



ITA TUNNELLING  
AWARDS 2017

MAJOR  
PROJECT OF THE YEAR  
- MORE THAN €500 MILLION -



# Qatar Rail – Doha Metro

Dr. Ing. Markus Demmler



ITA TUNNELLING  
AWARDS 2017

MAJOR  
PROJECT OF THE YEAR  
- MORE THAN €500 MILLION -

# Stakeholders

11

JVs with international  
companies

6

Project Management  
Consultants







ITA TUNNELLING  
AWARDS 2017

MAJOR  
PROJECT OF THE YEAR  
- MORE THAN €500 MILLION -

# About Qatar Rail

- Following its establishment in 2011, Qatar Rail is leading one of the largest rail projects in the world to meet the demands of Qatar's growing population.
- The company is responsible for the design, construction, commissioning, operation and maintenance of the entire network and systems.
- The state-of-the-art railway network will consist of:
  - Doha Metro, a rapid transit system connecting communities within Doha and its suburbs
  - Lusail Tram, a service for convenient travel within the new city of Lusail
  - Long Distance Rail, which will link Qatar to the region.





ITA TUNNELLING  
AWARDS 2017

MAJOR  
PROJECT OF THE YEAR  
- MORE THAN €500 MILLION -

# Qatar National Vision 20130

The National Vision 2030 aims at transforming Qatar into an advanced country by 2030, capable of sustaining its own development and providing for a high standard of living for all of its people for generations to come

The planned railway network will support this Vision delivering to the four pillars.







ITA TUNNELLING  
AWARDS 2017

MAJOR  
PROJECT OF THE YEAR  
- MORE THAN €500 MILLION -

# Strategic Direction

At Qatar Rail every strategic step is governed by the dedication to accomplishing our commanding vision.





ITA TUNNELLING  
AWARDS 2017



MAJOR  
PROJECT OF THE YEAR  
- MORE THAN €500 MILLION -

# Vision

To be the **favoured mode of transportation** for all

# Mission

Provide **integrated railway** services that are  
**RELIABLE, ATTRACTIVE** and **SAFE**,  
with a continual commitment to  
**EXCELLENCE** and **SUSTAINABILITY**





