egis

METRO

Solutions for Railway Manufacturers

egis

IMAGINE. CREATE. ACHIEVE.

a sustainable future

Carrying out a metro project is a complex operation that involves a large number of players, processes and technical fields.

Completing a successful metro project means being successful in integrating all the systems that form a metro, and meeting the expectations of the owner, the operator and users.

Building on over 50 years of experience in metro infrastructure and systems, with unwavering and recognised commitment to its clients, Egis offers a full range of solutions for railway manufacturers.

We have perfect knowledge of the expectations of institutional players and operators, and our 19,500 employees are able to provide you with support on all technical aspects all over the globe.

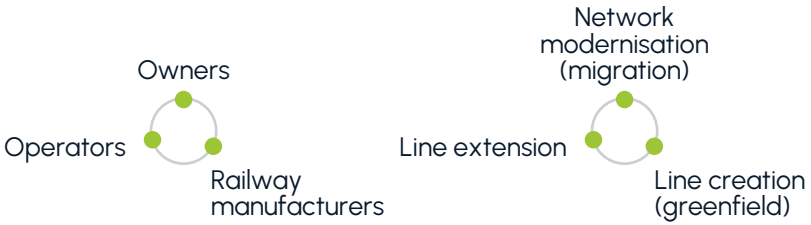
We are in a position to provide you with the added value you need for your projects, by combining technical excellence in each subsystem with the global approach to a metro system.

CONTENTS

Egis
the partner
of your projects

The ability to combine **technical excellence** in each subsystem and a **metro product vision** providing a global approach.

In-depth knowledge of both trios:



Choosing Egis means choosing the world leader in automatic metros.

1990s

Lyon, France
Project management, Line D: 1st wide-gauge automatic metro in the world
Project management, extension of Lines C and D

Marseille, France
Project management, extension of Lines 1 and 2

Toulouse, France
Construction of the light automatic vehicle system, Line A

Guangzhou, China
Design, Line 1
Eastern Railway - Huangsha

Nuremberg, Germany
Project management, line automation

Cairo, Egypt
Project management, Line 2

New York, United States
Technical assistance, modernisation, Line 1 "Canarsie Line"

Singapour
Quality control, Circle Line's equipment

Athens, Greece
Assistance to owner, Lines 2 and 3

2000s

Lyon, France
Project management, 2nd extension, Line B

Porto, Portugal
Project management, extension, Blue Line

Lausanne, Switzerland
Safety expert assessment, Line M2

New Delhi, India
ISA for the control and signalling of the extensions of Lines 1 and 2

Athens, Greece
Studies, extension of Lines 2 and 3

Isfahan, Iran
Assistance to owner, Line 1

Ahwaz, Iran
System study and design, Line 1

Toulouse, France
Project management, extension of Line A under operation

Lisbon, Portugal
Operation studies, Red Line

São Paulo, Brazil
Functional design, stations of Line 5

Barcelona, Spain
Assistance to owner, automatic line L9

Masshad, Iran
Preliminary studies, Line 2

Tabriz, Iran
Preliminary studies and invitations to tender, second line

2010s

Lyon, France
Project management, extension of Line B up to the Oullins station

Marseille, France
Project management, extension of Line 1
Renovation of the OCC

Rio de Janeiro, Brazil
Assistance and technical expert assessment of Line 4

São Paulo, Brazil
Impact study of the new CBTC system

Chennai, India
Project management, Lines 1 and 2

Salvador, El Salvador
Management, integration, and interface service for Lines 1 and 2

Jaipur, India
Safety assessment, train automatic control and metro signalling

Dehli, India
ISA for Lines 7 and 8

Bangalore, India
ISA, automatic signalling and train control on Lines 1 and 2

Bangkok, Thailand
System inspection and safety certification for the extension of the Green Line
Design studies and works supervision, extension of the Blue Line

Macao
Project management, Line 1

Doha, Qatar
Project management for the Golden, Green and Red Lines, and major stations

2020s

Grand Paris Express network, France
Project management, infrastructure, Line 16
Project management, systems, Lines 15 South, 16, 17 and 18. Site scheduling, management and general coordination, Lines 15 South, 16 and 17

Lille, France
Project management, modernisation and extension of Line 1

Lyon, France
Line B towards South Hospitals
GoA4 automation, Line B
Innovation: automation under operation, underground stabling, stations without platform screen doors
Project management, extension of Line B, and Avenir Métro operation

Rennes, France
Project management, infrastructure, Line B
Innovation: geothermal energy in stations' diaphragm walls

Lausanne, Switzerland
Project management, systems and equipment of automatic Lines 2 and 3

Cairo, Egypt
Project management, Line 3

Mumbai, India
Project management, Line 3

Nagpur, India
Project management, Lines 1 and 2

Tel-Aviv, Israel
Assistance to owner, 3 lines.
Innovation: stations without ticket gates

Montreal, Canada
Assistance to owner, Blue Line

Guadalajara, Mexico
Works supervision and ISA mission on Line 3

Kolkata, India
Project management, Line 2

Bangkok, Thailand
Project management and works supervision, Pink Line
Consultancy services for the creation of the Orange Line

Riyadh, Saudi Arabia
Project management and works supervision, Lines 1, 2 and 3

Dubai, United Arab Emirates
Extension of the Red Line. Integrated project management, Alstom consortium Red Line turnkey project

Bahrain
Technical assistance, overhead metro network project

+ 50 years of metro projects

Our history began in Lyon in 1968, with the design of the first metro line in Lyon, then the development of the city's mass transit system with its large-gauge automatic line – a first in the world – and the development of the surface tramway and trolleybus network. Since then, we have never stopped bringing support to owners and operators for the development, extension and modernisation of their metro networks.

With more than 800 km of metro lines commissioned, representing 30 lines in total, Egis is one of the world leaders in the design of metro networks, in France and throughout the world. We design 66% of light rail projects in the world. This shows Egis' reference position in the area.

Unique know-how

on the expectations of owners,operators, and railway manufacturers


D THE GAP

Owners are at the heart of our action

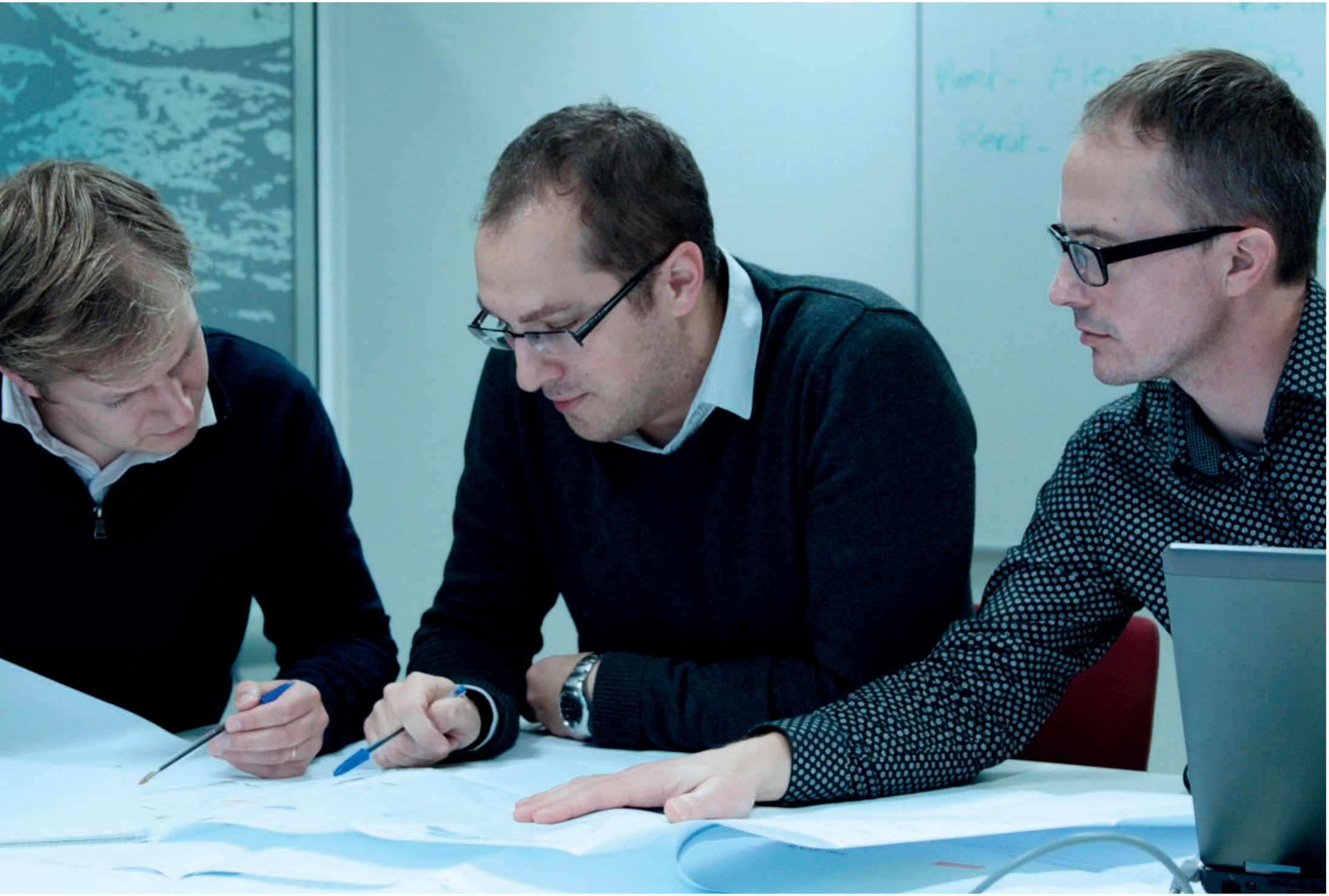
We have been assisting owners for over 50 years and we are familiar with their networks. We act from the origin of their projects, providing consultancy services, up to the efficient operation and defect liability period of the metro system. This proximity gives us an excellent vision of the owners' expectations. It is worth mentioning that our relationship with the client is partnership oriented.

Whether the considered network is a greenfield project or brownfield under ongoing operation, we understand, anticipate and adapt our projects to ensure the continuity of operation and services. In this regard we are recognised for our expertise in the migration of metro systems demonstrated through our several references in this field.

Managing and integrating the complexity of metro transport systems are part of our DNA: we design and develop the infrastructure and spaces in the overall perspective of their future use, and not on the basis of the sum of involved techniques.

Optimising the economic and operational performance of projects is a major priority: "design-to-cost" approach, optimisation of the performance of assets, reduction of the life cycle cost, and enhancement of the infrastructure lifetime. Providing upstream studies for clients in France and all over the world, we analyse and anticipate the societal trends, the way that people live and work, their consequences on mobility needs, in order to build a vision of transport in tomorrow's society.

Our proximity to owners and in-depth knowledge of networks make us a key player in the success of projects.



Constant concern to meet the operator's need

The operator is the fourth player in the act of building, and the final recipient of the structure.

Our 50-year experience in metro projects commissioned throughout the world and our expertise in services provided under operation enable us to perfectly understand the challenges related to operations: reliability, robustness, performance, travel time control, travel safety for passengers, etc.

This differentiating added value enables us to define priorities among the functional or performance-related issues met, and develop and manage with agility complex migration plans..

Insofar as we are used to closely associating the operator from the initial studies up to the end of the defect liability period, we are also able to challenge its own expectations with a constant objective of: progressing with agility, attentiveness and determination to commission a perfectly operable transport system within the allotted time.

We guarantee a better quality of interfaces based on efficient communication, reduced validation periods, and operator's maximum support.

