An Unrefined Ending

Lessons Learned from the Creation and Closure of the Philadelphia Energy Solutions Refinery

www.ucsusa.org/resources/philadelphia-refinery-closure
https://doi.org/10.47923/2023.14968

Christina E. Simeone, PhD

March 2023

Union of Concerned Scientists

Foreword

In 2018, Christina E. Simeone wrote a prescient report on the past, present, and future of Philadelphia's neighborhood-based oil refinery, Philadelphia Energy Solutions. *Beyond Bankruptcy: The Outlook for Philadelphia's Neighborhood Refinery*, written for the Kleinman Center for Energy Policy at the University of Pennsylvania, accurately predicted that the refinery would end up bankrupt again within a few years and called for greater public engagement to address toxic pollution and cleanup, prepare for worker dislocation, and explore redevelopment opportunities (Simeone 2018).

An Unrefined Ending, which draws deeply on Simeone's 2018 report, updates her findings based on the refinery closure following an explosion only a year later. She also shares key lessons learned from the events in Philadelphia—lessons that can inform other communities potentially facing refinery closures. Her findings are especially important as the transition to electric vehicles dramatically reduces demand for gasoline and diesel in the coming decades.

—***Jeremy Martin****, Senior Scientist and Director of Fuels Policy, Clean Transportation Program, Union of Concerned Scientists*

CONTENTS

Executive Summary

An Unrefined Ending informs stakeholders in US refining communities about some issues they may encounter as demand for refined petroleum products decreases. More specifically, to educate and prepare these stakeholders, this report distills lessons learned from events surrounding the Philadelphia Energy Solutions (PES) refinery, including the creation and closure of PES. It does not seek to reflect all the important and diverse stakeholder perspectives associated with those impacted by the refinery's operation, closure, and redevelopment.

The sprawling Philadelphia refinery property hosted petroleum storage and refining activities beginning in 1866. In 2011, long-time refinery owner Sunoco made a companywide decision to exit the refining business, threatening the shutdown of the Philly facility. Subsequently, a private equity giant, the Carlyle Group, acquired a majority interest in the aging refinery. In 2012, the Carlyle Group's investment and Sunoco's ongoing participation, as well as public subsidies and regulatory leniency, contributed to the establishment of the rebranded Philadelphia Energy Solutions refinery business.

Initially, PES financially prospered by exploiting shut-in Bakken crude supplies delivered via rail car. Shut-in meant that oil was coming out of the ground but there was too little or pipeline capacity to move it to refineries. Eventually, pipelines were built to move Bakken crude to Midwest and Gulf Coast refineries, forcing PES to rely once again on higher-priced crudes, now delivered via marine vessels. This loss of feedstock competitive advantage, along with aging infrastructure using low-conversion technology and the high costs of complying with renewable fuels standard (RFS) regulations, forced PES into bankruptcy in 2018.

PES successfully navigated the 2018 bankruptcy, based in part on the decision of the Environmental Protection Agency to excuse $350 million in RFS compliance costs. Majority ownership of the reorganized PES was transferred to a bank (Deutsche Bank) and a private investment firm (Bardin Hill).

That year, however, Christina Simeone predicted that PES, facing market headwinds and a large debt obligation due in 2022, would soon again face bankruptcy. Also, she discovered the facility had not been complying with regulatory requirements for public participation associated with characterization and remediation planning for legacy soil and water contamination. State and city regulators had lost track of the refinery's remediation process. Unfortunately, when regulators and representatives of Sunoco (the party responsible for cleanup costs) negotiated a solution to this oversight, they did so largely outside of the public purview.

In January 2019, as the refinery's financial position deteriorated, the owners made a remarkable decision: they abandoned a major maintenance turnaround one week before its planned execution. Then, in June, the breech of a metallurgically deficient pipe carrying toxic hydrofluoric acid resulted in an explosion and a 24-hour fire. City officials reassured neighboring communities that neither presented a threat to public health, but subsequent analyses put those claims into doubt.

The explosion precipitated PES's second bankruptcy and eventual closure. Although the refinery's economic viability had been called into question before this, city leaders had declined to envision a future for the property beyond refining until it was too late. Ultimately, a bankruptcy-court auction determined the fate of the 1,300+ acres of city-center land, with minimal opportunity for input from city leaders or community members.

Myriad lessons can be learned from the PES refinery closure.

First, these businesses go down fighting, using a portfolio of aggressive legal strategies. Many of the strategies seek to reduce regulatory (e.g., environmental, taxation) compliance costs.

Second, operational risks may increase as finances dwindle. Financially driven decisions to reduce costs, coupled with insufficient insurance to cover catastrophic risks, may expose neighboring communities to greater risks. There do not seem to be regulatory mechanisms in place to enhance oversight of refineries that are under financial duress. In populated areas, this omission is particularly critical given the capital-intensive nature of the refining business and the potential risks associated with the hazardous and toxic chemicals (e.g., hydrofluoric acid) used in refinery operations.

The third lesson concerns ensuring funding to maintain the communications and technical capacity required to hold refineries accountable. Unlike the situation in some areas of the United States (e.g., California), the imminent demise of PES was not widely anticipated. As such, environmental and community organizations lacked discretionary funding to respond fully to the complicated and dynamic situation, and a delay ensued to securing new funding streams. Although the refinery's closure yielded environmental benefits (e.g., it reduced toxic, criteria, and carbon emissions), an opportunity was missed to exert leverage in high-value areas. Specifically, capacity and resource constraints inhibited the ability to publicize the refinery's public participation failure, secure a more stringent, negotiated solution for shutting out the public, procure robust technical resources to evaluate contamination data, and ensure historic, long-term oversight of the multi-decadal remediation process. Advocacy groups on the ground—such as the Clean Air Council and Philly Thrive—did a tremendous job with the PES situation, under difficult circumstances. Yet one wonders if even better outcomes could have been secured if local environmental and community groups had more funding from the philanthropic community, government, or the company and greater support from statewide and national advocacy organizations.

Perhaps the most important lesson concerns working with and empowering unions. Refinery management may seek to deploy the political capital of unions to the benefit of a facility's financial bottom line, yet often doing so without sharing the company's plans and strategies. If refinery owners were honest with unions about a refinery's poor outlook, unions might choose to focus more time and resources advocating for worker transition assistance, and comparably less time advocating for ongoing refinery operations. This creates a potential incentive for refinery management to withhold certain information from unions. Union members depend on refinery operations, yet they may have experienced refineries acting against union interests in the past. For example, refinery management may have resisted calls for more stringent worker safety standards, benefitting the facility's financial position but not worker safety. As refinery markets contract, unions will benefit even more from impartial, accurate sources of information about refinery markets, economics, and competitiveness.

Refinery closure represents a loss of employment for refinery workers—union and non-union—but refinery redevelopment opens up the possibility for significant new employment—union and non-union—in various fields depending on future uses of the site. This may result in a redistribution of union employment, depending on the ability of labor unions to secure agreements for union construction and the operation of any future facilities. This creates a complicated situation for local union and political leaders to navigate.

Supporting union worker transition assistance is an important opportunity for environmental advocates to ally with unions. In the PES case, however, environmental groups generally lacked credibility with union leaders and workers. Moreover, the use of terms like a "just transition" may be counterproductive, as unions in Philadelphia perceived the term as "just transition already" rather than as "equitable transition."

Similarly, attempts by environmentalists to develop and define transition programs without the leadership of impacted refinery workers and deep engagement from labor may be counterproductive. Such attempts may make it more difficult for labor and environmental leaders to collaborate on refinery closure issues, whereas partnerships may be less tenuous on redevelopment opportunities after a refinery closure has been determined.

Some similarities and differences between the PES situation and the California refinery market should be considered. Both the East Coast and West Coast refinery markets are contracting. Unions have a strong presence in both regions. And some California refineries use modified hydrofluoric acid. All these refineries have environmental contamination, and the US Environmental Protection Agency requires most to remediate. On the other hand, California's much stronger policy drivers negatively impact refinery markets, making it easier to anticipate the demise of a refinery(s). There is far greater regulatory oversight and far more publicly available data on California refineries (e.g., through the California Energy Commission), and these refineries tend to be technologically more sophisticated than PES. Lastly, integrated, public companies, not private equity firms or banks, own most California refineries.

The victories and missteps associated with the PES refinery closure offer myriad learning opportunities. The inability to anticipate, build capacity, and plan for the refinery's closure left Philadelphia unprepared for the dynamic, fast-moving situation that ensued after the 2019 explosion. Primarily, the events represented a failure on the part of city leadership. Ultimately, a bankruptcy court auction determined the fate of the refinery property, with minimal input from city leaders and impacted workers and communities. Therein lies the greatest missed opportunity. Yet what transpired in Philadelphia could have been far worse had the explosion resulted in greater damage to public health. Perhaps that leads to the most critical lesson. If a well-established refinery operator sells a refinery asset to a less-experienced investor, the degree of attention, oversight, and planning must increase.

Chapter 1
Refinery Site History

History

Located just 2.5 miles southwest of Philadelphia's center city, along the confluence of the Delaware and Schuylkill rivers, is a sprawling 1,300+ acre parcel of land known for many years as the Philadelphia Refining Complex. Established in 1866 as a bulk petroleum storage facility called the Atlantic Petroleum Storage Company, refinery operations began there at Point Breeze in 1870 (PES 2018). By 1891, 50 percent of the world's lighting fuel and 35 percent of US petroleum exports came from the 360-acre Atlantic Refining Company (Hein 2016). In 1920, Gulf Oil built a terminal just south of the Atlantic refinery at Girard Point, and by 1926 a new refinery was operating on that site (PES 2018). The two refineries—Point Breeze and Girard Point—were bought and sold over the years.

The Sun Company (Sunoco) purchased the Point Breeze refinery in 1988 and the Girard Point refinery in 1994 (Quivik 2015). Sunoco subsequently constructed the Northeast Refining Complex along a 20-mile stretch of the Delaware River; it included the Eagle Point refinery in New Jersey, Sunoco's original Marcus Hook refinery (est. 1902) near the Pennsylvania-Delaware border, and the Philadelphia Refining Complex at the adjoining Point Breeze and Girard Point refineries. Sunoco converted Point Breeze from a heavy sour facility into a light sweet facility[1] to match the configuration of Marcus Hook and Girard Point. Sunoco then built a 15-mile pipeline system between the plants, with interconnection to Philadelphia International Airport (Norman 2004).

Sunoco Exits Refining

In 2009, Sunoco announced it would idle the Eagle Point refinery in New Jersey to increase utilization at Marcus Hook and the Philadelphia Refining Complex (*OGJ* Editors 2009). Two years later, Sunoco announced it was exiting the refining business to focus on its more profitable operations like retail distribution. After reducing its refining capacity by 43 percent since 2009, Sunoco intended to shut down its last two remaining refinery locations at the Philadelphia Refining Complex and Marcus Hook by July 2012 if it could not find a new buyer (Gilbert 2011). Management claimed the company's Northeast refinery operations lost $772 million between 2009 and 2011 and that it could not justify the new capital investments needed to make the two refineries sustainable (Wolfe 2011). Analysts attributed the failure of the Philadelphia Refinery Complex to a difficult business environment, marked by reliance on expensive imports of light sweet crudes, an inability to process cheaper crudes, and falling East Coast demand for refined products (GlobalData Deal Analysis 2012).

Chapter 2
The Formation and Operation of Philadelphia Energy Solutions

The Philadelphia Refining Complex included two separate refineries, Point Breeze and Girard Point, with a total of 350,000 barrels per stream day of crude oil distillation capacity. That represented about 28 percent of the East Coast's refining capacity.[2] The two refineries produced approximately 45 percent gasoline, 40 percent distillate, and 3 percent high-value petrochemicals; the remaining 12 percent were low-value products (9 percent residual fuel, 2 percent liquefied petroleum gas, and 1 percent other) (PES 2015).

