Kiewit

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KIEWAYS

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/wastewater; industrial; and mining. Kiewit had 2018 revenues of $9 billion and employs 20,000 staff and craft employees.

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KIEWAYS
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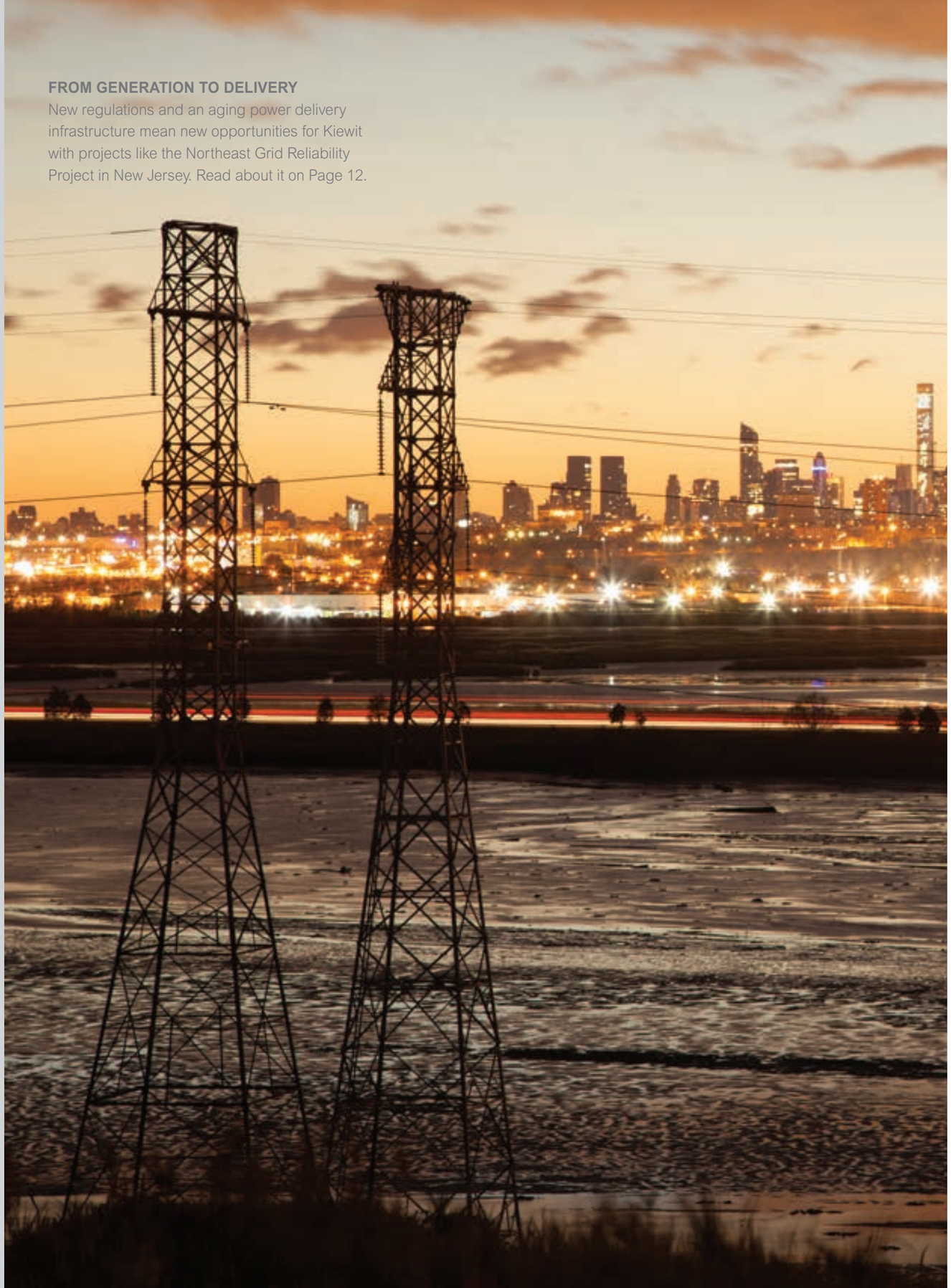
FROM GENERATION TO DELIVERY
New regulations and an aging power delivery infrastructure mean new opportunities for Kiewit with projects like the Northeast Grid Reliability Project in New Jersey. Read about it on Page 12.



ADAPTING FOR A COMMON GOAL

Adaptability is an important part of our culture here at Kiewit. Our company's legacy tells a good story about the value in flexibility and embracing challenge as opportunity. But the impact of changing markets, technologies and workforces reaches beyond Kiewit and our industry peers. Those things also affect our clients, so it's our duty to help them adapt as well.

Take the power market for example. On Page 12, learn how Kiewit helps utilities owners cope with new regulations, aging infrastructure and looming workforce shortages in a market that's quickly shifting from power generation to power delivery.

