How Risk and Resilience Shape PE Investment in High-Risk Industries

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Executive summary

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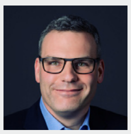

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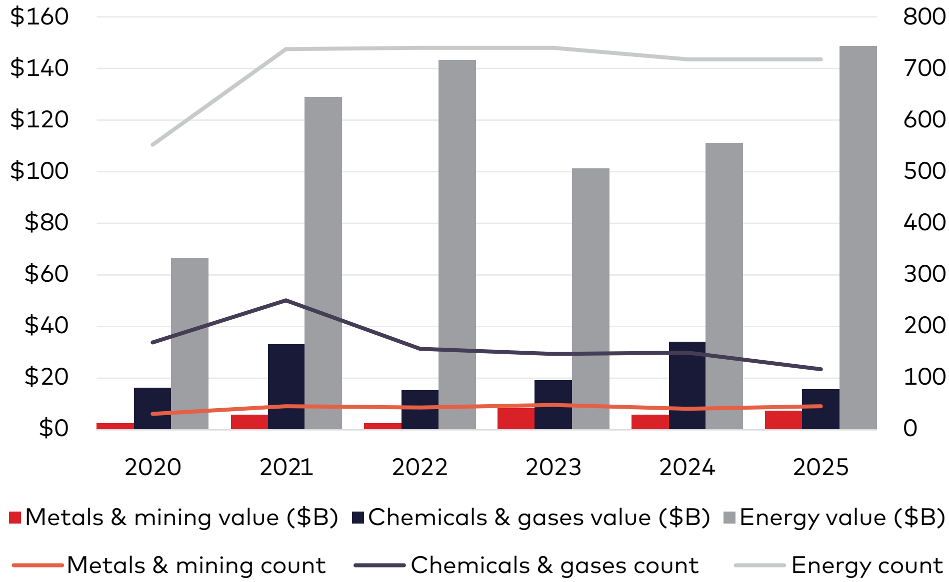
Figure 1: **PE deal activity by select extractive industries**



Source: PitchBook • Geography: Global • As of December 31, 2025

Private equity (PE) firms are uniquely positioned to transform mature, volatile, and high-risk industries. With ownership periods spanning several years and in some cases decades, PE firms invest for the long haul and are no stranger to capital-intensive operations. Mining, energy refining, and chemicals are among just some of the sectors that are increasingly being identified by PE firms as targets for value creation and consolidation.

PE dealmaking in these industries is becoming more concentrated and selective, with fewer but larger transactions driving aggregate value. Record average deal sizes and outsized exits reflect conviction in long-term demand, but they also heighten execution risk and concentrate fund performance in a smaller set of scaled assets.

Commodity price volatility directly shapes cash flows and investment timing across these areas. Firms may view this exposure as an opportunity to acquire assets at favorable valuations, apply operational discipline to stabilize performance if needed, and create scaled platforms for greater returns once prices normalize.

Structural flexibility in dealmaking signals risk management rather than retreat. Sponsors are leaning into growth investments and add-on strategies—particularly in the energy and metals & mining industries—to balance exposure and competitive positioning in volatile markets.

Geopolitical uncertainty and new demand for the materials and infrastructure that enable artificial intelligence (AI) technologies is having an outsized effect on the dealmaking landscape. Operational and strategic risk management are more critical than ever to ensure resilience, and private investors are adjusting their own strategies in response.

Resilience is largely a capability built through post-transaction operating discipline. Assets that sustain cash flow and cost positioning, tight compliance, and operational reliability are increasingly differentiated over time. Tightening regulatory constraints, financing bifurcation, and climate-driven disruptions are the primary underestimated signals that shape outcomes in heavy industrial sectors. Throughout this report, dss+ experts weigh in on critical considerations for firms assessing and operating in these sectors.

Similar to dealmaking trends, exit markets are increasingly held up by a limited number of larger transactions. This dynamic raises the bar for operational discipline, capital governance, and resilience for portfolio companies as investors seek proportionate returns over extended holding periods.

Trend analysis

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In high-risk industries where operating risk and capital intensity are high, what does "resilience" actually mean after a PE transaction, and how does that definition differ from what investors may assume during the due diligence process?

Resilience is often defined narrowly in diligence as the ability of an asset to withstand a price dip, a short-term demand shock or cost inflation. Looking at asset trading history through volatility in the past decade, nuances emerge. Premia concentrate in assets that sustain throughput, safety and compliance when conditions deteriorate, not in those whose diligence assumed resilience.

Post-transaction, resilience shows up as the ability to keep cash flowing safely at or below an asset's position on the cost curve under adverse conditions, while preserving exit optionality. That capability depends on operational reliability, safety and environmental performance, regulatory and community standing, cost agility and credible decarbonisation pathways.

