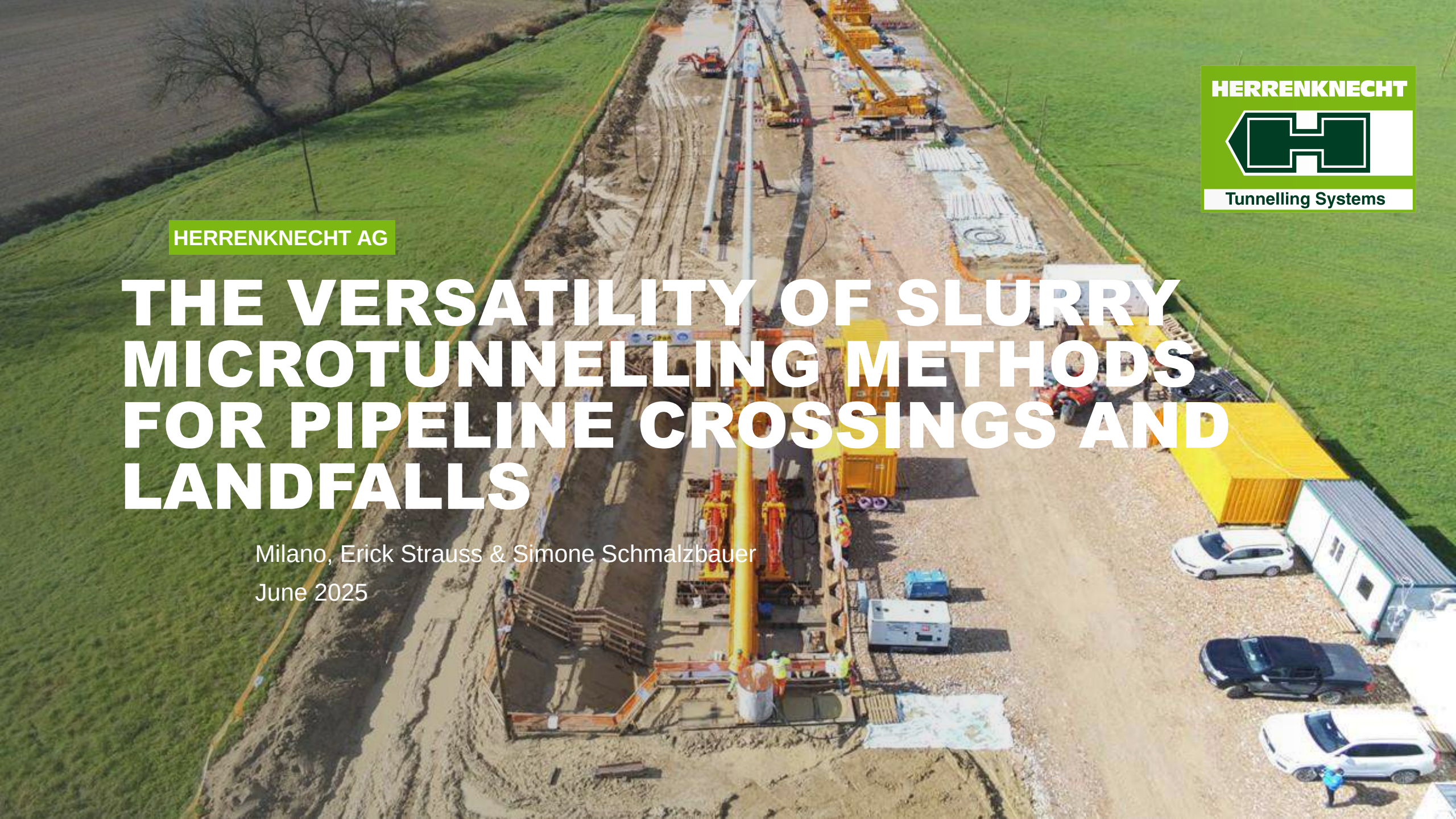


HERRENKNECHT AG

THE VERSATILITY OF SLURRY MICROTUNNELLING METHODS FOR PIPELINE CROSSINGS AND LANDFALLS

Milano, Erick Strauss & Simone Schmalzbauer

June 2025

HERRENKNECHT IN GERMANY

Strongly rooted in the location of Schwanau and the surrounding region

Around 2,400 employees work in Schwanau and Kehl

Our long-term and sustainable thinking is reflected in our support of education, environment and society

