



Desperately Seeking an Exit

Shell Sells Its Pennsylvania Tax Credits for Millions, But Still Wants Out

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Key Findings:

- Shell is reportedly seeking a buyer or partner for its Polymers Monaca facility. **The company is unlikely to recoup its \$14 billion petrochemical investment.**
- **After receiving the largest tax incentive package in Pennsylvania history, Shell has failed to deliver on promises of jobs and downstream growth.** Since Shell's ethane cracker project was announced in 2012, Beaver County has seen inflation-adjusted GDP contract by 12%, population decline by 3%, and employment more than 13% despite growth nationally and statewide.
- **Now, new analysis of public records shows the company has been awarded nearly \$90 million in tax credits intended to support the local petrochemical industry.** In 2022 and 2023, it sold almost \$30 million of its credits, largely to out-of-state insurance firms and other companies unrelated to petrochemicals manufacturing. The disposition of the \$57 million awarded in 2024 has not been published.
- **The Pennsylvania Resource Manufacturing Tax Credit's "lookback provision," set to trigger in 2028, could allow legislators to reevaluate the flow of tax credits to Shell Polymers Monaca.**
- **The lookback provision will make finding a buyer or partner difficult. But it's just one of many obstacles.** Others are:
 - **Shell Polymers Monaca remains isolated.** Standalone ethane crackers face a significant disadvantage compared to facilities located near developed supply chains, like those along the Gulf Coast's "petrochemical corridor." These plants have connections to storage and other plants that can provide a buffer when operational upsets occur.
 - **A global supply glut "crisis" continues to pinch petrochemical producers.** Shell Polymers Monaca launched at the tail end of the "chemicals supercycle," a decades-long period of unprecedented petrochemical demand growth. The supercycle led to a massive overbuild of ethylene production capacity, tightening competition and narrowing petrochemical operators' margins.
 - **The price of Appalachian ethane, a petrochemical feedstock, may rise.** Shell targeted Appalachia for its petrochemicals complex shortly after the region's fracking boom opened up a wealth of cheap ethane. Now, expanded access to other markets, rising data center demand, and increased LNG exports have moved Appalachian gas prices up. Gas and ethane are no longer "trapped" in a lower value market.
- **These persistent factors are likely to discourage prospective partners or buyers.** On top of global market headwinds, Braskem, Formosa Plastics, LyondellBasel, Ineos, and other petrochemical majors are struggling with their own financial challenges.

Introduction

Nearly a decade after Shell officially announced it would build a massive petrochemical plant in Beaver County, Pennsylvania, the company is reconsidering its investment. The Shell Polymers Monaca plant is officially seeking a partner or an outright acquirer. It's unlikely the company will recover its \$14 billion investment, or even come close.

Residents of Pennsylvania will fare even worse. Pennsylvania amended its tax policy to add the largest tax incentive in its history (\$1.6 billion) to its existing economic development programs to help bring Shell to Beaver County, hoping the plant would lead to a revival of the ethylene industry in the region and provide economic benefits: thousands of new jobs spilling into upstream and downstream industries. Shell-funded research by professors at Roger Morris University used faulty assumptions to portray economic benefits that, even at the time, seemed improbable. Industry-funded research by IHS Markit,¹ using different, but equally unrealistic assumptions, projected a rosy forecast and valued a hypothetical plant in Appalachia at more than \$930 million.

These forecasts have fallen far short.

Both Shell and Pennsylvania residents, especially those who live nearby, now face a disappointing future. The project, originally projected to cost \$4 billion to \$6 billion, came in at \$14 billion and was delayed by years. The plant's financial results have been lackluster, however, due in large part to challenges in bringing the plant online at full capacity.

The plant's startup in 2022 coincided with the end of the so-called "Chemicals Supercycle," a period of unprecedented growth in global petrochemical demand between 1992 and 2021. This Supercycle led to a massive overbuild of ethylene capacity,² tightening competition and pressuring petrochemical producers to operate with increasingly slim margins. Slowing growth in China has changed the macroeconomic environment for polyethylene (PE), the commodity product produced in the Monaca facility.

This global supply glut shows no sign of ending. Currently the industry is in a "rationalization" phase, otherwise known as massive restructuring, as it adjusts to market trends. This is particularly true for commodity petrochemicals like PE. The headlines now describe delays and cancellations for new ethane capacity construction in the US and Canada, as well as facility closures across Europe. The fluid situation around tariffs is creating uncertainty around future trade patterns.

In Beaver County, Shell's ethane/ethylene cracker plant continues to struggle through an array of operational "niggles"³ that show no sign of abating. A fire in June 2025 has kept the plant from operating at full capacity.⁴ Shell has provided no indication when the plant will return to full operation.

Promises of job creation and economic benefits have not materialized. Over the last several years, The Ohio River Valley Institute (ORVI) has tracked the economic impacts of petrochemical development in Beaver County. Neither Beaver County nor Pennsylvania has financially benefited from the Shell plant. In fact, conditions in Beaver County, based on multiple indicators, have deteriorated since the plant's construction phase. Meanwhile, scientists and health officials continue to document hazardous-level emissions, and the Pennsylvania Department of Environmental Protection (PA-DEP) has issued numerous notices of violations (NOVs), settlements, and fines.

Taxpayers have invested heavily in this project. Pennsylvania subsidized this project with two main tax incentive programs. The plant site was approved for designation as a "Keystone Opportunity Zone" in 2013. The "KOZ"

program was initially enacted in 1998. It provided for exemptions from sales and use taxes during the plant's construction phase, and from property and potentially other taxes after the plant was in operation, for a total of up to 22 years.⁵

The second program was a newly created amendment to Pennsylvania's tax code. Called the "Pennsylvania Resource Manufacturing (PRM) Tax Credit," this program provided for credits based on Shell's purchases of ethane feedstock of \$.05/gallon through 2042. This tax incentive legislation, enacted in 2012, did not restrict the use of the credits to Shell, its subsidiaries, related upstream or downstream industries, or even companies in the state. However, this was surely not the intent of the bill's initial supporters.

"Pennsylvania Resource Manufacturing Tax Credit," a memo published on the Pennsylvania Senate Republicans website and still available online,⁶ describes the rationale for the tax incentive: to provide an incentive to build a new petrochemical complex that would "generate jobs and prosperity." The facility would "attract up to \$16 billion in private investment through related companies building around it," according to the American Chemical Council (ACC) and cited in the memo.

Initial conditions for Pennsylvania's tax credit were outlined in the memo: Shell could only sell or assign the tax credits to upstream [companies that extract natural gas containing ethane] or "downstream companies in related industries, such as plastics manufacturers and chemical processors operating a plant in Pennsylvania." The memo concluded: "This [tax] credit would assure that all facets of the petrochemical supply chain remain in Pennsylvania."

The PRM tax credit was initially intended to be limited to 30,000 barrels of ethane per day, according to a quote in the *Beaver County Times* from State Representative Jim Christiana, R-15, Brighton Township. He told the community that if "Shell receives the credit, it would only apply to 30,000 barrels of ethane per day. Current estimates by Shell predict the cracker plant will consume more than 100,000 barrels per day."⁷ When the final legislation was written, however, the tax credit was not limited to 30,000 barrels of feedstock, or to Shell, its subsidiaries, or even the petrochemical industry.

Notably, the tax credits under the Pennsylvania Resource Manufacturing Credit program that were awarded to Shell Chemical Appalachia, a subsidiary of a foreign company, have, so far, not been used by Shell, its subsidiaries, or companies focused on the Ohio River Valley.

According to public records through 2024, Shell has been awarded nearly \$90 million (\$89,115,063) in PRM tax credits for tax years 2022, 2023, and 2024. To date, it has sold the tax credits awarded for 2022 and 2023 to other companies – companies not in the petrochemical business. Most are out-of-state insurance companies, with headquarters in other states.

When the incentives provided by the existing and new tax programs are combined, it appears that Shell Chemical Appalachia is essentially exempt from all state taxes, except for payroll taxes on employee wages, and possibly sales and use taxes on post-construction goods and services. In order to compensate Potter Township and the Central Valley School District, located in Beaver County, for the loss of property tax revenue, Shell did agree to a Payment In Lieu of Property Taxes (PILOT) program. This provides for a payment of 110% of the property taxes paid by Horsehead Corp., the former occupant of the plant site. The payments were to begin when the plant became operational and to continue for 22 years. They are estimated to total just \$350,000 per year,⁸ barely half of 1% of Shell's \$57 million PRM credit in 2024 alone. Assuming the average salary of \$41/hour, for 600 employees on site (based on Shell's estimate),⁹ the credit exceeded the site's annual payroll.

No wonder this final legislation—a poorly designed and implemented tax credit—has not led to a manufacturing or petrochemical renaissance. Taken together, these two programs appear to have been a bad bargain for the taxpayers of Pennsylvania so far. And now Shell is questioning its side of the deal too.

Despite its feedstock cost advantage and large scale, Shell Monaca is a standalone petrochemical plant in an oversupplied global market. Ethylene plants are challenging to operate in the best of circumstances. Without a nearby upstream or downstream ecosystem, these challenges intensify. Customers depend on a predictable supply of PE, and when a plant cannot reliably deliver, they need additional suppliers. As Shell CEO Wael Sawan pointed out in the company's second-quarter earnings call, Shell doesn't have multiple facilities like this to serve as backup or supplemental sources. This reduces its internal flexibility to respond to changes in market conditions or to operational issues.

