

UTILITY TUNNELLING

Underground Solutions Provider

CREG TBM

China:
China Railway Engineering Equipment Group Co.,Ltd.
E-mail: info_intl@crectbm.com
Tel: +86 0371 6581 5987
Address: No.99, 6th Avenue National Economic & Technical Development Zone 450016 Zhengzhou, Henan Province People's Republic of China

Southeast Asia:
China Railway Engineering Equipment Group Co., Ltd.
Singapore Branch
E-mail: info_singapore@crectbm.com
Tel: +65 6747 8091
Address: 1004 Toa Payoh North, #06-15/16/17, Singapore 318995

Korea:
CREG Co.,Ltd. South Korea Branch
E-mail: info_korea@crectbm.com
Tel: +82 010-2156-8662
Address: No.1521, Building B, Terra-tower, 651, Songpa-gu, Seoul, Republic of Korea

Europe & South & North Americans:
CREG TBM Germany GmbH
E-mail: info@creg-germany.com
Tel: +49 211 52288900
Address: CREG TBM Germany GmbH Willstätterstraße 15 40549 Düsseldorf Germany

Italy:
China Railway Engineering Equipment Group Co.Ltd Italy Branch
Email: creg.italy@legalmail.it
Address: Viale Giuseppe Mazzini 55, 00195 Roma

Oceania:
CREGA Australia Office
Email: info@crega.com.au
Tel: +612 9698 0018
Address: Unit 1, 118 Bourke Road Alexandria NSW 2015 Australia

Make Tunnelling Safer,
Better and Faster

Underground Solutions Provider

With the continuous development of cities, the utilization of underground space is becoming increasingly important. The construction of public utility tunnelling can enable the rational planning and efficient utilization of underground space. Public utility tunnelling can centralize the placement of multiple municipal pipelines such as power, communications, water supply, drainage, and gas, making the maintenance and management of various pipelines more convenient and efficient. It also saves urban underground space and reserves room for the further development of cities in the future and the expansion of underground facilities.

As an equipment manufacturer that best understands construction and a comprehensive service provider that is most proficient in manufacturing, China Railway Engineering Equipment Group Co., Ltd. adheres to a customer-centered concept and is committed to providing customers with all-round comprehensive solutions. With the help of tunnel boring machines of different diameters, it can make tunnel construction under various geological conditions safer, better and faster.

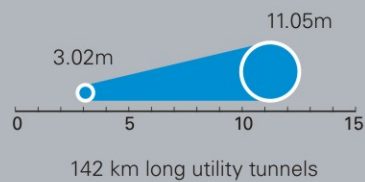
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Cover photo:
Common utility tunnel helps mankind
to develop urban underground space
more efficiently.

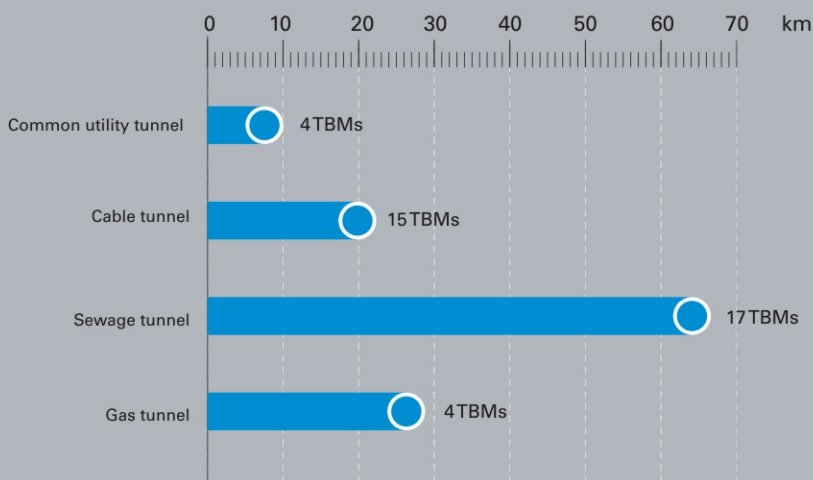
The cutterhead is being lowered down
to the launching shaft at FWS-West
project in Hamburg.

More than
45

advanced CREG TBMs
with diameter ranging
from 3.02 to 11.05 m



have been put into construction of
more than 142 km long utility tunnels
around the world:
common utility tunnel,
gas tunnel, thermal energy tunnel,
water diversion tunnel, cable tunnel,
sewage tunnel, underground parking lot,
road underpass etc.



Utility Tunnel Construction

Leading technology and expertise worldwide guarantee
safety and efficiency of tunnel construction

Various types of CREG TBM facilitate the construction of
utility tunnels worldwide. In these projects, the construction
of more than 142 kilometers of utility tunnels around the world
has employed the innovative tunnel boring technology of
CREG. Based on solid professional knowledge and rich
experience, CREG works closely with customers to
develop tailor-made technical solutions to overcome all
challenges and build robust tunnel structures while
maximizing the safety of personnel and the environment
as well as controlling budgets and schedules.

As the world's largest supplier of tunnel boring machines,
CREG provides customers with products and services of
the highest standards of technology and quality,
combined with fast and comprehensive service. CREG
pays special attention to teamwork and works hand
in hand with all parties involved throughout the project.

