

the magazine of kiewit corporation

KIEWAYS





Kiewit is one of North America's largest and most respected construction and engineering organizations. With its roots dating back to 1884, the employee-owned organization operates through a network of subsidiaries in the United States, Canada and Mexico. Kiewit offers construction and engineering services in a variety of markets including transportation; oil, gas and chemical; power; building; water/wastewater; and mining. Kiewit had 2016 revenues of \$8.6 billion and employs 20,000 staff and craft employees.

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KIEWAYS

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OUT TO SEA

The offshore platform at Dominion Energy's Cove Point facility is used to transport LNG onto large ships. More on the project on Page 14.



KEEPING UP WITH THE TIMES

Take a look back through Kiewit's history and you'll see how our work has evolved with the demands of the times. Each decade, we look different from the last, while still maintaining the fundamental values that have carried us this far. We started out in 1884 as a masonry contractor, but now cover six markets including building, mining, oil, gas and chemical, power, transportation and water/wastewater.

The Cove Point job in Lusby, Maryland, reflects that forward-thinking adaptability. On Page 14, go inside this major liquefied natural gas (LNG) project that's drawing a lot of attention across the global energy market and see why it's so unique.

Kiewit is now the number one builder of natural gas-fired electricity generating plants across North America. On Page 12, we give you an overview of some of the major power work we're performing in several states.

Our company has always had a pioneering spirit — building things that had never been built before. We still do a lot of that, but today that innovative work also involves removing, adapting or building upon older structures. The post-earthquake replacement of the San Francisco-Oakland Bay Bridge is a great example. On Page 6, go below the surface to see how Kiewit carefully removed the old bridge's marine piers while protecting the marine life around them. Be sure to check out the blast attenuation system diagram on Page 9 to see how we did it safely.

We're proud of our history, but part of that history is being able to adapt with the changing world. I believe that's one of the great secrets to Kiewit's success.

BRUCE GREWCOCK

Chairman and CEO

POWERING NORTH AMERICA

On Page 12, take a look at a few recent power projects underway by Kiewit Corporation and its subsidiaries, including Grand River Energy Center in Oklahoma.

ON THE COVER

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In the San Francisco Bay, implosions removed support piers for the Old Bay Bridge.

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OUR MARKETS

🏗️ BUILDING
⚙️ MINING
🛢️ OIL, GAS & CHEMICAL
⚡ POWER
🚗 TRANSPORTATION
💧 WATER/WASTEWATER

What began in 1884 with two hard-working brothers has grown into a Fortune 500 construction and engineering industry leader. As a multi-billion dollar organization, Kiewit can tackle projects of all sizes, in any market. Here are a few interesting facts about Kiewit.

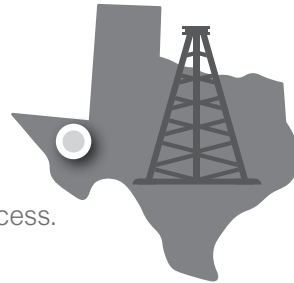


SOMETHING TO BE PROUD OF
 CEO and Chairman Bruce Grewcock represented Kiewit at a dedication ceremony for the Folsom Dam Auxiliary Spillway. In his remarks, Grewcock thanked all of the craft workers who helped build the new spillway. "For all of those out there that actually did the real work," he said, "I want to thank you for your efforts. You did a great job and this is something you all should be proud of."



OGC PROJECT WIN TIMES 3

TIC – The Industrial Company (TIC), a subsidiary of Kiewit Corporation, was awarded the Billy Miner Terminal 2 Central Gathering Facility (CGF) in Pecos, Texas. This is TIC's third project awarded by Noble Midstream in 2017. A CGF facility, like Billy Miner 2, is one of the first stages of the refining process.



GLIMPSE

Over the past 10 years, Kiewit has designed, constructed and/or provided start-up services for more than 600 power-related projects totaling nearly \$18 billion in contract revenue. Starting on Page 12, see a quick glimpse of some of Kiewit's current power work.



KIEWIT RANKS NO.1

in Engineering News-Record's 2017 rankings of top contractors in infrastructure mining.



RENAISSANCE VILLAGE

In Omaha, Nebraska, The Salvation Army's new Renaissance Village was dedicated in October. Kiewit Building Group, Inc. led construction of the new 70,000-square-foot building, which has 49 housing units and 20,000 square feet of administration and program management space.



LARGEST EVER

The Colorado Department of Transportation (CDOT) selected Kiewit Meridiam Partners for its Central 70 project in Denver. The \$1.2 billion project is the largest infrastructure development project in CDOT's history, and will reconstruct a 10-mile stretch of I-70 east of downtown.



OUR VALUES

PEOPLE | INTEGRITY | EXCELLENCE | STEWARDSHIP

For more than 130 years, Kiewit's culture has thrived on strong principles. From generation to generation, the torch has been passed down and carried by the company's leaders and workforce. Today, its core values — People, Integrity, Excellence and Stewardship — remain the company's cornerstone and are the way Kiewit runs its business.



SouthGate Constructors, a joint venture of Kiewit Infrastructure South Co. and Austin Bridge & Road that is building the Midtown Express project in Dallas-Fort Worth, collected supplies for those impacted by Hurricane Harvey and delivered them to Houston.



Kiewit engineers applied the skills they use designing and building complex power and energy projects to build dozens of bikes for Boys & Girls Clubs of Greater Kansas City.



