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SINCE 1884

the magazine of kiewit corporation

2023 / Quarter 4

KIEWAYS

WOMEN IN CONSTRUCTION
In early November, 105 women from 61 universities across the U.S. and Canada attended the Future Women in Kiewit Summit (FWIK) at Kiewit University in Omaha, Nebraska.

Kiewit

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; industrial and mining. Kiewit had 2022 revenues of $13.7 billion and employs 25,700 staff and craft employees.

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KIEWAYS
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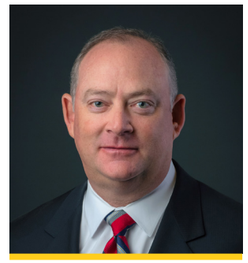

LOOKING TO THE FUTURE

The end of a year brings an opportunity to reflect on the past and anticipate what's to come. While it's important to celebrate our accomplishments, what's often set Kiewit apart is our ability to look forward and adapt to the future. The articles in our last issue of Kieways for 2023 are a great reflection of this.

With offshore wind projects cropping up throughout the Northeast, including the upcoming South Fork Wind Farm, our transformation of the Connecticut State Pier (Page 6) puts the region in a position to make the most of the demand for greener energy.

A decade ago, our solar experience was limited. The energy transition has changed that too. The Madison Fields Solar project, featured on Page 16, is among some of the engineering, procurement and construction (EPC) solar projects that have made Kiewit one of Engineering News-Record's top solar contractors.

Today, we're making better use of our data than ever before. Experts in our Data Services department are transforming our years of experience into actionable insights. Learn more about how we're empowering our people to make data-driven decisions on Page 10.

Twenty years ago, Kiewit may not have been recognized as an engineering company. Now, we have more than 3,000 design engineers on staff. On Page 20, get a sense for how our construction experience combined with our rapid growth in engineering capabilities brings clients unique value in the project development space.

The future is all about uncertainty, but I am certain that our craft and staff throughout North America can rise to any challenge that comes their way. Please enjoy these stories from a future-ready Kiewit.

RICK LANOHA
President and Chief Executive Officer

DUAL-PURPOSE FARM
In addition to providing power for over 35,000 homes, the Madison Fields Solar project features an area dedicated to experimental agrivoltaics in concert with Ohio State University. Gather the details on Page 10.

ON THE COVER

ALSO INSIDE

KIEWIT NEWS

What began in 1884 with two hard-working brothers has grown into a construction and engineering industry leader. As a multi-billion dollar organization, Kiewit can tackle projects of all sizes, in any market. Here's a brief collection of recent news and information from around the company.

OUR MARKETS:

- BUILDING
- INDUSTRIAL
- MINING
- OIL, GAS & CHEMICAL
- POWER
- TRANSPORTATION
- WATER

OUR VALUES:

- PEOPLE
- INTEGRITY
- EXCELLENCE
- STEWARDSHIP

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COLLEGIATE WOMEN PARTICIPATE IN THE FUTURE WOMEN IN KIEWIT SUMMIT

In early November, 105 women from 61 universities across the U.S. and Canada attended the Future Women in Kiewit Summit (FWIK) at Kiewit University in Omaha, Nebraska.

The event — which has hosted more than 1,000 attendees since it began more than a decade ago — is an opportunity for collegiate women pursuing primarily construction and engineering careers to learn more about Kiewit and the industry while networking with Kiewit employees and other attendees.

“We have evolved with our attendees as well as our presentations in terms of really bringing the attendees the content that they’re looking for to better understand Kiewit, who we are and the great projects that we work on,” said Talent Development Sr. Manager Nicole Rolling, who was a co-chair of FWIK this year along with Western Canada Sponsor Katie Allan.

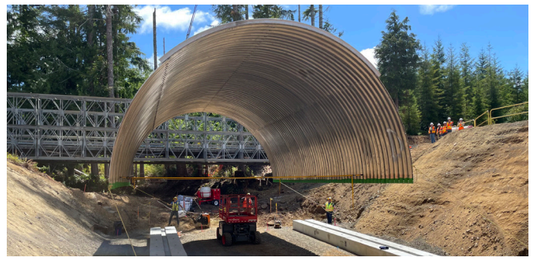
Some of the topics have become standard at the event over the past decade, including presentations on Kiewit markets, a conversation with one of Kiewit’s executive vice presidents and two Q&A panels — one with early-career employees and one with more tenured employees.

Other items were new to the agenda this year, including a presentation on Kiewit’s Under the Hat program emphasizing the importance of mental health.

Also new this year, participants shared their time to serve local nonprofits while learning about Kiewit’s stewardship core value. Attendees wrote cards of encouragement that Girl Scouts Spirit of Nebraska will share with their troops and troop leaders, and packed hygiene kits that Access Period and Project Harmony will distribute. While in Omaha, attendees also visited the Kiewit Luminarium, a science center which opened earlier this year.