Many of our clients battle challenges like budget constraints, schedule requirements and unique maintenance needs. On Page 6, we show you how Kiewit meets project owners where they are with alternative delivery models best-suited for the situation. Add project complexity and geography to that list of challenges. In this issue, we take you to Las Vegas where our Project Neon team used accelerated construction methods to deliver the largest transportation project in state history — on a stretch of interstate used by 300,000 commuters every day (Page 18).

We can't talk about complexity and urgency without mentioning the Lake Oroville Spillways Emergency Recovery Project. It warrants a second appearance in Kieways with Phase 2 on Page 8. Don't miss the side-by-side comparison of the two spillways (Page 11) to see the quantities it took to ensure the safety of the surrounding community.

Ultimately, we adapt to help our clients adapt. It's this mutually beneficial partnership that keeps us on our toes and everyone moving forward.

BRUCE GREWCOCK
Chairman and CEO

THE MILLION CUBIC YARD CLUB
More than 1 million cubic yards of roller-compacted concrete was placed on the Oroville Spillways Emergency Recovery Project. Learn more about the massive quantities involved in this fast-paced emergency repair project on Page 8.

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/WASTEWATER

OUR VALUES:

- PEOPLE
- INTEGRITY
- EXCELLENCE
- STEWARDSHIP

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ALASKAN WAY VIADUCT DEMO BEGINS

In Seattle, Kiewit Infrastructure West Co. started demolition of the Alaskan Way Viaduct in February. The work is expected to take about six months. Originally built in the 1950s, the viaduct was replaced by the recently completed SR 99 tunnel.

BIRDSBORO FIRST FIRE

In Birdsboro, Pennsylvania, the Birdsboro natural gas-fired power plant marked its first fire in early February. The EPC project, led by Kiewit Power Constructors Co., features a single-shaft 1x1 configuration, comprised of a gas turbine, a heat recovery steam generator and a steam turbine.

TURCOT AND CENTRAL 70 PROJECTS HOST WCLS

In January, Kiewit hosted its Women's Construction Leadership Seminar (WCLS) in Denver and Montreal. In total, 67 collegiate female leaders studying construction and engineering attended the two-day events. Attendees toured a project site with project management — Central 70 in Denver and Turcot in Montreal — and discussed what it takes to be successful in construction and engineering during a Q&A session with some of Kiewit's female construction and design engineers. Attendees were nominated by their professors. Following the event, one participant said, "We all need a boost now and again. For me, the conference was so much more. I feel empowered. I built relationships and met leaders that I can genuinely reach out to." Read more on the Kiewit Newsroom.

WRAPPING UP "RAISE THE ROADWAY"

All lanes are open in both directions on the Bayonne Bridge between Staten Island and New Jersey. The project, dubbed "Raise the Roadway," raised the Bayonne Bridge from 151 feet to 215 feet to accommodate larger, more efficient vessels entering into marine terminals. A joint venture of Skanska and Kiewit Infrastructure Co. completed construction.

LACKAWANNA GOES ONLINE

The Lackawanna Energy Center entered commercial operation on Jan. 15 — ahead of schedule. Located in Jessup, Pennsylvania, Kiewit Power Constructors Co. assembled its largest staff and craft workforce ever to complete the project. "It's been an excellent experience partnering with Invenergy, who values worker safety and project execution as much as we do," said Kiewit Corporation Executive Vice President Dave Flickinger. "We're proud to have been part of the team that successfully delivered this important project."

U.S. 34 REPAIRS PROJECT IS ENGINEERING NEWS-RECORD'S BEST

Engineering News-Record named U.S. 34 Permanent Repairs its Project of the Year. Crews rebuilt U.S. 34 through the Big Thompson Canyon between Loveland and Estes Park, Colorado. The repairs were required after the highway was destroyed in a major 2013 flooding event. The new alignment will protect the roadway if future flooding events occur.

A ROAD FOR ALL SEASONS

Work on the Tlicho all-season road in the Northwest Territories of Canada is scheduled to begin in the fall. The two-lane, gravel highway will be 97 kilometers in length. The new road will provide three Tlicho communities with year-round access to the North Slave Region and Southern Canada. Access is now limited to three months of the year. The government of the Northwest Territories and Tlicho government are working together on the project and selected North Star Infrastructure to help them deliver. North Star Infrastructure is a consortium consisting of Kiewit Canada Development Corporation, Peter Kiewit Sons ULC, Hatch Corporation and Thurber Engineering Ltd.