The impediments to owning a standalone petrochemical facility are paramount. Shell's conclusion that it isn't the natural owner of these facilities seems valid.

What next? Pennsylvania taxpayers may get some relief from a provision within Shell's tax-incentive legislation, a two part "look-back provision". This was codified by the Pennsylvania Assembly in Section 1710-G of the Amendments to the Revenue Code that included the credit. Due to be submitted to the Assembly by May 1, 2028, the first provision consists of a required "Reconciliation Report" on the effectiveness of the credit. The second provision requests recommended "reductions" if the total amount of the credits awarded exceeds the total amount of tax revenue reported during the first ten years of the credit's existence (2017-2027).

Perhaps when legislators and citizens realize that they've given the largest tax credit in their state's history to a foreign company that has sold these tax credits to companies with no interest in building a petrochemical or manufacturing industry in Pennsylvania, they may reconsider and revise the tax credit.

The Resource Manufacturing Credit has allowed Shell to increase its margins for PE production by an estimated 10% at the Monaca facility, based on the average price of PE for the time period. This conveys a significant benefit to the current and potentially any future plant owner or partner. However, this benefit may not last, depending on how the "lookback" report, due in May 2028, is received by the Legislature.

While benefits, such as the abundant, relatively low-cost natural gas and ethane in the region, remain intact, this benefit is dwindling. Natural gas and ethane producers can now ship their product outside the region, and regional gas prices are rising to near parity with prices on the US Gulf Coast after many years. The data center power market also provides an alternative use for natural gas and ethane as fuel.

Finding a buyer or partner in this environment may not be easy. Many potential buyers in the ethylene industry are facing the challenges of overbuilding and market upheaval as well. Many have seen steep revenue declines and must manage heavy debt loads. Some oil and gas giants are exiting the petrochemical business entirely, focusing instead on Liquefied Natural Gas (LNG) or hydraulic fracturing. BP, for example, sold its petrochemical business to INEOS. And Occidental Petroleum recently sold its chemical division to Warren Buffett.

Any firm that acquires the petrochemical facility will inherit the tax credits and exemptions. But the look-back provision in the Pennsylvania Resource Manufacturing tax credit program may cause legislators to reconsider the terms, creating additional uncertainty for a potential sale.

Shell Petrochemical Plant: A Cautionary Tale...For All Parties Involved

It has been just over a decade¹⁰ since Shell submitted its initial application to the Pennsylvania Department of Environmental Protection for permits to build the Monaca ethane-to-polymers production facility, a so-called ethane cracker plant, at the site of a former zinc smelter in Beaver County. This event marked what the region hoped would be a revival of the ethylene industry in the Northeast US. Unprecedented government incentives were offered by regional and, at one point, national supporters to jump-start the development of a new ethylene hub in the area, replacing production capacity that had been shuttered during the early part of the 21st century. Now, the operator of the only ethylene plant built in the region is looking at alternatives, including possibly selling its plant.

The Goal: Regional Industry Revival

The US ethylene industry began in 1920 with a site in Clendenin, West Virginia, operated by the Carbide and Carbon Chemicals Corporation, which later became Union Carbide. According to the West Virginia Economic Development agency, Carbide and Carbon Chemicals Corporation originally chose their site in the 1920s in the Kanawha Valley “because of the region’s abundance of hydrocarbon-rich gas, and access to river and railroad transportation”.¹¹ The decline in oil and gas production in the 1980s and 1990s eliminated the gas-based feedstock cost and availability advantage for regional ethylene production until shale gas development began in the 2000s.

Dow Chemical acquired Union Carbide in 2001, and the South Charleston site is now home to a large Dow research and development facility. Even with the drilling boom in shale gas, Dow opted not to pursue a rebuild of ethylene production capacity in the region. The ethylene derivative products, such as PE, to supply the regional market could be sourced from Dow’s other locations in the US and Canada.

The second ethylene “cracker” in the region was located at the former Sunoco refinery in Marcus Hook, Pennsylvania. This facility used refinery-sourced ethane, ethylene, and other refinery intermediates to produce ethylene derivatives, such as ethylene glycol. Since its feedstock was not dependent on gas drilling in the area, it continued to operate through the Great Financial Crisis in 2008, but was closed after a fire in 2009.

The storage, terminal, and pipeline facilities at this site in Marcus Hook have been repurposed and expanded to revive the location as a major export terminal. This facility provides regional oil and gas producers with expanded market access for their natural gas liquids (NGL) production. Operated by a major midstream company, Energy Transfer, Marcus Hook has supported the expansion of shale gas drilling in the region, providing producers a means to sell their ethane to ethylene production facilities overseas. This has impacted the ethane cost and availability advantage.

Shell Faces a Financial Reckoning

Now, despite unprecedented support from the Pennsylvania government, the growth in regional petrochemicals production – the purpose of the subsidies – has not materialized beyond Shell’s polymer plant. The Shell plant has not attracted private investment. Over the past several years, other companies considered building ethane cracker plants. None reached the Final Investment Decision (FID) stage. While industry-funded and

government-funded studies touted the economic benefits of a petrochemical renaissance, private companies did not move forward.

Shell's Monaca plant has had a tough decade. After it began operations in November 2022, the plant did not reach its full operating capacity until early 2025. This high level of operating capacity, however, was short-lived. A fire in June 2025 has closed down part of the facility.

In Shell's Q2 2025 earnings call, CEO Wael Sawan noted "(Chemicals) macro continues in an 'incredibly prolonged trough' that may continue for 'a lot longer.'¹² Shell has sold its Singapore refining and chemical assets, and is looking at selective closures in Europe. He noted that (Shell) is "focus(ing) on high grading our portfolio...We will be looking at the US at what we can do, but that takes time. And we've talked about the strategic and partnering opportunities."¹³

Repeating his comments from Shell's Q1 2025 earnings call, Sawan suggested Shell was not the "natural owner" of the Monaca plant, though he acknowledged the plant has advantages that make it a fit in a broader portfolio.¹⁴

As a standalone facility, the plant is not as economically viable as it might have been had the "Appalachian Petrochemical Renaissance," projected by the Department of Energy in 2019,¹⁵ been realized [See Sidebar: The Appalachian Ethane Storage Hub: An Epic Tale of an Epic Fail from the Past].

Sidebar: The Appalachian Ethane Storage Hub—An Epic Tale of an Epic Fail from the Past

The promise of a petrochemical or manufacturing renaissance in the Ohio River Valley has a long history. We listed several ethane plants once planned for the region in an earlier report.¹⁶ Only Shell moved forward with its Monaca Polymers plant, however.

Perhaps the most ambitious petrochemical plan for the region in recent history was the Appalachian Storage Hub. It was once seen as the essential component for a petrochemical buildout in the region. Storing ethane in massive underground storage caverns was seen as a key component of any regional petrochemical infrastructure. Massive investment would be needed. Government support was implied.

In 2017, President Trump and Xi Jinping trumpeted their support for the project. China promised an eye-popping \$84 billion in a Memorandum of Understanding (MOU). A trade war upended those plans, which were seen as wildly unrealistic.

Trump issued an Executive Order in 2017 that encouraged "opportunities, through the federal government or otherwise, to promote economic growth of the Appalachian region, including growth of petrochemical and other industries."

The federal government was supportive and funded studies. Under then-Energy Secretary Rick Perry, the Department of Energy published a report in 2018, "Ethane Storage and Distribution Hub in the United States."¹⁷ This report described the importance of creating an ethane storage hub in Appalachia. It detailed the potential

benefits that would derive from such a hub. Locating the hub in Appalachia would be a hedge against severe weather along the US Gulf Coast. Severe weather could disrupt the petrochemical industry in the US, warned the study.

The most significant financial support offered by the federal government was through a DOE loan guarantee program. The Appalachian Development Group applied for a \$1.9 billion federal loan guarantee through the Department of Energy's Loan Programs Office in September 2017. The DOE approved the first part of the application in January 2018, inviting the group to submit a comprehensive Part II application. This would have been one of the largest loan guarantees ever considered by the federal government.¹⁸

However, the group still needed to raise approximately \$1.4 billion in private capital and sign contracts with companies that would use the hub to satisfy the loan office's financing requirements.

The private sector, however, did not sign up. The Appalachian Ethane Storage Hub was championed by the industry, and federal and state governments. But the private sector wanted no part -- unless the government was footing the bill.

The market signal was clear: The potential benefits did not justify the risks.

The Department of Energy (DOE) in June 2020 published a 75-page report, "The Appalachian Energy and Petrochemical Renaissance: An Examination of Economic Progress and Opportunities,"¹⁹ to demonstrate how energy produced in Appalachia, primarily natural gas and natural gas liquids (NGLs) and coal, could propel the region to economic success.

In a departure from a prior DOE report touting the importance of ethane storage to support a petrochemical build-out, this subsequent report acknowledged that Appalachia has limited geologic storage, especially compared to Mont Belvieu. Apparently, the DOE no longer believed a massive ethane storage hub was an essential element in an expansion of the petrochemical industry in the region. Further, the report suggested that the market -- not the government -- would ultimately determine the future of storage facilities.

Ideas for smaller ethane storage hubs along the Ohio River were floated during this period, including one backed by Goldman Sachs. But again, the private sector wanted no part, and the projects quietly died on the vine.