ITA TUNNELLING  
AWARDS 2017

MAJOR  
PROJECT OF THE YEAR  
- MORE THAN €500 MILLION -

# Project Overview (Phase 1+2)

## DOHA METRO



101 stations



Multiple phases



219 kilometers



Red Line, Green Line,  
Gold Line, Blue Line



Phase 1 Operation:  
2020





ITA TUNNELLING  
AWARDS 2017



# Doha Metro Phase 1

Senior Director QIRP – Dr.-Ing. Markus Demmler





ITA TUNNELLING  
AWARDS 2017

MAJOR  
PROJECT OF THE YEAR  
- MORE THAN €500 MILLION -

# Doha Metro Project – Phase 1 (2013 – 2020)



3

Lines



21+5

TBMs  
Girders



111.5

Tunnels



8.7

Viaducts



37

Stations



2020

Phase 1 is  
operational



ITA TUNNELLING  
AWARDS 2017

MAJOR  
PROJECT OF THE YEAR  
- MORE THAN €500 MILLION -

# Doha Metro Project – Phase 1 (2013 – 2020)



40

Length of line



28km

Underground



22

Length of line



19km

Underground



14

Length of line



100%

Underground





ITA TUNNELLING  
AWARDS 2017



# Tunnelling

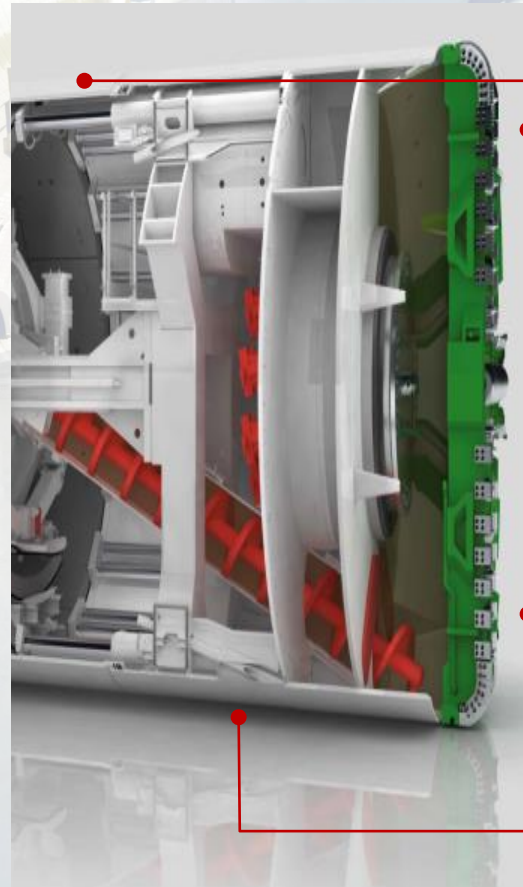


ITA TUNNELLING  
AWARDS 2017

**MAJOR  
PROJECT OF THE YEAR**  
- MORE THAN €500 MILLION -

# TBM – Tunnel Boring Machine

Contractor Selected Technology: EPB (Earth Pressure Balance)



Tailor made Cutter head

Total weight approx.: 750 t

Outer Diameter: 7.1 m

Propulsion Speed: 60mm / minute

Outer Tunnel Diameter: 6.9 m

Min. Radius: 170 m

Min. Ground Coverage: 7 m

Planned Progress: 10-12 m / day

Manufacturer: Herrenknecht Germany







ITA TUNNELLING  
AWARDS 2017

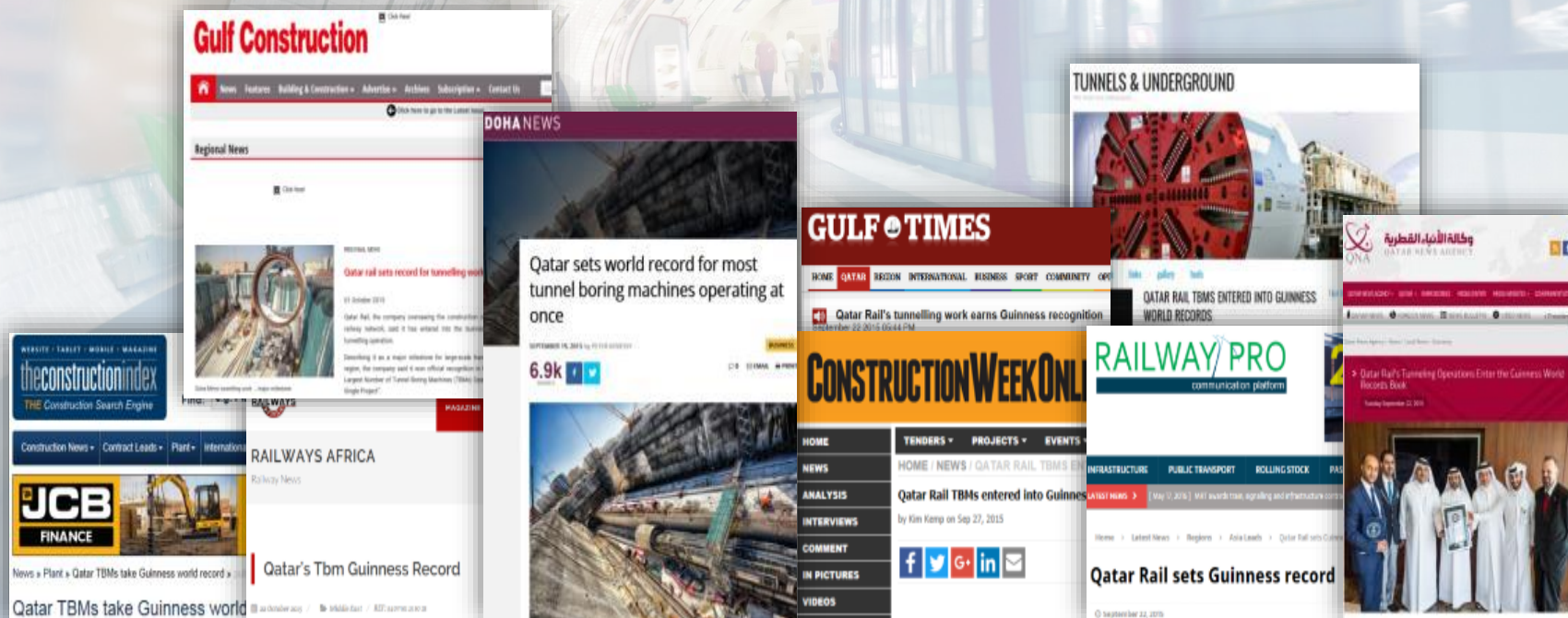
MAJOR  
PROJECT OF THE YEAR  
- MORE THAN €500 MILLION -

# World Record

## 20 TBMs

Working simultaneously

The highest number of tunnel boring machines operating simultaneously on a single project is 20 and was achieved by Qatar Rail (Qatar), in Doha, Qatar, on 22 August 2015.





