



# The Future of Wellbore Intercept Technology: Adhering to the Strictest Environmental and Economic Standards

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## Speaker Bio: Georgy Rassadkin



- **Gunnar Energy Services**
  - **Ranging Domain Manager**
- Prior Experience:
  - Gunnar Energy Services
    - Product Champion / Ranging Specialist
  - Scientific Drilling International
    - Magnetic Ranging Technical Product Champion
    - Technical Training Instructor
    - Service Quality Coordinator
    - Field Engineer
- Education:
  - Dubna State University
    - Master of Science in Mining Engineering and Geophysics



# Agenda

- Future Use Case – Carbon Capture and Wellbore Intercepts
- Passive Magnetic Ranging
  - Continuous PMR While Drilling
  - High-Angle Access-Independent Intercept in Australia
- Coiled Tubing Drilling and Rotating Magnet Ranging
  - Fast 5x Horizontal-to-Vertical Intercept in Kansas, USA
- Active Ranging While Drilling in Europe
  - Integration with Wired Pipe for Access-Independent AMR While Drilling
- The Future of Intercept Technology:
  - GWD + Continuous PMR + Access-Independent AMR While Drilling

# Carbon Capture and Wellbore Intercepts

- Adapting to Industry Changes
  - Carbon capture and storage (CCS) is becoming a key component of the evolving energy landscape
  - Regulatory requirements increasingly require CCS initiatives alongside oil and gas operations
  - Ensuring the seal integrity of old wells in storage reservoirs is crucial for the success and safety of CCS projects
- The Role of Magnetic Ranging and Intercept Technology
  - Provides solutions for accessing wells that can't be directly re-entered
  - Ensures precise wellbore interception to effectively plug problematic wells and support CCS initiatives

