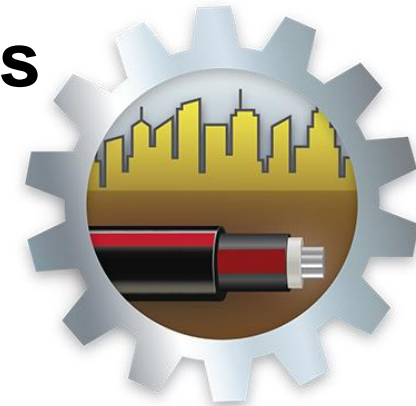


# Advancing Horizontal Directional Drilling for Rapid Undergrounding of Electrical Utilities

*Giann Su, Sandia National Laboratories*

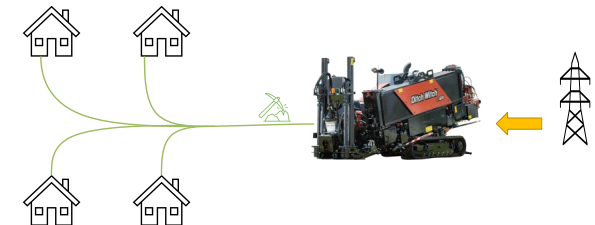
*Arun Jaganathan, Louisiana Tech*

*Category 1&2*



## Project Vision

*Enabling undergrounding utilities from a single-entry point which will not only enable installations in urban or congested environments where they were previously not considered but would also minimize surface disturbances and remediations. This will be accomplished through cross-bore sensing and tracking and advanced horizontal directional drilling (HDD) capabilities such as rapid penetration rates, short bend radius drilling, and bit-to-surface communications with dead reckoning navigation that allow real-time path following.*



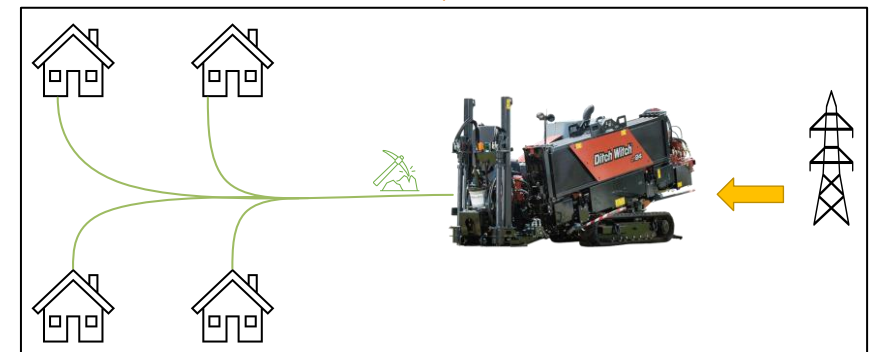
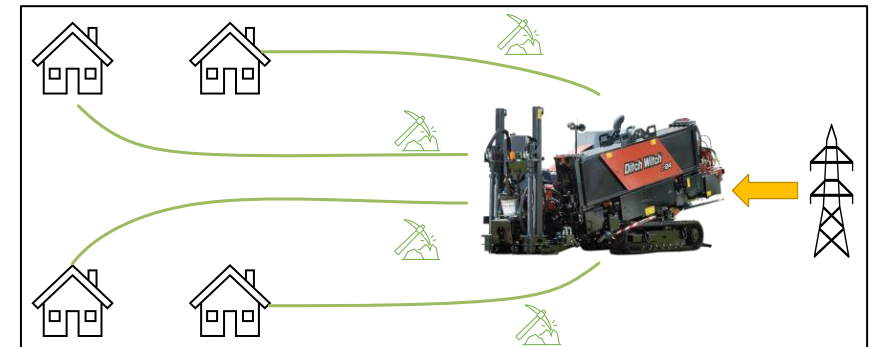
*Sandia National Laboratories is a multimission laboratory managed and operated by National Technology & Engineering Solutions of Sandia, LLC, a wholly owned subsidiary of Honeywell International Inc., for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-NA0003525.*

SAND2024-049580

# Project Objectives

- ▶ Reduce cost of undergrounding installations by 50% by minimizing surface disturbances and remediations
- ▶ Develop enabling technologies for hard-to-reach installations with single-point entry to multiple end points through maneuverable drill pipe and bit path tracking