The refinery products were primarily marketed in the US Northeast via pipeline to Pittsburgh, New York City, and Buffalo, supplemented by refined product distributed by barge (via Eagle Point) or truck (via Sunoco's Belmont Rack). The complex's Schuylkill River Tank Farm connected to the Harbor pipeline, enabling product to move north to the New York Harbor, the world's largest refined product market. The Schuylkill River Tank Farm also connected to the Laurel pipeline, allowing product to move west toward Pittsburgh. The refineries primarily relied on light sweet crude oil feedstocks from West Africa, Canada, North Dakota, Texas, and other areas (Kirkland and Ellis LLP 2018). The refinery could receive up to 100 percent of its crude supply needs by ship via the Delaware River, enabled by Sunoco's Fort Mifflin tanker offloading and Darby Creek crude storage tank facilities (Kirkland and Ellis LLP 2018).

Private Equity Interest

In July 2012, political will, public subsidies, and private capital from the Carlyle Group, as well as continued participation from Sunoco, coalesced to save the Philadelphia Refining Complex by creating PES (Heath 2012). Just a few months earlier, in April 2012, Energy Transfer Partners (ETP) had acquired Sunoco. Sunoco had originally intended to sell 100 percent of the Philadelphia Refinery Complex but settled on a joint venture with Carlyle after complete sale efforts were unsuccessful (Fair Disclosure Wire 2012). The joint-venture deal created PES; Sunoco (now an affiliate of ETP) contributed the Philadelphia Refinery Complex assets, and the Carlyle Group contributed $175 million in capital (Renshaw 2018).

For the Carlyle Group, investing in the aging refinery was likely an option in the event a large-diameter natural gas pipeline were built into southeastern Pennsylvania, enabling the company to retool the refinery as a natural gas and petrochemical refining facility. Pennsylvania was amid an unconventional shale gas boom from the Marcellus Shale formation. However, there was no direct pipeline connection to bring the gas from supply fields in southwestern and northern Pennsylvania to market demand centers in southeastern parts of the state. This opportunity resurrected discussions about a private sale of the financially struggling Philadelphia Gas Works (PGW), the largest municipally owned gas

utility in the country (Lucey 2012). Local officials were actively exploring sale of PGW to the private sector; if successful, that would have precipitated a natural gas revolution in southeastern Pennsylvania. First, a private company could engage in pipeline finance far more easily than could a municipal utility subject to the city's budgeting process and oversight. Second, obtaining regulatory requirements (e.g., a certificate of public necessity) for a large-diameter gas pipeline would be more easily justified if the line were intended primarily to serve gas utility customers, with additional capacity available for other customers.

The Role of Subsidies

Much of the public outcry opposing the refinery's potential closures (e.g., in 2011, 2018, and 2019) related to job losses and concerns about reduced economic activity for local businesses serving the refinery. Political pressure to maintain ongoing refinery operations yielded a host of financial and regulatory subsidies.[3] The Commonwealth of Pennsylvania provided various monetary and regulatory subsidies to facilitate the PES deal including, but not limited to, $15 million over three years through the Pennsylvania Economic Growth Initiative for refinery equipment upgrades, a $10 million grant for a high-speed rail unloader from the Pennsylvania Department of Transportation, a Keystone Opportunity Zone designation, and the opportunity for tax-exempt bonds through the Pennsylvania Economic Development Finance Agency (Fair Disclosure Wire 2012). After the publicly funded expansion of rail receiving capacity, PES had the ability to receive up to 75 percent of its total crude supply needs by rail from domestic sources enabled by its affiliated rail terminal, North Yard Logistics.

In addition to monetary subsidies, the state provided regulatory subsidies. First, a consent decree with the Pennsylvania Department of Environmental Protection (DEP) dealt with air pollution violations (Fair Disclosure Wire 2012). Second was an attempt to aggregate Clean Air Act emissions of the PES facility with those of the idled Marcus Hook refinery over 17 miles away (StateImpact 2012). Although emitters tend to dislike aggregation because it can result in more stringent pollution control requirements, in this case combining a large operating facility with a large, idled facility would have decreased emissions reduction requirements. This unique situation may not be widely applicable to other refineries.

Shielding PES from Legacy Contamination Liabilities

Selling the refinery required legal delineation between the seller's responsibility for remediating existing (including legacy) contamination and the buyer's responsibility for dealing with any future contamination. This was achieved through an August 2012 consent order and agreement (COA) among the Pennsylvania DEP, Sunoco, and PES.[4] The sale also required explicit protection for the buyer against claims (e.g., joint and several) for legacy contamination. This was achieved through a 2012 "prospective purchaser agreement" (PPA) among the US Environmental Protection Agency (EPA), Sunoco, and PES.[5] Ostensibly, the 2012 COA dealt with state regulatory liabilities, while the 2012 PPA dealt with federal liabilities.

Chapter 3
Unconventional Oil and the Shift in Refinery Economics

The economic exploitation of domestic, unconventional natural gas and oil shale deposits upended energy markets domestically and abroad, including how oil shale development affected PES.

The Opportunity of Shut-In Shale Supply

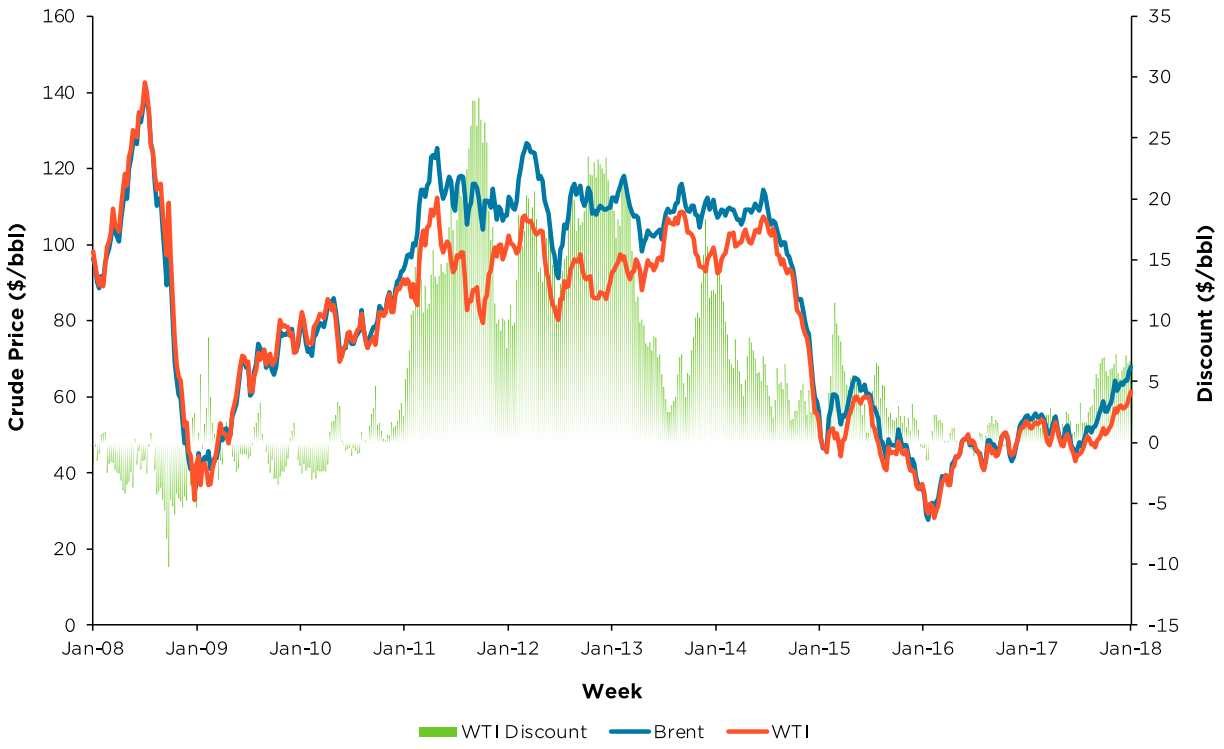
The configuration of the Philadelphia refinery limited the type of crude oil the facility could process to higher-priced light sweet crude. Historically, the refinery imported light sweet crude via marine vessel from foreign sources priced on the Brent exchange. The economic development of oil shale deposits in North Dakota (Bakken) and the Permian Basin (Texas) resulted in a new source of domestic light sweet crude. Moreover, this domestic supply priced on the West Texas Intermediate (WTI) exchange was trading at significant discounts compared with Brent crude because it was "shut-in." That is, a lot of oil was coming out of the ground with nowhere to put it: pipeline capacity was insufficient or did not exist in these new areas of oil development.

The WTI discount to Brent began in 2011 and persisted through 2015 (Figure 1) (EIA n.d.b). The discount made it possible for PES to pay the premium to ship Bakken crude by rail car into Philadelphia and still save money compared with the Brent marine imports. Aided by state subsidies to expand its rail receiving capacity, PES began to flourish, shipping crude by rail, and it became profitable by 2014. Meanwhile, regulators reported that nearly a dozen mile-long unit trains carrying 70,000 barrels of crude each were moving through Philadelphia daily (Powelson 2015).

The Bakken Pipeline

PES management surely knew the WTI discount opportunity would be short-lived. This was because Energy Transfer Partners, the parent company of PES's half owner Sunoco, was successfully pursuing development of a pipeline to alleviate the shut-in situation at the Bakken formation. In July 2012, the month PES was formed, ETP submitted paperwork to the Federal Energy Regulatory Commission to convert its Trunkline natural gas pipeline into an oil pipeline, called ETCO. In 2014, ETP conducted an open season (i.e., a solicitation for new pipeline customers) for construction of a new pipeline called Dakota Access that would move oil from the Bakken formation to ETCO, which would then move Bakken crude to refineries in the Midwest and Gulf Coast. In June 2017, the combination of the ETCO and Dakota Access lines, realized as the "Bakken Pipeline," came online and effectively cut off East Coast refineries from Bakken supply.

Figure 1. Weekly Brent and West Texas Intermediate Spot Prices and WTI Discount (FOB $/BBL)



The WTI discount to Brent began in 2011 and persisted through 2015, enabling PES to pay the premium to ship Bakken crude by rail car into Philadelphia and still save money compared with the Brent marine imports.
SOURCE: EIA N.D.B.

Unforeseen Events

Perhaps PES management did not foresee how dire the PES situation would become because it could not predict two very unlikely events that would impact domestic supply flows. First, in November 2014, OPEC decided not to cut oil production despite the fall in crude prices caused by new US shale oil supplies. Essentially, OPEC acted against its short-term interest (i.e., it sold product at low prices) to pursue the longer-term goal of putting new US shale producers out of business. OPEC's actions resulted in lower Brent prices, narrowing the WTI discount. Second, in December 2015, the United States lifted a long-standing ban on oil exports. This opened domestic supplies (mainly from the Permian Basin priced on the WTI exchange) to the international market and further eroded the WTI discount.

Chapter 4
2018 PES Bankruptcy

As events coalesced to upend PES economics earlier than could have been expected, the company attempted to go public. It quickly abandoned this effort only to declare bankruptcy a few years later.

Initial Public Offering

In September 2014, PES filed paperwork for an initial public offering (IPO) with the US Securities and Exchange Commission (SEC) for sale of a percentage ownership of PES Logistics Partners, a Master Limited Partnership comprised of the North Yard Logistics (NYL) rail receiving terminal. At the time, NYL had unloading capacity of two-unit trains (104 cars each) per day, which was equivalent to 140,000 barrels per day (bpd). There was also a project underway to expand from two-unit to three-unit trains per day, increasing capacity to 210,000 bpd, with the opportunity to expand capacity further (PES Logistics Partners, L.P. 2014). The IPO of common stock sought to raise $250 million and valued PES Logistics at about $105 million (PES Logistics Partners, L.P. 2014).

