DESIGNING FLUIDITY 2014
Rail travel offers sustainable answers to the fast-growing demand for mobility, guaranteeing a high level of safety while also preserving the environment.

We provide a listening ear and full comprehension of our customers’ needs. A constant focus on their expectations, combined with solutions that truly serve clean mobility, makes us a leader on the railway market.

Our solutions take into account the lifecycle of each product, from design to recycling, as well as its total lifecycle cost and future environment. Alstom Services teams are partnering with our customers all through the 40 year-long life span of their fleets, built by Alstom or not, to optimise the total cost of ownership. This comprehensive approach ensures that operators and thereby passengers enjoy the maximum safety and availability offered by our solutions.

Our proximity to our customers and sustainable geographical footprint position us as a dynamic international economic player and partner. The efficient network of alliances and partnerships developed by Alstom allow the company to fulfil our customers’ growing demand for localisation whilst developing adapted products.

Alstom’s solidity in these economically challenging times proves the relevance of its strategy. It rewards the continued commitment of our multicultural, united and inventive force of employees, which numbers around 25,000 and spans five continents.

Our customers’ satisfaction and trust, our employees’ commitment and our business successes all reinforce our strong conviction that with Alstom, designing fluidity becomes a reality.
FLUIDITY
[flu-’i-di-ty] n. From Latin fluidus, from fluere, to flow.

♦ 1 - State of being fluid. The ease with which a material or a liquid flows uniformly.
♦ 2 - Quality of traffic which is flowing smoothly.
♦ 3 - Character of something that is mobile.

ACCESSIBILITY
[ak-se-si-’bi-li-ty] n.

♦ 1 - Quality of that which is accessible.
♦ 2 - Ability to be reached, entered. Ability to be easily approached and appreciated.
♦ 3 - Law, the right to have access to something.

ADAPTABILITY
[a-dap-ta-’bi-li-ty] n.

♦ 1 - Ability to adapt to new environments and new situations.
♦ 2 - Psychology: faculty of adaptation.
♦ 3 - Suitability for use in a variety of environments and situations.
CONTINUITY
[kon-ti-’nu-i-ty] n.
♦ 1 - State of something that is a connected whole. ♦ 2 - Continuous duration. ♦ 3 - Permanent repetition, sequence.

RAPIDITY
[ra-’pi-di-ty] n.
♦ 1 - Quality of travelling a long distance in a short time. ♦ 2 - Fig. Promptness with which something acts or is done. ♦ 3 - Literature: rapid movement of ideas or expressions. Rapidity of style.

REGULARITY
[re-gu-’la-ri-ty] n.
♦ 1 - Quality of being regular. ♦ 2 - Geometry: proportion, harmony. Regularity of a figure, equality of all its sides and angles. ♦ 3 - Grammar: a formation that follows the usual rules.
FLUIDITY
[flu-’i-di-ty] n.
From Latin fluidus, from fluere, to flow.

♦ 1 - State of being fluid. The ease with which a material or a liquid flows uniformly.
♦ 2 - Quality of traffic which is flowing smoothly.
♦ 3 - Character of something that is mobile.
Pendolino EIC Premium manufacturing (Italy)
BY 2050, THE WORLD POPULATION IS LIKELY TO EXCEED 9 BILLION AND OVER 70% OF THESE PEOPLE WILL LIVE IN URBAN AREAS¹. MODES OF TRANSPORT MUST THEREFORE BE REVIEWED CONSTANTLY AND ARE TENDING TOWARDS INTELLIGENT SYSTEMS TO INCREASE CAPACITY USING CLEANER AND AFFORDABLE SOURCES OF ENERGY. ALSTOM IS COMMITTED TO DEVELOPING RAIL PRODUCTS AND SERVICES THAT MEET SOCIAL AND ENVIRONMENTAL PRIORITIES IN MOBILITY.

SOLUTIONS FROM ALSTOM, THE CHAMPION OF ECO-MOBILITY

AN ECO-DESIGNED LIFECYCLE

Alstom began placing the lifecycle of its products under more consideration in the mid-1990s. Incorporating environmental parameters into the design of a product or service is known as eco-design. This process aims at controlling and reducing a product’s impact on the environment throughout its life, from production to recycling. Alstom has recently issued a new eco-design policy which clearly states priorities for new products and services development: energy efficiency, noise, vibration and air emissions reductions. It also recommends the use of clean and recyclable materials making it easier to manage the end of a solution’s life. Lifecycle evaluations are conducted and published in Environmental Product Declarations, offering customers a comprehensive view of the impact of their products on the environment throughout their lifecycle. Through this proactive approach, Alstom, alongside various professional organisations (UNIFE², FIF³, VDB⁴, FIEEC⁵, ZVEI⁶), contributes to harmonising standards in the area of lifecycle analysis, hazardous materials, recyclability, energy efficiency and pollution reduction.