Metric	Commercial SOA	Proposed
Borehole bend radius	107 ft	<30 ft
Cross bore detection range	NA	Crossbore detector with <1 ft accuracy
Bit-to-surface communication	N/A	Power and comms over pipe (kHz to MHz)
Bit tracking and navigation	N/A	Integral driller assist



# Project Team

Organization	Key Participant	Project Tasks Role and Responsibilities
Sandia National Laboratories	Jiann Su	Advanced drilling capability development (short bend radius, communications, bit tracking/navigation)
Louisiana Tech	Arun Jaganathan	Cross-bore sensor development. Bit tracking and orientation development

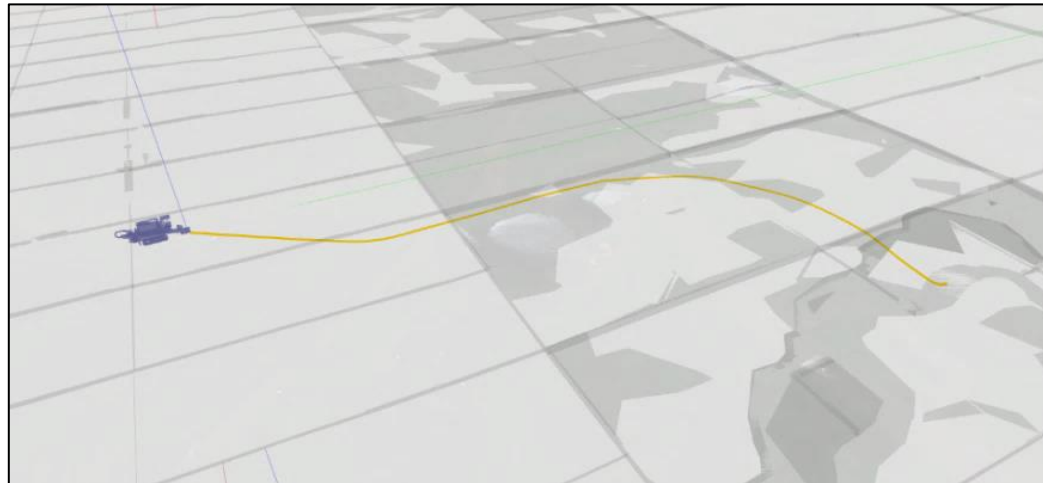


Image Credit: <https://www.crossboresafety.org/Leading%20Practices.htm>

# Overview of High-level Tasks

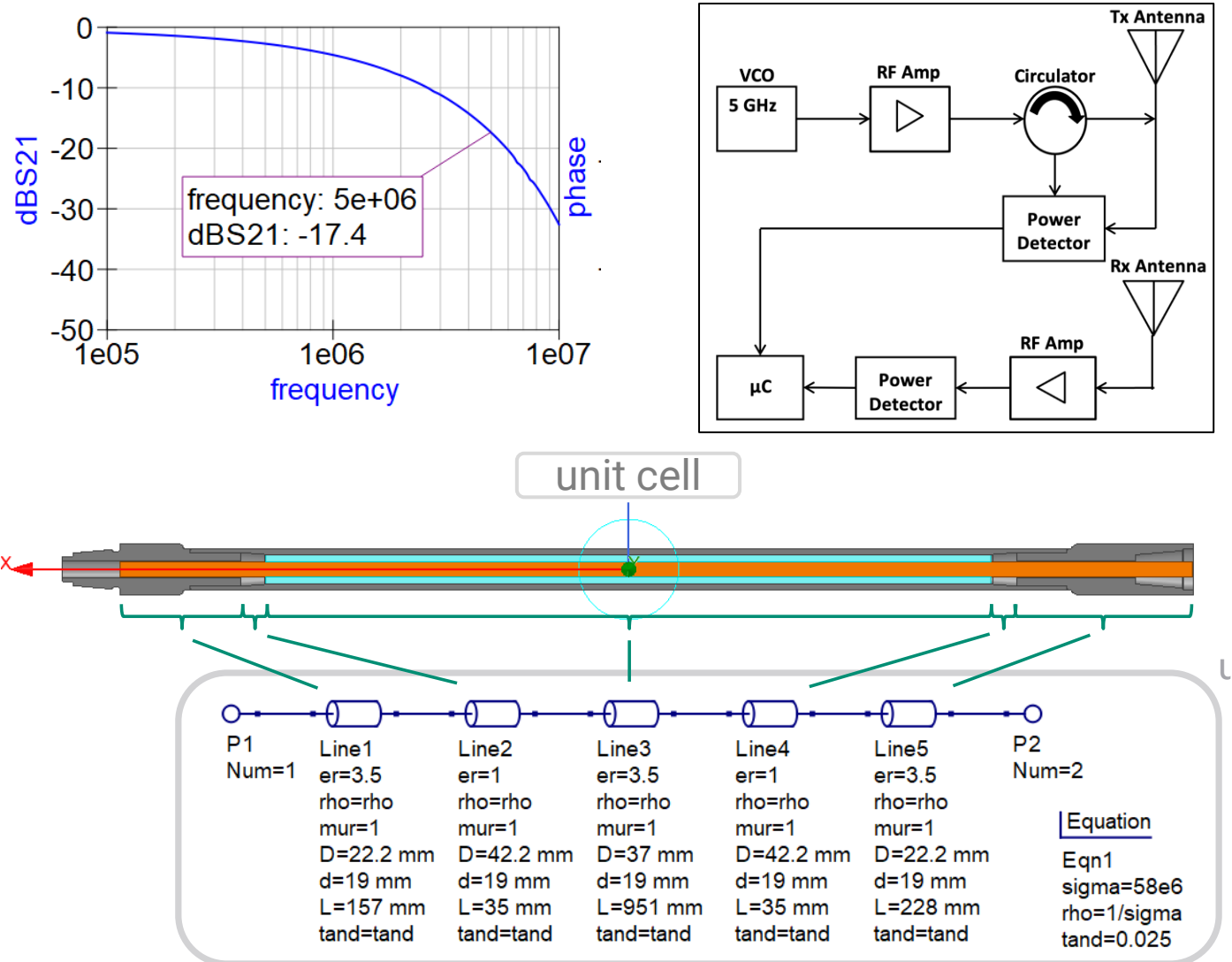
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- ▶ Task 1: Project management
- ▶ Task 2: Cross-bore sensor development (LaTech)
- ▶ Task 3: Advanced drilling capability development (SNL)
- ▶ Task 4: Bit-to-surface communications (SNL)
- ▶ Task 5: System integration (LaTech, SNL)
- ▶ Task 6: Field testing (LaTech, SNL)
- ▶ Task 7: Commercialization (SNL)

36 month period of performance, 2 go/no-go reviews

# Technical R&D Details

- ▶ Task 2: : Cross-bore sensor development (LaTech)
- ▶ Task 3: Advanced drilling capability development (SNL)
  - Tight bend radius drilling
  - Path tracking and navigation
- ▶ Task 4: Bit-to-surface communications (SNL)
  - Communication platform design
  - Comms platform modeling
- ▶ Task 5: System integration
- ▶ Task 6: Field testing



# Project Risks

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- ▶ Technical Risks
  - Navigation sensing (IMU vs. Mag)
  - Drilling time (drift)
  - Environment (shock, vibe)
  - Crossbore sensitivity
- ▶ Adoption Risks
  - Integration and scaling
  - Cost

# Technology-to-Market Approach

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- ▶ Commercialization Plan
  - Incremental testing from lab-scale benchtop testing to controlled field trials.
    - Evolving from basic functionality (TRL 2-3) to field-ready prototypes (TRL 5-6).
  - Internal resources are available to support commercialization efforts.
    - Sandia's Integrated Partnerships Organization (IPO) licensing and business intel groups to support the creation of a detailed T2M plan in Year 1 and perform tasks associated with finding and engaging potential licensees.
- ▶ Anticipated business model
  - Licensing

# Needs and Potential Partnerships

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- ▶ Needs
  - Potential test sites
  - Commercialization partners
- ▶ Capabilities
  - HDD platform
  - HDD specialty tool development



# Q & A



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