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Introduction

OPPORTUNITIES

hat if \$50 billion didn't represent a potential headquarters investment from a worlddominating online retailer, but instead stood for an entire ecosystem of companies, talent and resources that ... oh yeah ... might increase US energy independence?

The latter scenario is now unfolding in the tristate area of Ohio, Pennsylvania and West Virginia thanks to oil & gas-driven industrial activity in the Marcellus and Utica shale formations. "With nearly half of the \$170 billion of announced investment since 2010 completed or under development," said the American Chemistry Council in April 2017, "shale gas and increasing supplies of natural gas liquids (in particular, ethane) have secured a competitive advantage for U.S. chemical and resins producers."

The Tri-State Shale Coalition — initiated by the three states' governors in 2015 — is doing its part to get out the message in order to next get out the products. The Pittsburgh Regional Alliance and Benedum Foundation (Pennsylvania/West Virginia), Team Neo (Ohio), and Vision Shared (West Virginia) are leading the way with cooperation from the three states in such areas as marketing, permitting, infrastructure, workforce and research. All agree that opportunity long ago stopped knocking and has simply walked through the door. "The Marcellus-Utica basin is the third largest in the world behind Russia and Qatar," says Denise Brinley, senior energy advisor at the Pennsylvania Department of Community and Economic Development. "Our production is prolific — and will likely exceed that of Texas at some point in the near future."

The evidence is seen in the forming of industrial clusters atop the geologic formations underneath, and the follow-on formation of community prosperity that one expert calls the "roads and roofs" effect.

From mega-projects like ethane crackers to machine shops, testing labs and fabricators, the shale revolution, even with a dip in prices, is still upon us. In geology, stacked opportunities are defined as "multiple subsurface geologic formations or intervals that occur at different depths within a given geographic footprint," offering flexibility and potential economies of scale for site prep, well drilling, storage and logistics.

For companies, evaluating US energy plays, the tri-state stands out as a mountain range of stacked economic development and business opportunities. Read this Intelligence Report and find out how best to explore them.

A Ou for

Adam Bruns, Managing Editor, Site Selection

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Testimonial



One industrial real estate professional's experience of an energy revolution as it happened.

by BRYCE CUSTER editor@siteselection.com

il and natural gas is part of the history of Ohio, Pennsylvania and West Virginia. In West Virginia, gas was first struck while drilling for salt in Charleston in 1826. Pennsylvania lays claim to the first oil rush in Titusville in 1859. One of the country's largest oil fields was discovered in 1884 in northwest Ohio.

With the advent of technology that allows for recovery of natural gas, natural gas liquids and oil (horizontal drilling and fracking shale) the Point Pleasant, Utica/Marcellus Shale formations have created a new oil & gas boom in the tri-state area.

At NAI Spring Commercial Realty, I was called on to locate offices for a consulting and

engineering client that I had worked with in a previous career. The client explained the enormity of sampling wells for drinking water analysis and said that something big was about to happen in the area. It was at that time the focus on oil & gas began.

To learn more about the oil & gas opportunity, I invited myself to the State of Ohio's Governors Conference in Columbus. It was 2012 and the late Aubrey McClendon, at the time with Chesapeake Energy, made the bold statement that shale gas would be "the biggest thing to hit the state of Ohio economically since maybe the plow."

At the same time, I was working with a client who was scouting sites for a potential natural



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gas-fired power generation facility in either Carroll or Columbiana County, Ohio. A site was selected on the outskirts of Carrollton. A \$900-million, 700-megawatt electrical generation facility from Carroll County Energy was to become a reality for Carroll County. This facility resulted in 500 construction jobs and, most importantly, a new high school for Carrollton.

As land leases were being executed and drilling was beginning, the epicenter of

Between June 2012 and the end of 2016, the American Chemistry Council tracked 560 US plastics processor facility investments, noting the competitive advantage from shale gas development.

> Chesapeake Energy drilling activity was in Carroll County, population 27,669. Canton, Ohio, in Stark County trademarked the phrase "Canton: The Utica Capital." Stark County continues to be the home of Chesapeake Energy and many other E&P, midstream and downstream organizations. At NAI Spring, we had the opportunity to work with countless companies supporting the oil & gas industry.

Many new pipelines continue to be built while other pipelines are reversing flow from being importers of natural gas and natural gas liquids to being exporters of product to the Gulf Coast and East Coast.

Impact on Villages, Cities and Counties

Carroll County Energy's investment is by far the largest investment that this community has ever seen. A similar story is repeated in cities and towns throughout the tri-state area.

Canonsburg, Pennsylvania, is a direct beneficiary of oil & gas companies locating to the Marcellus Shale area. Canonsburg is home to Southpointe, a 589-acre suburban business park along I-79 that is home to numerous oil & gas companies, including CONSOL Energy. We are working with many companies in the Northern Panhandle of West Virginia. With the Shell petrochemical cracker in Monaca, Pennsylvania, this area of the Ohio River Corridor is seeing an extreme amount of activity both nationally and globally.

We are currently working with companies from Germany, Israel and other Middle East countries that require an abundant supply of low-cost natural gas or natural gas liquids. I have had the opportunity to take many out-of-country and out-of-state guests on tours of the area.

Starting on Interstate 379, the Shell Chemical facility is being constructed on the former Horsehead zinc smelter site in Beaver County, Pennsylvania, on the banks of the Ohio River. Traveling south along the river, there are multiple brownfield sites and facilities that could potentially house companies to support the Shell facility. We are also anticipating the possibility of plastics and derivative companies locating along the river.