Key figures

HERRENKNECHT GROUP

1.394
Total output
2024 in million euros

1.288
Turnover
2024 in million euros

1.399
Order inflow
2024 in million euros

EMPLOYEES WORLDWIDE

5.490
Employees
at the end of 2024

**incl. temporary workers*

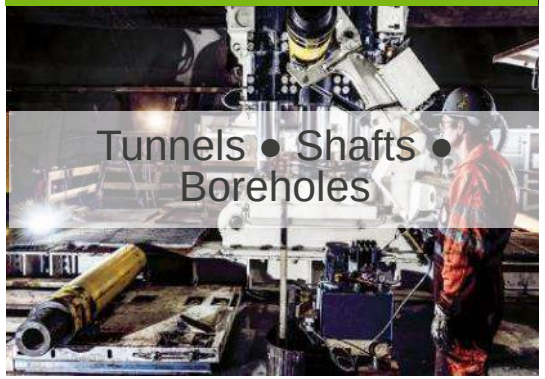
215
Trainees
at the end of 2024

Mechanized solutions for horizontal and vertical drilling applications

HERRENKNECHT GROUP

Traffic Tunnels

Mining



Exploration

Utility Tunnels

Pipelines

Shafts & Foundations

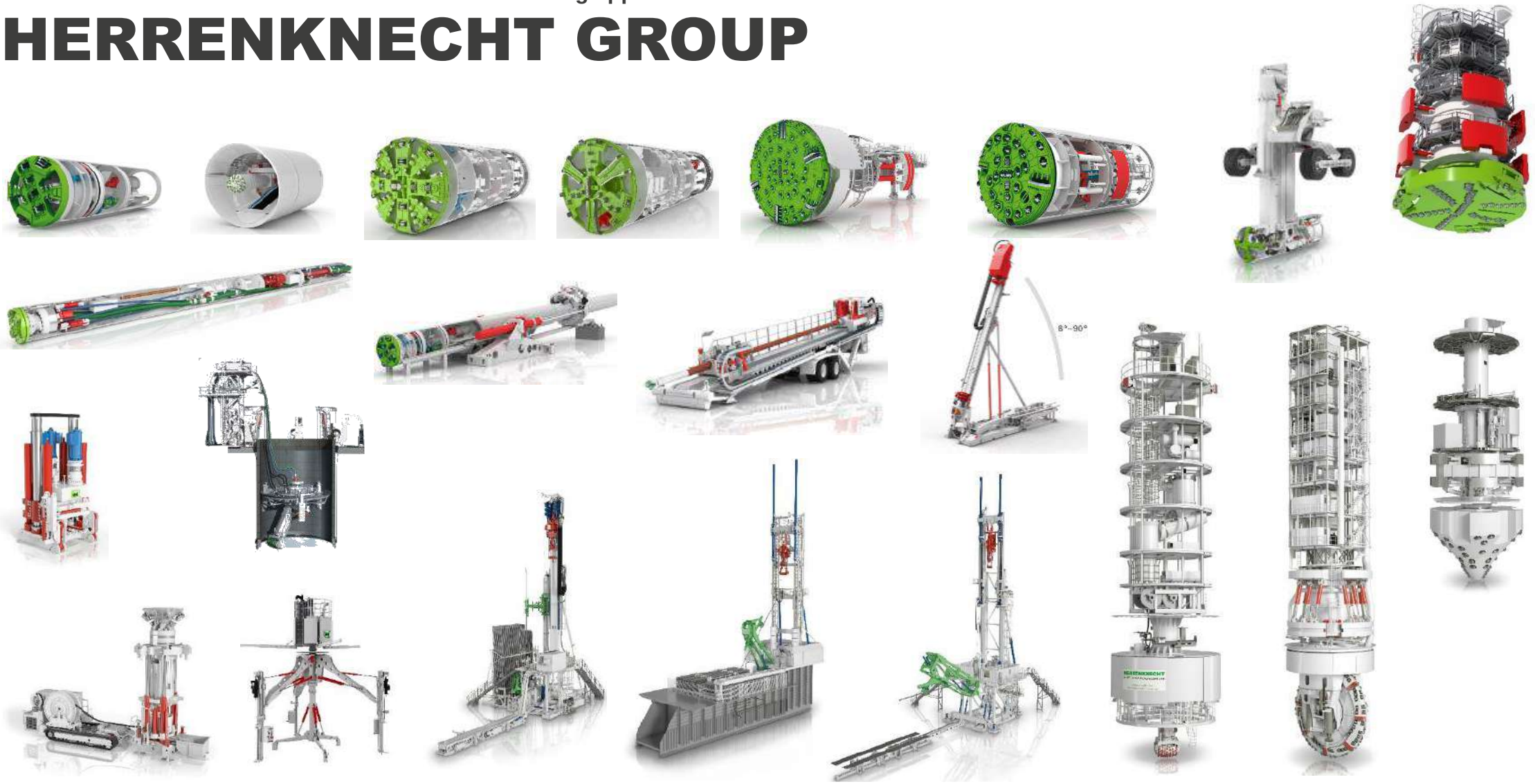
Business Unit

Utility Tunnelling

HERRENKNECHT

Mechanized solutions for horizontal and vertical drilling applications

HERRENKNECHT GROUP



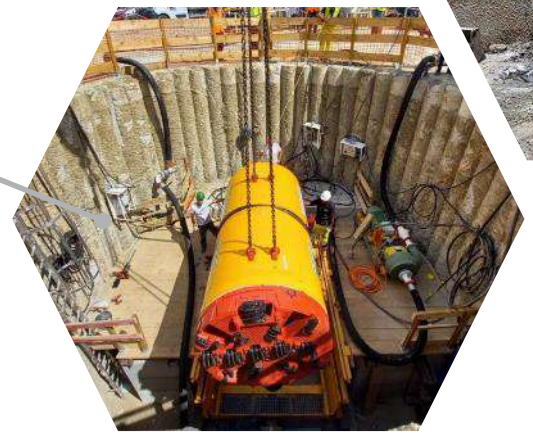
Business Unit Utility Tunnelling

UT PRODUCTS AND TECHNOLOGIES

Segment Lining

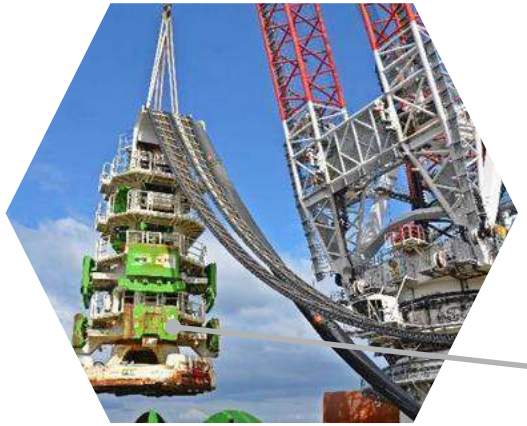
Microtunnelling

- Pipe Jacking
- Direct Pipe
- E-Power Pipe



Shaft sinking (VSM)

Horizontal Directional Drilling (HDD)



Offshore Foundation Drilling (OFD)

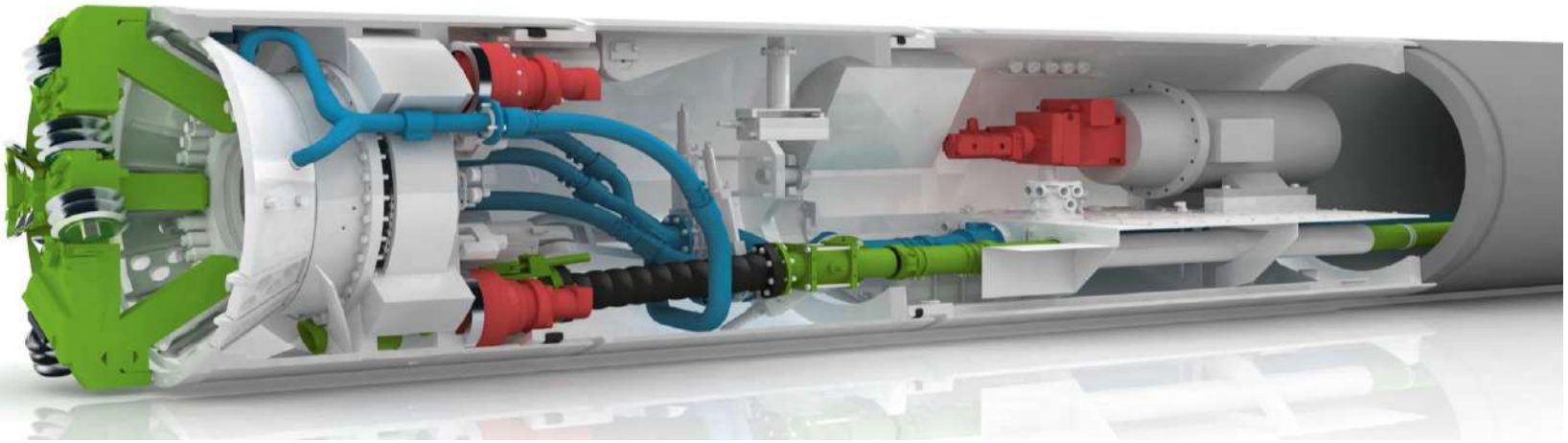
Utility Tunnelling

SLURRY MICROTUNNELLING METHODS OVERVIEW

	PIPE JACKING	DIRECT PIPE®	E-POWER PIPE®

AVN

Automatische
Vortriebsmaschine
Nassförderung



Utility Tunnelling

SLURRY MICROTUNNELLING METHODS OVERVIEW

	PIPE JACKING	DIRECT PIPE®	E-POWER PIPE®
MTBM	**AVN or AVNS** with jet pump		
Borehole support	**Mechanical borehole support** over the entire installation process		
Pipe material	**Pressure resistant** typically reinforced concrete pipes	**Pressure resistant** typically prefabricated steel pipeline	**All** Pullin of product pipe in second step
Pipe diameter	**250 – 4,000 mm** Ø Tunnel (ID)	**600 – 1,500 mm**	**250 – 700 mm** > 400 mm with backreaming MTBM
Max. installation length	**~ 2,000 m** *Depending on project-specific conditions*		

