14-17 October 2023
Perth Convention and Exhibition Centre

The role of green HDD for pipeline and power grid construction

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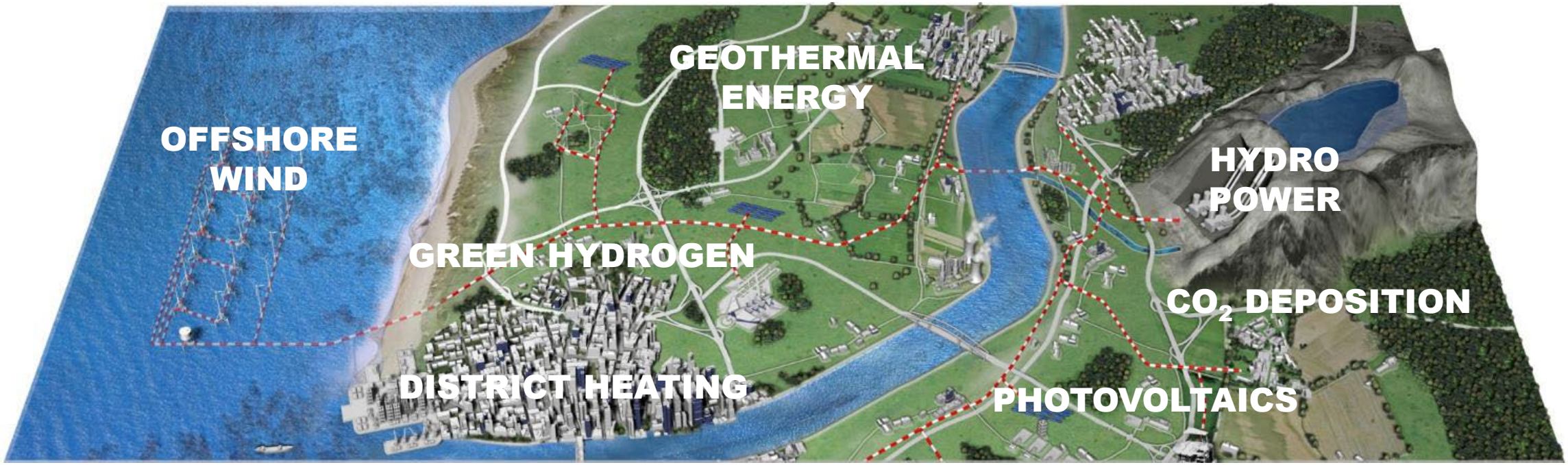
PIPELINE AND UNDERGROUND CABLE INSTALLATION

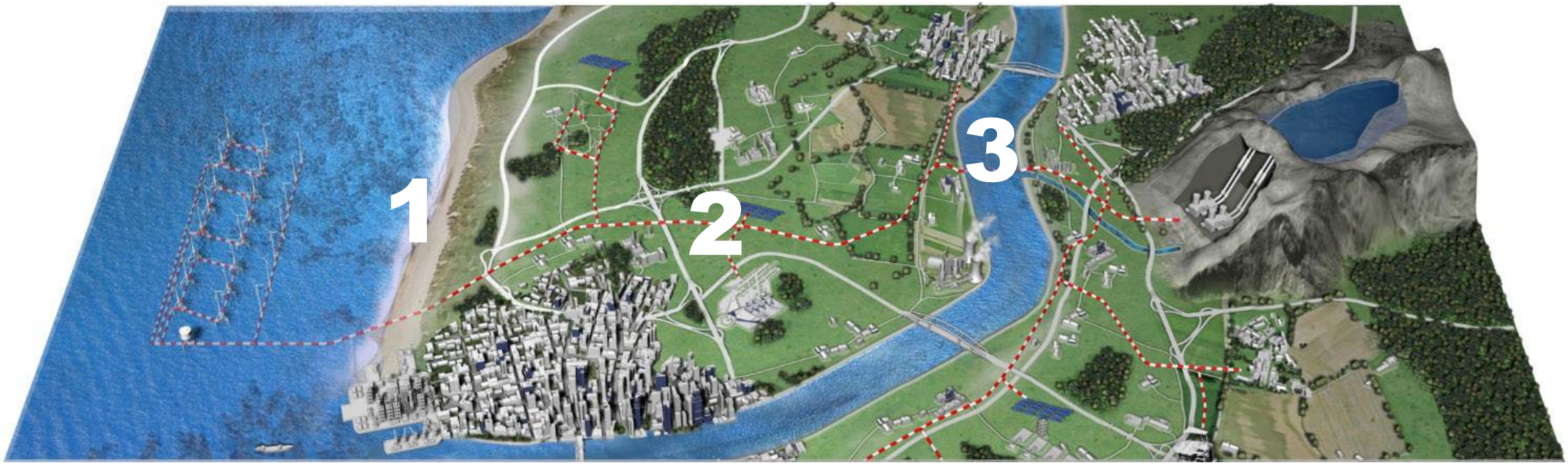
Main energy sources for sustainable energy transition



