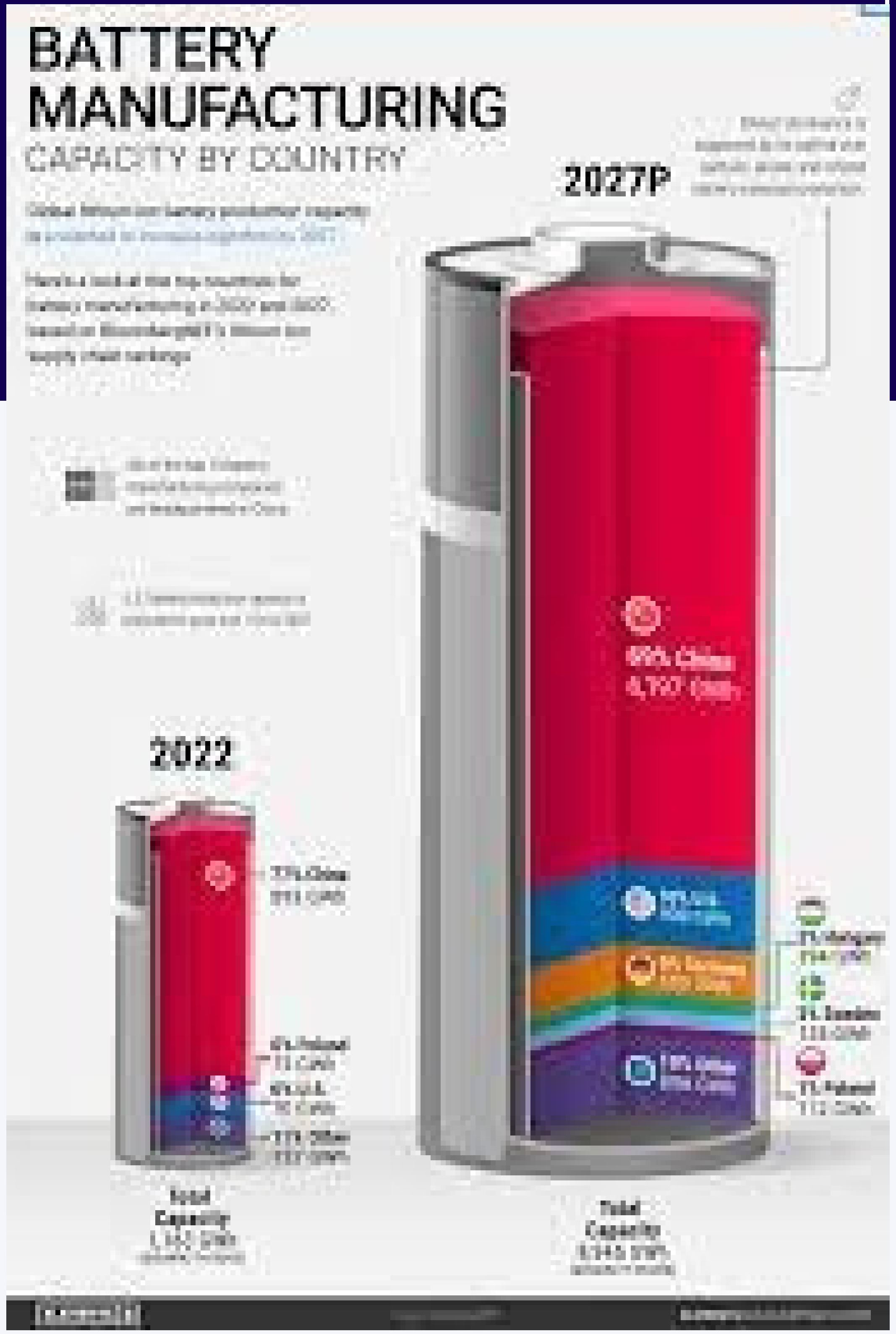
PRODUCTION OF LITHIUM BATTERY FROM LITHIUM ORE

Presented: Prof. Abdullahi Umar, Dr. Sani Musa, Engr. Sikiru Ibrahim, Dr. Musa B. Usman, Dr Awal Adamu. Dr. Isa Usman

Affiliation: Abubakar Tafawa Balewa University, Bauch

Introduction

Globally, lithium iron phosphate ($LiFePO_4$) batteries are gaining attention due to their safety, long cycle life, thermal stability, and cost-effectiveness compared to other chemistries. They are widely used in solar energy storage, electric vehicles, and backup power systems, making them an ideal choice for Nigeria's energy transition goals.



BACKGROUND STUDY

Nigeria's rising demand for reliable and sustainable energy storage is being driven by the growth of renewable energy systems, electric mobility, and the need to stabilize the national grid. Currently, the country depends heavily on imported batteries, which exposes the economy to high costs, foreign exchange losses, and supply chain disruptions.

At the same time, Nigeria is endowed with abundant lithium ore deposits, particularly in states such as Nasarawa, Kogi, Kwara, and Plateau. However, most of this lithium is exported as raw ore, with little or no local value addition. This results in loss of potential revenue, missed opportunities for job creation, and continued dependence on foreign technologies.