THREE MORE BRIDGES TO PROSPERITY

Three groups of Kiewit employees volunteered with Bridges to Prosperity early this year. The teams traveled to Bolivia, Uganda and Rwanda to help build footbridges in rural communities. Bridges to Prosperity's approach is to design, build and maintain durable and sustainable bridges to connect the rural last mile to the rest of the world. The organization partners with construction and engineering organizations like Kiewit to complete this work. Read more about these three Bridges to Prosperity projects in the next issue of Kieways.

WANT TO LEARN MORE?

KIEWIT NEWS

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ALTERNATIVE DELIVERY MODELS CATCHING ON

To optimize project outcomes, a growing number of Kiewit's clients use alternative delivery models for their projects. Complexity, budget constraints, opportunities for design/constructability innovation, schedule optimization and maintenance considerations all play a part in the decision.

"Quite often when a critical mass of these features is in play, some form of an alternative delivery method provides the most benefit," said Kiewit Senior Business Development Manager Joe Wingerter.

Using an alternative delivery model, contractors like Kiewit collaborate with the client team and stakeholders earlier on constructability, technical innovation and risk mitigation, among other key areas. There are many different types of alternative project delivery models, but they all contain a common thread of collaboration, innovation analysis, transparency and a 'what's-best-for-the-project' mindset," said Wingerter.

Here are a few Kiewit projects recently completed or underway using alternative delivery models.

W.A.C. Bennett Dam
British Columbia

Early Contractor Involvement (ECI)

Peter Kiewit Sons ULC completed upgrades to BC Hydro's W.A.C. Bennett Dam near Hudson's Hope, British Columbia, in August 2018. Construction started in September 2016 following an initial **early contractor involvement (ECI)** phase.

In a completion ceremony, Kiewit and BC Hydro leadership acknowledged the ECI model's success.

"We came together early with Kiewit, using an early contractor involvement procurement process. This allowed us to take more time up front to mitigate and plan for further risk and to work closely on design and planning," BC Hydro President and Chief Operating Officer Chris O'Riley said. "This process put in place safeguards, built a strong relationship and helped establish an effective project plan."

Peter Kiewit Sons ULC Senior Vice President Ryan Tones said the ECI model helped the project team engage with key project partners earlier.

"We were able to engage with First Nations partners early to finalize scopes of work," Tones said. "This positive relationship helped the team overcome challenges and make the project a success."

Design-build

Tennessee Department of Transportation's (TDOT) Interstate 440 reconstruction from Interstate 40 to Interstate 24 is a **design-build** project awarded to Kiewit Infrastructure South Co. I-440 is one of the heaviest traveled corridors in the state, leading TDOT to look for the fastest project delivery. Upon completion, there will be three lanes of travel for 7.6 miles in each direction along I-440.

"Using the design-build contracting method allowed us to explore every available option to deliver this large, complicated project," said TDOT Commissioner John Schroer in a news release announcing the contract. "We believe the process led to several innovative concepts, and the winning proposal saved more than a year of construction time."

The project's heavy construction operations began in March. Construction will take just over 15 months.

Engineer, Procure, Construct (EPC)

In Kiewit's energy market, the **engineer, procure, construct (EPC)** contract model has increasingly become more common and standard for complex projects. For many years, it has been used to successfully deliver large, combined-cycle power plants. It is also being used on oil, gas & chemical projects. In December, Venture Global LNG Inc. announced it selected Kiewit to deliver its Calcasieu Pass LNG export project being developed in Cameron Parish, Louisiana, using an EPC contract.

"We are very pleased to be partnering with Venture Global LNG on this important EPC project," Kiewit Chairman and CEO Bruce Grewcock said. "With outstanding commitment and talent working together, this project will be a model for supplying low-cost, clean and reliable energy to the global market.

Kingston Third Crossing
Ontario

Integrated Project Delivery (IPD)

The City of Kingston in Ontario selected Peter Kiewit Sons ULC, Hatch Ltd., and SYSTRA International Bridge Technologies to design and build its Third Crossing Project using the **integrated project delivery (IPD)** model. The Third Crossing Bridge will span 1.2 kilometers across the Cataraqui River to connect the east and west sides of Kingston.

The IPD model involves the owner, in this case the City of Kingston, more in early design validation and budget planning. Kiewit, Hatch, SYSTRA and the City of Kingston are all partners in the collaborative process. They develop project goals together and share risks and opportunities between all project parties, using a "project-first" mindset. In an announcement, the City of Kingston said it chose IPD to "deliver the project on time and on budget."

This is the first time the model is being used on a civil infrastructure project in North America.

A TALE OF TWO SPILLWAYS

It was a main spillway. It was an emergency spillway. There were dragon's teeth. There was a secant pile wall. There was structural, leveling, dental and roller-compacted concrete (RCC). Crews worked in grueling heat and under darkened skies.