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

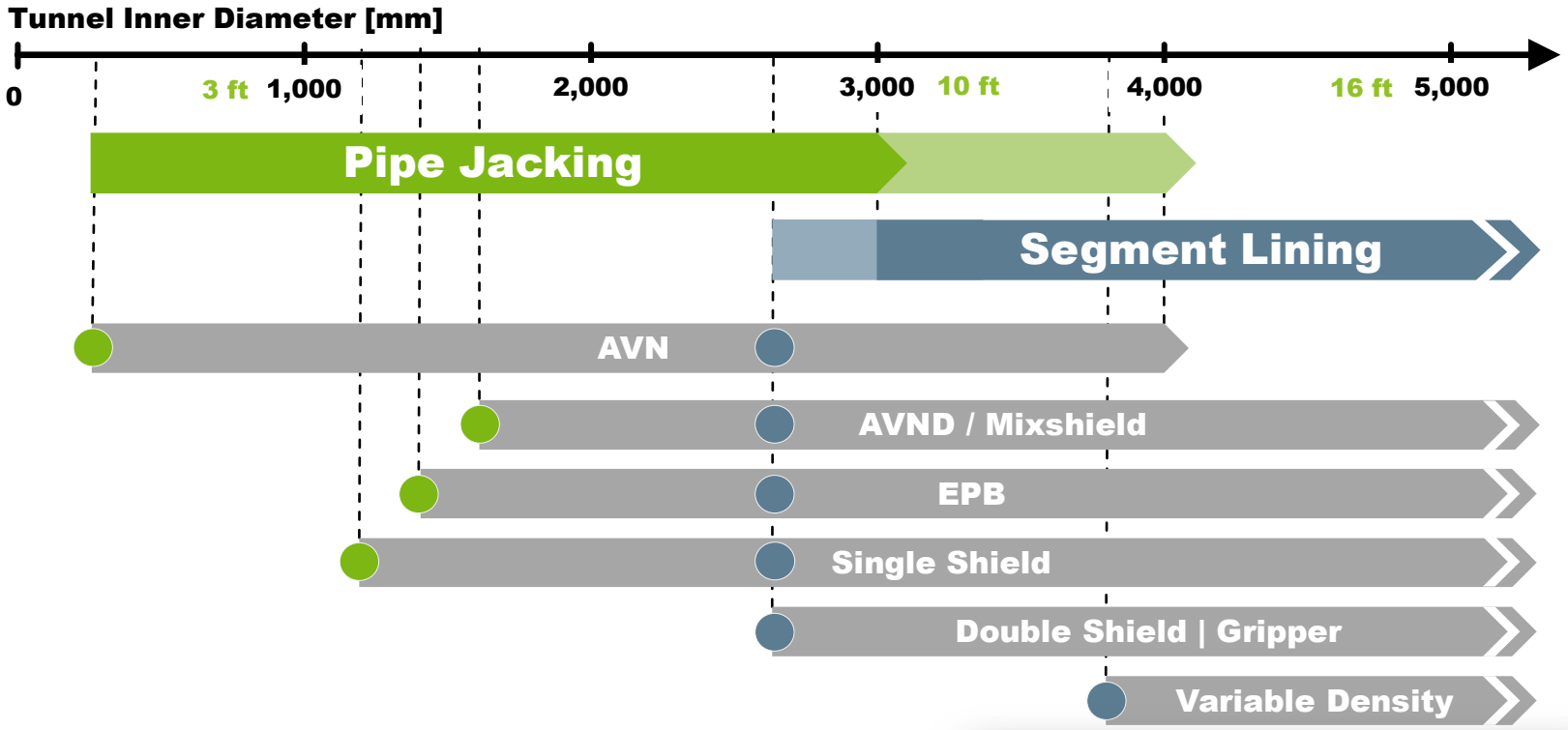
3 Crossing of obstacles, e.g. waterways and traffic routes

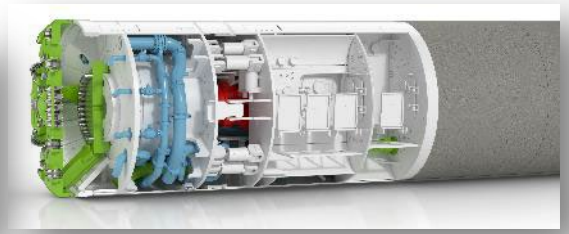
SUSTAINABLE EXPANSION OF POWER GRIDS AND PIPELINE NETWORKS

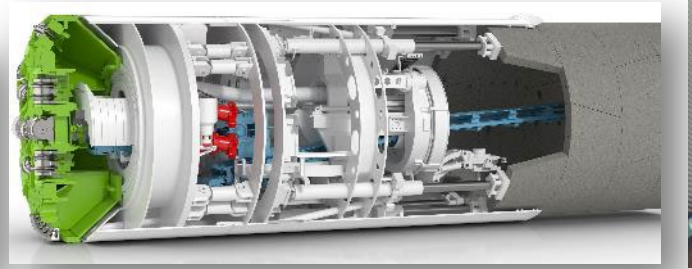
	Tunnelling	Direct Pipe®	E-Power Pipe®	HDD
Installation of **pipeline / protective pipe**				
	Indirect Cables in tunnel	**One-step** Steel casing	**Two-stage** HDPE single casings or bundle, steel casing	**Multi-stage** Cable bundle or steel casing
Diameter	**> 10" / 254 mm** Ø tunnel (ID)	**24–60"** **610–1,524 mm**	**10–28"** **254–711 mm**	**10–60"** **254–1,524 mm**
Max. installation length	**10 km**	**2 km**	**2 km**	**5 km**