The event emphasizes facilitating open, honest and candid conversations about how to thrive in the construction industry.

“At school, there are girls in my classes but not as many as I would like,” said Megan Palwaski, an attendee and student at the University of Alberta. “It’s nice to be around women who have the same career goals as me. We get to have interesting conversations.”



PACIFIC NORTHWEST PROJECT FOCUSES ON SALMON RECOVERY AND HABITAT RESTORATION

Over the summer, Kiewit kicked off construction on the Coastal 29 Project on the Olympic Peninsula.

The scope of work includes correcting 29 barriers that hinder fish from moving up or downstream. Correcting these barriers will help with salmon recovery, restore access to fish habitats and comply with a federal injunction.

The project is broken into five different phases, with one or two "bundles" being built each summer. Recently, Kiewit completed construction on Bundle 1, which consists of six different sites. With each site, crews must move traffic by detouring drivers onto existing roads or constructing a temporary road bypass around the site. Then, crews install a temporary stream bypass, remove the existing culvert and install a new culvert, which opens up water flow and allows for fish migration.

Between Coastal 29 and two other projects, Kiewit will be working on 56 more fish passages over the next six years.

CONSTRUCTION OF HIGHWAY 5 COMPLETE AHEAD OF TWO-YEAR FLOOD ANNIVERSARY

November 2023 marked the two-year anniversary of the atmospheric river and subsequent historic flooding and landslides that caused extensive damage to Highway 5, also known as Coquihalla Highway, in British Columbia. Less than two years after the historic event, the new climate-resilient bridges are open to public traffic in permanent four-lane configurations, and the project is substantially complete with work winding down for the winter season.

Kiewit and local Indigenous communities planted approximately 4,500 native plants around affected sites to help return the environment to its natural landscape.

This project was completed in an alliance model partnership between Kiewit, Emil Anderson Construction Inc. and the Ministry of Transportation and Infrastructure, providing design and re-construction of the infrastructure far more quickly than conventional bid-build or design-build models.

FEDERAL WAY LINK EXTENSION GIVES COMMUNITY FIRST-HAND LOOK OF PROGRESS

In an effort to build relationships with those who are directly impacted by construction on the Federal Way Link Extension Project in Washington, Kiewit and its client, Sound Transit, organized an event to discuss the importance of construction safety and give the community a first-hand look at what is being built in their neighborhood.

Kiewit engineers led children and their caregivers on a tour to show the progress of the light rail extension construction so they can see what’s happening near their homes.

During the tour, they received information about creek restoration happening underneath the light rail, walked on the bridge where the train will run in 2026 and learned about the different types of tracks.

TRANSFORMING A PIER: A PIVOTAL STEP FOR EAST COAST ENERGY

Casting a vision for a nation powered by 100% clean electricity by 2035, United States Secretary of Energy Jennifer Granholm took the stage at a 2023 news conference held against the backdrop of the Connecticut State Pier Infrastructure Improvements project. As she reflected on her tour of the construction activities she just witnessed, she emphasized the significance of this endeavor.

"The reason why the President was fascinated by what you are doing is because we want to replicate this."

What "this" signifies is a transformation that holds the key to enabling ocean-based electricity generation in the United States and places the Connecticut State Pier Infrastructure Improvements (CTSP) project at the forefront of this green energy endeavor.

METAMORPHOSIS OF A PIER

Kiewit Infrastructure Co. assumed the role of construction manager-at-risk (CMAR) with a mission to help reshape the New London pier in Connecticut into a modern, heavy-lift-capable marine terminal. Situated on the Thames River, its proximity to Long Island Sound makes it a strategic hub for maritime commerce. The pier's previous life revolved around importing and exporting bulk materials like salt and lumber, and was a key naval port through the 1950s. However, for the New London pier to become the first operational U.S.-based heavy-lift marine terminal accommodating offshore wind towers, nacelles and blades, it required a comprehensive overhaul.

As the CMAR, Kiewit rebuilt and transformed the site into a massive pad able to withstand heavy loads based on current and future marine cargo needs. The upgrades included the creation of two heavy-lift pads, each capable of handling loads of 5,000 pounds per square foot (psf). The rest of the facility's load-bearing capacity was enhanced to 3,000 psf. All utilities have been upgraded, and areas that were contaminated decades ago have been remediated.

The newly-expanded footprint of the terminal — combined with the Port's natural, deep-water harbor free of overhead obstructions or other harbor restrictions — now positions the facility as one of the most advanced and efficient marine terminals along the entire East Coast.

TWO BECOME ONE

Kiewit self-performed much of the scopes involved in pile driving, wharf compaction and concrete structures. At the central wharf, a dual-probe vibrocompaction method was employed to place and compact 400,000 cubic yards of material through 40 feet of water to connect the two finger piers — the first time this technique was used in the United States. What sets this method apart is its use of two vibratory probes instead of one, allowing for the compaction of larger sections of ground in less time. This process streamlined a critical phase of the project, where the frames were needed to support massive lengths of pile above the water's surface.