Problem Statement

i. Nigeria has significant lithium resources, but most ores are exported raw losing value and job creation opportunities.
ii. The global shift to renewable energy is driving huge demand for $LiFePO_4$ battery materials.
iii. Lack of local processing capacity leads to:
a. Missed industrialization opportunities
b. Import dependency for battery precursors
c. Low participation in global supply chains

Objectives

1. Develop processes for refining Nigerian lithium ore into battery-grade lithium phosphate.
2. Establish pilot-scale processing of LFP cathode materials for battery production.
3. Train Nigerian researchers, engineers, and technicians.
4. Strengthen local value chains for renewable energy st
5. Provide knowledge and technical foundation for future industrial battery production.

The Opportunities

i. The global $LiFePO_4$ battery market is projected to grow at a >20% CAGR (2025–2030).

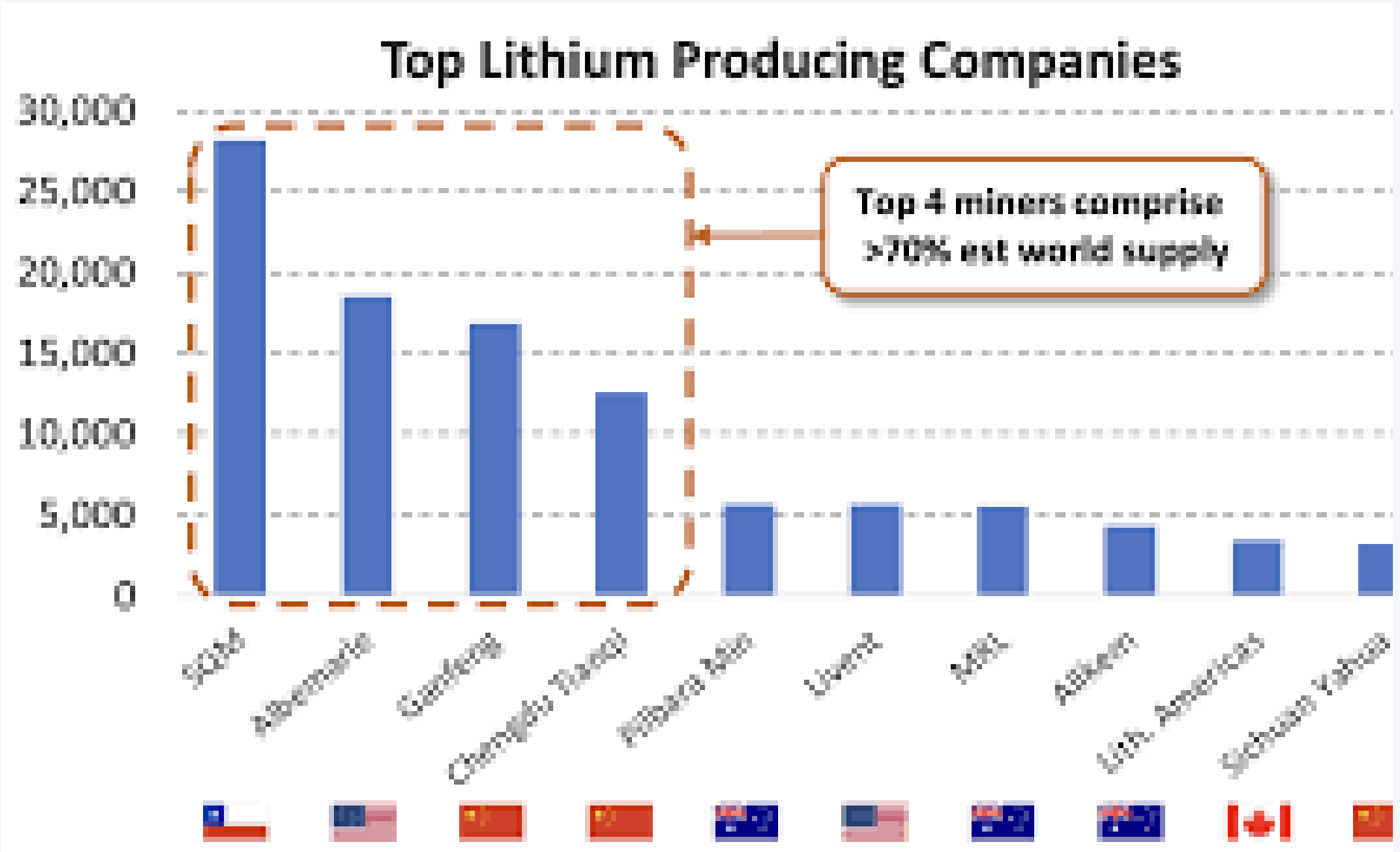
ii. Nigeria can become West Africa's hub for battery-grade lithium production.