In Kansas, Kiewit is sponsoring students at Frontier Trail Middle School as they research, design and build solar panel boards to charge personal devices, and power lights and small appliances. This hands-on opportunity will allow the students to learn about converting the sun's energy into electric energy.



The Brighton Boulevard project team in Colorado donated time, manpower and resources to build a wind turbine for the Garden Place Academy, one of north Denver's oldest elementary schools. The wind turbine provides power to run the community garden's irrigation, lighting and charging station.



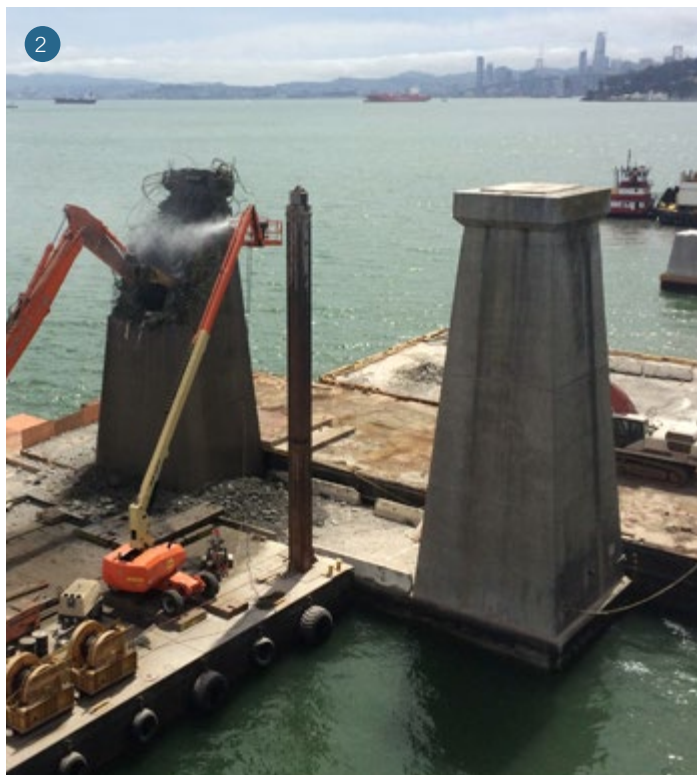
The Kiewit-sponsored Power of Hope golf tournament in Kansas City raised more than \$400,000 for Braden's Hope for Childhood Cancer to support childhood cancer research efforts through a partnership with Children's Mercy Hospital and University of Kansas Cancer Center.



WHAT LIES BENEATH

A demolition project in the San Francisco Bay has all eyes watching the waters.

Every day, about 270,000 vehicles make the commute between San Francisco and Oakland via the Bay Bridge. But it's what remains in the water below that's the focus of Kiewit/Manson, AJV and their client, the California Department of Transportation (Caltrans).



1. From 2002 to 2008, Kiewit/FCI/Manson, JV constructed the Skyway and E2/T1 segments of the new San Francisco-Oakland Bay Bridge east span replacement. The Skyway Segment project included twin 1.2-mile-long bridges. The E2/T1 Foundations project involved constructing the foundations for the new self-anchoring suspension (SAS) bridge.
2. Crews complete mechanical demolition of the above-water portion of the piers.

In 1989, the Loma Prieta earthquake rocked California's San Francisco Bay Area. The 7.1 magnitude event and the damage it caused prompted Caltrans to initiate a seismic retrofit of the San Francisco-Oakland Bay Bridge, including complete replacement of its east span. Construction began in 2002 and the new structure opened to traffic in 2013.

With the new bridge in place, attention then shifted to dismantling its predecessor. One of the most challenging tasks? Removing the marine piers which served as the old bridge's foundation.

Lurking under the bay's surface, the piers measured, on average, 100 feet long by 30 feet wide, with the largest footings extending over 180 feet below the cold waters.

Caltrans and its construction manager/general contractor, Kiewit/Manson, AJV, developed an innovative solution to get the job done: use more than 80,000 pounds of explosives to implode the more than 40,000 cubic yards of concrete that made up the 15 submerged footings.

The method had never been used before in the Bay Area, a community which Caltrans Chief Bridge Engineer Brian Maroney calls a "world leader in environmental balance." Of particular interest to residents: how would the team protect more than 70 species of fish and four species of marine mammals that call the bay home, as well as more than one million birds that stop or winter on the waterway?

PROGRAMMABLE EXPLOSIVES AND BLAST ATTENUATION SYSTEMS (BAS)

Protecting native species, as well as adjacent infrastructure like the new Bay Bridge, a Bay Area Rapid Transit (BART) tunnel and a nearby high-pressure gas line and water treatment outfall, were top priorities as work was planned.