As the case study on Shell's Monaca Polymers plant demonstrates, even when a state offers its largest tax incentive in its history, it's not enough to make a petrochemical plant succeed in the region.

Shell's CEO has acknowledged that "the issue is, it's our only one, our only major (polyethylene) facility. And that's why we're not the natural owner of that asset. Ideally, you want to be able to leverage that with two, three other plants and create optimization opportunities, as we do, for example, with our LNG facilities around the world...where we can meet our customer demands through different channels...take advantage of opportunities when one plant is shut down to supply from the other one. Not to mention obvious synergies on costs and the like."²⁰

Without the follow-on projects that were envisioned by regional development teams to create an industry hub, the economics for a standalone PE plant in Appalachia are challenging.

Even beyond the issues of a lone facility, the project has faced headwinds from the outset.

Headwinds Have Battered the Shell Cracker Plant throughout its History

Long before the plant began operations, the Ohio River Valley Institute (ORVI) in 2021 predicted the petrochemical plant was on “shaky ground” and would be unsuccessful. At that time, the build-out cost was reportedly \$6 billion, a figure Shell did not confirm or deny, until February 2024, when CEO Sawan confirmed the cost had topped \$14 billion.

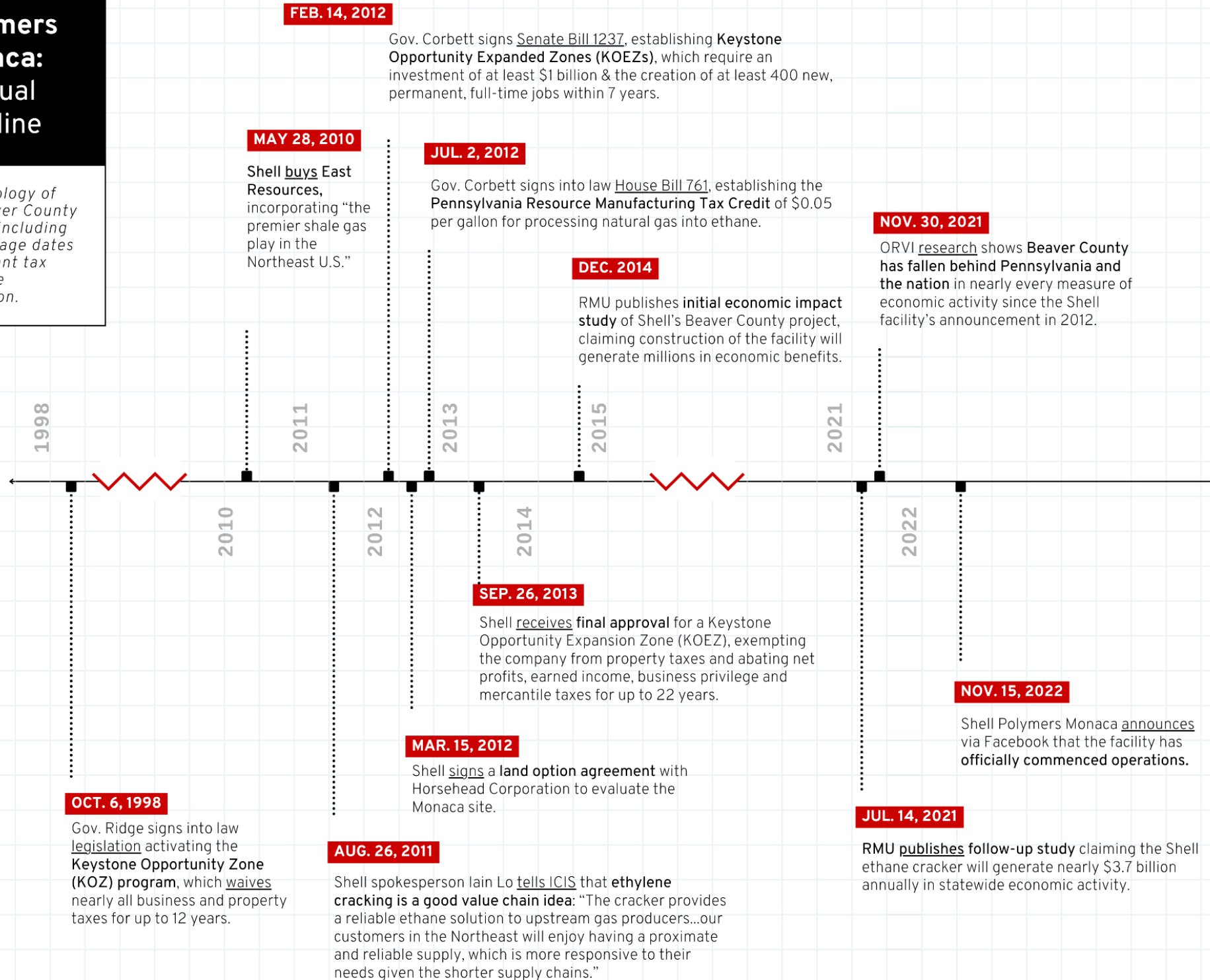
Shell’s view in 2025 contrasts sharply with the optimism cited by Shell management in 2012. In “Happy Days Are Here Again,”²¹ an aptly titled article summarizing the chemical outlook in 2012, then-Shell executive and later CEO, Ben van Beurden, who ultimately green-lighted the Pennsylvania facility, cited both risks and opportunities. A key advantage for the plant would be its location. He noted that half the county’s population -- and the PE they consume -- would be within a 500-mile radius.²² He also said that the company’s purchase of East Resources would secure its access to ethane, the feedstock for the plant. [Shell, however, sold off its shale gas assets in the Marcellus basin, before the plant opened. Industry sources described the transaction as a “fire sale.”]²³

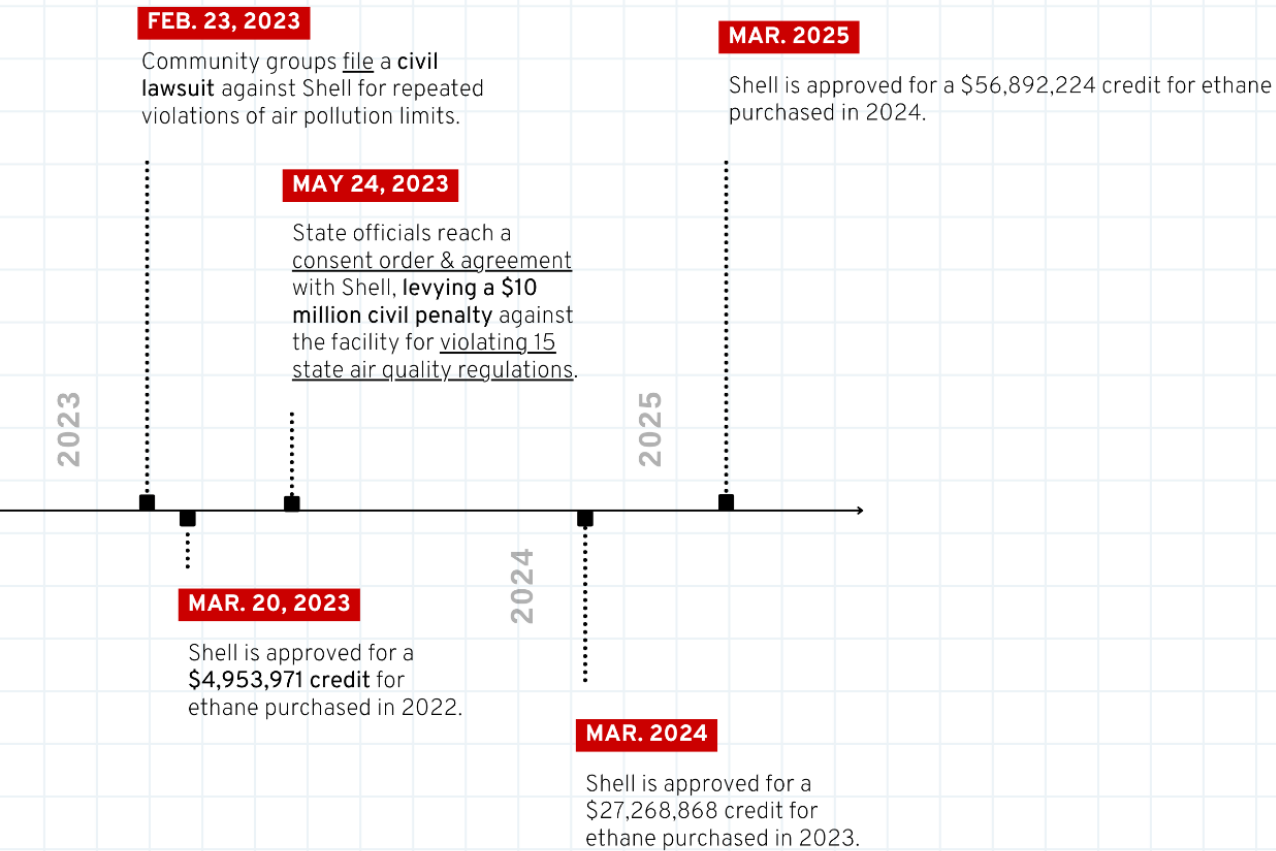
Ethane or ethylene can be converted into either a commodity chemical, such as polyethylene (PE) or a speciality chemical, such as ethylene oxide. Even though Shell is one of the world’s largest producers of ethylene oxide, management decided the Monaca/Beaver County facility would produce only PE. This decision locked the company into producing lower-value commodity-grade petrochemicals. Many factors likely went into this decision. Perhaps limited availability of additional ingredients to produce specialty chemicals in this location, or difficulty shipping ethylene oxide via pipeline, compared to PE, which is transported as nurdles via trucks or rail.²⁴ Consumers of PE tend to be price sensitive, and profitability depends on maintaining steady operations and keeping feedstock costs low.