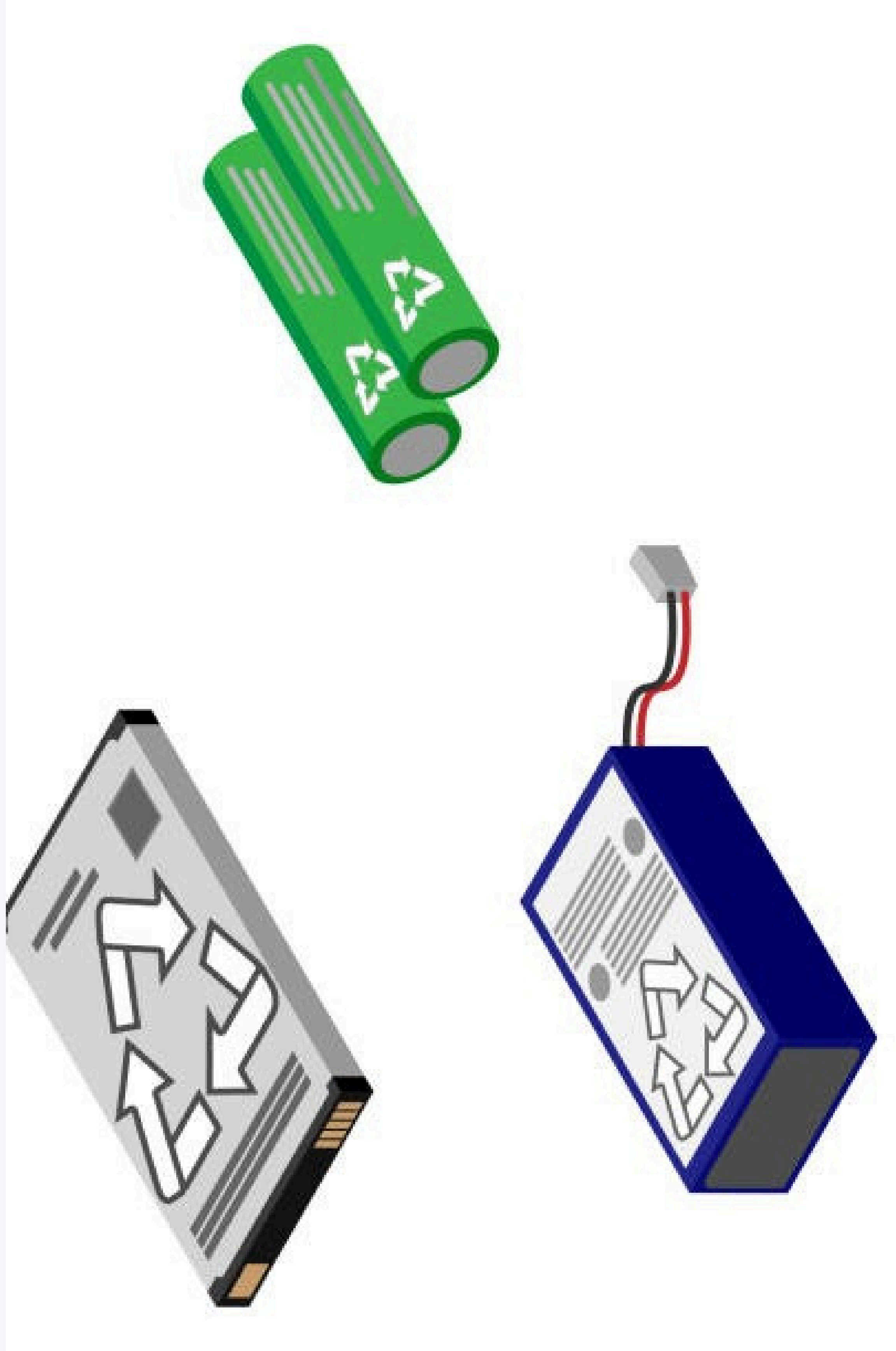
iii. Value addition creates:

a. High-tech manufacturing jobs

b. Competitive export products

c. Increased GDP contribution from the mining sector





Research Approach

Phase 1: Lithium ore sampling, characterization & beneficiation.

Phase 2: Laboratory-scale chemical processing into Li_3PO_4 precursors.

Phase 3: Pilot production of LFP cathode slurry materials.

Phase 4: Testing and evaluation in prototype cells.

Phase 5: Knowledge transfer, documentation, and scaling roadmap.

Solution / Innovation

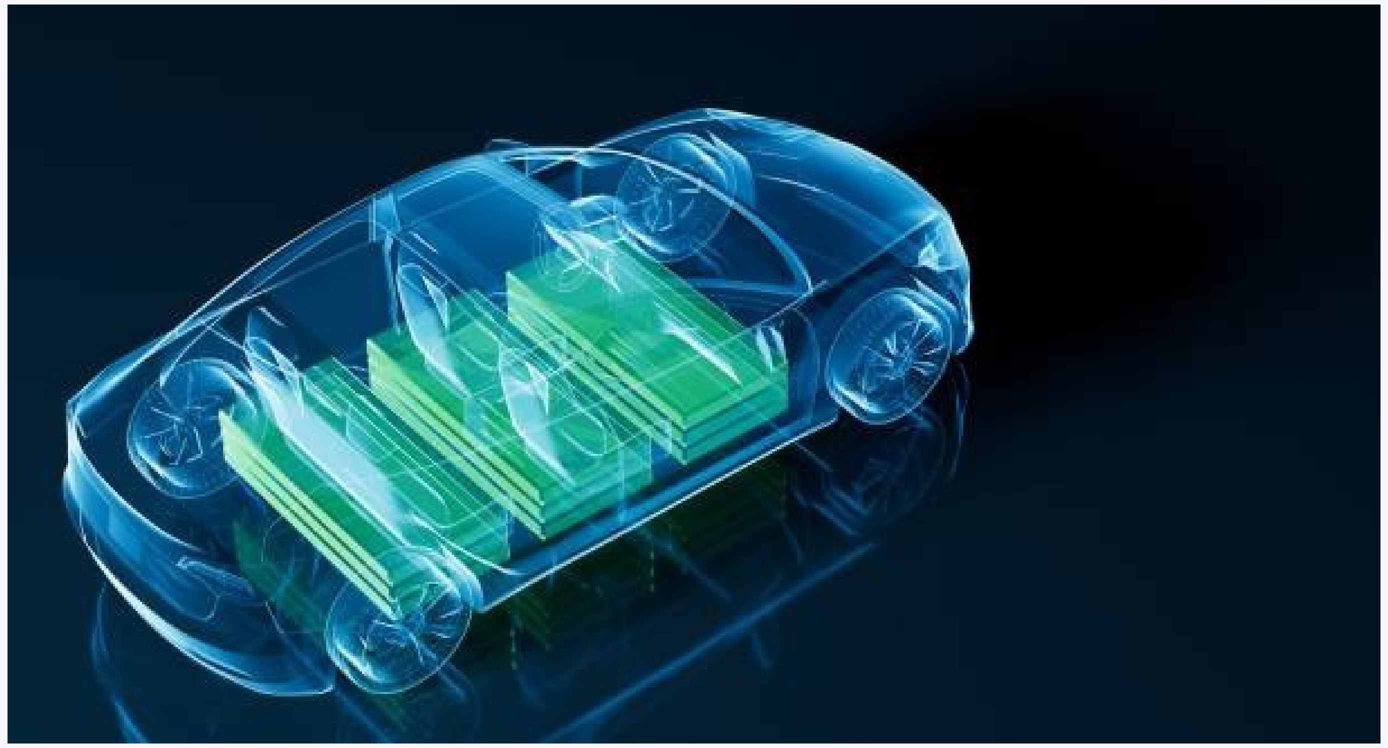
i. Novel Processing Flowsheet designed for Nigerian pegmatitic lithium ores:

a. Beneficiation → Roasting → Leaching → Precipitation → Purification

ii. Energy-efficient furnace design for spodumene conversion (15–20% lower energy).

iii. Optimized reagent use for higher lithium recovery and lower cost.

iv. Scalable process from lab to pilot to industrial scale.



Monitoring & Evaluation Plan

Quarterly reporting of milestones achieved.
Independent project audits.
Donor agency involvement in oversight.
KPIs: number of trained staff, lab outputs, process yields, published results

Market Validation

i. Market studies conducted for:

a. Lithium Iron Phosphate demand in Africa, EU, and Asia.

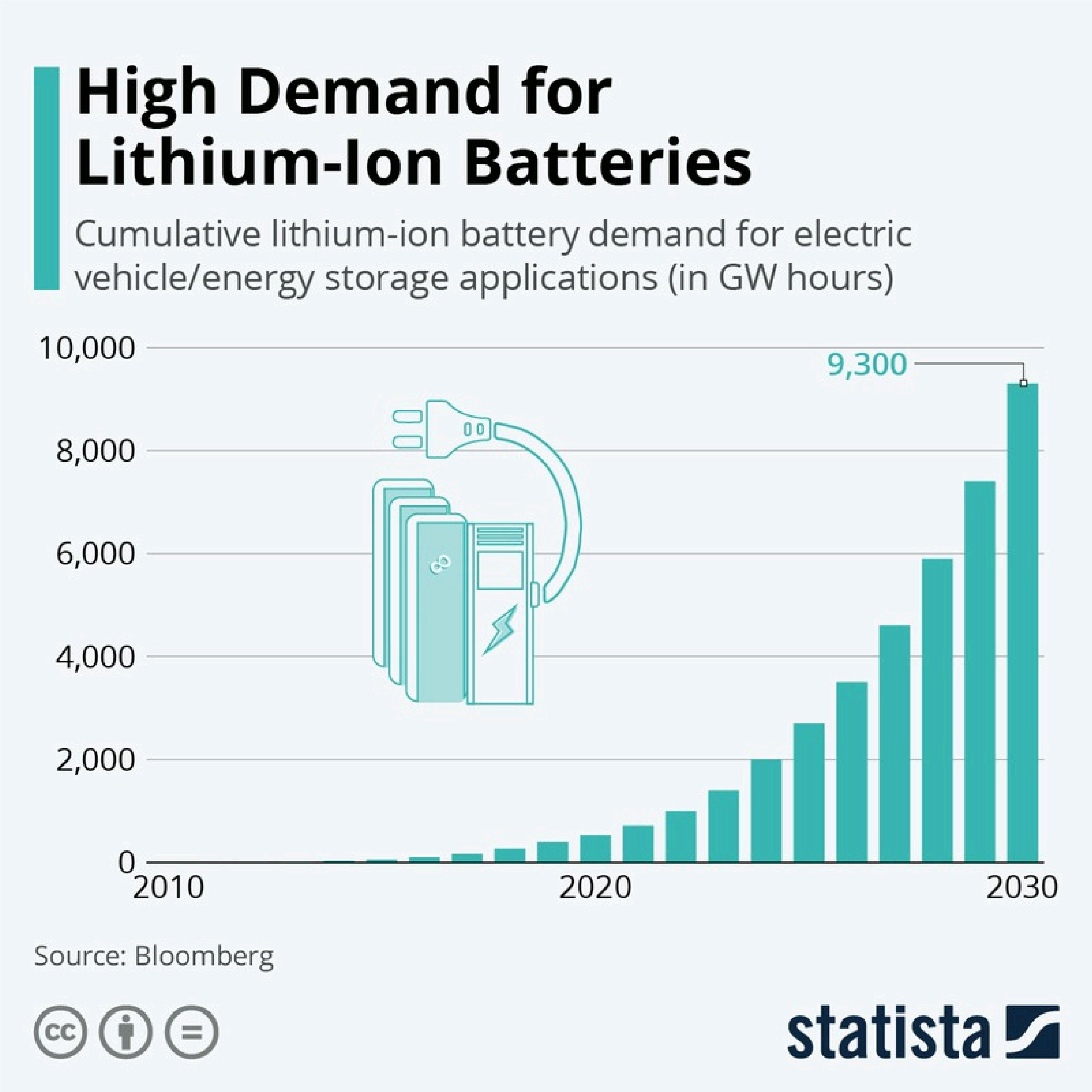
b. Price trend analysis (2020–2025).