## Plan to build California's first carbon removal and storage project gets a big boost

KVPR | By Joshua Yeager  
Published September 13, 2024 at 3:14 PM PDT

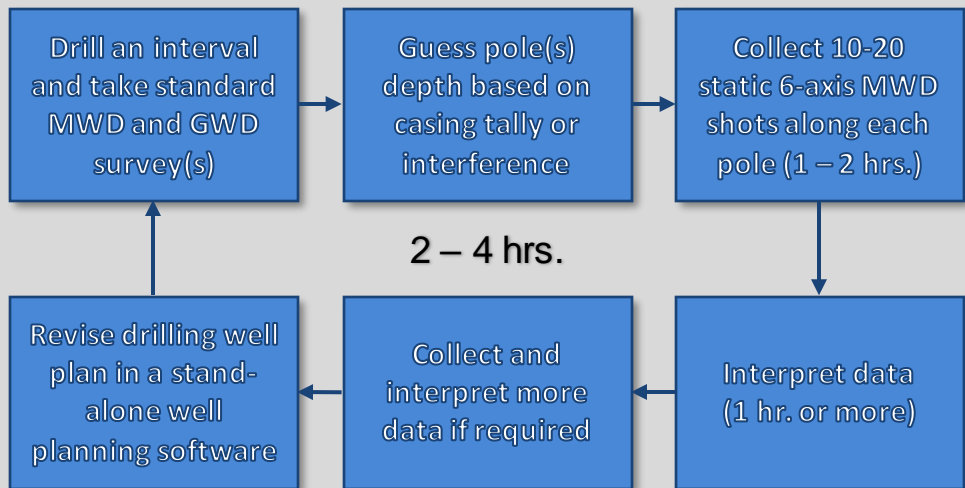


Joshua Yeager / KVPR

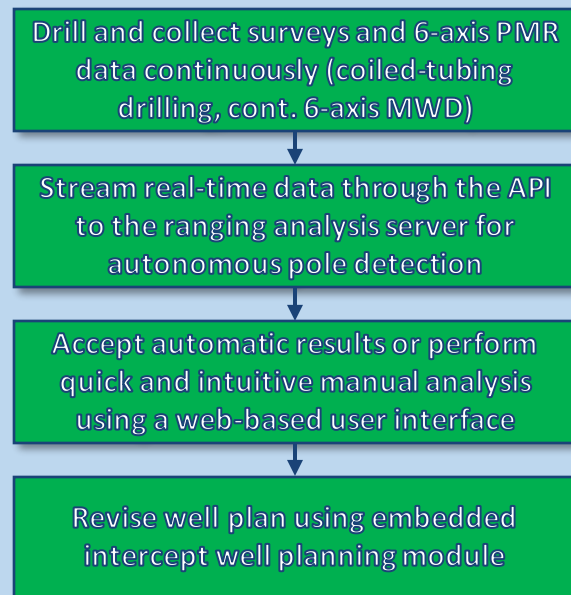
<https://www.kvpr.org/environment/2024-09-13/plan-to-build-californias-first-carbon-removal-and-storage-project-gets-a-big-boost>