During construction, Department of Energy Secretary Granholm met with Kiewit crews at the State Pier project.

NORTHEAST BULKHEAD — CTSP'S NEW HEAVY-LIFT BERTHING PLATFORM

Completing the new heavy-lift berthing platform required a 150 EA 30-inch-diameter pile filled with concrete, as well as a combination, or combi, wall made up of 42-inch-diameter pipe pile and NZ19 steel sheet pile. Additionally, crews placed 27 grade beams, one waterside beam and a slab and curb. Bollards, fenders, ladders and tie rods were also incorporated to support construction. The final result enhanced CTSP's lifting capacity from 1,000 psf to 5,000 psf.

The northeast bulkhead is the location where the new ships will arrive to offload offshore wind components for pre-assembly and storage before they are shipped out for ocean installation.

Nearly 5 million pounds of reinforcing steel, 10,000 yards of concrete, 22 miles of electric cable and hundreds of thousands of tons of stone fill went into upgrading the New London pier. Now, the site stands ready to support offshore wind projects commissioned by Connecticut, New York and Rhode Island. A total of approximately 160 turbines, with an output of 1,760 megawatts (enough to power over 1 million homes) are scheduled for assembly and delivery from New London.

A BEACON FOR A MORE SUSTAINABLE FUTURE

From its beginnings as a hub for salt, lumber and smaller-scale cargo, CTSP has evolved into a state-of-the-art facility ready to support an influx in demand for clean energy and more diverse, larger-scale cargo.

This transformation represents a vision for a sustainable future which aims to reduce the carbon footprint, create jobs and provide power to millions of homes. As wind turbines rise and offshore wind projects take shape, CTSP will continue to play a pivotal role towards a more environmentally-sustainable future.

Looking ahead to 2035 and the goal of 100% clean electricity, this transformation of the pier represents a key step for green energy in the Northeast. **K**

Connecticut State Pier by the numbers

5 million pounds of steel

10,000 yards of concrete

22 miles of electric cable

Hundreds of thousands of tons of stone

How to transform a pier

1 TOP OF 8TH STREET
At this location looking south, you can see the uplands area, which has been excavated over 20 feet in some areas to get to the bottom of the subgrade. From this grade, Kiewit installed drainage structures, new water utilities and a new electrical system. Kiewit excavated more than 200,000 cubic yards of material which all went into the Central Wharf. Kiewit also completed demolition of the existing retaining wall to the west and all of the existing utilities in this area.

2 NORTHEAST BULKHEAD
This location, known as the Delivery Berth, is where ships will arrive to offload offshore wind components for pre-assembly and storage before they are shipped out for ocean installation. Once complete, this platform will be able to handle loads up to 5,000 psf, a fivefold upgrade from the pier's previous capabilities.

3 STATE PIER RELIEVING PLATFORM (SPRP)
This location, also called the Installation Berth, is where the assembled wind components will be loaded onto the off-shore vessel for delivery to the installaiton point. SPRP is also capable of handling loads up to 5,000 psf.

4 WAREHOUSE
This facility remains in place today, left over from before construction started on CTSP.

5 SOUTH WALL OF STATE PIER
This area used to be filled with water, but now is embanked with over 300,000 cubic yards of material from onsite and from a local quarry. Kiewit completed the ground improvements using a specialized vibrocompaction method, which allowed placement and compaction of the material through 40 feet of water at once. The entire area from the edge of the new pier to the old Connecticut Valley Railroad pier nearby will be covered with dense rock aggregate to allow for easy movement of loads around the site.

CRUNCHING THE NUMBERS

Data drives timely, safe and on-budget projects

When making decisions, most of us typically draw upon the knowledge, skills and understanding that we've collected through the years. This, after all, is the very definition of experience. While personal experience can be valuable, it can also be limiting.

What if there was a way to harness the collective experience of thousands of employees to fine-tune decision-making to a science? At Kiewit, there is — by using data-driven solutions managed in-house by Kiewit's data services organization.

Over the past decade, Kiewit has gathered, refined and utilized data, amassing over 200 million work hours' worth of information, equivalent to the knowledge gained from 3,766 people's 30-year careers.

"We are well established. We have large volumes of data and are aggressively pursuing prediction systems," said Matt Pappas, Kiewit's chief data officer.

"We got in early and now we are ahead in the big data and artificial intelligence movement."

Pappas characterizes Kiewit's data services group as a holistic data management organization focused on making Kiewit the premiere data-driven organization in the construction industry. Its mission is to make sure employees have the right data, of the right quality, with the right level of analysis available to them at the right time.