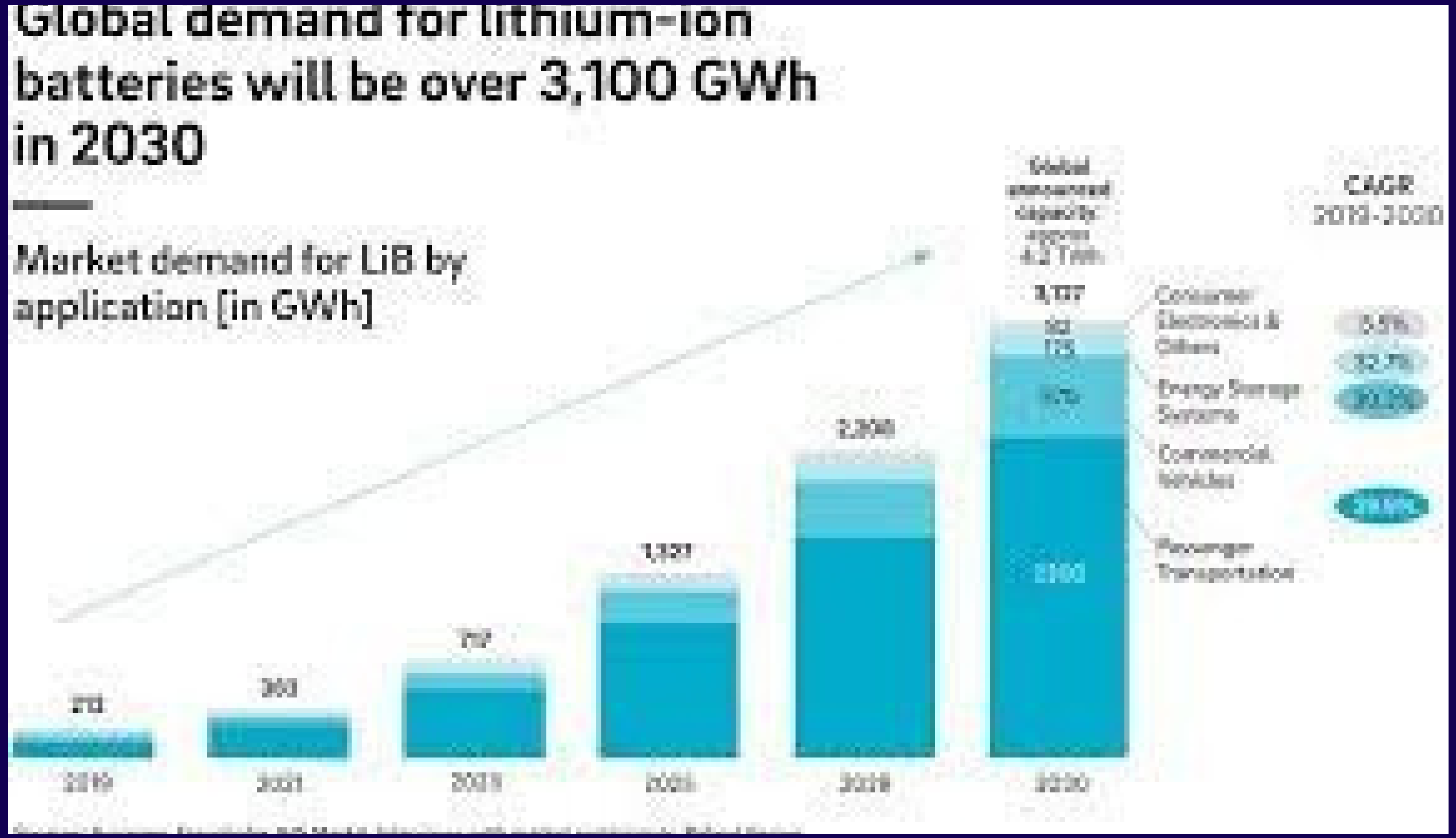
ii. Letters of Intent (LOIs) secured from:

a. Local battery assemblers

b. Renewable energy developers

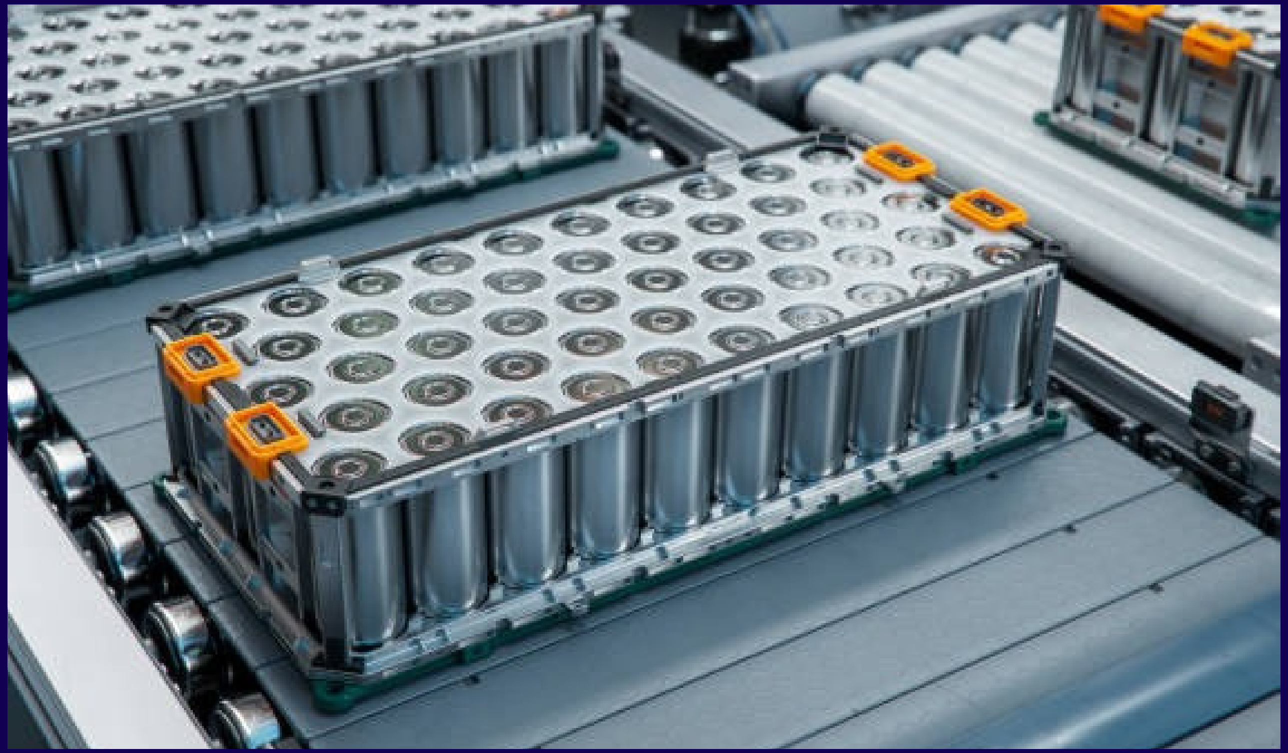
c. Potential off-take partners





Marketing Potential

Nigeria’s inverter & solar market already exceeds ₦100 billion annually (growing 20% per year).
Growing demand from EV industry (global LFP demand CAGR > 25%).
Local battery industry can capture West African markets worth billions.
Opportunity to supply batteries for solar, telecom, EV, and defense sectors.



Expected Outcomes

Proven local process for converting Nigerian lithium ore to LFP battery materials.

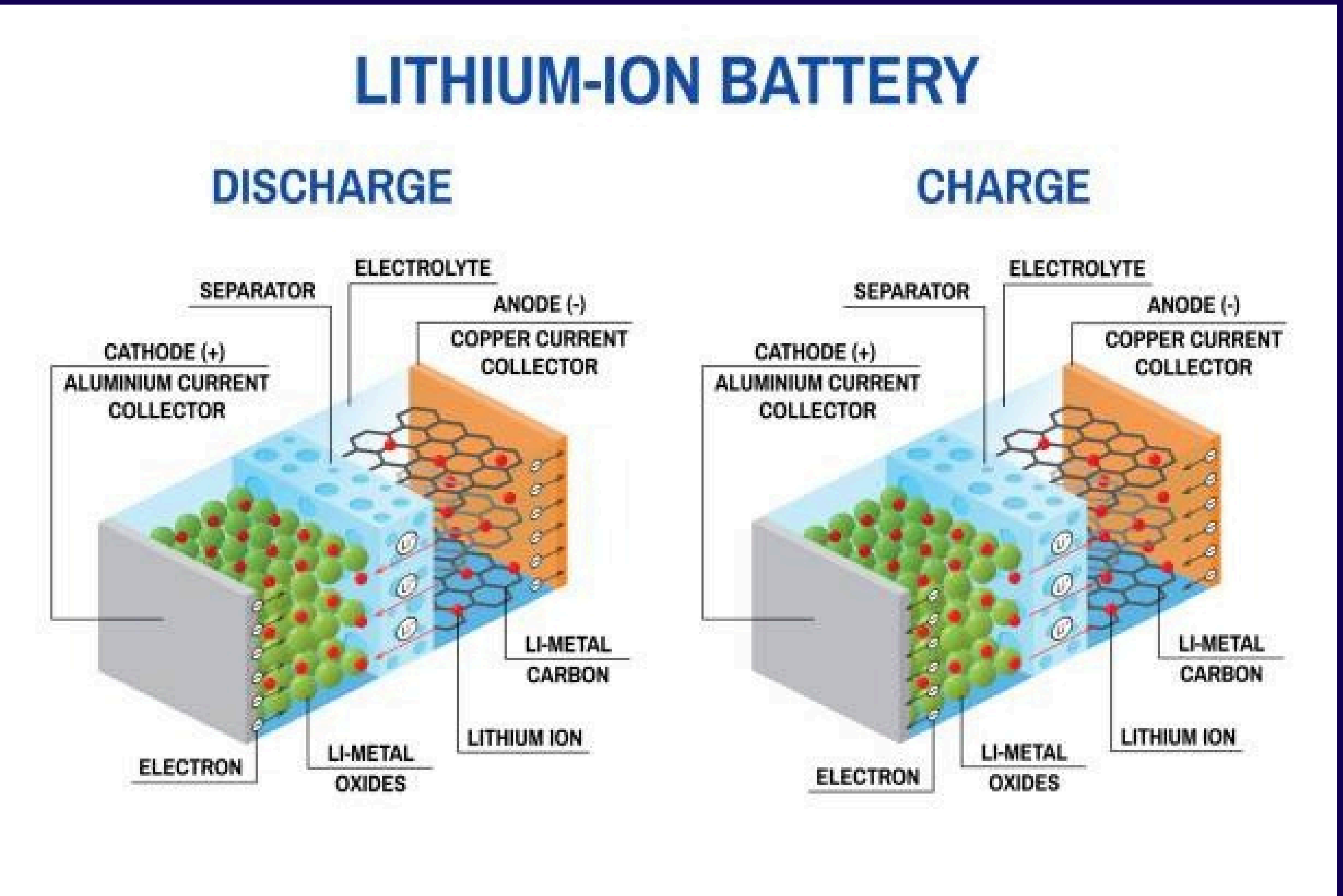
Technical skills development in advanced energy materials.