CREG has completed more than 1,200 projects around
the world in the fields of metro, road, railway, utility,
hydropower and mines. CREG's tunnel boring technology
is adaptable to all types of tunnels, pipelines, and shafts in
all geological conditions, with diameters ranging from 1
meter to 16 meters. Advanced technologies from CREG
are used to build new infrastructure and help improve
people's lives.

UTILITYTUNNELLING

Underground Solutions Provider

Vertical Shaft Sinking Machine (VSM)

Application Scenario:

- Ventilation shaft
- Rescue shaft

Slurry Pressure Balance (SPB) TBM

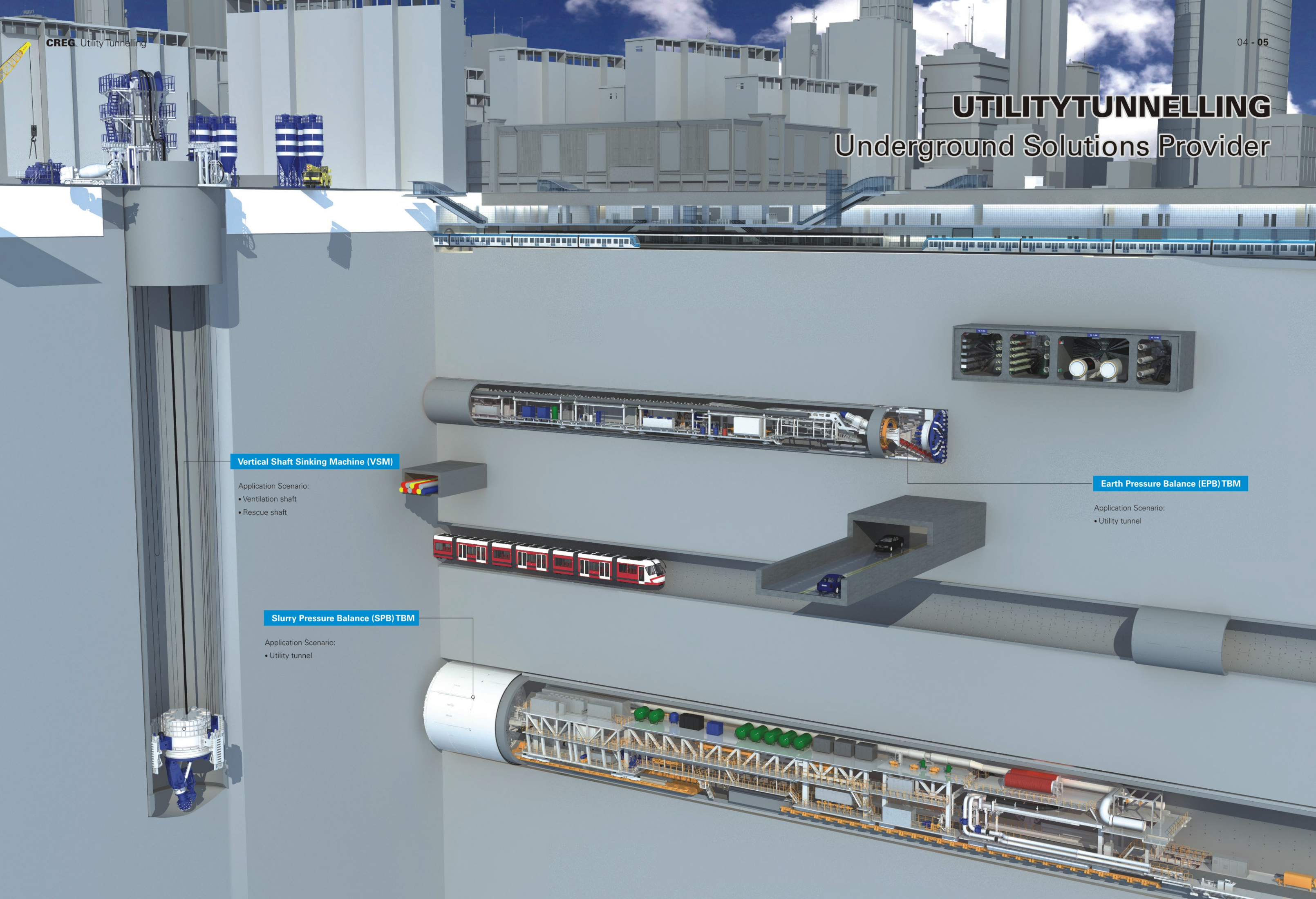
Application Scenario:

- Utility tunnel

Earth Pressure Balance (EPB) TBM

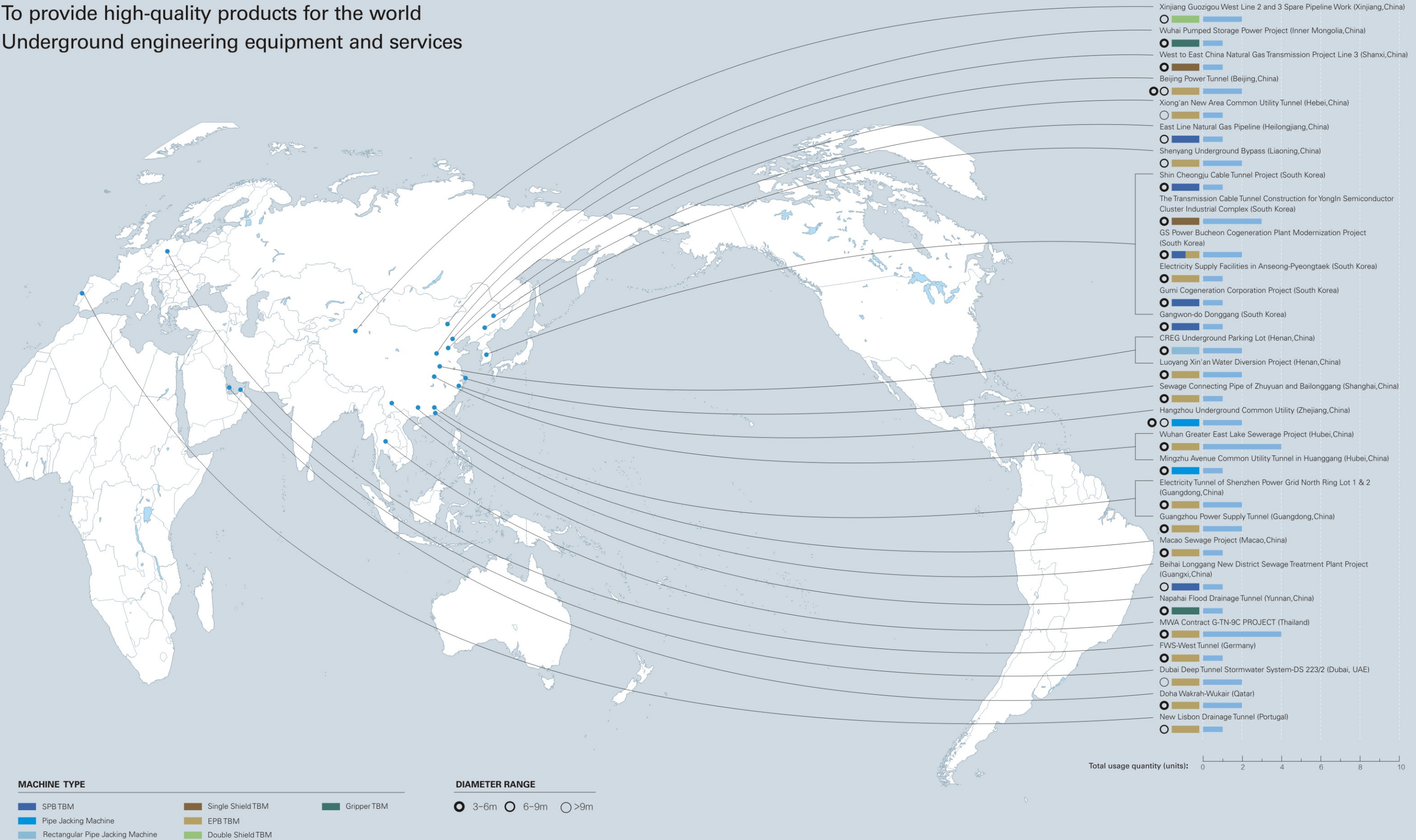
Application Scenario:

- Utility tunnel



GLOBAL VISION

To provide high-quality products for the world
Underground engineering equipment and services



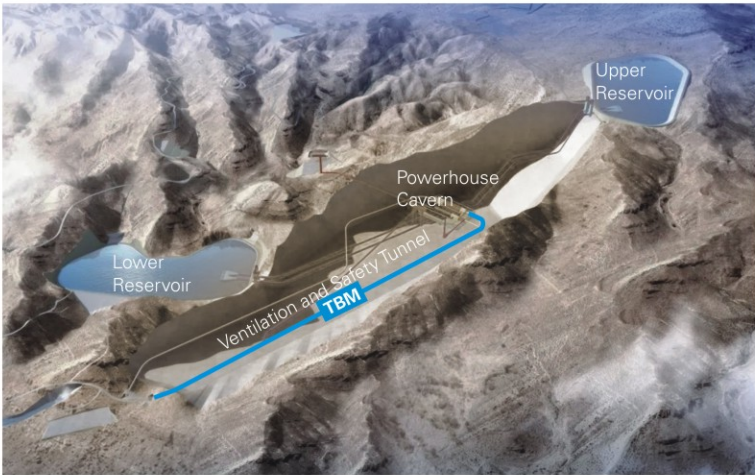
Wuhai Pumped Storage Power Station Project

Advanced TBM technology accelerates construction of hydropower station

The ϕ 3.53 m TBM is used in the construction of the ventilation and safety adit, which is a key project during the preparatory period of the power station and a necessary condition for the construction of the main powerhouse.

The TBM tunnelling achieves breakthrough one month ahead of schedule, setting a record of monthly advance rate of 919.042 meters for the same type of TBM in pumped storage power station field in China.