Diligence can diverge from reality. Pre-close models assume steady throughput and recoveries. Post-close, owners inherit maintenance backlogs, weak control verification and contractor safety variability; all reduce availability and introduce downside risk. A similar gap appears around ESG and decarbonisation. Data rooms demonstrate policy compliance. Exit markets increasingly price execution. Resilience is built through sustained operating performance, including reliable compliance, disciplined permitting, credible community engagement and abatement plans grounded in power, grid and offtake realities.

Resilience is not a one-and-done underwriting; it is an operating capability that determines whether value compounds or erodes over the hold period.

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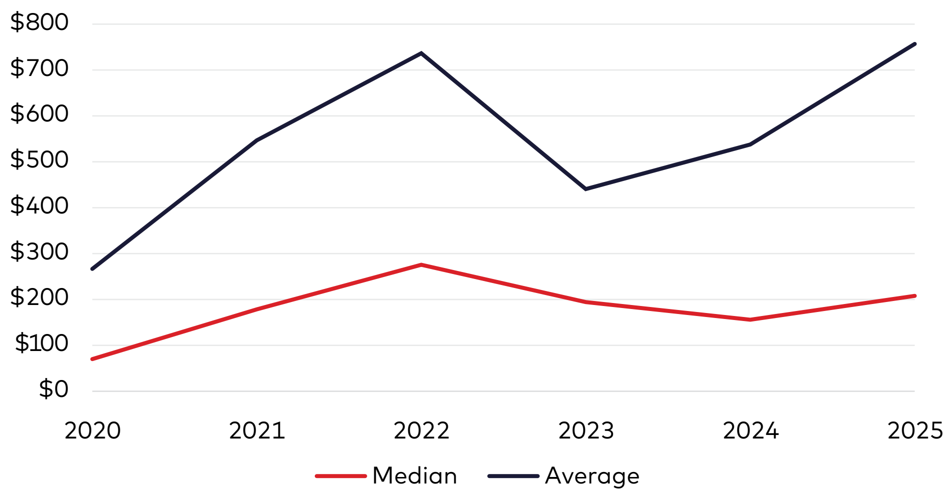
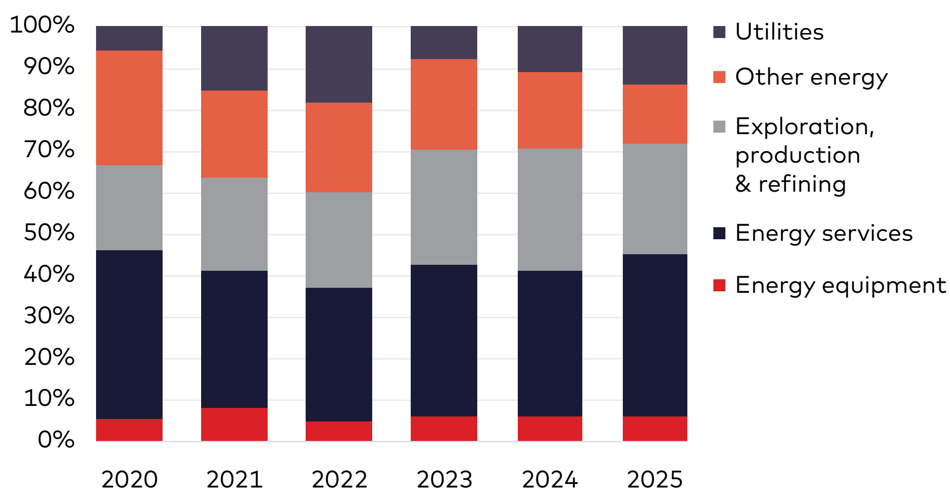
Figure 2: Median and average energy PE buyout deal value ($M)



Source: PitchBook • Geography: Global • As of December 31, 2025

Figure 3: Share of energy PE deal value by subsector



Source: PitchBook • Geography: Global • As of December 31, 2025

Capital concentration and valuation expansion outweigh volume softness

One major industry-agnostic trend unfolding in private capital markets is that of capital concentration. Fewer deals are closing, and fewer new capital commitments are being made for funds. Major deals are still closing, but for a more select number of players compared with the early 2020s.

Across extractive industries, capital concentration trends are taking shape as firms make a limited number of outsized investments in priority areas. A full rebound to the pace of investments made in the pre-pandemic era remains on the horizon, indicating a confident but uneven outlook (Figure 1). The average buyout size in the energy industry, for example, rose more than 40% in 2025 to a record $756.9 million (Figure 2).