The prior demand growth for commodity petrochemicals from 1992 to 2021, the so-called “Chemicals Super Cycle,” was driven by China’s exceptional demand for raw materials and favorable demographics in the West. This plant came online, after construction delays and cost overruns in part due to COVID, as the last of the “second wave” of greenfield ethylene plants built in the US. By that time, the PE market was oversupplied, with massive capacity coming online in the US Gulf Coast and in China. At the same time, global demand for PE waned as the Chinese economy softened with the end of its real estate boom.

Shell Polymers Monaca: A Visual Timeline

A chronology of the Beaver County facility, including the passage dates of relevant tax incentive legislation.





The Way Forward: Why Not Sell?

Throughout 2025, Shell management has signalled its intent to sell the Monaca plant. But the company has spent a significant amount of time and money building the plant and getting it to a reasonably high operating rate. During the first quarter of 2025, pipeline records show an average of 90,000 barrels a day of ethane feedstock delivered to Monaca. Using an estimate of 95,000 barrels a day as a feedstock capacity ceiling,²⁵ the ethylene cracker would have been running at a 94% utilization rate. This is a very good level, indicating that all three of the facility's production units, known as polyethylene trains, were also in service.

Shell's CEO hasn't completely ruled out a sale yet, but during a recent earnings call (Q2),²⁶ he indicated the advantages that were part of the original justification for the investment were still valid. They are:

- 1) Access to an "attractively priced resource," low-cost ethane feedstock
- 2) Fiscal incentives from the state
- 3) Unique location to reach a significant portion of potential customers

However, an updated review of these advantages reveals uncertainties. This could affect the potential value of the facility and limit the number of potential partners or acquirers for the Shell cracker plant.

The Ethane Advantage Still Exists, But Change is Coming

Although Shell is not producing ethane feedstock from its own gas production, the abundance of ethane in the region was – and still is – touted as a competitive advantage.²⁷

For nearly a decade, Appalachian regional natural gas companies increased production of both natural gas and ethane, led by the boom in horizontal wells and hydraulic fracturing ("fracking"). The increase in gas production outpaced the pipeline industry, and natural gas was trapped in the region. This situation led to an oversupply, or glut, of natural gas. Natural gas prices plunged, causing negative cash flows for regional producers.²⁸ Industry observers began to describe the plight of Appalachian gas producers (sometimes called frackers) as "Gasmageddon."

These takeaway constraints were made worse by the relatively high ethane content in the natural gas. Ethane can be sold in the natural gas stream until the volume causes the heating value to exceed the limits set by the pipelines. The need to reduce the ethane content in the gas also created the need to find other ways to handle ethane. Petrochemical plants provided a solution to this problem—they could take advantage of the region's cheap ethane to produce plastics.

This oversupply of cheap, fracked ethane also supported the vision of a petrochemical "renaissance" in the region. It offered producers a local market for their ethane. On paper, including industry-funded reports and studies by government agencies such as the U.S. Department of Energy (DOE), this seemed a perfect solution.²⁹ Producers would find a market for their excess natural gas and ethane. Petrochemical plants – many were envisioned – would thrive due to abundant, low-cost feedstock, and create a new "hub" that offered an alternative source of supply during hurricane disruptions on the US Gulf Coast. Hurricane Ike in 2008, in particular, was still on the minds of industry supporters. The storm surge from the hurricane had shut in a large number of Gulf Coast chemical facilities, from Dow's complex in Freeport to Chevron and Exxon facilities east of Houston. The restart process was also slow, resulting in lengthy supply outages.

US ethane is still considered the second-lowest-cost ethylene feedstock worldwide, next to Middle East ethane sources that aren't available outside that region. But over the past several years, the claim of "captive feedstock"³⁰ for the Northeast US (which includes the Ohio River Valley), has largely eroded. Had the plant been ready to operate during the "boom" phase of shale development between 2008 and 2016, ethane producers would not have been as motivated to seek alternative markets. But midstream companies, which operate pipelines, seized the opportunity to expand their systems with new and repurposed assets to transport ethane and other NGLs to markets outside the region. These projects were initially able to build on assets already in place to serve the conventional oil and gas industry. They were completed before the ethylene plant complex.

New (and converted) pipelines opened up other markets for Appalachia's trapped ethane reserves. Over the decade it took to sanction and build the petrochemical plant, pipelines that could transport ethane beyond the region were repurposed, extended, or completed. Among the major pipeline projects that began operation were Enterprise ATEX, which was repurposed to move ethane from Appalachia to the Gulf Coast, and Mariner West, which began sending ethane to NOVA's Sarnia, Ontario ethylene plant.

Other pipelines extended export access to overseas markets via Marcus Hook, Pennsylvania. The facility owner, Energy Transfer, built on a storage and terminal asset base originally used to support the refinery and former ethylene plant there to create an export terminal for natural gas liquids (NGLs), including ethane. The existing Mariner East pipeline was converted to propane and ethane service. Kinder Morgan worked with NOVA Chemical in Sarnia (located in Ontario, Canada) to build the Utopia pipeline, which added more capacity to move ethane to Canada for NOVA's expanded ethylene plant there. In essence, Nova was able to capture much of the benefit of the regional ethane "glut" with its expanded facility, while offering Appalachian ethane producers relief from takeaway bottlenecks earlier than a new plant could.

Promoters of the petrochemical revival initially envisioned a solution that would allow producers to continue to drill and recover ethane. This happened, but via the pipeline buildout, not through the development of a regional petrochemical hub. Expanding takeaway options for NGLs reduced the perceived feedstock cost advantage of Appalachia.

Shell's Biggest Reason to Stay: "Fiscal Advantages from the State"

Government officials from across the region were keen to support the development of shale gas resources. They preferred alternatives that promised the greatest number of local jobs. Pipeline construction disturbs landowners over a wide area, and can destroy forests, wetlands, and farms. It ultimately doesn't create nearly as many jobs as does a petrochemical plant. Politicians from the states directly affected by shale gas drilling -- Pennsylvania, Ohio, and West Virginia -- raced to support an ethylene industry in the region. While all three states offered the usual enticements, including site preparation costs and property tax exemptions, Pennsylvania trumped them all with its Pennsylvania Resource Manufacturing Tax Credit, known as the "PRM" tax credit.

The legislation that created this incentive was passed by the Pennsylvania Assembly in 2012. According to the Pennsylvania Department of Revenue, the program's provisions would follow the following guidelines:

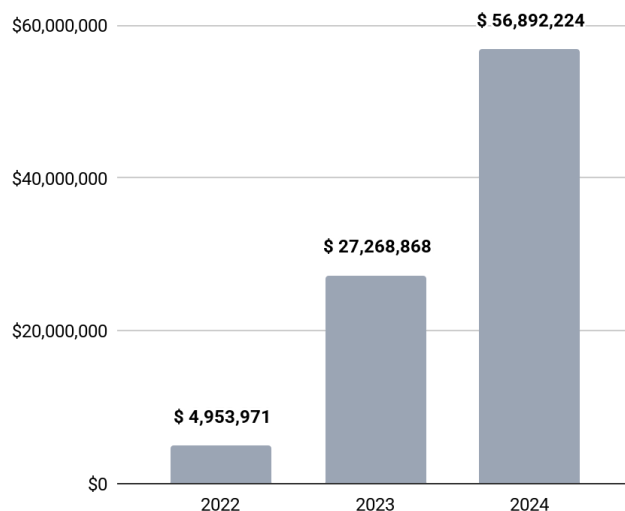
- 1) The PRM tax credit is available to business entities purchasing ethane for use in manufacturing ethylene at a facility in the Commonwealth that has made a capital investment of at least \$1 billion and created at least 2,500 full-time equivalent jobs during the construction phase.

- 2) The PRM tax credit is equal to \$0.05 per gallon of ethane (\$2.10/barrel) purchased for the period from January 1, 2017 to December 31, 2042.
- 3) The credit may be used to offset a taxpayer's liabilities for Personal Income Tax, Corporate Net Income Tax, Capital Stock and Foreign Franchise Tax, Bank Shares Tax, Title Insurance Company Shares Tax, Insurance Premiums Tax, and Mutual Thrift Institutions Tax.
- 4) A taxpayer may use this credit to reduce their tax liability by a maximum of 20% for any tax year in which it is awarded.
- 5) Within one year after the PRM credit is approved, a taxpayer can apply to the Department for Community and Economic Development (DCED) for approval to assign or sell eligible credits to another taxpayer. The eligible buyer of the credit may use the purchased credits to offset up to 50% of its Pennsylvania tax liabilities. The credit can be assigned to related entities.

According to a document produced by Pennsylvania Senate Republicans, the Pennsylvania Resource Manufacturing Tax Credit was "to assure that all facets of the petrochemical supply chain remain in PA.....It is important to note that these tax credits are a credit against tax liabilities, not a hand-out of taxpayer dollars. In fact, when the cracker is up and running, and the associated spin-off industries are in operation, tax revenues will actually increase."³¹

Figure 1: Shell has received nearly \$90M in tax credits through 2024.