# Passive Magnetic Ranging (PMR)

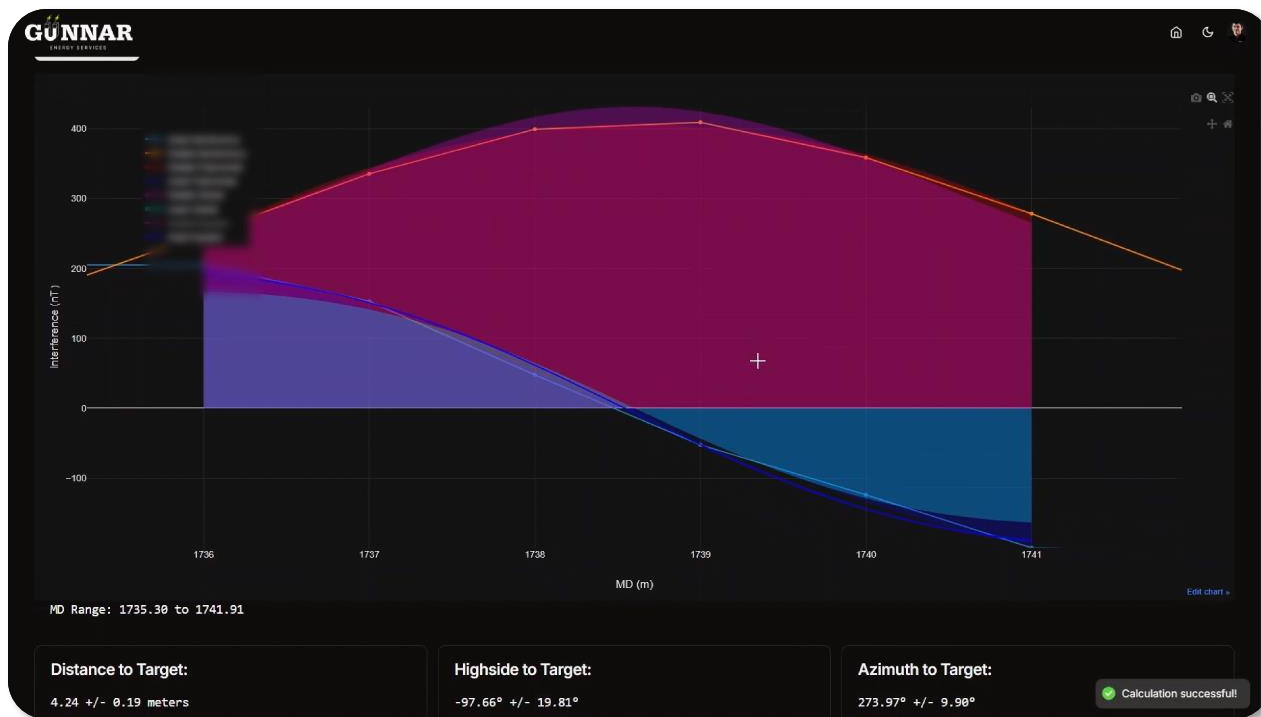
## Past



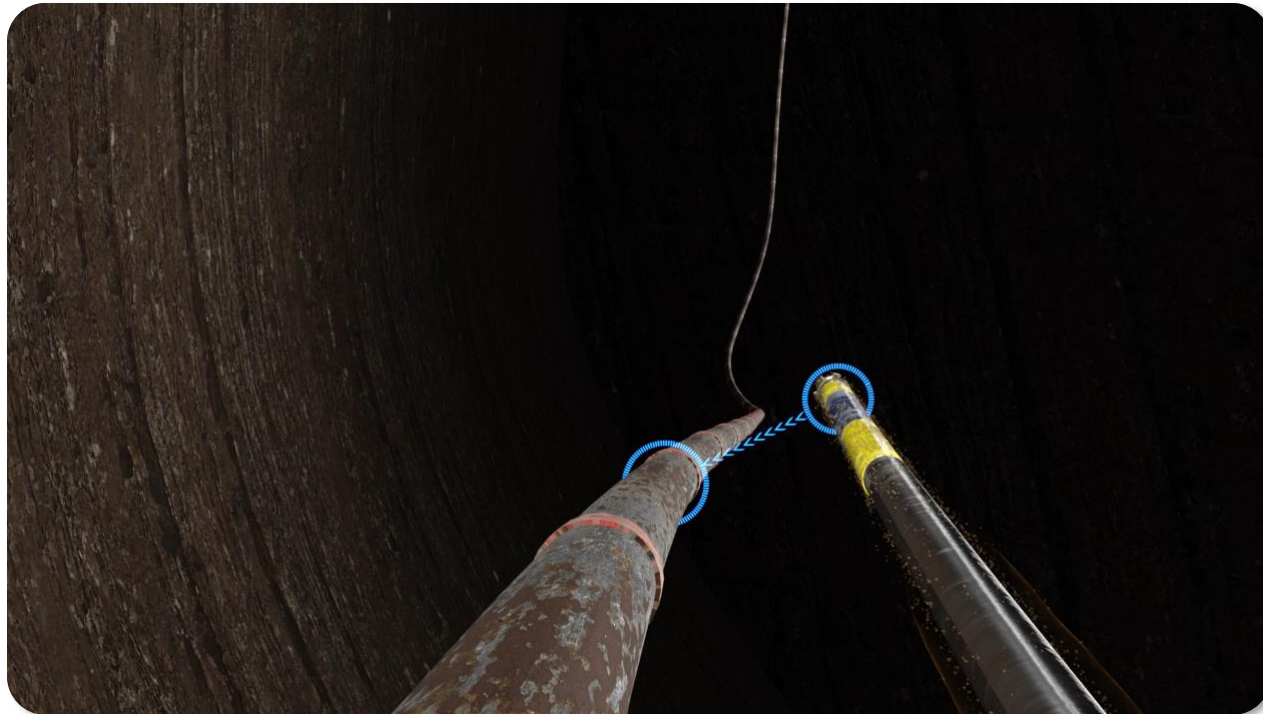
## Future/Now



# Continuous PMR While Drilling



## Australia, June 2024: High Angle Intercept, Mill & Re-entry with AMR and Continuous PMR



## Australia, June 2024: High Angle Intercept, Mill & Re-entry with AMR and Continuous PMR

New re-entry mill



After milling a window in the target casing

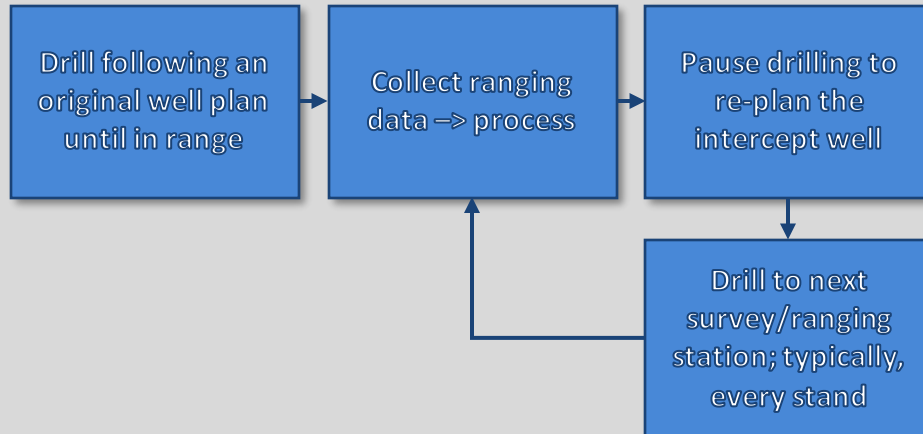




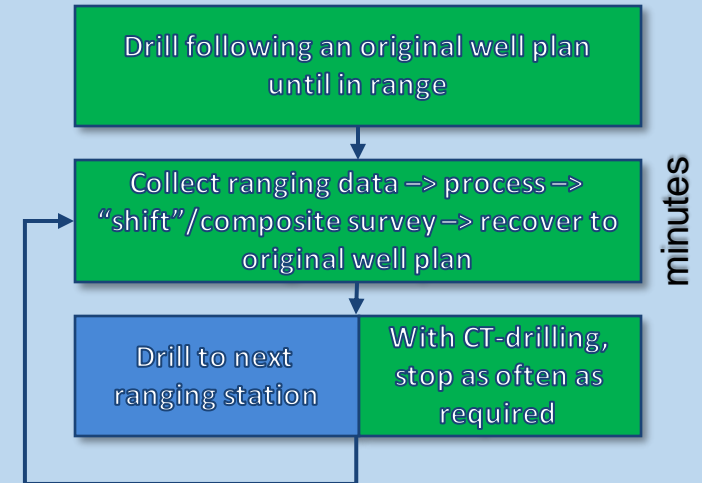