Grand Paris Express, Ligne 15 | Bouygues →
Bid services for 3 lots
Integrated engineering,
Line 15 East North


îledeFrance
mobilités
lignes 15 16 et 17
îledeFrance
mobilités
egis

In-depth knowledge **of railway and equipment manufacturers**

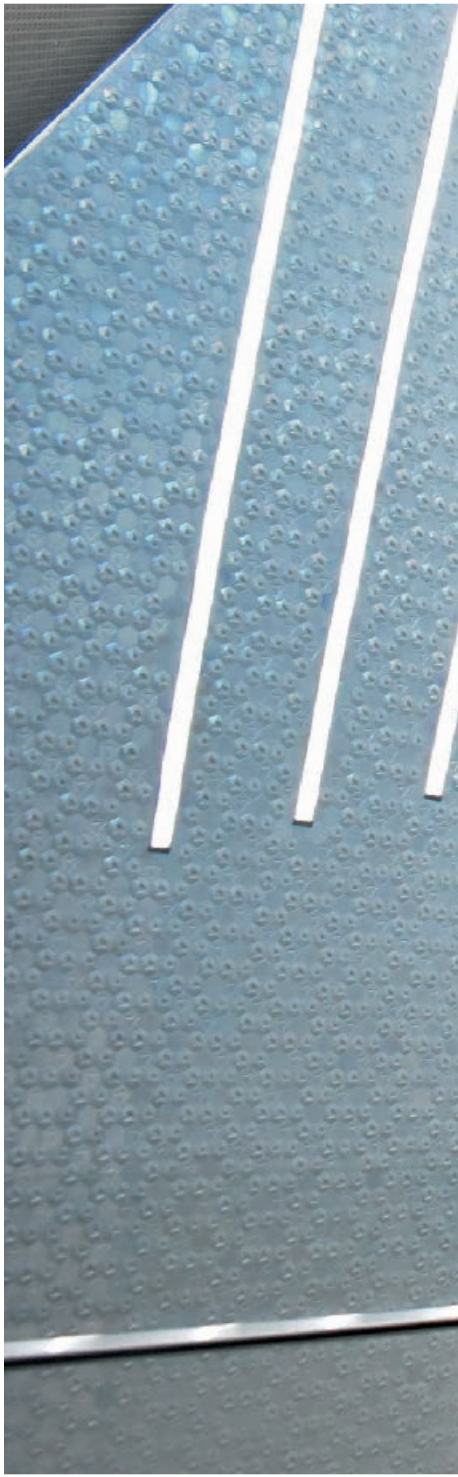
Our experience as project manager has made us a pivotal player and a facilitator between the owner, the operator, and systems manufacturing and construction railway companies. This position allowed us to develop a real technical expertise, a unique project-oriented approach, and a strong bond of trust with our partners.

We provide railway manufacturers and consortiums with our knowledge of railway networks, clients and operators, our technical expertise, our full knowledge of metro projects, and our expertise in integration to switch from the superposition of systems to a unified, integrated and efficient metro system.

We put this expertise and this partnership relation at the service of industrial contractors, metro construction companies and equipment manufacturers.

← Manila Subway Project (The Philippines) | Mitsubishi
Systems engineering & integration – Turnkey platform screen doors

Doha (Qatar), Red line extension under operation | Alstom →
Technical assistance: management of interfaces, risks, requirements, and civil engineering-systems integration

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Whatever the project, we are by your side

All metro projects, at all stages

We provide our services in the design pre-programming phase or in the construction phase of projects: new networks, network extension, or modernisation of networks under operation.

Our "metro product" approach enables us to relevantly deploy skills that cover the entire range of this transport system's needs in terms of traffic, operations, overhead or underground civil engineering, technical finishing, systems, rolling stock, operation security, among others, but also regarding site scheduling, design coordination, project management, and systems or structures integration.

As experts, we are also called upon for specific technical topics regarding either transport systems or operations.

Creation

P. 18

Mumbai, creation of Line 3 →

Extension

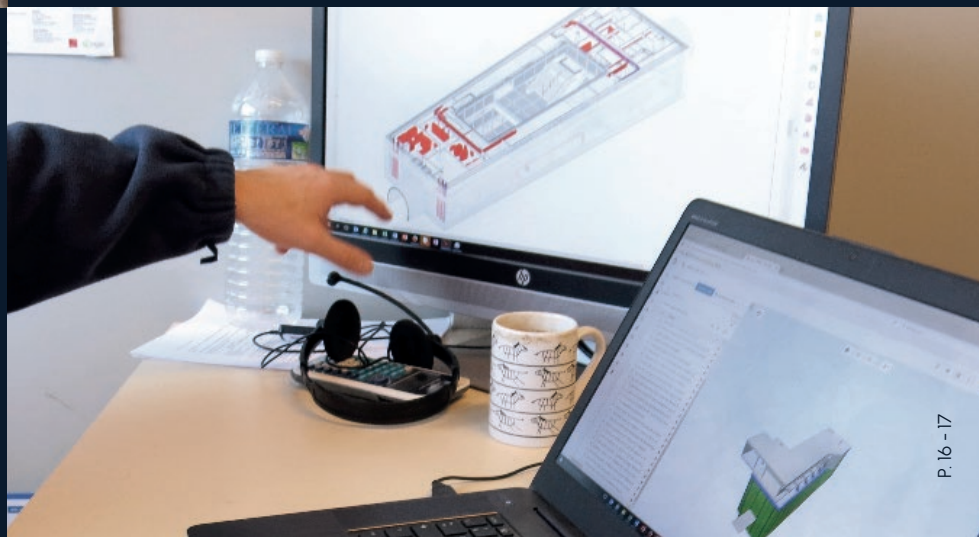
P. 20

← Grand Paris Express, Line 16

Modernisation

P. 22

Lyon metro line B, Modernisation →
GoA4 (fully automatic) under operation



Creation of networks

Amongst the five French metropolises equipped with a metro system, Egis participated in the design and construction of the totality of three networks, in Lyon, Marseille and Rennes. We are also working outside France, on the construction of the metro networks in Tel Aviv (Israel), Riyadh (Saudi Arabia), Doha (Qatar), Manila (The Philippines) as well as Line 3 in Mumbai (India).

Our experience and knowledge of the French and international networks make Egis a unique point of contact in France regarding metros, and position us a leader in automatic metro engineering throughout the world.

Still today, we are working on the construction of new metro networks in France: Line B in Rennes, and Lines 15 South, 16, 17 and 18 of the Grand Paris Express network.

- **Tel Aviv, Lines 1, 2 and 3**
  General assistance to owner (Project Management Office), to the National Transport Authority

- **Riyadh, Lines 1, 2 and 3**
  PMC for Arriyadh Development Authority

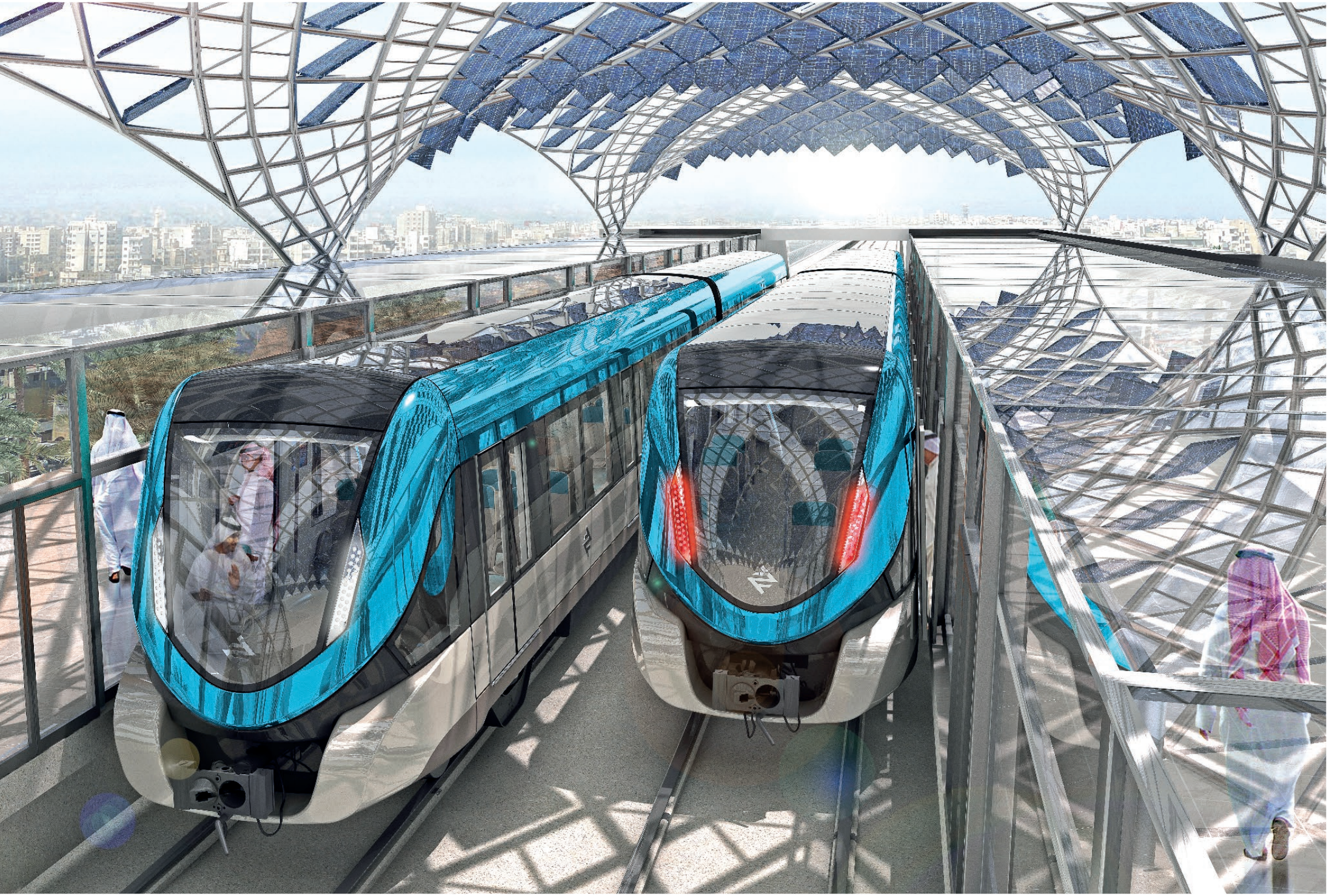
- **Mumbai, Line 3**
  Project management and integrated engineering for AECOM

- **Grand Paris Express network**
  Line 16, Infrastructure project management
  Lines 15 South, 16, 17 and 18, Systems project management
  Lines 15 South, 16 and 17, General site scheduling, management and coordination

- **Lyon, Lines A, B, C and D**
  General project management

← Lyon, metro line A

Riyadh, metro station projection →

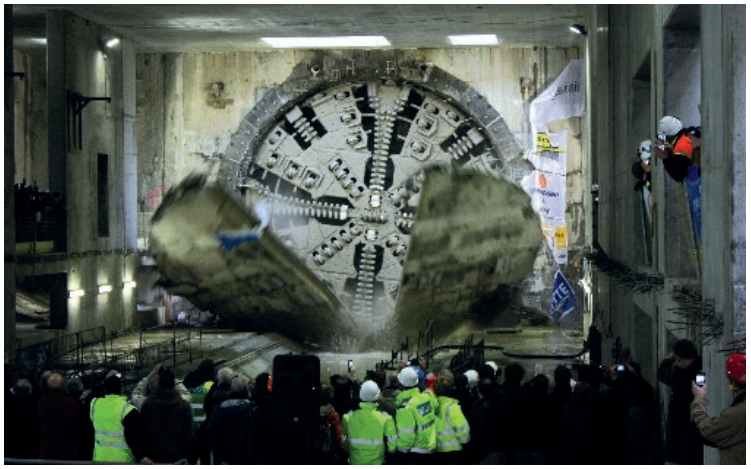


Extension of lines

Since the 90s, Egis has been participating in many network extension projects in France and elsewhere in the world. These more complex projects require perfect knowledge of the operating constraints, the design of existing lines and the challenges to be taken up to provide the owner with the guarantee that the design is in line with the issues (continuation, improvement, innovation), integrated and compatible with the existing network.

The phase dedicated to integrating the extension into the existing network is crucial for the success of this type of project. Our long-standing experience in the rising part of the V-cycle allows us to offer customised support to guarantee the perfect integration of the network's new parts.

Compliance with costs and deadlines is our trademark. The commissioning of Metro B towards the Lyon South Hospitals in October 2022 bears witness to this.



- **Lyon, Line B**
  Project management for the extension to Oullins (crossing under the Saône river)
  Project management for the extension to South Hospitals

- **Doha, Red Line Extension**
  Technical assistance and design supervision for Alstom

- **Marseille, Lines 1 and 2**
  Project management for extensions of the metro network

← Lyon, metro line B

Lyon, metro B extension to the South Hospitals and Oullins station →


722
Oullins

Modernisation of lines

Technically speaking, modernising a metro network is the most complex job. Our expertise as engineers specialising in this field is a differentiating competitive advantage.

There are manifold types of modernisation: modernisation or change of an existing ATO system, modification/addition of equipment (railway track, platform screen doors, ticketing, etc.), modification of the operating plan to increase the capacity of congested lines, or adaptation of structures for new uses (accessibility, ventilation, etc.).

All these types of modernisation take place under operation. This means permanent contact with the operator, an obligation of daily result, and fine-tuned phasing. These are all aspects Egis is familiar with.

- **Lyon, Line B**
  Switch to GoA4, Avenir métro project management

- **Lille, Line 1**
  Project management for the modernisation of the ATO system and the extension of platforms

- **Lausanne, Lines 2 and 3**
  Project management for systems and equipment. Modernisation of the ATO system

- **Manila metro, The Philippines**
  Platform screen doors (turnkey project: design, supply, installation and maintenance)

- **Paris, Lines 10, 7b et 3b**
  Modernisation project management under operation (OCTYS system)

- **Marseille, modernisation of platforms at Gare Saint-Charles station**
  Removal of the escalators from the platforms
  Access to the SNCF railway station

← Lausanne, modernisation of Lines 2 and 3

Lyon, Avenir métro project →


METRO B
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Our solutions

Our teams can bring support to industrial contractors and equipment manufacturers on all the components of a metro project: assistance with invitations to tender, systems integration, structure integration, project ecodesign, independent inspection and external audit, cybersecurity, etc.