By making data-driven decisions, the company has the power of insight that enhances human capabilities to help

uncover patterns, trends and correlations. This information helps projects finish on time and within budget while keeping everyone safe.

However, raw data alone is not what makes this possible. It takes data scientists, data engineers and analysts to manage, understand and consistently improve the data quality to reach the desired outcomes.

THE HUMANS BEHIND THE MACHINES

When it comes to assembling the data services team, leadership is poised to harness the talent of the young minds of recent graduates. Data Scientist Kati Stanzel is evidence of that.

As a junior at the University of Nebraska Omaha, she was excited to start her summer internship with Kiewit. But it was 2020 and she felt nervous watching as other companies canceled their internship programs while the COVID-19 pandemic was wreaking havoc on the world.

Rather than canceling, Kiewit pushed forward with a remote intern program. In June 2020, Stanzel put on her mask, picked up her laptop and hit the ground running. She didn't know it then but the internship would change her life.

After several months on the job, Stanzel was encouraged to join a machine learning project, which led to an invitation to apply for a position within the newly created data science team at Kiewit. She applied and became a full-time data scientist after her graduation in 2021.

Kati Stanzel progressed from a 2020 summer internship in her junior year at the University of Nebraska Omaha to a full-time position at Kiewit. As a data scientist, she helps build predictive and analytical tools for use throughout the company.

PREDICTIVE ESTIMATING TOOL

185M Work hours predicted

64% Model outperforms estimator on account codes

80% Model outperforms estimator on project total hours

"Kudos to the people who saw my talent and were able to say, 'this talent needs to be in this department and will succeed.' The fact that people would do that for me is amazing," she said.

In the short years since becoming a full-time data scientist, she has been able to work on key projects.

"Our team is so passionate about the different projects we work on. I think that's why we are successful — because we care. We have the heart and the drive to succeed."

DATA-DRIVEN DECISIONS

One program Stanzel has been able to work on as a data scientist is the Predictive Estimating Tool.

The tool has helped predict billions of dollars in estimates, ensuring cost and schedule certainty for clients by estimating the work hours per quantity, staffing ratios and tooling ratios correctly. Having an accurate estimate keeps costs low for clients and helps Kiewit bid work at the right price.

Pappas emphasized the value of data-driven decision-making and noted Kiewit is changing the way estimating has historically been done.

"The construction industry is almost entirely estimated by humans right now," said Pappas.

How do humans stack up to the machine? Pappas has crunched the numbers with a technique called a "backward walk." It looks at what the human estimated versus the algorithm.

"On completed work that has been run through the predictive estimating tool we found that 64% of the time the human will get outperformed by the model," he explained.

The model's algorithm can calculate multiple factors to get to a rate based on job size, location, weather data and more.

"A human alone just can't do that," he said.

The technology also allows estimators to run multiple scenarios to find what works for them to get the right cost.

"It really harnesses the power of everyone's experience and not just the experience of the people on the estimating team," he said.

However, the tool doesn't replace human experience. Pappas explains that the tool can serve as "a really strong second check" to traditional manual estimating. The model will tell the estimator whether the estimate is too aggressive or too conservative in certain areas.

WATCHDOG PROGRAM SERVES AS 'EARLY WARNING SIGN'

Six years ago, Kiewit created Watchdog, an app that tracks financial, schedule and hour-based metrics month-over-month for Kiewit projects. Vice President and Operations Controller Dave Freeman says it's a first-of-its-kind in t he industry.

It uses an algorithm to predict whether a project is at risk of going over budget.

In the last three years, the app has detected 94% of job losses, which Freeman explained is important to catch because when the cost is wrong, the schedule is wrong. The ripple effect will lead to an unhappy client.

"It can be used as an early warning sign," he said.

The Watchdog program includes a Job Schedule Report (JSR) function, which predicts issues with extremely high accuracy by forecasting work hour needs using cost and schedule data.

Why the need to predict the future? Predicting problems early can help project teams course correct and solve issues before they become problems.

DATA CAN IMPROVE JOBSITE SAFETY

In May 2021, Kiewit published the Safety Risk Forecast (SRF). According to Freeman, it is one way to provide "powerful predictions" to keep workers safe.

AI/Predictive Tools at Kiewit

GET WORK

- Probability of Success Index (PSI) Model
- IHS Escalation Model
- Job Loss Avoidance Model
- Bulk Commodities Models
- Engineering Schedule Model
- Predictive Estimating Model

BUILD WORK

- Watchdog
- Buyout Variance Analysis
- Cost Forecasting
- Schedule

MANAGE ASSETS

- Safety Risk Per Hour Model
- Fatality Rate Model
- Equipment Buy/Sell Model (sweet spot)
- Company-wide Planning Models

Kiewit's data scientists worked closely with safety and operations leaders to develop the model. It uses data to predict incidents that could happen in the near future. The program takes several factors into consideration (the "hurt rate impact"), including timing of future work, ratio of inexperienced staff, risky work hours and more.