Shell's Pennsylvania Resource Manufacturing Tax Credit awards, 2022-2024



Source: Pennsylvania Department of Revenue

So far, Shell Chemical Appalachia, LLC has been awarded a total of \$89,115,063 in credits for operating years 2022 through 2024, according to the Pennsylvania Department of Revenue.³² The enabling legislation requires recipients to submit a report that shows the amount of credits awarded, sold and/or transferred for each year. For the award years 2023 and 2024, which covered the initial startup year of the plant in 2022 and operations in 2023, Shell reported that they had sold or transferred almost 100% of the amount awarded. This seems to indicate that the company did not have a tax liability to apply the credit to during these years. [See Table 1 for a list of which entities purchased Shell's tax credits, and how much they paid, between 2022 and 2024.]

Table 1: Shell has sold off more than \$30M in tax credits, largely to insurance firms.*Pennsylvania Resource Manufacturing Tax Credit transfers, 2022-2023*

Year	Transferred to:	Headquarters	Credit Transferred	Purchase Price
2022	Erie Indemnity Company	Erie, PA	\$ 4,953,971	\$ 4,706,273
2023	Erie Indemnity Company	Erie, PA	\$ 18,000,000	\$ 17,100,000
2023	Erie Insurance Company	Erie, PA	\$ 3,993,178	\$ 3,793,519
2023	Hartford Life & Accident Insurance Company	Hartford, CT	\$ 1,850,000	\$ 1,757,500
2023	Erie Family Life Insurance Company	Erie, PA	\$ 800,000	\$ 760,000
2023	Hartford Fire Insurance Company	Hartford, CT	\$ 525,689	\$ 499,405
2023	Flagship City Insurance Company	Erie, PA	\$ 400,000	\$ 380,000
2023	Trumbull Insurance Company	Hartford, CT	\$ 400,000	\$ 380,000
2023	Erie Insurance Company of New York	Rochester, NY	\$ 300,000	\$ 285,000
2023	Hartford Underwriters Insurance Company	Hartford, CT	\$ 300,000	\$ 285,000
2023	Twin City Fire Insurance Company	Hartford, CT	\$ 300,000	\$ 285,000
2023	Hartford Casualty Insurance Company	Hartford, CT	\$ 100,000	\$ 95,000
2023	Hartford Insurance Company of the Midwest	Hartford, CT	\$ 100,000	\$ 95,000
2023	Property and Casualty Insurance Company of Hartford	Hartford, CT	\$ 100,000	\$ 95,000
2023	Sentinel Insurance Company	Hartford, CT	\$ 100,000	\$ 95,000

Source: Pennsylvania Department of Revenue

Sale of Tax Credits Reduced Shell's Feedstock Costs

The ability to monetize the Pennsylvania Resource Manufacturing Tax Credit outside the petrochemical supply chain, contrary to the stated intent of the subsidy, may provide Shell with an attractive boost to its margins. We calculated the estimated margin improvement per pound of ethylene produced between 2002 and 2024, using the credits awarded at \$.05 per gallon and the ethane to ethylene conversion yields per Shell's environmental permit filing. The result is a \$51/tonne reduction in manufacturing cost, or a 10% improvement in ethylene margin based on the average price of ethylene from November 2022 to December 2024. This is a significant advantage for Shell, and could be an incentive for a potential partner for the facility. [See Appendix for detail on our calculations.]

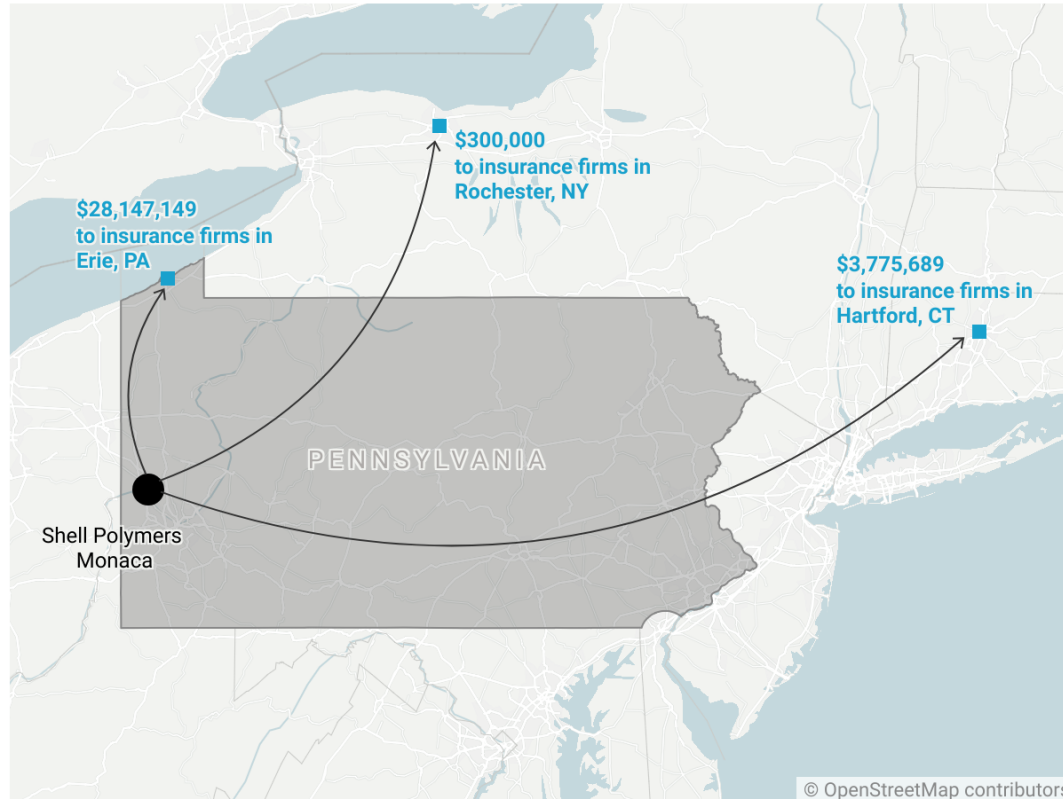
The State has an off-ramp that could change the credit and reduce the benefit to Shell's—or a future owner of the plant.

Since the original stated intent of the Pennsylvania Resource Manufacturing Tax Credit was to support the build-out of the petrochemical value chain in the region, it is reasonable to wonder why the State decided to make the credits transferable to any company when the final version was passed in mid-2012. Given that the

credits awarded so far don't seem to have a direct relationship to the "upstream or downstream" parts of the petrochemical industry, taxpayers could wonder whether they'll ever see the promised benefits.

Figure 2: Shell has sold millions in tax credits intended for local petrochemical development to out-of-state insurance companies.

Map of Pennsylvania Resource Manufacturing Tax Credit transfers, 2022-2023



Source: Ohio River Valley Institute

A provision of the enabling legislation requires performance reports to the Assembly (House and Senate). These include annual reports that must include the names of the qualified taxpayers using the tax credit, and the amount of the tax credits approved for, used by, or sold or assigned by a qualified taxpayer.³³

The legislation also requires the Department of Community and Economic Development (DCED) to submit a "reconciliation report" on the effectiveness of the credit program. This report is due May 1, 2028, and covers the first 10 years of the program, which began in 2018, although the plant didn't begin operations until 2022. The report must contain the business names and addresses of all "qualified taxpayers" who have been granted credits, and the amount of the credits they were granted. In addition, the report requires extensive disclosures around the number of jobs created and the amounts of taxes paid by the "upstream company and downstream company (in the gas to petrochemical supply chain) and any companies that provide goods, utilities or other services that support the business operations of the qualified taxpayer and upstream company and downstream company."³⁴

The legislation includes criteria for measuring the success of the credit, and a provision for introducing changes. Section 1710-G(c) of the Pennsylvania tax code, titled "Reduction," specifies that "If the reconciliation report issued...reveals that the total amount of the tax credits granted under this article exceeds the total amount of the tax revenue reported,...the report must include any recommendation for changes in the

calculation of the credit.”³⁵ This means that the credit program will be in effect from 2018 to 2027. It is no longer 100% certain that the benefits will be extended beyond that time.

The uncertainty around the extension of the credit will most likely be a consideration in a potential owner’s plans for this asset. A change that reduces or eliminates the benefit would reduce the advantage this location has over other facilities without this tax incentive.

Location was cited in multiple reports as a prime reason to relaunch the ethylene industry in Appalachia. The Ohio River Valley offered two primary benefits:

- 1) proximity to a large group of customers; and
- 2) a hedge against supply outages due to hurricanes on the US Gulf Coast.

Shell Polymers notes that Monaca isn’t just close to converters; it’s also able to withstand harsh elements in order to reduce weather-related delays. The site also has rail connections to a major rail line, CSX, which can move PE pellets throughout the region as well as to major export facilities on the East Coast.

Although one of the studies that assessed the advantage of the NE location referred to cost savings from moving polymers from Gulf Coast suppliers, there are other sources of supply for converters in the Northern US, including Nova in Sarnia and the Lyondell facilities in Illinois and Iowa. So while location, and in particular weather proofing does provide advantages for the site, the issue of its being a standalone facility, and the only one of its type in the Shell portfolio, presents offsetting challenges.