Alstom’s customers already benefit from these environmental innovations designed thanks to this process. For example, the Coradia Polyvalent regional trains and the Amsterdam Metropolis have very high-performance environmental profiles: good energy efficiency, a genuine strategy to reduce hazardous substances and priority given to recyclable materials at the design stage, a braking energy recovery system, good performance in outside noise emissions and the quantification of environmental impacts.

More generally, Alstom trains are currently recyclable at a level of more than 90%. They are recoverable at over 97% and benefit from noise levels 3 to 5 dB lower than those of previous generations. In terms of signalling, Alstom is offering a new urban solution, Urbalis Fluence, which provides up to 30% energy savings through smoother intervals between trains and decreases the volume of maintenance work by using 20% less equipment (see page 27).

“With its complete range of customised services, Alstom commits to and supports its customers throughout the entire lifecycle of their fleets.”

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¹ Source: UNFPA, The United Nations Population Fund
² Association of the European Rail Industry
³ French rail industry federation
⁴ German rail industry association
⁵ French electrical, electronic and communication industry federation
⁶ German electrotechnical and electronics industry federation
Alstom employees work with their local partners worldwide to improve living conditions in the communities near the company’s sites. Since its creation in 2007, the Alstom Foundation supports concrete actions based on socio-economic support, education, environmental protection and the preservation of natural resources. The Foundation’s mandate has been renewed until 2017, with a higher priority for projects based on innovation (www.foundation.alstom.com).

FROM BEGINNING TO END
With its complete range of customised services, Alstom commits to and supports its customers throughout the entire lifecycle of their fleets. The return of experience from the field teams contributes to the development of new and more competitive solutions for maintenance, integrated logistic support and the modernisation of rail systems. Alstom strongly supports the fact that environmental efficiency also applies to older rail equipment. Thanks to modernisation, operators can benefit from high-performance environmental technology for their existing fleets. For example, Alstom has started modernising 53 light rail trains for the city of Baltimore.

The first renovation work involves the car bodies by removing all interior and exterior components from each car and addressing any necessary car body repairs. Vehicles will then be equipped with new propulsion systems, on-board automatic train control technology, closed circuit TVs (CCTV), climate control units and new doors, seating and carpets. The renovation programme, which lasts four years, aims at improving the overall performance of the trains and extending their lifespan by 15 years.

Such examples illustrate how Alstom can optimise the lifecycle of all types of rail equipment.

FOCUS
A committed corporate foundation
Alstom employees work with their local partners worldwide to improve living conditions in the communities near the company’s sites. Since its creation in 2007, the Alstom Foundation supports concrete actions based on socio-economic support, education, environmental protection and the preservation of natural resources. The Foundation’s mandate has been renewed until 2017, with a higher priority for projects based on innovation (www.foundation.alstom.com).
FLUIDITY ENHANCES SAFETY

One of the imperatives for transport authorities is to ensure passenger security. Safety is at the heart of Alstom’s process for designing, manufacturing and maintaining railway solutions. Alstom provides control and information solutions to rail transport operators and infrastructure managers, supplying on-board and wayside equipment that allows safe and efficient operation, as well as passenger information and entertainment.

Alstom’s commitment to safety is particularly visible on its very high-speed systems. Carrying hundreds of passengers at speeds of up to 360 km/h requires a core expertise in all railway domains: trains, infrastructure, signalling and services. The first generation of very high-speed trains was launched in 1981. Since then, four generations later, no fatal accident has ever occurred aboard the 630 trains in operation. In addition, research and development has been performed at substantially higher speeds than the commercial speeds. This unique expertise was illustrated on 3 April 2007 when Alstom partnered with SNCF and RFF to beat the world record for high-speed rail travel, reaching 574.8 km/h under controlled safety conditions. Those records are significant and specific to Alstom. They are part of the company’s DNA.

THE ENVIRONMENTAL FOOTPRINT, A PROCESS OF CONTINUOUS IMPROVEMENT

MEASURABLE COMMITMENT

Alstom pursues its aim of reducing the environmental impact of its activities through five goals: ISO 14001 certification for all its sites, reducing energy consumption, its carbon footprint and the volumes of water used as well as managing waste efficiently while improving its recovery and recycling.