Utility Tunnelling

SLURRY MICROTUNNELLING METHODS WITH CONSTANT BOREHOLE SUPPORT

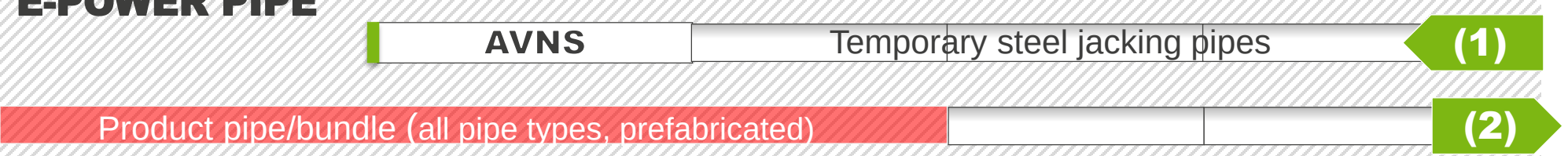
PIPE JACKING

Jacking frame
compact jacking frame or main jacking station

DIRECT PIPE

Pipe Thruster
with clamping unit, tested for various coatings

E-POWER PIPE



Rack and Pinion jacking frame
pushforce for pilot bore (1), pullforce for pipe pullin (2)

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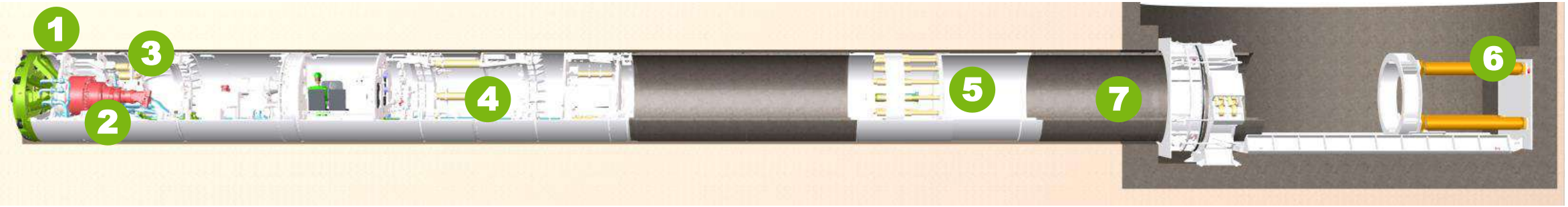
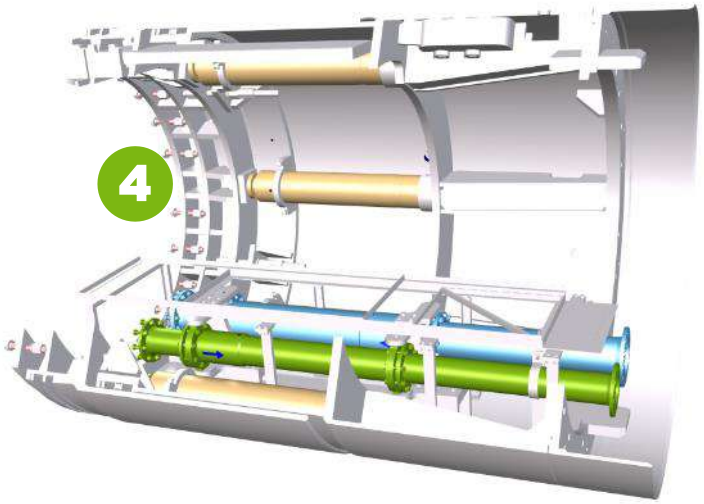
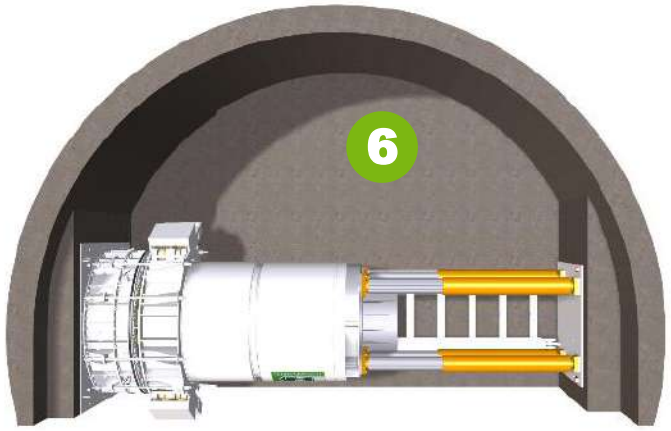
Pipe Jacking

SLURRY MTBM MACHINE DESIGN



1. Cutting wheel and cutter tools
2. Main bearing and main drive
3. Steering cylinders
4. Telecopic station
5. Intermediate jacking stations
6. Main jacking station
7. Jacking pipes





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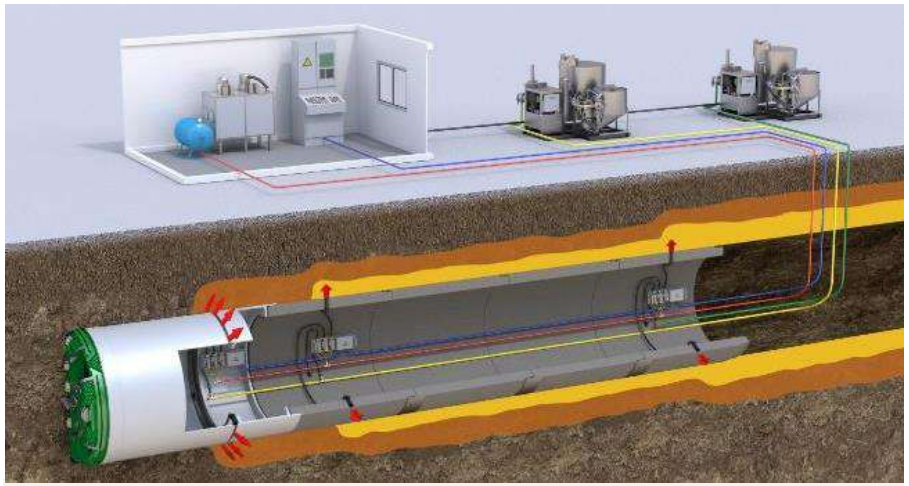
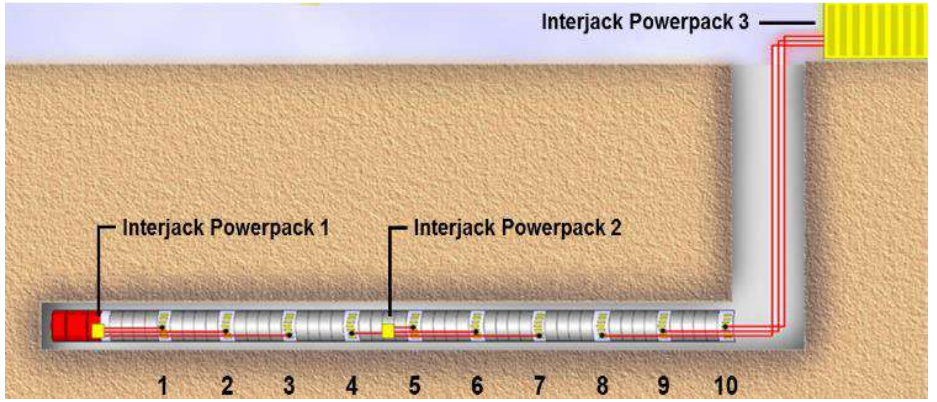
Pipe Jacking