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What are the most common operational or sustainability-related gaps you see inherited in these sectors, and which ones create the biggest drag on value if left unaddressed post-close?

In diligence, most of these risks are identified in some form. The issue is rarely awareness, but how consistently their impact on value is underestimated once volatility and longer holding periods are taken seriously.

Across post-close performance in energy, chemicals and mining, value erosion rarely stems from a single catastrophic failure. It comes from operational gaps that compound over time, especially when markets soften or conditions tighten.

The most persistent source of value drag is asset integrity and maintenance debt. Assets often enter PE ownership with deferred preventive maintenance, incomplete condition data and reactive spares strategies. In throughput-driven businesses, this suppresses availability and raises unit costs. Lost production in the early years of the hold is rarely recovered, turning what appears manageable into a drag on returns.

A second risk sits in critical control and process safety gaps. Risk registers may appear compliant, but verification around isolation, confined space entry, tailings, water management or major accident hazards is often weak. A serious incident can eliminate a year of earnings and narrow exit optionality. These low-frequency but high-impact risks are underweighted in underwriting cases.

Permitting, water and tailings governance are also mispriced. Often treated as compliance matters, minor noncompliances can lead to curtailments, regulatory intervention or insurer scrutiny, raising the asset's risk profile and affecting valuation.

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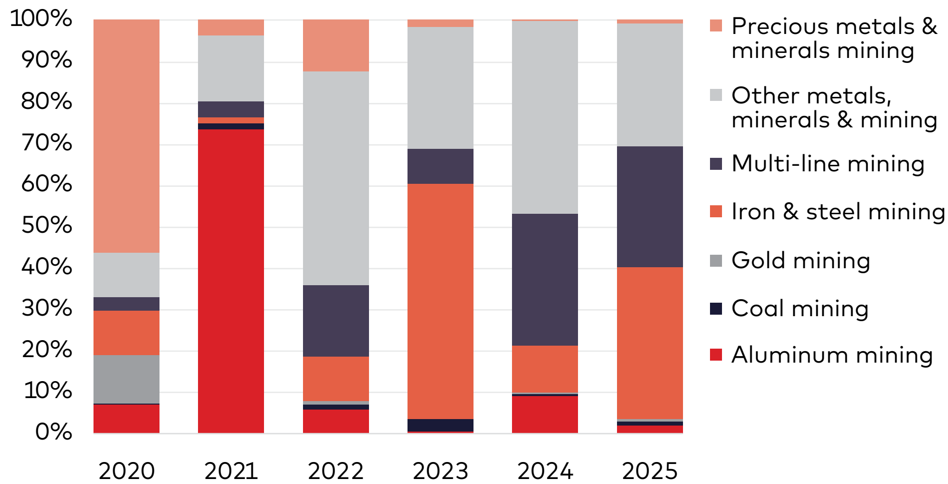
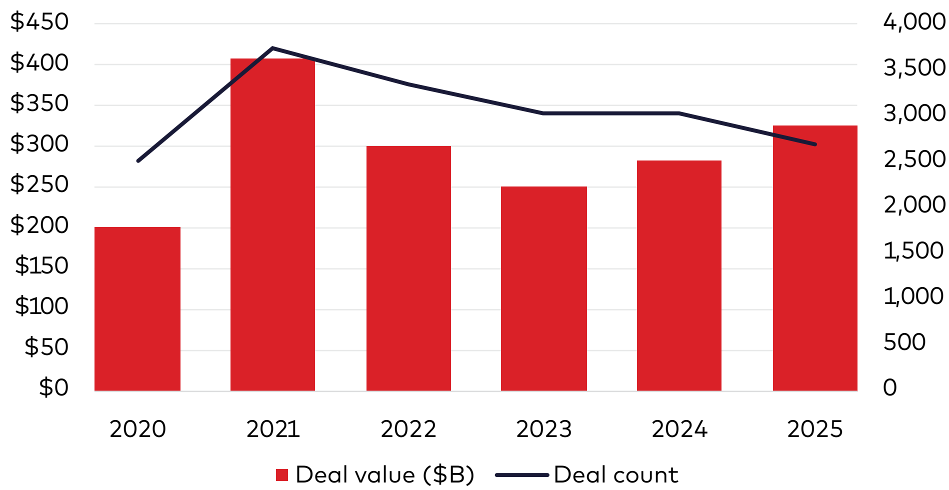
Figure 4: Share of metals & mining PE deal value by subsector



