: Recycling of aluminium uses as less as 90% energy than producing virgin aluminium, which align with Nigeria's and global SDGs.

iv. Financial Viability: The process turnout has a strong Return On Investment (ROI) prospect due to the low input cost and high cost of recycled aluminium in the market.

The feasibility study report concludes that the commercialization of the project is technically viable, economically promising, environmentally impacting with strong potential for profitability in the region of the chosen site. It however, recommend that the project can be executed with the detail planning, site selection, financial and stakeholders' engagement.

1. Business Description

i. Purpose of the venture

The purpose of the business is recycle used aluminium products and materials into aluminium ingots for industries that use them as raw materials for their production. The ingots are used by industries such as automotive, packaging, extrusion, construction, foundries and machine shop.

ii. Description of the aluminium furnace

The rotary furnace is an efficient furnace that has been in existence for decades with proven and high efficiency in smelting aluminium and throughout mixture capability. It is cylindrical in shape and rotate to mix and melt scrap while the charging chamber is fired. The furnace is gas-fired.

iii. Recycling process and value proportion

The aluminium scrap will be recycled through a process of sorting to remove foreign materials, remelting in the furnace with fluxes to remove impurities and casting into moulds to form ingots. The value proportion of the recycled ingot is 75%.

2. Market Analysis

i. Targeted Customers

The targeted customers for the products are foundries, automotive part manufacturers, packaging industries, extrusion industries and utensils producers.

ii. Location Advantage: The site has proximity to the sources of scrap which are numerous industries, eateries and scrap sellers.

iii. Competitive Landscape: The existing recyclers use crucible furnace with smaller capacity. This short coming will be avoided. Cost-effective furnace with efficient lining will be deployed to save energy and reduce cost of production.

3. Technical Feasibility

i. Furnace type selection: A rotary furnace is very appropriate for the site region due to its ability to process mixed scrap. It is efficient in mixing scrap thoroughly due to mode of operation.

ii. Energy source and efficiency: The fuel to be used for firing the furnace is Liquified Petroleum Gas (LPG) and natural gas. Electricity will be considered in the future if the rate of power supply

to the site improves. The furnace will be properly insulated to ensure efficient heat recovery system and achieve up to 70% thermal efficiency.

iii. Input materials and processing capacity

The input materials are beverage cans, extrusion waste, castings, automotive parts, used kitchen utensils, offcuts, chips from machine shop and damaged roofing sheets. Pre-treatment will be carried out through basic sorting and de-coating may be required for contaminated scrap. Addition of fluxes and degassing agents will improve the ingot quality. The production capacity is 1-2 ton per day which is suitable for pilot operations.

iv. Site requirement:

Land size: The land size is 800 m^2 - 1000 m^2 for small-scale operation.

Utilities: There is water supply, electricity supply and access roads.

Safety System: Fire suppression, fire bucket, ventilation and PPE protocols will be provided.

v. Quality Control and Output

Product: Aluminium ingots of 90-98% purity will be produced depending on the scrap integrity

Testing: Material characterization, spectrometry and density check will be carried out to ensure consistency of the products.

Packaging: Ingots will be bundled and transported to foundries, manufactures and other customers.

vi. Pollution Control and Emission Management

Noise and Heat: Insulation materials and zoning will be deployed to minimize community impact and noise effect.

Air Filtration: Baghouse filters and scrubbers will be used to meet the environmental standard of NESREA.

Dross Management: The dross is a by-product of the aluminium recycling and can be sold to cement or steel industries.

4. Regulatory and Environmental Consideration

Licensing and Permit

The license and permit would be sought from the concerned regulatory body for industrial operations and emission

Environmental Impact

The environmental impact will comply with the local and international standards for air quality and waste disposal

Sustainability Appeal

The recycling of aluminium saves up to 95% of the energy compared to primary production.

5. Financial Feasibility

Capital Expenditure (CAPEX)

S/N	ITEMS	ESTIMATED COST (NAIRA)	NOTES
1	Furnace and equipment	20,162,000.00	It a rotary furnace of 0.3 - 0.5 tons per day
2	Land acquisition	To be provided by the institution	Provided by the institution
3	Site development	15,200,000.00	Foundation, utilities and fencing
4	Pollution control system	2,039,000.00	Filters, scrubbers and dross handling
5	Testing and quality equipment	680,000/.00	Spectrometers, scales, packaging
6	Licensing and permits	1,350,000.00	NESREA, FMEvn. and Local government fees
	Total Estimated CAPEX	19,269,000.00	

Operating Expenses (OPEX)

S/N	ITEMS	COST (NAIRA)
1	Energy (LNG)	300,000.00
2	Labour (6 – 10 staff)	960,000.00
3	Scrap procurement	6,000,000.00
4	Maintenance and consumables	1,350,000.00
5	Logistics and packaging	100,000.00
	Monthly Estimated OPEX	8,710,000.00

Revenue Projections

S/N	ITEM	DESCRIPTION	REMARK
1	Output	0.3 – 0.5 ton per day	Recycled aluminium ingots
2	Selling price	300,000.00 – 500,000.00 per day	Depending on the purity
3	Monthly revenue	6,000,000.00 – 10,000,000.00	Assuming 20 working days)

Profitability and Return on Investment (ROI)

i. Gross Margin

40-60% depending on the scrap cost and energy efficiency.

ii. Break-even Point

Estimated within 18-30 months

Return ON Investment (ROI)

Potential to exceed 85% within 3 years

The funding of the project will come from government grants for recycling and sustainability.

6. Organizational and Operational Plan

i. Staffing and Skill Requirements

The project team will be engaged in the monitoring and operations of the project. However, 6-10 staff will also be employed to work at the Aluminium Recycling Centre (FPI-ARC)

ii. Supply Chain and Logistics

Procurement of scrap for production will be operational. Smelting of the scrap and production of ingots will be carried out. Supply of ingots to targeted customers will be carried out to keep the supply chain and logistics at an optimal operational level.

Production Workflow

The production workflow will be operational with all the stakeholders working to carry out the assigned tasks.

Safety and Training Protocol

The stakeholders and all staff will receive all the necessary safety equipment and training to reduce accident and risk to the barest minimum.

7. Risk Assessment

i. Market Risks

The market risks include price volatility of ingots and competition from other recyclers. The market price will be targeted at the optimal level.

ii. Operational Risks

The equipment may during operations which may affect the operations, production output and targeted sales. Scrap quality may also affect the quality of ingots and reduce income generation. Adequate equipment maintenance will be deployed and scrap quality will not be compromised.

iii. Regulatory Risks

The necessary regulatory agencies will be contacted to obtain all the needed license and permit document and certifications.

iv. Mitigation Strategies

The necessary mitigation, laws and regulations will be attended enforced and strictly adhere to.

8. Conclusion and Recommendations

The feasibility study shows that the project is economically viable, technically sound, market demanding with positive commercialization potential with minimal risks if the working plans are strictly used. The product commercialization can go on and the project can be executed. The next step is to receive the government grant and proceed to execute the project and commercialized the product.