"It's truly a predictive tool where in the past we've been very lagging in looking at all of our indicators and different types of data elements," said Kiewit Corporate Safety Director Alicia Edsen. "Now we're able to really see what's driving that risk."

The SRF gives project teams with the lowest safety ratings an opportunity to fix the most critical risk factors.

"We're not just giving them a tool that says, 'Here's your risk

"To be a construction company that focuses on data-driven decisions with that many data scientists shows Kiewit is paving the way in the industry."

KATI STANZEL
Data Scientist

drivers, go figure out what to do with it.' We're also giving them recommended best practices, resources and training that we know work to take action," Edsen said.

The Associated General Contractors of America (AGC) awarded Kiewit first place for this tool during the 2022 Construction Safety Excellence Awards (CSEA). The company was given the award in the heavy civil category for its commitment to safety and occupational health management and risk control.

Kiewit also uses data for the Life Saving Action (LSA) program, which draws from 60 million hours of data to prevent job site incidents. It works by using data to identify the riskiest categories of work, then gives context for what project teams can look out for to stay safe.

Kiewit has studied the effects of putting the data into action.

"We wanted to see the impact if someone goes through a project site and assesses it — to see if LSA identified risk behaviors are happening," said Pappas. "We found there is a corporate reduction in serious incidents by all projects meeting the corporate standard assessment rate."

"The team discovered that on the day an LSA Assessment is done, the site has a five time less likelihood of having an incident compared to a day when they don't do a single assessment," he added.

The Associated General Contractors of America (AGC) awarded Kiewit first place for the Safety Risk Forecast tool during the 2022 Construction Safety Excellence Awards (CSEA) for its commitment to safety and occupational health management and risk control.

With that discovery, Kiewit is now gearing its tools to help project teams understand how many LSA assessments should be done since it appears to suppress severe incidents.

"The LSA program is well-established on our projects, and we have the technology at our fingertips to assess ourselves, grow and improve," said Kiewit Infrastructure Co. Senior Vice President Bill Bodnar, a senior operations leader for the organization.

The Kiewit data services team is also examining how to use data to prevent job site fatalities. It has built a Fatality Study using data from fatalities that have happened over the past six decades. It breaks down each project and the rate at which they are most likely to have a fatality. Historically, the accuracy of the data is at a 50% error rate.

The report is provided to leaders who can enact change in the identified risk areas.

Analyzing, understanding and acting on all of this data will continue to be an important part of Kiewit's pursuit of its goal of Nobody Gets Hurt.

"As we look as safety leaders in the organization and try to look for different things to truly get us to the next level in safety, these data solutions are going to help us do that," said Edsen.

LOOKING FORWARD

Stanzel feels inspired for the future when she is helping build data driven tools requested by employees out in the field. She sees her role as walking hand-in-hand with field employees to be safer and more efficient using the tools the team creates.

"When I drive by a Kiewit construction site, all I can think of is the models that our team has built to help make the field as successful as possible," she said.

Since Stanzel joined the data scientist team in 2021, the team has grown significantly.

"To be a construction company that focuses on data-driven decisions with that many data scientists shows Kiewit is paving the way in the industry," she said.

Stanzel believes they are just scratching the surface on what's available in Kiewit databases.

"This makes me excited for the future because if we're able to extract some of that data and transform it in the way we need to in order to model it, then we will be in a tremendous position to further help the business."

Pappas agrees with Stanzel's outlook and noted the company is putting the time, resources and investment into unlocking the full potential of the data it owns.

In the future, Pappas sees Kiewit harnessing data-driven innovation to offer client solutions, such as pioneering new markets with cost-efficiency through risk-taking supported by algorithms and AI.

"Thoughtfully managed data-driven algorithms will bring about unparalleled accuracy in decision support that we have never experienced in our industry," he said. "I'm excited about where the tools we're building will take us." **K**

HARVESTING THE SUN

Solar power is the fastest-growing source of new energy in the country, according to the U.S. Department of Energy. With over 50 solar projects completed in North America over the last 15 years, it's also a burgeoning sector for Kiewit.

The Madison Fields Solar Project is the latest of several solar jobs for Kiewit Corporation and its subsidiaries in Texas, Nevada and now central Ohio. Located in Pike Township in Madison County, Ohio — about 30 miles west of Columbus — the project is a 234-megawatt solar-powered generating facility.

The facility, which will take up about 1,100 acres of a 1,932-acre project area, is expected to generate power for up to 35,000 households when it goes online.

Working with project owner Savion Energy, Kiewit Power Constructors Co. (KPC) has been leading an EPC (engineering, procurement and construction) contract since November 2022.