Source: PitchBook • Geography: Global • As of December 31, 2025

Figure 5: Manufacturing PE deal activity



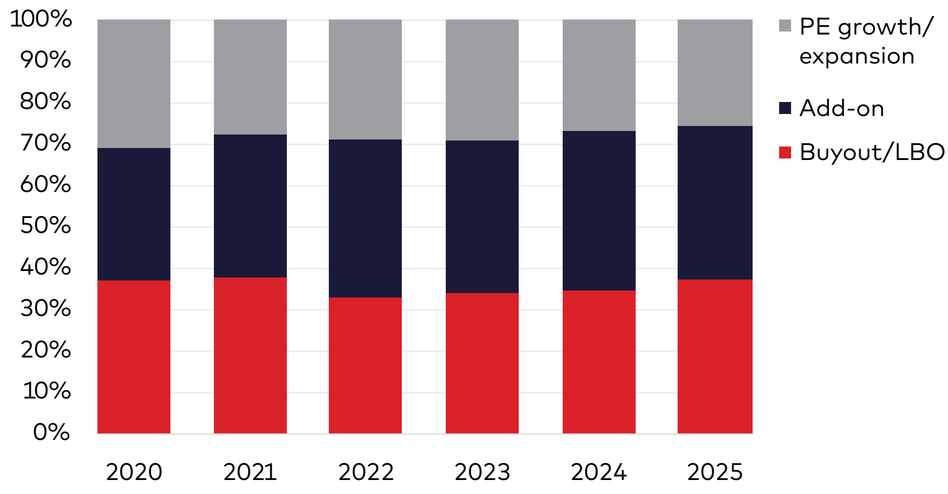
Source: PitchBook • Geography: Global • As of December 31, 2025

Brookfield's $9 billion buyout of US petroleum transportation provider Colonial Pipeline contributed to this jump and marked the sixth-largest PE energy deal on record.

Macroeconomic volatility weighed more heavily on overall dealmaking activity beginning in 2022, but momentum in AI has created some of the highest-valued private companies on record. Complementary technologies and inputs, such as silicon for chip production, lithium for grid-scale batteries, and specialty chemicals for cooling fluids, are seeing increased demand due to AI build-outs.

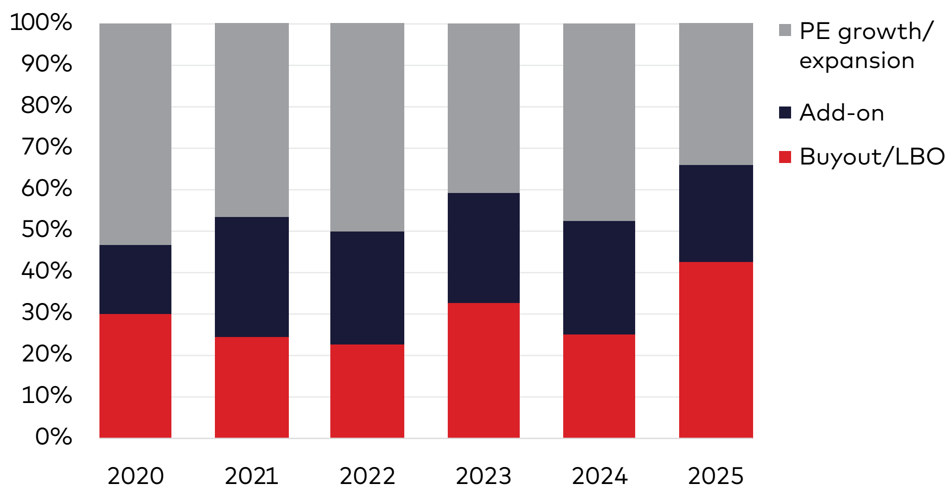
Extractive industries are unique in that they underpin the physical economy and will be structurally necessary regardless of any near-term technology cycles. These companies provide essential inputs for industrial production and infrastructure, and PE firms recognize that these sectors will benefit from durable, long-term demand, making them attractive for value creation across cycles.

Figure 6: Share of manufacturing PE deal count by type



Source: PitchBook • Geography: Global • As of December 31, 2025

Figure 7: Share of metals & mining PE deal count by type



Source: PitchBook • Geography: Global • As of December 31, 2025

Sector-specific themes like grid resilience, as well as firm-level priorities like portfolio diversification, are among the motivations for firms investing across these areas.

While extractive industries are typically located upstream on the value chain, PE firms are also deploying significant capital to downstream activities. This trend is illustrated in manufacturing PE deal activity, which has grown steadily over the past three years and is reapproaching the record levels of deal value achieved in 2021 (Figure 5).

Large transactions are nothing new for PE firms, but they do raise the stakes for risk management at both the operational and strategic levels. Capital-intensive and legacy industries require heightened oversight and safety checks that cannot slip through the cracks during an ownership transfer. Margin improvement in a highly valued extractive company requires careful day-to-day improvements and strong leadership. Strategic positioning is also likely to change through a PE transaction, as the new majority owners look to refine the direction of the business to maintain competitiveness.

