

## **South Africa Flow Battery Market Forecast 2025-2032**

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### **Report description:**

#### **KEY FINDINGS**

The South Africa flow battery market size is valued at \$2.67 million as of 2025 and is expected to reach \$9.42 million by 2032, progressing with a CAGR of 19.70% during the forecast years, 2025-2032.

South Africa confronts an unprecedented energy security challenge that reshapes its economic landscape. Load shedding has plagued the nation for years, with the energy crisis costing the economy R2.8 trillion in 2023 alone. The electricity sector has failed to meet demand for over 15 years, with coal accounting for 80% of power generation. Flow battery technology emerges as a strategic solution amid this ongoing crisis.

Although load shedding notably declined in 2024, the system remains fragile, as evidenced by the return of power cuts in early 2025. Mining operations bear particularly heavy burdens from unreliable electricity supply. Power costs represent up to 40% of operating expenses in African mines. Consequently, industrial facilities seek resilient backup systems capable of sustained multi-hour discharge during extended outages.

#### **MARKET INSIGHTS**

Renewable energy deployment accelerates across the country, with installed capacity expected to reach 18.41 gigawatts in 2025. However, intermittent solar and wind generation create grid stability challenges that demand robust storage infrastructure. Government projections indicate a need for 2GW to 6.6GW of battery storage capacity by 2032, representing a R24 billion investment opportunity by 2030.

In this regard, flow batteries offer distinct advantages for long-duration applications compared to conventional lithium-ion systems. Their ability to independently scale power and energy capacity makes them particularly suitable for industrial demand management. South Africa holds the world's third-largest vanadium reserves after Russia and China, positioning the nation favorably for vanadium redox flow battery manufacturing. Nevertheless, financing constraints and limited local awareness about flow battery technology slow widespread commercial adoption across key industrial sectors.

South Africa expects 30GWh deployment of battery energy storage systems over the next 10 years, creating early-stage opportunities for domestic vanadium battery manufacturers. Large-scale installations position South Africa to leverage its abundant vanadium resources while building indigenous technical capabilities. Skills development programs train local technicians in installation, commissioning, and maintenance procedures specific to flow battery technology.

These workforce initiatives complement government efforts to stimulate manufacturing sector growth through beneficiation of locally mined minerals. In 2023, South Africa was the world's leading producer of manganese, with vanadium representing

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another critical mineral for the global battery industry. Translating mineral wealth into manufactured products remains central to national industrial policy objectives and job creation targets.

#### SEGMENTATION ANALYSIS

The South Africa flow battery market is segmented into offering, battery type, material, ownership, storage, and application. The storage segment is further categorized into large-scale and small-scale.

Large-scale installations dominate South Africa's emerging flow battery deployment strategy as utilities and heavy industries prioritize grid-level applications. These systems typically exceed one megawatt of power capacity and offer multi-megawatt-hour energy storage capability. Mining operations particularly favor large-scale configurations for managing daytime solar generation and evening peak demand periods.

Such installations can cycle multiple times daily to meet both morning and evening peaks of South Africa's power system while reducing grid dependency during supply constraints. Industrial clusters value the technology's tolerance to complete discharge cycles without capacity degradation over decades of operation. This characteristic proves essential in environments where equipment must withstand frequent deep discharge events during extended grid outages.

South Africa's first solar-vanadium storage hybrid project reached financial close in 2022, combining 3.5 MW solar capacity with 1 MW / 4 MWh flow battery storage at a mining facility. The project demonstrates commercial viability for large-scale renewable integration at industrial sites. Utility-scale deployments benefit from flow batteries' non-flammable aqueous electrolytes that eliminate fire risks associated with lithium-based alternatives.

Safety considerations become paramount in crowded urban substations and industrial settings where thermal runaway could threaten personnel and infrastructure. Bushveld Energy and the Industrial Development Corporation constructed an 8-million-liter vanadium electrolyte plant in East London to support large-scale project deployment across the region. This domestic manufacturing capability reduces import dependencies and enhances local content requirements for public procurement tenders. Large-scale systems enable sophisticated grid services beyond simple energy arbitrage and backup power provision. They provide frequency regulation, voltage support, and black start capability that strengthen overall system resilience. Renewable energy parks across the Northern Cape and other provinces require such ancillary services to maintain grid stability as intermittent generation increases.