KEEPING JACKING AND FRICTION FORCES LOW



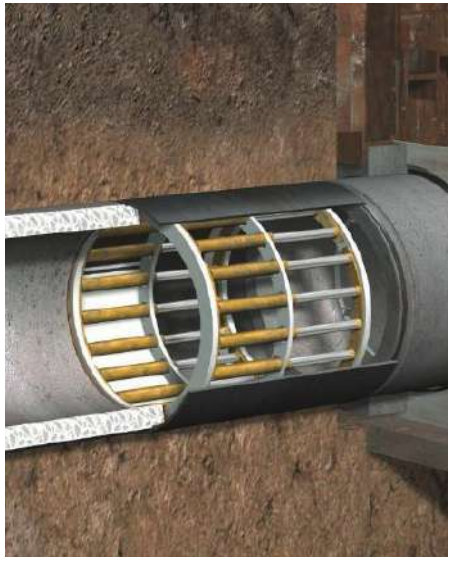
Bentonite lubrication system

- reduce skin friction
- adapt to changing geology



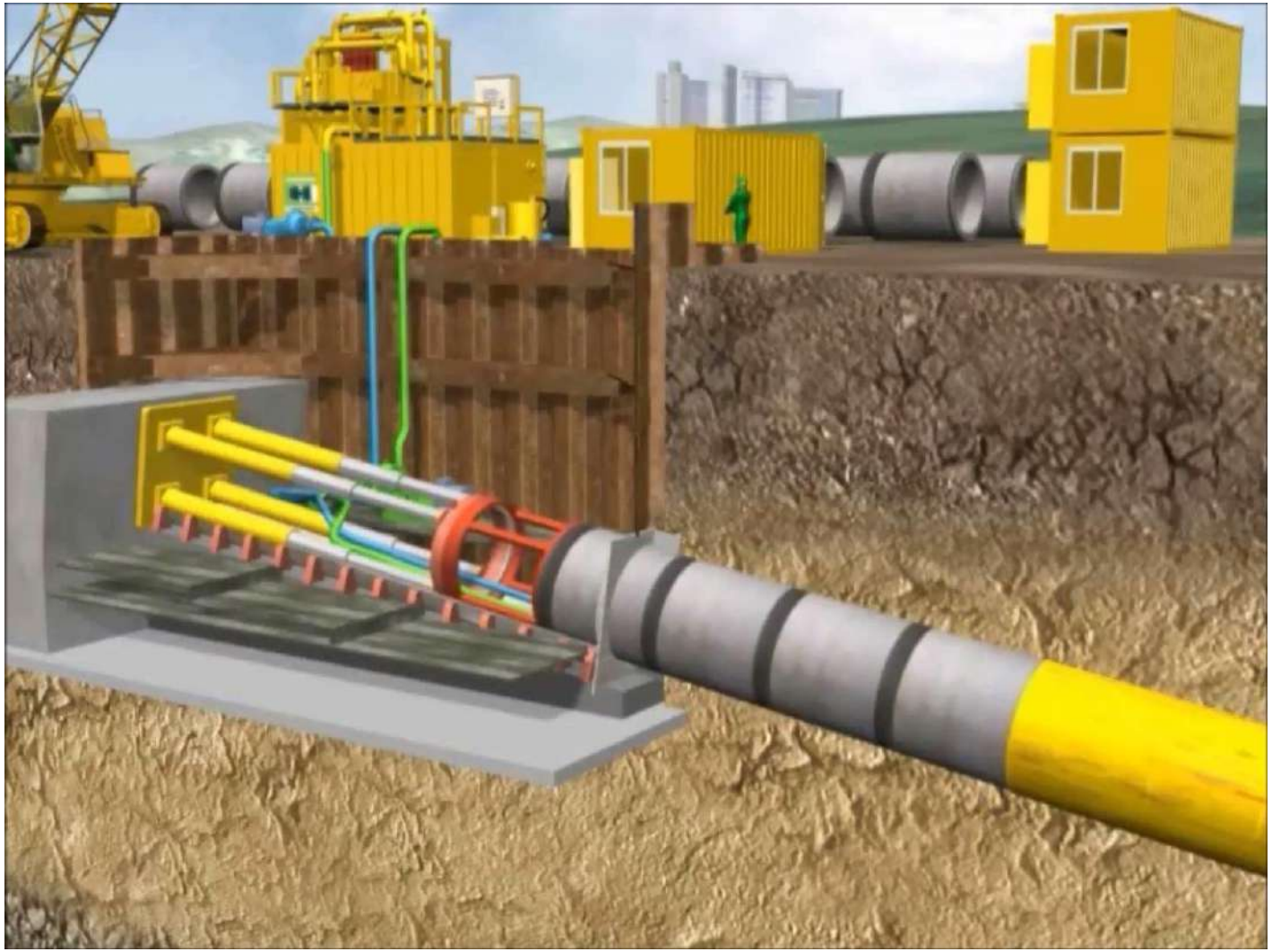
Interjacking stations

- regular intervals
- reduce jacking forces of main jacking station
- dismantled when finished



Utility Tunnelling | Microtunnelling technologies

SEA OUTFALL WITH PIPE JACKING



Sea Outfall Principle

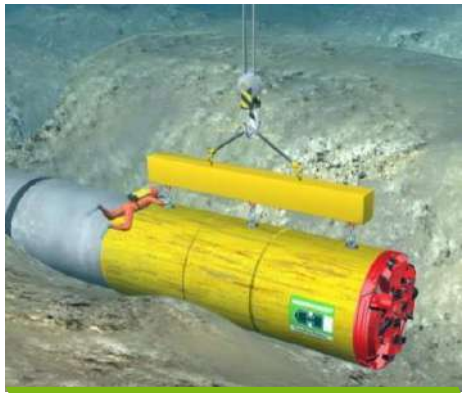
› With offshore recovery of the tunnelling machine

