



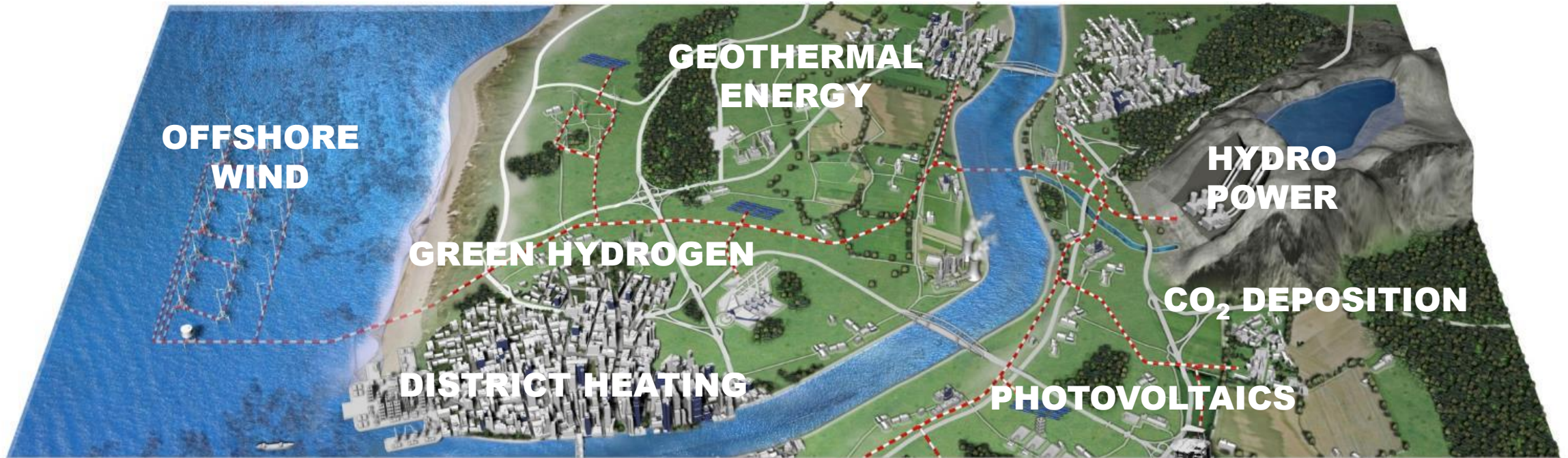
## THE ROLE OF GREEN HDD FOR ECO-FRIENDLY PIPELINE INSTALLATION





# PIPELINE AND UNDERGROUND CABLE INSTALLATION

Main energy sources for sustainable energy transition

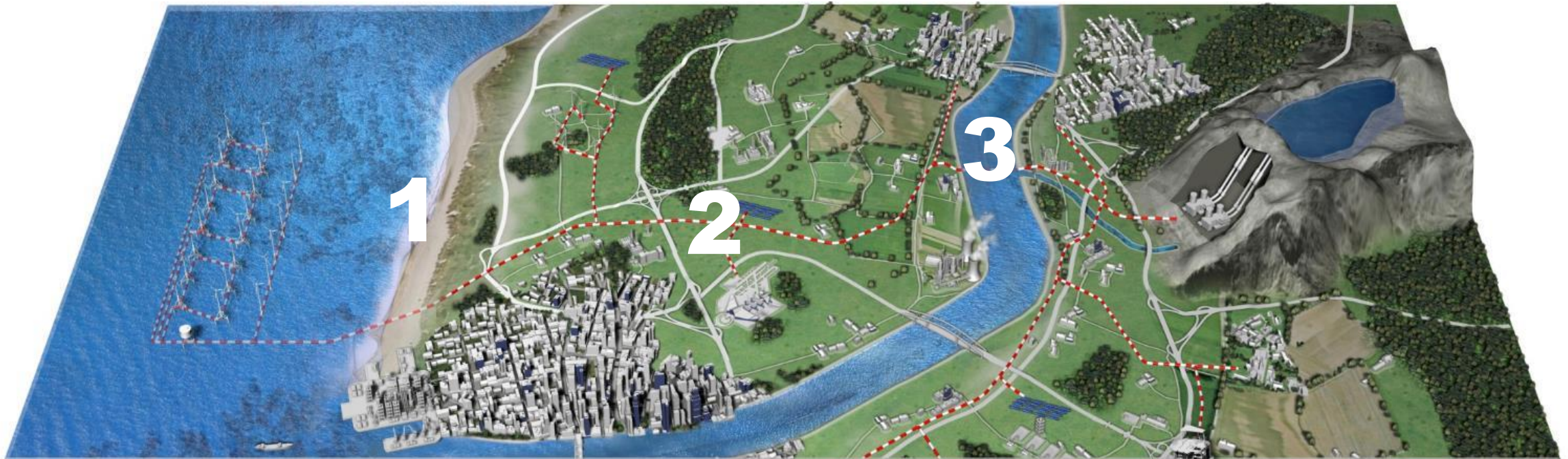


**TRANSMISSION GRID EXPANSION REQUIRED**



# PIPELINE AND UNDERGROUND CABLE INSTALLATION

Different purpose – same challenges for landfalls, crossings and cross-country installations





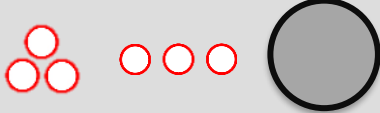
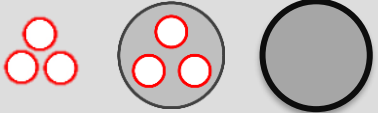
**1** Offshore-Onshore  
Connections /  
Landfalls