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

SMALL-DIAMETER TUNNELLING MACHINE RANGE



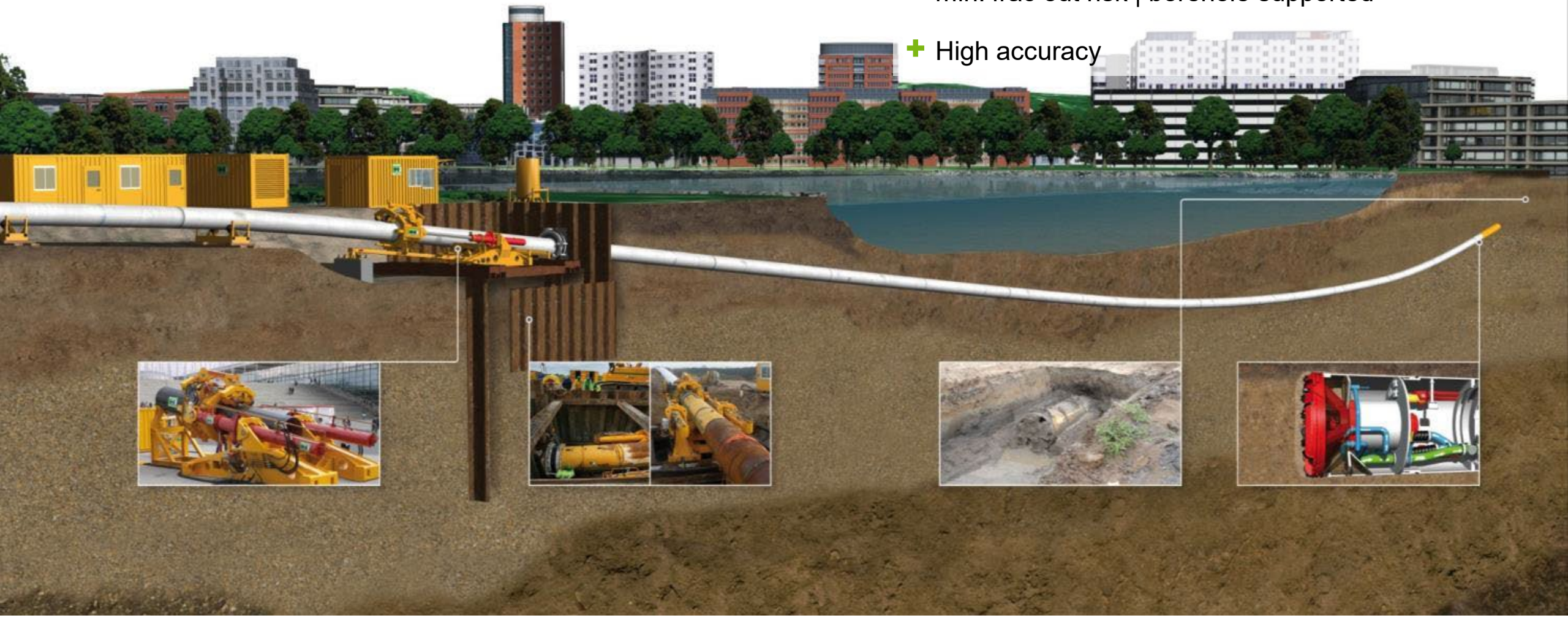




DIRECT PIPE® TECHNOLOGY

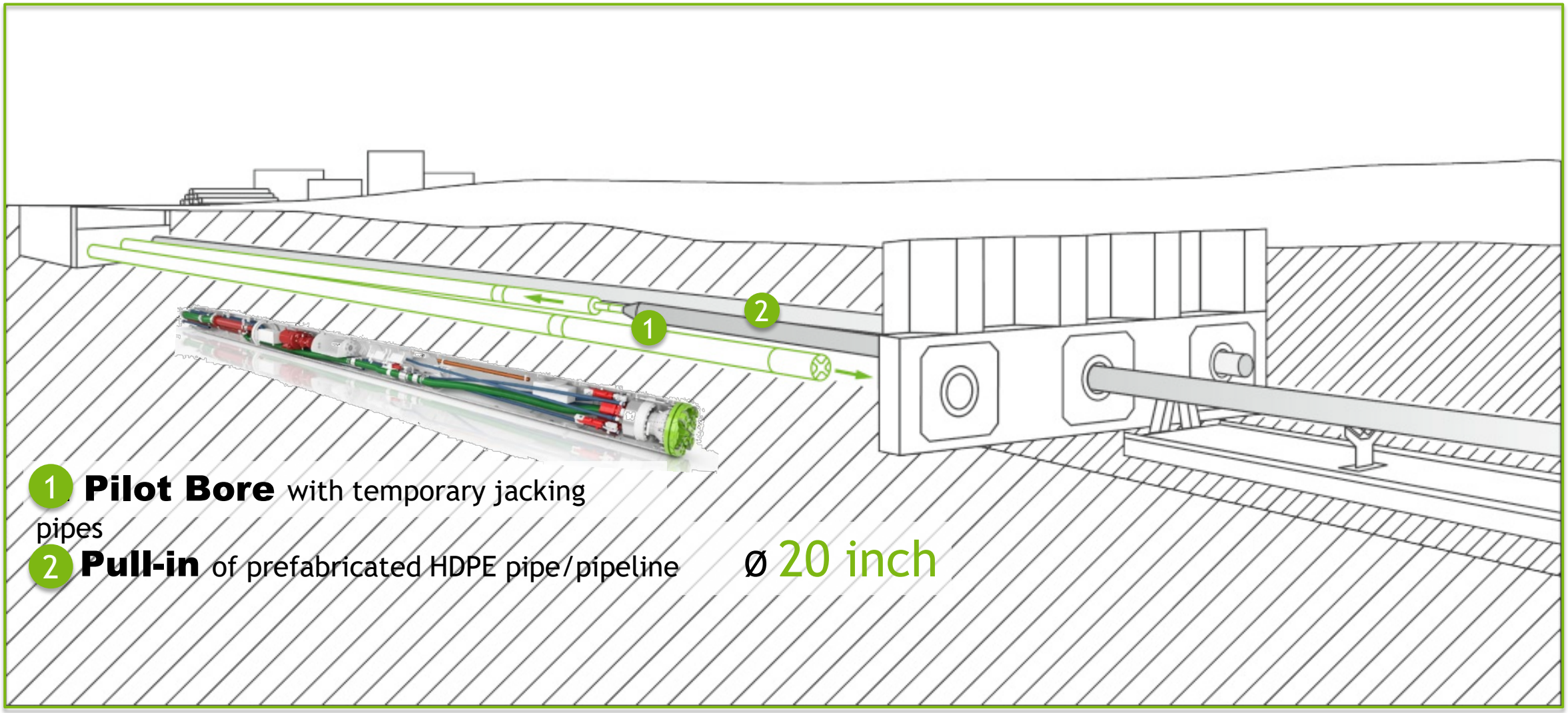
24“ up to 60“ steel pipeline installations

+ 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



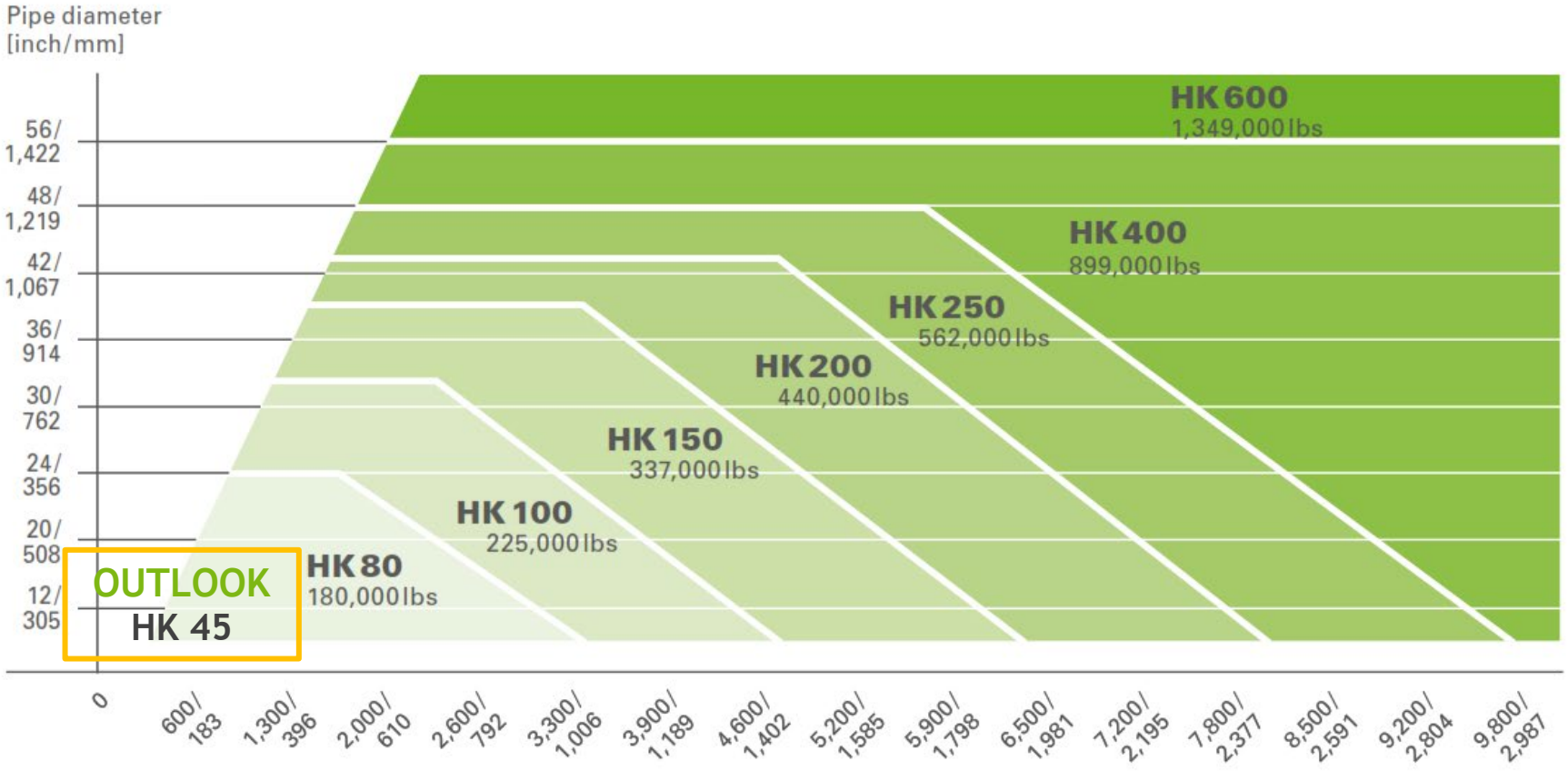
1 **Pilot Bore** with temporary jacking pipes