ITA TUNNELLING  
AWARDS 2017

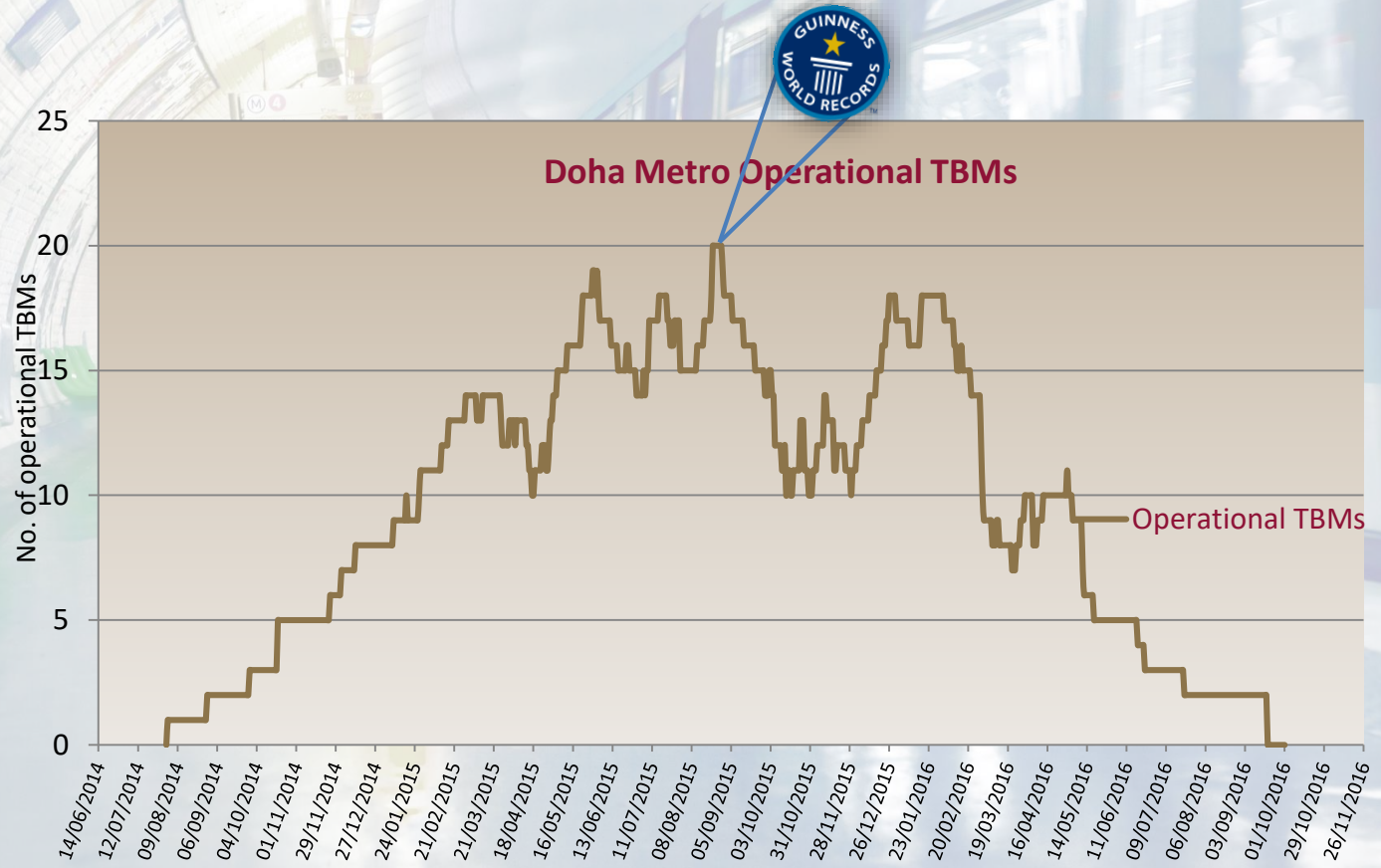
MAJOR  
PROJECT OF THE YEAR  
- MORE THAN €500 MILLION -

# TBM Performance 1/2

Tunneling period **July 2014**  
– **September 2016**

All **21 TBMs** have  
completed the drives for the  
Doha Metro Phase 1

There have been **72**  
**breakthroughs** including  
station/switchbox pass-  
through