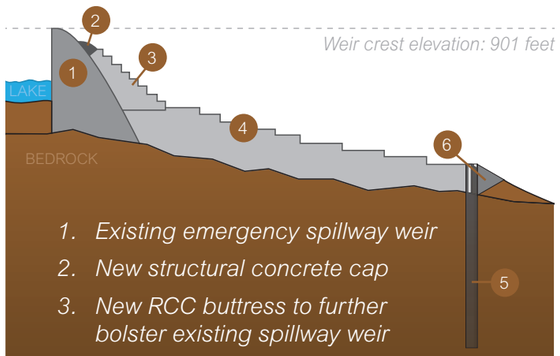
It's a tale of two spillways with one unwavering challenge — time.

In less than 18 months, Kiewit Infrastructure West Co. needed to complete an emergency repair and rebuild of two massive spillways for the California Department of Water Resources (DWR). In the Quarter 1, 2018, issue of Kieways, readers learned the story of Phase 1 of the Lake Oroville Spillways Emergency Recovery Project.

It began in February 2017 when Lake Oroville's main spillway was compromised after heavy rain and rapid snowmelt. After the emergency spillway was used for the first time, the hillside began eroding and nearly 200,000 people were evacuated from the city of Oroville and multiple downstream communities. After Kiewit bid and won the contract in 10 days and mobilized in one month, the team had less than 165 days to repair and rebuild portions of the 3,000-foot main spillway at the nation's tallest dam.

"When Kiewit finished the first phase in November 2017, the compromised 3,000-foot main spillway was back in working condition," said Project Director Todd Orbus. "But the project was only 40 percent complete. We had to wait until May of 2018 to start finishing more than half our scope."

A look at Oroville's emergency spilllway system



1. *Existing emergency spillway weir*
2. *New structural concrete cap*
3. *New RCC buttress to further bolster existing spillway weir*
4. *New RCC splashpad built with stair-step design to slow down water and lessen its erosive power*
5. *New 1,450-foot-long underground secant pile, built into bedrock at depths of 35 to 65 feet, prevents erosion and "head cutting" of the hillside*
6. *Downstream rip-rap energy dissipater*

THE MAIN SPILLWAY'S RACE AGAINST TIME

At the start of Phase 2, work on the main spillway was far from over. Crews had to demolish all the temporary walls that were erected along the spillway in Phase 1. Then a 3-foot layer of structural concrete was placed on top of the 1,050-foot RCC middle section of the chute, and the temporary walls were replaced with permanent structural concrete walls.

Crews also had to demolish and replace the top 730 feet of the spillway with structural concrete and hydro blast, and resurface the energy dissipaters (what crews called dragon's teeth) at the base of the spillway.

EMERGENCY SPILLWAY: 1.2 MILLION SQUARE FEET — BUILT IN 1-FOOT LIFTS

The emergency spillway system (ESS) is made up of a secant pile wall, splashpad and buttress — and it will prevent any uphill erosion, should the emergency spillway ever be used again.

In Phase 1, work in the ESS was focused on the secant pile wall, a 1,450-foot-long underground wall built into bedrock at depths of 35 to 65 feet. Once the wall was finished, crews could finally place RCC into the splashpad.

Crews placed 706,000 cubic yards of RCC in 1-foot lifts at a time, for a total of 1.2 million square feet — an area so big that 25 NFL regulation football fields could fit within the splashpad.

The job team processed over 2 million tons of on-site materials to crush the 1.2 million tons of aggregate required for the RCC production.

A JOB DONE WELL

Since the project began in late April 2017, more than 700 Kiewit employees worked over 1.6 million hours at Oroville. Along with Kiewit staff and crews, there were hundreds of other regional subcontractors, suppliers, vendors and DWR employees that worked at the site — all striving together toward a common goal: get both spillways built to final design by Nov. 1, 2018.

"We entered the winter season knowing we had a tremendous amount of work to complete in 2018 — nearly double the amount of concrete to place than crews completed in 2017," Orbus said. "But through extensive planning, execution, diligence and hard work, we met all of our project milestones ahead of schedule. This project is proof of what can be accomplished when you have the right team focused on a common goal."

Two spillways at a glance

TOTAL QUANTITIES

- **1.2 million cubic yards** of concrete, enough to fill more than **350 Olympic-sized swimming pools**
- **2.3 million tons** of aggregate produced by rock crushing crews for the RCC operations. This is equivalent to the weight of **23 aircraft carriers.**
- **55,000 feet** of drainage pipe. If you stacked the drainage pipe vertically, it would reach more than **10 miles high.**

EMERGENCY SPILLWAY

600,000 pounds of rebar

706,000 cubic yards of RCC

MAIN SPILLWAY

7,200 slab anchors

509,600 cubic yards of RCC, leveling and structural concrete

12.4 million pounds of reinforcing steel in the slabs, walls and dissipaters on the main spillway — enough to run a one-inch rod of steel from Portland, Oregon, to San Diego

612 concrete slabs and 204 concrete walls

4 towering energy dissipaters, or dragon's teeth, nearly 30 feet tall and 20 feet wide

POWER MARKET SHIFT

The flip of a switch. That's all it takes to turn on the lights, charge your computer or start a load of laundry. But behind the scenes there is a complex system of transmission and distribution lines, substations and other critical infrastructure.