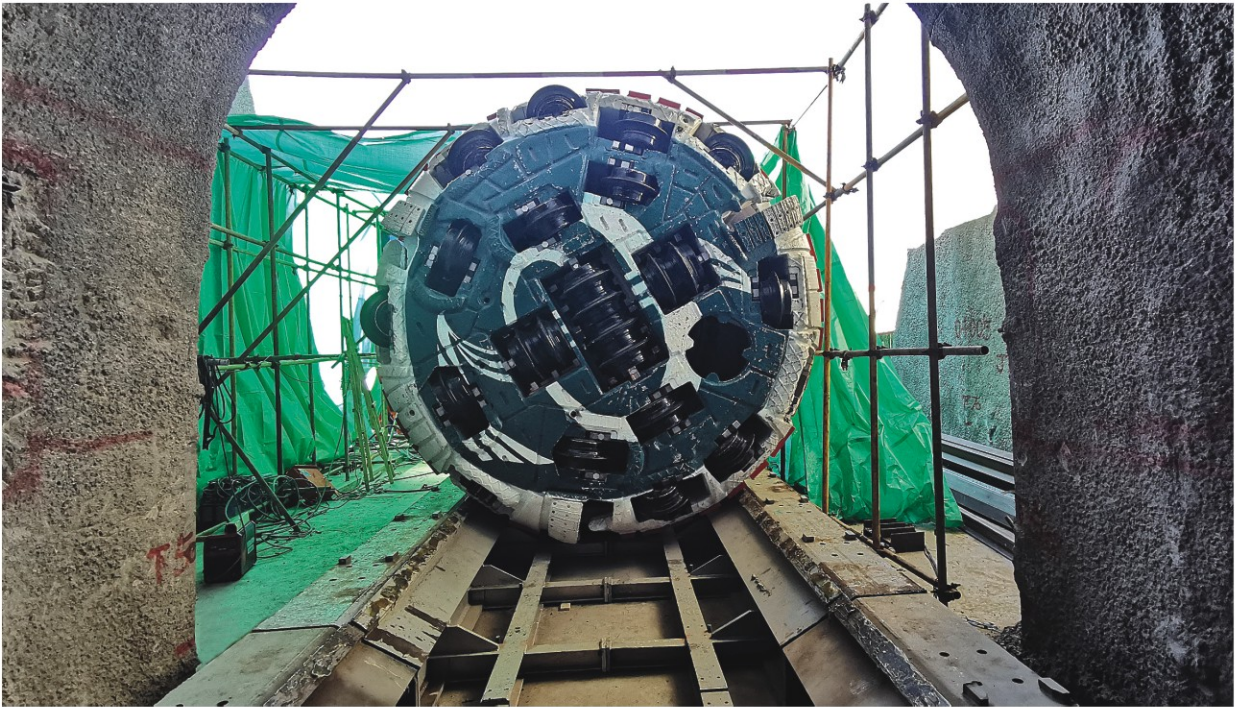
Project Information	Project Characteristics
› Tunnelling length: 3,000 m › Geology: Primarily limestone and quartz sandstone with Class IV&V surrounding rocks accounting for 38.5%, 4 fault zones and a 1,250m-long quartz sandstone section with quartz content of 93% › Contractor: Sinohydro Bureau 6 Co., Ltd.	› The TBM features turning radius of 30 meters. › Special wear-resistant design enables the TBM to cope with high quartz content of the surrounding rock.
TBM Parameter	Project Background
› TBM type: New type gripper TBM › TBM S/N: CREC 979 › Boring Dia.: 3.53 m › Main drive power: 900kW › FAT date: May, 2022 › Best performance: 50 m per day, 919 m per month.	The TBM tunnelling technology is currently one of the most advanced tunnel construction technologies in the world. Completion of the adit will further explore the geological conditions of the underground surrounding rock, optimize the construction schemes for the underground caverns, and will play an important role in shortening the construction period, improving the construction environment and reducing the blasting hazards.



Wuhai Pumped Storage Power Station Project Route



CREG service engineer is training the construction personnel.



The TBM is ready to bore a 3 km long tunnel.

Xiong'an New Area Common Utility Tunnel Project

Creative tunnelling technology facilitates common utility tunnel construction

The 175 m long ×5.44 m high U-shaped shield pipe erecting machine is applicable to the construction of 8 to 14 meters wide utility tunnels. It features precise assembly of pipes, automatic paving of cushion layers and synchronous green filling of side voids, realizing efficient construction of utility tunnel excavation, support, tunnelling, erection, and side

void filling. It saves project duration as well as labor costs and boasts outstanding technical advantages such as being environmentally friendly, reducing carbon emissions and minimizing pollution. The comprehensive efficiency is 37.5% higher than that of the traditional construction method.

Project Information

- › Tunnelling length: 2,400 m
- › Geology: Clay, silty clay
- › Contractor: China Railway First Group Co., Ltd.

TBM Parameter

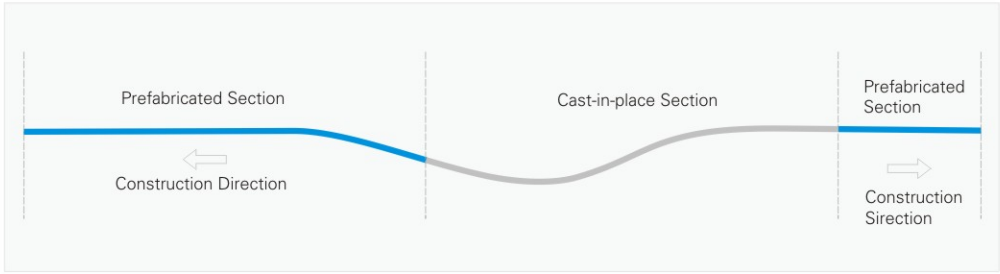
- › TBM type: U-Shaped Shield Pipe Erecting Machine
- › TBM S/N: CREG 1172
- › Boring Section: 8.5/11.6 m×5.64/17.5 m
- › FAT date: December, 2022
- › Best performance: 36 m per day, 407 m per month.