In East Liverpool, Columbiana County, Ohio we are working with the Columbiana County Port Authority on the redevelopment of industrial facilities in and around the Ohio River. We have large industrial facilities that could be revived and used for the new industries locating in the area. The World Trade Park in Leetonia, Ohio, is a 126-acre greenfield designated foreign trade zone industrial park that will see industry expanding or locating to the area.

Weirton, West Virginia, across the river from Steubenville, Ohio, is now the eastern US location for Bidell Gas Compression, a subsidiary of Canadian based total Energy Services, Inc. Bidell has leased the former ArcelorMittal central machine shop for their operations. Pietro Fiorentini, an Italian manufacturer of pressure regulators and valves will be building on a 26-acre parcel in the Weirton Three Springs Business Park.

We are beginning to see the landscape of the Ohio River Corridor change. Many people I speak with say that oil & gas has come and gone. But drilling gas wells in the Utica/Marcellus region was just the beginning. The real opportunity for the Ohio River Corridor is yet to come.



Bryce Custer, SIOR, CCIM, leads commercial and industrial real estate firm NAI Spring Commercial Realty in Canton, Ohio, and in 2016 founded Ohio River Corridor Inc. to focus on energy and petrochemical property and investment opportunities throughout the tri-state region. A former environmental chemist, he has been active in industrial real estate investment and advising for more than 20 years.

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Manufacturing



Shell's launch of construction on a cracker in Pennsylvania heralds great promise for manufacturing in the Tri-State.

by ADAM BRUNS adam.bruns@siteselection.com

hen Shell Chemical Appalachia announced on June 7, 2016, its final investment decision to build a major petrochemicals complex in Potter Township in southwestern Pennsylvania's Beaver County, the company said main construction would start in approximately 18 months.

It only took 17 months, as the company on November 8, 2017, announced the official start of construction on a project that includes an ethane cracker and three polyethylene units. The complex will use ethane from shale-gas producers in the Marcellus and Utica basins to produce 1.6 million metric tons of polyethylene per year. Polyethylene is used to make many products, from food packaging and sports equipment to furniture.

Around 6,000 construction jobs will be created. Commercial production is expected to ramp up early in the next decade, when the complex creates around 600 new permanent positions.

Those 17 months of site prep and detailed design and engineering work included building bridges, relocating a state highway, improving existing interchanges, repositioning a rail line and preparing foundations. Site prep included the movement of 7.2 million cubic yards of fill and installing 4,200 steel pilings for the foundations. The ethane cracker will be the largest part of the facility with more than 200 major components and 95 miles of pipe. Shell will also construct a 900-foot (274-m.) long cooling tower, rail and truck loading facilities, a water treatment plant, an office building and a laboratory. The site will include a 250-megawatt natural gas-fired power plant, which will produce electricity and steam for the facility. About a third of

Shell Chemical Appalachia's launch of main construction on November 8, 2017, in Potter Township, Beaver County, Pennsylvania, may be looked back on as an historic occasion, as the larger region is projected to have enough shale gas to feed four more complexes.

Photo courtesy of Shell Chemical Appalachia

the electricity produced will help supply the local electricity grid.

In an official statement on the occasion of the Nov. 8 announcement, Pittsburgh Regional Alliance President David Ruppersberger said, "This progress would not have been possible without numerous key public and private sector partners who worked in extraordinary cooperation to first attract Shell to southwestern Pennsylvania and who now continue to support making this once-in-ageneration investment a reality and an economic driver for the greater region."

Water and Earth

One thing that has helped the project advance is the Pennsylvania Land Recycling and Environmental Remediation Standards, known as Act 2.

"Shell is redeveloping an existing brownfield site, including several parcels of land used by different industries for nearly a century," says Shell spokesman Michael Marr. "Many of those industries were permitted when environmental requirements were less rigorous." Operating in accordance with the Act 2 regulations, Marr says, "Shell is working to improve and manage the environmental legacy of past land use, including protecting water quality. Our dual goal is to create a safe place to work while also eliminating the pathways by which past contamination could move offsite."

Those measures demonstrate the balance that can be achieved when regulators and corporations seek out common ground in the interest of remediating the ground itself. Among the measures undertaken by Shell are covering the site with an average of seven feet of fill; installing barriers between contaminated soil and groundwater; installing culverts; collecting, treating and testing storm water (rain or snow) that could contact potentially contaminate soil before releasing it to the river; implementing an advanced water



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quality testing and treatment program; and installing 16 groundwater monitoring wells.

"The land bordered by I-376, PA Route 18 and the Ohio River in Beaver County has been dramatically changed for the better because of Shell's serious interest in our region — both before and after its final investment decision in June 2016," Ruppersberger continued, noting new intersections, roads, a new power substation,

a new drinking water intake and water treatment plant; new docks along the river; additional rail and more. "These investments not only improve Shell's selected site, but also the surrounding community, to the benefit and safety of residents and existing and future businesses."

Ready to Compete

Manufacturing jobs directly or indirectly related to the Shell cracker and to shale development in general continue to grow at places like Elliott Group in Jeannette.

Elliott, headquartered in Jeannette for 103 years, builds complex units like compressors and compression trains for power plants and processing sites around the world. It opened a \$17-million headquarters in August 2012 just as the shale boom was gaining steam. That was the culmination of a company comeback from the brink of being closed down just four years previous. Now that Shell is ready to go, so is Elliott.

"Elliott will supply the cracked gas compressors and the ethylene and propane refrigeration compression trains for the new Shell plant," Elliott Group COO Michael Lordi says in an interview. This equipment comprises six largeframe centrifugal compressors and three large steam turbine drivers, together with lubrication systems and buffer gas seal systems for each compression string. Elliott is one of a handful of companies that can provide large-scale refrigeration compression. The order validates Elliott's superior technology and expertise in olefins production on a global scale."