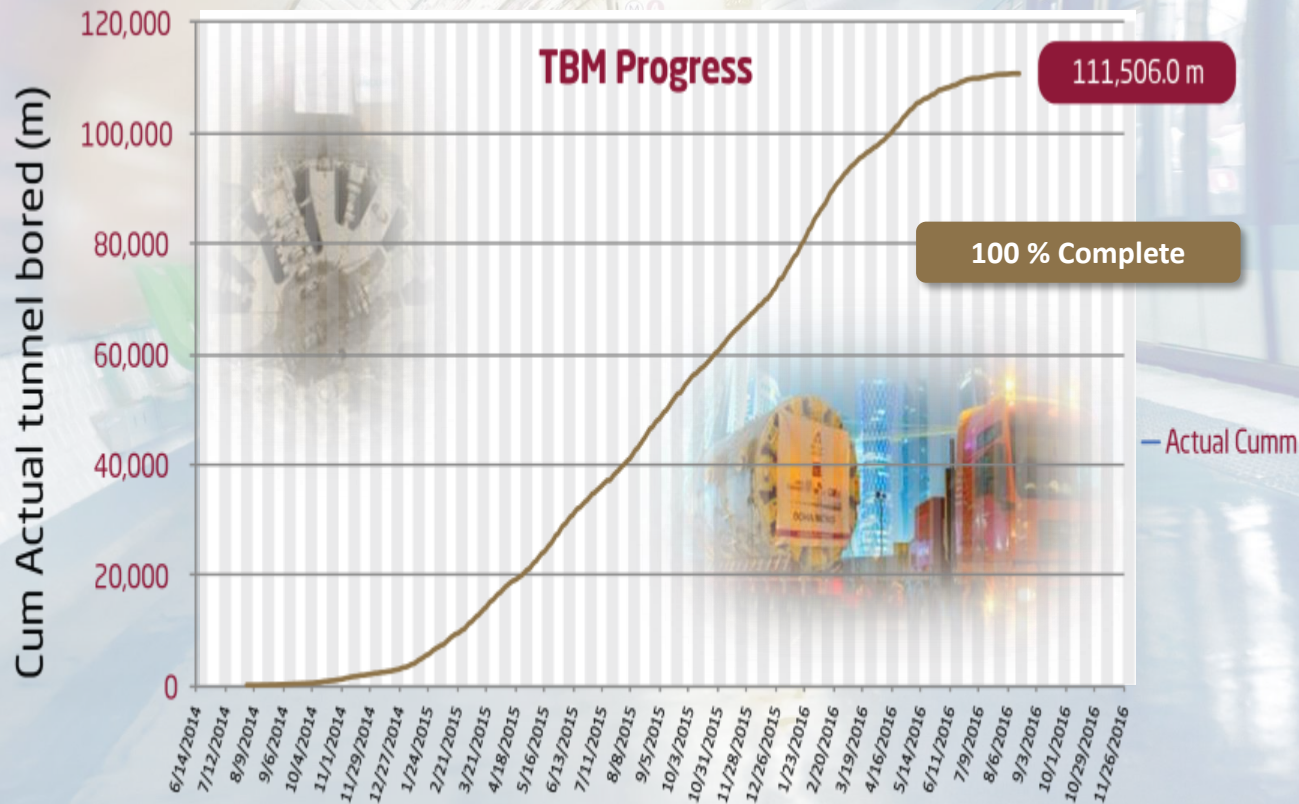




ITA TUNNELLING  
AWARDS 2017

MAJOR  
PROJECT OF THE YEAR  
- MORE THAN €500 MILLION -

## TBM Performance 2/2



140  
meter

Average excavation  
per day

490  
meter

Highest cumulative  
Daily progress (27.01.2016)