Depending on your needs, Egis is in a position to manage engineering as a whole or provide cutting-edge expert services .


CARD

Expertise at the heart of our activity

Civil engineering

1. Viaducts and bridges
2. Finishing works / technical trades and coordination drawings
3. Depots / maintenance premises

Systems

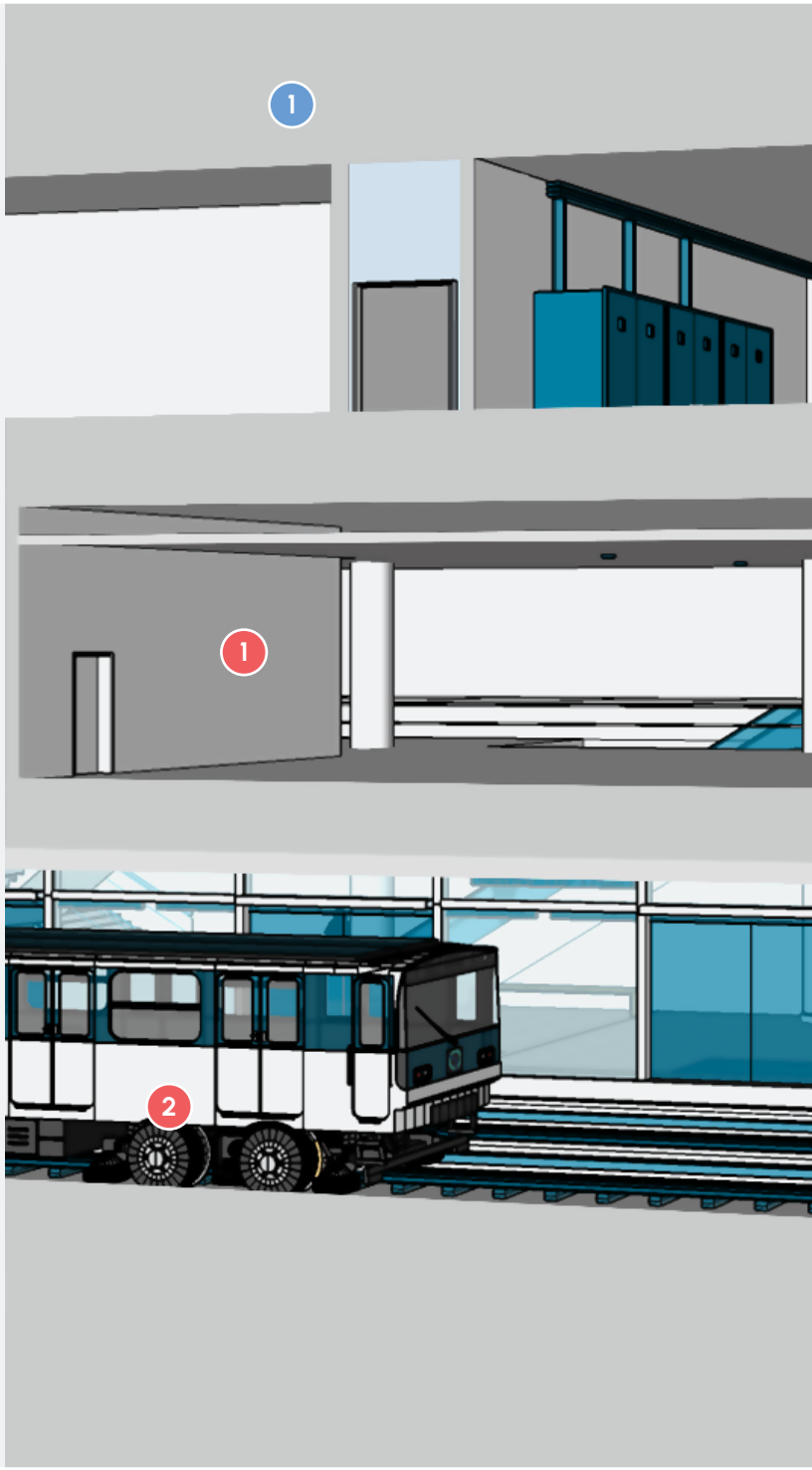
1. Operation control centre
2. Rolling stock - Signalling - Communication system - Systems integration - Cybersecurity - System assurance - Tests
3. Railway track and alignment - Conductor rail / Catenary (OCS/OCR) - Power supply - CBTC - ATS - Traction logic - Centralised control
4. Platform screen doors
5. Ticketing

MEP (mechanical, electrical and plumbing)

1. Lighting system
2. Heating, ventilation and air conditioning

Scope of services

1. Project management - Contract management - Site scheduling, management and coordination/Planning
2. Structure integration - Systems integration - Systems engineering

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Saint-Denis Pleyel
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Solutions
at your service

Systems integration

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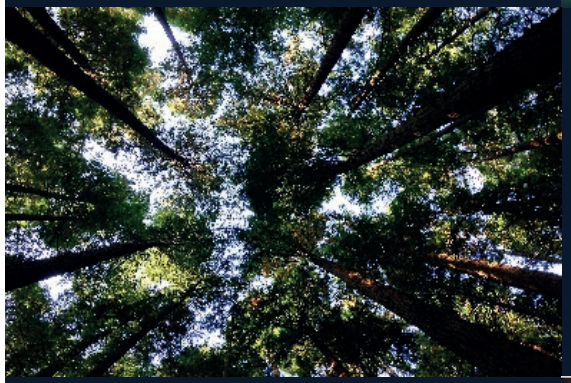
To switch from the superposition of systems to a single and efficient system.



Project ecodesign

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Low carbon design, energy savings, life cycle of subsystems, etc.

Detailed design (EXE in France)

P. 36

Detailed design studies: railway track, catenary/third rail, energy, engineering structures, civil engineering, etc.

Inspection / independent certification

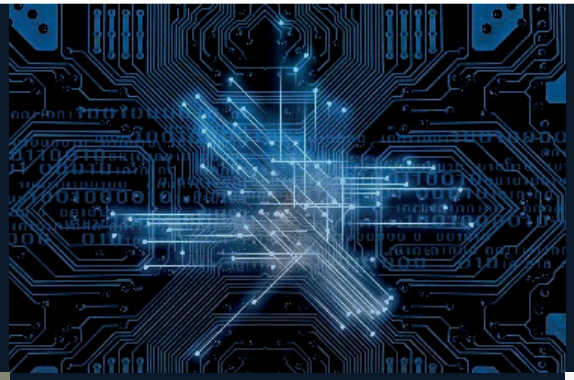
P. 39

ISA, risk assessment, ICA, etc.

Systems engineering

P. 31

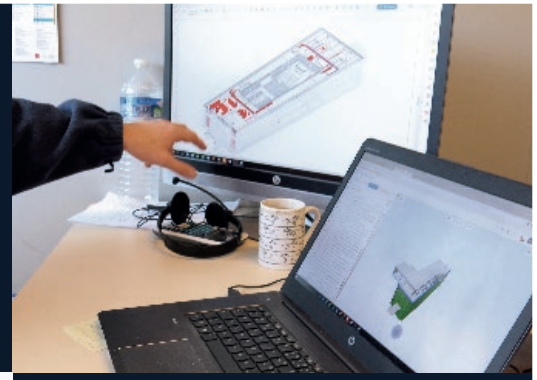
Design of systems, management of interfaces, management of requirements, etc.



Assistance in tender phase

P. 32

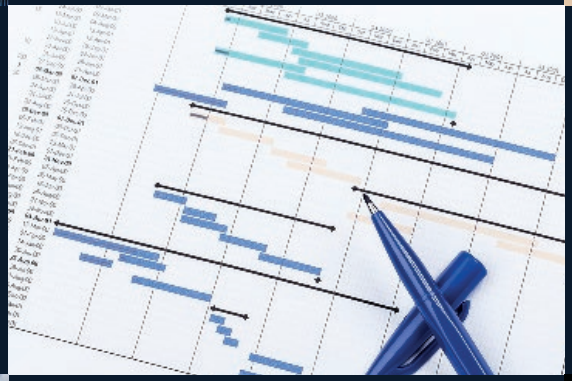
Design studies (preliminary design, detailed design, etc.), design management, etc.



Project management

P. 34

Design management, project management, reporting, etc.



Scheduling, management & coordination, and planning

P. 35

Scheduling, co-activity management, de-risking, level 1 to 3 schedules, etc.

Operating reliability

P. 37

Safety management, drafting of dossiers, operating reliability, etc.

Cybersecurity

P. 38

Architecture and strategy, management, audits and analyses, implementation, maintenance, etc.

External audit

P. 40

Quality of design studies, inspections, tests, checks, securing acceptance, etc.

Systems integrator

- **Grand Paris Express network Lines 15, East and North**
  General systems integrator for Bouygues - Colas Rail

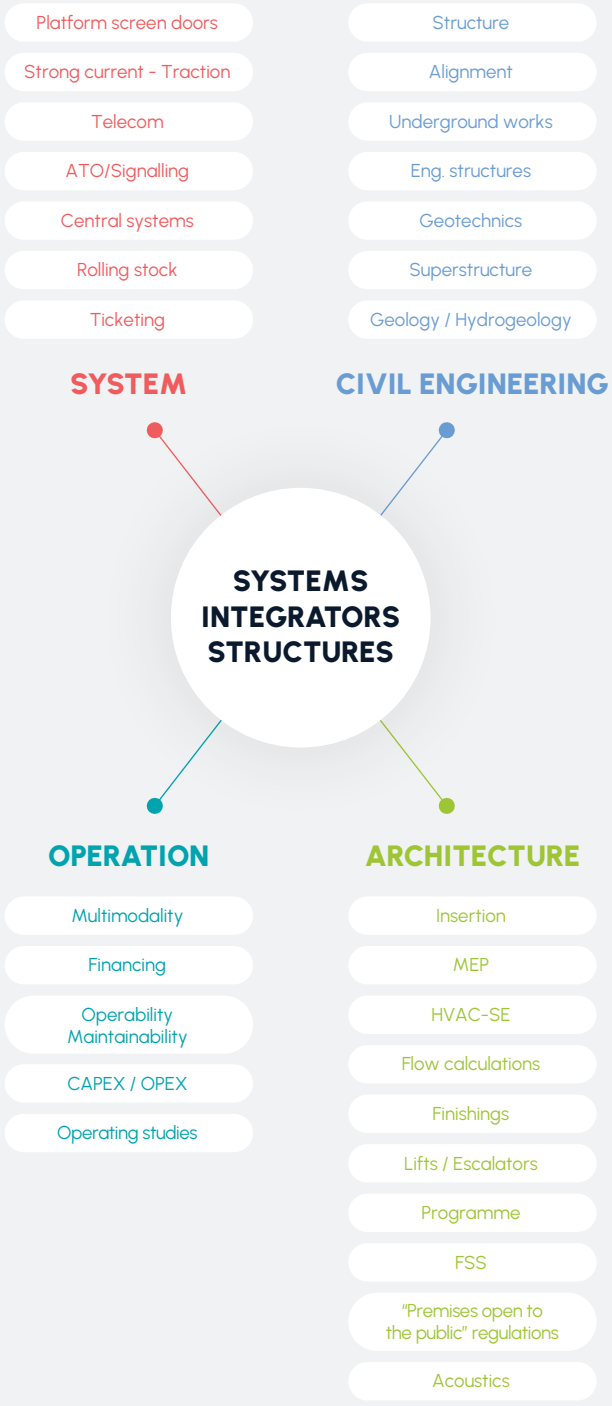
- **Lyon, modernisation (GoA4) and extension of Line B**
  General project management

Designing, building and operating a metro line or network require assembling a quantity of interdependent systems: transport system (automatic control systems, track, traction, etc.), station systems (platform screen doors, electromechanics, ventilation facilities, telecommunications, etc.), and central systems (technical rooms, control offices, etc.).

Every manufacturer has perfect and accurate knowledge of the systems it designs and sets up. Only the engineer has an overall view of the metro system and its operation, especially during the operating phase.
With over 50 years of experience, Egis is familiar with extremely diverse system configurations in France and elsewhere in the world. Our cross-cutting and integrated approach allows us to guarantee the design of optimal transport systems and the integration of the needs of users, operators and maintainers.

We can commit ourselves from the initial prefeasibility and concept studies up to the ultimate completion phase with, of course, strong and high value-added involvement during the testing and commissioning phase.

Our expertise enables us to switch from a set of systems to a reliable transport system, in line with the expectations of the owner and the operator.



Systems engineering

Organising activities as part of a multidisciplinary project as complex as a metro project requires implementing proven engineering processes.