IHS Markit forecasts that ethane production from the Marcellus and Utica shale formations will support up to four more world-scale ethane steam crackers in the tristate region in addition to the Shell cracker.

"Ethane steam crackers are the large, complex compression units at the heart of petrochemical processing," Lordi explains. "Cracked gas compressors 'crack' the ethane to produce ethylene, propylene, butadiene, and aromatics, the building blocks for plastics, fertilizer, and liquid fuels. Rotating equipment manufacturers such as Elliott are a critical part of the supply chain for petrochemical processing."

Has the business meant expansion for Elliott

itself? Lordi says the global footprint of its parent company Ebara International continues to expand, including new service centers in China and India, another coming to Saudi Arabia in 2018 and a new steam turbine manufacturing facility in India. "A new R&D Center on the Jeannette campus will be completed and fully operational in 2018, including new dedicated compressor and steam turbine test stands," he says. In October

Michael Lordi, Elliott Group, COO

2017, Ebara International's Cryodynamics business was integrated into Elliott Group. "Elliott is in the beginning stages of planning for and building a separate test facility for cryogenic pumps and expanders, and moving manufacturing of these products from the current site in Nevada to Pennsylvania, he says.

"Process innovation is key in a fiercely competitive market," Lordi says. "On the design side, we continue to advance aerodynamic and flow technologies to meet increased capacity demands, such as today's mega ethylene plants. At the same time, we are serving customers who are pushing for smaller equipment footprints and less weight, such as needed for shale.

Elliott Group, based in Jeannette, Pennsylvania for the past 103 years, will supply compressors and compression trains like this one to the new Shell complex. Photo courtex of Elliott Group We are exploring 3-D printing of stationary components as an option for reducing weight, and improving parts consistency. We are also exploring virtual reality technology as a tool to

accelerate the design, revision, and drawing approval process.

"On the manufacturing side, we have heavily invested in advanced machining and robotic welding capabilities to improve efficiency. We employ world-class metallurgists whose expertise and continuous advances in materials science extends equipment life in the challenging environments in which our equipment operates."

Ready for More

That sort of talk is music to the ears of Denise Brinley, senior energy advisor for the Pennsylvania Department of Community & Economic Development.

Asked to characterize the level of downstream interest, she says, "Over the past five years, we have seen a sustained economic interest in the tri-state region, with both domestic and international companies expressing a desire to locate and expand in our region." She ticks off the competitive advantages: proximity to the resource, key end users and markets; geographic



Denise Brinley, Senior Energy Advisor, Pennsylvania Department of Community & Economic Development

advantages that protect from many severe weather events; a well-developed plastics industry, robust transportation infrastructure, and now, experience in siting the first world-scale ethane

> complex in the U.S. outside of the Gulf Coast. Has the workforce kept pace?

"We are extremely pleased with how Pennsylvania's world-class universities, community colleges, local workforce investment boards, trades, and economic development organizations have risen to the challenge of meeting the workforce needs of our burgeoning energy and petrochemical industry," she says.

In addition to a broader overall approach in the K-12 system, the state is pushing boundaries to determine how energy and petrochemicals will impact the future of manufacturing,

and vice versa, Brinley says. In addition to groundbreaking work in robotics and automation at research institutions, the state is home to two of the four accredited plastics engineering technology programs in the country at Penn State Behrend and Penn College of Technology.

"Of course, we will meet the workforce demands of building Shell's ethane complex," she says. "But we also are taking a broader, longer-term approach to building our future talent pipeline."



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INVESTMENT PROFILE: FIRSTENERGY CORP.



FirstEnergy helps industrial customers take advantage of a huge gas play in the tri-state region.

once-in-a-lifetime supply of energy has the potential to fuel a manufacturing renaissance in the tri-state region of Ohio, Pennsylvania and West Virginia, and the principle electric utility serving that region is doing all it can to turn that potential into reality.

Akron-based FirstEnergy Corp. operates one of the nation's largest electric systems, serving more than 6 million customers in Ohio, Pennsylvania, New Jersey, Maryland, West Virginia and New York. With \$43 billion in assets, FirstEnergy controls about 17,000 megawatts of diverse generation and has more than 24,000 miles of transmission infrastructure.

What FirstEnergy sees in the huge gas play found in the Marcellus Shale and the Utica Shale is nothing less than the opportunity for widescale regional economic transformation, says Patrick by RON STARNER ron.starner@siteselection.com

J. Kelly, economic development director for FirstEnergy.

"The heart of the Appalachian basin for shale gas overlays much of our service territory," says Kelly. "FirstEnergy is committed to helping develop the manufacturing potential and to do what we can to make this not just an extraction business. Many of the manufacturers in the tristate region are energy intensive and can benefit from the lower energy costs. The natural gas liquids from the wet gas are the building blocks to many of our larger industries in which we are leaders in the globe: polymers, chemicals, coatings, etc."

Kelly says FirstEnergy is prepared to help companies take advantage of the sudden surge in cheap and plentiful natural gas. "When the shale development first started happening in the northern tier of Pennsylvania, it caught

The new switching station/ Static VAR compensator on a mountain in West Virginia that FirstEnergy built to help meet the increased electric load from the shale gas midstream companies. Photo courtesy of FirstEnergy our attention, but we didn't perhaps fully understand the impact," he notes. "When we started to see all the pipelines booming in Western Pennsylvania, Northern West Virginia and Eastern Ohio, it jumped on our radar screen."

Since then, FirstEnergy has invested heavily into developing relationships with midstream companies. "One of our big efforts was the remediation and sale of land of our former Burger Plant in Belmont County, Ohio" says Kelly. PTTGC has plans to build a \$5 billion to \$6 billion ethane cracker on that site.