**2** Cross-country  
installations with  
minimum disruption

**3** Crossing of obstacles,  
e.g. waterways and  
traffic routes

# SUSTAINABLE EXPANSION OF POWER GRIDS AND PIPELINE NETWORKS

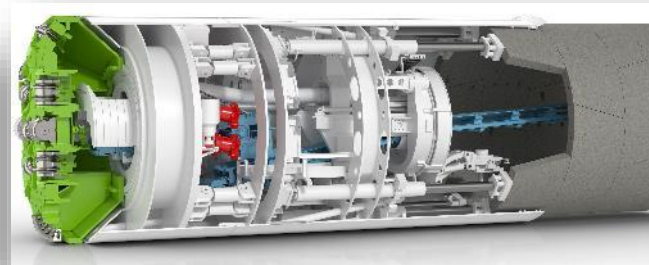
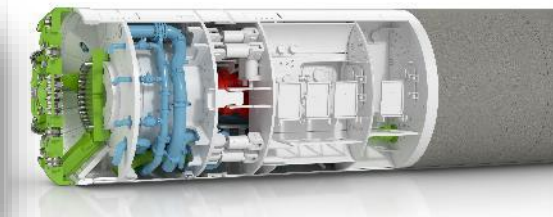
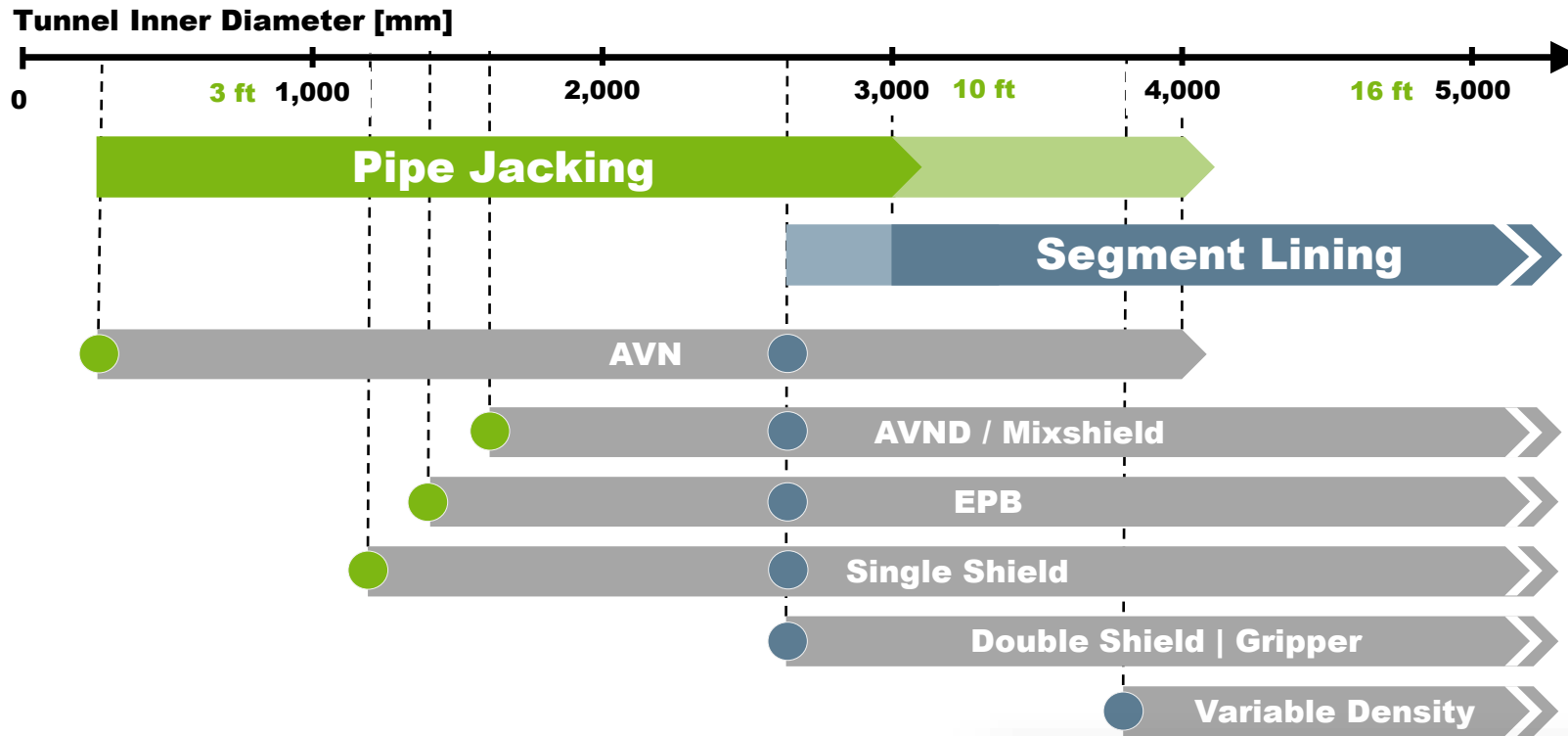


	Tunnelling	Direct Pipe <sup>®</sup>	E-Power Pipe <sup>®</sup>	HDD
Installation of <b> cable / casing </b> or <b> steel pipeline </b>				
	<b> Indirect </b> Cables/pipeline in tunnel	<b> one-step </b> steel casing/pipeline	<b> two-stage </b> HDPE single casings or bundle, steel casing/pipeline	<b> multi-stage </b> Cable bundle or steel casing/pipeline
<b> Diameter </b>	<b> &gt; 250 mm </b> Ø tunnel (ID)	<b> 24" – 60" </b>	<b> 10" – 28" </b> < 36" with backreaming	<b> 10" – 60" </b>
<b> Max. installation length </b>	<b> 10,000 m </b>	<b> 2,000 m </b>	<b> 2,000 m </b>	<b> 5,000 m </b>

\*The information in this table is intended as an initial guideline; the parameters may vary depending on the project.



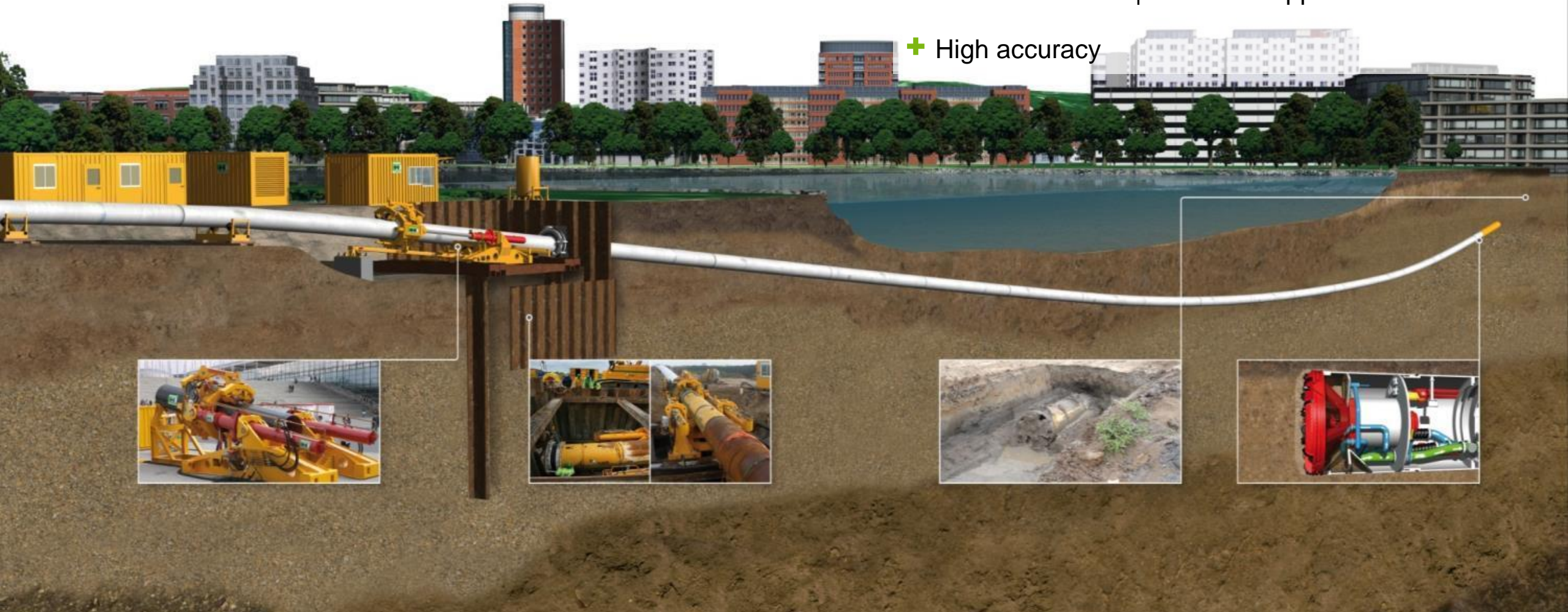
# SMALL-DIAMETER TUNNELLING MACHINE RANGE