Beyond a convential overall deployment, which is costly and often inappropriate, our approach relies first on the definition of tailor-made concepts for the project (engineering metamodel). Based on clear objectives, these concepts are integrated into the project processes as and when needed. In order to guarantee a genuinely efficient project, the implementation of these concepts can be limited to specific activities or technical areas.

In particular, we take charge of the following aspects:
· Management of requirements
· Design of the systems architecture
· Management of the configuration
· Deployment phasing, processes and migration strategy

The experience we have acquired as part of the projects we have been entrusted with is at the basis of our agile and appropriate approach. It allows us to identify the phases and technical areas for which the implementation of processes has high added value.

ENGINEERING PROCESS

ENGINEERING CONCEPTS

Assistance during tender phase

Bid services

- **Toulouse metro Line C**
  Integrated engineering
  CAF-Thales consortium

- **Glasgow metro**
  Integrated engineering
  CAF consortium

- **Bahrain metro**
  Assistance with consortium agreement for the Ministry of Transport

- **Dubai metro, Blue Line**
  Integrated engineering
  Supporting Parsons-Atkins JV

- **Riyadh metro Phase 2, Line 2 extension and new Line 7**
  Integrated engineering
  Egis-Systra-Dar consortium

We are in a position to provide you with support during the tender phase, by optimising the organisation of your proposal, working towards risk reduction, and putting at your disposal the processes, methods and management tools suited to your context.

We are able to support the design required by the owner in the tender phase, challenge it and suggest the best variants, analyse the design, check consistency, ensure compliance with the requirements, analyse interfaces, and provide you with a planning and scheduling proposal.

We are accustomed to resolving technical and partnership interfaces to guarantee the appropriate development of the tender phase and reach the financial optimum.

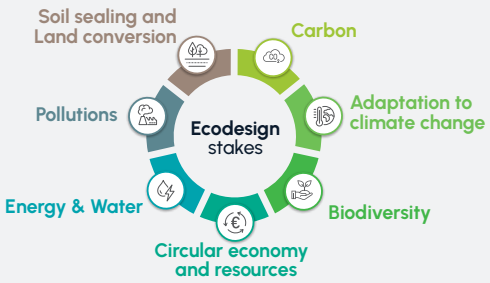
We also bring our operational experience with regard to value engineering and risk analysis, as well as our in-depth knowledge of the owners' and operators' expectations.

Project ecodesign

- **Grand Paris Express network, Line 16**
  Regenerative braking and lift energy recovery at stations, smart grid of the distribution network, low carbon rails

- **Rennes, Line B**
  Geothermal energy for district heating, 80,000 kWh of solar energy

- **Lyon, Line B, extension to South Hospitals**
  Recovery of 99.9% of waste, recovery of 100% of sludge less than 30 km away, low-carbon concrete track bed



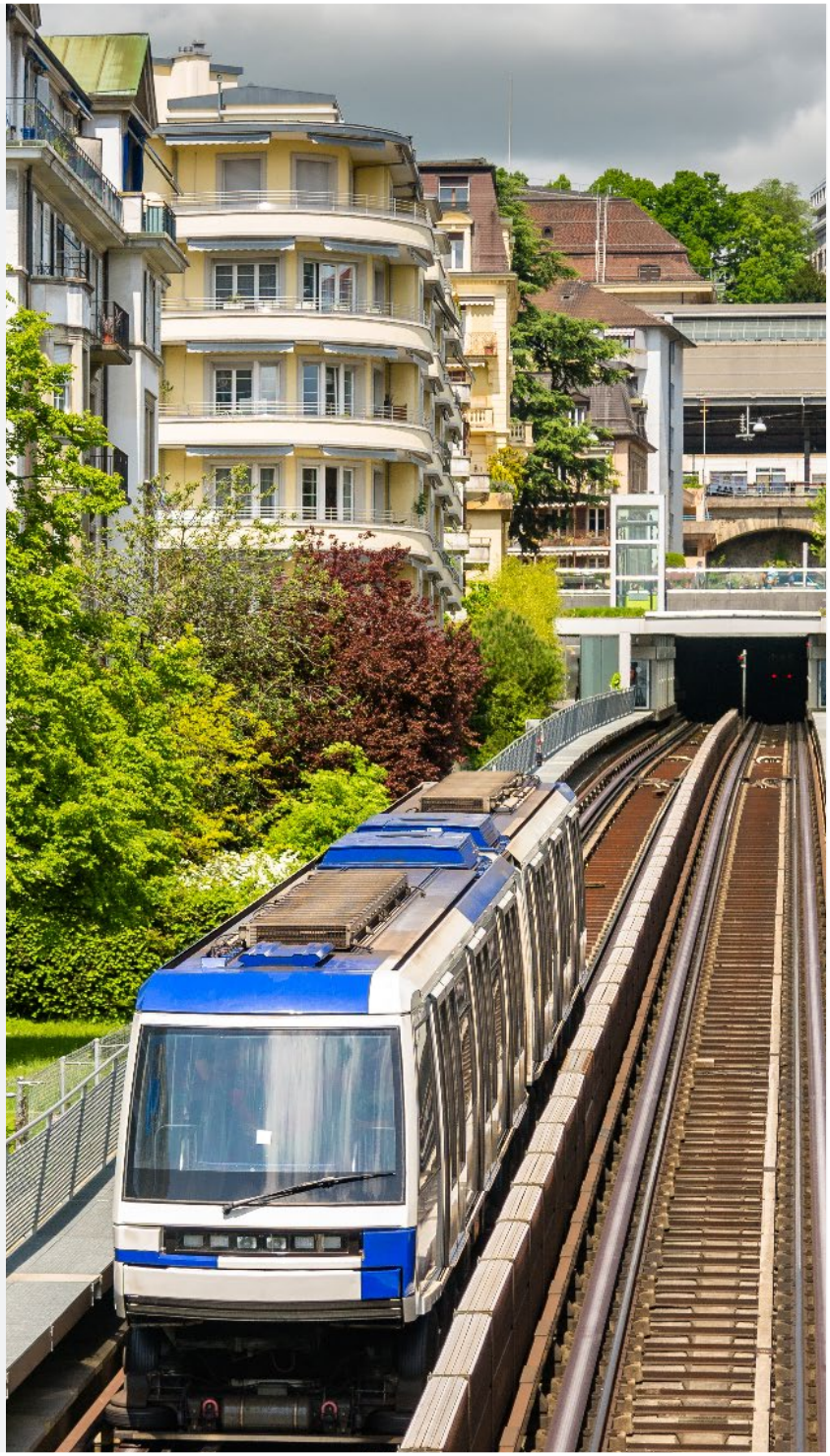
Designing a metro project is designing a long-term infrastructure, for the future generations. Today, Egis designs infrastructure and systems with lower carbon footprint and improved life cycle.

The design of sustainable infrastructure leads us to focus on the following:

- reduction of the infrastructure carbon footprint (low-carbon concrete, bio-sourced materials, 3D printing, material reuse, etc.)
- design of low-energy stations (geothermal energy, adaptative lighting, etc.)
- design of less energy consuming systems (energy recovery, optimisation of longitudinal sections and operating plans, etc.)
- increase of the lifetime of the infrastructure and dematerialised systems

Egis has a unique ecodesign reference framework, Act4ecodesign©, that allows for assessing and reaching high environmental performance levels for the 7 ecodesign criteria.

Our added value : integrating all ecodesign solutions for the various components of a metro system to build an infrastructure with an optimised environmental assessment.



Project management

- **Dubai, Red Line extension (Route 2020) for the Expo 2020 World Fair**
  Expolink/Alstom consortium for Roads and Transport Authority

- **Guadalajara, Metro Line 3**
  PMO assignment for the Transport Department

- **Mexico, modernisation of Line 1**
  Project management, technical expert assessment, coordination

- **Cork RER**
  PMO assignment for Iarnrod Eireann - Irish Rail

- **Riyadh metro, Phase 1, Lines 1, 2 and 3**
  PMCM for Royal Commission for Riyadh City

- **Makkah, Al Mashaaer Al Mugaddassah metro, Southern Line**
  Egis-Systra JV PMO for operation and maintenance services

We organise the smooth development of your projects and secure the achievement of your objectives on time and with the quality and safety levels required in your contracts. To that end, we implement processes, methods and management tools specific to each stage of your projects, suited to their specific features, capable of ensuring their success, and tried and tested by owners.

Our experience in support to owners, industrial contractors and equipment manufacturers has showed us how important it is to integrate the need for project adaptability to frequent changes and the crucial guarantee of permanent control and rigorous planning of projects, while improving the balance of the functional and operational performance/costs/timeframe triptych in our management processes.

We have in-depth knowledge of the risks inherent in metro projects, especially those related to the owners' and operators' requirements. We take their management into account as from the project management upstream phases to better serve your interests by securing the stakeholders' satisfaction, reducing the threat of disputes and being proactive regarding avoidance, mitigation and compensation measures.

Entrusting us with the overall management of your projects or part of it means benefitting from our expertise in project management to the owners' satisfaction, so that you can focus your efforts on the suitable and optimised provision of your technical contributions, in total peace of mind.

Lyon Metro B, extension to South Hospitals

Site scheduling, management & coordination, **and planning**

- **Grand Paris Express network, Lines 15, 16 and 17**
  General site scheduling, management and coordination

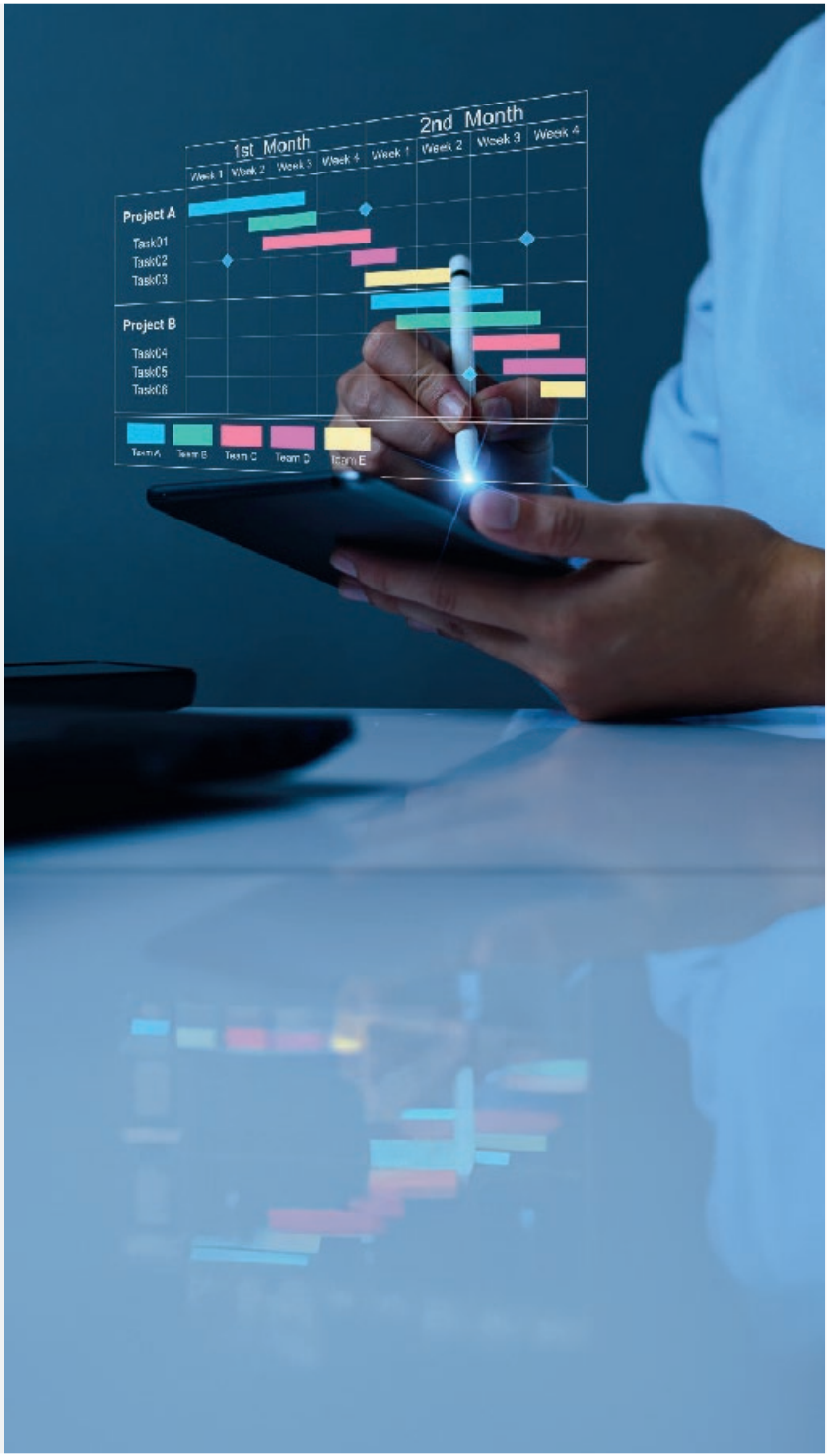
- **Grand Paris Express network, Line 14, Eole and Line 18 extension**
  Works scheduling, management and coordination

- **Grand Paris Express network, Project management-Systems**
  Planning unit

Our in-depth knowledge of all the disciplines involved and their basic duties, of the sequence of activities, of the risks associated with coactivity and the allowed room for manœuvre, and our proven experience in the simultaneous management of multiple participants and the harmonisation of operations in time and space enable us to have a central and strategic role in the orchestration of your projects. In close collaboration with the other stakeholders, we successfully ensure project delivery in the required conditions.