Shell’s Biggest Reason to Leave: Limited Optionality as a Standalone Facility

The promoters of the ethylene “hub” concept recognized the importance of multiple facilities. They advocated for a centralized storage and distribution system that would expand the “swing” storage capacity for ethane and ethylene, which would support multiple plants. Despite private industry initiatives and ultimately a push by the US Department of Energy to provide financial support, only Shell opted to invest [See Sidebar: The Appalachian Ethane Storage Hub: An Epic Tale of an Epic Fail from the Past].³⁶

Unfortunately for Shell, a lone production site is problematic. US Gulf Coast ethylene plants are connected by a pipeline network that extends from the Mississippi River to South Texas. Many underground salt caverns also provide millions of barrels of storage to buffer plant outages and shutdowns. Without these connections, Shell must synchronize the operations of the part of the plant that produces ethylene with the section that produces PE to ensure uninterrupted production.

This makes it more difficult to compete for long-term contracts with customers who want to minimize their on-site inventory, but do not want to risk extended stockouts at their supplier’s plant. The customers that Shell is looking to supply were already getting their PE from other plants. To assume the position of primary regional supplier, Shell must demonstrate that they can maintain continuous deliveries of on-spec material. Companies with multiple facilities can source orders from other locations. Shell has multiple supply points for other chemicals in its product portfolio, but making up shortfalls for PE would require having backup sources from other producers. A joint venture partner with other plants could provide the combined entity with this optionality.

Additional Headwinds: Global Trends in the Petrochemical Industry Slam the Shell Plan

The startup of the Shell plant in 2022 marked the end of the so-called “Chemicals Supercycle.” This 30-year boom in production capacity was driven by China’s rapid modernization and industrial expansion, as well as favorable demographics and feedstock prices in the West.

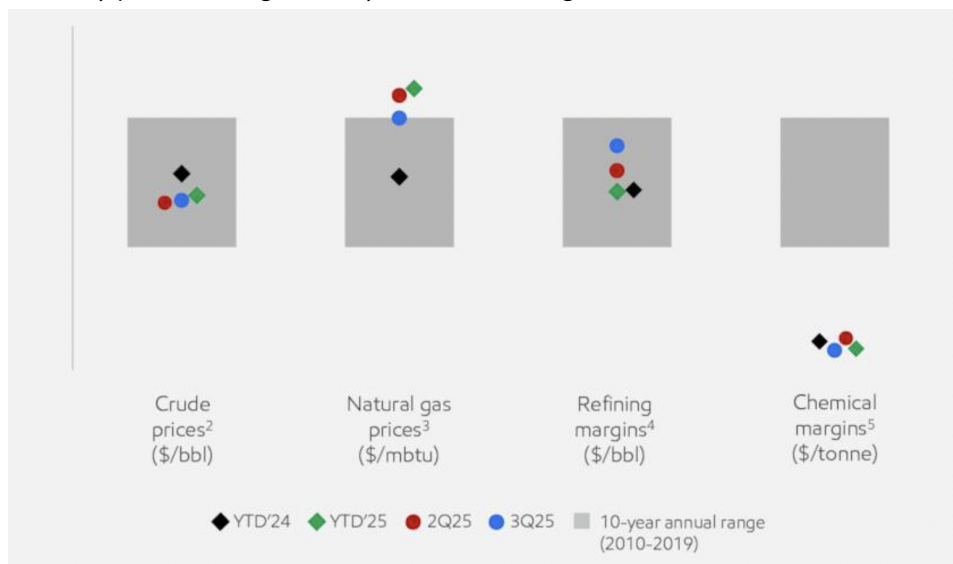
The timing was unfortunate for the Shell cracker plant, which was just coming online in 2022 at the end of this supercycle. It ran headlong into the global glut of petrochemicals, particularly commodity chemicals such as PE.

Led by China, this oversupply shows no sign of abating soon. Chemical analysts at ICIS describe the glut as a “crisis,” which will not bottom out until 2028 or 2030.³⁷ WoodMackenzie writes “cracker closure threat” quarterly reports, and estimates the industry will not recover before 2029.³⁸ In a column written in late August,³⁹ Reuters energy columnist Ron Bousso described how the current oil and gas markets have caused a glut in the petrochemical industry. As summarized in Plastic News: “[C]urrent production (capacity) has outpaced the current market. Oil-producing regions are investing in petrochemicals production to offset an expected decrease in demand for gasoline and other fuels as sales of electric vehicles rise. U.S. companies have built new plants to take advantage of inexpensive feedstock costs from shale oil fields. In China, production capacity ramped due to an infrastructure building boom, as well as expanded consumer spending and later, a national goal of increased self-reliance.”⁴⁰

The poor state of the petrochemical industry is captured in the following chart, included in ExxonMobil’s Q3 earnings presentation, with the note “Chemical margins remain below historical range, as oversupply persists.”⁴¹

Figure 3: Chemical margins remain below historical range as oversupply persists

Industry prices/margins, 10-year annual range (2010-2019)



Source: ExxonMobil

Trump’s tariffs, as well as decidedly lackluster second-quarter 2025 earnings, are forcing the petrochemical industry to address new market realities. ExxonMobil, for example, has delayed its PE project, Coastal Plain Venture, citing market conditions.⁴² Dow Chemical has delayed a planned expansion of its ethane cracker plant in Alberta, Canada. South Korea’s petrochemical sector is also scaling back, with analysts noting the “structural

shift” in the industry.⁴³ That country has seen an estimated \$4-5 billion capacity expansion projects postponed or canceled.

Europe’s petrochemical sector, in particular, has been devastated by the downturn. An Oxford Economics report commissioned by INEOS found that half of Europe’s ethylene production capacity will close by 2030.⁴⁴ The study notes that 21 chemical sites are already closing. Citing this report, the chairman and founder of petrochemical giant INEOS, called on Europe’s politicians to intervene, including removing carbon taxes and other so-called “green taxes” on energy, and implementing tariffs.⁴⁵

Poor Financial Decision for Pennsylvania, Despite Industry Research, Some Funded by Shell

Central to Shell’s decision to locate a petrochemical facility along the Ohio River was Pennsylvania’s \$1.6 billion tax incentive, the largest in its history. Pennsylvania had competed with West Virginia and Ohio for the Shell plant. Even after Shell selected Pennsylvania, state officials worried, on an official Pennsylvania Senate Republicans site in 2013, about such competition. “While Pennsylvania is the preferred site, West Virginia and Ohio could still make a play for the project.”⁴⁶

Local politicians and business groups in Pennsylvania touted job creation and other economic benefits. They cited Shell-funded reports, including two studies by professors at Robert Morris University (RMU).

These 2014 and 2021 studies modeled potential economic benefits that would accrue to the county and state.⁴⁷ An ORVI analysis of these reports revealed numerous flaws, including incorrect economic multipliers that significantly overestimated the potential economic benefits.⁴⁸

The first RMU study in 2014 projected between 5,300–6,700 new direct, indirect, and induced jobs. Its subsequent study (2021) increased this job-creation estimates and projected more than \$80 billion state-wide in economic benefits over 40 years.⁴⁹ Both RMU studies also relied on 40-year economic projections, which are more than twice as long as industry standards. The biggest flaw of the RMU studies, however, was its misclassification of the plant as “Petrochemical Refinery” instead of “Plastic Resin Manufacturing,” skewing results.⁵⁰ These overly optimistic and incorrect assumptions amounted to what ORVI described as “academic malpractice.”⁵¹

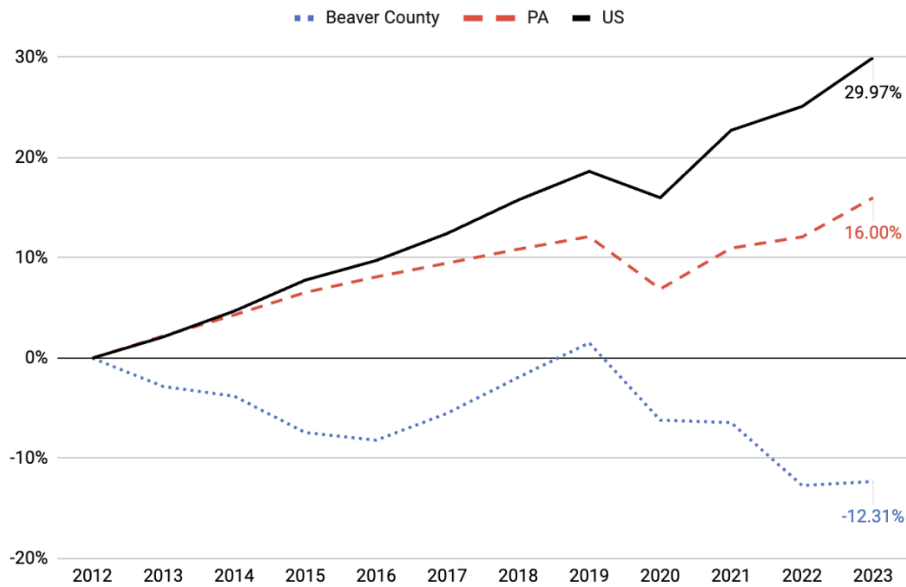
Plant Fails to Deliver Economic Benefits to Beaver County and Pennsylvania

The plant has not yielded the economic benefits once envisioned. Several objective economic metrics illustrate the poor impact the plant has had on Beaver County. Since Shell’s 2012 announcement that it would build the plant, Beaver County has performed worse than both Pennsylvania and the U.S. in several critical metrics, including:

- GDP: Beaver County contracted by over 12 % (adjusted for inflation), while the state and national economies grew significantly.