# DIRECT PIPE® TECHNOLOGY

24" up to 60" steel pipeline installations

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

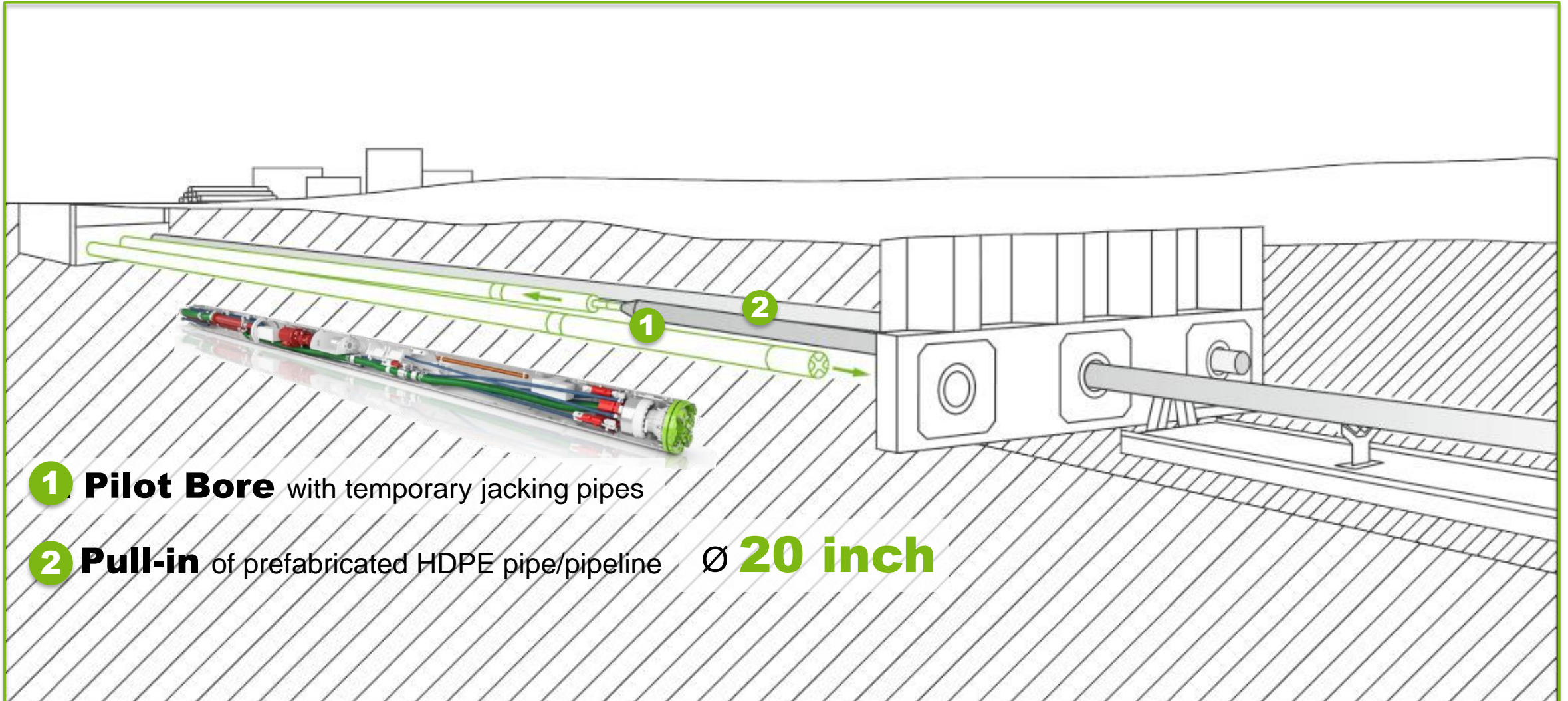




# E-POWER PIPE® TECHNOLOGY



Two-step installation of HDPE protective pipe or small-diameter pipelines

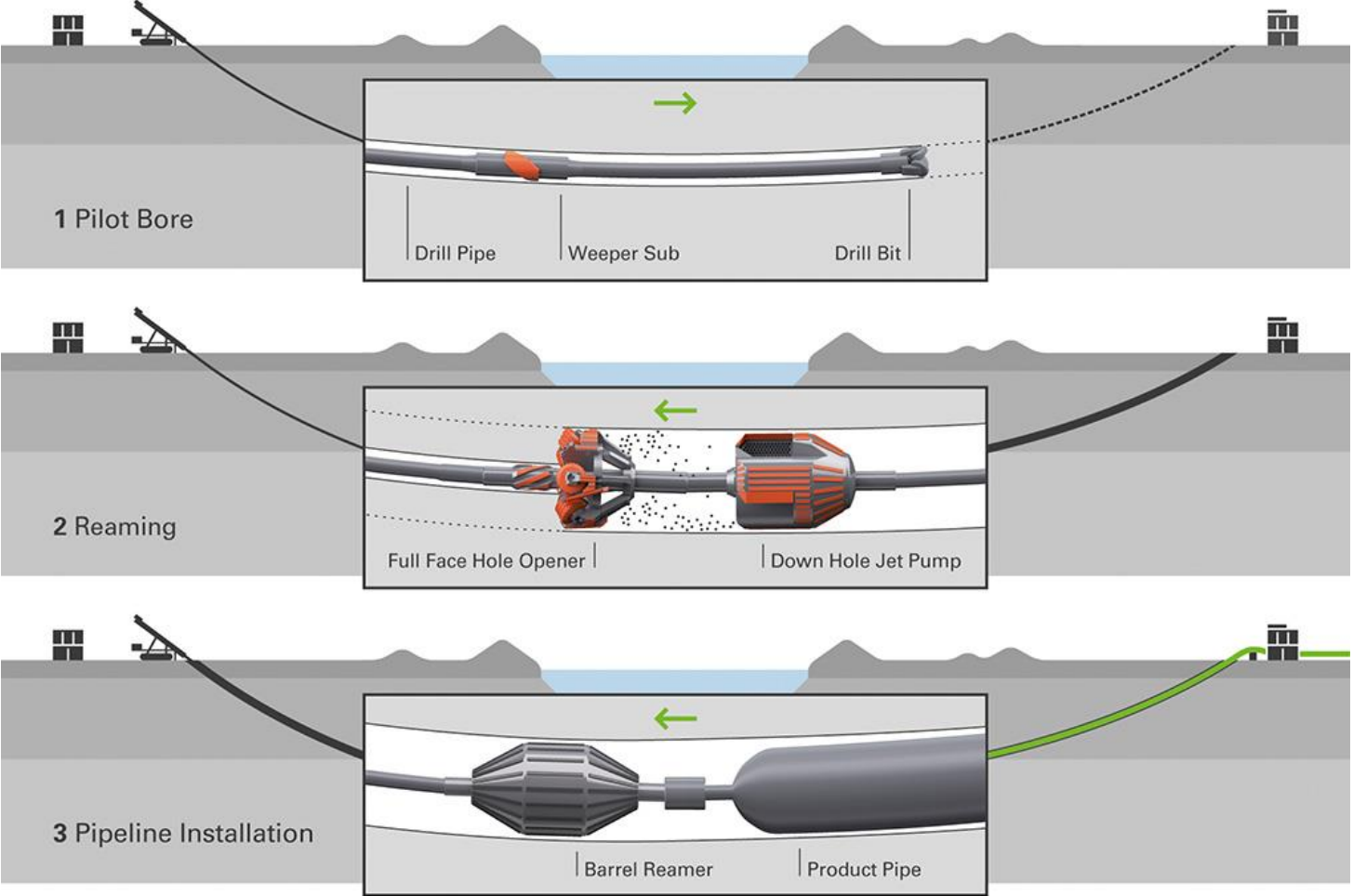


**1 Pilot Bore** with temporary jacking pipes

**2 Pull-in** of prefabricated HDPE pipe/pipeline  $\varnothing$  **20 inch**

# HDD Technology

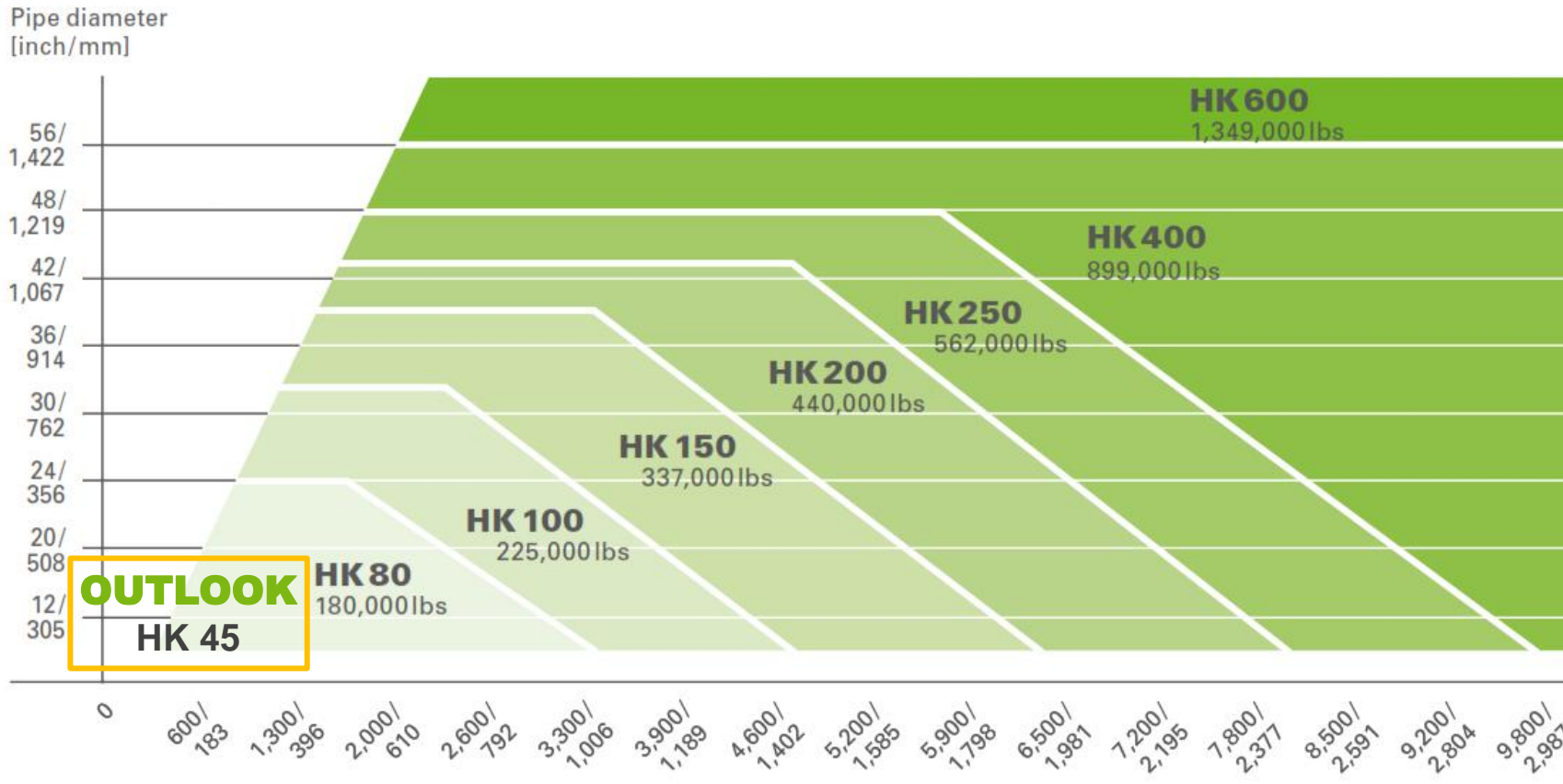
## General





# TRENDS IN HDD PROJECTS

- › **GREENER** operation >> all-electric HDD Rigs to use renewable energies  
>> Minimize frac-out risks with smart tooling concepts
- › Focus of the drilling industry on grid construction
- › Smaller drilling diameters in grid construction → Smaller HDD Rigs



Drilling length [feet/meter]

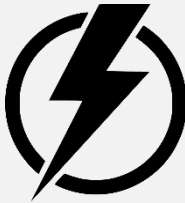
# HDD RIG RANGE AND EQUIPMENT

**Conventional  
HDD Rig**  