In February 2015, PES filed IPO paperwork with the SEC for percentage ownership in Philadelphia Energy Solutions, Inc. (PES Inc.), a holding company with two subsidiaries, including the refinery complex and related marketing activities and PES Logistics. The IPO for PES Inc. valued the company at over $1 billion (PES 2015). In August 2015, PES postponed its IPO efforts as a result of market conditions and pressure on energy investors and funds (*Street Insider* 2015). Unfortunately for PES, the IPO offerings had been timed a little late. The combined effects of the lifting of the oil-export ban and OPEC's continued production levels reduced both the WTI discount and PES's profitability.

2018 Bankruptcy Claims

On January 21, 2018, PES filed for Chapter 11 bankruptcy protection, seeking to continue operating while shedding some debt, converting other debt to equity, and gaining new investment. At the time of the bankruptcy petition, PES was $581.2 million in debt secured by its refinery business and $97.5 million in debt secured by its rail logistics business at North Yard (Kirkland and Ellis LLP 2018). In the bankruptcy filing, PES primarily blamed its economic woes on regulatory compliance costs associated with the federal renewable fuels standard policy. PES cited a grand total of $832 million in RFS compliance costs between 2012 and 2017; it asserted that its 2017 RFS expenses of $218 million were twice its annual payroll, representing the company's largest expense after crude oil (Kirkland and Ellis LLP 2018).

After RFS compliance costs, PES blamed the elimination of affordable access to domestic WTI-exchange crude (namely from the Bakken formation in North Dakota) as the second factor pushing it into bankruptcy. PES also cited industry-wide reduced gross refining margins as the third greatest factor. Specifically, the 2-1-1 Brent crack spread, which used New York Harbor market values for refined product, dropped from $14.52 per barrel (average September 2012 to

September 2015) to $13.37 per barrel (average October 2015 to December 2017). PES asserted that each $1 drop in the crack spread reduced its revenues by about $110 million (Kirkland and Ellis LLP 2018).

2018 Bankruptcy Reality

PES fashioned its bankruptcy claims in an attempt to gain regulatory leniency on RFS compliance, a strategy that proved viable. Achieving leniency on RFS compliance costs was perhaps the only thing the company could influence. President Donald Trump had taken office in 2017, about one year before the bankruptcy, and he appointed Carl Icahn as special advisor on regulations. Icahn, then majority owner of the petroleum refining company CVR Energy, encouraged Trump to end the RFS requirement, including but not limited to a provision that required blending 10 percent ethanol into every gallon of gasoline (DiChristopher and Rosenfeld 2017). Bolstered by a 2017 federal appeals court ruling,[6] the Trump administration began liberally awarding small-refinery hardship waivers from RFS compliance. This had the effect of reducing the stringency of the RFS by more than 7 percent (Coppess 2018). In other words, the Trump Administration's EPA was less supportive of the RFS than previous administrations. Through the bankruptcy, PES sought to be excused from $350 million in outstanding RFS compliance obligations (Kirkland and Ellis LLP 2018). Compared with the RFS policy, the reduction in the WTI discount (i.e., from OPEC and the lifting of the export ban) and being shut off from Bakken crude supply (i.e., from the Bakken pipeline) were beyond PES's control.

PES did not mention the financial demands of its majority equity holders as a factor leading to its bankruptcy. Meanwhile, the Carlyle Group invested $175 million in PES, but it eventually extracted at least $594 million in cash distributions from the company prior to the bankruptcy (Renshaw 2018). This was in addition to payouts to other equity shareholders. Most of these payouts were financed through loans securitized to PES assets (Renshaw 2018). Refining is a capital-intensive business, which required PES to invest over $855 million in refinery capital projects, operations, and rail expansions (Kirkland and Ellis LLP 2018). While RFS compliance (an expense for all refineries), investor payouts, and capital expenditure requirements contributed to the PES bankruptcy, it was the loss of access to discounted WTI crude that played the most significant role.

Refinery crack spreads are influenced by the difference between the market price of crude input cost and the market price of refined product outputs. PES found itself in a situation where crude input costs were rising (i.e., due to a shift from cheap WTI to more expensive Brent) and refined product prices were relatively low (e.g., due to soft demand along the East Coast). This was the major factor negatively impacting PES economics (Table 1).

Table 1. Estimated Selected Costs and Revenue Reductions Leading to the PES Bankrupcy, 2012–2017

Select PES Cost/Revenue Reductions	2012–2017
WTI to Brent, with Margin Compression	$1,829,300,000
Capital Projects (less PA grants)	$855,000,000
RFS Compliance (RINs)	$832,000,000
Dividends, Debts, Fees	$616,000,000
Total	$4,132,300,000
Annualized Total	$688,716,667

The loss of access to discounted WTI crude was the most significant contributor to the PES bankruptcy.
SOURCE: SIMEONE 2018.

Chapter 5
Navigating the Bankruptcy Process

Renewable Fuels Standard Deal with the EPA

The initial bankruptcy plan relied on the EPA to excuse PES of all $350 million in compliance costs under the RFS, corresponding to about 467 million renewable identification numbers (RINs) owed from operations in 2016 and 2017 (Kirkland and Ellis LLP 2018).[7] This would reduce PES's compliance obligations and allow the company to sell (rather than retire) the RINs it held. On March 12, the US Department of Justice, on behalf of the EPA, filed a settlement agreement with PES. It would obligate PES to retire only 138 million RINs credits held by the company for pre-bankruptcy RFS obligations, retire 64.6 million RINs for post-bankruptcy RFS obligations for 2018, consent to retire RINs on a semiannual basis through 2022, and submit itself to stipulated penalties if it failed to achieve its RIN obligations (Wood et al. 2018). Documents uncovered in 2019 showed that PES intensely lobbied the EPA for this exemption in the lead-up to the bankruptcy (Hiar 2019).

In support of the RFS settlement portion of the bankruptcy, the Department of Justice hired Harris & Associates, a certified public accounting firm, to assess PES's financial ability to comply with the RFS. "PES's plan is already approaching the limit of viability," the accounting firm found, referring to the post-bankruptcy plan for going forward. "In my opinion, any requirement to retire RINs to meet past obligations, either presently or in the future, in addition to the 138 million outlined in the settlement agreement, poses a significant risk to the company remaining a viable entity post bankruptcy" (Harris 2018).

Essentially, the rationale for excusing a portion of PES's RFS compliance obligation was based on the company's inability to pay even after successful bankruptcy reorganization.

Back Tax Claims

The RIN settlement was an expected controversy in the PES's bankruptcy; unexpected were multiple assertions of significant liabilities for unpaid back taxes. Several government agencies and taxing authorities, including but not limited to the federal government, the Pennsylvania Department of Revenue, the City of Philadelphia, and various Texas taxing authorities, protested the bankruptcy plans. These creditors asserted that PES owed or might owe back taxes, and they objected to procedures sought by PES that would potentially impair their ability to recover taxes owed. Most remarkably, the Pennsylvania Department of Revenue asserted that PES potentially owed an estimated $3.81 *billion* in unpaid sales and use taxes and liquid-fuels taxes, as well as interest and penalties accrued between January 1, 2015, and January 21, 2018. The department noted that an audit was underway to determine the exact amount owed (Shapiro 2018). After PES's 2019 explosion, reporters who followed up with Pennsylvania about the status of back-tax payments were told the state had worked with PES's lawyers to negotiate the $3.8 billion in potential back taxes down to just $86,000 (*NBC News* 2019).

Liquidation Value

PES's Chapter 11 reorganization plan was accompanied by a Chapter 7 insolvency plan that anticipated the potential need to liquidate PES assets to pay creditors. The combined liquidated value of the refinery and rail terminal was estimated, in the best-case scenario, at a little over $700 million. Meanwhile, PES's bankruptcy petition identified over $678 million in debt secured by the refinery and its rail assets in addition to other unsecured obligations. This plan did not consider environmental issues with the property or decommissioning costs.

Challenges Ahead

PES successfully completed Chapter 11 bankruptcy reorganization, but many obstacles remained—so many that it was easy to see bankruptcy would again become inevitable. Importantly, the bankruptcy plan restructured some debt and pushed back to 2022 the due date on PES's $523 million term loan. (It was originally due April 2018, thus precipitating the bankruptcy.) PES would have a limited time to raise funds to pay back this loan. Its own reorganization plan projected net income of $386 million in 2018, $33 million in 2019, $99 million in 2020, and $121 million in 2021, while incorporating attractive assumptions about the future of the refinery's market.

The reality was the future looked bleak. Large trends were at play. East Coast refinery utilizations rates were dropping as Midwestern and Gulf Coast refinery rates were increasing. Midwestern and Gulf Coast refineries were increasing their capacity investments, benefiting directly from Canadian tar sand and domestic oil shale production and pipeline assetss. PES was now shut out from cheap domestic crude and did not have the heavy-residuum-processing technology needed to process cheap Canadian grades. The strength of the Midwestern refineries also prompted Buckeye's Laurel Pipeline, which historically brought PES-refined product from eastern Pennsylvania west to Pittsburgh markets, to petition to reverse the direction of the pipeline's flow (from east-to-west to west-to-east) to allow Midwestern refineries to serve the Pittsburgh market. Separately, in April 2018, the state approved Pittsburgh's plan to eliminate its lower Reid vapor pressure summer gasoline requirement. This requirement had historically created a competitive advantage in the Pittsburgh market for PES.

PES also expected major turnarounds coming due in order to continue operating, and these would require investments in equipment renewals: sulfuric alkylation (2018), low-sulfur gasoline (2019), sulfur plant (2019, 2020), distillate desulfurizer (2020), hydrofluoric alkylation (2020), Girard Point fluid catalytic cracker (2019), reformer (2020), Udex (2020), and butane isomerization (2020) (Kirkland and Ellis LLP 2018). At the time, it was also unclear if PES had invested in the equipment needed to comply with the EPA's Tier 3 Motor Vehicle Emissions and Fuel Standards (compliance due March 2018) or the International Maritime Organization's low-sulfur bunker fuel requirements (compliance due January 2020). In September 2018, PES's collective bargaining agreement with the United Steelworkers would expire, likely requiring new terms. In 2023, PES's Keystone Opportunity Zone tax status would expire, significantly increasing certain property-related state and local tax rates.

Chapter 6
Environmental Contamination

The PES property was home to petroleum storage and refining for over 150 years, and during most of that time no regulatory oversight regime was in place for environmental protection. Not surprisingly, the soil and groundwater at the site are heavily contaminated with hydrocarbons. Light non-aqueous phase liquids (e.g., refinery products like gasoline) are present in the groundwater at many areas of the facility. Specific chemicals of widespread concern include benzene (a known human carcinogen), lead, MTBE, toluene, benzo(a)pyrene, and many other toxic compounds. In some areas, contaminants have migrated off site, and a drinking water aquifer used by the state of New Jersey could potentially be impacted.

Regulating Remediation

In December 1993, Sunoco (then Sun Company) entered into a consent order and agreement with the Pennsylvania DEP to address petroleum products in the soil, groundwater, and rivers. Subsequently, Pennsylvania's Act 2 Land Recycling Law, enacted in 1995, encouraged voluntary cleanup of contaminated commercial and industrial sites.[8] In 2003, the original consent order and agreement expired; it was extended with a new COA stipulating required site characterization and remediation activities, noting that the site's contamination was a public nuisance and that the DEP could require Sunoco to remediate the site under the Clean Stream Law.[9] In 2006, Sunoco entered the facility into Pennsylvania's Act 2 program. Although Act 2 is a voluntary cleanup program, Sunoco was required to clean up the site through the 1993 and 2003 COAs (and authority under the Clean Stream Law). The Act 2 pathway enables owners of contaminated sites to be cleared of future liabilities for environmental contamination provided certain cleanup standards are met. In 2011, Sunoco entered the refinery complex into the One Cleanup Program so that meeting Pennsylvania's Act 2 state standards would also fulfill certain federal standards, including the Resource Conservation and Recovery Act of 1976 (RCRA) and the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA).[10]

Under the Act 2 One Cleanup Program, the PES site was divided into 11 "areas of interest" to be characterized for contamination and remediation. Sunoco chose to pursue site-specific cleanup standards rather than remediate to the more stringent statewide health-based standards. The site-specific standards are proposed and risk-justified based on human exposures that would occur given a specific future use of the site, which Sunoco maintained would always be an operating refinery (hence minimizing human exposures). For example, the statewide health-based standard for lead in soil in a non-residential property was 1,000 mg/kg; however, the DEP approved Sunoco in 2015 for a site-specific cleanup standard of 2,240 mg/kg, more than twice the health-based standard. Sunoco justified this higher standard by assuming the property would always be a refinery and by integrating a target blood lead level of 10 ug/dL in a fetus, which is twice the limit of 5 ug/dL recommended by the federal Centers for Disease Control and Prevention (Ahlers 2021).