"We worked closely with JobsOhio, which provided financial support," Kelly adds.

What's Old Becomes New Again

FirstEnergy also works closely with the state of Pennsylvania to put decommissioned power plant sites back into productive use in the area economy.

Denise Brinley, senior energy advisor for the Pennsylvania Department of Economic and Community Development, says that FirstEnergy and the state "became engaged about 18 months ago about how to move some of the older closed power plants into productive reuse. Power plant owners are not used to being owners of real estate. A new paradigm is out there. As coalfired power plants are retired, owners must find a means to divest of those properties."

FirstEnergy did more than that, however. As Brinley notes, the electric utility put together a repositioning "playbook" for its decommissioned power plants. One such site on the Monongahela River in Washington County "became a high-priority site for us at the department," she says. "Pennsylvania wanted to see this site put back into productive reuse in the community, and so did FirstEnergy. We had a shared commitment regarding the overarching goals. An Economic Repositioning Playbook was born to identify the highest and best use of this property. The old Mitchell Power Station site will be reborn thanks to this plan."

Brownfield redevelopment is a core principle of the state, Brinley adds. "The \$6-billion Shell ethane cracker in Beaver County is being constructed on a 1,200-acre redevelopment of a former smelter site," she notes. "Sites like these and the decommissioned power plant sites are loaded with infrastructure: transmission infrastructure, railroad lines, roads, river



Our Shale Team developed a proactive strategy to make investments in our transmission system and provide one point of contact for our midstream customers across our service territory."

 Lisa Nentwick, Manager of Economic Development, FirstEnergy Corp.

access, etc."

Brinley says that Pennsylvania Gov. Tom Wolf "is committed to seeing manufacturing make a comeback in the southwest part of the state, and sites like those being provided by FirstEnergy are a pivotal part of that plan."

A Steely Resilience Takes Shape

Katie Klaber, managing partner of The Klaber Group in Pittsburgh, says that the advent of an abundant supply of natural gas liquids has the potential to be the most transformative event in the history of the region's economy.

"We are looking at new manufacturing opportunities because of this," Klaber says. "Downstream opportunities include a major shift in natural gas-fired electric power plants. The Shell ethane cracker will take local ethane and turn it into ethylene and polyethylene. As it is produced locally, there will be additional demand within a certain radius of the plant. The building of the cracker plant itself has required the building of new hotels, new suppliers, new cement plants and other operations involved in the supply chain."

Chemical and petrochemical companies in the supply chain will benefit directly from this expansion of feedstock, notes Klaber. "FirstEnergy is providing electric service to places that did not have it before," she adds. "Construction is underway at Shell, and PTTGC will make its final investment decision by the end of the first quarter of 2018. We will go from one major petrochemical plant being built outside the Gulf region to two and maybe even three."

Klaber notes that "the pace and excitement around economic development in this region is the highest it's been in my lifetime. I grew up here in the days of steel mills closing down, and I have never seen anything like this." This Investment Profile was prepared under the auspices of FirstEnergy Corp. For more information, contact Lisa K. Nentwick at 724-453-3438 or nentwickl@firstenergycorp.com.



A longstanding partnership leads to what could be the largest foreign investment in the history of West Virginia.

by ADAM BRUNS adam.bruns@siteselection.com

f an MOU evolves from understanding into action, November 9, 2017, will go down as a turning point in Appalachian history.

On that date in Beijing, in the presence of President Donald Trump and Chinese President Xi Jinping, China Energy Investment Corporation Limited's Ling Wen signed a memorandum of understanding with West Virginia Secretary of Commerce H. Wood Thrasher on a plan to invest \$83.7 billion in shale gas development and chemical manufacturing projects in West Virginia. The China Energy announcement in West Virginia was the largest investment in a series of projects in US corporations and other states totaling a reported \$250 billion of investment in the United States.

Planning for the projects is underway and will proceed in phases over 20 years. The projects will focus on power generation, chemical manufacturing and underground storage of natural gas liquids and derivatives. "The plans clearly demonstrate a total value chain approach, integrated from raw materials through the production of useful chemical intermediates locally," said a state release. They also follow on years of work backed by a number of organizations including the Tri-State Shale Coalition evaluating the geology and infrastructure of the Mountain State — where hundreds of depleted gas fields, mined-rock and salt cavern spots await — as an ideal Appalachian Storage and Trading Hub for natural gas liquids.

"This is a great day for the State of West Virginia," said West Virginia Gov. Jim Justice, a longtime energy and real estate industry leader.

Side by Side

China Energy is the recent creation of a merger between China's state-owned coal mining company Shenhua Group and energy producer Guodian Group. West Virginia University (WVU) and then-Shenhua Group began working together in 2002 with joint research on direct coal liquefaction technology. The merger positions

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China Energy as the world's largest power company with more than 200,000 employees.

WVU President Gordon Gee called the announcement the culmination of years of relationship-building. "It is also an excellent example of the possibilities that

While this is a great day for West Virginia, we truly believe there are thousands of more great days to come."

— Jim Justice, West Virginia Governor

we have been discussing within the West Virginia Forward initiative with our partners at the state Department of Commerce and Marshall University," he said. Responsible use of shale gas is one of WVU's five "Mountains of Excellence" — topics important to West Virginia that have great potential for research across disciplines. Wealth generated from shale development activity might very well aid in addressing the others, which include addressing health

> disparities in Appalachia; improving STEM education and scientific literacy; and promoting stewardship of water resources.