Pipe Jacking

MTBM SUBSEA RECOVERY PROCEDURE WITH RECOVERY MODULE

01

Tunnelling machine is prepared for release from pipestring; bulkhead is closed



02

Divers fix the crane to lifting eyes of machine

03

Divers connect hydraulic supply lines to machine for the telescopic cylinders

04

Cylinders are extracted to release machine from the pipestring

05

Tunnelling machine is recovered and lifted up to the surface

Pipe Jacking

MTBM SUBSEA RECOVERY LIFTING OPTIONS

› With airbags

› Crane in harbor

› Crane on barge / jack-up plattform

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Pipe Jacking Reference Project | Sea Outfall

SOUTHEAST GATEWAY PIPELINE PROJECT, GULF OF MEXICO

Pipe Jacking

Coatzacoalcos landfall

- AVND 2400AB, OD 3081 mm
- Drive length: **1,715 m**

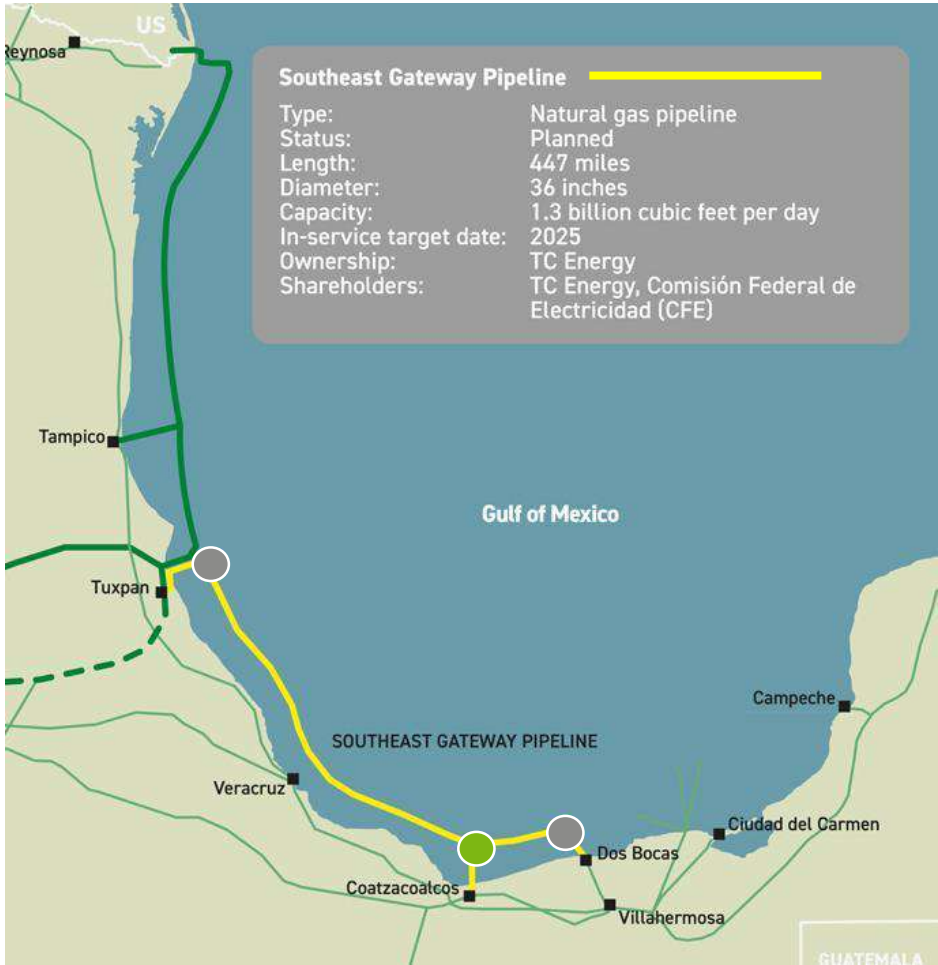
Direct Pipe 56”

Tuxpan shore crossing

- Drive length: **1,370 m**

Dos Bocas landfall

- Drive length: 1,048 m



UTILITY TUNNELLING

DIRECT PIPE SLURRY MICROTUNNELLING FOR SIMULTANEOUS PIPELINE INSTALLATION

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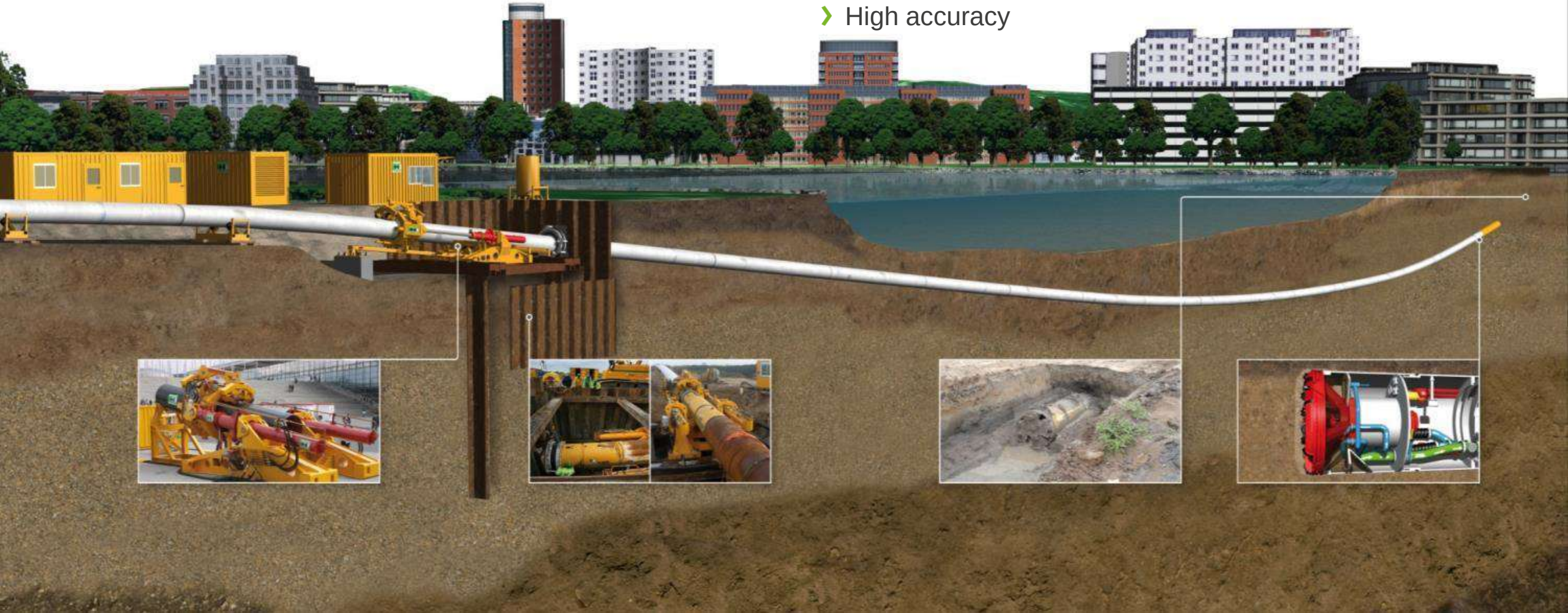
Utility Tunnelling | Microtunnelling technologies