# Rotating Magnet Ranging

## Past

± 1 hr.



## Future/Now



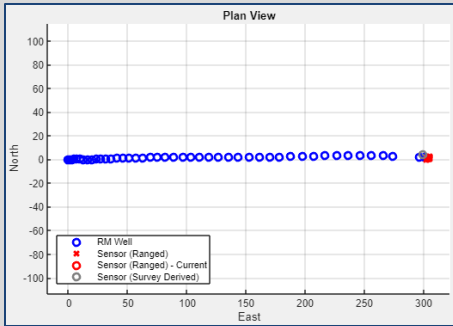
## Kansas, July 2024: Fast 5x Intercept using Coiled-Tubing Drilling and Rotating Magnet Ranging



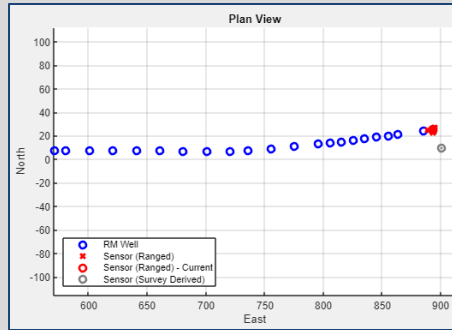


# Kansas, July 2024: Fast 5x Intercept using Coiled-Tubing Drilling and Rotating Magnet Ranging

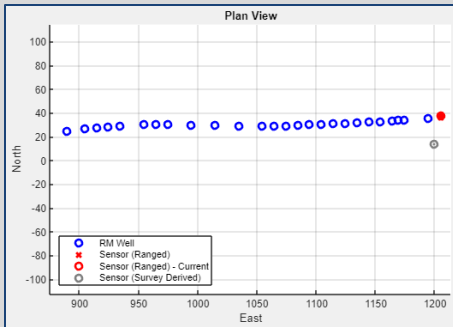
Tgt #1



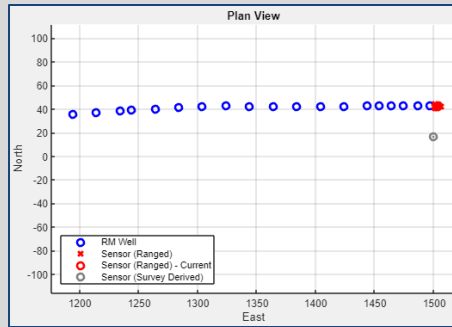
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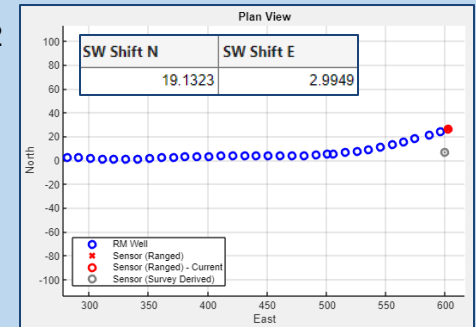
Tgt #4