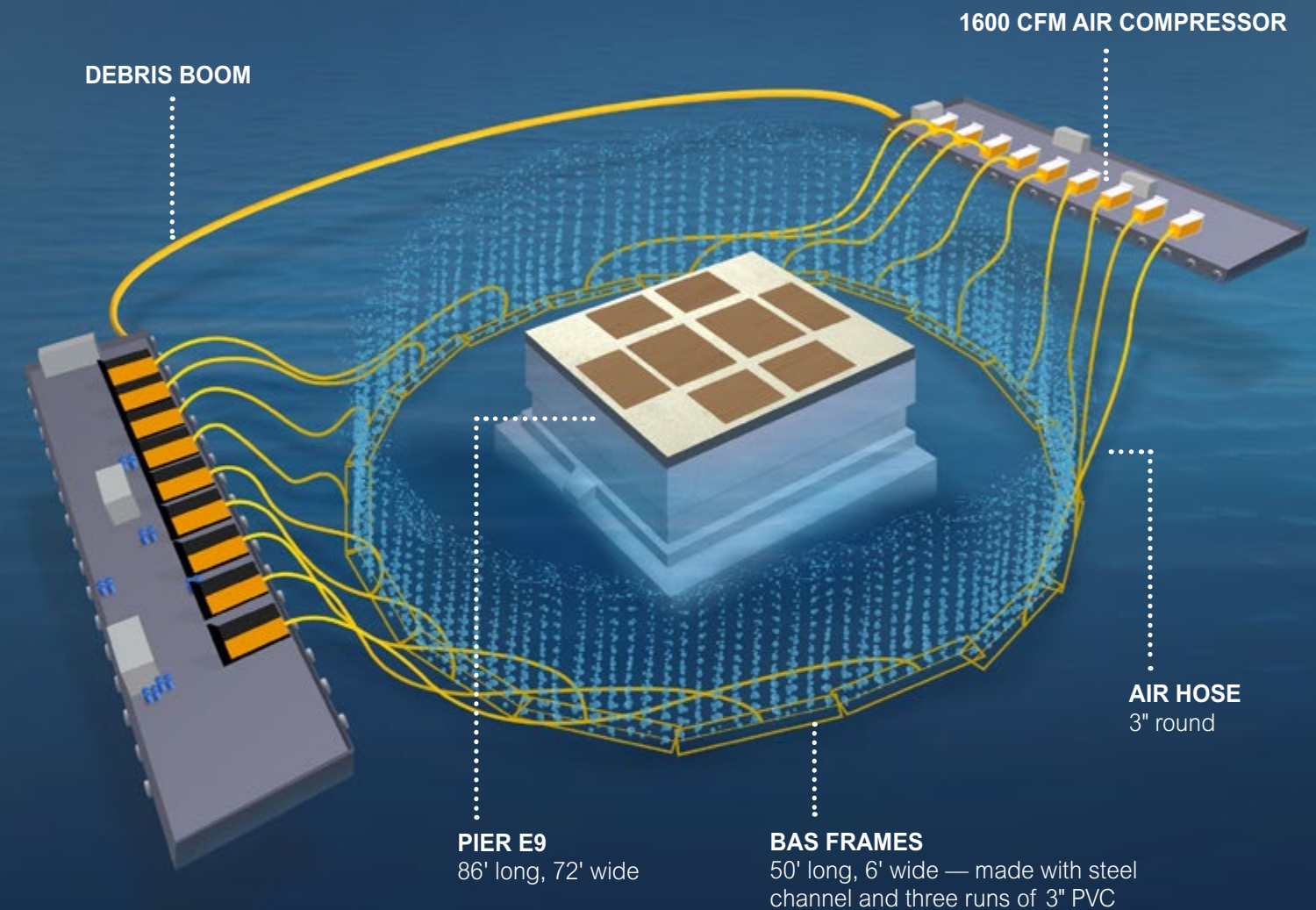
"Reducing the blast energy released was a crucial component of the project and one that we've worked diligently on from Day One," said Keith Boulton, a Kiewit/Manson, AJV marine superintendent.

The team's diligence led to the development of a two-pronged solution to mitigate the effects of high-blast energy on the surrounding environment.

First, using programmable explosives, millisecond delays were incorporated between the detonation of each charge. The delays, while nearly unnoticeable, ensure that only a very small quantity of explosives was detonated at any particular moment.

What is a blast attenuation system?

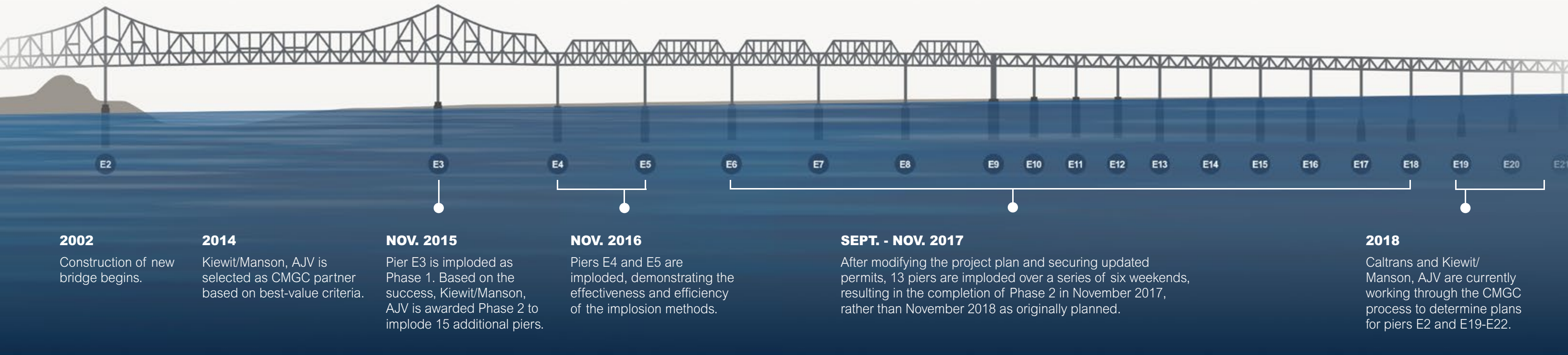
A blast attenuation system (BAS), otherwise known as a bubble curtain, protected marine life during the implosion. Here's how it works.