Our experience, strengthened alongside owners, industrial contractors and builders, gives us the reactivity and proactivity needed when solutions are to be put in place and obstacles must be overcome to de-risk the critical paths of projects and minimise the threat of additional expenses resulting from works contingencies and penalties for delays.

Our proven experience in project scheduling, interface management and coordination with multiple stakeholders is available to you.



Infrastructure detailed design studies and drawings

- **Bangkok, Orange and Purple Lines, Singapore Jurong, J150**
  Railway track detailed design drawings

- **Montreal, Blue Line | Santiago de Chile, Lines 8 and 9**
  Energy simulations and detailed design drawings

- **Singapore, CR 159 | Bangladesh, Dhaka, Line 5**
  Catenary/ICP, detailed design drawings

- **Bangkok, Purple line and extensions | France, Toulouse, Line C**
  Engineering structures

- **Grand Paris Express network, Line 15 South and Line 14 North**
  Civil engineering and retaining structures, detailed design drawings

Based on the project management experience we have acquired in construction supervision and detailed design drawing approval, we produce detailed design studies and drawings for projects in France and throughout the world.

We rely on our design centres, located in France, Thailand and India, to provide you with the skills, the volume of resources and the reactivity required for the completion of your detailed design studies and drawings. To guarantee perfect coordination and the necessary quality level, a project manager/coordinator is systematically appointed to provide a link between the Egis design centres and your teams.

- **Railway track**
- **Energy simulations**
- **Catenary**
- **Engineering structures**
- **Civil engineering and retaining structures**

Safety assurance, safety cases

- **Montreal metro**
  Safety management
  (NFPA130, EN50126)

- **Grand Paris Express network, Lines 16, 17 and 18**
  RAMS management, safety cases

- **Lille, modernisation, Line 1**
  RAMS management and ILS, safety cases

- **Lausanne, modernisation, M2-M3**
  Implementation of the RAMS approach

Our System Assurance department has proven experience in RAMS management. We participate in all types of projects in France and worldwide, whether as a member of the engineering team or for specific expert assessments to assist systems manufacturing and construction railway companies in charge of implementing metro systems.

We are active in all subjects relating to operation security and safety.

Reliability - Availability – Maintainability (RAM)

Definition and contractualisation of the service quality and RAM objectives

Comparison of architectures and technical solutions so that RAM be a criterion for the choice of options

Assistance to owners for the implementation of an approach that guarantees the response to the RAM objectives

Safety

Overall approach to safety

Mastery of the safety frameworks applicable to transport systems

Knowledge of the safety issues specific to critical systems

Handling of fire-related risks and evacuation conditions

Mastery of the reference frameworks

CENELEC EN 50126 / EN 50128 / EN 50129

IEC 61508

NFPA 130

National and international regulations

Integrated Logistics Support (ILS)

Strong knowledge of the ILS standard frameworks

Checking that all the transport system's components integrate the maintenance constraints

Training

Raising teams' (projects, management) awareness of the management of railway safety

Training the engineers in the implementation of complex operation security methods

Cybersecurity

- **Ile-de-France, RATP, Metros 3b, 7b and 10**
  Project management for the deployment of the OCTYS system for line automation

- **Melbourne, metro (HCMT)**
  Analysis of cybersecurity risks

- **Lyon, *Avenir métro*, Line B**
  Definition of the cybersecurity requirements applicable to each subsystem

- **Ile-de-France, Grand Paris Express Line 18**
  Project management for systems, analysis of overall cybersecurity risks

Cybersecurity is a major issue for the safety of passengers and the facilities of metro networks.

Over the years, Egis has developed a cutting-edge expertise in network cybersecurity, integrating the operators' needs and expectations.

We can operate at different stages:

- Upstream design: integration of cyber issues and defence-in-depth design
- Governance and management: long-term plan, and approval of information systems
- Analyses and audits: compliance audits, assessment and prioritization, pen testing/red team
- Deployment and maintenance: SOC construction, implementation of measures, safety compliance monitoring, periodic inspections, and training

METRO Toulouse

Inspection
and independent certification

- **Montreal, Metropolitan Express Network**
  Design & build ISA

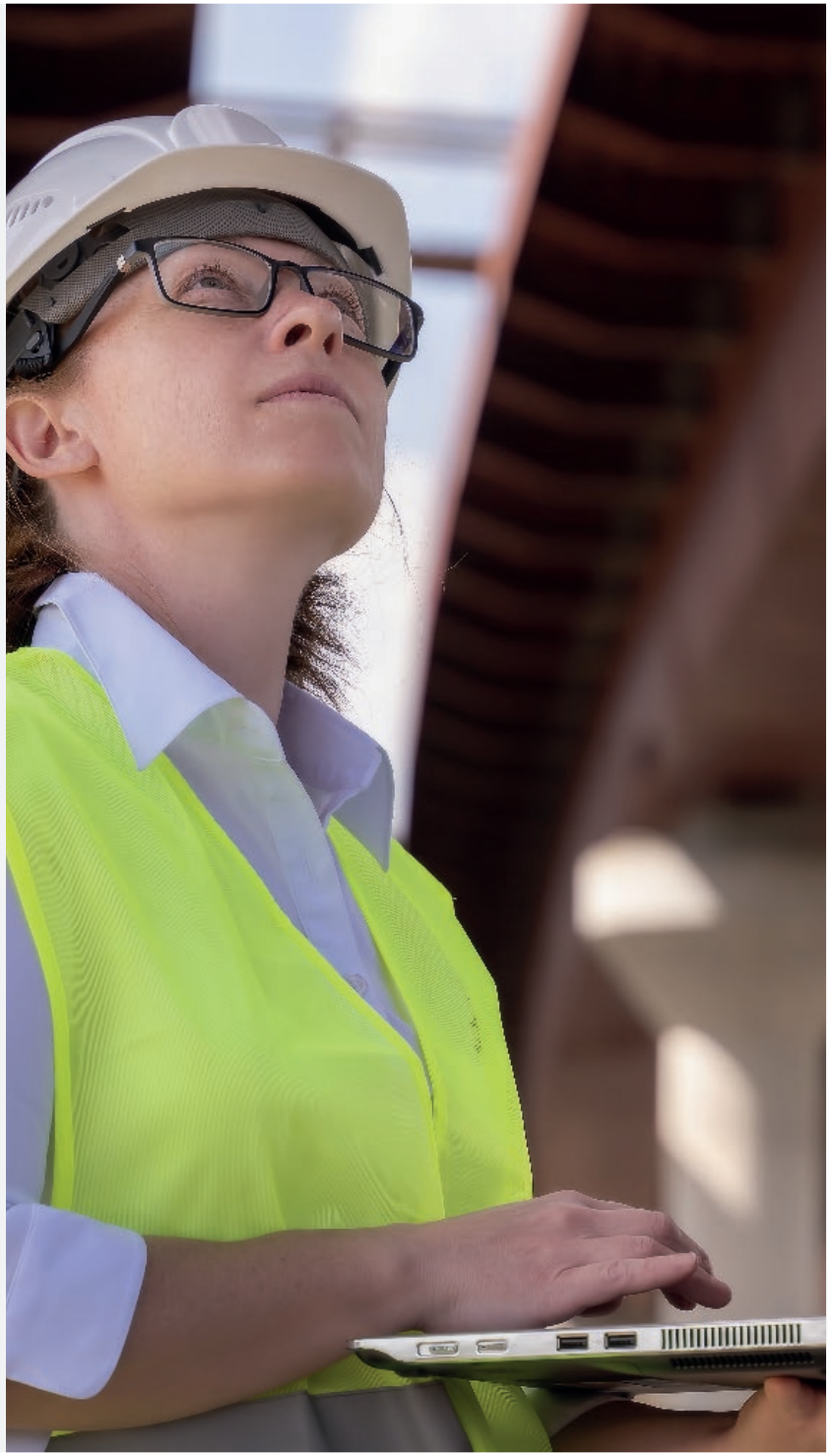
- **Rennes, Metro Line A**
  ISA at mid-life of the VAL 208 AG trains

- **Monterrey, 2 monorail lines**
  ISA for the whole project

Egis has been carrying out safety assessment assignments on railway systems since the early 2000s.
Totally independent of design assignments, the AuditSafe excellence centre was created in 2016 to assess the safety of systems. It is strongly represented in France and worldwide thanks to the Egis group's locations.

Services provided:
· ISA (Independent Safety Assessment)
· AsBo (assessment of the risk analysis)
· DeBo (Designated Body) in rail transport
· ISA in urban mass transit
· ICA (independent assessment of the cybersecurity of railway applications)

AuditSafe is certified by COFRAC (French accreditation committee) and has received all the accreditations and certifications needed for urban and rail mass transit systems or subsystems.



External audit

- **Palembang, light rail system**
  External audit and technical assistance to owner

- **Guadalajara, Metro Line 3**
  External audit

- **South Korea, high-speed train line**
  Inspection and external audit of the signalling facilities at the Osong depot

We operate at all stages of your projects (invitations to tender, detailed design drawings, deployment, installation and acceptance of equipment) in order to make your assumptions and input data more reliable and certify the quality of your studies to the owners.

Our assignments cover all the technical areas involved in a metro transport system, handled with relevance thanks to our vision as integrator, our expertise in detailed design approval, and our in-depth understanding of the issues specific to this type of project, to guarantee a response in line with the owners' expectations.

Our proven experience as external auditor to owners and in support to systems manufacturing and construction railway companies and equipment manufacturers gives you the assurance of a clear understanding of your issues while guaranteeing the external positioning required by owners.


egis
egis

Our references

Egis, present on the five continents, completed several hundreds of metro projects representing more than 800 km of lines.

The following pages show selected project references that illustrate our expertise in France and worldwide, classified into three major project categories.

Contents

Rennes

Line B, France

From December 2010 to September 2022

14 km long

15 stations

Budget: €700 million

Specific features:

- Management of interfaces with Siemens, the system integrator (infrastructure, station and shaft equipment)
- Design of a geothermal system in the diaphragm walls
- BIM design of stations: civil engineering, finishing works and MEP
- Engineering, integration and coordination drawings with the architectural projects of stations
- Use of a mud pressure tunnel boring machine

The planned Line B is a response to the constantly growing needs for public transport due to the vitality of the Rennes city region.. Line A started operating in 2002. and has been hugely successful, getting close to its capacity limits with 656 million passengers per year.. This led to the city council considering the construction of a second high-capacity driverless line.

Line B entered service in 2022. It crosses Rennes from south-west to north-east. It is a complex infrastructure, combining underground sections (8.6 km of single tube tunnel bored with a TBM et 2.65 km of cut-and-cover) and elevated sections (2.4 km of viaduct). Three park-and-ride facilities offering total capacity of 2,000 spaces round off the project.

The selected system is the Cityval, the light automatic metro system developed by Siemens. The line has been a great success since its commissioning to reach 85,000 journeys per day in 2023.

Owner: Trajectoires (delegated contracting authority for Rennes Métropole)

Contract holder: Egis

Egis' contribution: Project management for civil engineering and equipment (not related to Siemens' transport system), for the tunnel, cut-and-cover, the viaduct, the stations (12 underground and 3 elevated), the 4 shafts, the maintenance depot and the systems of the park-and-ride facilities: design phases, works procurement, monitoring of detailed design studies and works, management of tests (excluding systems), consolidation of the safety case, acceptance and guarantee monitoring.

Grand Paris Express

Line 15, France

From April to July 2024 (preliminary design) and August 2025 (detailed design)

8 km long

3 stations

Budget: €1.1 million

Specific features:

- Facilitating communications between the outskirts of Greater Paris without crossing Paris
- Real estate projects integrated as from the design & build phase
- An environmentally friendly project throughout its design
- 175 digital models and information associated for better project understanding

The design & build contract relating to the northern section of the Grand Paris Express Line 15 East starts at the interface structure with Line 15 West (including service structure 32E01) located at Saint-Ouen and ends at service structure 6701 (not included) located at Bobigny in interface with Line 15 East South. The northern section of Line 15 East is completely underground. It aims to facilitate communications between outskirts without crossing Paris.