Tgt #5



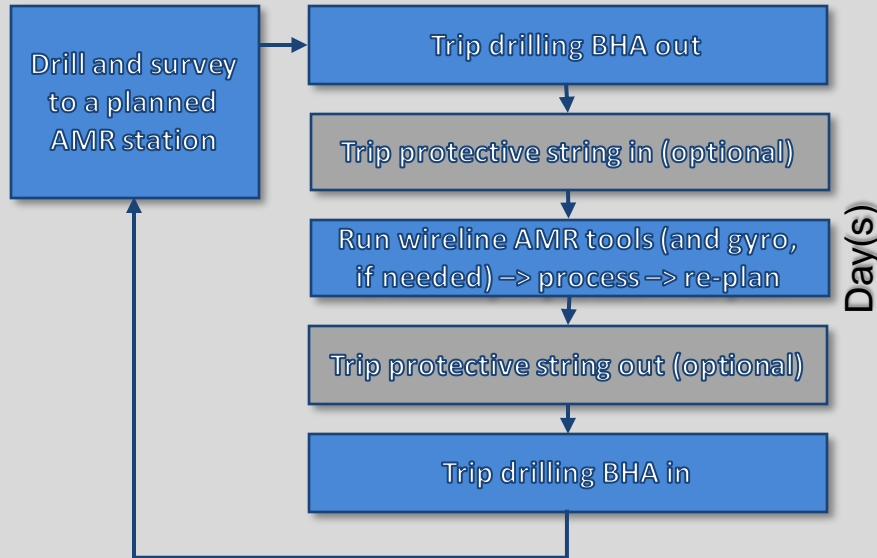
Tgt #2



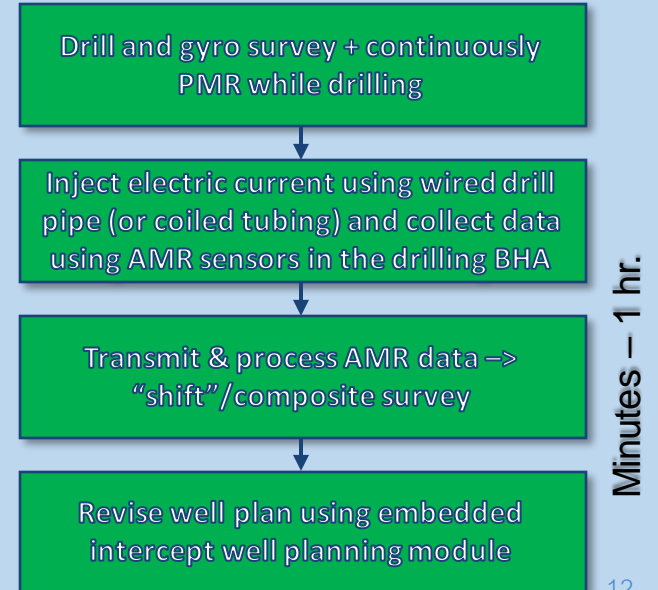
Intercepted at the end using an open-hole sidetrack to avoid excessive tortuosity in the main wellbore due to the unexpectedly high “shift”.

# Access Independent Active Magnetic Ranging (AMR)

## Past



## Future/Soon



# Europe, Ongoing: Closed-Loop Geothermal Intercepts with Active Ranging While Drilling

59<sup>th</sup> General Meeting  
17<sup>th</sup> & 18<sup>th</sup> of April 2024  
Glasgow



Wellbore Positioning Technical Section



The Industry Steering Committee on  
Wellbore Survey Accuracy (ISCWSA)