Project Characteristics

- › The machine is an innovate combination of U-shape TBM and bridge erecting machine.
- › It saves earth excavation and backfill volume, construction period and labor cost.
- › It realizes green, low-carbon, intelligent and efficient construction of utility tunnels.

Project Background

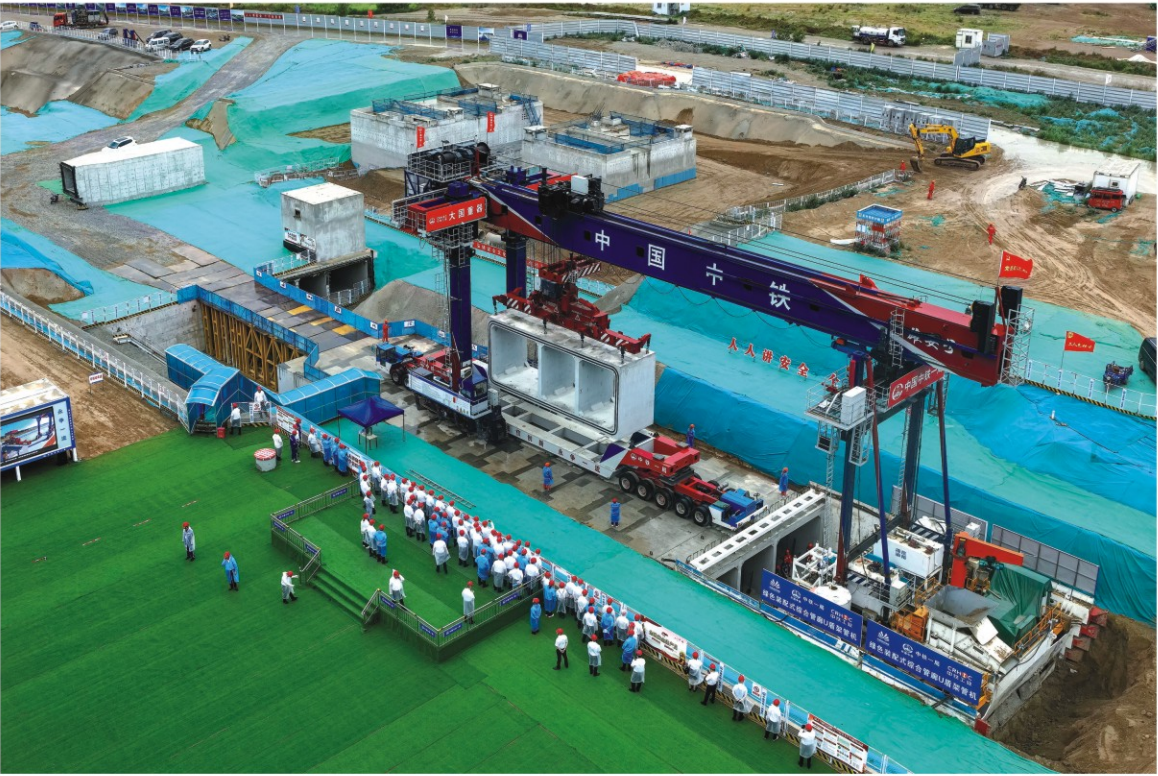
In view of the shortcomings of the traditional construction methods for utility tunnels, such as complex procedures and relatively low efficiency, CREG has explored a complete set of technologies for the intelligent, low-carbon and mechanized construction of prefabricated and assembled utility tunnels by combining the new concepts, technologies, and specialized equipment for utility tunnel construction from both domestic and international sources.



Xiong'an New Area Common Utility Tunnel Project Route



The project has created a new method of construction for open-cut tunnels.



The machine and new construction method have attracted extensive attention.

Luoyang Xin'an Water Diversion Project

Two TBMs serve welfare project

The project aims to connect Guxian Reservoir and Xin'an new waterworks through a pipeline and tunnel with a total length of 21.167 kilometers, of which the tunneling length is 18.65 km long. In order to shorten the tunnel construction

period, two sets of ϕ 3.83 m EPB TBM were adopted to bore towards each other from the inlet and outlet respectively.

Project Information

- > Tunnelling length: 18,652 m
- > Geology: Clay, sandstone, gravelly stone
- > Contractor: Henan Water Construction Co., Ltd.

