

Linde's Next Hydrogen Gate: Preserve the Option or Wait?

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All dollar amounts are U.S. dollars. This case uses public information available by the decision date. The decision described below is hypothetical.

The decision

On the afternoon of October 31, Linde's strategy committee must decide how to handle a possible next stage of its relationship with Dow's Path2Zero project in Alberta, Canada. Linde signed a long-term supply agreement for Phase 1 and announced an investment exceeding \$2 billion in a new industrial-gas complex. Separately, Dow's board took a final investment decision on the broader Path2Zero project in November 2023. The committee is not being asked to reopen Linde's Phase 1 agreement or investment announcement.

The narrower question is whether to authorize a limited, staged, reversible preparation effort for a possible Dow Phase 2 and related low-carbon hydrogen opportunities-or wait for stronger customer commitments, project economics, and execution evidence before committing additional resources. The scope and cost of any early engineering effort are not public. No Linde Phase 2 authorization had been announced by the cutoff.

At its morning earnings call, Linde management said Phase 2 was not committed and that an investment decision would come over the next few years. Management also said it was speaking with potential customers and described possible follow-on demand as part of a broader opportunity set. Those discussions and opportunities were not contracted backlog. Students advising the committee must decide what, if anything, Linde should spend to learn more or preserve access-and what evidence should be required before the next irreversible step.

A contracted first phase

Linde is one of the world's largest industrial-gas companies. It makes and supplies atmospheric gases, hydrogen, and other gases through a mix of on-site plants, pipelines, bulk deliveries, and merchant sales. Dedicated plants can support long customer relationships, but they also require large, long-lived investments whose value depends on reliable operation and customer demand.

Under its August 2024 announcement, Linde will build, own, and operate an industrial-gas complex at Dow's Path2Zero site in Fort Saskatchewan, Alberta. Linde said the facility would supply atmospheric gases and low-carbon hydrogen and provide related carbon-dioxide capture and off-gas cleanup services. The companies described planned capture for sequestration of more than two million metric tons of CO₂ annually. Start-up was expected in late 2028. These are announced plans and expectations, not operating results.

Linde described the long-term supply agreement as a traditional over-the-fence contract and said the project met its fixed-fee investment criteria. Management said this structure protects returns from changes in input costs. The public disclosures do not provide the fee formula, escalation provisions, minimum volume or take-or-pay terms, credit support, termination rights, or remedies for customer underperformance. Nor do they show how construction overruns, delayed start-up, carbon-capture performance, carbon-credit changes, or CO₂ transport and storage availability are allocated. “Fixed-fee” therefore describes management’s characterization of part of the economics; it does not establish that the project is risk-free.

Dow’s board had approved its broader Path2Zero project in November 2023. That customer-side decision is distinct from any future Linde investment decision for Phase 2. Dow’s September 2024 project update described the site’s intended transformation and anticipated timing, but it did not commit Linde to later phases.

Capital is being deployed elsewhere

Linde reported third-quarter sales of \$8.4 billion. Diluted earnings per share were \$3.22 under GAAP and \$3.94 on an adjusted basis; the adjusted figure is non-GAAP. Reported operating profit was approximately \$2.1 billion and adjusted operating profit approximately \$2.5 billion. The company reported a 29.6% adjusted operating margin. These measures describe Linde’s broader operating performance; they do not disclose the expected return on the Dow project.

Management described industrial end markets as soft, with sequential declines of 1%-2%, weakness in Europe and China, and no near-term catalyst. North America was comparatively stronger. For full-year 2024, Linde expected capital expenditure of \$4.0-\$4.5 billion. Its third-quarter release reported a \$10 billion sale-of-gas backlog, including \$7 billion of contractual sale-of-gas project backlog. The backlog is not revenue, net present value, or a clean-energy-only measure. It must not be added to a separate decarbonization opportunity figure.

Linde’s project capital expenditure increased 40% year over year as it executed its sale-of-gas backlog; base capital expenditure declined 4%. Management said its contracted project backlog comprised growth investments under customer contracts with fixed-fee returns protected against input-cost changes. That claim concerns the described contracted backlog and should not automatically be extended to unsigned Phase 2 possibilities.