Alstom has already achieved its first goal. As of 2013, all its factories employing over 200 people have ISO 14001 certification. By 2015, energy intensity (energy consumed per unit of sales) must be cut by 20% in relation to 2008 levels. A further goal is to reduce water consumption in sites located in areas of water stress identified by the World Resources Institute by 20% between 2010 and 2015. The efforts made in this area have already exceeded the target: between 2011 and 2012, water consumption has been reduced by 9% for a total 21% lower than in 2010. The Group will continue this downward trend at an average rate of 3% per year. Emissions of volatile organic compounds (VOCs) other than methane must also be limited. Between 2011 and 2013, Alstom Transport has already achieved a significant drop of over 30% in these emissions. Finally, with regard to the recovery of all the waste produced, Alstom Transport has reached a level of 81%, hereby anticipating the Group’s target of 80% by 2015.

“Safety is at the heart of Alstom’s process for designing, manufacturing and maintaining railway solutions.”
Alstom has expressed its commitment to the Warsaw statement on low-carbon transport and sustainable development adopted during “Transport Day 2013”, an event held during the 2013 UN climate change negotiations (COP19) in Warsaw, Poland. The Warsaw statement endorsed by Alstom contains recommendations on how to strengthen the integration of sustainable, low carbon transport in the UN climate change process, notably the new agreement on climate change which is due to be concluded in Paris in 2015.

Alstom endorses Warsaw statement

Alstom’s Industrial Sites, Models of Eco-construction

In late 2013 Alstom laid the first stone of its future building in Villeurbanne, France. This new 36,600 m² building, due to open in 2015, will house the employees in charge of Alstom Transport’s electronic rail activities, currently spread out over five buildings. The new site will offer staff improved levels of comfort: access to natural light, more spacious areas for work, services, socialising and discussion, open spaces on a human scale... The building will also set new standards in terms of sustainable development. It will be the first in the country to benefit from both HQE® and BREEAM® certification.

Another example is the Sri City factory in India, opened at the end of 2012. Specialising in the production of the future Metropolis trains for Chennai, the site was built with respect for sustainable construction criteria, enabling it to achieve IGBC® certification (Silver level): preservation of arable land, storage areas reserved for hazardous substances, solar panels for external lighting, natural light and ventilation, irrigation and water management systems. The employees’ environment is also designed to provide maximum comfort: outdoor relaxation areas, wide-open spaces and a fully non-smoking site. Altogether, these initiatives enable the Sri City site to control its energy consumption and reduce its operating costs. The results of these developments can be seen very quickly. The renovation of the Alstom site in Tarbes (France) has proved its worth; in less than two years, it has reduced its electricity consumption by 25% and its gas consumption by 60%. It also recovers 80% of the heat it produces.

These environmental measures are reinforced by voluntary actions taken by sites with more than 50 employees. 90% of these carry out environmental self-assessments in order to plan suitable improvement actions.

(7) International standard aiming at helping companies manage the Environmental impact of their activities and demonstrating effective management
(8) High Environmental Quality, a French standard
(9) BRE Environmental Assessment Method: method for evaluating the environmental performance of a building developed by the UK Building Research Establishment
(10) A standard issued by the Indian Green Building Council
Pushing boundaries in mobility

PERMANENT MAGNET MOTORS, FLYWHEEL ENERGY STORAGE, ECO-DRIVE, HYBRID SHUNTING LOCOMOTIVE, APS, APPITRACK, LATEST CBTC\(^{11}\) SOLUTION URBALIS FLUENCE, TRAINTRACER PREVENTIVE MAINTENANCE SYSTEMS... ALL THESE INNOVATIONS ARE ILLUSTRATIONS OF ALSTOM’S TECHNOLOGICAL ADVANCES IN EVERY FIELD OF RAIL.

AN OPEN VISION
At Alstom, innovation is a driver for strategic growth. In 2012, the Alstom Group was among the companies ranked highest by the European Patent Office for patent application filings in Europe. Innovation provides the possibility to envisage technological progress and changes in industry practice. This foresight and pro-activity depends, in turn, on a company’s ability to unite its own employees around the great challenges of the future and to cooperate with others in the long term. Alstom has chosen to promote innovation in a very broad sense, particularly by placing strong emphasis on cooperation with academia – both for technological research and development – as well as for education and training.

TARGETED COOPERATION
In line with this philosophy, Alstom has entered into several hundred cooperation agreements worldwide. Alstom puts this strategic commitment into practice by closely monitoring developments in key areas and by acquiring the new skills and know-how required to apply new discoveries to its business lines. Essential to this process are several forms of cooperation, including research, training and targeted cooperation projects. Alstom keeps pace with progress by participating in industry committees at universities for example in the USA, Canada, China and Europe. In addition to these partnerships with public and university research centres, Alstom has launched initiatives with other businesses, particularly SME\(^{12}\) and start-ups. In France for example, these include Railenium and ten French competitiveness clusters targeting onboard systems and transport systems of the future.