DIRECT PIPE® TECHNOLOGY

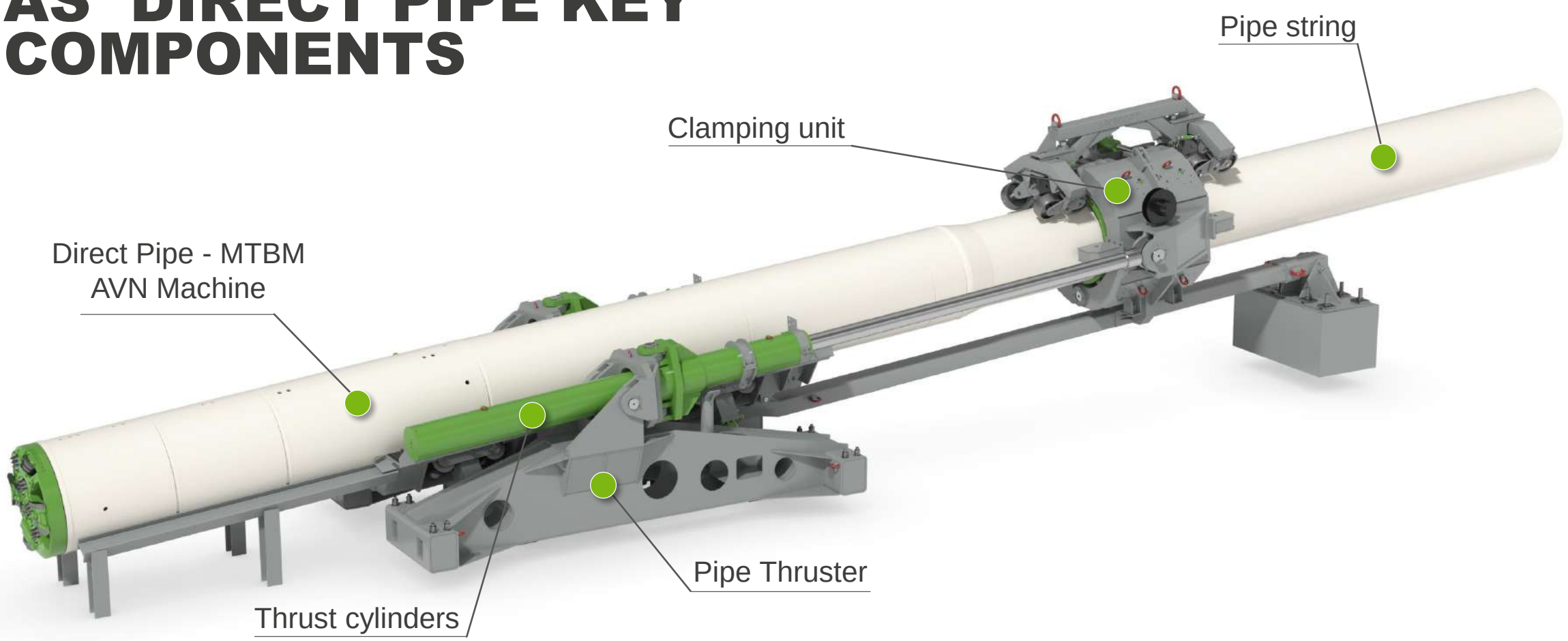
24“ up to 60“ steel pipeline installations

- One-pass installation
- min. frac out risk | borehole supported
- High accuracy



Utility Tunnelling | Microtunnelling technologies

MTBM AND PIPE THRUSTER AS DIRECT PIPE KEY COMPONENTS



DIRECT PIPE® Smallest Diameter in ITALY

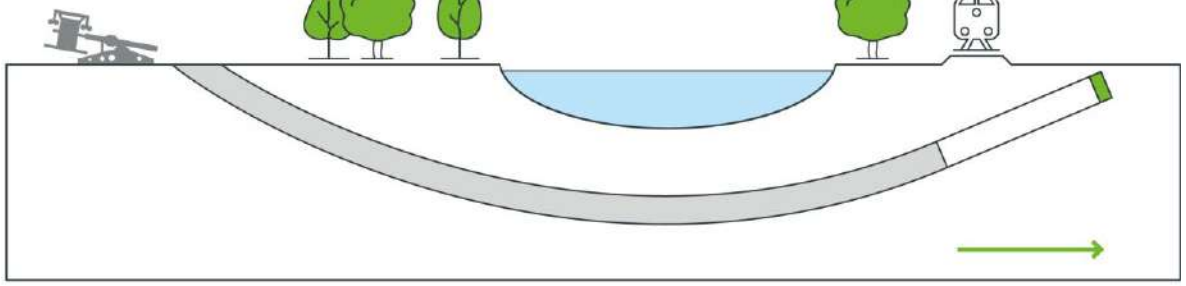
- SNAM - Gas Network Adriatic Coastline
- #1 Tratto Recanati – S. Elpidio
  Geology: some sand, clay, gravel
- #2 Metanodotto Recanati – Chieti
  Geology: sand, silt, sandy clay, clay, some gravel
- Pipeline: **26”** w/ PE/GRP Coating
- Distance: 310m + 521m (1017 ft + 1778 ft)

26”

DIRECT PIPE® VARIATIONS

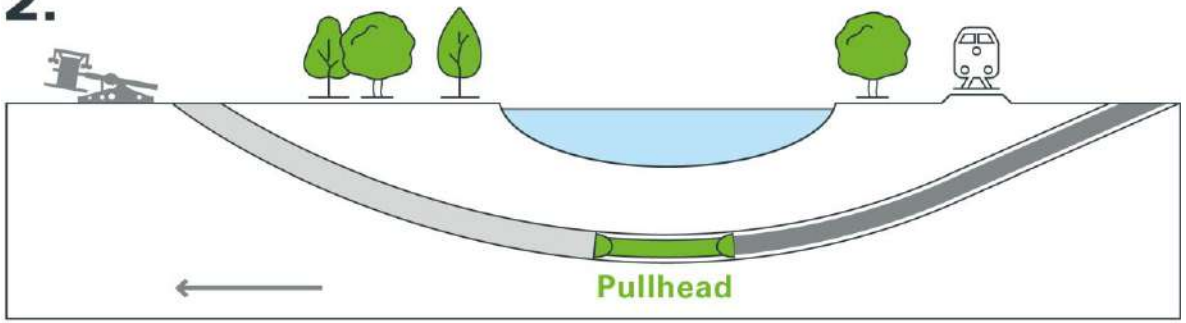
INSTALLATION OF HDPE PIPE
EXAMPLE RIVER CROSSING

1.