Figure 4: Beaver County's GDP Declined as State and National GDP Grew Consistently

Percent change in real GDP, 2012-2023

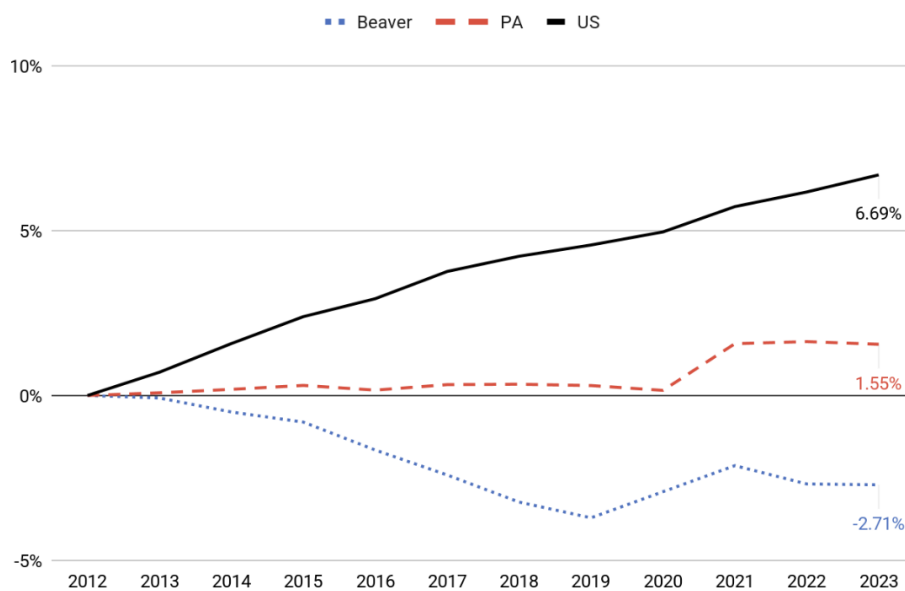


Source: US Bureau of Economic Analysis

- Population: The county's population declined by roughly 3 %, in contrast to increases at the state and national levels.

Figure 5: Population in Beaver County declined as PA, US grew

Percent change in population, 2012-2023

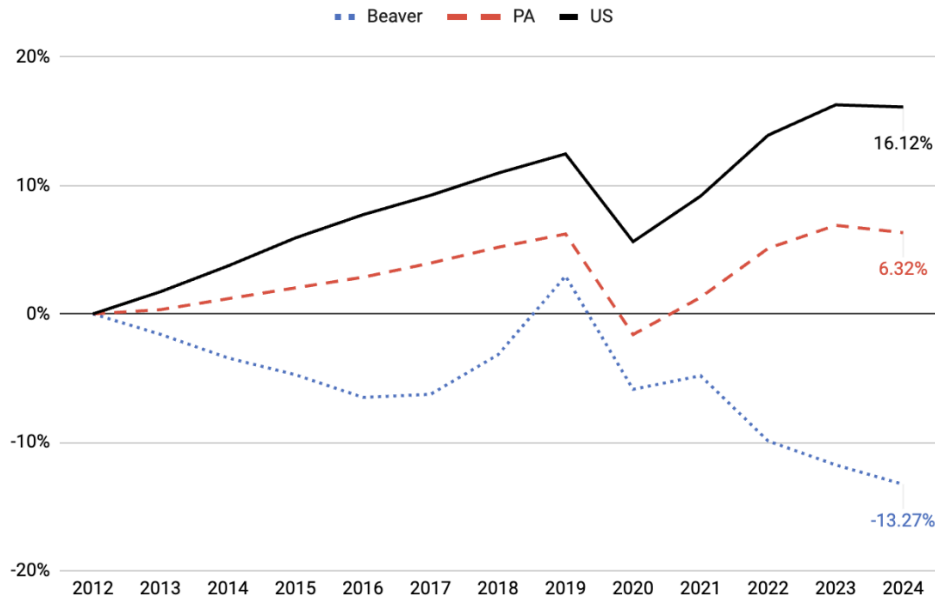


Source: US Census Bureau, American Community Survey

- Employment: The county's employment plummeted over 13 %, compared to rising employment elsewhere in the state.

Figure 6: Federal Labor Statistics Show Beaver County Losing Jobs as PA and US Gained

Percent change in employment (QCEW), 2012-2024

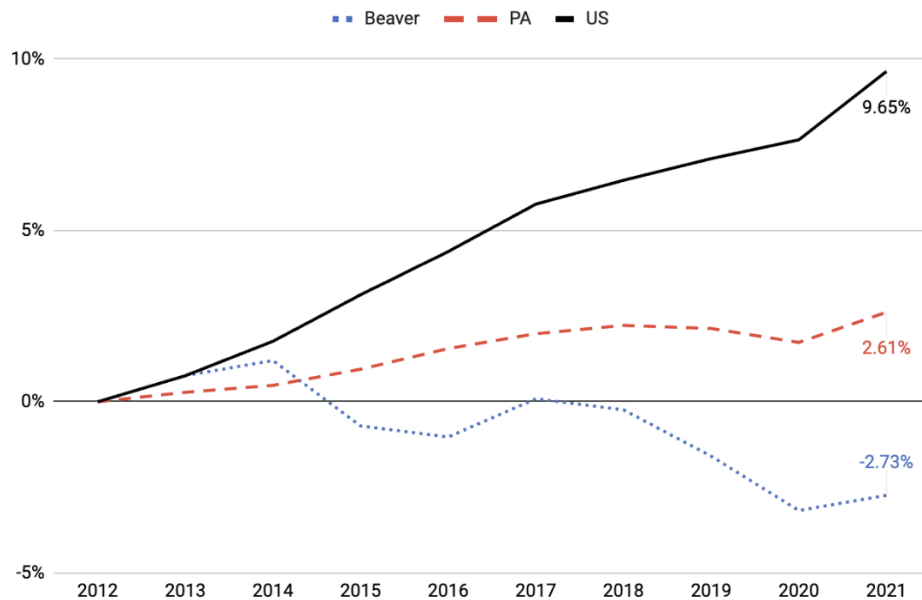


Source: US Bureau of Labor Statistics, Quarterly Census of Employment and Wages

- Businesses: The county saw net losses in the number of business firms and establishments, despite statewide growth.

Figure 7: Beaver County lost business establishments despite growth across PA and US

Percent change in number of business establishments, 2012-2021



Source: US Census Bureau, Statistics of US Businesses

Temporary Boost Overshadowed by Long-term Economic Declines

While Beaver County did experience a short-lived economic uptick tied to construction-phase jobs and temporary in-migration, these were temporary. Once the project transitioned to full operations in 2022 onward, county metrics declined again, solidifying long-term economic distress.⁵²

Most crucially, for the residents of Beaver County and Pennsylvania, the economic modeling used to support the RMU conclusions did not account for public costs, environmental damage, and declining property values.

Who Might Buy the Petrochemical Facility?

The chemical industry is in the “depth of the trough,” acknowledged Shell CEO during the company’s most recent earnings call (Q3 2025). “We were hoping that this is a typical cycle...We just don’t see a line of sight to when that up cycle is going to come. And therefore, we have decided to really go after...cash preservation.”⁵³ He also noted \$25 billion of underperforming capital is “sitting in chemicals.”⁵⁴

Shell has loudly broadcast its reasons for finding a partner or selling its Monaca plant. But, given the weakness in the global chemical industry, who is an obvious buyer? Like Shell, other petrochemical companies must confront a global glut. And many of them are struggling with challenging finances.

The following partial list of potential acquirers illustrates the weak financial condition of most potential partners or acquirers. In short, it is unlikely Shell will reap its initial investment.

Table 2: Who might buy Shell Polymers Monaca?

Company	Details	Likelihood
PTT Global Chemical	Failed to reach final investment decision (FID) on nearby ethane cracker project	Less likely
Braskem	- Financially distressed; potentially restructuring debt - Abandoned West Virginia ethane cracker project in 2019	Less likely
Formosa Plastics	- Weak financials; declining revenues since 2019 - Expanding petrochemical capacity along Gulf Coast - Purchasing a turnkey, discounted ethane cracker project in Pennsylvania may be appealing	More likely
LyondellBassel	- Revenue has fallen 38% since 2022 - Looking to divest assets to raise cash & reduce debt - Has operational expertise to run Shell plant	Less likely
Ineos	- Set up to import ethane from the East Coast; Shell plant could be a strategic asset - Subject to dire financials facing European petrochemical industry - Discloses limited financial information	More likely
Dow Chemical	- Revenue & profit declines in 2023 and 2024 - Analysts say Dow should shift from commodity volume to differentiated, lower-carbon materials	Less likely
BASF	- World's largest chemical producer; stronger financials than competitors - Buying Shell could expand company's North American footprint while leveraging what remains of 'feedstock advantage' - Cutting costs in Germany due to financial hurdles	More likely
Exxon	- Relatively strong financial performance in 2024 and early 2025 - Management appears to be prioritizing specialty chemical production or facility integration - Scrapped ethane cracker plans in the Ohio River Valley in 2019 - Gulf Coast polyethylene project delayed due to difficult market conditions	Less likely
Chevron	- Relatively strong financial performance in 2024 and early 2025 - Management appears to be prioritizing specialty chemical production or facility integration - Sold off Appalachian assets in 2019; suggesting little investment appetite for the region	Less likely
OXYChem	Warren Buffet's \$9.7B acquisition doesn't indicate bullishness on petrochemicals	Less likely

Source: Ohio River Valley Institute

PTT Global Chemical, Thailand's state-owned company, spent years considering building an ethane cracker complex along the Ohio River, in Belmont County, Ohio. In 2015, it first announced its plan to construct the facility. It purchased hundreds of acres in Ohio to pursue the project. The company received \$70 million from JobsOhio, the state's economic development arm, to spur the project. PTT invested roughly \$200 million to conduct an engineering design and clear land.