Utility companies managing and operating these systems face tremendous responsibility and significant challenges — from new regulations, aging infrastructure and looming workforce shortages, to the impact of renewable energy on the electric grid. Fortunately, with support from engineering and technical experts at Kiewit, utilities don't have to tackle new obstacles alone.

The U.S. electrical grid consists of an estimated 55,000 substations, which serve a critical role in transporting electricity from power plants to end users.

In the past, utilities were heavily focused on investments in power generation to keep up with the growing demand from customers. As the demand leveled off, investment shifted to power delivery — the infrastructure that transports electricity from the plant to the end user. The transmission and distribution market has doubled since 2010 and is expected to hold steady with an annual investment of about $70 billion through 2022.

"We are prepared to help clients effectively maneuver through this shift, offering three valuable things," said Jon Gribble, executive vice president at Kiewit Engineering Group Inc. "We reduce risks, maximize efficiency and build confidence by providing the right people, technologies and solutions. We can offer new methods to enhance the reliability, security and longevity of the power delivery systems that people, businesses and our economy depend on."

A PEOPLE-POWERED INDUSTRY

According to the U.S. Bureau of Labor Statistics, utility company employees have had historically longer tenures than other industries. However, times have changed and the U.S. Department of Energy estimates that roughly 25 percent of employees working in the power industry will begin plans for retirement in the next five years.

"The obvious challenge is that utilities need to attract new talent and fill open positions," said Cap Fergen, distribution planning and design manager at Kiewit. "A real dilemma is the loss of institutional knowledge and hands-on system experience that long-time utility employees have accrued. That's where our team at Kiewit can help."

In a market where the pressure to deploy capital quickly continues to mount, retirement and attrition at utility companies will make it more difficult to get projects done. At the same time, safety cannot be compromised.

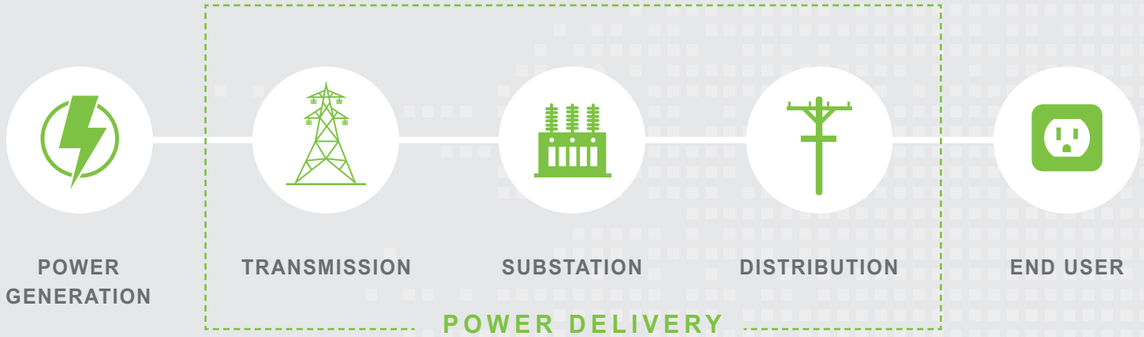
"Power lines and substations are considered a zero-error environment," said Paul Conry, business development manager. "Any design flaw or failure to adhere to construction standards exposes others to safety-related risks. Safety is more important than anything else and the backbone of a trusting relationship with clients."

A WELL-CONNECTED SYSTEM

On August 14, 2003, a faulty alarm failed to properly tip off utility operators to a downed high-voltage transmission line in northeastern Ohio. Fifty million people lost power, some for up to two days, marking the biggest blackout in North American history at an estimated cost of $7 billion to $10 billion. It was a stark reminder that the operations and assets that comprise the electrical grid are highly interdependent — a key driver behind the meticulous planning required to repair or replace transmission lines.

The path of power

Delivering power to a home or business involves a complex system of components and technology.



POWER GENERATION

A wide array of energy sources — such as natural gas, water, wind or solar — are converted into electricity at a power plant.

TRANSMISSION

High-voltage lines move electricity from the power plant to substations. The lines typically span long distances and are connected by a series of tall, large towers.

SUBSTATION

The most common role of a substation is to transform electricity from high to low voltage, which is required to safely deliver electricity to end users.

DISTRIBUTION

Lower voltage electricity flows through distribution lines that are connected directly to homes and businesses. The lines are connected by poles or buried underground and are often accompanied by transformers that further reduce voltage to ensure safe usage.