Installation of steel pipe
Simultaneous excavation of borehole and installation of temporary steel pipe.

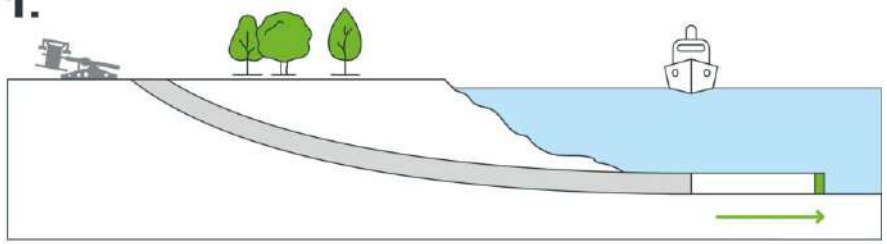
2.



Installation of HDPE pipe
Connection of HDPE pipe via pullhead;
Pull-in of HDPE pipe by retraction of steel pipe with Pipe Thruster.

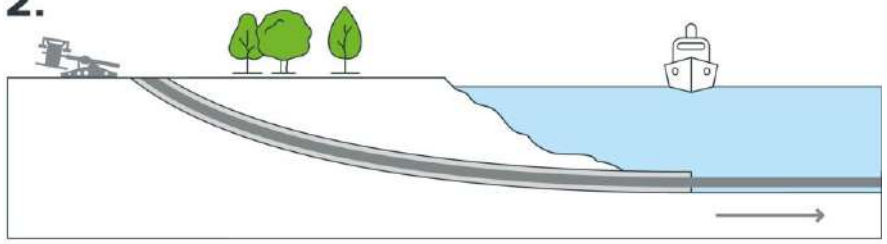
INSTALLATION OF HDPE PIPE
EXAMPLE SEA OUTFALL

1.



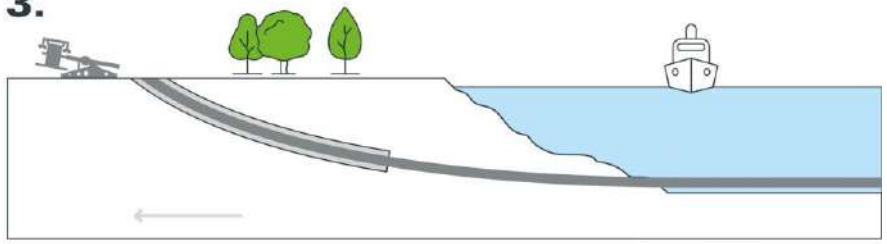
Installation of steel pipe
Simultaneous excavation of borehole and installation of steel pipeline.

2.



Installation of HDPE pipe
Subsequent insertion of HDPE pipe into the steel pipe.

3.



Retraction of steel pipe with Pipe Thruster.