In an interview, Brian Anderson, director of the WVU Energy Institute, says the ongoing work with Shenhua, which began with coal liquefaction research, naturally led to trying to identify economic development opportunities in

West Virginia and in China a couple years ago. Among other connections, his team runs the U.S. Department of Energy's Advanced Coal Technology Consortium in China. With two offices there, his team is in China about 15 times a year. With ongoing and new partnerships across

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the state and region and with the Chinese, he's rarely in the office, answering in one direction to his provost, another direction to Gov. Justice and in a third direction to the 154 members of the consortium. "We even have a ceramics kiln collaboration in China," he says.

Anderson knows the value of the value chain. The native West Virginian got his first job at what was then the Kaiser aluminum plant, where his grandfather worked for 30 years, and where his great-grandfather worked as an electrician as the plant was constructed.

"That property is 2,000 acres of flat riverbottom property," he says. "It's one of our best sites in the state." After the smelter shut down (the rolling mill is still operational), Applied Partners has come in to remediate the property to be suitable for new manufacturing. The site is one of a slew of industrial sites in all three states that are prime candidates for membership in a tri-state petrochemical portfolio.

Multinational Pioneers

Anderson has nothing but praise for the impressive organization and leadership of Shenhua/China Energy, including cuttingedge work in renewables and other cleantech applications. But it's coal that has led them to the prospective mega-deal.

"They operate an interesting niche ... a whole coal chemicals sector that only exists in China. They gasify it, and run it through a Fisher Tropsch process to make polymers and plastics. We would get those from the back end of a cracker and polyethylene unit. Shenhua has vertically integrated across the entire supply chain, with 1,200 kilometers of rail, and their own pipeline, ports and ships, all the way to plastic pellets. So when we started talking with them about the investment opportunities in the Appalachian Basin, and showing them we have this extremely low-cost high-value material in the natural gas liquids and value chain not fully realized, they got very excited about taking that same model and building that value chain out here."

It's not the first time the company has invested in the region. That was in a JV in a Marcellus formation field in Greene County, Pennsylvania, just across the state line. "So they learned a bit about doing business in the US, and are starting to work with partners around here on individual projects," says Anderson.

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The company sees a huge market in the US and worldwide for low-cost polymers and chemicals, Anderson says. Bottle up the lowcost ethane in Appalachia that's currently going to waste or out of state, run the numbers, and "that's where they come up with investing a very large chunk of capital in the region."

Anderson says the shale storage and trading hub concept has attracted a lot of interest from large integrated chemical manufacturers as well as dedicated chemical makers, some of whom have publicly stated that building the storage and trading hub is absolutely critical to maximizing the region's resources. "It all comes from the fact we're rejecting anywhere from 250,000 to 300,000 barrels of ethane a day and burning it," Anderson says. "That's not going to stop unless we build the hub."

The Shell cracker now under construction in Pennsylvania will consume 105,000 barrels a day. The PTT Global cracker, if its plans continue to move forward, would consume 90,000 barrels a day.

"Even those invested in the Gulf see this as an opportunity to build out the chemicals sector in the Appalachian Basin," says Anderson. "It's much easier and cheaper, and the Gulf Coast can then take existing capacity to have deep penetration into the export markets around the world. Even those that have been expanding in the Gulf are all on board."

Especially so since that coast has had to recover from the most recent hurricane season.

"The polymer processors and blenders who get all their polyethylene resin from the coast today are salivating," Anderson says.

The West Virginians — and business leaders and citizens of the whole tri-state region — will settle for smiling ear to ear and keeping their fingers and toes crossed. After all, a report released by the American Chemistry Council in 2017 estimates that 101,000 jobs could be created if the full potential of the value chain is realized.



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TRI-STATE COALITION INTELLIGENCE REPOR 😾

Workforce



An oil & gas training and certification leader sheds light on development of specific skill sets in the tri-state region.

tark State College (SSC), home to an oil & gas training center that one industry consultant calls "very impressive," and part of the ShaleNET Consortium that also includes Penn College of Technology, Westmoreland County Community College, Pierpont College, Navarro College, The Allegheny Conference, Chesapeake, Marathon, Shell, Chevron and XTO. Stark State's oil & gas training and certification menu runs the gamut so companies can run product, including welding, water sampling and analysis, safety, surveying, environmental compliance, industrial operations and industrial maintenance.

Dan Schweitzer, director of Oil & Gas and Environmental at Stark State College, recently fielded a few questions from Site Selection:

Site Selection: Describe the sorts of skills requests, recommendations, support and feedback you're receiving from the entire range of corporate employers in the oil & gas/ petrochemicals fields. Dan Schweitzer: Stark State College's (SSC) petroleum technology degrees were developed with ongoing input from several entities including: The ShaleNET Consortium, the Tristate Shale Coalition, Canton Regional Chamber of Commerce, RG Drage Career Center's Oil and Gas Advisory Committee, Stark State's Oil and Gas Advisory Committee and periodic input from employers who have hired our completers.

The most consistent labor force need can be classified as an Industrial Maintenance Technician with specialties in the Instrumentation and Electronics, Process Operation, or Pipeline and Measurement Technologies. Dominion, Momentum M3, Marathon, Williams, and Chesapeake have each individually requested Measurement specialization with electro-mechanical technician level curriculum be added to our degree canon.

The electro-mechanical (mechatronics) component represents a broadly applicable crossover skillset for midstream, downstream, advanced manufacturing and numerous other industries where process control is an integral part of daily operations. The measurement component is a fundamental skillset required for instrumentation and electronics technicians to master and represents a key upward mobility path: I&E Tech to Measurement Technician.

Site Selection: Are shale-related opportunities re-awakening the asset and knowledge infrastructure already in the state?

Dan Schweitzer: SSC provides a pre-engineering pathway for students that is 100-percent transferrable through articulation agreements with University of Akron and The Ohio State University engineering programs. This provides a low-cost option for the first two years of any engineering degree at those colleges, and also allows students to circumvent waiting lists in those programs, when they exist.