The latest filed quarterly report available at the cutoff, for June 30, showed first-half capital expenditure of \$2.181 billion and estimated capital cost of \$4.7 billion for large sale-of-gas plants under construction. The \$4.7 billion was an estimate for those plants, not Linde’s remaining spending, project revenue, or the cost of Phase 2. For context, Linde’s 2023 Form 10-K reported \$3.787 billion of annual capital expenditure and \$4.9 billion of estimated capital cost for large sale-of-gas projects under construction at year-end.

The potential follow-on opportunity sits within a much larger capital-allocation system. Linde has contracted growth projects, maintenance needs, industrial-gas investments, potential acquisitions, and shareholder returns competing for resources. The company has not disclosed a project-level ranking that lets an outside observer determine which use has the highest risk-adjusted return. It has also not disclosed a cost for the early engineering or planning that might preserve the Phase 2 option.

An opportunity pipeline is not a commitment

In its 2023 Sustainable Development Report, Linde described about 200 clean-energy opportunities and up to \$50 billion of potential involvement over the following decade. At year-end 2023, it reported nearly \$2 billion of decarbonization project backlog. These are company-reported pipeline and backlog figures with different dates and scopes. The \$50 billion represents potential involvement, not Linde capital expenditure or revenue.

On the October call, management described an \$8-\$10 billion clean-energy investment ambition and said roughly half was signed across OCI and Dow Phase 1. It identified Dow Phase 2 as uncommitted. An analyst's questions included suggested pipeline figures, but those figures were not management's own estimates. The committee has no public Phase 2 engineering scope, capex plan, customer volume commitments, contract terms, return estimate, or project-specific policy-credit analysis.

Follow-on projects could benefit from Linde's regional infrastructure, operating experience, customer relationships, and proximity to industrial demand. Management pointed to potential customer conversations and network density. The scale and timing of such spillovers are unknown. A pipeline count or total potential involvement does not show which opportunities will proceed, when customers will commit, or whether shared assets would lower incremental costs enough to meet Linde's hurdle.

Contracts, policy and project execution

The signed Phase 1 agreement gives Linde more customer evidence than an uncontracted project pipeline does. Yet its public terms remain limited. Students should distinguish what a contract may protect from what is undisclosed: feedstock or utility pass-throughs, fixed and variable charges, minimum offtake, escalation, customer credit, construction obligations, performance standards, and termination exposure.

Other risks span the project system. Linde must construct and commission a complex facility on a multi-year schedule. Dow must execute its own site investment and operate the customer facilities that create demand. Hydrogen's "low-carbon" status and project economics may depend on policy credits and carbon accounting. Capture equipment must perform as planned; transport links and sequestration capacity must be available under workable terms. Permits, infrastructure interfaces, construction contractors, input supplies, customer operations, and policy rules can all affect timing or economics. Public disclosures do not quantify these exposures for Phase 1 or a possible Phase 2.

A useful structural comparison is Air Products' NEOM project. In its Q1 FY2024 Form 10-Q, Air Products described approximately \$6.1 billion of non-recourse project financing for the joint venture and a \$6.7 billion EPC contract. These are separately reported financing and contract figures; the filing does not state that the financing was secured against or sized to the EPC contract. The disclosure illustrates one possible ownership and financing architecture. NEOM differs in geography, ownership, customer arrangements, technology and project scope; its figures do not establish a comparable return or risk level for Linde's Dow arrangement.

What does waiting buy?

Research on investment under uncertainty offers competing insights. A September 2024 NBER paper's abstract reports that returns for carbon-solution providers move positively with carbon prices and negatively with carbon-price uncertainty, a pattern consistent with waiting when investment is hard to reverse and policy-linked payoffs are uncertain. The evidence is European and based on provider returns; it does not estimate Linde's North American project economics. The original paper's full text was not available for verification here, so the case uses only its abstract-level mechanism.

Other research cautions against simple portfolio conclusions. Campa and Kedia's study finds that the measured diversification discount falls and sometimes disappears when firms' endogenous choices to diversify are addressed. This does not prove that every adjacent investment creates value. Stein's conceptual work describes how a corporate center may create value by directing scarce capital to stronger opportunities; only the publisher abstract was verified for this case. Together, these studies frame questions about uncertainty, selection, and capital allocation. None supplies a Linde-specific return or a forecast for hydrogen demand.