Evading Public Participation

Sunoco/Evergreen completed a significant amount of work to characterize pollution and establish cleanup standards under the One Cleanup Program/Act 2 without adhering to public participation requirements. Evergreen, an affiliate of Sunoco, was formed to manage Sunoco's legacy environmental cleanup at the Philadelphia Refinery (Doerr 2020).

Philadelphia's formal request in 2006 legally triggered enhanced requirements for public participation, but these mandates were not followed. Perhaps given the decades-long duration of Act 2 activities at the refinery, it seemed that no one at the DEP, the city, or the public was aware of these shortcomings. Omissions included public notices that failed to include required summaries of findings and recommendations, a failure to integrate municipal and public comments and responses to those comments into the reports filed for review with the DEP, and failure to make required materials available to the public at local libraries. These omissions were originally identified in *Beyond Bankruptcy* (Simeone 2018). As a result, Sunoco/Evergreen was required to open up many previously approved remediation documents for public comment via a new and expanded public relations effort.[11]

Chapter 7
Explosion and Closure

Explosion at PES

At 4:00 am on June 21, 2019, a series of explosions and fires occurred at the PES refinery; the fires took more than 24 hours to extinguish (extinguished at 8:30 am on June 22) and injured at least five refinery workers. A preliminary report by the US Chemical Safety and Hazard Investigation Board (CSB) determined that a significantly corroded elbow joint at the Girard Point refinery's hydrofluoric acid (HF) alkylation unit ruptured, allowing the escape of a ground-hugging vapor cloud of propane (94.7 percent) and highly toxic hydrofluoric acid (2.5 percent) to form (CSB 2019). The cloud ignited, causing a fire that triggered three explosions, the last of which sent projectiles of three large containment drum fragments flying across the refinery property.

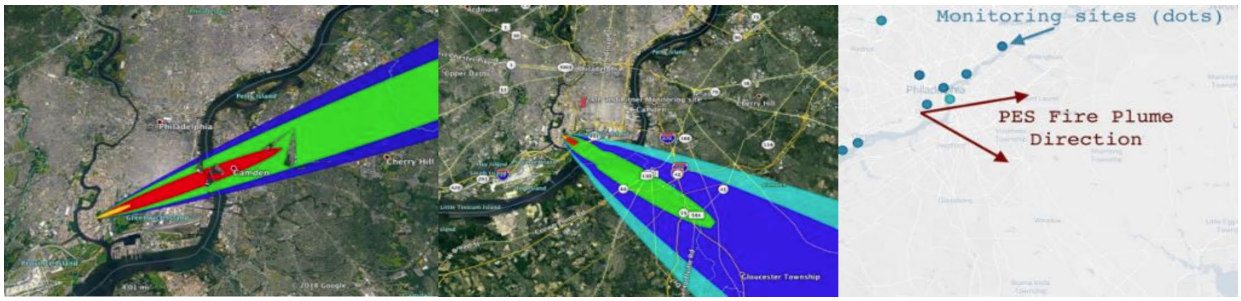
Shortly after the initial fire, and before the first explosion, a refinery operator activated the HF Rapid Acid De-Inventory system, removing a large quantity of HF from the alkylation circuit. This action has been widely credited with protecting the public from more significant HF exposure. Still, PES reported to the CSB that 5,239 lbs. of HF were released, with approximately 3,271 lbs. escaping into the atmosphere and the remainder contained in the process equipment (CSB 2019). Luckily, the CSB indicated that no on- or off-site negative health impacts associated with HF exposure were reported. Subsequently, the CSB found the 1973-installed elbow joint's metallurgic composition included small amounts of nickel and copper, which in the presence of HF can increase non-uniform corrosion by up to five times (CSB 2019). The elbow-joint location in question was not included in PES's corrosion monitoring program and had eroded to about half the thickness of a credit card.

The CSB's final report on the explosion, issued on October 11, 2022, largely confirmed the findings of the preliminary investigation, with additional details such as inappropriate re-stamping of piping (CSB 2022). The report also recommended changes to regulatory programs and industry standards. In December 2019, the US Department of Labor's Occupational Safety and Health Administration (OSHA) cited PES with 10 serious violations for safety and health hazards related to process safety management (OSHA 2019). Though the allegations were significant, the monetary penalty amounted to only $132,600. The PES incident caused $750 million in property damage, ranking it as the third greatest loss in the history of the global refining industry (Marsh JLT Specialty 2020).

False Information on Air Quality Concerns

During the 24+ hours of the refinery fire, concern was widespread about potential health impacts to neighboring communities. The City of Philadelphia repeatedly assured the public that there was no cause for concern. However, Peter DeCarlo, a Drexel University air-quality engineering professor, asserted that the city's particulate matter (PM) air-quality monitoring sites were not downwind of the fire plume (Figure 2). Therefore, those sites could not monitor public exposure accurately (DeCarlo 2019). This point was reinforced by the fact that PES's onsite PM monitoring units that were downwind of the fire plume showed significant pollution spikes.

Figure 2. Pollution from PES Explosion Was Not Captured by City Air Monitors



While the City of Philadelphia assured the public there was no cause for concern about community health impacts from the PES explosion, the projected pollution plumes (above left and center) were not downwind of the city's PM monitoring sites (blue dots, above right), and could thus not monitor public exposure accurately.
SOURCE: DECARLO 2019.

Even more concerning, the city's air monitors picked up elevated HF at a location near PES, but the city dismissed this reading as a false positive (Maykuth 2019). PES personnel later measured at the same site and did not detect HF, but DeCarlo asserts the HF "puff" would have dissipated by the time of the PES staff measurement (DeCarlo 2019). DeCarlo also criticized the city's reliance on handheld monitors as unsuitable for monitoring outdoor air quality, delivering false negatives and contributing to the city's safety narrative (DeCarlo 2019). In October 2019, FEMA's Interagency Modeling and Atmospheric Assessment Center issued the results of its air-quality modeling simulation, which the city had requested; it found it was unlikely that significant HF had crossed the facility perimeter either during the first two minutes of the leak or during the subsequent fire (IMAAC Technical Operations Hub 2019). The CSB's final investigation report noted that the specific circumstances limiting the off-site migration of low-concentration HF (i.e., low wind speeds before the gas was blown up into the atmosphere) would not always be present, and that previous studies indicated worse-case conditions could lead to off-site migration at a range of 2.2 to 5.2 miles (CSB 2022).

In February 2020, the Environmental Integrity Project, a national nonprofit, released a report analyzing public data from EPA's new 2018 requirement for refineries to monitor fenceline average benzene concentration emissions (Environmental Integrity Project 2020).[12] The new regulatory program requires perimeter monitoring, a root-cause analysis, and corrective action if annual concentrations exceed 9 micrograms per cubic meter ($\mu g/m^3$) of air at any monitoring location. For the year ending on September 30, 2019 (which included the explosion), PES had the highest net benzene concentration of any refinery in the nation at 49 $\mu g/m^3$—444 percent higher than the EPA action level. The EPA's long-term exposure standards were also compared with a short-term/acute exposure standard maximum of 30 $\mu g/m^3$ measured over a two-week period. PES exceeded the maximum threshold for 16 two-week periods between January 2018 and January 2019 (excludes the explosion), with maximum concentrations of 189 $\mu g/m^3$, making it the second-worst refinery on the report's list. The Environmental Integrity Project reported that 5,125 people lived within one mile of PES, 70 percent of whom were below the poverty line and 45 percent were African American.

Second Bankruptcy, Closure, and Payouts

After the explosion, PES idled the refinery and, on July 21, 2019, declared bankruptcy again. PES secured $100 million in financing from lenders to help the refinery navigate Chapter 11 reorganization. Reports indicated the company could be the beneficiary of up to $1.25 billion in claims from property-damage and business-interruption insurance (Kearney and Renshaw 2019). However, the bankruptcy reorganization eventually converted to liquidation, with plans to auction the refinery property off to a bidder that created the best value for PES creditors.

Many parties objected to the bankruptcy plan, including unions and unsecured creditors. Union workers wanted the refinery to be sold to a company that would restart operations, and they objected to including PES executive bonuses in the bankruptcy plan (Kearney 2020). The Trump administration even publicly supported ongoing refinery operations at the site to support jobs and national security (Yerak 2020). The bankruptcy judge eventually approved sale for redevelopment to Hilco Redevelopment Partners for $240 to $252 million in February 2020.

The final bankruptcy plan deal included a $5 million severance fund for former refinery workers, a $29 million settlement with unsecured creditors, and PES's retention of rights to pursue insurance benefits. A few months later, the bankruptcy judge agreed to lower Hilco's purchase price by $26.5 million as a result of COVID-related economic uncertainty, increased environmental cleanup costs, and a bulkhead breach (Jaramillo 2020a). In November 2021, the claim for business-interruption insurance was settled, with $200 million going to the PES liquidation trust (US Bankruptcy Court of Delaware 2021). The property-insurance coverage claim was settled in January 2022 for an undisclosed amount (Greenwald 2022). Reports indicated that PES sought $250 million in property-damage claims (Yerak 2022). Funds recovered from the insurance claims were distributed to PES creditors (Gill and Pappas 2020).

Failure to Plan for the Inevitable

While the PES explosion could not be predicted, the 2018 *Beyond Bankruptcy* report did predict the failure of the refinery business. Unfortunately, nothing was done to plan for the inevitable. A 2013 multi-organizational, multi-stakeholder city planning and redevelopment Lower Schuylkill Master Plan was conceived for the Southwest Philadelphia area, but it failed to incorporate any discussion of potential alternative uses for the refinery site.[13] The city did not start engaging the public in envisioning potential future uses for the site until the second bankruptcy process was underway. By that time, public input was largely irrelevant. Similarly, the unions never prioritized public advocacy for worker transition assistance until the refinery shutdown materialized in bankruptcy court.

Mayor's Refinery Advisory Group

In the wake of PES's closure and second bankruptcy filing, Philadelphia Mayor Jim Kenney formed a Refinery Advisory Group (RAG) to advise city leaders and facilitate public meetings and input on the future of the refinery.[14] The group had five subcommittees: government, business, environmental/academic, community, and labor and employment; each hosted public meetings. The final report of the RAG process was issued on November 26, 2019

(Abernathy & Thiel, 2019). Written by the RAG co-chairs (the city's managing director and the chief of the fire department), the report captured perspectives on the benefits and drawbacks of the operating refinery, a recap of the June 2019 incident, the current state of the property, potential reuses of the site, and a set of guiding values for moving forward. While not critiquing the possibility of ongoing refinery operations at the site, the guiding values focused on protecting public safety, environmental quality, productive economic reuse, and direct community investment. The report also highlighted areas in which the city needed to improve if industrial operations were to continue at the site. These included reviewing air monitoring capabilities, increasing oversight of HF and other toxic chemicals, reviewing HazMat response capabilities, improving environmental impacts of the site, planning for climate resilience related to sea level rise, and landscape beautification.

Almost a year after the RAG report's release, in October 2020, Drexel University's Lindy Institute for Urban Innovation and the Clean Air Council released a multi-stakeholder report exploring a host of potential future uses for the PES refinery site (Clean Air Council 2020). This new report, funded in part by the William Penn Foundation, represented an incredible effort to bring diverse stakeholders together to imagine new uses for the refinery site, subject to real-word constraints. However, it was completed well after Hilco acquired the site. Given the clandestine nature of PES's speculative future, it is unclear if a funder would have materialized to support such an effort in advance of the refinery's closure.