Wind currently accounts for approximately 42% of South Africa's renewable generation, with the country holding substantial wind power potential estimated at 67,000 GW. Matching this variable generation with long-duration storage prevents curtailment and maximizes renewable asset utilization. Project developers increasingly recognize that pairing solar or wind installations with flow battery systems enhances project bankability and revenue certainty under power purchase agreements.

#### COMPETITIVE INSIGHTS

Some of the top players operating in the South Africa flow battery market include Bushveld Minerals (Bushveld Energy), Invinity Energy Systems, VRB Energy, etc.

Bushveld Energy leverages vertically-integrated vanadium supply chains to develop flow battery projects across South Africa and the broader African continent. The company operates as the downstream energy subsidiary of London-listed Bushveld Minerals, one of three primary vanadium producers globally. Construction of a 200MWh electrolyte manufacturing plant began in South Africa's Eastern Cape, with commissioning planned for the second half of 2021.

This facility establishes critical mid-stream manufacturing capability between mining operations and final battery assembly. Bushveld Energy successfully financed and constructed Africa's first solar-vanadium hybrid mini-grid, demonstrating the commercial viability of long-duration storage paired with renewable energy at an industrial scale. The company's integrated business model spans electrolyte production, investments in battery manufacturing, and independent power project development tailored to specific customer requirements across the mining, utility, and commercial sectors.