END USER

Electricity goes into a service panel in a garage, basement or utility room. The panel consists of breakers or fuses that protect wires from being overloaded while delivering electricity through wires directly to switches and outlets.

Offshore wind power generation

Kiewit has a long-standing, successful track record of adapting to changing market conditions and emerging technologies. Keeping a pulse on what's to come ultimately helps utilities tackle challenging issues, such as how to best meet new renewable energy requirements through offshore wind power generation.

According to the Global Wind Energy Council, there was a 95 percent increase in global offshore wind power from 2016 to 2017. While the majority of power generation was in Europe, the U.S. market is well positioned for exponential growth.

The U.S. Department of Energy has set its sights on using wind energy to generate 20 percent of the nation's electricity by 2030, 35 percent by 2050.

The U.S. offshore wind market continues to evolve with the development of state-level commitments. New Jersey adopted a target to deploy 3,500 megawatts of offshore wind by 2030. Both California and New York have a goal of 50 percent renewable power generation by 2030, which cannot be met by solar and onshore wind alone.

Offshore wind generation requires hundreds of turbines with individual submarine cables that connect to each other, and export submarine cables to bring power from offshore to the grid onshore. Installing turbines and cables in a marine environment is complicated. Offshore wind "farms" are generally located miles from shore, creating logistical obstacles in mobilizing equipment and crews. Long-distance submarine cables are typically installed 6 to 10 feet below the seabed to protect them from damage, requiring specialized hydraulic plow machines and installation crews.

"To meet the anticipated demand for such a niche market, we are laying the foundation for the supply chain network now," said Forest Rong, who specializes in underground and submarine transmission. "We see tremendous potential for offshore wind in the U.S. and are excited to jump into this market."

For example, to take a high-voltage transmission line (typically 345 kilo-volts or above) out of service for repairs, utilities must plan years in advance and build redundancy around the line to avoid potential outages. Even lower-voltage lines require a careful, coordinated plan, since taking it out of service might overload other lines.

To mitigate these risks, Kiewit uses project management technologies that integrate detailed planning, implementation and monitoring.

"To maintain service to customers, utilities have a limited window of time to schedule outages for repairs or replacement of transmission and distribution lines," said Erik Brinkman, who heads up line construction for Kiewit's power business. "Using comprehensive, real-time project management tools, we are able to give utilities the confidence and certainty they need."

Kiewit's project management technology can also help utilities replace aging transmission and distribution lines more efficiently. According to the American Society of Civil Engineers, the majority of power lines were installed 60 or 70 years ago, operating well beyond their 50-year life cycle. With roughly 640,000 miles of high-voltage transmission lines in the U.S., repairing or replacing the lines is a huge undertaking.

"We've expanded our ability to self-perform line construction work to help expedite line replacements," adds Brinkman. "With our project management tools, self-perform capabilities and partnerships with local contractors, we are equipped to tackle hundreds of miles of distribution lines."

DISRUPTING THE GRID

The increased use of renewable energy, electric vehicles and energy storage is putting new demands on the existing grid. It presents both concern and new opportunity.

A large wind farm in rural Kansas would require additional transmission and distribution lines to transport electricity to where it's needed most, in more densely populated areas. Peak demand could be more effectively managed using applications that couple solar power generation with energy storage, which captures energy in sunny, high-production periods and stores it for later use.

The electrification of vehicles (EV) is gaining traction in the transportation and logistics industry. What was once relegated to cars or personal vehicles has evolved into trucks and delivery vehicle fleets. As a point of reference, a fast-charging station serving 20 cars simultaneously would draw approximately 2 megawatts, or enough to power 1,000 homes. Multiply that to account for a fleet of 100 vehicles, which could have an enormous impact.

"To accommodate EV fleets without comprising the grid's integrity, clusters of charging stations will need to be installed quickly," said Sam Scupham, who focuses on design engineering aspects of emerging markets for Kiewit Engineering Group, Inc. "We have established partnerships with EV charging station manufacturers to help streamline the process and can leverage the expertise of our engineers to work through the intricacies of connecting to the grid."

Many utilities are trying to determine how to take advantage of energy storage to enhance their systems. Kiewit is helping evaluate new technologies as they are introduced and analyze overall capital and lifetime costs.

One of the most practical applications is using energy storage to hold energy back and reduce the load on an older transmission line, eliminating the need to replace the line. A similar approach is being used by energy-intense manufacturing facilities to help curtail higher rates during peak-usage times. Using energy storage in conjunction with gas turbines at power generation facilities is also being explored as a way to reduce operational costs and wear and tear on the equipment.

"We are truly a partner to our customers and want to help them figure out how to use this technology to their benefit, from a quality and economic perspective," said Reid Strain, energy storage manager. "We are very purpose-driven. We want this to succeed. We want you to succeed."

