

Pumped Hydro Storage Components

ANMD-MRS17-169 · Energy Storage & Grid Flexibility Technologies

A Global Sustainability Due Diligence & Market Research Study

History 2020–2024 · Base Year 2025 · Forecast 2025–2032 · Outlooks 2035 / 2040 / 2050 · Currency US\$

WHY THIS REPORT

Pumped hydro storage components are the mechanical heart of the world's largest energy-storage technology — the reversible pump-turbines, variable-speed units, generator-motors, closed-loop system components and civil works that move water between reservoirs to store grid-scale energy. Providing the vast majority of global storage capacity, pumped hydro is being revitalised by closed-loop and variable-speed designs for the renewable era. This report is a comprehensive, decision-grade study of that component market across component type, speed configuration, application, end user and business model, spanning history 2020–2024, a 2025 base year, a 2025–2032 forecast and long-term outlooks to 2035, 2040 and 2050. This decision-grade study sizes the global market three ways — value, capacity (GWh) and installed power (GW) — across segmentation, seven regions and four scenarios to 2032, with outlooks to 2050.

SUSTAINABILITY & SDG IMPACT — THE ANMD LENS

The sustainability case is the report's backbone. Pumped hydro provides massive, long-life, low-carbon storage and grid inertia — though siting and water use require careful management. The analysis applies double materiality, maps outcomes to GRI, SASB, ISSB, TCFD, TNFD, CSRD and the EU Taxonomy, and Environmental and water-use impact, siting and biodiversity, and civil-works footprint are treated as material risks — with greenwashing and SDG-washing screens applied throughout.

Mapped Sustainable Development Goals:

SDG 7 Affordable & Clean Energy	SDG 9 Industry & Infrastructure	SDG 11 Sustainable Cities	SDG 12 Responsible Consumption	SDG 13 Climate Action
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Measurable sustainability outcomes assessed:

- Massive, long-life, low-carbon bulk storage
- Grid inertia and renewable-balancing flexibility
- Closed-loop siting that avoids river systems
- Siting, water use and ecology as material risks

Framework alignment: Double materiality mapped to GRI, SASB, ISSB, TCFD, TNFD, CSRD and the EU Taxonomy, with greenwashing and SDG-washing screens applied throughout.

WHAT'S INSIDE AT A GLANCE

53 Chapters	9 Report Parts	7 Regions Covered	40+ Country Markets
2025–32 Forecast Horizon	4 Forward Scenarios	25+ Companies Profiled	5 SDGs Mapped

REPORT COVERAGE

Geographic scope: North America, Europe, Asia Pacific, Latin America, Africa, Middle East and Rest of World — with named country intelligence. Asia Pacific (China) leads new pumped-hydro build; Europe revitalises and retrofits; North America advances closed-loop projects; other regions assessed on their own merits.

MARKET OVERVIEW

From legacy assets to revitalised, renewable-balancing pumped hydro.

Pumped hydro is being revitalised for renewable balancing. Demand is driven by large-scale, long-life storage needs, variable-speed flexibility, and closed-loop siting that avoids river systems — with efficiency and grid-services capability central to value. The market is read three ways — value, capacity (GWh) and installed power (GW) — and forecast under four scenarios (conservative, base, accelerated and disruption), each region reported separately.

- **Europe leads turbine technology** — anchored by Voith Hydro, Andritz Hydro, Siemens Energy and Litostroj across pump-turbine supply.
- **Asia drives deployment scale** — with PowerChina, Dongfang, Harbin and Toshiba and Hitachi Mitsubishi building the largest projects.
- **North America revitalises pumped hydro** — with GE Vernova Hydro and closed-loop projects under renewable-balancing demand.
- **Variable-speed is the differentiator** — variable-speed units add fast, flexible grid services and efficiency that fixed-speed machines lack.

REGIONAL OUTLOOK

Across seven reporting regions, the report separates commercialisation and supply leaders from high-growth and emerging markets — each profiled in full rather than aggregated into Rest of World.

Region	Stage	Lead Markets & Drivers
Europe	Turbine-technology leader	Germany, Austria, Slovenia — Voith, Andritz, Siemens, Litostroj
Asia Pacific	Deployment scale	China, Japan — PowerChina, Dongfang, Toshiba, Hitachi Mitsubishi
North America	Revitalising	United States — GE Vernova Hydro, closed-loop projects
Latin America	Emerging	Brazil, Chile — pumped-hydro development
Africa	Frontier	South Africa — pumped-hydro expansion
Middle East	Emerging	UAE, Saudi Arabia — pumped-hydro interest

KEY MARKET DRIVERS & RESTRAINTS

Drivers	Restraints
<ul style="list-style-type: none"> • Large-scale long-life storage needs • Variable-speed flexibility & services • Closed-loop siting advantages • Renewable-balancing demand • Grid-inertia & stability value 	<ul style="list-style-type: none"> • Long development & permitting timelines • High capital cost & financing • Geographic & topographic constraints • Environmental & water-use concerns • Competition from batteries at short duration

SEGMENTATION SNAPSHOT

By Component Type	Reversible pump-turbines · variable-speed units · generator-motors · closed-loop components · penstock & civil
By Speed Configuration	Fixed-speed · variable-speed · ternary
By Application	Front-of-meter · commercial & industrial · residential
By End User	Utilities · IPPs · developers · C&I · residential
By Business Model	Equipment sales · integration · storage-as-a-service
By Configuration	Open-loop · closed-loop

TABLE OF CONTENTS — PARTS & CHAPTERS

The full report is organised into nine parts across 53 chapters, listed below. Detailed sub-headings, country tables and directories are provided in the full report.