- 1 First, the BAS frames are placed on the bay floor. The crane operator and crew use side-imaging sonar to view real-time underwater visuals as they position the frames.
- 2 Next, the compressor barges are towed and positioned into place just outside the blast radius.
- 3 Then, divers connect each compressor to a frame via 3-inch hoses.
- 4 Finally, air is added, essentially surrounding the pier in a bubble bath during the implosion.

CMGC contract enables early completion

The project was procured using the construction manager/general contractor (CMGC) contract model. It allowed Kiewit/Manson, AJV and Caltrans to partner together and work through challenges earlier, and ultimately finish the project a year ahead of schedule.



“During each individual implosion, instead of one really big blast detonating 15,000 pounds of explosives all at once, you end up with a series of 500 mini blasts, each detonating about 30 pounds of explosives,” said Zach Reilly, Kiewit/Manson, AJV project manager. “The result is a slightly longer blast duration with a greatly reduced peak energy release.”

Second, a blast attenuation system (BAS) reduced the effect of the blast by creating a wall of air — or “bubble curtain” — and was especially effective at protecting nearby marine life.

“The BAS uses up to 19 high-volume compressors to pump more than 31,000 cubic feet per minute of air to a network of pipes that circle the foundations on the bay floor,” said Joe Eiras, Kiewit/Manson, AJV safety and environmental manager. “When the compressors are fired up, a 5-foot-wide wall of air bubbles rises upward from the bay floor, surrounds the pier, and decreases the shock during the implosion.”

AHEAD OF SCHEDULE

Each foundation implosion lasted just seconds. However, bringing the plan from blueprint to blast took a lot longer. Careful consideration had to be given to the June 1 to

Nov. 30 in-water work window as permitted, and the Sept. 1 through Nov. 30 explosives blast window.

“When we started the project, we anticipated needing all of the 2016, 2017 and 2018 in-water work windows to complete the job,” Reilly said.

But after successfully removing two of the foundations in 2016 and demonstrating the effectiveness of the controlled implosions and the BAS, the team set its sights higher.

Working closely with permitting agencies, Caltrans and Kiewit/Manson, AJV secured an early start to above-water work in 2017 and modified their project plan to implode up to four foundations in a single blast event, as opposed to the original plan that allowed for only one pier per implosion.

On Nov. 11, the last piers were removed from the bay — a full year ahead of the originally anticipated 2018 completion date.

Reilly credits the early finish in part to the contract model chosen for the project.

“The CMGC model allowed our team to truly partner with Caltrans, leverage each group’s unique strengths, and work collaboratively with the numerous other agencies

and organizations associated with the project. It was a difference maker and I think a huge success for all stakeholders.”

‘A REALLY SMART TEAM’

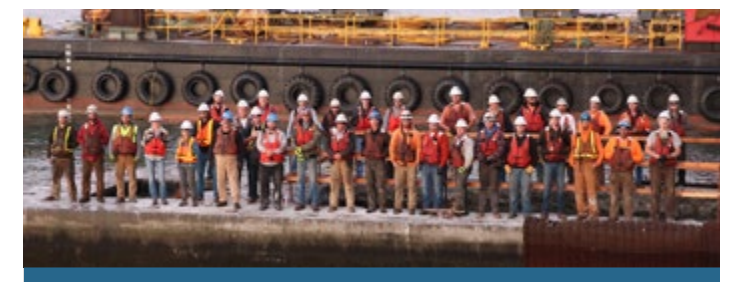
Like Reilly, Maroney can’t say enough good things about the partnership.

“Kiewit/Manson brought a really smart team to the group. They’ve not even hesitated, they haven’t even blinked an eye and they’ve been 100 percent supportive in helping make sure these parameters are monitored at a superior level.”

“Kiewit’s reputation of following the rules is really valuable. People have a lot of confidence in the team. When the rules are laid out environmentally, they’re going to follow them, and we count on that.”

Embracing the fundamentals is part of Kiewit’s approach to any job, Reilly said.

“I think the team has done a great job of working with the client. We’ve been innovative in our means and methods, and we haven’t settled.” **K**



Award-winning

Kiewit/Manson, AJV and Caltrans have been recognized with several awards for excellence on the project, particularly for their teamwork on Phase 1.

- Associated General Contractors (AGC), 2017 Marvin M. Black Partnering Excellence Merit Award
- California Transportation Foundation, Transportation Awards, 2017 Unique Project
- Federal Highway Administration 2017 Environmental Excellence Award
- AGC California, The Construction Awards Finalist, 2016 Meeting the Challenge of a Difficult Job – Heavy Equipment
- World Demolition Awards, 2016 Collaboration Award
- Caltrans, 2015 Partnering Success in Motion Award

GLIMPSE

Over the past 10 years, Kiewit has designed, constructed and/or provided start-up services for more than 600 power-related projects totaling nearly \$18 billion in contract revenue. Here's a quick glimpse at some of Kiewit's current power work.



ST. JOSEPH ENERGY CENTER

The 700-megawatt **St. Joseph Energy Center** project located just 5 miles west of South Bend, Indiana, is only a few months from completion. As the project team prepares for major milestones such as combustion turbine first-fire and steam blows, there is a push to get buildings weather-tight and pipe insulated prior to winter. Recently, the project completed chemical-cleaning of both heat recovery steam generators, lube-oil flushes on all turbines, and crossed the 90 percent completion mark.