TBM Parameter

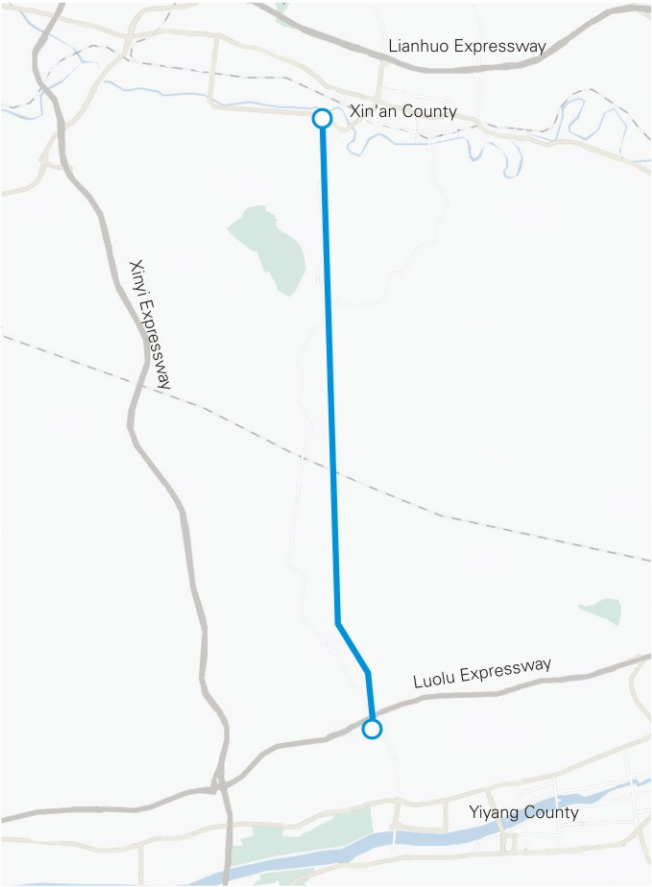
- > TBM type: EPB TBM
- > TBM S/N: CREC 635, CREC 636
- > Boring Dia.: 3.86 m
- > Main drive power: 1000 kW
- > FAT date: September, 2021
- > Best performance: 626.4 m per month, 31.2m per day.

Project Characteristics

- > Buried depth of the tunnel is up to 161 meters.
- > The tunnel is rather long, and one of the TBMs has completed over 10 kilometers long tunnelling.
- > The tunnel construction is faced with complex hydro-geological conditions like high water level and existence of fracture zones.

Project Background

The project has provided Xin'an County with a stable, reliable and high-quality water source, enhancing the safety and reliability of urban water supply. It has offered a powerful water resource guarantee for the economic and social development of Xin'an County, and has promoted the development of local industries.



Luoyang Xin'an Water Diversion Project Route



CREG service team is busy with TBM commissioning before launching.

Fernwärmesystemanbindung West, Los T1 Tunnel, Hamburg, Germany

TBM contributes to thermal energy tunnel construction beneath the Elbe River

In view of the high water pressure environment in the project and the strict requirements for settlement control, CREG has customized the ϕ 4.57 m TBM that integrates

a number of advanced technologies, which has greatly enhanced the safety, comfort and environmental protection during TBM operation.

Project Information

- > Tunnelling length: 1,165 m
- > Geology: Mica clay, marl
- > Contractor: Implenia

TBM Parameter

- > TBM type: EPB TBM
- > TBM S/N: CREG 1144
- > Boring Dia.: 4.5 m
- > Main drive power: 660 kW
- > FAT date: September, 2022
- > Best performance: 20.4 m per day

Project Characteristics

- > The water and earth pressure is up to 4.5 bar.
- > The tunnel travels beneath the Elbe river and thus settlement control is extremely demanding. Independent man lock meeting CE standard
- > is introduced to small diameter TBM for the first time.