Unfortunately, the RAG and Lindy Institute reports were issued far too late in the process to have been relevant to the refinery sale (e.g., passing ordinances or local laws). However, these documents could prove useful in guiding the refinery developer's future actions.

Chapter 8
Early Comparisons to California

The demise of PES was not widely anticipated, but the situation in the California refinery market presents both differences and similarities that should be considered.

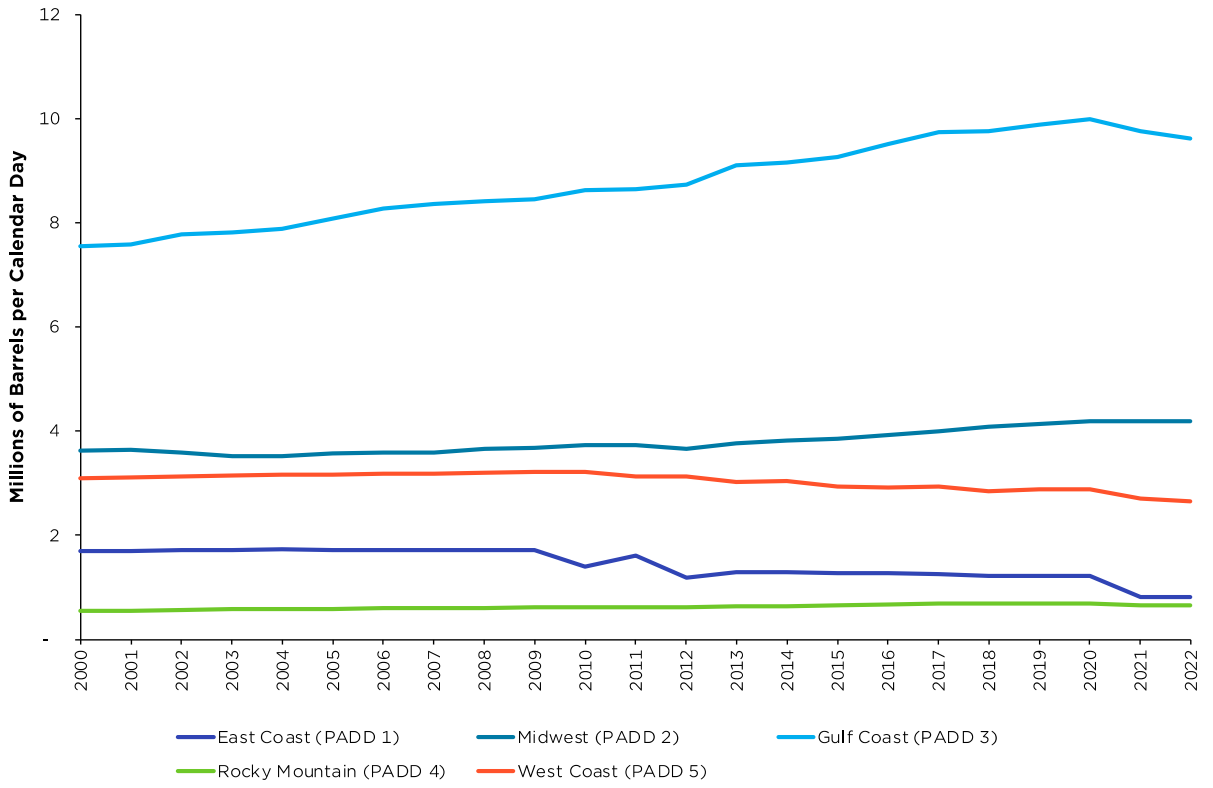
Similarities

East-West Coastal Contraction. Refinery capacity for the East Coast Petroleum Administration for Defense District (PADD 1) and West Coast (PADD 5) are contracting, while capacity in the Midwest/Gulf Coast (PADD 3) is expanding (Figure 3) (EIA n.d.a). This is largely the results of the PADD 3 economic access to cheap domestic and Canadian crudes, pipeline infrastructure investments, and history of considerable refinery assets along the Gulf Coast.

Political Strength of Unions. While there are many nuances and differences, unions are politically strong in Philadelphia and in some (but not all) refining communities in California. As an empirical example, the US average for all employed workers covered by a collective bargaining agreement (i.e., union-covered) in 2021 was 11.6 percent (Hirsch and MacPherson 2021a). For the Philadelphia-Camden-Wilmington metropolitan statistical area (MSA) in 2021, 15.4 percent of workers were union-covered (Hirsch and MacPherson 2021b). For the San Francisco-Oakland-Hayward MSA in 2021 (home to several San Francisco Bay Area refineries), 13 percent of workers were union-covered (Hirsh and MacPherson 2021b). While the Philadelphia and Bay Area refineries are not located in the highest quartile of union-covered MSAs, both are in areas with more union-covered workers than the US average. This greater representation could suggest that unions may have relatively greater political power in these areas compared with areas with lower percentages of union-covered workers.

Union Political Capital. PES refinery management had a clear strategy of seeking to wield the union's political capital to benefit the refinery. In this process, the refinery management was not forthcoming with union employees or their representatives about the economic challenges facing the facility. Rather, it appears that refinery management attempted to utilize the unions and the threat of job losses as a political tool to seek support (e.g., subsidies) from political leaders. Had refinery management been forthcoming with the unions, the unions might have used some of their political capital to secure transition assistance or other public support to help prepare workers for the plant's inevitable closure. This phenomenon—refinery management misrepresenting information about a facility's competitiveness—does not seem to be unique to the PES situation.

Figure 3. Refinery Annual Operable Atmospheric Crude Oil Distillation Capacity as of January 1



Refinery capacity for the East Coast and West Coast is contracting, while it is expanding for the Midwest and Gulf Coast.
SOURCE: EIA N.D.A.

Concerns with Hydrofluoric Acid. Like PES, California's Torrance refinery (PBF Energy) and Wilmington/Ultramar refinery (Valero) both used HF gas, a highly toxic, potentially lethal chemical, as an alkylation catalyst. In California, the South Coast Air Quality Management District (SCAQMD) acted as early as 1991 to attempt to reduce threats of HF gas (SCAQMD 2019). Currently, these California refineries use modified HF (MHF), but a series of leaks and explosions has prompted public calls to ban MHF too (SCAQMD 2019). Also, like PES, the Torrance and Wilmington refineries are in densely populated areas where an HF or MHF release could result in thousands of human exposures (Hutchings 2022). In 2019, the SCAQMD chose to abandon a long-standing effort to ban MHF (Barboza 2019), though there are still public calls to institute a ban (Hutchings 2022). Philadelphia banned the use of HF and MHF gas in petroleum processing on July 13, 2020, only after Hilco closed the deal to buy PES and transform the property into a logistics hub.[15]

Contamination. Almost all US refinery sites seem to be either RCRA Corrective Action (RCRA CA) or Superfund sites. This means there is site contamination, a regulatory docket of data, and, usually, a viable entity with financial liability for cleanup. This presents an opportunity to provide education about site contamination to benefit local communities, engage in remediation planning efforts to enhance cleanup stringency, and plan for highest and best future uses of the site.

Differences

Data Access and Regulatory Oversight. The regulatory oversight and public information available about the California refineries far surpass what was available about PES prior to the bankruptcies and explosion. For example, the California Energy Commission (CEC) makes a wide range of data available about state petroleum markets,[16] including required data submissions from qualifying petroleum industry companies.[17] In addition, California's various air quality districts incorporate refinery-specific rules,[18] disseminate public information on air quality including refinery flares and causes of flares,[19] and develop community health monitoring and protection programs.[20]

Policy Drivers. In California, demand destruction for refined petroleum products is occurring through multiple policy drivers, mostly under the statutory and regulatory authority to reduce greenhouse gases. This was not the case for PES. The challenges facing the refinery related directly to high feedstock costs, less complex technology, poor operating performance, and other factors, including a generally contracting Eastern refining market.

Technology and Feedstocks. California refineries are highly complex, built to produce high-quality, lower-emissions (i.e., meeting California Air Resources Board fuel specifications) products from cheaper heavy sour crudes. California refineries are not built to process light sweet crudes like those extracted from oil shale basins in Texas and North Dakota. PES was less complex than most California refineries and built to process more expensive light sweet crude. PES had temporary rail-based access to discounted domestic light sweet crude, but eventually it had to return to more costly marine imports.

Refinery Business Models. Most California refineries are part of large, publicly traded companies. Many of these companies have some degree of vertical integration on the petroleum extraction, logistics, or retail sales side of the industry. PES, a merchant refinery, had no affiliated business other than its minority parent, Sunoco Logistics.

Chapter 9
Lessons Learned

Five categories of broad-based observation from the PES experience are relevant when considering the future of petroleum refineries:

- **Refineries go down fighting.** Failing refineries employ aggressive legal strategies to cut costs.
- **Risks increase as finances dwindle.** Financially constrained refineries present higher risks.
- **Communications and technical capacities are critical.** Public education and analysis capacities are needed to strengthen transition (e.g., organizing, regulatory) efforts.
- **Planning and remediation capacities are valuable.** Distilling information about site contamination and advocating for stringent cleanup standards creates value for local communities.
- **Unions are important.** Unions play a vital role in local political and community dynamics.

Refineries Go Down Fighting

Failing refineries are likely to employ aggressive legal strategies to maintain their viability. Sunoco, Sunoco's subsequent owner Energy Transfer Partners, and PES all pursued aggressive legal strategies to support their goals. These strategies tended to be far more aggressive, expensive, forward-looking, and top-down than the legal strategies used by environmental organizations. With few exceptions, environmental advocates, community leaders, and other stakeholders were either unaware of these aggressive legal efforts or became aware of them only after the opposition had already laid significant groundwork.

HOLDING LAND HOSTAGE

As allowed by state law, site-specific cleanup standards justified through risk assessments based on human exposure were sought for most of the refinery property. These less-stringent, site-specific standards assume that human exposures will be limited to refinery workers at an operating refinery. In 2012, when Sunoco sold the site to PES, it filed a deed restriction on the refinery property that attempted to limit future uses of the site to refinery operations (Maykuth 2020). This deed restriction limited future uses of the site to energy or refinery activities, ensuring that Sunoco/Evergreen would not have to increase the stringency of its cleanup standards and therefore would control cleanup costs. Hilco and Sunoco/Evergreen are in the process of negotiating an amendment of the deed restriction to allow for broader development and uses (Pennsylvania DEP 2020).

RELIEF FROM FEDERAL COMPLIANCE

Through its bankruptcy process, PES successfully lobbied the federal government and secured over $350 million in relief from compliance costs associated with the federal RFS program.

BANKRUPTCY CLAIMS TO ESCAPE BACK TAXES

Initial bankruptcy plans attempted to absolve PES of back-tax claims from multiple federal, state, and local authorities. This prompted those parties to intervene in objection to related provisions of the 2018 reorganization plan.

SUING FOR SUBSIDIES

PES unsuccessfully sued the federal government, claiming it was owed over $550 million in tax refunds associated with alternative fuel tax credits for mixing butane with gasoline (*TaxNotes* 2022). In September 2022, PES asked a federal circuit court to reverse a lower court's decision to deny the $550 million in tax refunds.

INCREASING ALLOWABLE POLLUTION STANDARDS

In 2020, the Pennsylvania DEP proposed to increase its lead-in-soil statewide health-based standard for non-residential properties from 1,000 mg/kg to 2,500 mg/kg. While this effort cannot definitively be connected to Sunoco/Evergreen, the DEP based its justification for higher allowable lead levels using the same flawed blood lead level of 10 μg/dL that Sunoco/Evergreen used to justify its site-specific lead-in-soil level for the Philadelphia refinery (Ahlers 2021).