diesel-hydraulic

**HYBRID  
HDD Rig**  
electric-hydraulic

**ALL-ELECTRIC  
HDD Rig**  
direct electric

**Generator**  
One source | independant | proven  
& robubst



**Local grid**  
Quiet operation | low emissions |  
„plug and play“

**Separation  
plant**

**Mud  
mixing  
unit**

**Mud  
transfer  
tank**

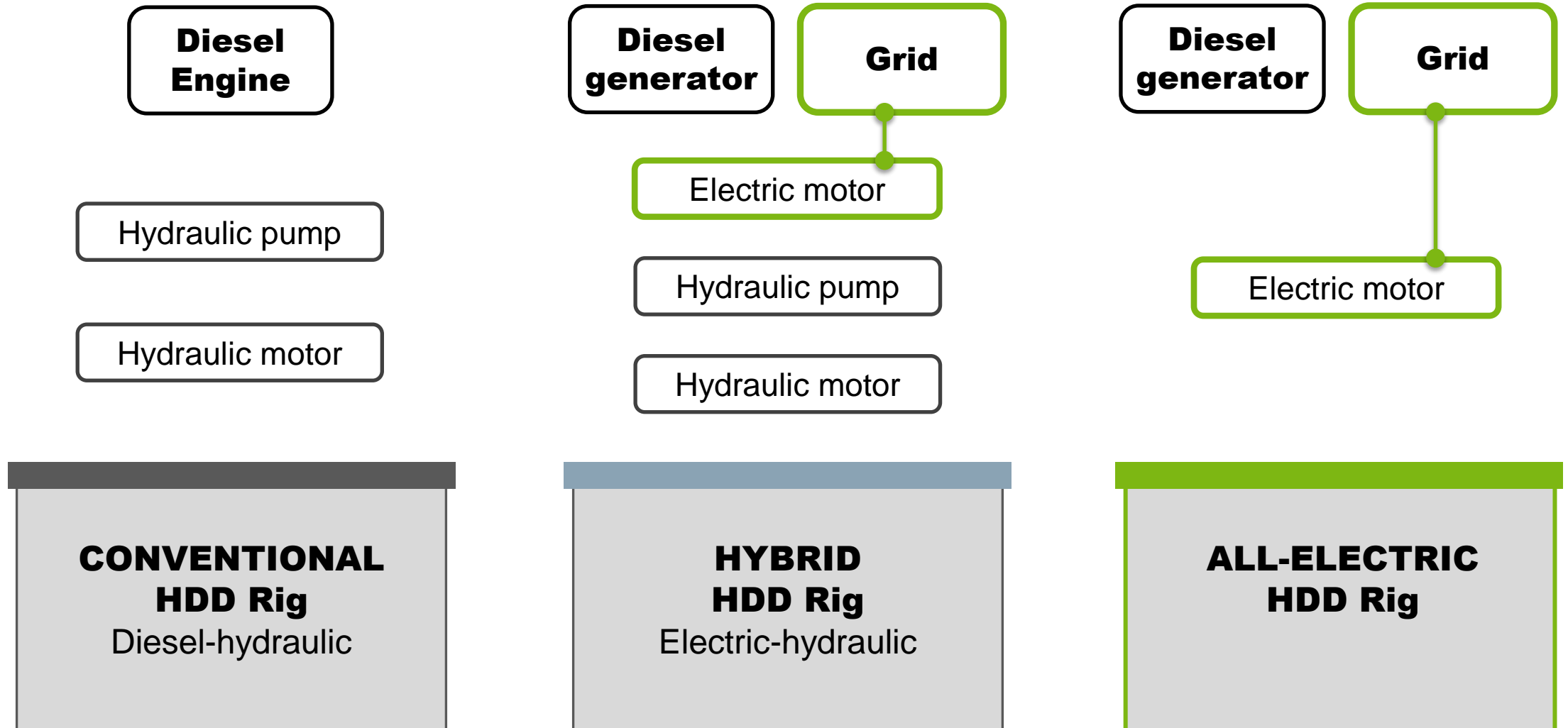
**Mud pit  
pump**

**High  
pressure  
mud pump**










**Breakout  
unit**



# HDD RIG RANGE AND POWER SOURCES



# HDD RIG RANGE COMPARISON

	CONVENTIONAL HDD RIG	HYBRID HDD RIG	ALL-ELECTRIC HDD RIG
Power source	Generator	Generator / Grid	Generator / Grid
Efficiency	+	+	+++
Emissions / Noise			
Investment Costs			
Maintenance Costs			



# HYBRID HDD RIG | HK80CK HYBRID

- › Compact crawler rig with electric engine
- › Small footprint for jobsites in urban areas
- › all components can be mounted directly on the rig
- › Low in emissions and noise