Project Background

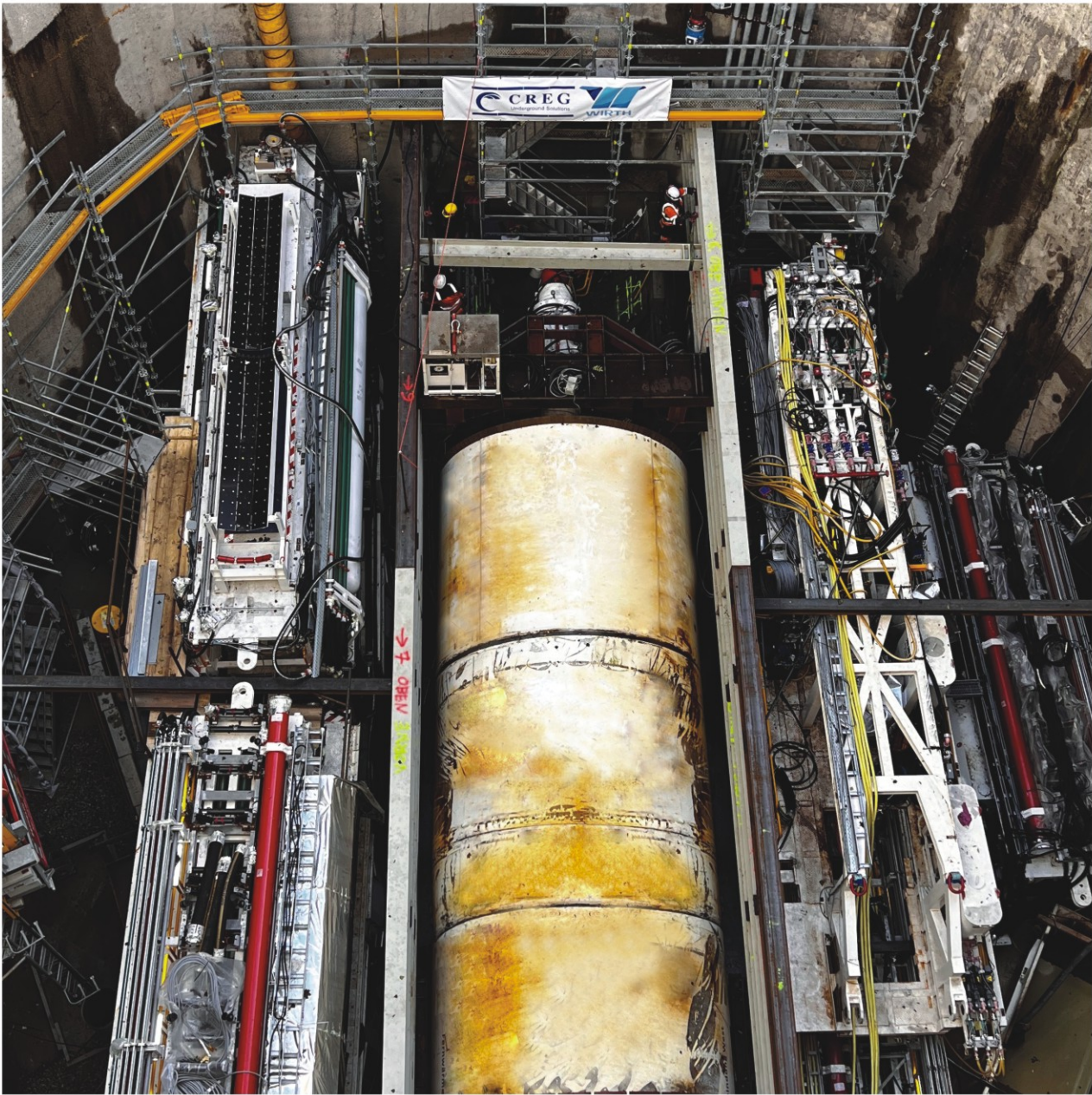
The Hamburg Thermal Energy Tunnel, serving as the "throat" passage for heat supply connecting the industrial area and the urban area, will convert the waste heat generated during the operation of the industrial area in southern Hamburg into urban heating and transport it through the tunnel to the northern residential area, replacing existing coal-fired power plants and natural gas heating.



FWS-West Tunnel Route



CREG service team celebrates the breakthrough of the tunnel.



The TBM assembly is in progress.

Transmission Cable Tunnel Project for YongIn Semiconductor Cluster Industrial Complex

Three TBMs serve infrastructure construction in Korea

A total of 3 sets of ϕ 4.38 m CREG single shield TBMs have been employed to bore three sections of a 5,183 meter long transmission cable tunnel for YongIn Semiconductor Cluster Industrial Complex, and the TBMs are responsible

for 1,112 m, 2,119 m and 1,952 m respectively. Based on reliable performance, the TBMs achieve tunnel breakthrough 7 months ahead of schedule, winning high praise and recognition from the client.

Project Information

- > Tunnelling length: 5,183 m
- > Geology: Granite, gneiss, weathered rock
- > Contractor: SK ecoplant Co., Ltd.

TBM Parameter

- > TBM type: Single shield TBM
- > TBM S/N: CREC 1141, CREC 1142, CREC 1143
- > Boring Dia.: 4.38 m
- > Main drive power: 1400 kw
- > FAT date: TBM1: May. 2023; TBM2: Jan. 2023
- > TBM3: August, 2023
- > Best performance: 261.6 m per month, 15.53m per day.

Project Characteristics

- > The tunnel passes through fracture zone and the Ssangji River, which poses high requirement on the performance of the TBMs.
- > Robust structure enables the TBMs to cope with high abrasiveness of surrounding rock.

Project Background

The project is CREG's third TBM order in Korea and thus a full spectrum of CREG TBMs have been applied to the market besides the previous EPB TBM for Incheon Metro Line Geomdan Extension and the slurry TBM for Shincheongju Cable Tunnel. It is also a vivid demonstration of CREG's contribution to serving infrastructure construction of Korea.



Transmission Cable Tunnel Route



The TBMs completed tunnel breakthrough 7 months ahead of schedule with reliable performance.

Product portfolio for Utility tunnel

Tunneling technology suitable for various geological conditions and diameters

CREG is the only underground solutions provider that offers a comprehensive range of tunneling technologies suitable for various diameters and geological conditions. Furthermore, each CREG TBM or machine is specifically customised according to the geological, hydrological and

other parameters of the project. Consequently, our products are recognized for their durability, reliability and performance. We are dedicated to providing exceptional customer service, and we constantly strive to exceed customer expectations.

Product Portfolio



The 11.52x7.22 m rectangular pipe jacking machine has completed 324 m long underpass with curve.

For more information of CREG, please refer to contacts at back cover.