SSC has pathways related to mechatronics, industrial maintenance, and automation and robotics and a robust enrollment of approximately 1,000 students in the industrial and engineering division. SSC's capacity is approximately 3,000 students in these programs. We are ready and able to support a labor shed need related to gas processing, petrochemical feedstock, additive and advanced manufacturing and skilled building trades (e.g. HVAC).

Site Selection: How are pipeline developers and projects in particular taking advantage of Stark State's offerings?

ported to our degree program classes for college credit, and if a student becomes employed by a contractor at any time during their studies, we will provide Operator Qualification services to the student (and employer) free of charge. Dominion is also a critical employer partner for SSC degree program graduates. Between three and five students per year have participated in Dominion's summer internship program, and many receive job offers upon completion. Other pipeline providers support our programs and hire our students. Williams has been instrumental in helping SSC obtain measurement instrumentation such as Sick and Daniel ultrasonic meters, SpectraSensor moisture analyzers, oxygen sensors and other equipment used in gas measurement. Williams personnel

used in gas measurement. Williams personnel have donated time to help in the lab to configure these devices and design teaching activities that use them. NEXUS donated \$50,000 in 2017 to be used for the purchase of equipment and supplies used in plastic joining and other pipeline related classes (Corrosion Basics, Pipeline Operations).

which include a variety of plastic joining tasks,

including manual butt fusion, hydraulic butt

fusion, electrofusion and mechanical joining

tasks. Stark State provides the services on an

as needed or contract training basis for various

contractors who provide gas utility installation

work for Dominion. This partnership helps Dominion manage their training load, and also

enforce their standards of training. All plastic

joining curricula used in contract training is also

Site Selection: How have you been able to collaborate with JobsOhio and other agencies?

Dan Schweitzer: The Measurement and Mechatronics pathway, after vetting with ShaleNET partners, Tristate Shale Coalition and Stark State's Oil and Gas Advisory Council, was included in the ODHE ShaleNET Share Grant application which was awarded in the Summer of 2016. ODHE awarded SSC \$506,000 and Chevron added \$200,000 to be used to develop the ShaleNET Share program.

ShaleNET Share is part of an accelerated (18-month completion pathway) 40/20 shared services collaborative grant initiative among technical colleges in Ohio (Stark State College, Belmont College, Hocking College, and Eastern Gateway Community College). Each college will develop an analogous Measurement and

At Stark State College's Well Site Training Center in Canton, students are trained on state-of-the-art equipment, simulators and compression trains.

Photo courtesy of Stark State College

Dan Schweitzer: We have worked with Dominion to provide thirdparty Veriforce Evaluator services for contractors who work on Dominion Jobs.

who work on Dominion Jobs. Stark State staff were trained and sponsored by Dominion to provide Operator Qualification (OQ) services,

Image: Commercial growing Commercial

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Mechatronics Degree, with SSC providing 20 credit hours of technical training, leveraging its Well Site Training Center and industry partnerships to provide an experiential learning environment over the course of a 14-credithour, 10-week intensive summer session.

This pilot program establishes a partnership with Ohio colleges that we hope can be replicated throughout the Appalachian Basin. It serves the burgeoning labor shed at multiple points in Ohio, and is a critical workforce development initiative, designed to help potential employers address their projections for employment and hopefully, encourage them to consider sites in the Appalachian Basin.

Site Selection: We first learned of ShaleNet some years ago. How has it evolved to meet employer needs?

Dan Schweitzer: ShaleNET was a TAAACCT grant award from the US Department of Labor awarded with the goal of developing the labor shed in the Appalachian Basin. The ShaleNET Consortium aligned programs in Texas, Pennsylvania, Ohio, and West Virginia related to various industrial maintenance technician careers described in former sections.

As the grant began to sunset in March 2016, sustainability of these programs became a critical concern because ShaleNET was designed to address the early stages of the shale gas economy: production of gas and liquids, distribution of these products (pipeline infrastructure), and processing of the products. Now the Appalachian Basin shale gas economy is transitioning from an infrastructure-limited period with inadequate take-away and processing capacity, to an enduser-driven industrial ecosystem driven by power generation and plastics and polymers.

Accordingly, the ShaleNET consortium is also transitioning. The ShaleNET partners (except Navarro College in Texas) have joined others in Pennsylvania, Ohio and West Virginia to form the TEAM (Tristate Energy and Manufacturing) consortium led by the Community College of Beaver County (CCBC) in southwest Pennsylvania. This consortium is in the primary stages of sharing curriculum and resources to further address the evolving shale gas labor shed in the Appalachian Basin. The same basic industrial maintenance skill sets developed in ShaleNET is also required for power generation and resin end-use. The TEAM consortium will be leveraging the partnerships and experiences of ShaleNET to expand our workforce training in a unified manner, which we believe is also beneficial to potential entities looking to establish an industrial presence in the Appalachian Basin. 🕰

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TRI-STATE COALITION INTELLIGENCE REPOR 🐺

Infrastructure



hen an energy and petrochemicals boom is unfolding, all the players know moving product and people is at least as important as gathering the resource.

Cleveland-based law firm Bricker & Eckler has built up a specialty practice for shale oil and

gas over the past several years. A detailed project list the firm put together in fall 2015 showed 162 shale-related projects in eastern Ohio alone worth a combined \$18 billion. Even with the drop in commodity prices, says Matt Warnock, a Columbus-based partner in the firm, "I don't know that that list is going to shrink anytime soon. The trajectory slowed a bit, but it didn't stop."