## HYBRID RIG HK80CK

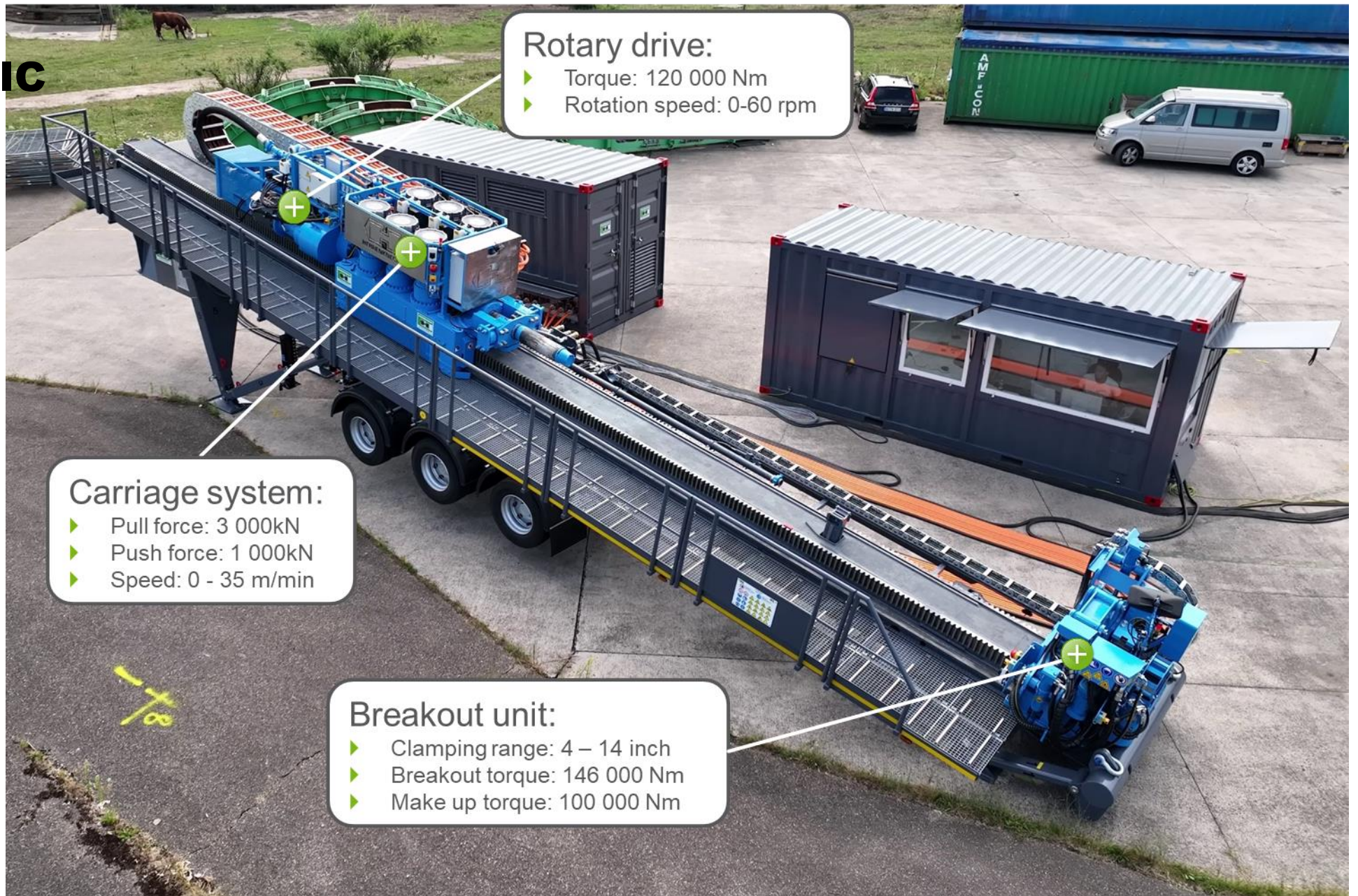
### Rig

- › Installed power: 324 kW (434 hp)
- › Power transmission: Rack & Pinion
- › Drilling angle: 9°–21°
- › Drill pipe length: 6,000 mm (20 ft)
- › Pipe support system on mast: 2





# ALL-ELECTRIC HDD RIG | HK300TE



## Rotary drive:

- ▶ Torque: 120 000 Nm
- ▶ Rotation speed: 0-60 rpm

## Carriage system:

- ▶ Pull force: 3 000kN
- ▶ Push force: 1 000kN
- ▶ Speed: 0 - 35 m/min

## Breakout unit:

- ▶ Clamping range: 4 – 14 inch
- ▶ Breakout torque: 146 000 Nm
- ▶ Make up torque: 100 000 Nm



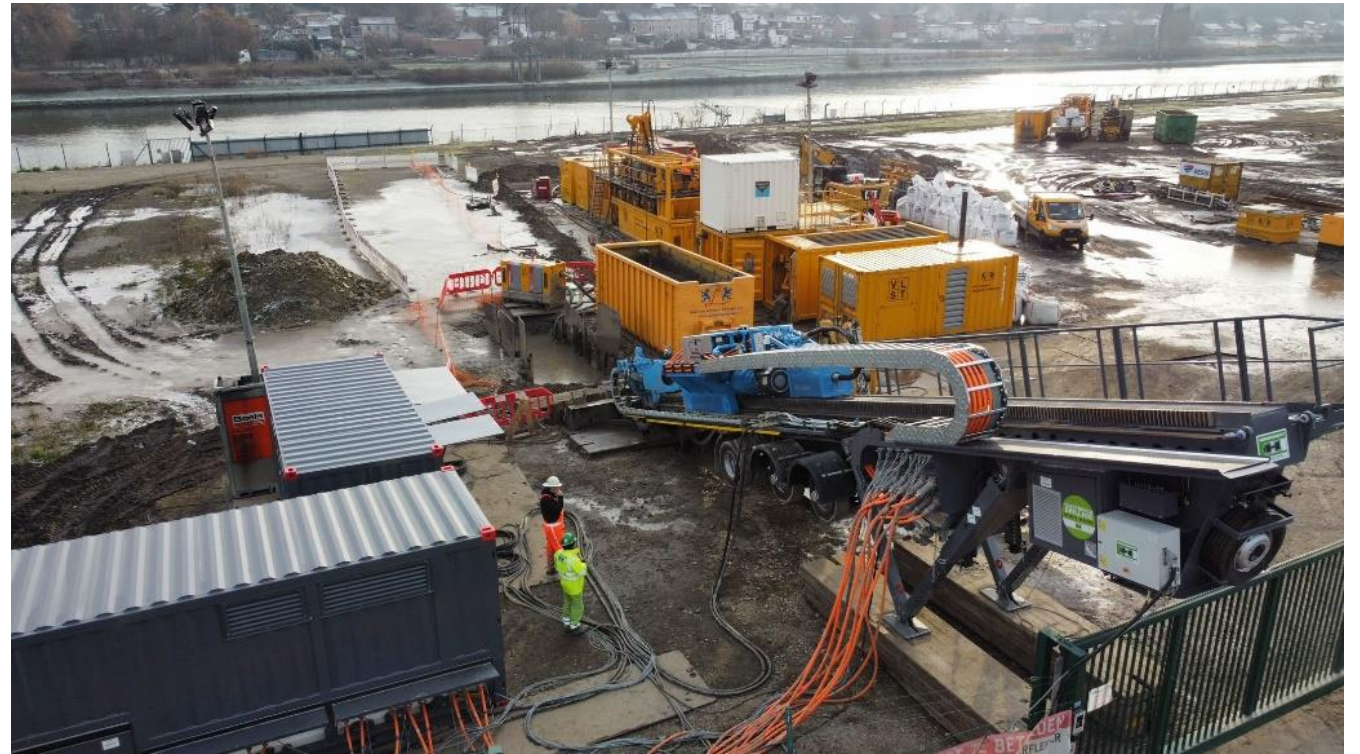
# ALL-ELECTRIC HDD RIG | HK300TE





# ALL-ELECTRIC HDD RIG | HK300TE

- › Electric Motors directly on carriage
- › High efficiency by elimination of hydraulic power losses
- › Low in emissions and noise
- › High availability: sensitive electronic parts located off the HDD Rig