#### COMPANY PROFILES

1. REDFLOW LIMITED
2. BUSHVELD MINERALS (BUSHVELD ENERGY)
3. VRB ENERGY
4. INVINITY ENERGY SYSTEMS
5. DELECTRIK SYSTEMS

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**Table of Contents:**

TABLE OF CONTENTS

1. RESEARCH SCOPE & METHODOLOGY

1.1. STUDY OBJECTIVES

1.2. METHODOLOGY

1.3. ASSUMPTIONS & LIMITATIONS

2. EXECUTIVE SUMMARY

2.1. MARKET SIZE & FORECAST

2.2. MARKET OVERVIEW

2.3. SCOPE OF STUDY

2.4. CRISIS SCENARIO ANALYSIS

2.5. MAJOR MARKET FINDINGS

2.5.1. SOUTH AFRICA IS AMONG AFRICA'S EARLY ADOPTERS OF FLOW BATTERY TECHNOLOGY FOR ENERGY SECURITY

2.5.2. LOCAL PROJECTS AIM TO SUPPORT GRID STABILITY AMID CHRONIC POWER SHORTAGES

2.5.3. MINING AND INDUSTRIAL SECTORS DRIVE DEMAND FOR RELIABLE LONG-DURATION STORAGE

2.5.4. PARTNERSHIPS WITH INTERNATIONAL BATTERY DEVELOPERS EXPAND TECHNOLOGY ACCESS

3. MARKET DYNAMICS

3.1. KEY DRIVERS

3.1.1. GOVERNMENT FOCUS ON ENERGY INDEPENDENCE AND GRID RESILIENCE

3.1.2. INCREASING RENEWABLE ENERGY DEPLOYMENTS REQUIRE STORAGE INTEGRATION

3.1.3. FAVORABLE CLIMATE FOR SOLAR ENERGY MAKES STORAGE A NATURAL COMPLEMENT

3.1.4. RISING INTEREST FROM INDUSTRIAL USERS SEEKING DEMAND MANAGEMENT SOLUTIONS

3.2. KEY RESTRAINTS

3.2.1. LIMITED FUNDING AND POLICY FRAMEWORKS FOR LARGE-SCALE STORAGE PROJECTS

3.2.2. HIGH IMPORT DEPENDENCE ON TECHNOLOGY AND SYSTEM COMPONENTS

3.2.3. LOW AWARENESS AND TRAINING LEVELS IN THE LOCAL ENERGY STORAGE SECTOR

3.2.4. ECONOMIC UNCERTAINTY AND CURRENCY FLUCTUATIONS AFFECT PROJECT VIABILITY

4. KEY ANALYTICS

4.1. KEY MARKET TRENDS

4.1.1. INCREASED DEPLOYMENT IN MINING SITES AND RURAL MICROGRIDS

4.1.2. INTERNATIONAL DEVELOPMENT AGENCIES SUPPORT PILOT AND DEMONSTRATION PROJECTS

4.1.3. GROWTH OF LOCAL EPC CONTRACTORS SPECIALIZING IN ENERGY STORAGE SOLUTIONS

4.1.4. POLICY DISCUSSIONS UNDERWAY FOR ESTABLISHING NATIONAL ENERGY STORAGE STRATEGY

4.2. PORTER'S FIVE FORCES ANALYSIS

4.2.1. BUYERS POWER

4.2.2. SUPPLIERS POWER

4.2.3. SUBSTITUTION

4.2.4. NEW ENTRANTS

4.2.5. INDUSTRY RIVALRY

4.3. GROWTH PROSPECT MAPPING

4.3.1. GROWTH PROSPECT MAPPING FOR SOUTH AFRICA

4.4. MARKET MATURITY ANALYSIS

4.5. MARKET CONCENTRATION ANALYSIS

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- 4.6. VALUE CHAIN ANALYSIS
  - 4.6.1. RAW MATERIAL SUPPLIERS
  - 4.6.2. ELECTROLYTE MANUFACTURERS
  - 4.6.3. MEMBRANE AND STACK PRODUCERS
  - 4.6.4. SYSTEM INTEGRATORS
  - 4.6.5. PROJECT DEVELOPERS
  - 4.6.6. UTILITY AND COMMERCIAL END USERS
- 4.7. KEY BUYING CRITERIA
  - 4.7.1. COST PER KWH
  - 4.7.2. CYCLE LIFE
  - 4.7.3. SCALABILITY
  - 4.7.4. MAINTENANCE REQUIREMENTS
- 4.8. REGULATORY FRAMEWORK
- 5. FLOW BATTERY MARKET BY OFFERING
  - 5.1. ENERGY STORAGE SYSTEM
    - 5.1.1. MARKET FORECAST FIGURE
    - 5.1.2. SEGMENT ANALYSIS
  - 5.2. BATTERY
    - 5.2.1. MARKET FORECAST FIGURE
    - 5.2.2. SEGMENT ANALYSIS
  - 5.3. SERVICE
    - 5.3.1. MARKET FORECAST FIGURE
    - 5.3.2. SEGMENT ANALYSIS
- 6. FLOW BATTERY MARKET BY BATTERY TYPE
  - 6.1. REDOX
    - 6.1.1. MARKET FORECAST FIGURE
    - 6.1.2. SEGMENT ANALYSIS
  - 6.2. HYBRID
    - 6.2.1. MARKET FORECAST FIGURE
    - 6.2.2. SEGMENT ANALYSIS
- 7. FLOW BATTERY MARKET BY MATERIAL
  - 7.1. VANADIUM
    - 7.1.1. MARKET FORECAST FIGURE
    - 7.1.2. SEGMENT ANALYSIS
  - 7.2. ZINC-BROMINE
    - 7.2.1. MARKET FORECAST FIGURE
    - 7.2.2. SEGMENT ANALYSIS
  - 7.3. IRON
    - 7.3.1. MARKET FORECAST FIGURE
    - 7.3.2. SEGMENT ANALYSIS
  - 7.4. OTHER MATERIALS
    - 7.4.1. MARKET FORECAST FIGURE
    - 7.4.2. SEGMENT ANALYSIS
- 8. FLOW BATTERY MARKET BY OWNERSHIP
  - 8.1. CUSTOMER-OWNED
    - 8.1.1. MARKET FORECAST FIGURE
    - 8.1.2. SEGMENT ANALYSIS