FORT GRIFFIN

The American Electric Power (AEP) **Fort Griffin** project in Abilene, Texas, is an engineer, procure, construct (EPC) project with substation and transmission line work. Approximately 27 miles of transmission line is being upgraded from 69 kilovolt (kV) on wood poles to 138 kV design standards on steel monoples. Substation work includes three new stations and expansions or modifications to five existing stations.

Fort Griffin is a Transmission Partners project. Transmission Partners is a joint venture between Kiewit and Aldridge Electric.



TVA ALLEN COMBINED-CYCLE

The **TVA Allen combined-cycle power plant** will be Kiewit's first project that features General Electric 7HA.02 combustion turbine generators. Upon completion in 2018, the facility will provide about 1,100 megawatts of clean energy to the Memphis, Tennessee, area. The project recently commissioned both combustion turbines, which passed all performance testing. In an effort to use renewable resources, the project will use both biogas and a solar farm to contribute up to approximately 6 megawatts of renewable energy to the plant's total output.



GRAND RIVER ENERGY CENTER

The **Grand River Energy Center (GREC) Unit 3** project in Chouteau, Oklahoma, began providing commercial power in October and now provides 495 megawatts of reliable electricity to the people of Oklahoma. The new combined-cycle plant was built by TIC-The Industrial Company, a subsidiary of Kiewit Corporation, and features the nation's first installed M501J combustion turbine generator. The plant has already received industry accolades: the project was recently named a Top Gas Plant by POWER magazine and an Eagle Award winner in the mega-projects category by the Associated Builders & Contractors' South Texas chapter.

*20,800 tons of structural steel,
5.4 million linear feet of electrical cable,
58 cranes on a 54-acre site,
675 drilled shafts,
3,600 workers,
30,000 deliveries,
nearly 20 million hours of work.*

ONE COVE POINT



1. The power block will use two steam turbine generators to generate electricity for the facility. 2. The main cryogenic heat exchanger (MCHE) has a crucial role in the LNG process, cooling warm gas into a liquid state. 3. A centralized command center was developed to safely and efficiently manage crane activity.

In the small town of Lusby, Maryland, “One Cove Point” refers to the team responsible for the construction of Cove Point, the first liquefied natural gas (LNG) export facility on the east coast of the U.S. — attracting significant attention across the global energy market.

In its more than 130-year history, Kiewit hasn’t backed away from a challenge and this project was no different. In April 2013, a joint venture of IHI E&C International Corporation and Kiewit Energy Group Inc. was selected by Dominion Energy, Inc. as the engineering, procurement and construction (EPC) contractor for the project.

“A first-of-a-kind project like this may only come around once a generation, if it all,” said Bill Bodnar, project director for Kiewit. “We were extremely excited by the challenge, which was naturally a motivating factor for our entire team.”

The scope of work included the addition of a 5.25 million metric tons per annum (MTPA) LNG export facility at Dominion’s existing import facility, which has been in operation since 1978. Specifically, this included the construction of a feed-gas receiving area, pretreatment area, liquefaction unit and a new 130-megawatt power plant. Tie-ins to the existing facility, enhancements to the marine terminal and the relocation of infrastructure were also completed. To insulate adjacent neighborhoods from noise, a 60-foot high sound wall around the perimeter of

the terminal was also included in the scope. Adding to the complexity of the project, all of this needed to be built within a roughly 54-acre site — the smallest footprint in the U.S. for a project of this size.

“The Dominion Energy Cove Point export terminal helps meet the global demand for cleaner fuel sources, while bringing substantial economic benefits to the local community,” said Jim Strohman, construction director for Dominion. “It was a huge undertaking from a construction perspective, however, we all pulled together and persevered to build a quality facility.”

ONE MEGA JOB, SIX SEGMENTS

The project team was organized into “segments” with dedicated “segment managers” that reflected different areas of the facility and core functions, including anchor bolts down/underground, pre-treatment, liquefaction, site services, testing and tie-ins, and power block.

This approach allowed segment managers to focus on specific areas and break the work down to the smallest component possible without becoming overwhelmed by the overall magnitude of the project. It also helped to keep communication lines open.

“On such a large project, good communication is so important, including making sure that the right people are

at the right meeting,” said John Huber, operations manager for Kiewit. “What one person is doing may affect hundreds.”

54 ACRES IN ALL

To overcome the small size of the construction site, the project team devised a strategy to coordinate the locations and facilities that were needed to plan, stage and build the work. A dedicated site logistics team was tasked with the efficient, effective movement of people and materials.

“The entire process was much like building a small city from the ground up,” said Brian Watkinson, site services segment manager for Kiewit.

Accommodations were made to support the movement of thousands of workers and tons of materials and equipment, as well as core functions like office space, laydown yards and maintenance centers. These arrangements required meticulous analysis and planning for special traffic signals, off-site parking, bus transportation, water stations, lunchrooms, wayfinding signage and more.

As Watkinson explains, keeping a close eye on the construction schedule was critical in keeping operations running smoothly.

“The construction schedule and quantities were used to generate a footprint for what logistically needed to be



done,” he explained. “Our first step was to understand the magnitude of the work and how it would change over time, including volume of materials and where they were sourced, as well as preparing for peak workforce levels.”

Strong foundations

One of the key focal points of the project is a massive sound wall around the perimeter of the facility. While the sheer magnitude of the 60-foot-tall wall is a sight to see, the underground components are equally impressive.