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Many PE sponsors are now holding assets longer than originally planned. In your experience, how does a longer ownership period impact the priorities for companies in these industries?

Longer PE ownership materially changes operating agendas in extractive and industrial sectors. Financial engineering and short-cycle optimisation no longer drive returns. As hold periods extend to 7-10 years, value creation depends on structural improvement, risk reduction and asset resilience.

Reliability and asset integrity become nonnegotiable. When exit horizons were shorter, equipment risks or deferred maintenance could be tolerated. Under longer holds, sponsors own the consequences of downtime and integrity backlogs. In energy, $151 billion of 2025 exit value concentrated in uptime-reliable assets, making operational stability a value driver.

Longer ownership also changes capital project evaluation. In mining, chemicals and energy, investments rarely pay back quickly. Extended holds allow sponsors to benefit from expansions, debottlenecking and staged growth, if capital is tightly governed. Poor sequencing or inflexible capex structures introduce execution risk and liquidity strain that erode returns.

Crucially, longer holds remove the option of passing ESG or compliance risk to the next owner. Buyers are increasingly unwilling to absorb unresolved permitting, water or emissions exposures. In chemicals, where multiples compressed to around 7.4x in 2025 as compliance and sustainability risks were priced in, sponsors invest earlier in emissions control and permitting discipline to protect valuation and exit options. Finally, longer ownership raises the bar on organisational capability. Sponsors must build teams capable of multiyear transformation.

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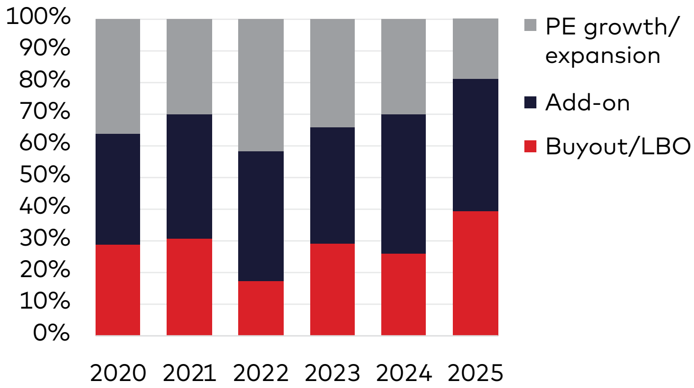
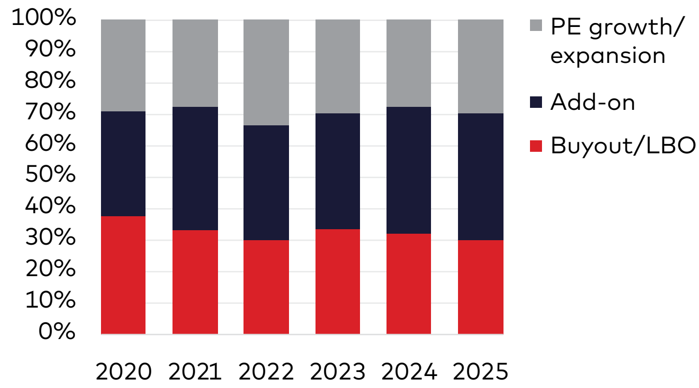
Figure 8: Share of chemicals & gases PE deal count by type



Source: PitchBook • Geography: Global • As of December 31, 2025

Figure 9: Share of energy PE deal count by type



Source: PitchBook • Geography: Global • As of December 31, 2025

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Longer holds reward those who shift early from arbitrage to operations and from short-term optimisation to durable resilience. Looking ahead, what signals do you think owners are still underestimating when it comes to resilience in extractive industries, whether related to regulation, financing conditions, or operational disruption, and how should that shape post-transaction strategies today?

Even as resilience has moved up the agenda, owners continue to underestimate three signals reshaping outcomes in extractive and heavy industrial sectors. The issue is not awareness, but that these risks remain underpriced in underwriting and addressed too late post-transaction.

The first is the pace and rigidity of regulatory and permitting constraints. Emissions thresholds, water availability and approval timelines are tightening faster than many base cases assume. These are binding operating constraints that directly affect throughput and growth optionality. Strategies that treat permitting as static often discover too late that flexibility has been lost.
The second is bifurcation in financing conditions. Debt and exit markets are differentiating between assets with demonstrable operating discipline and those carrying unresolved reliability or sustainability exposures. Assets on the wrong side face higher debt costs, tighter covenants and a narrower buyer universe. This is already visible in refinancing outcomes. Post-transaction strategies need to build early credibility with lenders through transparent maintenance plans, liquidity buffers and clear governance of operational and sustainability risks.