Reduced reliance on imported battery components.

Foundation for large-scale local battery production.

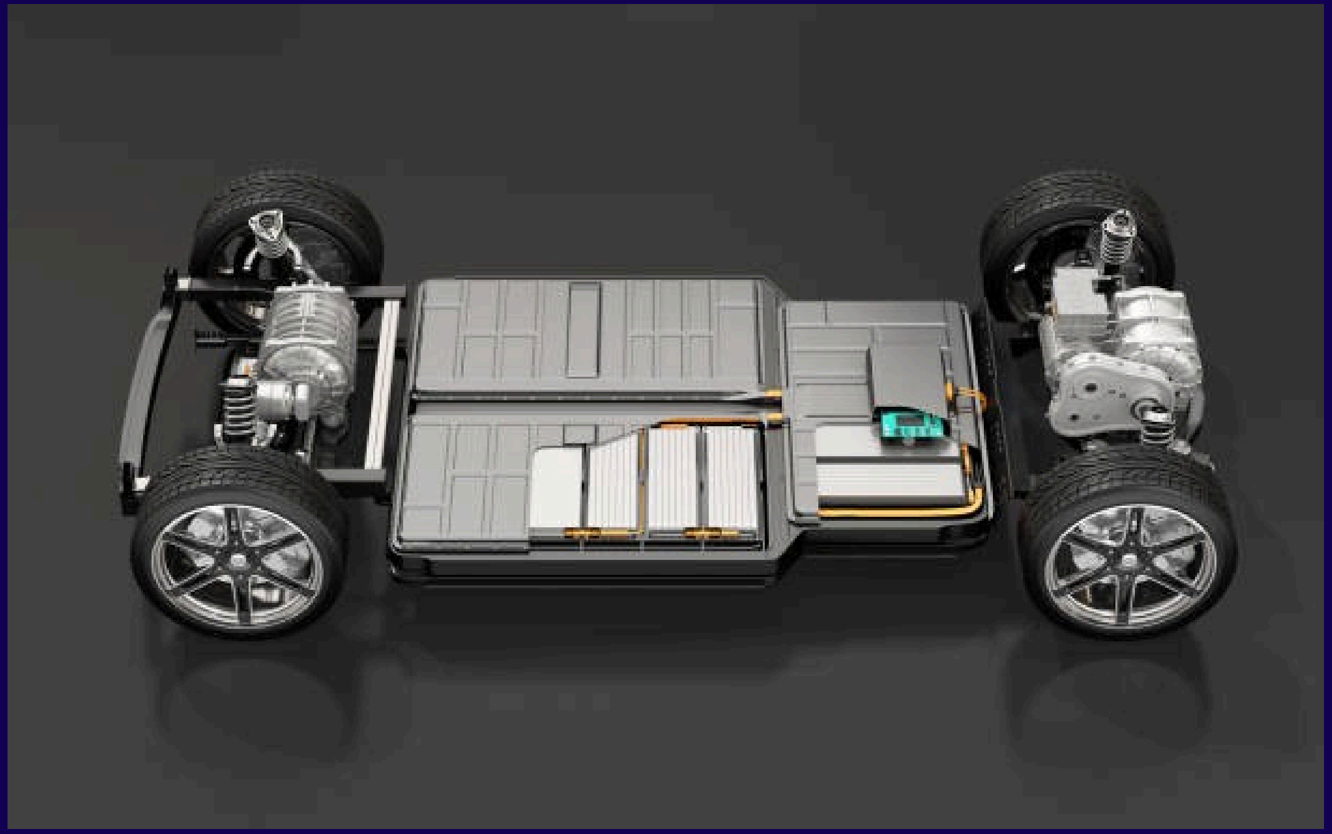
Contribution to energy independence and sustainability in Nigeria.