All of the weight of the sound wall had to bear on 5-foot diameter drilled shaft foundations. This required special expertise in foundation work, which is part of Kiewit’s expansive and diverse array of self-perform capabilities.

“A major advantage for self-performing the foundations work is that everyone was in sync with the Kiewit philosophy and approach from the start,” said Scott Wimmer, area manager for Kiewit’s foundation work. “The shared culture and fundamentals enabled different operational teams to proactively collaborate in the field on a daily basis to determine the best solution for the project.”

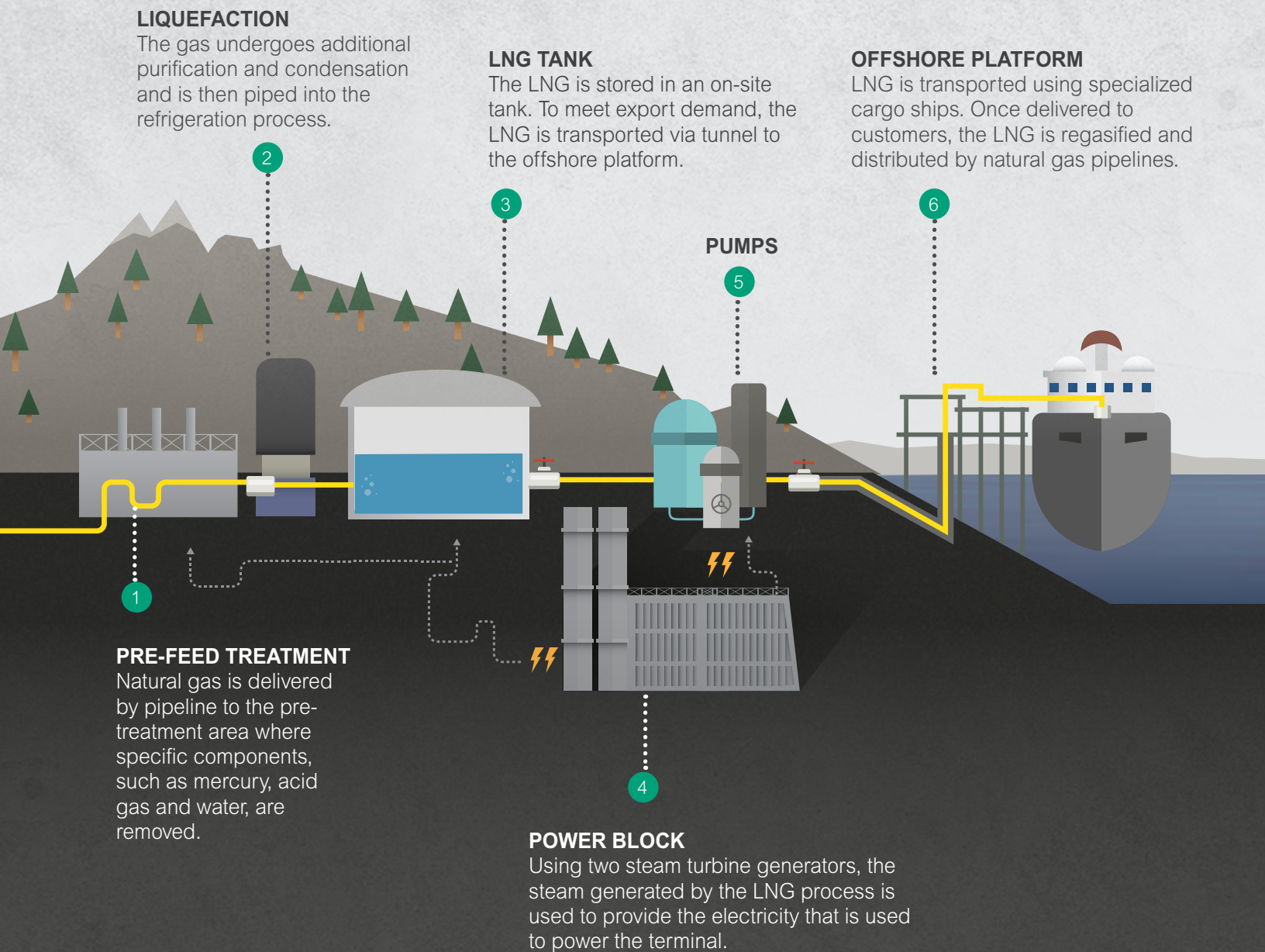


At Cove Point, Kiewit crews drilled more than 675 shafts. To maintain the aggressive schedule, four drilling crews navigated the site in concert with all the other anchor bolt down operations. Temporary steel casing and polymer slurry were used to drill the shafts. Three larger drilling rigs were used for the five-foot diameter shafts, while a smaller drill rig was used for the 24-inch and 36-inch diameter shafts.

The LNG process

WHAT IS LNG?

Natural gas is converted into a liquid form by exposing it to extremely cold temperatures, 260 degrees below zero (Fahrenheit). The liquefied natural gas (LNG) is 600 times more dense than gas form, making it easier to store and transport.



Ultimately, construction operations spanned multiple locations in southern Maryland, along with steel fabrication shops in Wisconsin and engineering teams in Houston and Kansas City. In addition to the construction terminal in Lusby, an off-site area was developed for administrative, onboarding, training and warehouse activities. Several miles south of the terminal, on property adjacent to the Patuxent River, a temporary pier was built to receive shipped-in materials.