The DEP eventually abandoned the 2,500 mg/kg level after intense public backlash, and it has embarked on a new effort to review the existing 1,000 mg/kg lead-in-soil level for non-residential property. Increasing the statewide health-based standard would ensure that lead remediation costs would still be limited even if the Philadelphia refinery's site-specific standard were vacated.

Risks Increase as Finances Dwindle

Private equity investors may be able to extract value from struggling refineries even when public, integrated companies are unwilling to go forward. Just because there is a willing buyer for a refinery, it does not mean the refinery is a viable asset.

PRIVATE EQUITY INTEREST SIGNALS A MARGINAL ASSET

The sale of a refinery to a private equity investor should be a signal that the asset is economically marginal. A sub-class of private equity focuses on distressed or vulture funding (e.g., vulture capitalism). Here, acquisition targets are poorly performing or nearly bankrupt companies that may have the potential to be improved and sold for a profit or otherwise have intrinsic value that can be sold off for a profit (e.g., asset stripping). For refineries operating in a market with contracting demand, there may be fewer opportunities for management and operating changes to yield financial returns. More likely, the refinery assets can serve as collateral for debt, with proceeds to be used to distribute dividends or otherwise create profits for investors. Private equity investors benefit from lack of public disclosure, strategic methods

for return of investment (e.g., management and performance fees), and reduced regulatory oversight (e.g., by the SEC). Refinery assets acquired by private equity investors benefit from reduced pressure for quarterly earnings.

Pertinent to private equity ownership of an operating refinery, there do not seem to be checks and balances on the qualifications required to operate a refinery. For example, the 2012 version of PES included title by a previous owner, Sunoco (with significant refinery operations experience), and the Carlyle Group. Initially, the refinery was led by a CEO experienced in the refining business. However, as failure became imminent, PES was placed in the hands of a CEO with only private equity investment experience. After the 2018 bankruptcy was complete, an experienced CEO was put back in place. Then, after that bankruptcy, PES emerged owned primarily by creditors Deutsche Bank and Bardin Hill, with the Carlyle Group as a minority owner. Under bank leadership, it was reported that a $130 million maintenance turnaround project was dramatically cut back in January 2019 due to financial concerns (Renshaw 2019). This abandonment was remarkable because refineries typically take six to twelve months to prepare for a turnaround, yet the abandonment took place less than a week before the turnaround was scheduled to begin, in January 2019.

The turnaround was set to occur in the same area of the refinery where the subsequent June 2019 explosion occurred. It is impossible to say whether the thinning pipe that caused the June 2019 explosion would have been caught if the turnaround had been implemented. Regardless, the explosion raises strong questions about how private equity management balances the competing goals of safety and profitability as finances become constrained.

Large banks and large private equity firms (e.g., Deutsche Bank, Carlyle) have access to capital; however, these large institutions may avoid deploying capital resources toward failing assets. This is problematic in the capital-intensive refining industry, where significant and regular capital infusions are required to ensure plant safety and performance (e.g. turnarounds). There does not seem to be a regulatory regime in place to vet or monitor the financial health of potential (or current) refinery owners to ensure that they have access to capital and deploy that capital as dictated by best practice. Specifically, if a major turnaround is abruptly abandoned or dramatically cut back, regulatory notification and oversight could be required to ensure that financial concerns do not endanger public health and welfare.

UNDERFUNDING AGAINST CATASTROPHIC RISK

Documents from PES's failed IPO effort indicated the company had property, business interruption, and liability insurance, as well as $10 million in self-insurance (PES 2015). The documents also stated that the insurance did not cover all potential losses and liabilities. The filing stated the refinery conducted businesses that could result in personal injury, loss of life, damage and destruction to property and equipment, and pollution and environmental damage that might not be fully insured.

Lack of adequate insurance coverage is especially troublesome considering the 2019 explosion. Given PES's subsequent bankruptcy and lack of insurance to cover certain catastrophic losses, it is unlikely the firm could have compensated the city or community for non-refinery property damage or public-health harms associated with the explosion. There does not seem to be a regulatory requirement to provide financial assurances (e.g., insurance, bonding) for catastrophic risks for refineries, especially those operating in highly populated areas.

Communications and Technical Capacities are Critical

The Philadelphia area is home to many active environmental and community organizations, and the city, a Democratic stalwart, has a track record of practical environmental policies. Nonetheless, few local nonprofit organizations or city leaders expected and were prepared to deal with PES's failure. Few grant-dependent nonprofits were funded to track the refinery's economic health; hence, capacity-building to engage lagged. Meanwhile, city leadership was unwilling to deal with the political ramifications associated with publicly acknowledging the refinery's imminent demise. This resulted in suboptimal outcomes.

Such a situation could potentially be avoided in the future—for example, through more proactive land-use planning, establishing local ordinances that prohibit or encourage certain future activities, and other actions. In Philadelphia, the Clean Air Council[21] (specializing in nonprofit legal advocacy) and Philly Thrive[22] (a community organizing nonprofit) were the most active environmental groups working on refinery issues. They did an incredible job with little advance notice, insufficient financial resources, and minimal support from statewide or national advocacy groups. Comments here are not meant to criticize these organizations; rather, the intention is to highlight the need to better fund and prepare such organizations to respond to refinery closures, especially when such closure can be anticipated (e.g., in California).

MEGAPHONE ORGANIZATION

Advocacy organizations should maximize the collection and use of available data on refinery markets, operations, emissions, corporate financials, SEC filings, site-characterization reports, enforcement actions, news reports, and all other publicly available data sources. Keeping up to date with issues impacting refineries would enable performance monitoring, allowing early identification of issues and technical or legal analysis needs. This would also help identify instances of attempted regulatory leniency or capture. Funding to empower and maintain a trusted community nonprofit as the go-to organization on refinery issues would enable quicker mobilization to combat issues that arise.

Ideally, this leader organization should have access to complementary resources required to monitor the refinery, including community-level organizing and communications tools, legal compliance professionals, and petroleum refining economics analysts. For example, when Sunoco/Evergreen's omission of public participation was discovered, regulators, city officials, and some local environmental leaders were alerted. Eventually, local environmental leaders were invited to meet with city officials and regulators about the omission, but this was not until after a "deal" to rectify the omission had been largely negotiated with Sunoco/Evergreen. Had there been a community "megaphone" organization in place at the time to raise greater awareness of the omission, leverage would have increased. This would have made it much harder for regulatory officials to cement a deal behind closed doors, without community input. Had an organization like this been funded and in place all along, it would have been impossible for local leaders and regulators to lose track of the company's efforts to involve the public in RCRA CA remediation-planning activities.

TECHNICAL RESOURCES NEEDED FOR PUBLIC PARTICIPATION

Strong organizing capacity is needed to facilitate public participation in various regulatory opportunities. Moreover, maximizing the substantive impact of such participation may require significant technical resources as well. For example, political leaders and the media are compelled by personal stories about the real or perceived human harms caused by the refineries. However, emotions alone are far less compelling in a regulatory docket. Complementary legal arguments and technical analyses strengthen efforts to achieve community goals. While a refinery is operating, these resources include legal and technical expertise in Clean Air Act implementation, air quality monitoring and modeling, and petroleum refining and economics.

For remediation-related endeavors, expertise is required in such areas as hydrology, geology, chemistry, and the implementation of brownfield laws and regulations. For example, the relaunched public participation process required by Sunoco/Evergreen resulted in the release of hundreds of pages of data on contamination testing. Reviewing these data required hydrogeologic expertise, which required engaging an external consultant. Expensive consulting firms can supply such services, but many may be conflicted given the volume and breadth of work Sunoco/Evergreen required at the refinery.

Planning and Remediation Capacities are Valuable

Despite decades of data collection, the public was unaware of the extent of contamination at the Philly refinery, and the public did not participate in remediation planning. Meanwhile, city planners were unwilling to imagine a future for the land that did not include a refinery. As a result, Philadelphia was caught flat-footed, unable to exert as much influence as it might have with more forward-thinking planning. This reduced the city's power to negotiate better outcomes for the 1,300+ acres of city-center property.

TRACK REFINERY REMEDIATION EARLY

A quick review of the EPA website indicates that almost all refineries in the United States are RCRA CA sites, with some Superfund sites. This means significant pollution has been released, a regulatory docket is in place at the EPA or with the state containing the nature and extent of the contamination, and, for RCRA CA sites, someone is on the hook to pay for cleanup. This also means that public participation opportunities have been or will be associated with the characterization, cleanup planning, and remediation of the sites. The nature and extent of contamination at these sites, as well as the regulatory milestones and processes underway, should be reviewed, summarized, and publicized. This would facilitate public education and participation and enable an upfront understanding of the obstacles to achieving unrestricted future-use status for the site.

Greater organizing and education on refinery condition and remediation options could help apply pressure for more stringent cleanup standards paid for by the polluter. They could also avoid standards that restrict certain future activities at the site (i.e., restricted use with land covenants). This could be achieved through a review of online materials, legal requests for access to files, and by conducting in-person file reviews. Refineries that are at risk for closure and refineries located in highly populated areas should be prioritized.

PROACTIVE PLANNING FOR HIGHEST AND BEST UNRESTRICTED USES OF POST-REFINING LANDS

Planning for the post-refining future of operating refinery lands is vital to capturing the imagination of local leaders and potential investors. In Philadelphia, collaborative, multi-stakeholder city planning efforts failed to entertain the potential for non-refinery future uses for the PES site, even after Sunoco offloaded its asset to private equity investors. After PES's first bankruptcy, and despite multiple warning signs of imminent failure, city leaders did nothing to plan for a post-refining future. The work of the mayor's refinery advisory group and the Lindy Institute at Drexel University came far too late to impact the outcome of the bankruptcy proceedings and sale to Hilco. As a result, the bankruptcy auction determined the fate of the 1,300+ acre refinery property in downtown center city. However, the planning efforts may be informative to Hilco's redevelopment process.

Inaction by city leaders on long-term planning around the refinery property was likely due to both a lack of vision and a desire to avoid upsetting unions. Instead, planning should occur far before the emergence of signs of refinery financial instability. Specifically, studies could be conducted to identify the highest and best potential unrestricted uses for a site—from the standpoint of net public benefits and/or private benefits—that would maximize outcomes related to economic development, job creation, community beautification, and environmental protection, among other areas.

Unions Are Important

Refineries often depend on union workers for refinery operations and maintenance, and those workers depend on the refineries for their livelihoods. This co-dependency does not mean refinery management will always prioritize the best interests of workers or that workers will always represent the best interests of refinery management.

POLITICAL CAPITAL

Refinery management may attempt to exploit the political capital of unions to the financial benefit of the refinery. For example, management may reassure union members of a vibrant future ahead for the refinery when the reality is not so bright. In many circumstances, union and refinery interests will be aligned, yet unions recognize that refineries may not always be on their side—for example, when refinery management pushes back against stricter worker safety regulations to save money. There is an opportunity to provide credible, accurate information about the refinery's technical and economic health and to fact-check refinery management claims when applicable. However, unions must perceive the source of this information as credible.

LACK OF CREDIBILITY

In Philadelphia, unions did not see environmental or community groups as allies, likely because these organizations were promoting the cessation of refinery operations. There was inherent skepticism from the unions about environmental groups' concern over union interests. For example, unions perceived calls by environmental and community organization for "a just transition" as calls to "just transition already" rather than as meaningful attempts to engage with the concerns and needs of refinery workers.

SUPPORT TRANSITION ASSISTANCE FOR REFINERY UNION WORKERS

Groups interested in refinery closures should prioritize advocating for transition assistance for refinery workers in the instance of a refinery closure. Importantly, such groups should work with unions to develop specific recommendations for assistance (rather than make nebulous calls for "a just transition"), using-well recognized union nomenclature. Attempts by community or environmental groups to develop specific recommendations for worker assistance without guidance and leadership from refinery workers may only worsen relationships with unions. And in the absence of clear data pointing toward a potential refinery closure, unions may not receive well any attempt to develop worker transition strategies.