Part I — Report Foundation, Discovery and Strategic Intelligence

- › Chapter 1. Scope, Methodology and Report Architecture
- › Chapter 2. Industry Discovery Summary — Pumped Hydro Storage Components
- › Chapter 3. Executive Intelligence and Decision Dashboard
- › Chapter 4. Strategic Findings, Materiality and Investment Verdict Preview

Part II — Market Intelligence, Sizing, Forecasting and Segmentation

- › Chapter 5. Industry Overview and Market Evolution
- › Chapter 6. Market Dynamics
- › Chapter 7. Global Market Size and Forecast, 2020–2032
- › Chapter 8. Market Segmentation Analysis
- › Chapter 9. End-User and Demand-Side Intelligence
- › Chapter 10. Pricing, Cost and Commercial Model Intelligence

Part III — Regional and Country Intelligence

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- › Chapter 12. North America Market Intelligence
- › Chapter 13. Europe Market Intelligence
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Part IV — Technology, Innovation and Category-Specific Intelligence

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- › Chapter 20. Emerging and Next-Generation Technology Intelligence
- › Chapter 21. Category-Specific Intelligence Module
- › Chapter 22. Research, Innovation and Funding Landscape

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Part IX — Annexes, Directories and Reference Material

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- › Chapter 52. Sustainability KPI Annex
- › Chapter 53. Reference Annexes

COMPETITIVE & INVESTMENT SNAPSHOT

The competitive field spans hydro-turbine OEMs and large EPC suppliers.

Representative players profiled in the full report:

Voith GmbH & Co. KGaA (Voith Hydro) · Andritz AG (Andritz Hydro) · GE Vernova Inc. (Hydro Power) · Toshiba Corporation · Hitachi Mitsubishi Hydro Corporation · and 20+ further profiled players across hydro-turbine OEMs and large EPC suppliers.

Investment intelligence: venture, infrastructure, development, climate and blended finance, green bonds and sustainability-linked loans — culminating in a bankability assessment and a clear, decision-ready investment verdict.

KEY QUESTIONS THIS REPORT ANSWERS

- ? How large is the global pumped hydro storage components market, and how fast will it grow to 2032?
- ? Which regions, countries and segments offer the strongest risk-adjusted opportunity?
- ? How does variable-speed flexibility change grid-balancing value versus fixed-speed units?
- ? Who leads, and where is the competitive and patent white space?
- ? Is the investment case bankable — and under what conditions?
- ? How does the category align with the SDGs, circular-economy and resource-security and disclosure regulation?

WHY ANMD — THE DIFFERENCE

Most market studies stop at units and revenue. This report is built as a sustainability due diligence instrument — fusing market sizing with ESG, SDG, climate, water and natural-capital intelligence and a decision-ready bankability verdict in a single architecture.

- **Triangulated sizing** — every market read three ways (value, capacity (GWh) and installed power (GW)) so value-led and volume-led views reconcile rather than conflict.
- **Region-honest forecasting** — Latin America, Africa and the Middle East reported in full, never hidden inside Rest of World, every forecast resolved to the 2025 base year.
- **Integrated evidence base** — company, patent and project databases linked to the analysis, with published-filing patents and FTO treated as an indicator, not a legal conclusion.
- **No-fabrication discipline** — every estimate carries a data-confidence rating and disclosed sources; gaps are flagged for further diligence, never filled with invented numbers.
- **Anti-greenwashing rigour** — SDG-washing and greenwashing screens plus claim-substantiation checks built into the ESG and project analysis.
- **Decision-first structure** — 9 Parts and 53 Chapters culminating in stakeholder playbooks and a clear, decision-ready investment verdict.

WHO SHOULD BUY THIS REPORT

Investors and infrastructure / PE funds, utilities and grid operators, hydro OEMs and EPCs, procurement and sustainability leaders, policymakers and lenders, and corporate strategy and ESG teams.

Access the Full Report

The complete report delivers all 53 chapters in full, with every sub-heading, country table, company and patent directory, forecast model and due diligence checklist.

Purchase at www.anewmarketdynamics.com · Standard & Premium licences · Single-Site (SSL) and Global-Site (GSL) options at checkout.

Want the Complete Detailed Table of Contents?

This prospectus lists the nine parts and 53 chapters. The complete detailed table of contents — every sub-heading, country table, exhibit, company and patent directory and annex — is available on request to registered users. To receive it, register with your official company email at www.anewmarketdynamics.com. The full detailed table of contents will be sent directly to your registered company email address.