2 **Pull-in** of prefabricated HDPE pipe/pipeline

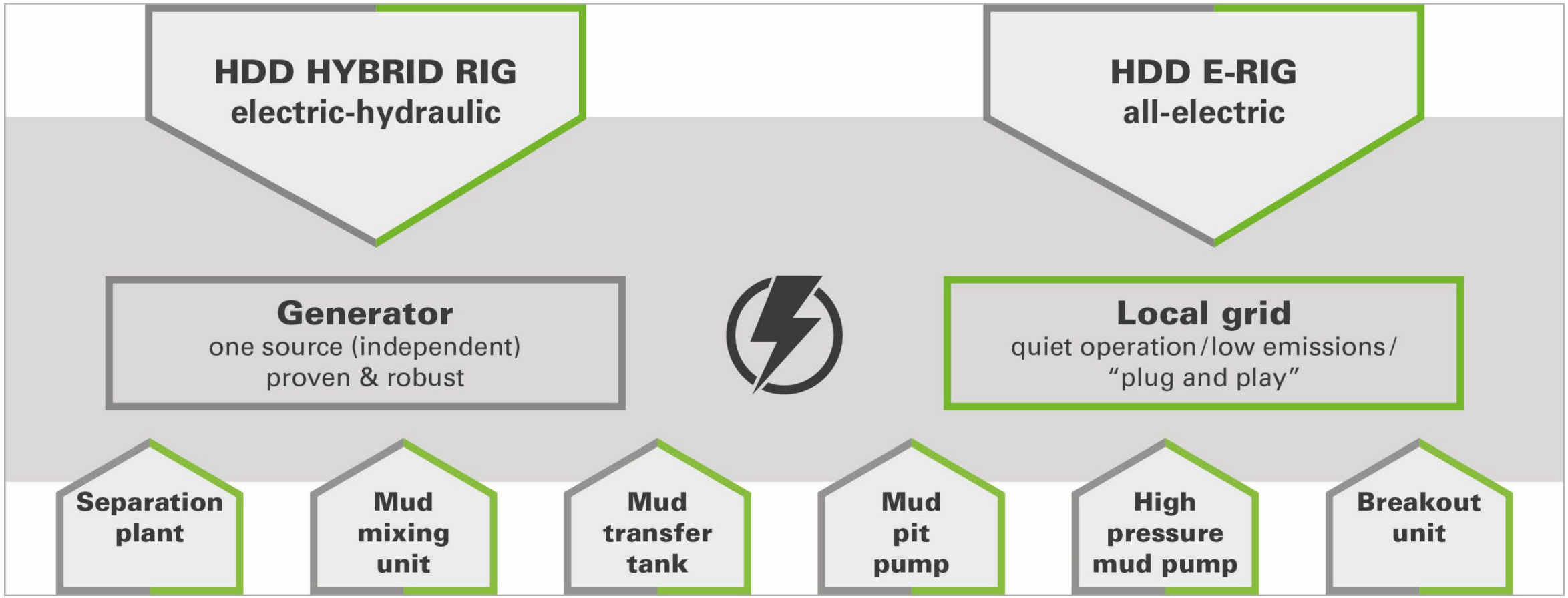
Ø 20 inch

TRENDS IN HDD PROJECTS

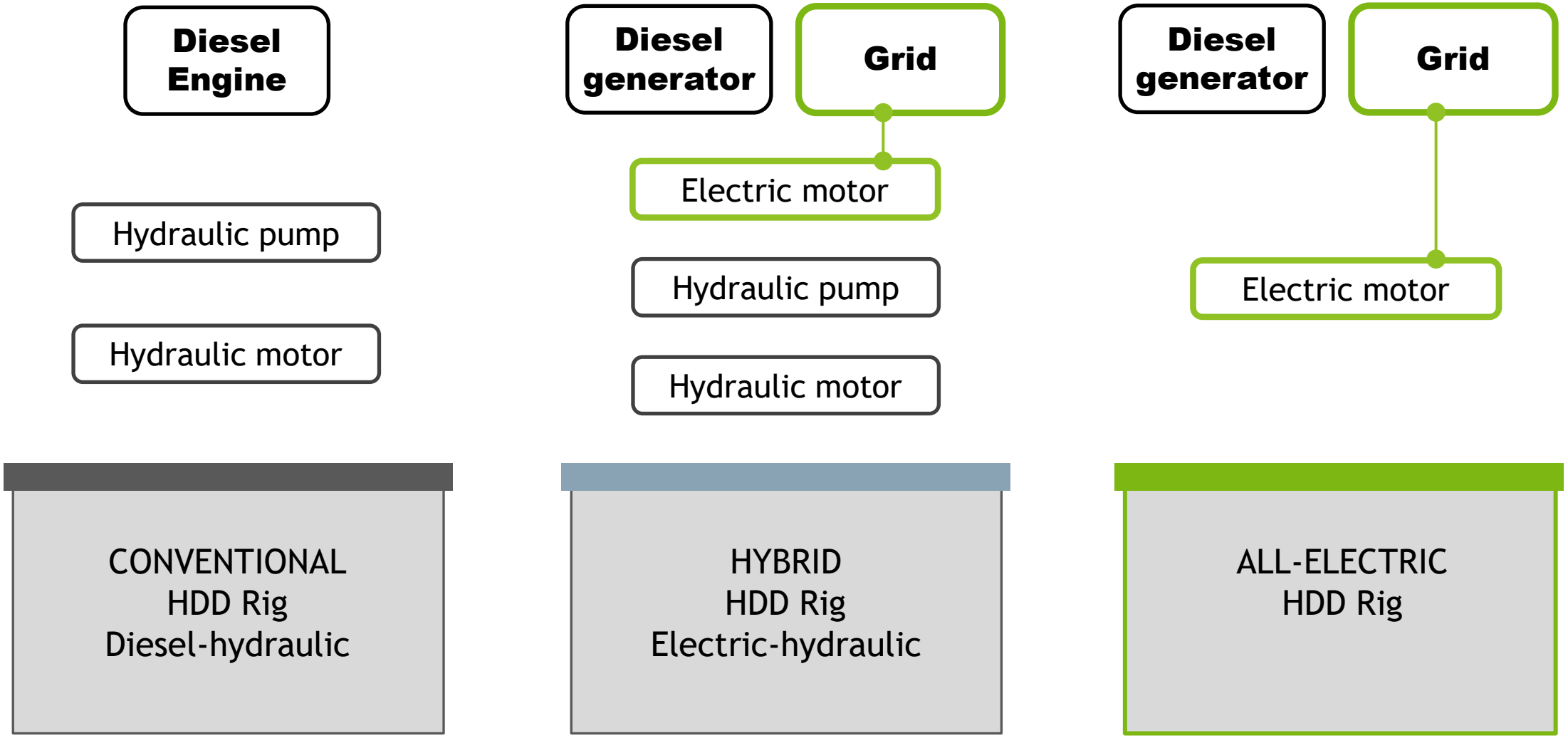
- GREENER operation
  - >> all-electric HDD Rigs to use renewable energies
    >> Minimize frac-out risks with smart tooling concepts
- Focus of the drilling industry on grid construction
- Smaller drilling diameters in grid construction → Smaller HDD Rigs



HDD RIG RANGE AND EQUIPMENT



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

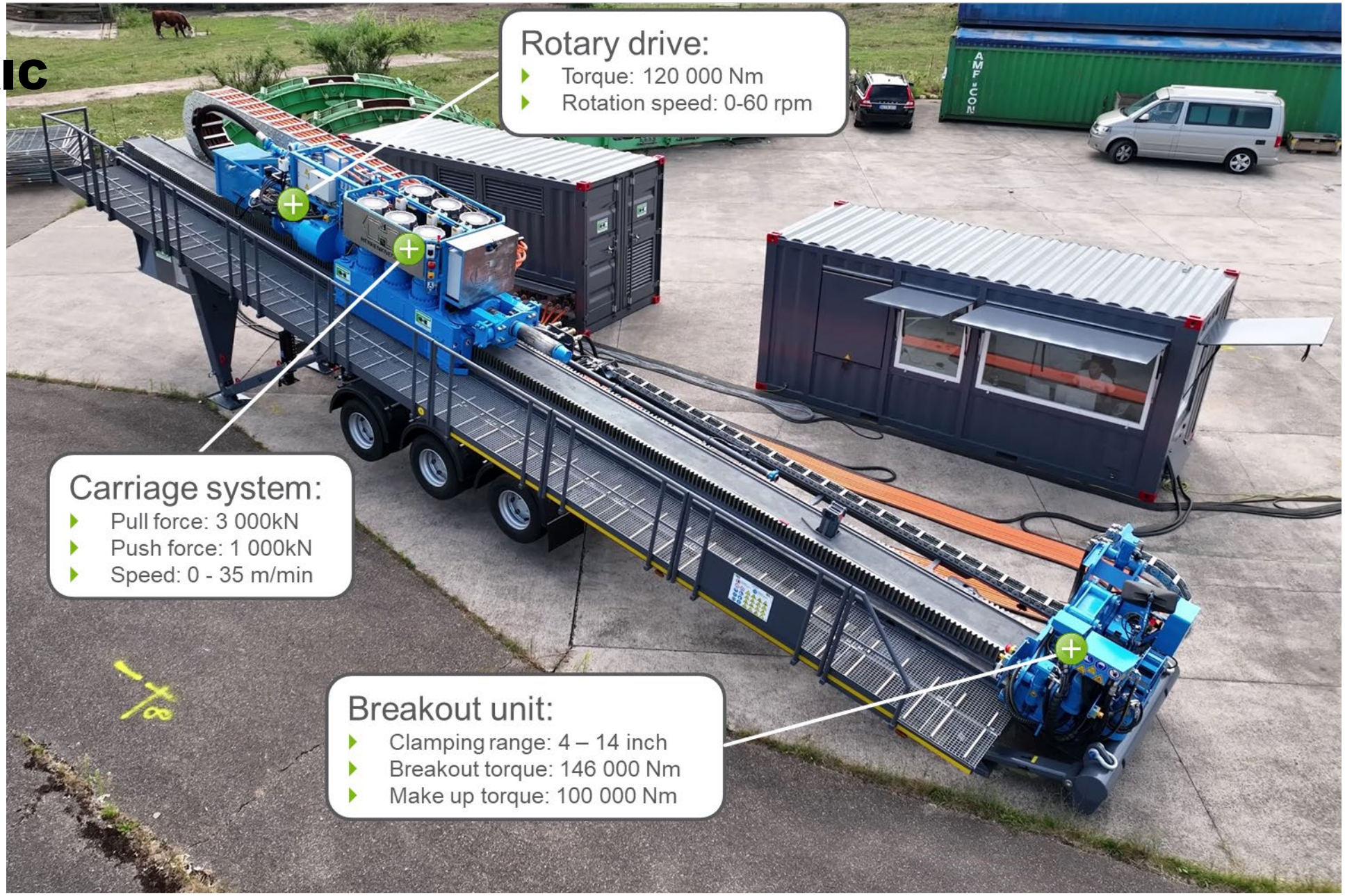
- Compact crawler rig with electric engine
- Small footprint for jobsites in urban areas
- all components can be mounted directly on the rig
- Low in emissions and noise