After the PES explosion and fire, refinery management gave out $4.5 million in executive bonuses before filing for bankruptcy (Jaramillo 2019). At the same time, PES laid off union workers with no severance pay or medical benefits and even froze pension funds (Jaramillo 2019). In June 2019, a class-action lawsuit against PES was filed on behalf of union workers, claiming the refinery did not give the required 60 days advance notice of job termination (Rizzi 2019). As part of the bankruptcy settlement process, a $5 million severance fund was established for former refinery workers; it included about 1,000 workers, about 600 of whom were represented by the United Steelworkers (Jaramillo 2020b). It is important to understand whether this severance fund was adequate and, if not, what more was needed and how former PES workers fared after the facility closed.

EMPLOYMENT REDISTRIBUTION

Refinery closure and the remediation of land for higher and better uses may result in a redistribution or decrease in union employment, depending on the new uses of the redeveloped site and the success of labor unions in securing agreements for union construction and operation of the new facility. The loss of union jobs or redistribution of union employment may make it difficult for local leaders to take positions on these issues.

Chapter 10
Conclusion

The victories and missteps associated with the PES refinery closure offer many learning opportunities. A major environmental victory was achieved when more than 150 years of refining operations ceased. All residents of the city now benefit from less air pollution, even if the impact of on-site pollution cleanup to neighboring communities will be revealed only after remediation plans are finalized and implemented. Many people lost high-quality jobs, but many more jobs could be created at some time in the future. To achieve the optimal outcome, significant work by community, environmental, and labor advocates will be required to ensure that site redevelopment meets the community's needs and vision and results in meaningful benefits for the community.

Therein lies the greatest missed opportunity. The failure to anticipate, build capacity, and plan for the refinery's closure put Philadelphians in a passive position, forced to take whatever the bankruptcy court's auction gave them. Now, Philadelphia stakeholders must work on making the best of what they were handed. Far more could have been achieved to secure the highest and best use for the site.

Yet what transpired in Philadelphia could have been far worse had the explosion resulted in greater damage to public health. Perhaps that is the most critical lesson. If a well-established refinery operator sells off a refinery asset to a less-experienced investor, the degree of attention and oversight must increase.

Christina E. Simeone wrote this report as an independent consultant to the Clean Transportation Program at the Union of Concerned Scientists.

Acknowledgments

This report was made possible by the generous support of Breakthrough Energy, LLC, the David and Lucile Packard Foundation, and members of the Union of Concerned Scientists.

The author would like to thank Jeremy Martin (Union of Concerned Scientists), Matt Walker (Clean Air Council), and Peter Winslow (SMART Collaborative, Philly Thrive) for their comments on a draft of this report.

Endnotes

[1] For more information on refinery technology and crude oil feedstock quality, see the chapter "Unconventional Oil and the Shift in Refinery Economics."

[2] "Stream day capacity" is a measure of a refinery's designed processing capacity. "Calendar day capacity" incorporates operational factors that can lower effective capacity.

[3] Only some of these are detailed here.

[4] The 2012 COA can be found at https://phillyrefinerycleanup.info/wp-content/uploads/2019/05/2012-Buyer-Seller-Agreement.pdf.

[5] More information about the Prospective Purchaser Agreement with PES can be found at https://www.epa.gov/sites/default/files/documents/sunoco-ppa.pdf.

[6] See *Sinclair Wyoming Refining v. EPA*, No. 16-9532 (10th Cir. 2017) at https://law.justia.com/cases/federal/appellate-courts/ca10/16-9532/16-9532-2017-08-15.html.

[7] RINs are credits used for compliance. They are the "currency" of the RFS program.

[8] In 1995, Pennsylvania established a series of laws (Acts 2, 3, and 4 of 1995) aimed at encouraging the voluntary cleanup and reuse of contaminated sites. Collectively, these programs are often referred to as "Act 2" or the Land Recycling Program.

[9] The 2003 Consent Order and Agreement can be found at https://phillyrefinerycleanup.info/wp-content/uploads/2019/05/2003-Consent-Order-Agreement.pdf.

[10] In 2004, the Pennsylvania DEP and the US EPA signed a memorandum of understanding identifying procedures by which remediation under the Land Recycling Program may also satisfy federal requirements under RCRA, CERCLA, and the Toxic Substances Control Act.

This MOU established the One Cleanup Program that created a "one-stop shop" for remediators to follow when attempting to meet state and federal standards for remediation and liability relief.

[11] Located at https://phillyrefinerycleanup.info.

[12] See 40 CFR part 63 subpart CC.

[13] The Lower Schuylkill Master Plan is available on the Philadelphia Industrial Development Corporation's website at https://www.pidcphila.com/images/uploads/resource_library/LSMP_Small.pdf.

[14] Information on the Philadelphia Refinery Advisory Group, including videos of public meetings, can be found at https://www.phila.gov/programs/refinery-advisory-group/.

[15] For information on Philadelphia's HF/MHF gas ban in bill No. 200147, see https://phila.legistar.com/LegislationDetail.aspx?ID=4332741&GUID=C85E2A9B-B6A4-4A46-AFD5-060A7C3F06C2&Options=ID|Text|&Search=HYDROFLUORIC.

[16] See CEC's California Petroleum Market webpages at https://www.energy.ca.gov/data-reports/energy-almanac/californias-petroleum-market.

[17] See CEC's Petroleum Industry Information Reporting Act (PIIRA) forms and requirements on CEC's website at https://www.energy.ca.gov/rules-and-regulations/energy-suppliers-reporting/petroleum-industry-information-reporting-act-piira.

[18] See, for example, the Bay Area Air Quality Management District's (BAAQMD)Refinery Rules pages at https://www.baaqmd.gov/rules-and-compliance/rule-development/refinery-rules-definitions.

[19] See, for example, BAAQMD's refinery flare data and causal reports at https://www.baaqmd.gov/about-air-quality/research-and-data/flare-data and https://www.baaqmd.gov/about-air-quality/research-and-data/flare-data/flare-causal-reports.

[20] See, for example, BAAQMD's Richmond Area Community Health Protection Program at https://www.baaqmd.gov/community-health/community-health-protection-program/richmond-area-community-health-protection-program.

[21] See https://cleanair.org/.

[22] See https://www.phillythrive.org/.

References

Abernathy, Brian, and Adam Thiel. 2019. *A Close Call and an Uncertain Future: An Assessment of the Past, Present, and Next Steps for Philadelphia's Largest Refinery.* Philadelphia: City of Philadelphia. https://www.phila.gov/media/20191202091559/refineryreport12219.pdf

Ahlers, Christopher. 2021. "Testimony on Philadelphia Energy Solutions Refinery Site and Clean-Up Effort." November 17, 2021. https://environmental.pasenategop.com/wp-content/uploads/sites/34/2021/11/2021-11-16-Ahlers-written-statement-to-PA-Senate-ERE-Committee.pdf

Barboza, Tony. 2019. "Air Board Kills Regulation of Dangerous Refinery Acid in Favor of Oil Industry Plan." *Los Angeles Times,* September 6, 2019. https://www.latimes.com/environment/story/2019-09-06/oil-refinery-acid-pollution-regulation

Clean Air Council (Clean Air Council and Lindy Institute for Urban Innovation at Drexel University). 2020. *Visioning the Reuse of the Philadelphia Energy Solutions Refinery Complex.* Philadelphia. https://drexel.edu/~/media/Files/lindyinstitute/_LindyReports/PESVisioningDoc.ashx?la=en

Coppess, Jonathan, and Scott Irwin. 2018. "EPA 2019 RFS Proposed Rulemaking: What You See Is Not What You Get." University of Illinois, Department of Agricultural and Consumer Economics. *farmdoc daily* (8): 128. https://farmdocdaily.illinois.edu/2018/07/epa-2019-rfs-proposed-rulemaking-what-you-see-is-not-what-you-get.html

CSB (US Chemical Safety and Hazard Investigation Board). 2019. *Fire and Explosions at Philadelphia Energy Solutions Refinery Hydrofluoric Acid Alkylation Unit.* Washington, DC. https://www.csb.gov/assets/1/20/pes_factual_update_-_final.pdf?16512

CSB (US Chemical Safety and Hazard Investigation Board). 2022. *Investigation Report: Fire and Explosion at Philadelphia Energy Solutions Refinery Hydroflouric Acid Alkylation Unit.* Washington, DC. https://www.csb.gov/file.aspx?DocumentId=6195

DeCarlo, Peter. 2019. "Written Remarks of Peter DeCarlo Regarding the Assessment of Air Quality Monitoring during PES Fire." Accessed February 5, 2023. https://environmental.pasenategop.com/wp-content/uploads/sites/34/2019/07/decarlo.pdf

DiChristopher, Tom, and Everett Rosenfeld. 2017. "Carl Icahn Resigned from Trump advisor Role Ahead of Article Alleging Conflict of Interest." *CNBC.com,* August 20, 2017. Accessed July 22, 2022. https://www.cnbc.com/2017/08/20/carl-icahn-resigned-from-trump-advisor-role-ahead-of-article-alleging-conflict-of-interest.html

Doerr, Tiffany. 2020. "Please Explain the Formal, Legal, and/or Organization Ties That Evergreen Has to Sunoco and/or Energy Transfer." Philadelphia Refinery Legacy Remediation. https://phillyrefinerycleanup.info/questions/please-explain-the-formal-legal-and-or-organization-ties-that-evergreen-has-to-sunoco-and-or-energy-transfer

EIA (US Energy Information Administration). n.d.a. "Atmospheric Crude Oil Distillation Operable Capacity." Accessed June 21, 2022. http://www.eia.gov/dnav/pet/pet_pnp_cap1_a_(na)_8d0_bpsd_a.htm

———. n.d.b. "Spot Crude Oil Prices (Weekly)." February 28, 2018. https://www.eia.gov/dnav/pet/pet_pri_spt_s1_w.htm

Environmental Integrity Project. 2020. *Monitoring for Benzene at Refinery Fencelines.* Washington, DC. https://environmentalintegrity.org/wp-content/uploads/2020/02/Benzene-Report-2.6.20.pdf

Fair Disclosure Wire. 2012. "Sunoco and the Carlyle Group Conference Call to Discuss Resolution Regarding Sunoco Philadelphia Refinery—Final." Accessed March 1, 2018. http://link.galegroup.com/apps/doc/A296561957/ITOF?u=upenn_main&sid=ITOF&xid=f079b7b9

Gilbert, Daniel. 2011. "Sunoco to Quit Oil Refining Business." *Wall Street Journal,* September 7, 2011.