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- 8.2. THIRD-PARTY-OWNED
  - 8.2.1. MARKET FORECAST FIGURE
  - 8.2.2. SEGMENT ANALYSIS
- 8.3. GRID/UTILITY-OWNED
  - 8.3.1. MARKET FORECAST FIGURE
  - 8.3.2. SEGMENT ANALYSIS
- 9. FLOW BATTERY MARKET BY STORAGE
  - 9.1. LARGE-SCALE
    - 9.1.1. MARKET FORECAST FIGURE
    - 9.1.2. SEGMENT ANALYSIS
  - 9.2. SMALL-SCALE
    - 9.2.1. MARKET FORECAST FIGURE
    - 9.2.2. SEGMENT ANALYSIS
- 10. FLOW BATTERY MARKET BY APPLICATION
  - 10.1. GRID/UTILITY
    - 10.1.1. MARKET FORECAST FIGURE
    - 10.1.2. SEGMENT ANALYSIS
  - 10.2. COMMERCIAL AND INDUSTRIAL
    - 10.2.1. MARKET FORECAST FIGURE
    - 10.2.2. SEGMENT ANALYSIS
  - 10.3. EV CHARGING STATION
    - 10.3.1. MARKET FORECAST FIGURE
    - 10.3.2. SEGMENT ANALYSIS
  - 10.4. OTHER APPLICATIONS
    - 10.4.1. MARKET FORECAST FIGURE
    - 10.4.2. SEGMENT ANALYSIS
- 11. COMPETITIVE LANDSCAPE
  - 11.1. KEY STRATEGIC DEVELOPMENTS
    - 11.1.1. MERGERS & ACQUISITIONS
    - 11.1.2. PRODUCT LAUNCHES & DEVELOPMENTS
    - 11.1.3. PARTNERSHIPS & AGREEMENTS
    - 11.1.4. BUSINESS EXPANSIONS & DIVESTITURES
  - 11.2. COMPANY PROFILES
    - 11.2.1. REDFLOW LIMITED
      - 11.2.1.1. COMPANY OVERVIEW
      - 11.2.1.2. PRODUCTS LIST
      - 11.2.1.3. STRENGTHS & CHALLENGES
    - 11.2.2. BUSHVELD MINERALS (BUSHVELD ENERGY)
      - 11.2.2.1. COMPANY OVERVIEW
      - 11.2.2.2. PRODUCTS LIST
      - 11.2.2.3. STRENGTHS & CHALLENGES
    - 11.2.3. VRB ENERGY
      - 11.2.3.1. COMPANY OVERVIEW
      - 11.2.3.2. PRODUCTS LIST
      - 11.2.3.3. STRENGTHS & CHALLENGES
    - 11.2.4. INVINITY ENERGY SYSTEMS
      - 11.2.4.1. COMPANY OVERVIEW

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- 11.2.4.2. PRODUCTS LIST
- 11.2.4.3. STRENGTHS & CHALLENGES
- 11.2.5. DELECTRIK SYSTEMS
  - 11.2.5.1. COMPANY OVERVIEW
  - 11.2.5.2. PRODUCTS LIST
  - 11.2.5.3. STRENGTHS & CHALLENGES
- 11.2.6. CELLCUBE INC
  - 11.2.6.1. COMPANY OVERVIEW
  - 11.2.6.2. PRODUCTS LIST
  - 11.2.6.3. STRENGTHS & CHALLENGES

#### LIST OF TABLES

- TABLE 1: MARKET SNAPSHOT - FLOW BATTERY
- TABLE 2: MARKET BY OFFERING, HISTORICAL YEARS, 2018-2023 (IN \$ MILLION)
- TABLE 3: MARKET BY OFFERING, FORECAST YEARS, 2025-2032 (IN \$ MILLION)
- TABLE 4: MARKET BY BATTERY TYPE, HISTORICAL YEARS, 2018-2023 (IN \$ MILLION)
- TABLE 5: MARKET BY BATTERY TYPE, FORECAST YEARS, 2025-2032 (IN \$ MILLION)
- TABLE 6: MARKET BY MATERIAL, HISTORICAL YEARS, 2018-2023 (IN \$ MILLION)
- TABLE 7: MARKET BY MATERIAL, FORECAST YEARS, 2025-2032 (IN \$ MILLION)
- TABLE 8: MARKET BY OWNERSHIP, HISTORICAL YEARS, 2018-2023 (IN \$ MILLION)
- TABLE 9: MARKET BY OWNERSHIP, FORECAST YEARS, 2025-2032 (IN \$ MILLION)
- TABLE 10: MARKET BY STORAGE, HISTORICAL YEARS, 2018-2023 (IN \$ MILLION)
- TABLE 11: MARKET BY STORAGE, FORECAST YEARS, 2025-2032 (IN \$ MILLION)
- TABLE 12: MARKET BY APPLICATION, HISTORICAL YEARS, 2018-2023 (IN \$ MILLION)
- TABLE 13: MARKET BY APPLICATION, FORECAST YEARS, 2025-2032 (IN \$ MILLION)
- TABLE 14: KEY PLAYERS OPERATING IN THE SOUTH AFRICA MARKET

