Preparing for electric grid hardening

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What's driving the need for reliable and resilient electrical infrastructure?

- Natural disaster — As of October 11, the U.S. has been affected by 15 weather/climate disaster events in 2022 with losses exceeding $1 billion.
- Shift in energy generation — Renewable energy power plants are on the rise and need to connect to the grid.
- Increasing energy demands — Electric vehicles and construction equipment are trending upwards. Our current electrical infrastructure is not prepared to keep up with this demand and deliver fast-charging options.

https://www.ncei.noaa.gov/access/billions/

Natural disaster

- Reduction in impact – the ability to mitigate the size and duration of an outage
- Withstand capability
  - Ability of utility to manage disruptions
- Quick response to restoring service

https://library.e.abb.com/public/7a64680d31a6477985299cba9612d7c5/9AKK108466A7171_Whitepaper_Grid%20Hardening_v2%20(Utilities%20have%20options%20when%20it%20comes%20to%20grid%20hardening).pdf

Shift in energy generation

- By 2026, global renewable-electricity capacity will rise more than 80 percent from 2020 levels
- Two-thirds coming from wind and solar
  - Increase of 150 percent
- By 2035, renewables will generate 60 percent of the world's electricity.

https://www.mckinsey.com/industries/electric-power-and-natural-gas/our-insights/renewable-energy-development-in-a-net-zero-world

Energy demand increases

- Global electricity demand rises by 25 - 30% to 2030 in the Stated Policies Scenario (STEPS) and Announced Pledges Scenario (APS) due to more electric motors, electric vehicles, heat pumps and hydrogen.

https://www.iea.org/reports/world-energy-outlook-2022/outlook-for-electricity

Shared responsibility to support the electrical hardening initiative

- Utilities — Going from overhead to underground requires significant upfront costs that are recouped over time because of less ongoing maintenance costs.
- Government — Infrastructure spending (the Infrastructure Investment and Jobs Act) are helping to support the shift to renewable energy sources and its distribution.
- Contractors — Be ready with skilled labor and equipment to underground transmission and distribution lines in rural and urban areas.
- Equipment manufacturers — Outfit the industry with the equipment and technology needed to get the job done.

Government

- California zero emission vehicle regulation
  - Zero-emission vehicle requirements within ACC II are designed for new vehicles to reach 100% zero-emission and clean plug-in hybrid-electric in California by the 2035 model year
- The National Electric Vehicle Infrastructure (NEVI) program will
  - Providing $5 billion in funding to build out charging infrastructure along highway corridors
  - Filling gaps in rural, disadvantaged, and hard-to-reach locations while instilling public confidence in charging.
- States focusing on hardening in response to severe storms (Texas and Florida)
- Inflation reduction Act- Solar tax credits and a focus on domestic panel manufacturing

https://www.whitehouse.gov/briefing-room/statements-releases/2022/06/09/fact-sheet-biden-harris-administration-proposes-new-standards-for-national-electric-vehicle-charging-network/

https://ww2.arb.ca.gov/our-work/programs/zero-emission-vehicle-program/about

Utilities

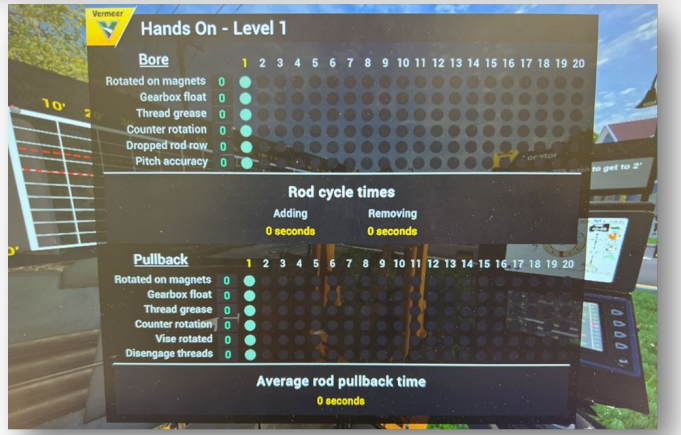
- California Public Utility Commission states converting overhead distribution to underground is up to 10 times more expensive than installing new aerial distribution lines and approximates the cost at $350 to $1,150 per foot, or $1.85 million to $6.07 million per mile.
- Pacific Gas and Electric Company (PG&E) undergrounded 180 mi (290 km) in 2022, doubling the 2021 completion.
- PG&E is planning to underground 3,600 mi (5,790 km) from 2022 to 2026.

- https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/infrastructure/electric-reliability/undergrounding-program-description
- https://www.pge.com/en_US/residential/customer-service/other-services/electric-undergrounding-program/electric-undergrounding-program.page
- https://www.pge.com/pge_global/common/pdfs/customer-service/other-services/electric-undergrounding-program/PGE-Undergrounding-Fact-Sheet.pdf

Manufacturers

- Day 1
  - Introductions and class overview
  - Pretest
  - Soil and drilling fluids
  - HDD overview
  - Pullback and machine maintenance
- Day 2
  - Bore planning
  - DCI®
  - Post test
  - Certificates
  - VR HDD Simulator demo
  - Equipment walkarounds

- Topics
  - HDD safety
  - Mud mixing
  - Calculations
  - Drill operation
  - Bore planning
  - DCI® locating
  - DCI® log-while-drilling (LWD™)
  - HDD Simulator training
  - And more



Installation method considerations

- Considerations
  - Above-ground environment
  - Ground material
  - Bundle size
  - Installation depth
  - Distances
- Open cut — There's a need for deep, wide trenches with specific fill-material requirements.
- Trenchless — In many areas, above-ground obstacles limit how much of the work can be done using open-cut methods or trenchless equipment not capable of installing large product bundles over longer distances.

Long Island Electrical transmission line project

- Long Island, New York
- Sandy soil
- 18,400-ft (5,608.3-m) electrical transmission conduit
- 800 feet between manholes
- Bore diameter: 18 or 20 in (45.7 cm or 50.8 cm)
- Product: double or triple 6-in (15.2-cm) conduit bundles
- Contractor: Eastern Utilities Services LLC and Haugland Group LLC

Equipment

- Vermeer D100x140 S3 HDD
- Vermeer R250C reclaimer
- DigiTrak® Falcon® F5®
- Typical shot length: 800 ft (244 m)

Equipment

- Central mud recycling site
- Dirty mud hauled in; clean mud hauled back to drill
- Managed 65,000-gal (246,051.8-L) drilling fluid per day

Project Outcome

- 800 foot bores were being completed in eight hours
  - Pilot: 25 feet per minute
  - Pre-ream: 10 feet per minute
  - Final ream and pipe pullback: 30 feet per minute
- Over one million gallons of drilling fluid use
  - 125 gpm average mud flow rate
  - Drill fluid viscosity greater than 90 seconds
  - Drill returns of 20% to 40% sand content
  - Reclaimer reduced sand content to .35%
  - Clean sand off shaker was used as fill material or for concrete
- 22 drill shots completed in 35 drilling days

Questions?