## Field Test April 2024

In partnership with:  **Eavor™**

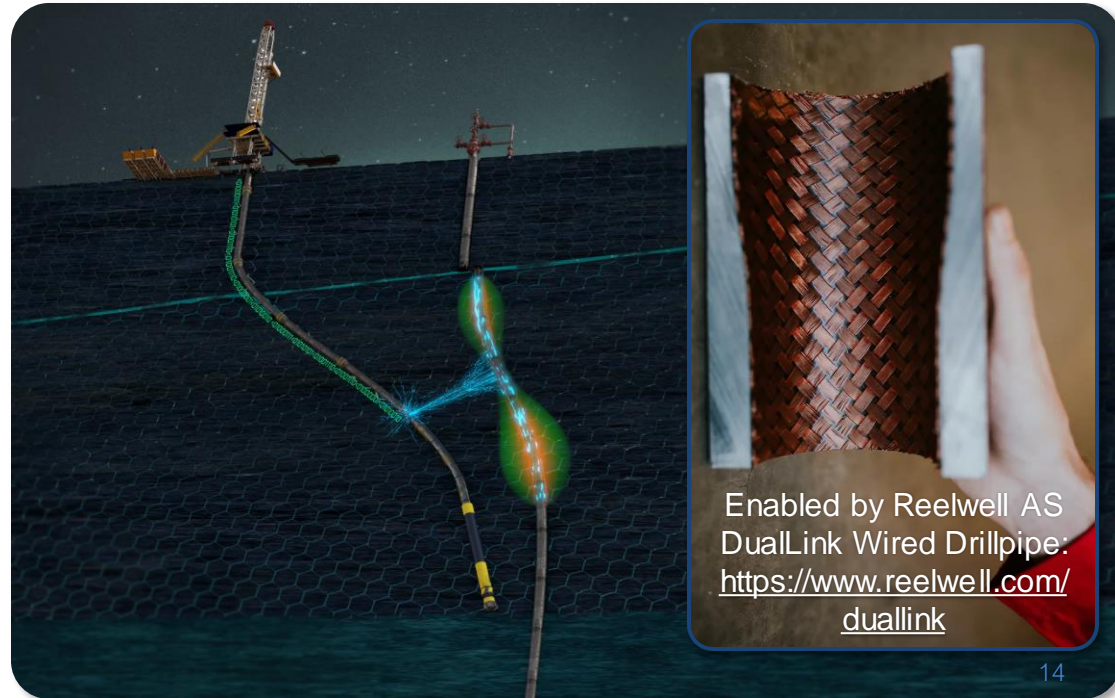


Intersecting Wells with AMR for a Closed-Loop Geothermal System



# Access Independent AMR While Drilling

- Depth of investigation (range) of AMR systems is limited by the electric current injected into the formation
- Wired pipe enables:
  - 20x increase in current delivery
  - Elimination of open-hole wireline runs and BHA trips
  - 150m range is theoretically feasible
- Downhole and surface software is being actively developed
- Fit-for-purpose integrated intercept well planning to streamline intercept operations





# The Future of Wellbore Intercept Technology: Gyro Surveying + Continuous PMR + Access Independent AMR While Drilling

- Gyro Surveying
  - Surveying near offset casing
  - Background field modeling for PMR
  - Minimal bit-to-sensor offset
- Continuous PMR
  - Estimates direction and distance on the fly
  - Eliminates static data collection
  - Crucial if target casing has breaks in electrical continuity
  - Able to reduce (or sometimes eliminate) AMR measurements
- Access-Independent AMR While Drilling
  - Uses new ranging while drilling technology
  - Integrates current injection assembly in drilling BHA (Patent # US 11,781,421 B2)
  - Pinpoints target location for optimal alignment, milling and re-entry
  - Eliminates BHA trips and open-hole wireline runs



# Conclusion

- Ranging and intercept techniques are gaining momentum
  - Numerous intercept studies are being produced for future CCS projects
  - Solution mining and closed-loop geothermal
  - Complex P&A and relief wells
- Accurate technology and expertise are established, delivering consistent results
  - Efficiency is improving to meet environmental and economic demands
    - Continuous PMR while drilling ✓
    - Rotating magnet ranging and coiled tubing drilling ✓
    - Active ranging while drilling ✓
    - Access independent AMR while drilling (coming soon)
      - No BHA trips
      - No open-hole wireline runs
      - Intercepts achieved in **a fraction** of the standard time



60<sup>th</sup> General Meeting  
25<sup>th</sup> & 26<sup>th</sup> of September 2024  
New Orleans, LA



Wellbore Positioning Technical Section



The Industry Steering Committee on  
Wellbore Survey Accuracy (ISCWSA)

# Thank you! Questions?