800  
days

TBM excavation



ITA TUNNELLING  
AWARDS 2017



# Health and Safety





ITA TUNNELLING  
AWARDS 2017

MAJOR  
PROJECT OF THE YEAR  
- MORE THAN €500 MILLION -

# Health and safety performance

## Total Company AFR

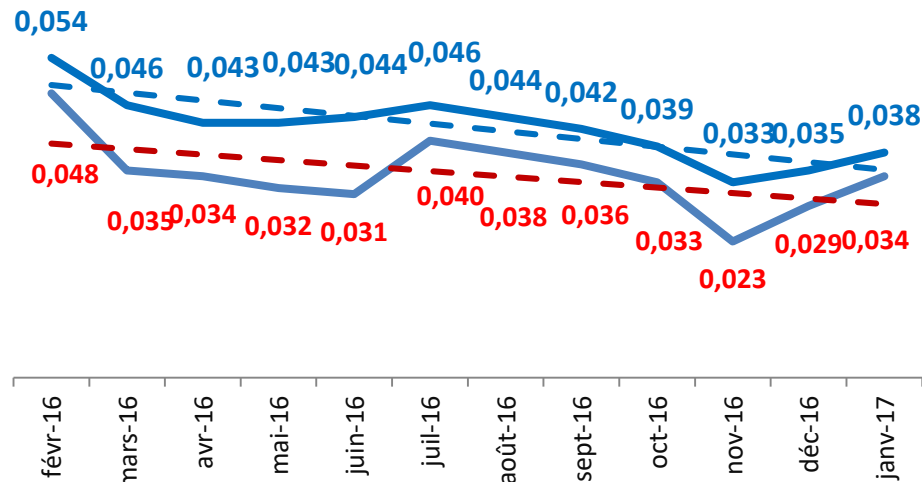
0.039

Metro 0.038  
Corporate  
0.113

## Incident Type Breakdown

Contractual AFR 0.1  
AFR Stretch Target 0.05

## AFR - Accident Frequency Rate



\* WEF 07 Feb 2017

<sup>1</sup> ITD -Total incidents to date (since June 2013)



Over 57,000  
Workers on site; multiple  
RoSPA Safety Awards  
earned



ITA TUNNELLING  
AWARDS 2017



# Logistics





ITA TUNNELLING  
AWARDS 2017

MAJOR  
PROJECT OF THE YEAR

- MORE THAN €500 MILLION -

# Strategic Direction

## TBM MUCK OUT

4,5 Mio m<sup>3</sup>

300,000 truck trips

## STATION EXCAVATION

11 Mio m<sup>3</sup>

740,000 truck trips  
(3 stations with conveyor)

## TUNNEL SEGMENTS

70,000 rings

70,000 truck trips

Steel 100 x

MLPA West

99,000  
Truck trips/month

MLPA Al Riffa

37,300  
Truck trips/month

MLPA South

72,200  
Truck trips/month

Excavation 8 x



ITA TUNNELLING  
AWARDS 2017

MAJOR  
PROJECT OF THE YEAR  
- MORE THAN €500 MILLION -

# Logistics Traffic and Coordination Center



## Tracking + Monitoring

- GPS Tracking vehicle movements
- Identify deficiencies and violations
- Identify illegal movements



## Safety

- Site and road over-speeding tracking
- Over-speeding reports and dashboards
- GPS devices ALERT feature



## Analysis & Assessment

- Travel time information
- Support planning of roadway facilities
- Micro-simulation





ITA TUNNELLING  
AWARDS 2017



# Achievements



ITA TUNNELLING  
AWARDS 2017

MAJOR  
PROJECT OF THE YEAR  
- MORE THAN €500 MILLION -

# Achievements – 1/2



## High TBM advance rates

Average cumulative advance rate: 141m/day,

Maximum cumulative advance rate: 490m/day

## Number of TBMs

A total of 21 EPB TBMs

Simultaneously : 20 TBMs - Guinness World Record

## Innovative SFRC approach

Optimum solution of balancing cost, serviceability  
and strength requirements

## Logistics and safety related innovation

Logistics Traffic Control Center - GPS platform for  
vehicle movement monitoring

## Great variety of excavation methods

TBM, Conventional (NATM, Box jacking, Open cuts,  
Piles & Anchors, D-Walls)

## Logistics innovation (environmental)

for muck removal from areas of dense traffic





ITA TUNNELLING  
AWARDS 2017

MAJOR  
PROJECT OF THE YEAR  
- MORE THAN €500 MILLION -



# Achievements – 2/2

## ~1500 Adjacent structures

Structures with a variety of structural sensitivity and importance; State of the art impact assessment and monitoring schemes

## Extensive campaign by QRC PR DPT.

To inform Doha Community about the Metro project and future benefits

## Internal Stakeholders

8 Civil + 1 Systems Contract, 6 PMCs, Several designers & DVEs coordinated to deliver one harmonized project

## Surface and TBM geophysical

Surface and TBM geophysical survey: mitigation of risk associated with karstic voids

## Strict sustainability and environmental

Strict policies to reduce environmental impact and optimize operational costs

## Impact on the adjacent structures

Negligible impact on the adjacent structures at the end of the construction





ITA TUNNELLING  
AWARDS 2017

MAJOR  
PROJECT OF THE YEAR  
- MORE THAN €500 MILLION -



الرائيل RAIL

تحقيق رؤيته  
Accomplishing a Vision

Thank You



Senior Director QIRP – Dr.-Ing. Markus Demmler