The northern section will link the Saint-Denis Pleyel, Stade de France, Mairie d'Aubervilliers, Fort d'Aubervilliers and Drancy-Bobigny stations.

Owner:
Société des Grands Projets (SGP)

Contract holder: IRIS - Bouygues Travaux Publics consortium

Egis' contribution: Egis acts as integrated project manager. Its scope of work covers design studies including preliminary design studies initiated during the tender phase and detailed design studies; the review and approval of the compliance of the project developed at the detailed design drawing stage by construction sub-consortia; construction monitoring and supervision; and checking of the compliance of the structures once they have been built (acceptance + guarantee period). The consortium strives to deploy all of its innovation resources to meet the environmental challenges, in particular the reduction of greenhouse gas emissions

Grand Paris Express

Line 18, France

From February 2016
to February 2033

36 km long

10 stations

Budget: €810 million

Specific features:

- The 45-m trains will be able to carry 350 passengers and reach an average commercial speed of 65 km/h. Of considerable importance to Egis is the technical reputation of Line 18's systems, which must meet the same standards of excellence as those displayed by the Paris-Saclay science and technology hub.

This driverless metro line will run from Orly airport to the Versailles-Chantiers station, via Massy-Palaiseau, in 32 minutes.

With 10 new stations, it will comprise a 23-km underground section and a 13-km elevated section crossing over the Saclay plateau..

There will be multiple connections with other transport services, notably at Orly with the extended Line 14, at Massy-Palaiseau with the TGV and the RER Lines B and C, and at Versailles-Chantiers with the RER Line C and Transilien rail services. The Grand Paris Express is a major project for the Île-de-France region. It consists in building 200 km of metro lines. Line 18 will serve the strategic hubs located in the south-west Paris region.

Owner: SGP (Société du Grand Paris)

Contract holder: Egis

Egis ' contribution: Egis is tasked with project management services for all of Line 18's systems, as well as stations and maintenance and operation centres. The assignment includes high-voltage and low-voltage electricity, platform screen doors, tunnel ventilation and the guiding system. Egis' work scope includes rolling stock, automatic train control and the operation control centres.

Grand Paris Express

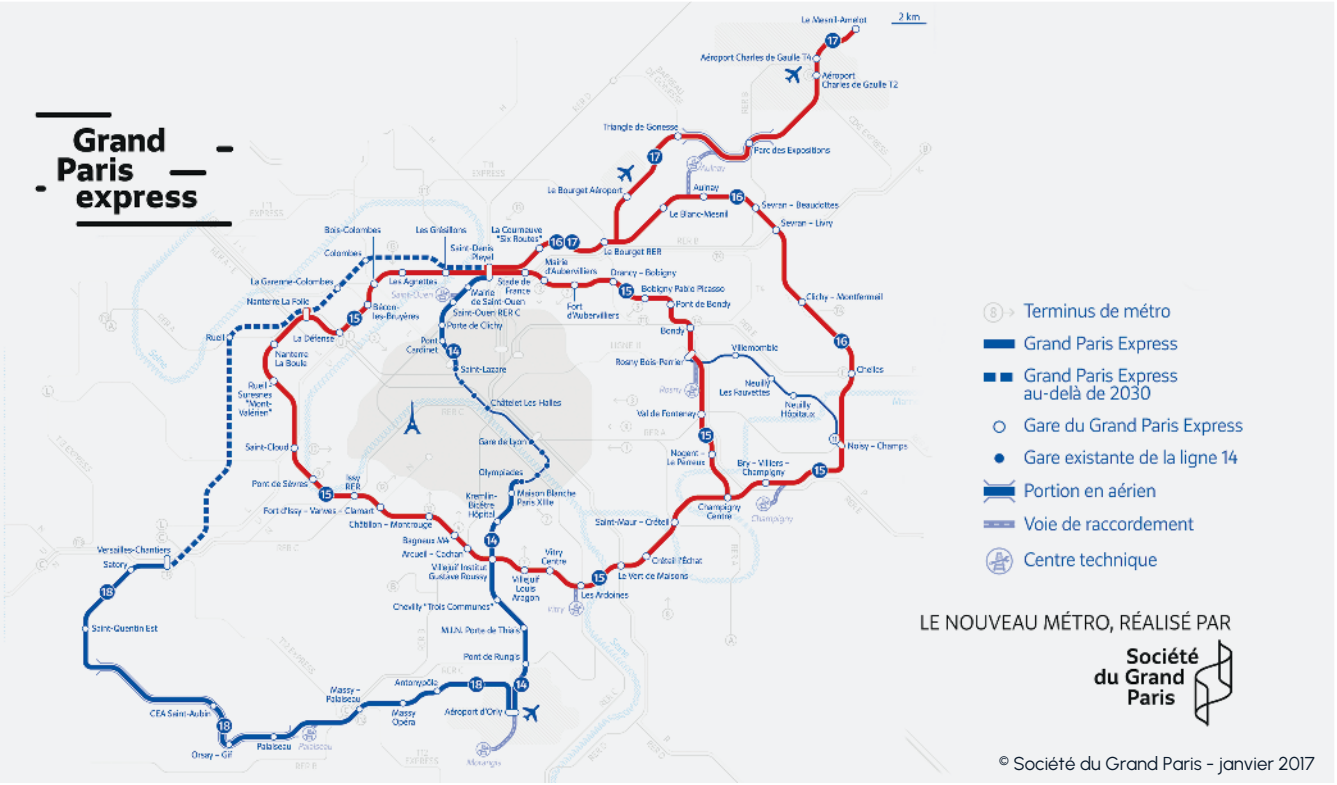
Red Line, France

2013 - 2031

127 km long

50 stations

Budget: €1.6 billion



Specific features:

- An exceptional project: 127 km of line and 50 stations
- The demonstration of Egis' expertise in driverless metros
- The implementation of ecodesign solutions resulting in energy savings, and a design that integrates the life cycle of subsystems

Grand Paris Express is a strategic project for the Île-de-France region since it involves the construction of 205 km of driverless metro lines and 72 new stations to link the region's territories.. About 2 million passengers will use the network every day.

Grand Paris Express will de-congest the existing road and mass transit networks, reduce travel times for the local population, and foster the region's economic development.. The opening of the Saint-Denis Playel station just before the 2024 Olympics will allow for giving access to the last stop of Line 14.

The Red Line will be commissioned section by section: Line 15 South in 2025, and Lines 16-17 and the east and west sections of Line 15 between 2026, 2028 and 2030.

Owner: Société des Grands Projets

Contract holder: Egis

Egis' contribution: Systems project management (excluding the rolling stock and ATO system), for the design and procurement assistance phases, the monitoring of detailed design drawings and construction works, the management of tests, the consolidation of the safety case, and the acceptance and guarantee monitoring process.

Strong currents (high voltage, low voltage and electric traction); low currents (RMS, radio, FSS, passenger information, embedded systems and ticketing); lifts and escalators; platform screen doors and LED strips, tunnel ventilation and smoke extraction; railway tracks/catenaries and in-line mechanical equipment

Mumbai

Line 3, India

From May 2015
to June 2022

32.5 km long

27 stations

Budget: €2.9 million

Specific features:

- Entirely automatic, 27 stations of which 26 underground
- An almost entirely underground line, over 30 km in length

To combat the extremely dense and poorly distributed road traffic and develop real mass transit services, the municipality of Mumbai decided to build a high-quality metro network to serve as many people as possible thanks to the longest underground metro line in the country.

Owner: MMRC (Mumbai Metro Rail Corporation)

Contract holder: Aecom India Private Limited

Egis' contribution: Services include the preliminary design studies, the detailed design studies, the authoring of prequalification requirements and specifications, the analysis of tenders, the choice of successful contractors and the negotiation of contracts.

Doha metro

Qatar

From August 2012
to December 2021

33.7 km long

18 stations

Budget: €12.3 billion

Specific features:

- The only project management contract relating at once to underground, elevated and at-grade sections
- Not less than 21 TBMs simultaneously in operation (world record)

Doha, the capital of Qatar, was faced with serious congestion problems and the need for building an efficient transport network to improve the traffic of tourists during the FIFA World Cup in 2022. It was decided to create a metro network with three lines (four lines by 2025) to efficiently serve the city's territory.

Since then, road traffic has decreased considerably in Doha.

Owner:
QRC (Qatar Railways Company)

Contract holder: Louis Berger

Egis' contribution: Project management for the first network construction phase (consortium), assistance to the owner, provision of services for the Yellow Line as well as the elevated and surface sections of the Green and Red Lines, and assistance in monitoring the construction of the two major stations of the network (Education City and Mshreib).

Riyadh metro PMC

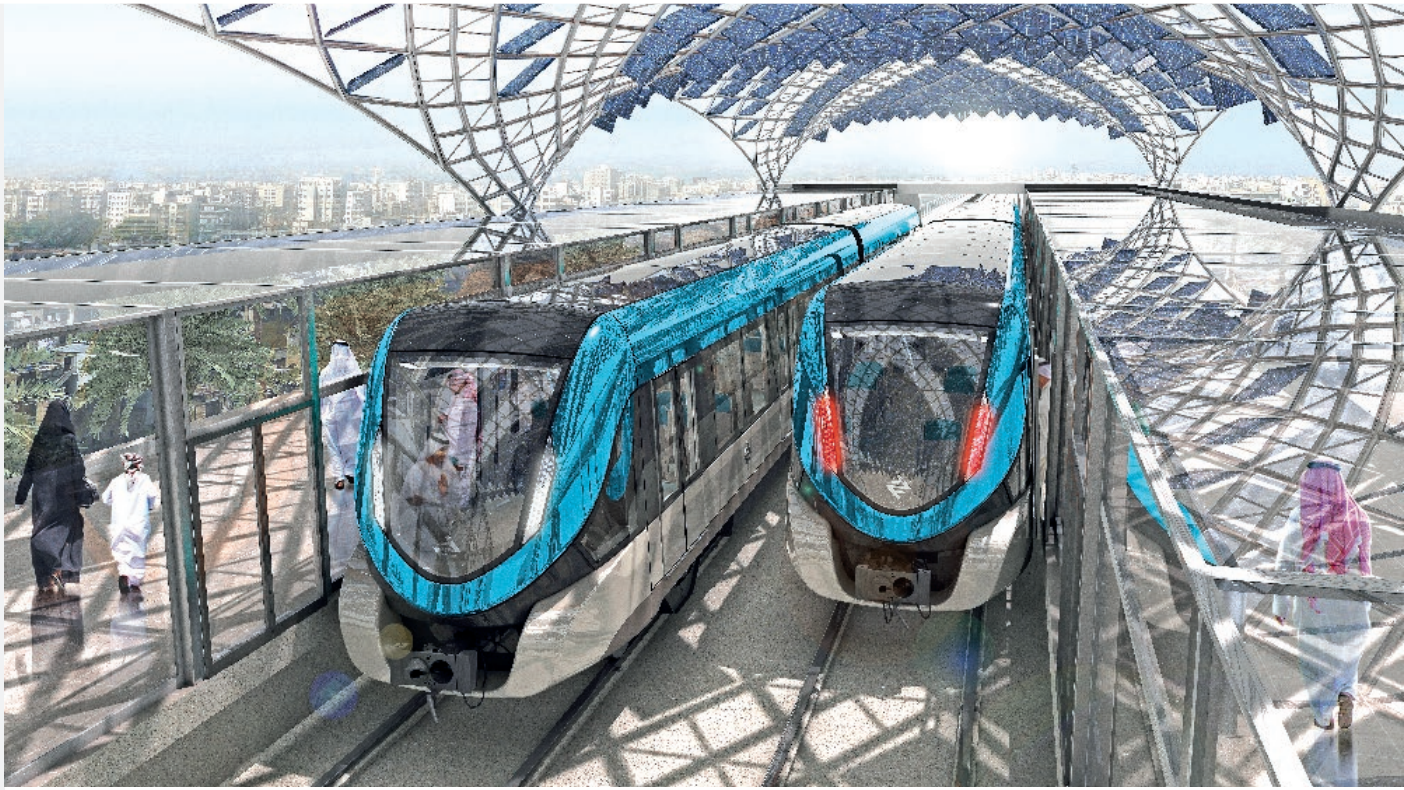
Lines 1, 2 and 3, Saudi Arabia

From September 2013 to November 2024

106.6 km long

64 stations

Budget: €17 billion



Specific features:

- The biggest metro project in the world
- Implementation of a sustainable development approach and ecodesign actions for different issues: energy and climate, water, resources and waste

Riyadh, the capital of Saudi Arabia, had no mass transit system in the 2000s. In late 2011, the city's authorities launched a vast plan with the creation of six metro lines and an extensive bus network to relieve roads in the city and its surroundings.

Owner:
Royal Commission for Riyadh City (RCRC)

Contract holder: Parsons-Egis-Systra

Egis' contribution: Project management and construction supervision for metro Lines 1, 2 and 3.