Research Budget



1. Personnel & Research Staff – ₦9,000,000
2. Fieldwork, Sampling & Logistics – ₦4,500,000
3. Laboratory Equipment & Consumables – ₦14,000,000
4. Pilot Cell Fabrication & Prototyping – ₦6,000,000
5. Capacity Building, Training & Workshops – ₦3,500,000
6. Project Management & Administrative Costs – ₦5,000,000
7. Contingency (5%) – ₦3,000,000

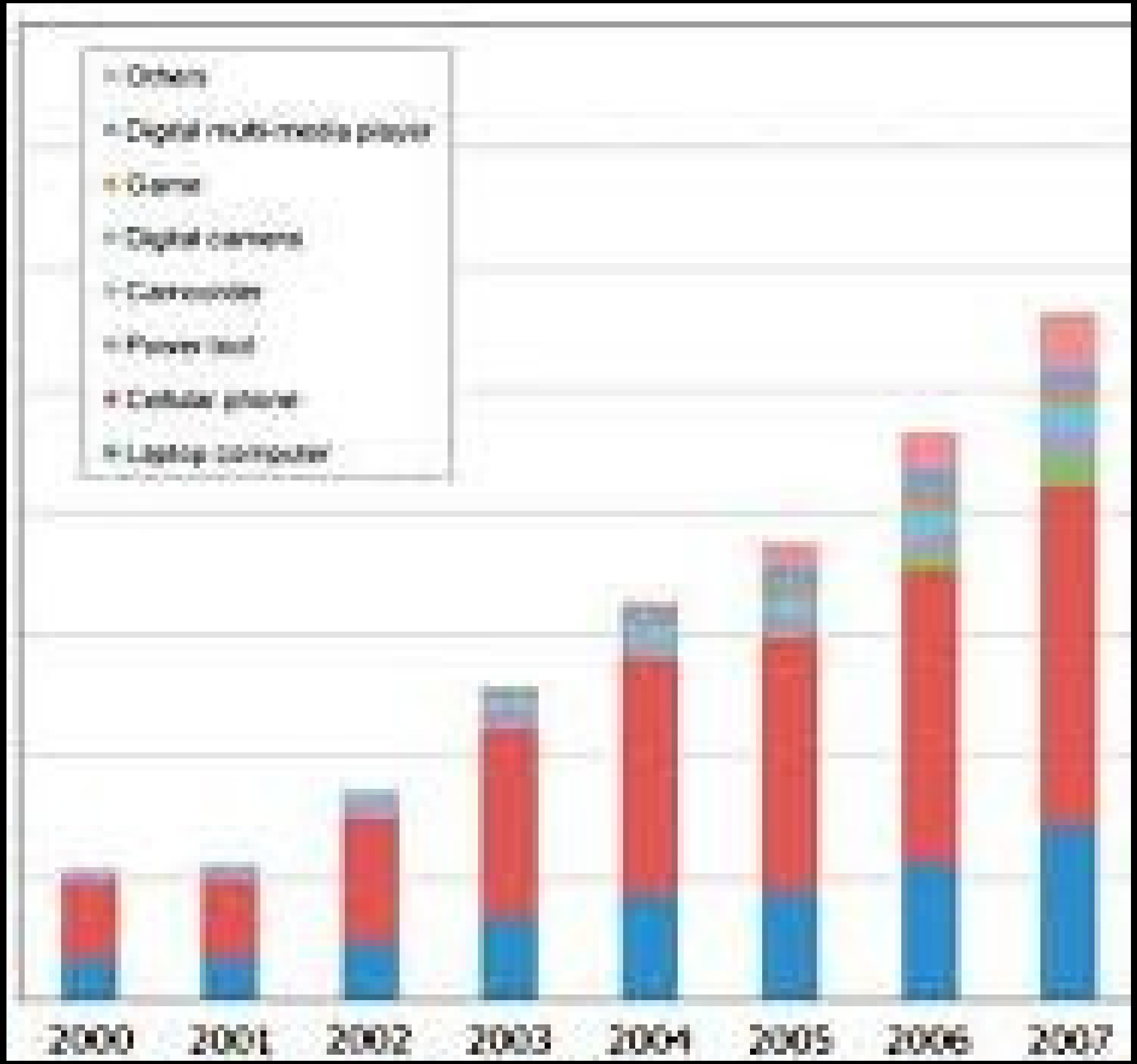
Total = ₦45,000,000



Research Impact

Economic: Job creation, SME growth, and forex savings.
Technological: Transfer of battery processing know-how.
Environmental: Support renewable energy adoption.
Social: Affordable, reliable energy solutions.

Scalability & Roadmap



i. Phase 1: Laboratory research (✓ Completed)
ii. Phase 2: Pilot plant demonstration (Funding Required)
iii. Phase 3: Industrial-scale processing facility (5,000–10,000 tpa output)
iv. Phase 4: Integration with local battery production initiatives

Our Team & Partners

i. Principal Investigator – Prof. A. Umar
ii. Metallurgical Expertise – Dr. Sani Musa
iii. Manufacturing Engineer – Engr. Sikiru Ibrahim
iv. Market Analyst – Dr. Musa b. Usman
v. Chemistry Department – Dr. Awal Adamu
vi. Electrical/Electronic Dept.- Dr. Isa Hassan Usman
vii. Mrs. Fausat Ayilara- Marketing Dept. SIKTEC Int. Serv. Ltd.

Industry Partner: SIKTEC Integrated Services Ltd.
Round Angle Logistic Nig. Ltd.

Call to Action

i. Funding sought: ₦45,000,000 ($30,000) for plant development

ii. Strategic partnerships with:

a. Battery manufacturers

b. Mining companies

c. Renewable energy stakeholders

iii. Policy support for local value addition incentives

Contacts

+234 8036148547,
08023742547, 08069548236,

siktecintegrated@gmail.com,
sanimusa157@gmail.com

No12, Ahmadu Bello way,
Former Re-insurance House
Bauchi, Bauchi state
ATBU Bauchi