# INSTALLATION OF CABLE BUNDLE WITH HDD

HK250T – 250to Trailer Rig in Denmark

- › H-395, HK250T
- › Crossing of Eastern Limfjord
- › Installation length: **1,551 m**
- › Cutting diameter: 1,200 mm
- › bundle 3xDN400 + 1xDN355 (HDPE)
- › Geology: soft soil, dense chalk with flint

- › Client: Energinet, Denmark
- › Contractor: Leeuwen Sleufloze Technieken (VLST)



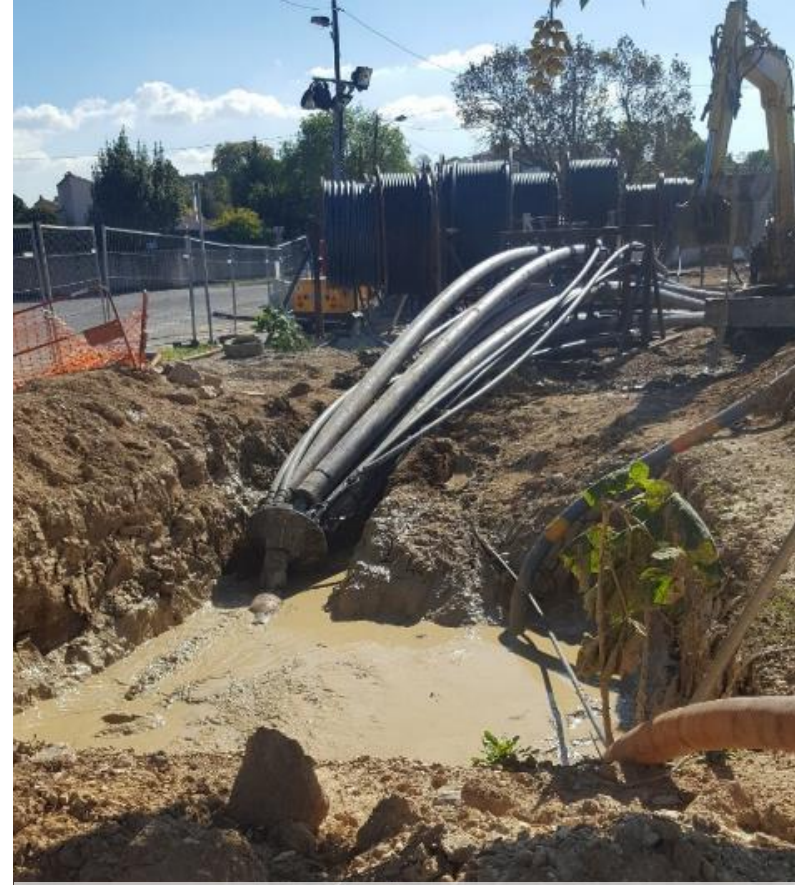


# INSTALLATION OF CABLE BUNDLE WITH HDD

HK250T – 250to Trailer Rig in Marseille, France



Preparation of pipeline bundle on Pipe side



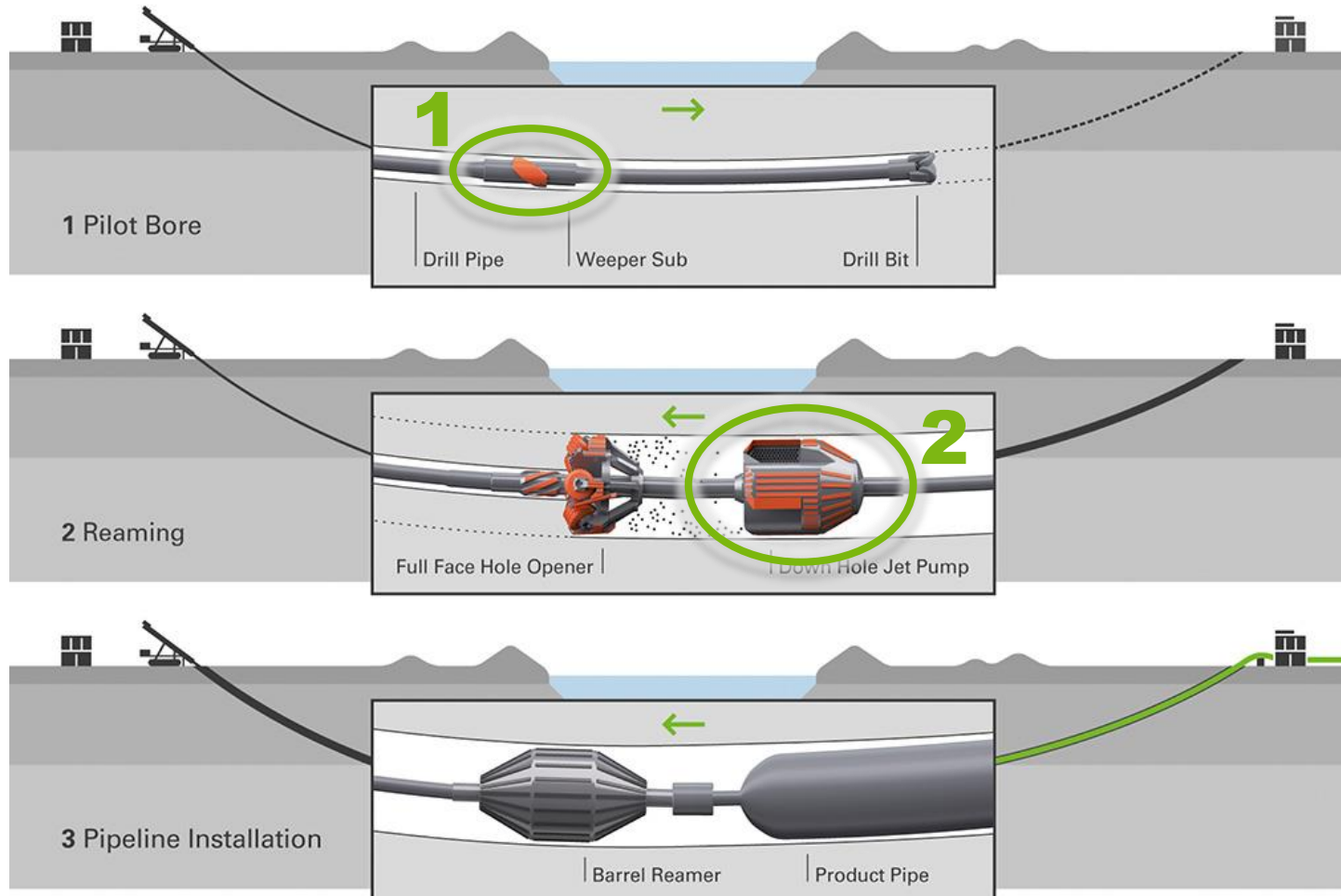
Lines fixed to pullhead





# GREENER HDD | MINIMIZING FRAC-OUT RISK

Tooling concepts for HDD



## 1 WEEPER SUB

Reduces the risk of frac-outs significantly by gradually increasing the volume flow in the borehole. Less drilling fluid required at the drill bit.

### TOOL DATA

- › Operation diameter: 8 ½" – 12 ¼"
- › Adjustable jet volume: 20 gpm – 105 gpm (75 l/min – 400 l/min)

## 2 DOWN HOLE JET PUMP

Installed directly behind the Full Face Hole Opener. Cleans the borehole and removes the cuttings directly inside the drill string.