The project scope includes 15 miles of access roads to the power blocks, driving 80,000 piles to support the racking system that holds and tracks the photovoltaic (PV) modules, installing 420,000 bifacial PV modules to produce power, running over 2 million linear feet of DC and AC cable and placing 45,000 linear feet of permanent fencing.

NIMBLY NAVIGATING CHALLENGES

Turning the job over on a compressed schedule — only 13

months from breaking ground to pushing power back to the grid — meant finding nimble solutions to challenges.

When work began on the access roads to be used by construction crews and eventually by facility personnel, fickle winter weather meant temperatures could swing from minus 10 degrees Fahrenheit to 60 degrees in less than a week.

"We had a lot of freeze-thaw cycles through December, January and February, so it was really a struggle just to build access to our work," said Project Manager Nick Schiegner.

At times, the cement didn't have enough time to hydrate and cure prior to freeze-thaw conditions taking place, resulting in a substandard reaction.

The solution: adding quicklime, a chemical compound derived from natural limestone deposits to the mix to kick the cement into heating mode and the right consistency. To protect the surface, they used 5-inch-thick hard plastic matting for temporary craft parking.

UPDATING THE GAME PLAN

Accommodating equipment delivery delays was another challenge.

Working closely with the project owner, the team knew in advance that the PV modules, which collect sunlight and generate power, would be delayed.

"We have a really good rapport and relationship with the client," said Schiegner. "They notified us immediately of any issues and we were able to pivot and update our game plan."

That ability to pivot was thanks to training the crews on other tasks while they were waiting, said Hunter Harlow, electrical general superintendent.

"We were very strategic with saying 'Yes, we've got a crew of guys that does the scope of work, but we can cross-train these guys to do this other scope of work.' It was easy for us to leverage different scopes, and where we did have material, we could start work."

SOLAR PROCESS:
FROM THE PANEL TO THE GRID

BIFACIAL SOLAR PANELS
Generates DC power from both sides of the panel while receiving sunlight.

COMBINER BOX
Power is transfered from the panels through DC feeders to the combiner boxes.

INVERTER
DC power is received and then inverted into AC power.

SUBSTATION
Substations receive the AC power and then transfter the power to the grid.

GRID
The grid distributes the power to homes and businesses.

STAYING AHEAD OF SCHEDULE

The toughest stretch of the schedule was undoubtedly the push at the end to commission and performance-test the facility, said Schiegner. "With a mere three months between the plant backfeed availability to substantial completion, we knew we had to think outside the box."

The team mobilized a 4MW equipment package, complete with generators, transformers and a load bank, known as a grid emulation system. It would imitate backfeed power and grid-loading capacity to start the commissioning process six weeks prior to backfeed.

With the equipment set up near the project's substation, the team was able to commission each circuit one at a time, completing many activities ahead of schedule.

Construction Manager Allan Fuhs also credits KPC's experience with another recently completed solar project with helping the job be successful.

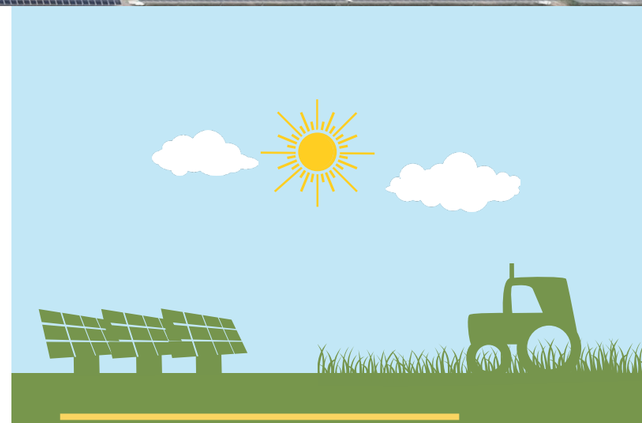
WORKING WITH THE BEST

"In the world we live today, getting the right people here to work is tough, not just in the middle of Ohio but across the country," Fuhs said.

About 13 foremen followed the job from another project to Madison Fields, which meant little retraining was needed.

"The best thing about knowing foremen in central Ohio, they know a lot of great people that are willing to come out here and help us out," Fuhs said.

He says he's proud of the team that they put together. "They're only going to want the best to work with them and we only want the best to work with us." K



The best of both worlds

An innovative pilot project at the Madison Fields Solar project offers new ways to look at the future of farming in the form of agrivoltaics.

A combination of "agriculture" and "voltaics," the word means using land for both agriculture and solar photovoltaic energy generation.

Four blocks have been set aside at Madison Fields to be designated for agrivoltaics, said Hunter Harlow, electrical general superintendent.

It's an exciting project to be part of, Harlow said. "For us, this is the first project where we've had four blocks like that and it's kind of a test bed for our client. If it's wildly successful, they're definitely going to be looking at doing that on a much larger scale for some projects down the road."