The investors are all the big names: MarkWest, Nexus, Blue Racer, Williams, Transcanada, Marathon and Energy Transfer Partners among them. The Nexus project will support 6,800 jobs, more than \$650 million in wages and \$830 million in total economic activity. In its first five years of operation, NEXUS will generate an estimated cumulative tax revenue of \$412 million, of which approximately \$116 million will go directly to local school districts in Ohio.

MarkWest maintains multiple offices to support its business in both the Marcellus and Utica plays, which includes six major processing



Matt Warnock Partner, Bricker & Eckler

complexes in the liquids-rich Marcellus. Williams Partners in September said construction is officially underway in Pennsylvania on the greenfield portion of the nearly \$3-billion Atlantic Sunrise pipeline projec, designed to increase natural gas deliveries by 1.7 billion cubic feet per day, is scheduled to be placed into full service in mid-2018.

In July, MPLX, a limited partnership owned by Findlay, Ohio–based Marathon Petroleum, announced that its

Utica Build-Out projects were fully operational. "The Cornerstone Pipeline and the Utica Build-Out pipelines are key liquids pipelines from these shale plays and they now provide connectivity to refineries throughout the Midwest," said MPLX President Michael J. Hennigan.

Tapping In

At Bricker & Eckler, the energy team's work touches upstream, midstream and downstream phases of the shale oil & gas development. While oil & gas has been around in Ohio for a century, the boom unfolding since 2010 is very different in size, scope and scale, Warnock says. There are plenty of issues such as water and seismic activity grabbing headlines, but the No. 1 area of focus now is infrastructure.

Along with the huge spider web of gathering and distribution lines taking shape in Ohio alone comes a host of legal issues, including easement negotiations, property and mineral rights, legislative and regulatory administration, and other aspects of site location. Warnock notes the proactive and supportive work of JobsOhio and the Ohio Department of Natural Resources in attracting, supporting and collaborating with industry — and in coordinating across boundaries. river and rail. The next step will be to imitate the Gulf Coast and connect industrial processing sites by pipe.

As for building the roster of sites, "We're working among the three states to identify and coordinate," Anderson says. "We're specifically targeting some cross-river sites — if you need 800 acres, and there are 500 on one side and 300 on the other, we can connect them, and we'll co-market and work together to get them permitted. That's a real commitment from [state capitals] Columbus, Harrisburg and Charleston."

Money Is Infrastructure Too

One major player in the effort is Power of 32 (P32), which takes its name from the 32-county Greater Pittsburgh region encompassing parts of four states. Established in 2014 and with commitments of \$49 million, the P 32 Site Development Fund closes critical infrastructure financing gaps by making



"Our experience with JobsOhio is extremely positive," he says. "They have a very strong energy team that we've worked with on a number of types of projects."

As for the bevy of infrastructure projects, "What a lot of people don't realize is these pipes go from point A to point B, but have a lot of taps on them designed to facilitate industrial development over time," he says. "Five or 10 years from now, the local distribution company can tap into it for a new industrial end user."

The infrastructure for prosperity takes other forms too.

"There are two natural gas power plants in northern Ohio that are either in service or close," Warnock notes, "and at least two more that are permitted and will be under construction."

Brian Anderson, director of West Virginia University's Energy Institute, says the biggest infrastructure opportunities right now are in the midstream pipeline sector. "There is huge capacity for fractionation of ethane, propane and butane," he says. "The cracker folks already know that. There are a number of industrial sites the three states are working on to rehabilitate."

Those sites are already connected by

"patient" mortgage loans to sites that have the potential for regional impact or that are identified as a priority for the greater region.

The Fund's first investment was Trimodal Terminal in Follansbee, West Virginia, which received the 2017 West Virginia Brownfields Award for Environmental Impact for the team's work on remediating 400 acres at the former Wheeling Pittsburgh Steel Corporation site. Other sites include Clinton Commerce Park in Clinton, Pennsylvania; Hazelwood Green (formerly Almono) in Pittsburgh; and Turnpike Industrial Park in Big Beaver, Pennsylvania.

"The fact is we have more companies wanting to invest and build facilities here than we have places ready to go for brick-andmortar construction," said Dennis Yablonsky, chairman of the Fund's Board of Managers and CEO of the Allegheny Conference on Community Development, in September 2017. "When companies are ready to invest and start construction, having to wait on infrastructure can be a deal breaker."

Josh Lavrinc, CEO of Power of 32 Fund Manager Callay Capital, says growing interest from natural gas midstream and downstream users only increases the potential for repositioning even more sites that "were strategically located for prior industrial activities and remain so today due to their access to quality working populations, natural resources, and logistical infrastructure."

The Fund is actively working with site owners and developers to encourage projects to move forward across the region, says Lavrinc. "In the absence of sufficient supply to accommodate anticipated future demand, there is room for additional investment in creating pad-ready sites — including for institutions or end users that have the talent and resources to identify and pursue a strategic plan (which plan may include related infrastructure, like port, rail, utilities, etc.), and with the assistance of our region's public and private financing tools including the Power of 32 Site Development Fund that can help to create a more efficient capital stack."

Other funding opportunities also exist, including through structured financings like tax credits and incentives, as well as other impact investment funds managed by Callay or its affiliates such as the Strategic Investment Fund, the Building PA Mezzanine Loan Program, and the Employees Real Estate Construction Trusts.

The Distribution of Daily Life

Even as some aspects of infrastructure continue to play catch-up, evidence

continues to build that communities and their citizens already are reaping benefits.

"The influx of money and jobs to a rural area of the state is huge in and of itself," says Matt Warnock. "The number of new hotels that have gone up in the past five years is staggering, along with restaurants and retail. Prices have dropped, but there's been building coming out of the ground."

