



# **Regulatory & Environmental** Aspects

**WEBINAR** 

Does Deep Drilling need A

**Revolution**?

4<sup>th</sup> April 2025

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UNIVERSITÀ **DEGLI STUDI** DI PADOVA



IAPT





Renewable Energy Development



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### **Topics Covered**

- Legislative and Regulatory Processes around Drilling
- Considerations of Environmental Impacts at drill sites
- How the conventional drilling regulatory system compares with innovative drilling technologies



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## Legislation, Regulation & Standards

#### Aspects Considered:

- What is unique or novel about DeepU from the perspective of a regulator?
- What are the fundamental EHS risk management principles that will frame how a regulator will view the technology?
- What are representative examples of existing regulatory processes and at what point in the process could there be a misfit of DeepU technologies and the requirements?
- What would be the requirements if the technology was deployed?
- What are the consequences for project delivery in a real-world scenario that may need to be mitigated?



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#### Legislation, Regulation & Standards





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### Legislation, Regulation & Standards

#### **DeepU Challenges:**

- Use of an industrial laser in an uncontrolled and/or changing operational environment.
- Cryogenic fluid as part of the drilling process gas to flush cuttings out of the wellbore
- Deep drilling (>4km) and maintain hole integrity over the life-time of the project with limited casing or external material applied to the wellbore wall
- Integration of new technologies with established exploration and formation evaluation practises, existing drilling equipment, practises and skill sets to ensure widespread deployment in a commercial manner.



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#### Legislation, Regulation & Standards

• Fundamentals of Drilling Legislation and Regulation





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## Legislation, Regulation & Standards

 Health & Safety elements with respect to Deep Drilling Legislation, Regulation & Standards





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# Legislation, Regulation & Standards

Hierarchy of Controls in Process Safety Management





# Legislation, Regulation & Standards

 Analysis of Several Jurisdictions in Europe as examples of the licensing system:

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- Ireland
- Italy
- France
- Germany
- The Netherlands





# Legislation, Regulation & Standards

- Generalised Summary of the main licensing process
- Yellow dots highlight topics for DeepU technology requirement



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# EHS Indicators for Conventional Drilling



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#### EHS Indicators for DeepU vs Conventional

EHS Indicator	Conventional Drilling	DeepU
GENERAL OPERATIONAL H&S Practices	Х	To be established
Drilling Programme Design and Well Plan	Х	X
Training & Certification (equipment & personnel)	Х	X – Training & Certification plan required
Well Control & Barriers	X (Drilling fluids, BOP, Casing)	X – No primary well control. Plan Required
Environmental Management	Х	X
Incident Management Reporting	Х	X
Emergency Response Plan	X	X –'Wild well' conditions require additional planning.



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#### Technology development

#### Laser System

• Fail safe operations procedures for industrial laser usage on a drill site – safety management system

#### Nitrogen System

- **Operational procedure** for use & storage safety management system
- Separation from cuttings & Emissions
- Drill String
  - Drilling Depth Limitation Governed by Material and Connection specification
  - Certification/Standardisation- DNV, Lloyds, API, IADC, ISO
- Electrical Infrastructure & Total Power Supply
- Lithologies & Borehole Completion
  - Well Control Measures & Borehole Breakout
  - Multi-method approach to ensure Environmental compliance & Final geothermal well structure