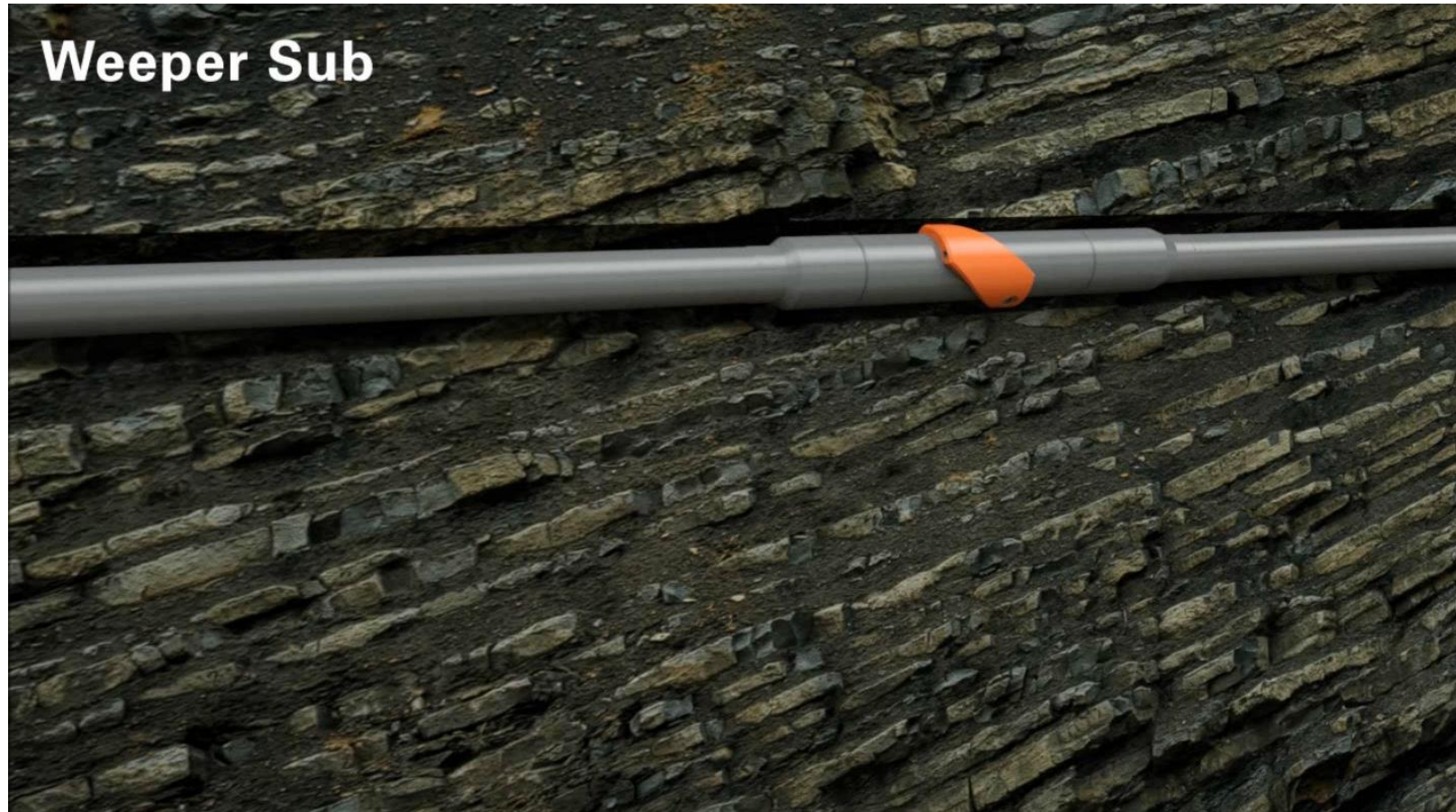
### TOOL DATA

- › Operation diameter: 20" – 72"
- › Operation flow rate: 475 gpm (1,800 l/min) at 65 bar