1. The majority of power lines in the U.S. were installed 60 or 70 years ago, operating beyond their intended life cycle and in need of replacement. 2. Using horizontal directional drilling, Kiewit is installing new underground distribution lines as part of a major renovation project along the Detroit River.

A WINNING ROADWAY

Las Vegas commuters will likely feel they've hit the jackpot this summer when Project NEON is complete. Three years in the making, the design-build project led by Kiewit Infrastructure West Co. is transforming a key roadway near downtown Las Vegas.

With a price tag of nearly $1 billion, Project NEON is the largest and most expensive transportation public works project in Nevada's 154-year history.

For northbound I-15, travel speeds will increase from 28 miles per hour to 60 miles per hour. For southbound I-15, average speeds at peak morning and evening drives will increase from 18 miles per hour to 56 miles per hour.

For years, the 3.7-mile stretch of I-15 between Sahara Avenue and the "Spaghetti Bowl" interchange has tested drivers' patience.

An estimated 300,000 commuters — that's one-tenth of Nevada's population — travel this thoroughfare daily. The corridor sees 25,000 lane changes per hour. An unlucky three vehicles are involved in a crash every day.

It's the most heavily used roadway in the state of Nevada. And with traffic in the area expected to double by 2035, city and state officials knew a fix was in order.

The vision for Project NEON was born nearly 20 years ago. By 2013, the Nevada Department of Transportation (NDOT) was accepting bids for the design-build project.

Kiewit's winning proposal, featuring an accelerated completion schedule that beat the nearest competitor by six months, set in motion in July 2016 a transformation that will not only impact local traffic but also interstate commerce from Los Angeles to Salt Lake City.

BEYOND BUSINESS AS USUAL

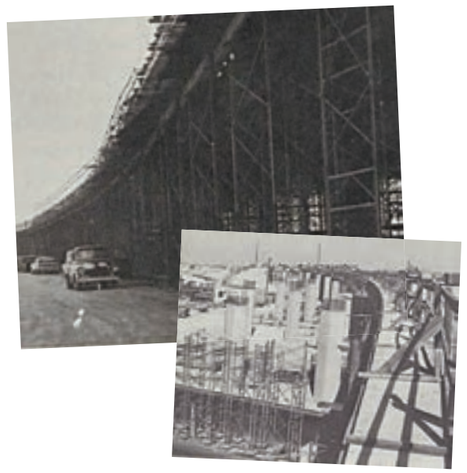
Project NEON involves much more than just rebuilding 3.7 miles of roadway.

Kiewit's work includes building an 81-foot-tall, 2,606-foot-long High Occupancy Vehicle (HOV) flyover bridge, as well as converting two existing I-15 express lanes into a general purpose and HOV lane.

Also included in the project is a diamond interchange designed to improve access to downtown, the city's medical district and Symphony Park. Several "braided" ramps will reduce merge and weave traffic on I-15.

A page from history

Kiewit built the original Spaghetti Bowl interchange in the 1960s. The structure consisted of four lanes of viaduct that routed adjacent completed freeways into the downtown business district. Total contract amount: $2.8 million.



To meet every milestone on time and on budget, the Kiewit team knew this project needed to go beyond business as usual.

That meant bringing team members together for the usual play-of-the-day midday meeting. Project foremen and superintendents also gather in the morning; later in the day, the night shift and their foremen and superintendents meet.

These three-a-days happen up to seven days a week. "They're necessary to the choreography required in a relatively small footprint like this one," said Structures Manager Chris Miske.

"There are just a lot of details and parts and pieces. It's important that we communicate and coordinate with other disciplines prior to the start of work so they all know when we're working in that area, and how big our access and work areas need to be so we can all co-exist."

Dale Keller, NEON project manager for NDOT, says he appreciates the extra communication Kiewit has brought to the job and it shows every day.

"Kiewit is definitely the most organized contractor I've ever worked with. They've really exceeded expectations on allowing us to participate in the play-of-the-days, providing input where necessary and talking with staff as well as the crews in the field."

CHANGES ON THE FLY

There's another equally crucial kind of choreography on this job.

That involves the Maintenance of Traffic (MOT) phasing — the plan that keeps traffic moving during construction by designing effective alternate traffic patterns and keeping drivers updated about changes.

Being co-located with Atkins, the lead project designer, has made a difference in how the entire team communicated MOT design changes to work well with construction, said MOT Manager Mike Whittick.

"We always had free access to help improve our MOT designs or change them so they would work better with construction. Nothing was locked in, and our relationship with NDOT allowed us to make changes that would make improvements relatively on the fly after approvals."

That relationship, Whittick said, made it possible to shrink the timeline for MOT closures in some cases to as little as

PROJECT NEON Snapshot

A look at what it took to transform the busiest roadway in the state of Nevada.