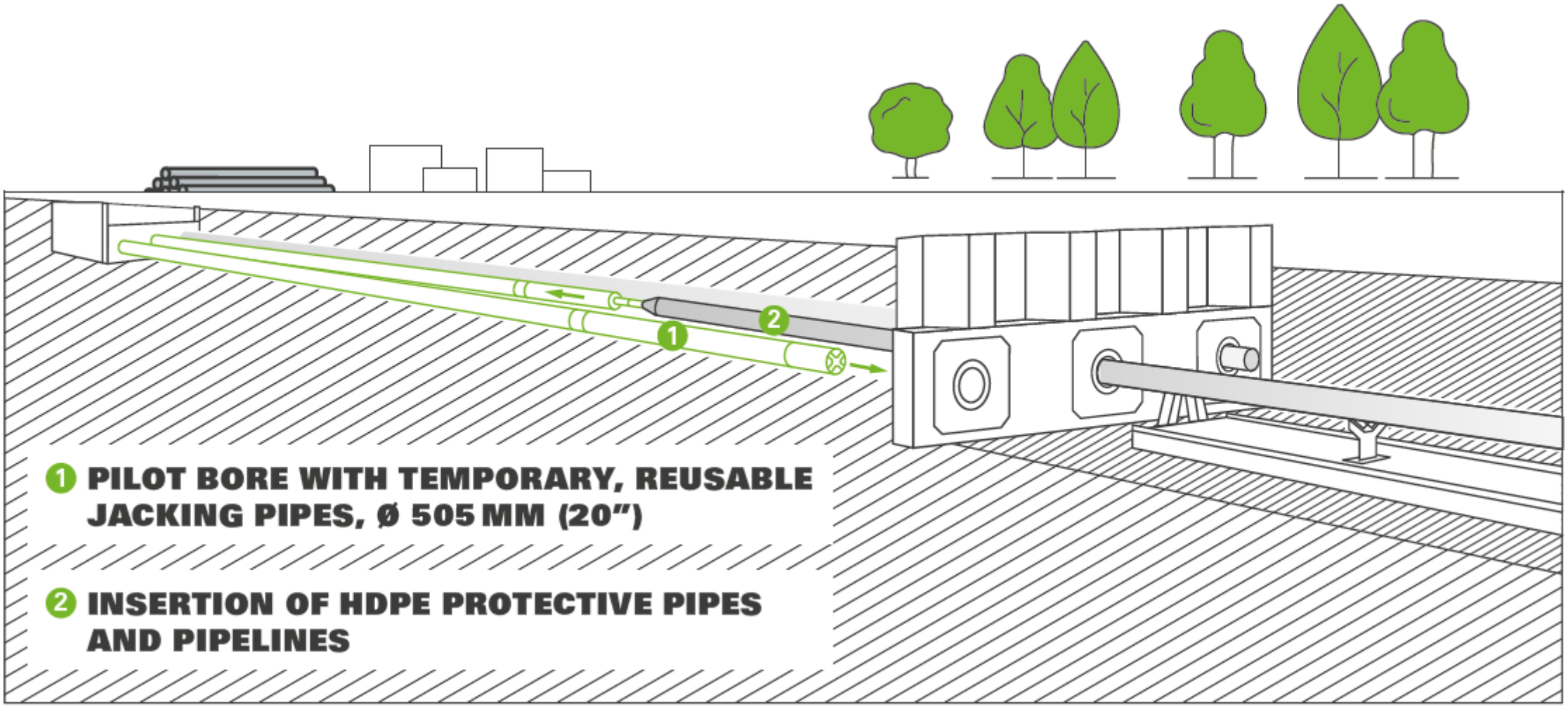
UTILITY TUNNELLING

E-POWER PIPE SLURRY MICROTUNNELLING AND SUBSEQUENT PIPE PULLING

Safe installation of pipelines, cable protective pipes and bundles

Trenchless Technologies

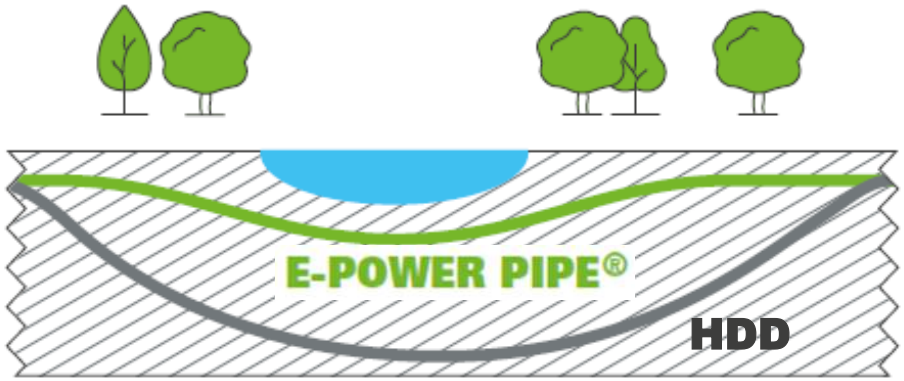
E-POWER PIPE® INSTALLATION STEPS



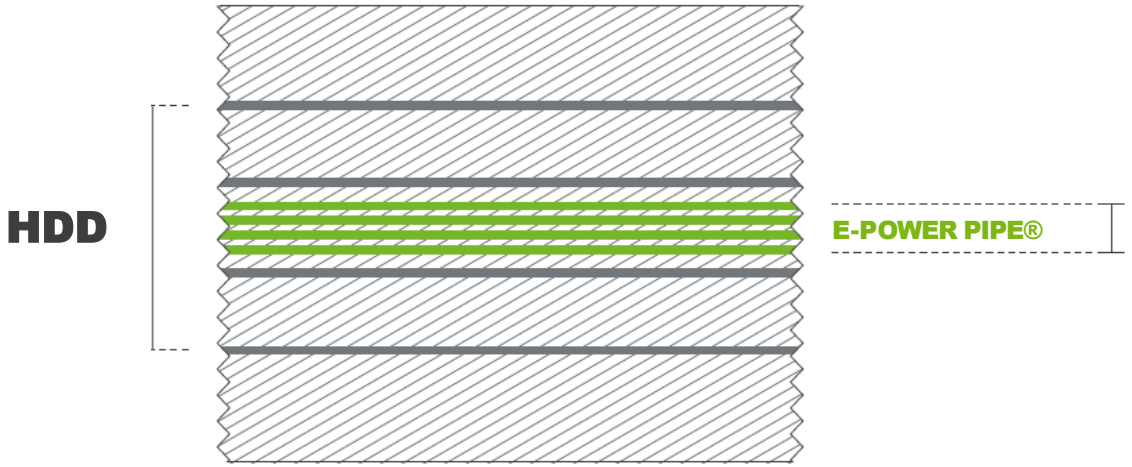
Trenchless Technologies

E-POWER PIPE® VERSUS HDD

Installation depth



Installation corridor / distance between lines



Benefit E-Power Pipe®

- Near-surface (shallow) installation and constant depth possible
  - Min. overburden: **1.5 m | 5 ft**

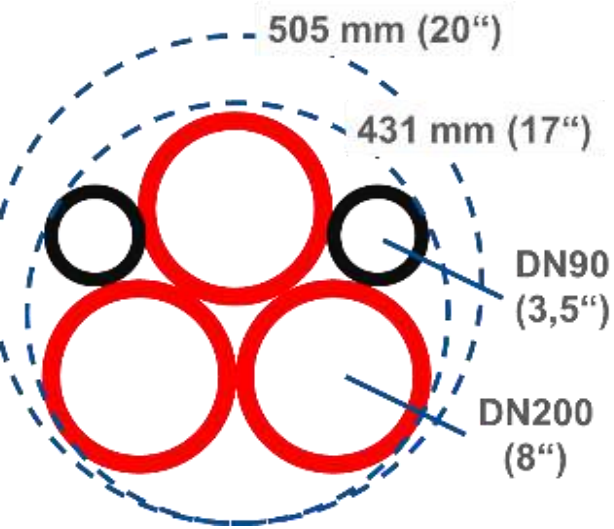
Benefit E-Power Pipe®

- Precise, parallel installation distance: only min. **1.0 m | 3 ft**
- Smaller surface for installation corridor and operation required

RECORD CABLE PROJECT IN THE NETHERLANDS

EPOWER PIPE

2 km



EPOWER PIPE

JOBSITE INSTALLATION

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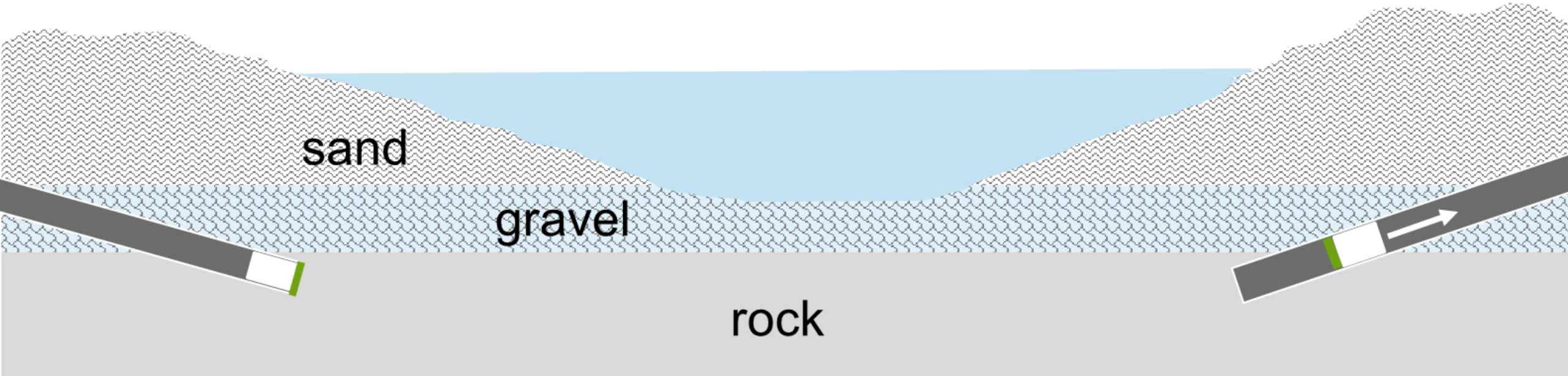
Microtunnelling assists HDD

RETRACTABLE MTBM CONCEPTS FOR HDD INSTALLATIONS

- Steel casings for HDD in unstable ground conditions
- Retraction of MTBM, e.g. by jacking frame, winch or Pipe Thruster



FOLDABLE CUTTING WHEEL MTBM RETRACTION THROUGH TUNNEL

Retractable MTBM Reference Project

RETRACTABLE DIRECT PIPE FOR HDD STARTER CASING

- For 48“ HDD casing of 85m length
- HDD project: New Jersey Expansion Project
- New Jersey, USA
- M-1547M, AVN 800 + HK500PT
- Geology: fill, wood, sand, cobbles, boulders
- Client: Spectra Energy
- Contractor: Michels Directional Inc.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Tunnelling Systems