Madison Fields' owner, Savion Energy, is partnering with researchers from Ohio State University to study the potential for hay and alfalfa production with solar grazing. The team recently was awarded a grant from the U.S. Department of Energy to support this research.

FROM FEED, FEL AND FEASIBILITY TO FID

How Kiewit does Project Development

Kiewit's project development processes and expertise help clients make good decisions based on detailed project scope definition and early cost and schedule certainty.

There's plenty of lore about big ideas that originate as something quite simple.

A note on the back of a napkin kick-starts a new creative endeavor or business venture.

So, what happens next? How do you get those ideas off the napkin — or the pages of a notebook, the whiteboard of an office, the notes app in a phone — and turn them into something that has a legitimate shot at becoming real?

In the world of energy and industrial capital projects, it's a phase called project development. Increasingly, clients are turning to Kiewit during this phase to help advance their vision from initial idea to something worthy of a final investment decision (FID). The objective is to increase a project's scope definition to provide cost and schedule certainty and a high probability that it meets the required business plan objectives.

"As we've continued to grow our engineering business, clients are gravitating to Kiewit for project development support," said Kiewit Engineering Group Inc. President Dan Lumma, noting that the company's revenues in project development have increased more than tenfold since 2021.

Clients range from some of the largest oil, gas and chemical organizations in the world, to new startup companies. Many of them are looking to develop solutions to further energy transition and sustainability efforts to build a greener economy. Production facilities for hydrogen, ammonia, methanol and other lower carbon intensity fuels; carbon capture solutions for power and industrial plants; mineral processing facilities; and manufacturing facilities that produce goods — like compostable takeout containers — from more sustainably sourced materials are among the many projects Kiewit is supporting.

Clients vary in terms of their level of understanding of the project development processes.

"Some of our clients know exactly what they want out of the process and have higher expectations," said David Newton, director of Kiewit's oil, gas and chemical engineering operations. "But we also work with investors who come to us, and engineering is not what they do. They're trying to develop investment packages and need our help to determine if an idea is cost effective and if it matches their business model to proceed forward."

Feasibility studies, front end loading (FEL) and front-end engineering and design (FEED) are common project development models that Kiewit completes for these clients. A feasibility study is a high-level suitability investigation for a client's project concept used in the early stages of project development. FEL, as defined by Association for the Advancement of Cost Engineering (AACE), is a phased development process with client approval gates occurring through phases. FEED often follows a feasibility study, or pre-FEED, and includes basic engineering and design to advance project definition.

The models have phases that start with conceptual design, which leads to further scope development before completing a final project definition for FID. The project definition is built on three major outcomes: engineering deliverables, an engineering, procurement and construction (EPC) schedule, and price.

The overall process is very iterative.

"It's not a smooth curve," said Lumma. "You do things and then undo them. You go down one road and then another. It's a very iterative process to figure things out."

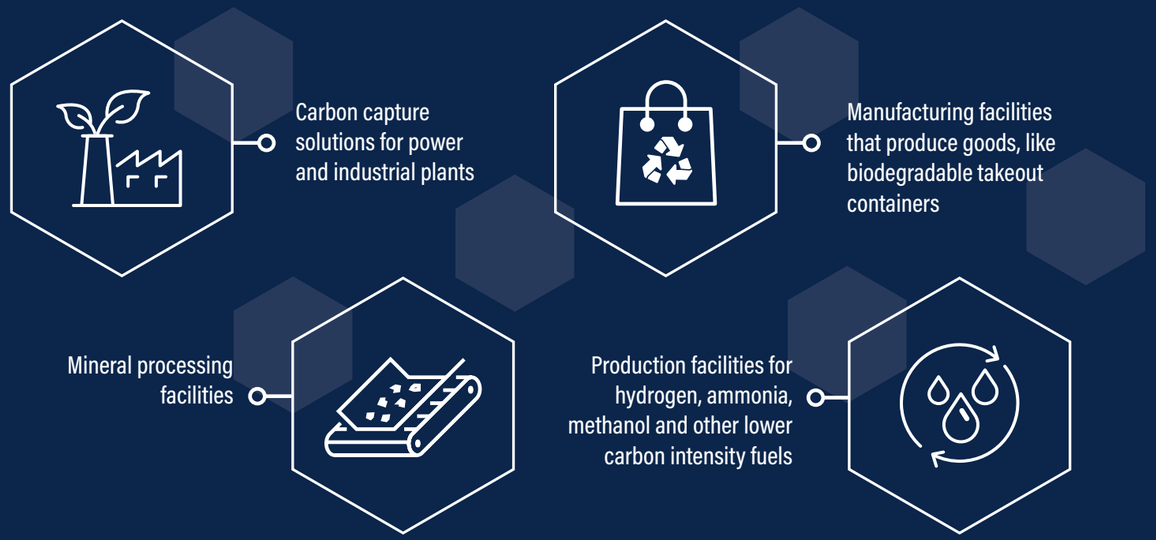
This allows Kiewit and clients to think creatively through many possible paths to meet the business objective. What would happen if we selected a different site? Laid the plant out in a different configuration? Used different technology or equipment?