Once the facilities were in place, the focus shifted to monitoring on-site logistics through a centralized command center. To monitor activity and boost efficiency, high-definition cameras were mounted on tower cranes and access roads throughout the construction site. All truck deliveries — totaling more than 30,000 — were scheduled through the command center, which prevented congestion and ensured on-time delivery of materials to crews. This centralized process also helped reduce congestion on nearby roads, a concern to local residents and businesses.

Of all the on-site activities, the presence of 58 cranes on a roughly 54-acre site presented the most unusual challenge.

The crane management program was modeled after a traffic control system at an airport. Similar to the flight pattern of a plane, each crane had a computer-aided design that showed its turning radius and an operational zone that did not overlap with other cranes. Specially trained zone coordinators were assigned to each crane, much like an air traffic controller.

“We put structured processes behind everything we do. Each and every day, we move a small city in and out of the jobsite and no one thinks twice about it. It’s a routine part of business and that’s exactly how we want it to be,” said Watkinson.

100,000 TRAINING HOURS

Training programs at Cove Point came in all shapes and sizes. First and foremost, the project focused on safety-related training, which was provided to every new person on the project as part of orientation. Using a three-story scaffolding apparatus, workers participated in hands-on fall protection training learning different ways to safely tie off when working at heights. Workers completed more than 2,100 hours of signalman training to ensure that everyone maneuvered safely through busy construction sites.

New training initiatives were driven by the design of the facility, the small footprint of the construction site, and the amount of industrial and heavy pipe that needed to be

installed. For example, the project adopted an alternative method for getting pipe installed into racks using bull rigging techniques.

“On other projects, pipe might be installed in a ‘pancake’ style where you install a first level and then stack the second, third, etc., on top,” Huber said. “Bull-rigging allows you to install pipe between levels so that you aren’t potentially holding up work waiting for pipe to be fabricated and delivered onsite to install in a sequential manner.”

In total, thousands of workers and employees benefitted from training programs, which totaled more than 124,000 hours.

Giving back to the community



For the hundreds of employees and their families who relocated to work on the project, southern Maryland quickly felt like home. A strong sense of community, by Dominion, Kiewit and its employees, was further enhanced through a wide array of volunteer work and other philanthropic donations.

Long hours were dedicated to cleaning up roads and on-park restoration projects. Food, toys and back-to-school supplies were collected each year to help families in need. Employees exercised their competitive spirit at charitable golf, soccer and football tournaments. They also connected with students through career day presentations, site tours and computer donations.

“Cove Point was an enormous project that was very fast-paced and engineering-intensive,” said Bodnar. “Even though the job was very demanding, we didn’t want to lose sight of training and professional development opportunities that added value to the project and individual career growth.”

6 MILES OF SUPERLOADS

As part of its scope of work, Kiewit was responsible for the procurement of specialized, engineered equipment needed to liquefy natural gas, one of the main functions of the new terminal. Since key equipment suppliers were

located across the globe, intricate plans were needed to get this equipment to site.

In order to deliver equipment via barge, a temporary pier and trestle were constructed next to the Thomas Johnson Bridge at Solomons Island. Improvements were made to existing roadways, including grading and paving work. To accommodate cargo heights of up to 30 feet, existing overhead utilities, carrying telecommunication, power and cable wires, were relocated underground.



Out of more than 70 planned superloads, transport of the main cryogenic heat exchanger (MCHE) — more than 150 feet in length and 19 feet in diameter — was the most complex. The process of aligning cargo specifications, setting the barge and cranes for lift operations, modeling vehicle turn radiuses, securing permits and constructing the foundation for the MCHE required 18 months of planning. Moving the MCHE from the barge to the terminal was completed in a 5-hour time period on a 6.2-mile route.

“The MCHE reflects a monumental investment and countless hours of engineering, manufacturing, planning

and transporting,” said Jesus Mejias, senior trade compliance manager for Kiewit. “We took extremely calculated measures to eliminate any risks of damage, which could have derailed the entire project.”

In total, there were more than 33 barge loads hauling 75 pieces of equipment. The pier was dismantled after deliveries were completed. In addition to planting grass seed, Dominion is restoring a natural oyster bar that is many times larger than the original area that was impacted.

A global effort

-  Procurement locations
-  Dedicated office locations

Suppliers from more than 20 U.S. states contributed to Cove Point, extending the economic reach of the project.

Since LNG export facilities are relatively new in the U.S., the project turned to manufacturers in Asia-Pacific to source engineered equipment.

The Cove Point LNG project has had a tremendous economic impact on the local area and beyond.

Approximately one-third of workers and subcontractors are from a three-county area surrounding the project.

Off-site hubs for engineering and technology teams, as well as dedicated pipe fabrication operations, operated across five states. Hundreds of local union halls across the U.S. were engaged and contributed to the project. And highly-specialized equipment, supplies and materials were procured from approximately 60 geographic markets across the globe.

The project leveraged an in-house global logistics team to manage all imports, exports and heavy-haul operations.

ONE HUB FOR MILLIONS OF DATA

New technology and project controls helped the team adopt a data-driven mindset, focusing on the use of the best available information as soon as it was available to keep construction progress on track. With more than a million data points to manage and hundreds of employees that needed to access the information and customized dashboards, this was no easy feat.

“One key driver of our success has been the non-negotiable use of new technology. We could have never managed the data, especially in real time, without the scalability of these tools,” Bodnar said. “Our approach went well beyond reporting and was a means for timely decision-making and optimized operations.”