The third is climate-driven operational disruption. Heat stress, water scarcity and extreme weather are materially affecting uptime, maintenance cycles and workforce availability. Many assets are still managed against historical operating envelopes that no longer apply. When disruption increases, lost EBITDA is permanent.

Resilience can no longer sit at the periphery of the value creation plan. Strategies need to front-load integrity, compliance and reliability, prioritising maintenance backlogs and permitting discipline before growth initiatives that assume uninterrupted operations. Capex and sustainability roadmaps should be modular and sequenced to preserve optionality as conditions shift. Resilience must be treated as a core financial assumption that protects downside and preserves exit options.

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Structural flexibility in dealmaking reflects risk management rather than retreat

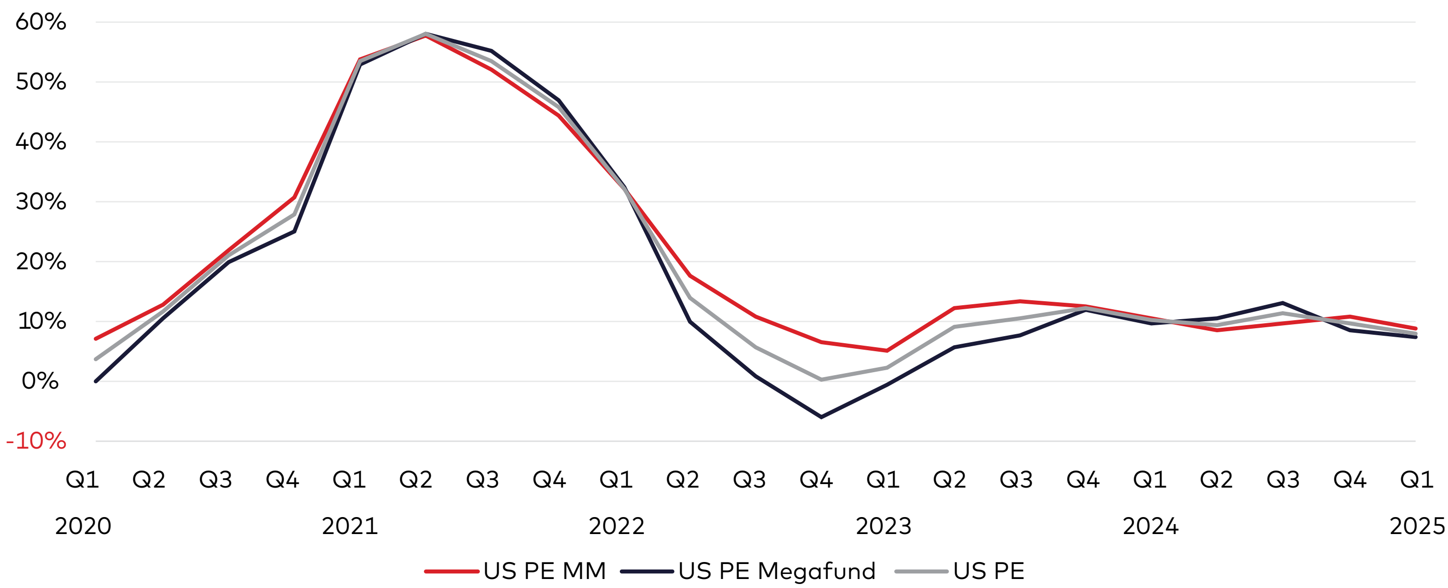
As PE firms seek to balance healthy returns with ever-changing risk profiles in extractive industries, some are choosing to manage exposure through specialized deal types, including PE growth deals, which operate like a venture capital (VC) deal with a minority ownership stake. The energy and metals & mining industries both attract a material flow of these growth deals, which accounted for 29.7% and 34.0% of total PE deal count in 2025, respectively (Figures 9 and 7). The prominence of these deal types reflects the capital intensity and cyclicality of the industries, which can complicate traditional buyouts. For generalist firms in particular, growth deals can balance flexibility with exposure preferences.

Consolidation through platform creation and add-on deals remains a core strategy, reflected in the rising share of add-ons in chemicals and gases and manufacturing (Figures 7 and 8). Both sectors are globally fragmented, offering a broad pool of targets that can be integrated into larger platforms over time. Add-ons enable sponsors to scale assets incrementally and improve operations without higher upfront risk of large transactions. In volatile markets, they also offer flexibility on valuations and exit timing, supporting disciplined capital deployment as firms prioritize margins and profitability.