The committee's alternatives

The committee can frame its choice in at least two credible ways:

- **Preserve the option:** authorize a capped, staged preparation effort for possible Phase 2 or related customer opportunities. Define the work as reversible where possible and specify what evidence would be needed at each later gate: customer commitments, contract protections, cost and schedule estimates, permits and infrastructure, policy-credit exposure, carbon transport and storage, and incremental network economics.
- **Wait for stronger evidence:** limit new discretionary work until customer demand, engineering scope, economics, and execution dependencies become clearer. Keep capital and management attention available for contracted backlog, maintenance, other industrial-gas projects, and other capital-allocation needs.

A committee could also consider a narrower variant: fund only work paid for by a customer or protected by a clear contractual right, while deferring other spending. Any proposed cap, date, resource allocation, or threshold not disclosed by Linde must be identified as a teaching assumption rather than a company fact.

Staging can generate information and preserve future access, but it can still consume engineering capacity, create expectations, or lead gradually to sunk commitments. Waiting can preserve capital, but might delay customer engagement or forfeit a position in a dense regional network. The public record does not quantify these costs.

Assignment

You are advising Linde's strategy committee as of October 31, 2024. Recommend whether to authorize limited, staged, reversible preparation for possible Dow Phase 2 and related follow-on opportunities, wait for stronger evidence, or adopt a narrower alternative. Identify the next decision gate and the evidence that should be required before any irreversible commitment.

State which risks Linde should bear, share, or transfer; identify the strongest argument against your recommendation; and define observable conditions to proceed, pause, or stop. Separate reported facts, management claims, derived comparisons, and teaching assumptions. Do not calculate or invent a Phase 2 NPV, IRR, contract term, capex figure, or customer commitment

from the public information provided.

Student source notes

1. Linde, “Linde Announces Third Quarter 2024 Earnings and Conference Call Schedule,” October 8, 2024; release, call, and replay timing; [company release](#).
2. Linde, Q3 2024 earnings release and tables, October 31, 2024; opening highlights, “Capital Management,” “Project Backlog,” full-year outlook, and GAAP/non-GAAP reconciliations; [company release page](#), [tables PDF](#).
3. Linde, 3Q24 earnings-call transcript, October 31, 2024; pp. 1-3, 6-7, 11, and 14-15; [company transcript](#).
4. Linde, Form 10-Q for the quarter ended June 30, 2024, filed August 2, 2024; MD&A “Investing,” liquidity and cash flow; [SEC filing](#).
5. Linde, 2023 Form 10-K, filed February 28, 2024; MD&A “Investing”; [SEC filing](#).
6. Linde, 2023 Sustainable Development Report, 2024; PDF p. 22, clean-energy pipeline and backlog; [company report](#).
7. Linde, “Linde Signs Long-Term Agreement to Supply Clean Hydrogen to Dow’s Path2Zero Project in Canada,” August 27, 2024; project scope, investment and expected timing; [company announcement](#).
8. Dow, “Dow’s Board of Directors Approves Final Investment Decision for Path2Zero Project,” November 28, 2023; [Dow release](#).
9. Dow, Path2Zero project update, September 2024; [Dow project page](#).
10. Air Products, Q1 FY2024 Form 10-Q for quarter ended December 31, 2023, filed February 5, 2024; Note 3, “Variable Interest Entities,” NGHC Joint Venture; [SEC filing](#).
11. Maximilian Fuchs, Johannes Stroebel, and Julian Terstegge, “Carbon VIX: Carbon Price Uncertainty and Decarbonization Investments,” NBER Working Paper 32937, September 2024; abstract only; [NBER record](#).
12. José Manuel Campa and Simi Kedia, “Explaining the Diversification Discount,” *Journal of Finance* 57, no. 4 (2002): 1731-1762; full working-paper version read selectively; [working paper](#), [journal record](#).
13. Jeremy C. Stein, “Internal Capital Markets and the Competition for Corporate Resources,” *Journal of Finance* 52, no. 1 (1997): 111-133; publisher abstract only; [publisher record](#).

Information boundary: This student case stops at 4:00 p.m. EDT on October 31, 2024. It excludes later filings, outcomes, and decisions.