PTT's original partner on the project was Marubeni, a Japanese firm. Marubeni was later replaced by South Korea's Daelim Chemical USA. In 2020, Daelim withdrew from the deal. After many years of announcements and delays, PTT confirmed in 2021 it would not move to a final investment decision (FID) on the project. It also agreed to repay \$20 million to JobsOhio for failing to move forward with the plant.

Several years ago, **Braskem**, a Brazilian petrochemical company, might have been a potential buyer of Shell's cracker plant in Pennsylvania. The company had explored constructing an ethane cracker plant in West Virginia in 2013, but abandoned the project in 2019. Currently, the company is financially distressed. In late September, Fitch and S&P downgraded the company's debt to the lowest rating, suggesting the company may restructure its debt.⁵⁵ Braskem has hired law firms that specialize in debt restructuring. In October, it tapped the entirety of its \$1 billion credit facility, signaling a cash crunch.⁵⁶

For years, its parent company, Novonor, has been trying to sell its controlling interest. It is reportedly planning to divest its US assets,⁵⁷ including polypropylene facilities in Pennsylvania and West Virginia.⁵⁸ Potential acquirers, however, may want to retain the US facilities.⁵⁹ Given Braskem's weak financial position, its apparent plans to sell its US assets, and its uncertain future, it is considered unlikely to acquire the Shell plant.

Formosa Plastics is a potential acquirer. Despite weak financials, the company remains bullish on the petrochemical business. It currently operates an ethane cracker plant in Point Comfort, Texas, along the US Gulf Coast. It is investing \$150 million to expand this facility. It has spent several years attempting to build a \$9.4 billion petrochemicals complex in St. James Parish in Louisiana, in a region known as Cancer Alley. Formosa has faced opposition to its project in Louisiana, including lawsuits filed by environmental organizations and local residents who fear more pollution from an additional chemical facility. The potential to purchase a turnkey, finished project in another state, potentially at a steep discount, may be appealing. Formosa may believe it can overcome the constraints of operating an isolated facility. Formosa's financials have been weak, with declining revenues since 2021, and a credit downgrade by Moody's earlier this year.

LyondellBassel, headquartered in the Netherlands, is facing financial headwinds in the weak global market like all major petrochemical companies. Its revenue has declined 38% in the past 3 years, from \$50.5 billion in 2022 to \$38.7 billion in 2024. Its focus is on improving its cash position and protecting its balance sheet. Although it has the operational expertise to run the Shell cracker plant, it is looking to divest assets to raise cash and reduce debt.

Ineos, a privately traded company headquartered in London, is still moving forward with its net-zero facility in Europe. The strategic hook for acquiring the Shell Monaca plant would be to source feedstock from the US, since the company is already set up to import ethane from the East Coast. It could also import plastic pellets from Charleston, South Carolina. Ineos may lack the financial resources, however, to fund such an acquisition. Ineos' CEO has described the dire financial situation facing the European petrochemical industry. As a private company, Ineos discloses limited financial information.

Dow Chemical, an American chemical giant, has also experienced steep revenue and profit declines over the past three years, as have Braskem and LyondellBasell. Both 2023 and 2024 saw revenue and profit declines; even when volumes of PE sales increased, lower prices crushed revenues and profits. The first half of 2025 suggests the company lacks the financial capacity to be a likely buyer of the Shell cracker plant. The company has delayed construction of its Path2Zero project in Canada, a net-zero ethylene facility that would produce PE, due to economic headwinds and market volatility.⁶⁰ Analysts have recommended that Dow focus on shifting "from commodity volume to differentiated, circular, and lower-carbon materials,"⁶¹ which would rule out an acquisition of the Shell Monaca facility.

BASF, the world's largest chemical producer, could conceivably acquire the Shell cracker plant. Its financial results have been stronger than its competitors, putting it in a position to make a large acquisition. Strategically, a case could be made that purchasing Shell Polymers Monaca would expand the company's North American footprint while taking advantage of the advantaged feedstock, though that benefit has eroded since Shell first opted to build the plant. However, BASF faces specific challenges⁶² in Germany, including plant closures, mass layoffs, and other cost-cutting measures. Its German operations, the company's largest operational base, have not been profitable for the past two years. High energy costs and general economic weakness in Germany have been cited for the company's financial difficulties in Europe.

Exxon & Chevron, despite their strong financial performance in 2024 and the first half of 2025, are unlikely acquirers. Senior management of these oil giants has likely decided that survival for companies in the petrochemical industry must be limited to either the production of specialty chemicals or the integration of the facility, such as a nearby refinery. Exxon had reportedly considered building an ethylene cracker plant in the Ohio River Valley a few years ago, in 2019,⁶³ but ultimately opted to pursue these plans instead. Exxon recently postponed its plan to build a PE facility along the US Gulf Coast, citing difficult market conditions: "Based on current market conditions, we are going to slow the pace of our development for the Coastal Plain Venture."⁶⁴ After selling its gas-producing assets in Appalachia in 2019 and recording a stunning \$10.4 billion write-off,⁶⁵ Chevron apparently has little investment appetite for the region.

Warren Buffett's \$9.7 billion acquisition of **OXYChem** from Occidental Petroleum appears to be a one-off purchase rather than a bullish view on petrochemicals. His firm, Berkshire Hathaway, had invested heavily in Occidental Petroleum in 2019. The divestiture will allow Occidental Petroleum to focus on its fossil fuel business.

Conclusion

Shell's decision to sell its Monaca ethane cracker facility in Beaver County, Pennsylvania—or to find a partner—illustrates how difficult it is for a petrochemical plant to operate standalone without connections to other higher-capacity storage or other locations to serve as backup supply. Pennsylvania's \$1.6 billion tax credit was originally intended to spur the development of such a petrochemical hub in the Ohio River Valley. Poorly written legislation, however, allowed Shell to sell its tax credits to firms beyond the petrochemical industry. From 2022 to 2024, Shell sold nearly \$90 million of the tax credits to outside firms. These firms are mostly insurance firms with headquarters in other states. All appear to be unrelated to the petrochemical industry. It's possible that the credits could be used to support other projects, such as a data center using some of the excess power generation capacity installed at the plant, but that industry wasn't in the sights of the economic development groups when this program was set up.

A so-called "look back" provision in the 2012 legislation that established the tax credit will allow legislators in 2028 to review how the tax credits have been used. Perhaps they will revise the legislation once they—and the public at large—analyze the results of the tax credit. This will make any transfer of the facility even more difficult.

The global petrochemical industry is facing a massive glut. Analysts believe the glut will not end anytime soon. The glut has led to a massive restructuring of the industry, particularly for commodity petrochemicals, such as polyethylene (PE), which the Monaca facility produces. It is unlikely Shell will reap its original \$14 billion investment.

Pennsylvanians, and especially residents of Beaver County, should press their legislators to revise the language in the tax credit to ensure that the next owner of the petrochemical plant in Beaver County receives tax credits that will support the local economy, not just enrich a foreign oil and gas firm.

Appendix

Figure 8: Detail on Shell's Feedstock Cost Calculations

Feedstock Vols	Total Year	Estimated Credit	Awarded Credit	Difference
2022	4,563,522	\$ 9,583,396	\$ 4,953,971	\$ 4,629,425
2023	11,090,000	\$ 23,289,000	\$ 27,268,868	\$ (3,979,868)
2024	30,012,080	\$ 63,025,368	\$ 56,892,224	\$ 6,133,144
Total Barrels	45,665,602			
Credit \$2.10/bbl	\$ 95,897,764			
Awarded	\$ 89,115,063			
Difference	\$ 6,782,701			

Note - assuming this difference is linefill

Estimated volumes used in production:

Unclaimed Credit	\$ 6,782,701	
\$/bbl	\$ 2.10	
Barrels	3,229,858	
Consumed	42,435,744	
# Ethane Feed	5,339,774,575	<i>Convert Barrels to Gallons at 2.996 #/gallon of ethane</i>
Conversion to C2=	3,844,637,694	<i>Using top end of conversion for ethane to ethylene in Title V permit filing</i>
Conversion to PE	4,113,762,333	<i>Average per model ethylene to PE rounded to 1.07 # PE per # ethylene</i>

Credit \$/# C2=	\$ 0.0232	<i>\$/lb credit for ethylene</i>
Credit \$/# PE	\$ 0.0217	<i>Est \$/lb credit for PE</i>
Credit \$/Tonne C2=	\$ 51.11	
Credit \$/Tonne PE	\$ 47.77	

Average Ethylene Price, Spot/Ton	\$ 473.36
November 2022-December 2024	
Credit \$ % of avg. ethylene spot price	11%

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