HYBRID RIG HK80CK

Rig

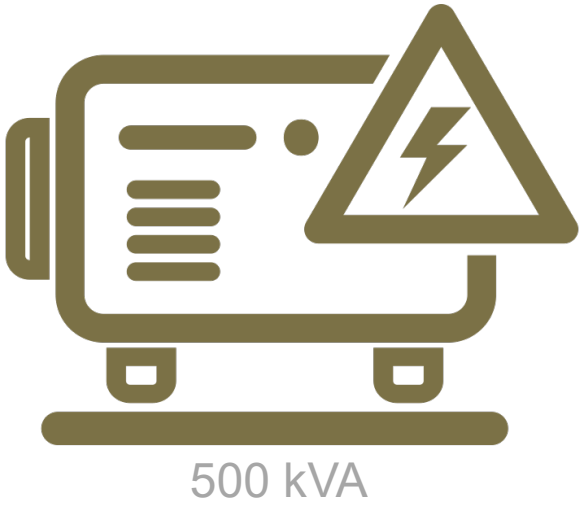
- Installed power: 324 kW (434 hp)
- Power transmission: Rack & Pinion
- Drilling angle: 9°–21°
- Drill pipe length: 6,000 mm (20 ft)
- Pipe support system on mast: 2

ALL-ELECTRIC HDD RIG | HK300TE

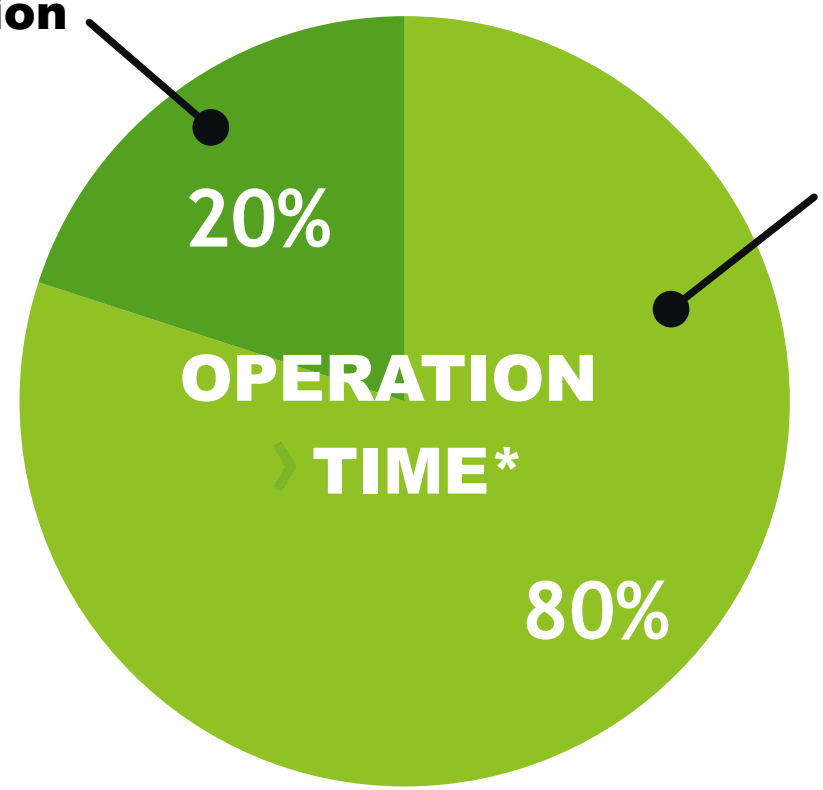


ALL-ELECTRIC HDD RIG | HK300TE

SMART GENERATORS FOR OPERATION OF ELECTRIC RIG (HK300TE)