System engineering services provided by Egis as the direct point of contact for contractors.. Egis' teams were in charge of approving the detailed design of systems and the infrastructure, the detailed design drawings, and construction methods.. They were also in charge of checking the management of interfaces, the quality assurance procedures, and the RAMS (Reliability, Availability, Maintainability, Safety) actions. Finally, the services included the monitoring of construction works with continuous inspection of sites and the supervision of tests and dry runs.

Macao

Line 1, China

From March 2009
to June 2016

21 km long

21 stations

Budget: €1.2 billion

Specific features:

- The first driverless metro line in Macao's history
- A line mostly built on viaducts

The city of Macao (China, close to Hong Kong) can be compared with Monaco in Europe or Las Vegas in the USA, with an economy based on tourism and casino activities.

It was in need of a rapid, efficient and aesthetic transport network to link its various points of interest (airport, casinos, port, etc.).

Owner: GIT (Gabinete para as Infra-estructuras de Transportes)

Contract holder: Egis

Egis' contributions: Egis is a member of the consortium acting as design firm, project manager and technical assistant, from the optimisation of preliminary studies up to the infrastructure commissioning.
All the project's components were managed by the consortium: civil engineering, systems, rolling stock, depot, etc.
For these components, the consortium was in charge of the analysis and optimisation of the preliminary studies that had already been carried out; production of the invitation to tender documents for systems, rolling stock and civil engineering suppliers, and the Independent Safety Assessment (ISA) services provider; procurement with the operation and maintenance company; assistance to the owner (analysis of tenders and drawing-up of contracts); project management for the design & build work of the systems and rolling stock contractor; taking-over monitoring for plant and equipment; planning and management of the entire construction process; revenue service start-up.

Santiago

Line 7, Chile

From April 2022
to June 2027

26.4 km long

20 stations

Budget: €2.3 billion

Specific features:

- The metro network of Santiago, capital of Chile, was commissioned in 1975. Today it consists of 140 km of line and 136 stations spread over 7 lines.

The metro network of Santiago, was commissioned in 1975. It consists of 140 km of line and 136 stations spread over 7 lines. It is operated by the company Metro SA.

The construction of Line 7 was announced in 2017. The line crosses the city from east to west, with 25 km of line and 19 stations; it is equipped with driverless trains..

The whole line is underground. An extension of Line 6 (1.4 km underground and one station) is being built simultaneously, to be connected with Line 7.

Owner: Empresa de Transporte de Pasajeros Metro S.A.

Contract holder: Egis

Egis' contribution: Assistance to the owner for systems within the framework of the construction of Line 7 and extension of Line 6. In the context of this project, a major part of the systems contracts have already been awarded and the detailed design phase is ongoing; Egis therefore takes account of the technical and functional guidelines and specifications defined in basic engineering as well as the RAMS objectives of the project.

Guadalajara

Line 3, Mexico

From September 2015
to September 2020

20.9 km long

18 stations

Budget: €1.2 billion

Specific features:

- A mainly viaduct-based line
- Supervision of the system design, construction and commissioning

The second largest city in Mexico with more than 4 million inhabitants, Guadalajara is an important economic and cultural hub in the country. The widespread metropolitan region had a transport network composed of two metro lines. Commissioning a third line was considered by 2020..

Line 3 consists of 18 stations and stretches over 20.9 km. It connects the city centre with the north-west and south-east neighbourhoods, giving thus access to the municipalities of Zapopan, Guadalajara, and Tlaquepaque.

The major part of the track is on viaducts (14.8 km); the tunnel section is 5.4 km long with a 0.5-km tunnel-viaduct transition.

Owner:
Secretaría de Telecomunicaciones y Transportes (SCT)

Contract holder: Egis

Egis' contribution: Egis was appointed, as part of a consortium formed with Transconsult, for the supervision of the design, construction and commissioning of all the systems of Line 3, as well as civil engineering, the maintenance depot's systems and maintenance machines, interface management and the ISA assignment for the entire programme. The consortium's scope includes the railway track, energy, signalling, telecommunications, the catenary, the electromechanical systems on viaducts and in tunnels, and the rolling stock.

EXTENSION

Lyon

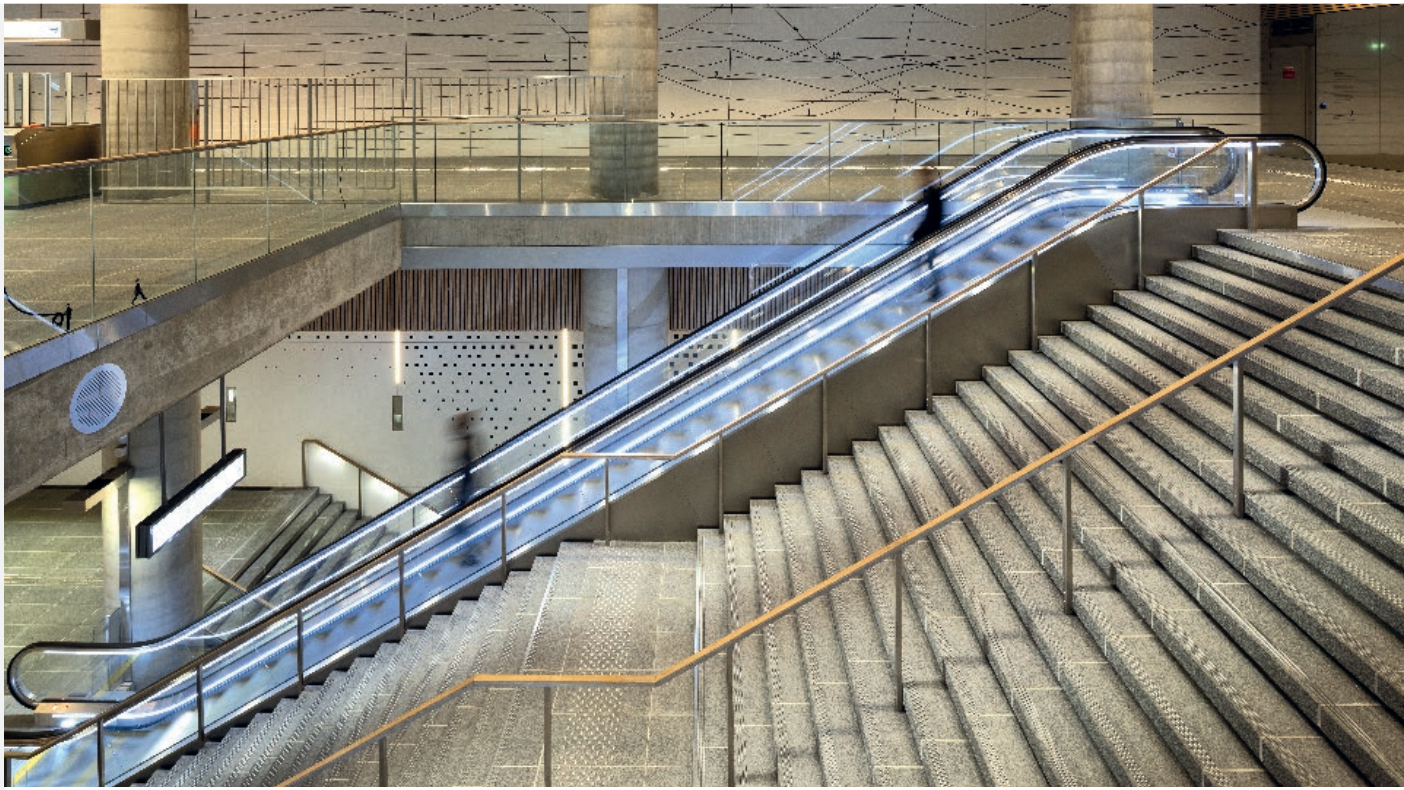
Extension of Line B to South Hospitals, France

From September 2015 to September 2024

2.4 km long

2 stations

Budget: €295 million



Specific features:

- Rhône river crossing
- Project carried out in parallel with the line modernisation project with switch to ATO (GoA4)
- Construction of the extension without interrupting the operations of Line B

The extension of Lyon metro Line B is a large-scale project initiated in a context of urban development and increasing mobility needs. The need for reaching strategic points of the metropolitan area such as the Lyon South Hospital from the city centre and the south of Lyon had become more and more urgent in the city's population growth context.

In view of the successful commissioning of the extension to the Oullins station in 2013, SYTRAL decided to renew its confidence in the consortium led by Egis, which associated with Systra and the architect offices Atelier Schall and Atelier Zündel & Cristea for the stations.

The contract covers civil engineering, station fittings and equipment and the transport system equipment (railway track, high- and low-voltage electricity) of the extension. To complement the conventional steps (preliminary design to taking-over certification), the contract includes project management assignments: coordination of participants; site scheduling, management and coordination; coordination drawings; and interface management.

Owner: SYTRAL

Contract holder: Egis

Egis' contribution: Project management, from the preliminary design up to taking-over certification for civil engineering, station fittings and equipment, the transport system, and high- and low-voltage electricity.

Project management; railway planning; administrative procedures; underground stations; finishings; smoke extraction-ventilation; energy-electric sizing; low currents; interfaces; site scheduling, management and coordination; coordination drawings; operation security.

Paris

EOLE line extension, France

From January 2012
to January 2022

55 km long of which 8 km in a tunnel

3 new stations

Budget: €1.4 billion

Specific features:

- A tunnel under Paris that crosses sensitive areas
- Great depth leading to build certain structures in deep geological layers, with regular mixed front conditions for the TBM
- Construction of an exceptional station under the Porte-Maillot roundabout: 225 m long, 21 m wide, and 30 m deep, with a long-span glass roof

The EOLE (Est-Ouest Liaison Express/ East-West Express Link) project is that of a large-gauge railway link between Paris' eastern and western outskirts, crossing the capital. The westward extension of RER E will provide an important transverse connection with high capacity (6 trains per peak hour, capable of travelling at speeds of up to 120 km/h beneath Paris and carrying 620,000 passengers per day), easy to access, and interconnected with the existing network and other transport modes. The westward EOLE extension implies building an 8-km tunnel in Paris' centre, between the existing last stop at the Haussmann Saint-Lazare station and Nanterre-La Folie.

Owner: SNCF Réseau

Contract holder: SED consortium (Setec / Egis / Agence Duthilleul)

Egis' contribution: Project management within a mixed management team formed with Setec TPI. Other duties: design studies and monitoring of tunnel boring works (6.1 km in length, 11 m in diameter, and 30 m beneath ground level) using a mud pressure TBM; design studies and monitoring of the construction of the new Porte Maillot underground station; design studies and monitoring of the construction of special connection structures at the east end (Haussmann-Saint-Lazare), 200 m long, of variable width, in the immediate vicinity of RATP Lines 3, 9, 13 and 14, with particularly limited rights of way; design studies and monitoring of the emergency access shaft and ventilation works; catenary system studies, with rigid catenary (OCS) in the tunnel and transitions between flexible and rigid catenary systems at the ends of the tunnel sector; and studies of finishings in the tunnel and shafts.

EXTENSION

Montreal

Blue Line, Canada

From January 2019
to July 2029

55 km long

5 stations

Budget: €4.4 billion

Specific features:

- The busiest metro system in Canada and the third one in North America in terms of daily ridership, after New York and Mexico City
- The AECOM - Tetra Tech - EXP consortium called on Egis for its unique system expertise and its experience in working on networks under operation

STM (Société de Transport de Montréal) is overseeing construction of the extension of the Blue Line to the east of Montreal, Canada's second-largest metropolis (4 million inhabitants, half of Quebec's population). This extension is the first of its kind since 2007; it is financed by a federal agreement signed in April 2018, with construction to start in 2021, and service to begin in 2029. The extension is 7.8 km long, with 5 new stations, 6 auxiliary structures and a garage at the last stop. The project also includes the migration of train control to a CBTC system for the entire Blue Line.

Owner: STM (Société de Transport de Montréal)

Contract holder: Egis

Egis' contribution: Egis, subcontractor to the AECOM - Tetra Tech - EXP consortium, is providing the following services: system expert assessment, provision of skilled resources, technical support for the preparation of invitations to tender, project management and monitoring, provision of a second view on the systems, and preparation of the technical integration management programme for the systems specific to the Project Office.

Marseille

Saint-Charles XXL metro station, France

From December 2010 to September 2022

1 station

Budget: €40 million

Specific features:

- The Saint-Charles metro station in Marseille is one of the first stations of the network to be put into service in 1977
- It remains the main node with the Castellane station, one of the two connection stations between Lines 1 and 2
- Egis' unique experience allowed for works carried out without interrupting operations

The Régie des Transports Métropolitains (RTM) entrusted the Egis-Arep consortium with the station extension and modernisation project, with the objective of strengthening the Saint-Charles multimodal interchange hub in its function as a major gateway to the city of Marseille. This overall project was intended to completely rethink how the station operates and enable it to meet the new challenges of the network.