https://www.wsj.com/articles/SB10001424053111904537404576554291631658986
Gill, Daniel, and Leslie A. Pappas. 2020. "Court Settles Rights to PES' $1.25 Billion Insurance Claim." *Bloomberg Law,* March 2, 2020. https://news.bloomberglaw.com/bankruptcy-law/court-settles-rights-to-pes-1-25-billion-insurance-claim
GlobalData Deal Analysis. 2012. *Sunoco Plans to Sell Refineries in Pennsylvania due to Dependence on Costly Feed Inputs and Falling Market Demand.* London: Global Data Ltd. https://search.proquest.com/docview/1112691596?pq-origsite=summon
Greenwald, Judy. 2022. "Insurers Reach Settlement in PES Refinery Fire." *Business Insurance,* January 28, 2022. https://www.businessinsurance.com/article/20220128/STORY/912347555?template=printart
Harris, Robert. 2018. "Exhibit A: Declaration of Robert L. Harris, CPA," March 30, 2018. In *United States' Motion and Memorandum of Law in Support of Motion to Approve Proposed Consent Decree and Environmental Settlement Agreement.* https://casedocs.omniagentsolutions.com/cmsvol2/pub_47219/664273_347-1.pdf
Heath, Thomas. 2012. "Carlyle Group Invests in Philadelphia Refinery." *Washington Post,* July 2, 2012. https://www.washingtonpost.com/business/economy/carlyle-group-invests-in-philadelphia-refinery/2012/07/02/gJQAVBURIW_story.html?utm_term=.2e79ad18405e
Hein, Carola. 2016. "Refineries (Oil)." In *The Encyclopedia of Greater Philadelphia.* Accessed February 13, 2018. http://philadelphiaencyclopedia.org/archive/refineries-oil/
Hiar, Corbin. 2019. "EPA Leaders Helped Bail Out Failed Philadelphia Refinery." *Greenwire,* June 27, 2019. https://www.eenews.net/articles/epa-leaders-helped-bail-out-failed-philadelphia-refinery/
Hirsch, Barry T., and David A. MacPherson. 2021a. "Historical Tables: All Wages and Salary: Union Membership, Coverage, Density and Employment, 2021." UnionStats.com. Accessed September 27, 2022. https://unionstats.com/All-Wage-and-Salary-Workers.htm
———. 2021b. "Metropolitan Area: Union Membership, Coverage, Density, and Employment by Metropolitan Area and Sector, 2021." UnionStats.com. Accessed September 27, 2022. https://unionstats.com/Met_121.xlsx
Hutchings, Kristy. 2022. "Local Battle over Toxic Chemical at Torrance, Wilmington Refineries Continues." *Daily Breeze,* March 7, 2022. https://www.dailybreeze.com/2022/03/07/local-battle-over-toxic-chemical-at-torrance-wilmington-refineries-continues/
IMAAC Technical Operations Hub. 2019. "Potential Off-Site Hazard from Hydrogen Fluoride Releases from PES Facility, 21 Jun 2019." https://www.phila.gov/media/20191204161425/IMAAC-PES-Facility-modeling.pdf
Jaramillo, Catalina. 2019. "Bonuses Paid to PES Refinery Executives Infuriate Ex-Workers and Environmentalists." *WHYY.org,* September 10, 2019. https://whyy.org/articles/bonuses-paid-to-pes-refinery-executives-infuriate-ex-workers-and-environmentalists/
Jaramillo, Catalina. 2020a. "Bankruptcy Judge Clears Away Final Hurdle in PES Refinery Sale." *WHYY,* June 25, 2020. https://whyy.org/articles/bankruptcy-judge-clears-away-final-hurdle-in-pes-refinery-sale/
———. 2020b. "Bankruptcy Judge Approves Philadelphia Energy Solutions' Sale to a Developer That Has No Plans to Re-Start a Refinery." *StateImpact Pennsylvania,* February 13, 2020. https://stateimpact.npr.org/pennsylvania/2020/02/13/bankruptcy-judge-approves-pes-refinerys-sale-to-hilco-redevelopment-partners/
Kearney, Laila. 2020. "Sale of Philadelphia Refinery Nears, Foes Vow Long Legal Fight." *Reuters,* February 11, 2020. https://www.reuters.com/article/us-pes-bankruptcy-sale-objections/sale-of-philadelphia-refinery-nears-foes-vow-long-legal-fight-idUSKBN2052E9
Kearney, Laila, and Jarrett Renshaw. 2019. "Philadelphia Energy Solutions Files for Bankruptcy After Refinery Fire." *Reuters,* July 22, 2019: https://www.reuters.com/article/us-pes-bankruptcy/philadelphia-energy-solutions-files-for-bankruptcy-after-refinery-fire-idUSKCN1UH0O9
Kirkland and Ellis LLP. 2018. *Disclosure Statement for the Joint Prepackaged Chapter 11 Plan of Reorganization of PES Holdings, LLC and its Debtor Affilitates.* January 22, 2018. http://www.omnimgt.com/cmsvol2/pub_47219/654434_10.pdf
Lucey, Catherine. 2012. "City Moves Forward with Possible PGW Sale." *Philadelphia Inquirer,* March 20, 2012. http://www.philly.com/philly/blogs/clout/City-moves-forward-with-possible-PGW-sale.html

Marsh JLT Specialty. 2020. *100 Largest Losses in the Hydrocarbon Industry, 1974–2019.* https://www.marsh.com/content/dam/marsh/Documents/PDF/UK-en/100-largest-losses-in-hydrocarbon-history.pdf

Maykuth, Andrew. 2019. "Did Deadly Gas Cloud Escape During Philly Refinery Fire? City Said It Was a Faulty Meter." *Philadelphia Inquirer,* July 24, 2019. https://www.marsh.com/content/dam/marsh/Documents/PDF/UK-en/100-largest-losses-in-hydrocarbon-history.pdf

Maykuth, Andrew. 2020. "Newly Revealed Restrictions Challenge Redevelopment of Bankrupt Philly Refinery's Land." *Philadelphia Inquirer,* January 20, 2020. https://www.inquirer.com/business/pes-philadelphia-refinery-bankruptcy-auction-deed-restriction-20200130.html

NBC News. 2019. "Billions in Debt, Philadelphia Refinery Avoided Clean Air Compliance Through Bankruptcy, Court Records Show." *NBC 10 News Philadelphia*, June 24, 2019. https://www.nbcphiladelphia.com/news/local/refinery-fire-investigation-cc_philadelphia/171473/

Norman, James. 2004. "From Four Aging Refineries Around Philadelphia, Sunoco Crafting Modern Giant." *Platts Oilgram News,* 82.

OSHA (Occupational Safety and Health Administration). 2019. *Citation and Notice of Penalty, Inspection Number 1411622.* Philadelphia: US Department of Labor. https://www.osha.gov/sites/default/files/citations/Philadelphia_Energy_Solutions_1411622_1219_19.pdf

OGJ (Oil and Gas Journal) Editors. 2009. "Sunoco Idles Eagle Point Refinery in New Jersey." Accessed March 12, 2018. https://www.ogj.com/articles/2009/10/sunoco-idles-eagle.html

Pennsylvania DEP (Department of Environmental Proection). 2020. "First Amendment to Consent Order and Agreement. Commonwealth of Pennsylvania, Department of Environmental Protection. https://phillyrefinerycleanup.info/wp-content/uploads/2020/07/First-Amendment-to-Consent-Order-and-Agreement.pdf

PES (Philadelphia Energy Solutions, Inc.). 2015. *Form S-1 Registration Statement Under the Securities Act of 1933.* https://www.sec.gov/Archives/edgar/data/1632808/000104746915000839/a2223083zs-1.htm

PES (Philadelphia Energy Solutions, Inc.). 2018. "History of the Refining Complex." Accessed February 2018. http://pes-companies.com/refining-complex/

PES Logistics Partners, L.P. 2014. *S-1 Registration Statement Under the Securities Act of 1933 for PES Logistics Partners, L.P.* Accessed February 7, 2023. https://www.sec.gov/Archives/edgar/data/1611673/000104746914007775/a2221503zs-1.htm

Powelson, Robert F. 2015. "Testimony of Chairman Robert F. Powelson of the Pennsylvania Public Utility Commission before the Pennsylvania Senate Appropriations Committee." https://www.puc.pa.gov/general/pdf/testimony/Powelson-Senate_Budget_032315.pdf

Quivik, Fredric L. 2015. "Abundance, Dependence and Trauma and Philadelphia's Point Breeze Petroleum Refinery: A Mirror on the History of Pennsylvania's Oil Industry." *Pennsylvania Magazine of History and Biography* 139 (3), 265–292. http://doi.org/10.5215/pennmaghistbio.139.3.0265

Renshaw, Jarrett. 2018. "Refiner Goes Belly-Up After Big Payouts to Carlyle Group." *Reuters,* February 20, 2018. https://www.reuters.com/article/us-usa-biofuels-pes-bankruptcy-insight/refiner-goes-belly-up-after-big-payouts-to-carlyle-group-idUSKCN1G40I1

Renshaw, Jarrett. 2019. "Before Fire, Philadelphia Refinery Scaled Back Big Maintenance Project: Sources." *Reuters*, June 26, 2019. https://www.reuters.com/article/us-refinery-blast-philadelphia-maintenan/before-fire-philadelphia-refinery-scaled-back-big-maintenance-project-sources-idUSKCN1TR2NP?utm_source=pocket_mylist

Rizzi, Corrado. 2019. "Philadelphia Energy Solutions Hit with WARN Act Class Action Over July 1 Mass Layoff." *Newswire,* July 1, 2019. https://www.classaction.org/news/philadelphia-energy-solutions-hit-with-warn-act-class-action-over-july-1-mass-layoff

Shapiro, Josh. 2018. *Objection of Commonwealth of Pennsylvania, Department of Revenue to Debtors' Joint Prepackaged Plan of Reorganization.* US Bankruptcy Court for the District of Delaware.

Simeone, Christina. 2018. *Beyond Bankruptcy: The Outlook for Philadelphia's Neighborhood Refinery.* Philadelphia: Kleinman Center for Energy Policy. https://kleinmanenergy.upenn.edu/wp-content/uploads/2018/09/KC-013-Beyond-Bankruptcy-Update-singles.pdf

SCAQMD (South Coast Air Quality Management District). 2019. "Status Update on PR 1410—Hydrogen Fluoride Storage and Use at Petroleum Refineries." Governing Board Meeting Presentation, February 1, 2019. http://www.aqmd.gov/docs/default-source/Agendas/Governing-Board/2019/2019-feb1-025.pdf

StateImpact. 2012. "Clean Air Council and DEP Spar Over Emissions Aggregation." *StateImpact Pennsylvania,* October 3, 2012. https://stateimpact.npr.org/pennsylvania/2012/10/03/clean-air-council-and-dep-spar-over-emissions-aggregation/

Street Insider. 2015. "Philadelphia Energy Solutions (PESC) Postpones IPO." *Street Insider,* August 7, 2015. https://www.streetinsider.com/Corporate+News/Philadelphia+Energy+Solutions+(PESC)+Postpones+IPO/10792458.html

TaxNotes. 2022. "Energy Company Denied Tax Credits for Gasoline-Butane Mixture." March 25, 2022. https://www.taxnotes.com/research/federal/court-documents/court-opinions-and-orders/energy-company-denied-tax-credits-for-gasoline-butane-mixture/7db2t?h=*

US Bankruptcy Court of Delaware. 2021. *PES Liquidating Trust's Motion for Entry of an Order (I) Approving the Business Interruption Settlement by and among the Debtors, ICBC Standard Bank Plc, and Certain Insurers and (II) Granting Related Relief.* https://casedocs.omniagentsolutions.com/cmsvol2/pub_47347/8105c631-5b5b-47b1-a4e1-8c768a22bc18_1781.pdf

Wolfe, Jeff. 2011. "Sunoco to Sell or Close Refineries." *Delaware County Daily Times,* September 9, 2011. Accessed February 13, 2018. http://www.delcotimes.com/general-news/20110907/sunoco-to-sell-or-close-refineries

Wood, Jeffrey H., Alan S. Tenenbaum, Robert Darnell, Susan Parker Bodine, and Thomas Scargle. 2018. "Consent Decree and Environmental Settlement Agreement Ch. 11 Case No. 18-10122." March 12, 2018. US Bankruptcy Court for the District of Delaware. https://www.justice.gov/enrd/consent-decree/file/1043081

Yerak, Becky. 2020. "Trump Administration Wants Philadelphia Energy Site to Remain a Refinery." *Wall Street Journal Pro,* January 29, 2020. https://www.wsj.com/articles/trump-administration-wants-philadelphia-energy-site-to-remain-a-refinery-11580340196

Yerak, Becky. 2022. "Philadelphia Energy Trial Starts with Property Damage Claims in Bankruptcy." *Wall Street Journal Pro,* January 24, 2022. https://www.wsj.com/articles/philadelphia-energy-trial-starts-with-property-damage-claims-in-bankruptcy-11643071785

Union of Concerned Scientists

FIND THIS DOCUMENT ONLINE:
www.ucsusa.org/resources/philadelphia-refinery-closure

The Union of Concerned Scientists puts rigorous, independent science to work to solve our planet's most pressing problems. Joining with people across the country, we combine technical analysis and effective advocacy to create innovative, practical solutions for a healthy, safe, and sustainable future.

www.ucsusa.org