› **PEAK Operation**



› **REGULAR Operation**

› 30-40%* REDUCTION of FUEL consumption

* rough estimation

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

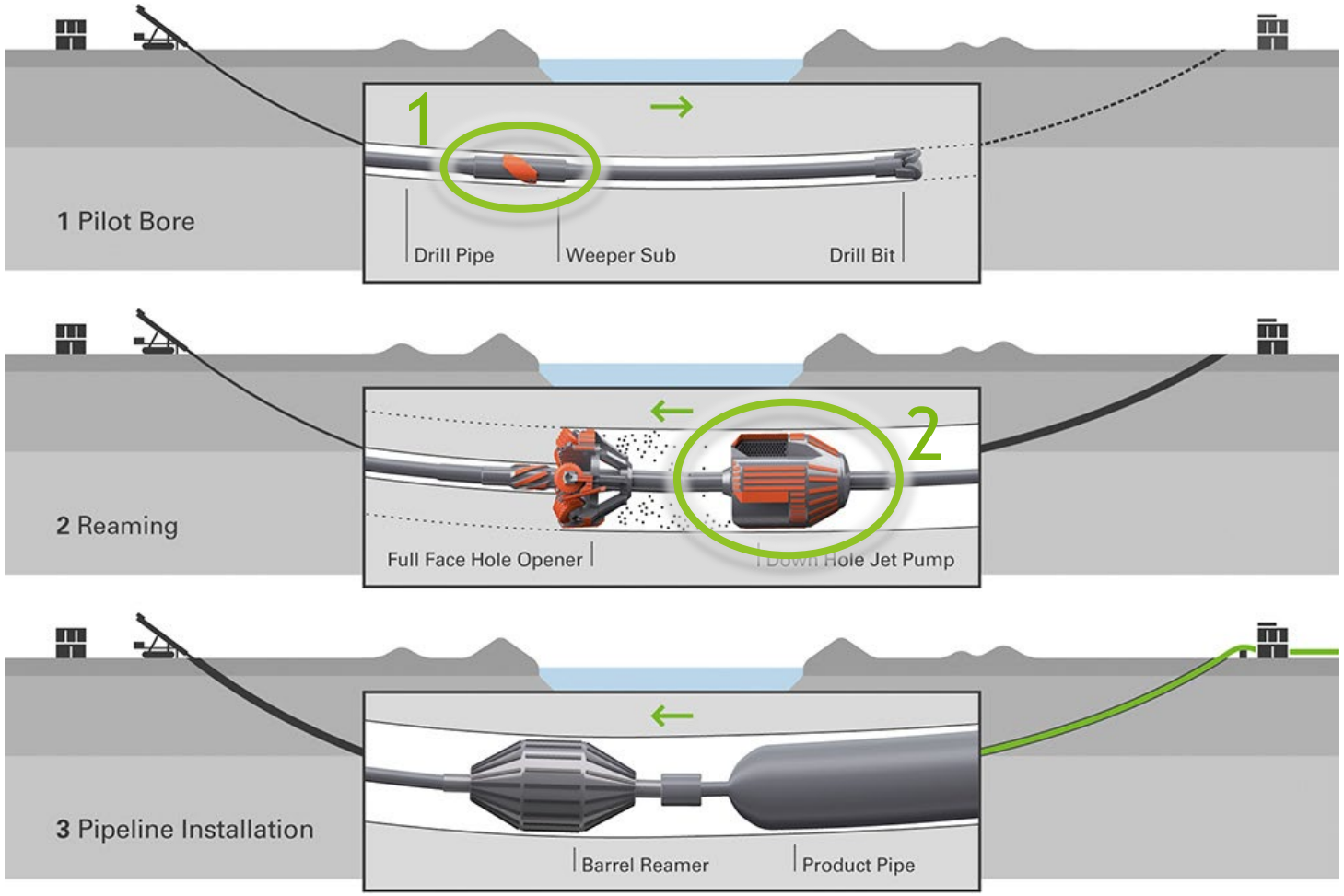
HK250T – 250to Trailer Rig in Denmark

- 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: VanLeeuwen Sleufloze Technieken (VLST)

GREENER HDD | MINIMIZING FRAC-OUT RISK

Tooling 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.