Owner: RTM (Régie des Transports de Marseille)

Contract holder: Egis

Egis' contribution: Egis and Arep managed the modernisation-extension works that were carried out under operation. Their services covered the reorganisation of flows, the modernisation of spaces and upgrading of all the equipment, the reorganisation of shopping areas, accessibility for disabled people, and the station capacity increase.

MODERNISATION

Lille

Line 1, France

From March 2010
to May 2025

14 km long

18 stations

Budget: €680 million

Specific features:

- First implementation of Alstom's Fluence system on a line under operation
- The project took place without interrupting operations thanks to the simultaneous development of new 52-m station platforms used to accommodate the new rolling stock

This line, which was commissioned in 1983, was the first driverless light rail system in the world. It stretches over 14 km and includes 18 stations. Driverless operations resulted in a 66-second frequency at peak times.
In 2010, this frequency became insufficient to meet the increasing demand. It was thus decided to double the length of trains (52 m instead of 26 m), by coupling existing trains and through the supply of new generation rolling stock. This was an opportunity to put many systems and the 18 stations of the line in compliance with the standards in force.

Owner:
Métropole Européenne de Lille

Contract holder: Egis

Egis' contribution: This project enabled Egis to illustrate its engineering experience in the renovation of existing systems and the migration to driverless metro systems. Such a project is still singular and led to a great deal of reflection on the adaptation and interfacing of systems to ensure the simultaneous operation of two types of rolling stock using an ATO system.

Lausanne

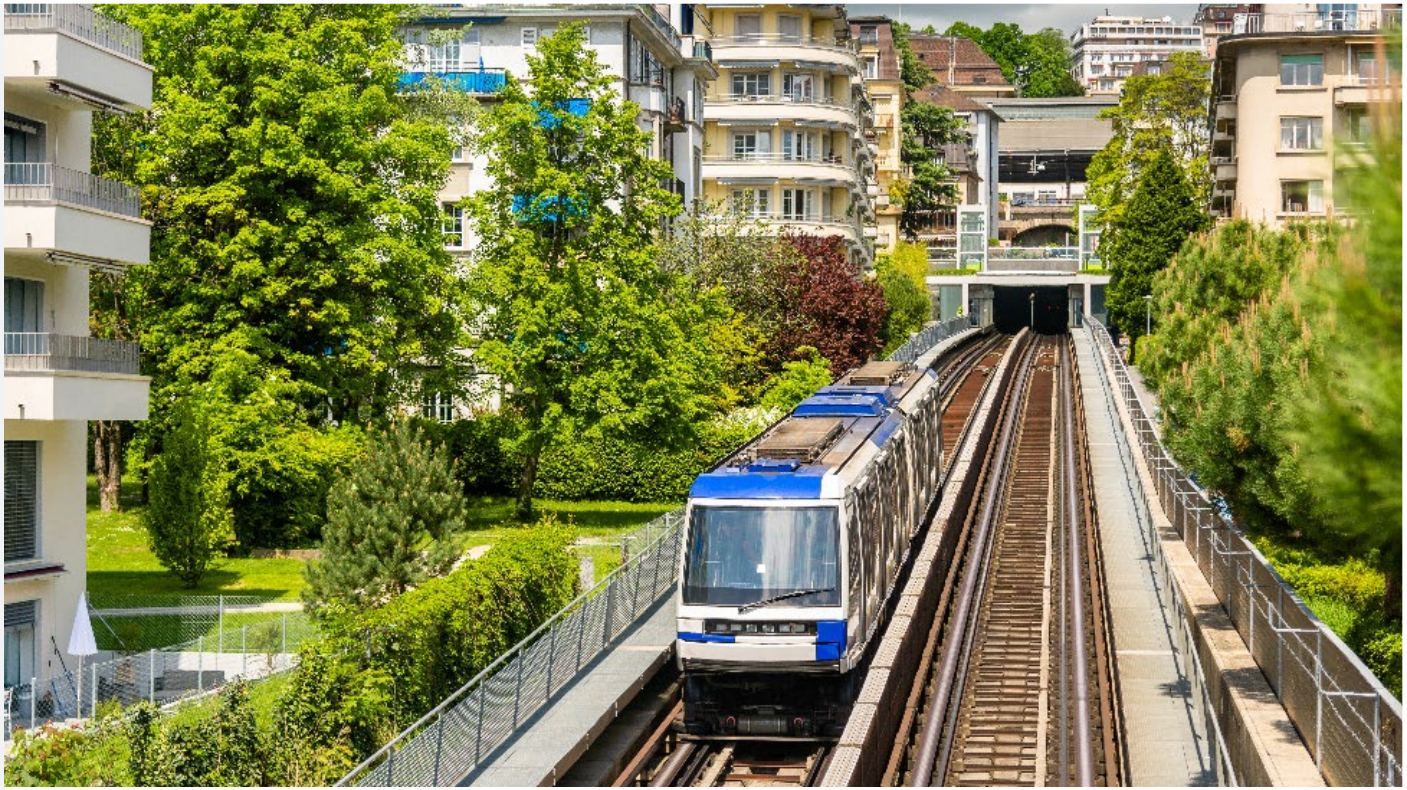
Lines M2 and M3, Switzerland

From October 2017 to 2030

M2: 6 km long - M3: 4 km long

M2: 14 stations - M3: 7 stations

Budget: €795 million



Specific features:

- Steep slopes up to 12%
- Complex project governance requiring flexibility and adaptability from Egis to support the project at best

Lausanne launched a project to increase the capacity of its metro Line M2 and create a new Line M3.
This required reconfiguring the line to remove bottleneck points (creation of a single-track passing loop and reorganisation of a last stop), replacing the existing train control system by a more efficient system (CBTC) to increase the frequency of trainsets, and the supply of additional trainsets.

Owner: Canton of Vaud – Lausanne Municipality - Transports Publics de la Région Lausannoise S.A.

Contract holder: Egis (systems) and BG Ingénieurs Conseils (equipment)

Egis' contribution: In charge of all project phases, from design studies to commissioning. Egis' main areas of activity are as follows: project leadership; metro system leadership (overall system, performance, RAM/ILS, operability); management of migration, interfaces, monitoring of requirements; system security; automatic train control and railway signalling; rolling stock; railway track; alignment; telecommunications; power (all voltages).

Manila

Platform screen doors, The Philippines

From October 2022
to December 2030

32 km long

17 stations

Budget: €50 million
(turnkey contract – platform screen doors)

Specific features:

- Egis is managing a turnkey project for platform screen doors: ensuring the coherence of the contract's requirements with the design and construction methods of Japanese consortia, as well as the design and fabrication of the doors by the company Panasonic. Installation in the 17 stations will be managed by Egis' specialist teams.

The Metro Manila Subway Project (MMSP) is the first underground rail system project initiated in the Philippines. Egis is committed in a consortium with Thales and Colas Rail (leader) in the CP106 design and build project: E&M systems and track works. The consortium is a subcontractor of Mitsubishi Corporation, which is the prime contractor.

Owner: Department of Transportation of the Philippines

Contract holder: Colas Rail - Egis - Thales

Egis' contribution: As part of this design & build contract, we are responsible for the turnkey project for the platform screen doors of all stations including the test line in the depot.
The scope of PSD works covers design, manufacturing, shipping including spare parts, installation, testing and commissioning, documentation of operation and maintenance training plans and manuals, with a two-year defect liability period.

We are also in charge of the consortium engineering and systems integration (joint-venture 50/50 Colas - Egis): requirement and configuration management; systems engineering in preliminary, pre-final and final designs, construction and as-built drawings; systems assurance; interfaces management; integrated testing and commissioning and participation in test runs; operations and maintenance; BIM management.

Mexico

Line 1, Mexico

From September 2021 to May 2024

20 km long

20 stations

Budget: €1 billion

Specific features:

- A complex project due to the development of the line equipment over more than 50 years of operation
- Necessity of limiting the impact on operations
- Our experience in modernising metro lines and our expertise in managing interfaces and systems integration have been key for the success of the project.

Inaugurated on 4 September 1969, Line 1 of Mexico city's metro has not stopped growing. It is now the eighth busiest metro network in the world.

Metro Line 1 is connected with 8 of the 12 lines of the network. Before the pandemic, its average ridership was 723,000 passengers per day. All the line's infrastructure - ballast, tracks, sleepers, drainage and the systems that keep the trains running - has remained the same since its inauguration.

The owner of Mexico city's metro launched a vast programme for renovation, capacity increase, operation reliability improvement, and maintenance cost savings.

STC Metro (Sistema de Transporte Colectivo Metro) awarded the contract for the complete modernisation of Line 1 to the Chinese consortium CRRC Zhuzhou Locomotive. The overall contract includes the renewal of the 20 km of tracks, including all points and the depot, the supply of 29 new trainsets, and the modernisation of the signalling system.

Owner: STC Metro (Sistema de Transporte Colectivo Metro)

Contract holder: CRRC

Egis' contribution: Our team comprised of about 20 people integrated into CRRC's organisation has been entrusted with: project management, technical expert assessment (management of interfaces, system integration, migration from the former system to the new CBTC, testing and commissioning, overall RAMS studies); coordination of subcontractors (CBTC, telecommunications, railway tracks, design offices, etc.); communication with the public entity in charge of supervising the project and the owner STC Metro.

MODERNISATION

Lyon Avenir Métro

Modernisation of Line B, France

From July 2015
to July 2026

7.7 km long

10 stations

Budget: €400 million

Specific features:

- Inventing a migration strategy to replace a CBTC system by another system without disrupting operations (including changes in the rolling stock fleet)
- Uninterrupted operations throughout the construction phase
- Management of contract changes in a multi-risk environment

The Lyon metro network comprises 4 lines which were introduced progressively, from the 1970s onwards. Increases in ridership were absorbed using the original plant and equipment and by improving the capacity of the rolling stock. However these improvements are becoming more and more complex and costly, and the original systems are today partly obsolete. This led SYTRAL to start up a modernisation process called "Avenir Métro". It consists in fully automating services on Line B (at the same time as its extension to South Hospitals), switching thus from GoA2 to GoA4, renewing its entire rolling stock fleet, and increasing its fleet of trainsets.

The project also includes the adaptation of all the equipment and subsystems of the metro to these developments (operation control centres, supervision systems, low- and high-voltage energy, etc.).

Owner: SYTRAL.

Contract holder: Egis

Egis' contribution: Egis has been involved as from the design studies up to the testing, commissioning, and revenue service start-up. Our assignment includes monitoring of the system integration, management of interfaces with the other subsystems (ATO, low-current systems-video, sound, radio, TMD, etc.), interfacing with operating and maintenance teams, and integration of necessary elements into the safety case.

As the general project manager for automated systems, Egis is in charge of the following: project leadership; equipment of automated systems; supervision of systems; low- and high-voltage power; supervision the purchase of new trainsets; and finalising the treatment of obsolete ATO systems.


SANS VOYAGEURS
727
LIGNE B CHARPENNES
723
GN3
US/UM

OPERATION - MAINTENANCE

Thessaloniki

Greece

From 2023 to 2034

15 km long

18 stations

Specific features:

- GoA4-type automation level, a first in Greece
- Operation and maintenance of more than 14 km of infrastructure
- The first driverless metro of the city, complemented by the depot and the operation control centre

The company THEMA, owned by ATM (Italy) and Egis, was chosen in late 2023 for operating and maintaining the new driverless metro line (GoA4 type) of Thessaloniki, the second Greek city in terms of population (more than 1 million inhabitants), for a period of 11 years.

The line crosses the city from east to west and includes 13 stations between Nea Elvetia station and its last stop at Thessaloniki's railway station (9.6 km). A 5-station extension (4.8 km) has been planned between 25 Martiou station and the south-western area of the city, up to Mikra station, six months after its revenue service start-up scheduled for the end of 2024.

Equipped with sophisticated control and maintenance systems, the metro will provide a daily service with 18 trains in the first phase, which will grow to 33 trains with the extension to Kalamaria station.

Owner: Elleniko Metro

Contract holder: CompanyTHEMA (51% ATM, 49% Egis)

Egis' contribution: Provision (with its partner) of the services relating to the network operations; rolling stock, infrastructure and green space maintenance; the management of energy, stations and information systems; cleaning; as well as obtaining necessary authorisations. Installation and commissioning or the corresponding information system (ERP).

Egis is an international player active in architecture, consulting, construction engineering and mobility services. We create and operate intelligent infrastructures and buildings that respond to the climate emergency and contribute to more balanced, sustainable and resilient territorial development.

Operating in 100 countries, Egis puts the expertise of its 19,500 employees at the service of its clients and develops cutting-edge innovations accessible to all projects. Through its wide range of activities, Egis is a key player in the collective organisation of society and the living environment of citizens all over the world.

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