# GREENER HDD | MINIMIZING FRAC-OUT RISK

Tooling concepts for HDD

## 1 Weeper Subs for Pilot Bore



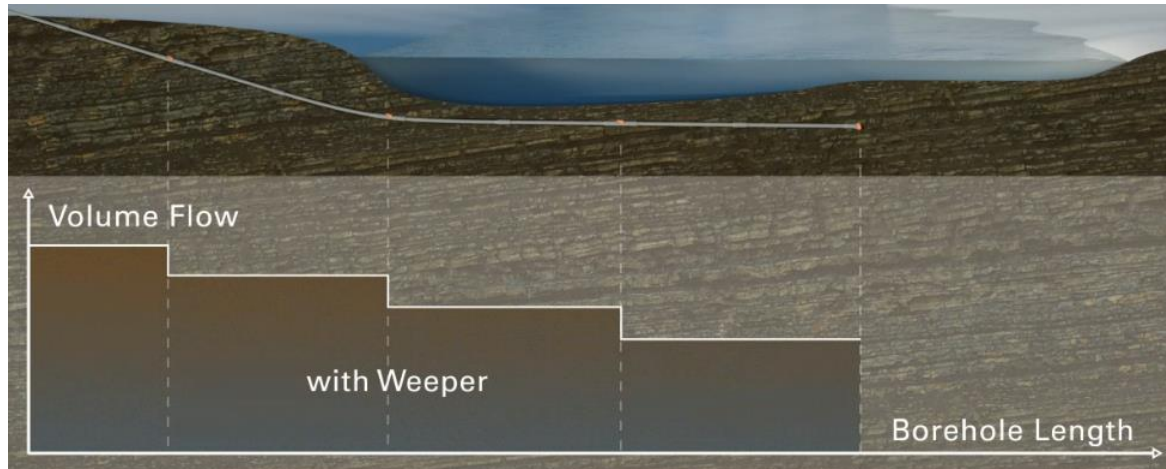


# GREENER HDD | MINIMIZING FRAC-OUT RISK

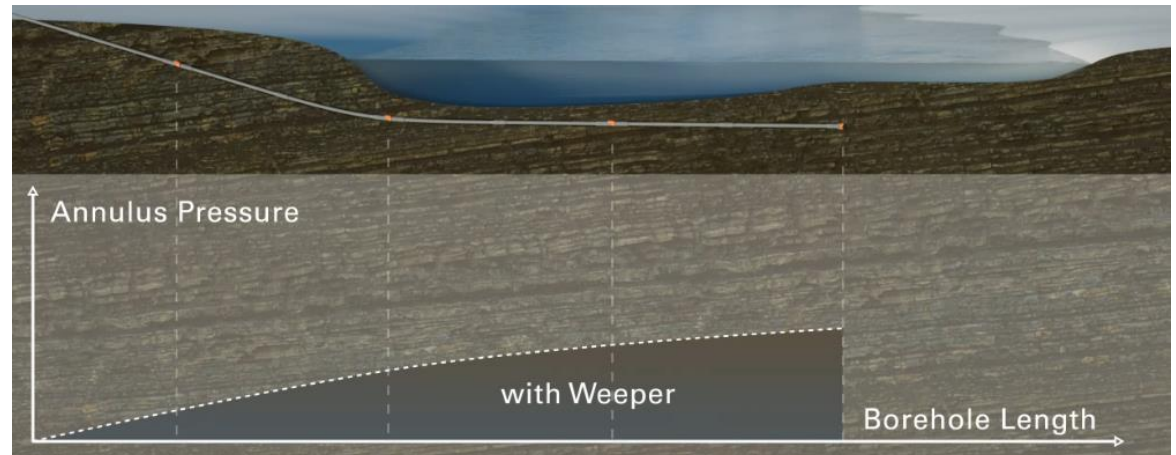
Tooling concepts for HDD

## 1 Weeper Subs for Pilot Bore

Volume flow



Annulus pressure

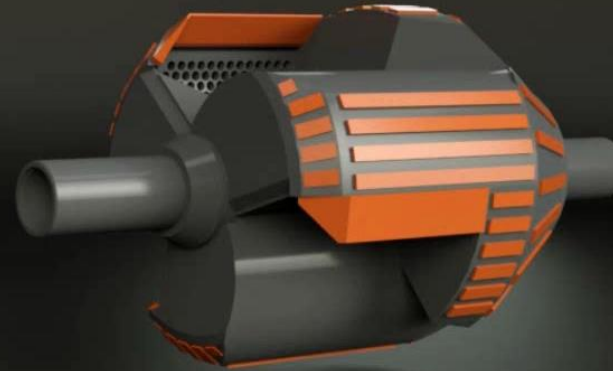


# GREENER HDD | MINIMIZING FRAC-OUT RISK

Tooling concepts for HDD

## 2 Down Hole Jet Pump for Reaming Stage

### Down Hole Jet Pump



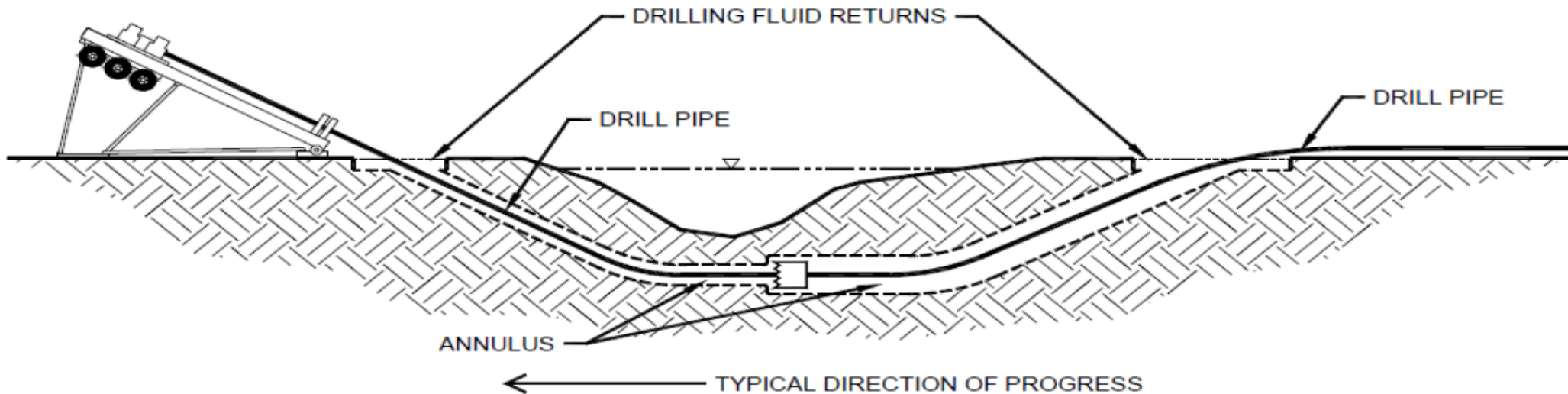
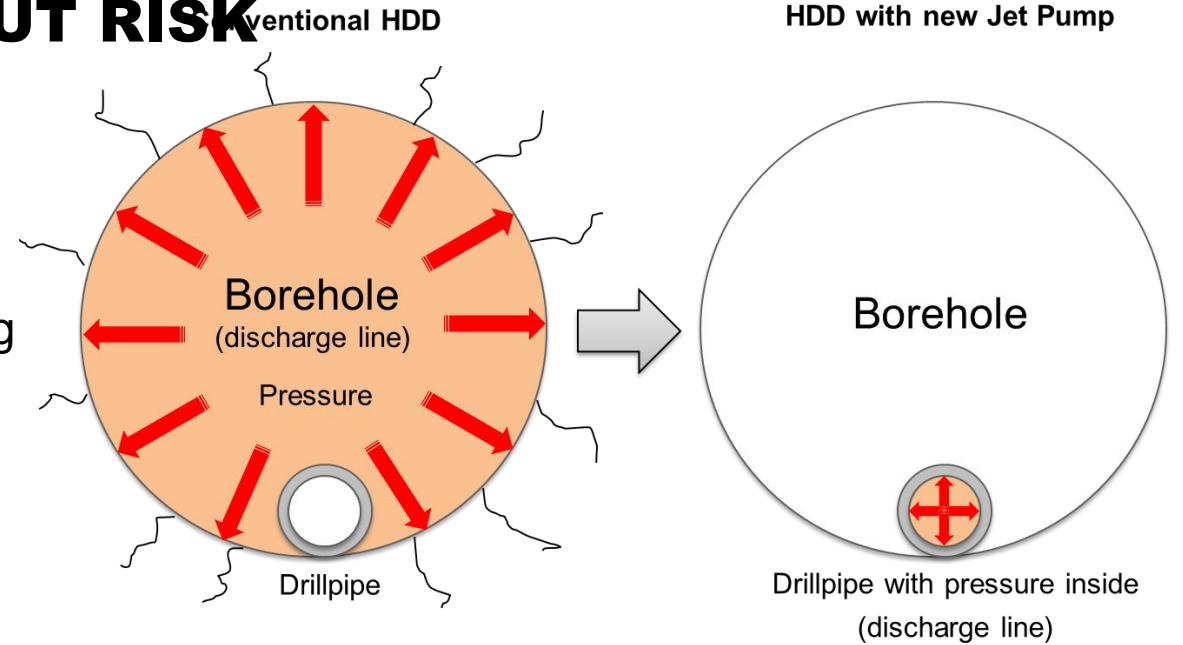


# GREENER HDD | MINIMIZING FRAC-OUT RISK

Tooling concepts for HDD

## 2 Down Hole Jet Pump for Reaming Stage

- › Principle HDD arrangement of the borehole and drill string
- › Return flow through borehole
  - › either to Rig side or to Pipe side

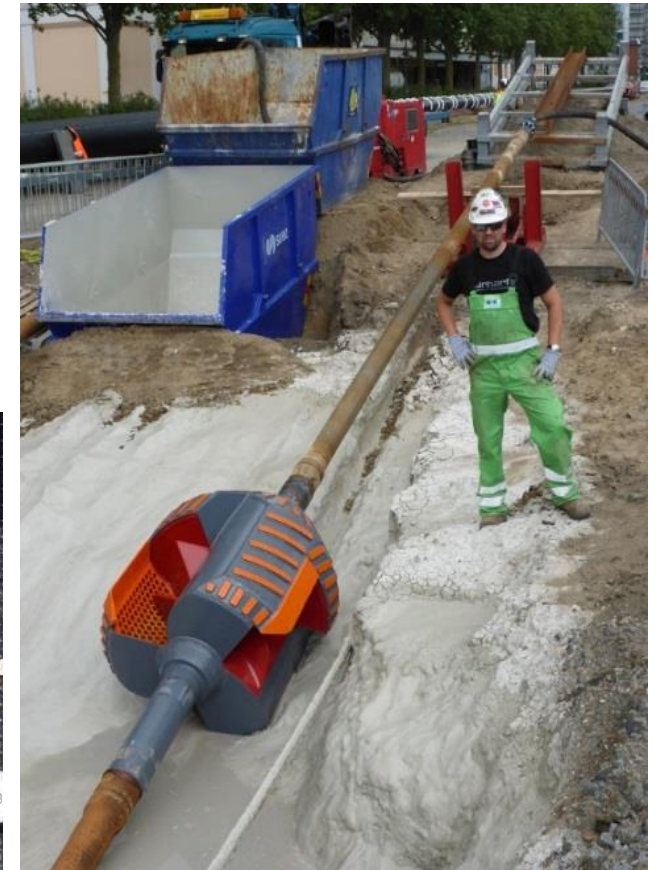


# GREENER HDD OPERATIONS

Risk types in HDD

## Down hole jet pump | Reference Project: Malmö Harbor Channel Crossing

- › H-165, HK150C Crawler Rig
- › Location: Malmö, Sweden
- › Project: District Heating Pipeline
- › Drilling length: 850 ft. (263 m)
- › Pipeline: 40" HDPE casing pipe with inner steel pipeline for heat transport
- › Geology: hard limestone, flintstones






## CONTACT


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