"One of the most profound changes that we've seen as the energy infrastructure continues to grow is the delivery of natural gas to our communities and businesses," says Denise Brinley, senior energy advisor to the Pennsylvania Department of Community & Economic Development. "Schools, hospitals, manufacturers and residents are experiencing an economic uplift as a result of having direct access to abundant, lower-cost fuel," in part because of Governor Tom Wolf's Pipeline Investment Program (PIPE). Infrastructure investments stemming from the advancement of natural gas liquids are different, but no less meaningful, she says, noting how the industry development around the Shell cracker already is attracting additional investments in key transportation, logistics, water and wastewater treatment assets.

"Shell's investment has triggered the expansion and improvement of our collective infrastructure," she says.



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Analysis

Gathering Intelligenc

by ADAM BRUNS adam.bruns@siteselection.com

> n the midst of an energy play, the only thing more plentiful than the resources in the ground is the mountain of research devoted to optimizing it. But proper data mining and talking to the right people can yield rich pockets of insight.

May 2017 analysis from the American Chemistry Council (ACC) that says the Appalachian region could become no less than a second center of US petrochemical and plastic resin manufacturing, similar to the Gulf Coast.

ACC's analysis projects a \$32.4-billion investment in petrochemicals and derivatives and a \$3.4-billion investment in plastic products, put toward the construction of five ethane crackers and two propane dehydrogenation (PDH) facilities. "These capital investments are underway and will likely continue through the mid-2020s," said the report. "By 2025, the quad-state region could see 100,000 permanent new jobs, including 25,700 new chemical and plastic products manufacturing jobs, 43,000 jobs in supplier industries and 32,000 'payrollinduced' jobs in communities where workers spend their wages," said the ACC. "The new investment could also lead to \$2.9 billion in new federal, state and local tax revenue annually."

Voice of Experience

Need to drill down further? A good place to start is a conversation with Dr. Iryna Lendel, a research associate professor and the director of the Center for Economic Development at the Maxine Goodman Levin College of Urban Affairs at Cleveland State University. She is also affiliated with that college's Energy Policy Center, one of a number of institutional think tanks in the tri-state region, among them the University of Pittsburgh's Center for Energy within its Swanson Engineering School and its Shale Gas Governance Center within its Graduate School of Public and International Affairs.

A native of Ukraine with extensive knowledge of the Eastern Europe energy sector, she led the first economic impact study of shale development in the region, published six years ago, when only about 33 wells had been drilled and none were producing. Her team recently



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Dr. Iryna Lendel Director, Center for Economic Development. Maxine Goodman Levin College of Urban Affairs, Cleveland State University

released the follow-up "Shale Investment Dashboard in Ohio." How did the projections from before work out?

"We guessed at the acceleration of development pretty well," she says. "We projected 600 wells, and it was 598 wells that were drilled." The research also projected the current bottleneck in infrastructure — a situation

that a bevy of pipeline projects are hurrying to rectify. The team also overlaid

several levels of workforce analysis to project skills shortages in certain

occupations. But she sees promise if institutions such as those affiliated with the ShaleNET consortium collaborate more with industry, especially in developing those with an education below the engineer level. She also says the opioid crisis has combined with heightened interest from foreign companies used to working with worker collectives abroad to lend a more attractive shine to unions.

"They are amenable to unionized labor

because that is opioid-free labor, people show up on time, and they can call on a large quantity of special occupations they may need for a short period of time," Lendel says. "We talked to a couple of companies, and they like paying a higher premium for labor because of the convenience of organized labor."

Another trend the research team has identified is industry funding on-the-job training and establishing programs for high-school graduates.

Hit the Road

Asked how her everyday observations back the data, she says, "Roofs and roads tell the story." Less visible but no less powerful are the temporary and permanent pipelines for water as well as product. "Drive in southeast Ohio and you see new roofs," she says. "Go to a tiny little restaurant and you immediately notice a new washroom and new tables. They're refurbishing local service businesses. And you see advertisements from supply chain businesses serving oil & gas companies — it's not like you need to look in a database or directory. You can just drive the road and see it."

To what extent have State of Ohio energy policies or regulatory schemes helped shale-driven

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activity? "Ohio is doing a really great job," she says. "They made energy a priority with the understanding it can transform downstream. I think from very early development, what this government did right is to pay attention to mid-size foreign companies, for whom our market would be super-attractive," mainly because US companies already socked in with massive complexes on the Gulf Coast are not necessarily going to be developing an entirely new hub in Appalachia. Lendel thinks that focus on those mid-size foreign companies is a smart move by the state "I applaud them for focusing on downstream, and vocally saying, 'We don't want to just be an extractive economy.' We have such a lion's share of companies already in the Midwest, and within a day's trip by truck."

Today's energy prices of around \$50 a barrel mean caution is still in the air, and ROI and efficiency are priorities. The give and take between upstream and downstream is a balancing act but, Lendel says, "Right now we're in a sweet spot of prices that allows us to develop upstream but is very encouraging for the downstream."

Lendel says the three states have positioned the region well, and have done a fine job overcoming political turf. Now they need to be more proactive and collaborative in their proposals and trade missions. "I want to see more aggression," she says, One reason why? Other countries aren't waiting around. PTT Global, for instance, is mulling the big Ohio cracker, but also moving forward with expanded operations in Thailand, Myanmar and Malaysia. Mitsubishi and BASF are planning to invest in a petrochemical park in India. A consortium of South Korean and Japanese firms wants to fund a number of projects in Iran, while Iran's own Tappico just signed an MOU with Kazakhstan.

The new \$83-billion MOU between China and West Virginia will of course benefit its neighboring states, Lendel says, but "I would like to see the next announcement be one occurring in three states."

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