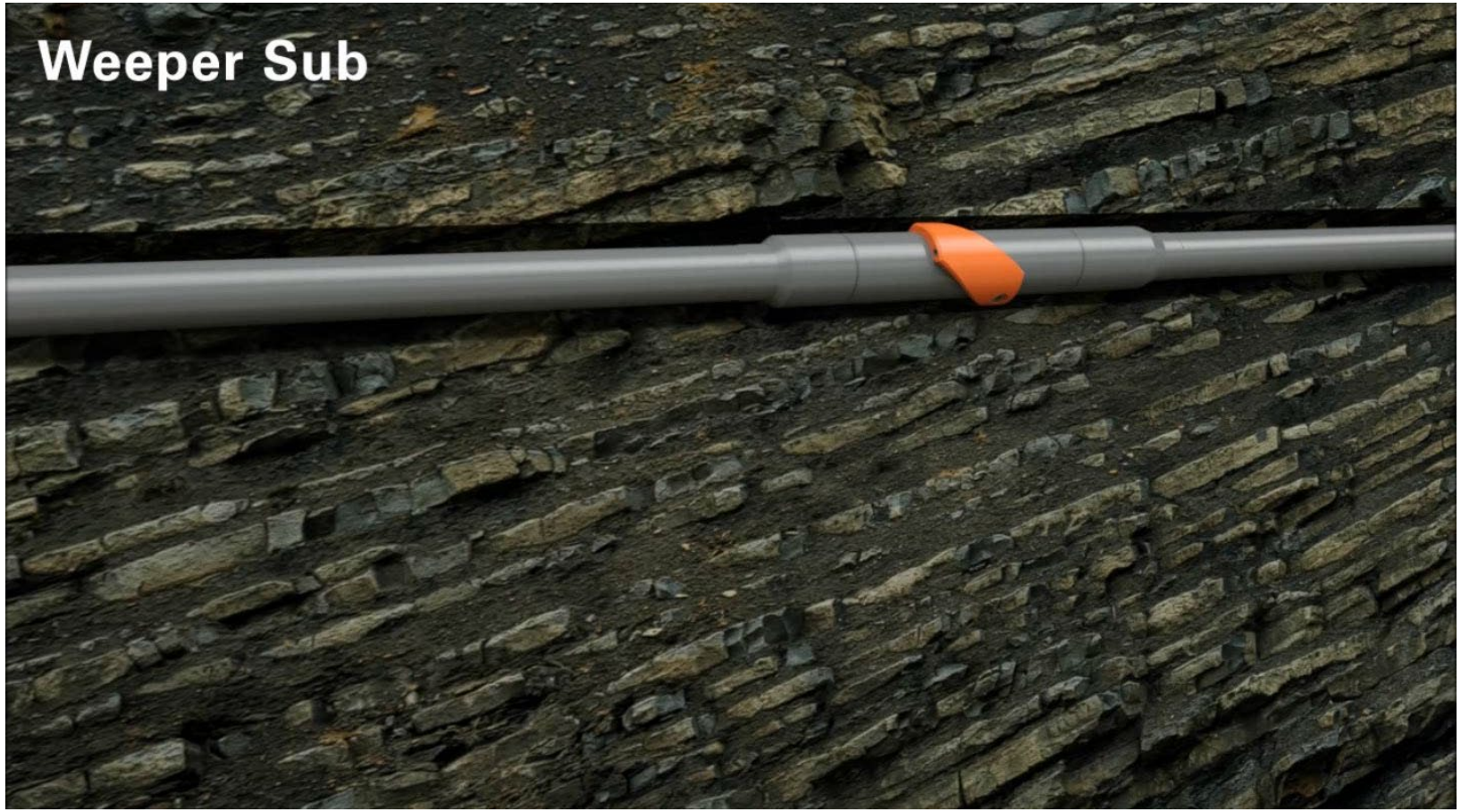
TOOL DATA

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

GREENER HDD | MINIMIZING FRAC-OUT RISK

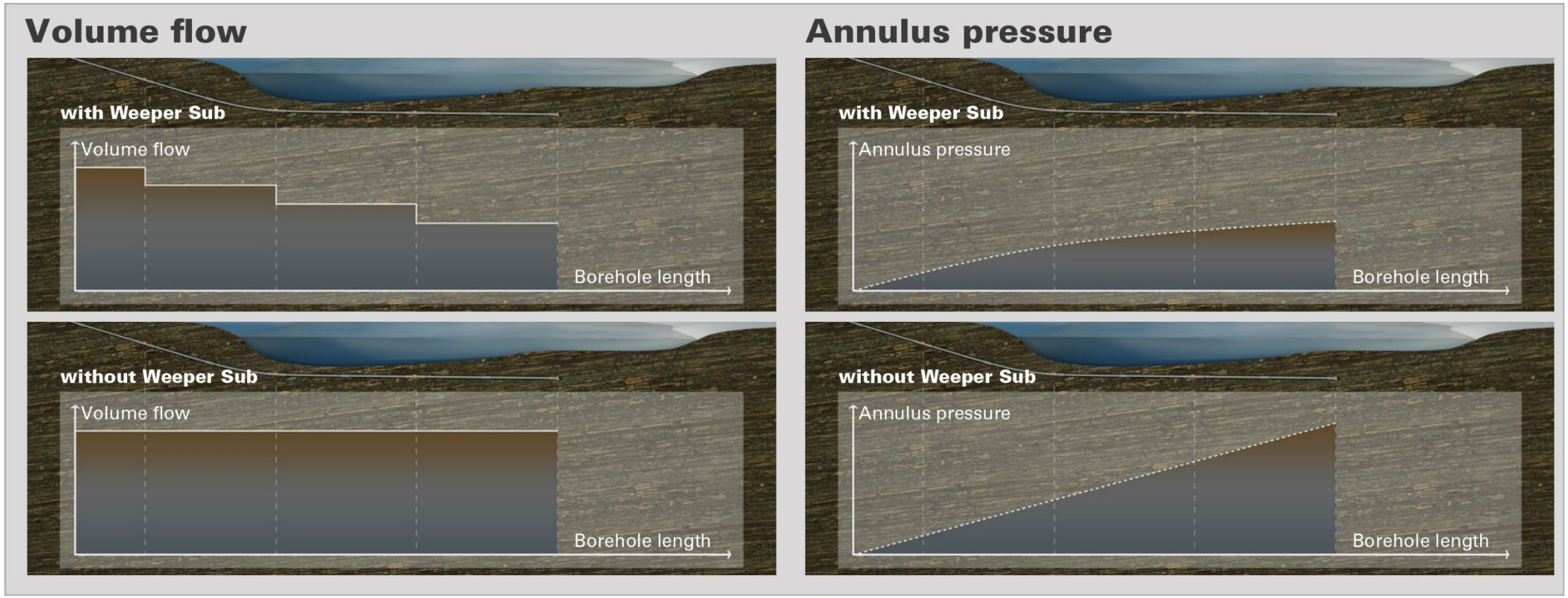
Tooling concepts for HDD

1 Weeper Subs for Pilot Bore



GREENER HDD | MINIMIZING FRAC-OUT RISK

1 Weeper Subs for Pilot Bore



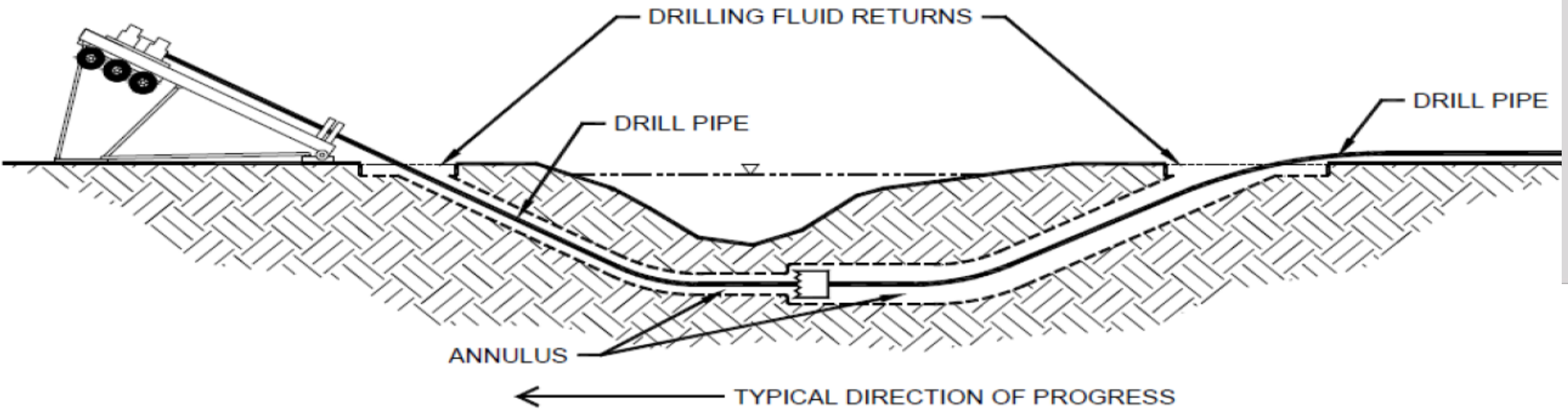