The use of a dedicated “project controls team” helped to transform data into meaningful, actionable information. Since detailed engineering drawings were being finalized simultaneously with construction, it was important to streamline processes while also making sure that crews

understood the work. A live data feed with the quantities associated with the drawings flowed directly to crews, informing them of the work they needed to do. As crews completed the work, they reported it back through the system — which was automatically incorporated in the schedule and a detailed forecast. If changes or updates to engineering drawings were made, it was reflected seamlessly across quantity management, schedules and forecasts.

As a result, various segments and functions of the project were all in sync, vastly improving efficiency. It allowed the team to shift from monthly to weekly schedule updates, converting a four-day process into a four-hour task. It also provided insight into the big picture of construction progress with the flexibility to drill down to specific segments and crews. For example, a superintendent in the power block segment could quickly see how many workers were needed on their crew over the next week, the next month and to finish the work.



1. Crews completed expansive tabletop concrete pours safely and effectively. 2. Project controls technology was used to coordinate work and increase productivity.

From Australia to Cove Point

Kiewit assembled a strong team with a diverse set of experiences and skill sets to build the project, bringing talent from across the globe, literally. Mike Harbour and his family relocated more than 11,000 miles to Lusby, Maryland, from Perth, Australia. With extensive, previous experience on large-scale LNG projects, Mike notes that the keys to success were similar on both projects.

“Safety of course is paramount. We pride ourselves on making sure that everyone goes home safe. It’s the right thing to do and absolutely necessary in winning new work,” Harbour said. “A high level of adaptability is also required, especially as quality requirements and documentation continue to evolve. Fortunately, we have access to top-notch technology and tools that streamline these processes, which would otherwise be very time-intensive.”

Additionally, Harbour points to strong client relationships as a universal factor for successful projects.

“If we maintain a clear and open relationship with our clients, issues on the project tend to be solved quicker and life just seems easier all around,” he said. “In the construction industry, word of mouth and reputation go a long way.”



SO, WHAT'S NEXT? WHAT DOES THE FUTURE HOLD?

“Kiewit has a strong LNG portfolio and good credibility in the industry. We have a very exciting future ahead of us including the opportunity to build Jordan Cove, the first and most advanced LNG export terminal on the west coast of North America.”

The project controls team also developed a predictive analytics tool known as the tsunami index, which compared the existing workforce to the number of workers needed to complete the work. Given the wide range of skilled trades — such as carpenters, ironworkers, electricians and sheet metal workers — and the large volume of work, the index quickly became an invaluable management tool.

“If the index showed a significant gap in the number of electricians you have and will need, and the gap continues to widen over the next six months, we proactively addressed and shifted resources,” said Jon Eggleston, director of engineering and analytics for Kiewit. “Prior to the index, there was a tendency to overestimate what could be completed in the near term; now we have great, useful data to help focus on critical work, keeping us on track.”

Due to the small size of the construction site, the sheer number of workers in a given area had the potential to disrupt overall operations. To better manage the issue, a worker density tool was developed. Based on a threshold of the minimum square feet per worker, the tool combined the construction schedule with a detailed map of the square footage within the site to depict worker density. If specific areas were getting congested, potentially affecting

Cove Point by the numbers



10,000 craft workers brought their skill and expertise to the project throughout construction

3,600

At peak construction, there were 3,600 workers onsite



58 cranes operating on the 54-acre site



800 miles of wire and cable used on the project



Nearly 21,000 tons of steel used — the equivalent of more than 8,000 cars



More than 30,000 deliveries made to the construction site



The heaviest piece of equipment was 800,000 pounds, which is twice the weight of the Statue of Liberty



Cargo ships can carry roughly 34 million gallons of LNG — enough to meet the daily energy needs of more than 10 million homes



Craft workers from 49 states, 4 Canadian provinces and Puerto Rico worked on the project

“It was gratifying to see the young people come through the project and seeing them learn. Hopefully you can impart a little wisdom on them and they can become better than you. That should always be the goal for us.”

JOHN HUBER,
OPERATIONS
MANAGER, KIEWIT

productivity, quality and safety, decisions could be made to alter the location or timing of specific activities.

SECOND TO NONE

The Cove Point team powered through a multitude of challenging scenarios at Cove Point.

“The tenacity of the team — taking the initiative to learn, collaborate and find solutions — was second to none,” said Danielle Kensinger, Kiewit’s Human Resources manager. “When you are in the thick of it, it was overwhelming at times, but then you look back and realize just how amazing this project and team were.”


For Kiewit Field Engineer Molly Halpin, Cove Point was her first job after college.

“Cove Point has taught me the importance of thinking on my feet and working with a sense of urgency. There was never a time where we were not working full throttle, coordinating with other segments, getting modifications made to access work areas, or meeting deadlines for pipe installations so ironworkers could build the next sequence of steel.”

The more seasoned team members also valued their experience at Cove Point.

“It was gratifying to see the young people come through the project and seeing them learn. Hopefully you can impart a little wisdom on them and they can become better than you. That should always be the goal for us,” said Huber, who has more than 20 years of experience at Kiewit.

As for Dominion, they are proud to see the project come to fruition and begin serving their customers.

“With the level of focus from all levels of the team, we are certainly well-positioned to do so,” said Strohm. “It’s been an amazing journey.” 





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The Kiewit Commitment

People | Community | Environmental Stewardship



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