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TABLE 15: LIST OF MERGERS & ACQUISITIONS  
TABLE 16: LIST OF PRODUCT LAUNCHES & DEVELOPMENTS  
TABLE 17: LIST OF PARTNERSHIPS & AGREEMENTS  
TABLE 18: LIST OF BUSINESS EXPANSIONS & DIVESTITURES  
LIST OF FIGURES  
FIGURE 1: KEY MARKET TRENDS  
FIGURE 2: PORTER'S FIVE FORCES ANALYSIS  
FIGURE 3: GROWTH PROSPECT MAPPING FOR SOUTH AFRICA  
FIGURE 4: MARKET MATURITY ANALYSIS  
FIGURE 5: MARKET CONCENTRATION ANALYSIS  
FIGURE 6: VALUE CHAIN ANALYSIS  
FIGURE 7: KEY BUYING CRITERIA  
FIGURE 8: SEGMENT GROWTH POTENTIAL, BY OFFERING, IN 2024  
FIGURE 9: ENERGY STORAGE SYSTEM MARKET SIZE, 2025-2032 (IN \$ MILLION)  
FIGURE 10: BATTERY MARKET SIZE, 2025-2032 (IN \$ MILLION)  
FIGURE 11: SERVICE MARKET SIZE, 2025-2032 (IN \$ MILLION)  
FIGURE 12: MARKET GROWTH POTENTIAL, BY BATTERY TYPE, IN 2024  
FIGURE 13: REDOX MARKET SIZE, 2025-2032 (IN \$ MILLION)  
FIGURE 14: HYBRID MARKET SIZE, 2025-2032 (IN \$ MILLION)  
FIGURE 15: SEGMENT GROWTH POTENTIAL, BY MATERIAL, IN 2024  
FIGURE 16: VANADIUM MARKET SIZE, 2025-2032 (IN \$ MILLION)  
FIGURE 17: ZINC-BROMINE MARKET SIZE, 2025-2032 (IN \$ MILLION)  
FIGURE 18: IRON MARKET SIZE, 2025-2032 (IN \$ MILLION)  
FIGURE 19: OTHER MATERIALS MARKET SIZE, 2025-2032 (IN \$ MILLION)  
FIGURE 20: SEGMENT GROWTH POTENTIAL, BY OWNERSHIP, IN 2024  
FIGURE 21: CUSTOMER-OWNED MARKET SIZE, 2025-2032 (IN \$ MILLION)  
FIGURE 22: THIRD-PARTY-OWNED MARKET SIZE, 2025-2032 (IN \$ MILLION)  
FIGURE 23: GRID/UTILITY-OWNED MARKET SIZE, 2025-2032 (IN \$ MILLION)  
FIGURE 24: SEGMENT GROWTH POTENTIAL, BY STORAGE, IN 2024  
FIGURE 25: LARGE-SCALE MARKET SIZE, 2025-2032 (IN \$ MILLION)  
FIGURE 26: SMALL-SCALE MARKET SIZE, 2025-2032 (IN \$ MILLION)  
FIGURE 27: SEGMENT GROWTH POTENTIAL, BY APPLICATION, IN 2024  
FIGURE 28: GRID/UTILITY MARKET SIZE, 2025-2032 (IN \$ MILLION)  
FIGURE 29: COMMERCIAL AND INDUSTRIAL MARKET SIZE, 2025-2032 (IN \$ MILLION)  
FIGURE 30: EV CHARGING STATION MARKET SIZE, 2025-2032 (IN \$ MILLION)  
FIGURE 31: OTHER APPLICATIONS MARKET SIZE, 2025-2032 (IN \$ MILLION)

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