GREENER HDD | MINIMIZING FRAC-OUT RISK

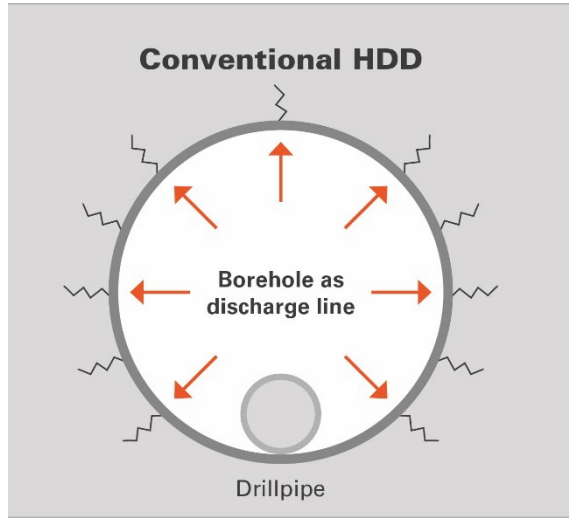
2 Down Hole Jet Pump for Reaming Stage

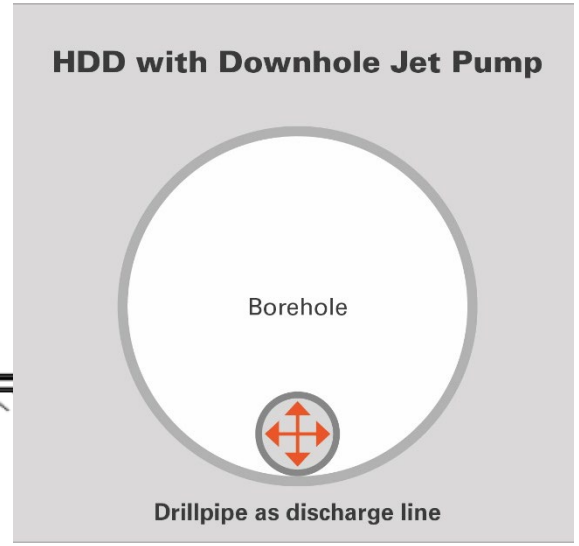
GREENER HDD | MINIMIZING FRAC-OUT RISK

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

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

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