CREG headquarters

CREG

Underground Solutions Provider

China Railway Engineering Equipment Group Co., Ltd. (referred to as "CREG") is a worldwide underground solutions provider for a full spectrum of mechanized tunnelling technology and services. The company's headquarters is located in Zhengzhou, the capital city of Henan province. We draw together more than 4,500 employees including over 700 designers to design and manufacture TBMs and associated equipment. As the largest TBM supplier in the world, CREG boasts outstanding

productivity, performance, safety and geological adaptability, impressive R&D competence, a number of invention patents, as well as excellent after-sales service and support.

CREG has 16 production bases with an annual production of more than 300 TBMs. We have supplied TBMs ranging from ϕ 2m to ϕ 18m used in all kinds of ground conditions, including hard rock, soft soil and complex geology. Our

products consist of Single/Double Shield Open-type TBM, Gripper TBM, Earth Pressure Balance TBM, Rectangular TBM, Slurry TBM, Horseshoe-shaped EPB TBM, U-shaped Open-type TBM, Pipe Jacking Machine, Shaft Boring Machine, Reamer TBM and Inclined Shaft TBM. CREG is committed to every client as an efficient and reliable partner in the tunnel construction field. Until now, CREG has exported more than 140 TBMs to 34 countries and regions including Doha, Singapore, France, Italy, Australia, Lebanon, Poland, Denmark, South Korea and Austria etc.

With our extensive research and practical experience, CREG offers a series of auxiliary mechanized tunnelling equipment and service packages. In addition to various types of TBMs, CREG also designs and manufactures Shaft Boring Machines, Cutters, Rolling Stock, Roadheaders, Three-boom Drill Jumbos, and Wet Shotcrete Machines etc. We provide a full range of tunnelling equipment and all-around solutions.

Overseas Business and R&D institutions

- CREG TBM Germany GmbH
- China Railway Engineering Equipment Group Co., Ltd. Singapore Branch
- CREG Co., Ltd. South Korea Branch
- CREG Co., Ltd. Italy Branch
- カレグ・テクノロジー日本株式会社

Full Range Services

CREG also provides high value-added customized services, including design, consultancy, tunnelling service, maintenance, remanufacturing, mechanical & electrical installation, technical service, spare parts, etc. CREG establishes remote support system for delivered TBMs to facilitate CREG rendering quick troubleshooting and real-time monitoring during tunnelling.



CREG has sent a service team to facilitate TBM umbilical launching in limited launching shaft.



Trend

Lack of safely managed drinking water services

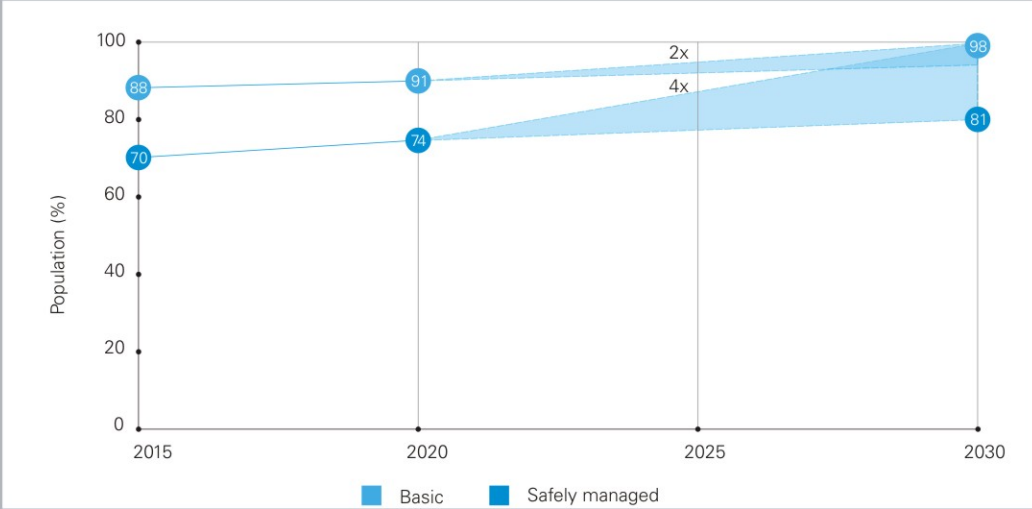
Even before COVID-19 struck, the world was off track to meet Sustainable Development

Goal 6 (SDG 6) – the goal of ensuring water and sanitation for all by 2030.

Two billion people (26% of the world's population) still lacked drinking water services on their premises , available when needed and free from contamination in 2020. None of the SDG regions are currently on track to achieve universal coverage by 2030. In sub-Saharan Africa, the number of people lacking safely managed drinking water has increased by more than 40% since 2000.

771 million people still lacked even basic drinking water services in 2020. Among these, eight out of 10 lived in rural areas. Nearly half of them in least developed countries.

The number of city inhabitants lacking safely managed drinking water has nearly doubled since 2000. Achieving universal access to safely managed drinking water by 2030 will require a fourfold increase in current rates of progress, including a substantial increase in current investment levels.



Achieving universal access to basic drinking water by 2030 will require a doubling of current rates of progress, and achieving universal access to safely managed drinking water by 2030 will require a quadrupling of current rates of progress.

Sources: SUMMARY PROGRESS UPDATE
2021 – SDG 6 – WATER AND SANITATION FOR ALL

CREG's 14.82x9.446 m rectangular pipe jacking machine has bored two underpass in Jiaxing City without hindering urban traffic.