ASPHALT PAVING:
1.8 million square yards =
28 lane miles

EXCAVATION/EMBANKMENT:
1.06 million cubic yards =
324 Olympic swimming pools

BRIDGE STRUCTURE CONCRETE:
69,000 cubic yards
(excludes sub concrete) =
21 Olympic swimming pools

ROADWAY PCCP (CONCRETE PAVING):
247,812 square yards = **51 acres**

RCB (REINFORCED CONCRETE BOX):
7,620 feet = **1.4 miles**

ROADWAY BARRIER:
119,179 linear feet
22.5 miles

REINFORCING STEEL:
15.3 million pounds = 7,670 tons
Outweighs the Eiffel Tower by 300 tons

MSE WALLS:
619,277 square feet =
14 acres of surface area

E/L/B RCP PIPE:
43,462 linear feet = **8 miles**

510 INLETS AND 146 MANHOLES

CRAFT JOBS:
500 total

BRIDGES:
24 bridges demolished,
30 new bridges built

BEFORE:
Average commute speeds of **23** miles per hour

AFTER:
Average commute speeds of **58** miles per hour

overnight. The resulting changes allowed the Kiewit team to complete closures sooner, helping to avoid big impacts to drivers.

SPEEDING UP CONSTRUCTION TIME

Achieving substantial completion by summer 2019 has also involved implementing some accelerated construction methods, like the type of bridge girder used for the majority of the 30 super structures.

Constructing typical steel girders requires a lot of lead time. Using a precast concrete girder instead can shorten construction time considerably.

For projects like these, Kiewit uses a California wide flange girder. Its shorter, wider base meets the height restrictions while minimizing the number of girders needed for each bridge.

“Normally, we figure out a way locally to get our precast concrete girders, but NDOT hadn’t really used that method and nobody in Las Vegas was set up to construct them,” said Jody Schott, project director.

Kiewit looked beyond geographic boundaries and brought in nearly all the girders from Arizona.

“That was a huge effort to coordinate that,” Schott said. “They came all the way across Arizona with Arizona Department of Public Safety officers escorting them in front and back.”

The decision has paid off, shaving as much as two months off a traditional schedule. In total, 422 precast girders will be set, including the longest precast components in the state of Nevada at 168 feet.

A FIRST-OF-ITS-KIND SYSTEM

For one particular part of the project, Kiewit’s work has extended beyond the main footprint to about 10 miles of the I-15 strip and the U.S. 95 corridor.

1. Pier caps for the HOV flyover structure. 2. Carpenters build formwork for a cast-in-place soffit. 3. Planning Manager Chris Miske walks through the next day's planned work at the Play of the Day meeting.

The team has been involved in NDOT's implementation of a first-of-its-kind active traffic management system (ATMS) for the state.

The system uses full-color, high-resolution dynamic message signs over the roadway — think a stadium scoreboard — to communicate real-time information about alternate routes, incidents and traffic restrictions.

ATMS detectors collect data on average speeds, pinpointing incidents. Drivers see warnings about problems ahead and suggested alternate lanes to use to avoid the congestion.

Installing the structures that hold the signage has been no small job.

"The screens are much larger than what we normally install," said Schott. "It's been hard work just because the foundations that hold those signs are pretty substantial."

That's not all, said Miske.

"There's a foundation in the median and on the shoulder for each sign structure — that's 42 signs total. You have to coordinate a lot of lane closures and full closures of the freeway in order to get it put together. And then you have to work with wiring it and making sure the system is fully integrated."

A SURE BET

As completion grows nearer, Whittick reflects on the progress of the team so far.

"We're in the entertainment capital of the world here, and we have a lot of people we need to keep happy and coming into their businesses.

"We've just done a really good job so far of meeting our schedules, meeting our big dates and keeping traffic impact down. We've heard a lot of good things from the traveling public, from the city, and from the state."

You can bet the Kiewit team will look back on Project NEON with pride and have some best practices to take to the next job.

Working closely with emergency responders

Emergencies happen all hours of the day.

So the Kiewit team wanted to keep all emergency responders up to date on Project NEON traffic closures to make sure they were able to respond to calls quickly.

"From day one, we aimed to get buy-in from them on this project and let them know how we planned to get them through as fast as possible with no time delays," said MOT Manager Mike Whittick.

He and others developed strong working relationships with the Nevada Highway Patrol (NHP), the Las Vegas Metropolitan police and fire departments, ambulance drivers and hospital staff.

Kiewit also kept NV Roads in the loop. The group supports the NHP, the Regional Transportation Commission, the Metro Police Department and 911 operators.

In turn, local responders have been quick to react when the team needed their help.

"We have a good ally in all of those groups," Whittick said.