Stage gates throughout the project development timeline provide opportunities to evaluate deliverables in multiple phases. These stage gates are a time to course-correct and make decisions to move forward down a particular path. Sometimes, it leads to a decision to take an off-ramp and not proceed with the project, if it becomes clear business objectives can't be realistically met.

A key differentiator between Kiewit and other firms performing project development work is the company's experience self-performing construction. The historical data on costs and schedule are a huge advantage for project development.

"We're often selling to our clients that we engineer with construction in mind, because in North America, one of the largest cost drivers is the construction costs due to labor," said Newton.

Types of projects in development



What is project development?

Project development is advancing a client's vision from an idea to a final investment decision by increasing a project's scope definition to provide cost and schedule certainty.

IDEATION
Assessment and scoping that establishes business objectives and high-level strategy to execute the opportunity

CONCEPTUAL DESIGN
Define the opportunity and evaluate options to support business plan objectives

SCOPE DEVELOPMENT
Select the preferred option, then document and lock the scope of work for the opportunity

PROJECT DEFINITION
Basic engineering and design of preferred option to define the final scope, cost, schedule and risks

PROJECT EXECUTION
Detailed engineering, procurement, construction and commissioning (EPCC) to meet contract

Kiewit Engineering Technical Summit drives conversations on fresh ideas and innovative thinking

Kiewit's Chief Engineers Council sponsors the annual Kiewit Engineering Technical Summit. Kiewit engineers present project case studies, innovations in technology, and examples of Kiewit's holistic, integrated approach to projects that leverage the full complement of the company's engineering capabilities.

Each day of the three-day event features an external keynote presentation highlighting the changes and trends in Kiewit's markets.

For Kiewit engineers and external attendees, the summit provides an opportunity to share innovations, consider how Kiewit's markets will change in the next 5, 10 or 20 years and discuss how Kiewit can prepare to meet the needs of a rapidly evolving marketplace.

Attendees can earn professional development hours. Additionally, it provides presenters with opportunities to continue to develop their presentation skills and demonstrate their expertise.

While Kiewit's engineering teams initiate its project development endeavors, construction professionals are brought in early to provide input and perspective for field execution.

"We get construction operations involved as soon as possible," said Brian Kearns, vice president of project development for Kiewit's industrial and water engineering team. "It starts with high-level, cursory involvement, but construction operations gets much more involved as we get to FEL 2 and beyond."

"Once we get to a pre-FEED or FEL 2, we'll get construction folks involved for discussion on things like concept for modularization, traffic and logistics for a workers' camp, and optimizing crane access," said Newton. "Then as we get closer to FEL 3 or full FEED, we get into more detail to confirm our construction execution plan and schedule."

As clients look beyond the project development phase, past FID and into project execution, construction experience as a differentiator becomes even more apparent. For clients, the opportunity to convert project development contracts to EPC contracts when an FID is approved allows for a smooth transition from into project execution.

"Traditionally there's a risk to a client that there are going to be changes down the road due to constructability efforts that drive back to 'the engineer didn't know,'" said Kearns. "That risk is reduced with a contract conversion, and it can increase the speed to market. We also bring to the table a consistency of being involved from beginning to end that carries a lot of weight."

Phil Welsh, executive vice president of Kiewit's power engineering group, oversees a team focused on project development of carbon capture solutions. The consortium of Kiewit subsidiary TIC – The Industrial Company and Mitsubishi Heavy Industries America engineered, procured and constructed the Petra Nova Carbon Capture Project, the first in the United States. Though Petra Nova wasn't a project development effort for the Kiewit organization, the EPC project execution experience carries a lot of weight with Welsh's clients.

"When we're designing projects for companies with these first-of-their-kind technologies, they want the comfort of knowing the people building their project are experienced and build large projects all the time," said Welsh.

Kiewit's leaders are focused on continuous improvement, and employee development is an important focus. They're committed to ensuring employees continue to gain the experience and expertise they need to be successful in a project development environment and understand how those experiences benefit their personal careers. Employees can pursue advanced degrees and participate in industry events, organizations and internal committees. Kiewit's Chief Engineers Council is instrumental in leading these employee engagement efforts.

One of the major selling points for employees comes back to one of the same differentiators for clients: Kiewit's ability to not just engineer these projects — but also build them.

"People can come to Kiewit and be part of projects from the earliest development phases and see them move all the way to project execution and support it getting built in the field," said Lumma. **K**

"People can come to Kiewit and be part of projects from the earliest development phases and see them move all the way to project execution and support it getting built in the field."

DAN LUMMA
President, Kiewit Engineering Group Inc.