SPOTLIGHT

Fund performance and exit impacts

Figure 10: Rolling one-year US PE fund performance by type



Source: PitchBook 2025 Annual US PE Breakdown • Geography: US • As of March 31, 2025

Fund performance reflects volatility and cautious optimism

PE fund performance data illustrates the volatility firms have faced in realizing returns on their investments over the past five years. Performance has stabilized after a lull in late 2022, when macroeconomic volatility dampened market receptiveness, causing exit timelines to extend. Middle-market PE funds edged ahead of the overall asset class throughout 2024, but the aforementioned capital concentration in fewer dealmaking stages could result in megafunds outpacing the rest of the asset class in the near term. Survey data shows PE industry players expect energy and technology to produce the greatest upside in the near term (Figure 10),[1] meaning investment in extractive industries and their downstream channel partners will likely hold steady, and backlogged exits may continue to clear. Holding periods for exiting PE companies ticked downward to a median of six years in 2025, indicating faster overall returns after a period of extension (Figure 11).

Exit markets are increasingly bifurcated between scale winners and the rest

Exit markets saw uneven growth for extractive industries, with energy exit count dropping significantly despite a record $151 billion in cumulative value (Figure 12). The chemicals and mining sectors experienced similar trends, pointing to uneven growth.
This combination of sharply lower exit counts and record cumulative exit value underscores a winner-take-most dynamic in realizations. Fund performance and exit values are increasingly tied to a smaller number of scaled, high-quality outcomes, raising the importance of selectivity and timing for firms at the beginning of their investment cycles. This creates a renewed emphasis on operational and strategic risk management during extended holding periods. As long as large exits are possible and macroeconomic opportunities remain in place, extractive industries can expect continued investment from firms, but heightened due diligence and operational control can be expected until an exit recovery becomes broader and more even.

1: "2026 US Private Equity Outlook," PitchBook, Marina Lukatsky, Jinny Choi, and Kyle Walters, December 3, 2025.

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How much of the value case we underwrite today actually depends on uninterrupted operations, and what would our returns look like if we modelled even a modest increase in unplanned downtime, supply chain disruption, or climate-driven outages over a 7-10 year hold?

If owners examine their underwriting assumptions closely, much of the value case in extractive and industrial sectors depends on uninterrupted operations, stable throughput and largely linear asset degradation over a 7-10 year hold. This assumption is embedded in cash flow forecasts, capex plans and exit timing.

Returns are highly sensitive to modest deviations from that baseline. A small rise in unplanned downtime, supply chain disruption or climate-driven outages can erode value disproportionately over longer holds. The asymmetry is straightforward. EBITDA lost during downtime is permanent, while recovery is constrained by capacity, maintenance cycles and regulatory limits.

Few underwriting cases model this compounding effect. Disruption is treated as a tail risk rather than a recurring condition. Yet the frequency and correlation of these events are increasing.

Market outcomes reflect this shift. Premium exits are concentrating in assets that demonstrate sustained reliability through cycles. Assets with unresolved reliability, permitting or climate-exposed risks face multiple compression, tighter financing terms and reduced buyer appetite. This is visible in exit selectivity and deal structures.

The implication is clear. Under longer holds, operational risk is central to the value case. Owners who underwrite frictionless operating futures are mispricing risk. Assets that outperform invest early to reduce volatility, protect throughput and preserve exit optionality across operating conditions.

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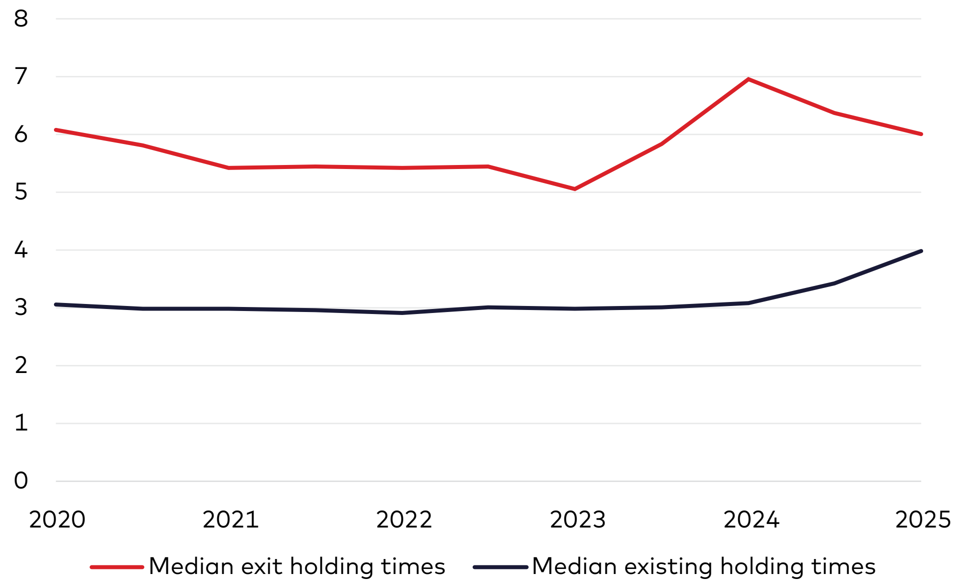
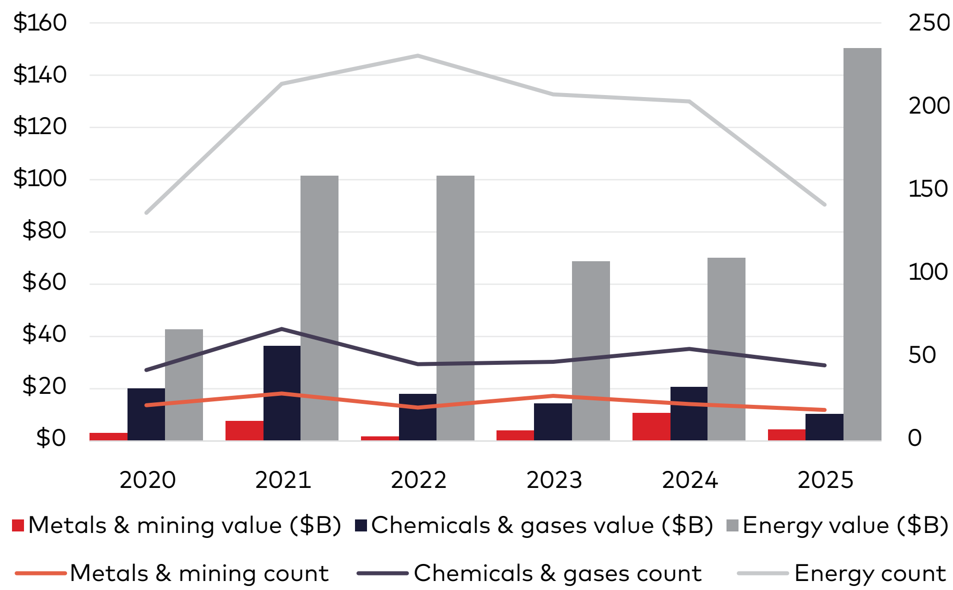
Figure 11: Median US PE company holding times (years)



Source: PitchBook 2025 Annual US PE Breakdown • Geography: US • As of December 31, 2025

Figure 12: PE exit activity in select extractive industries



Source: PitchBook • Geography: Global • As of December 31, 2025

Conclusion

PE activity across extractive industries is entering a more selective and structurally disciplined phase rather than a period of retrenchment. The data indicates a sustained conviction in the long-term relevance of energy, metals, chemicals, and manufacturing, even as firms recalibrate how they deploy capital amid geopolitical uncertainty and uneven exit conditions. Extractive industries continue to underpin the physical economy, and their role in enabling AI, electrification, and grid resilience reinforces their strategic importance despite short-term cyclical pressures.

Despite the strong fundamentals, PE firms' overall approach to these industries has shifted. Capital is increasingly concentrated in fewer, larger transactions and platforms, raising both the upside potential and the consequences of execution risk. At the same time, firms are leaning more heavily on structural flexibility through growth investments, add-on acquisitions, and staged consolidation strategies. These approaches allow sponsors to manage commodity exposure, regulatory risk, and valuation uncertainty while still positioning portfolios to benefit from durable demand trends. Fragmentation across global extractive supply chains further supports this strategy, offering a long runway for incremental scale-building rather than reliance on single, transformative buyouts.

Exit dynamics reinforce this discipline. The divergence between exit value and exit volume suggests that only scaled, high-quality assets are clearing consistently, while subscale or operationally constrained businesses face longer holding periods. This reality feeds back into deal selection, underwriting assumptions, and post-acquisition priorities, elevating the importance of operational excellence, capital discipline, and strategic clarity from day one of ownership.

PE firms are likely to remain active participants in extractive industries, but success will hinge on patience, selectivity, and risk management rather than financial engineering alone. As long as these sectors remain essential to industrial production and technological advancement, they will continue to attract private capital, albeit under tighter scrutiny and with a sharper focus on execution and exit viability.

Methodology

Reports are prepared in accordance with PitchBook's methodology, which is described in detail on the PitchBook report methodologies page.

Verticals and industries examined in this report are not mutually exclusive as companies may operate in more than one area.

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