SUSTAINABLE INNOVATION
Alstom also invests in innovative businesses and business projects with products and solutions that are compatible with Alstom’s own offer in order to anticipate operators’ needs as effectively as possible and propose useful innovations. Alstom is famed for the development of new-generation trains, components and cutting-edge signalling products and solutions, as well as the development of innovative services and infrastructure activities. All these R&D efforts are directed towards two priority objectives: addressing the needs of the customers and passengers as well as taking into account the environmental and sustainability impact of its offers. Alstom is committed to contributing to the environmental performance of rail systems, focusing on lower energy consumption (motor efficiency, weight reduction, new materials or recovery of braking energy), reduced internal and external noises and limited global impact throughout its product lifecycle. These ambitions to develop new products and solutions based on sustainable technologies make the company a key practitioner of responsible innovation in the service of society.

INNOVATIVE SERVICES
As is the case in other industries, modern systems are producing more and more data. Whether this concerns infrastructure, passenger use or the train itself, railway systems are generating larger and larger volumes of raw data. Capturing this data with sensors, transmitting it, consolidating it, storing it and processing it in a distributed fashion can be managed easily thanks to ever more accessible technologies. However, making sense of the data, transforming it into relevant information and feeding it to decision support systems is a matter of experts. Alstom has fully embraced the digitalization of the industry. Such asset management does not apply to trains alone but is likewise applicable to infrastructure with automated data collection on track, catenaries and trackside equipment such as signalling systems.

“Alstom has fully embraced the digitalization of the industry.”

(11) Communication Based Train Control
(12) Small and Middle Enterprises
Delivering the best requires working with the very best

MATERIALS, COMPONENTS AND SERVICES PURCHASED REPRESENT AROUND 60% OF ALSTOM TRANSPORT’S SALES. MORE THAN 10,000 SUPPLIERS AND CONTRACTORS AROUND THE WORLD ARE CLOSELY LINKED TO THE ACTIVITIES AND SUCCESSES OF THE COMPANY. IN LINE WITH ITS RESPONSIBLE APPROACH TO PURCHASING, ALSTOM NATURALLY SEEKS TO FOSTER LONG-TERM TIES WITH THESE PARTNERS BY INVOLVING THEM IN ITS GROWTH STRATEGY.

SUSTAINABLE PERFORMANCE
As part of its Vision and Corporate Social Responsibility strategy and as an adherent to the United Nations Global Compact, Alstom is committed to achieving a sustainable value chain involving its partners and stakeholders. It thus commits to integrating sustainable development within its sourcing operations. The company aims to source eco-designed, environmentally friendly and socially responsible products and services. Alstom closely monitors its suppliers’ commitment to sustainable development.

A WORLDWIDE FOOTPRINT
As market leader in providing global railway systems and services, Alstom understands that the key to excellence, innovation and competitiveness in the railway market is through fostering close partnerships within the supply chain. Collaborating with a large base of suppliers and subcontractors around the world, with the objective of sustaining the performance of this global network, requires a lean and agile organisation capable of responding to localisation and project stakes in a worldwide context. As the railway markets...
What our suppliers say

“On Stemmann’s side, the Leading Partners programme brought several benefits. First of all, we set up a real partnership in the interest of both companies. For example, for the Kazakhstan locomotives, we designed equipment that can sustain temperatures as low as -50°C. When working on innovation, we need a few projects with short-term applications in order to amortise and optimise our resources. For projects such as the development of a pantograph for the Euroduplex platform, we share costs, experience and certainly long-term benefits. Last but not least, we share trust, confidence and ethics and this is key on localisation projects. This was highly valuable when we worked on the South African Prasa project for example or when we went hand in hand with Alstom to the CIS region.”

Duong Chaduc-Nguyen, Stemmann-Technik France – Key Account Manager for Alstom

Alstom Transport France was awarded the Responsible Supplier Relationships hallmark thanks to its pioneering spirit, its true commitment towards sustainable sourcing principles, its mobilisation and its maturity when implementing them.”

Françoise Odolant, Buyers, charts and labels division manager Ministry for Productive Recovery, Mediation for inter-enterprises relations and Mediation for public procurement
These alliances, mainly JVs but also partnerships, allow Alstom Transport to comply with customers’ growing demand for localisation whilst developing adapted products. One illustration of these alliances is the strategic partnership between Alstom and Transmashholding (TMH), the most powerful player in the Russian rail market. The two companies are working closely to develop locomotives before branching out to tramways.

TMH-Alstom: a major strategic partnership

Covering 150,000 kilometres, the 1,520 mm gauge rail network is the biggest in the world. Russia and the CIS region launched an ambitious programme to enhance passenger comfort, increase train performance, modernise aging fleets and extend the rail system, from mainline to regional and urban lines. TMH is the largest railway engineering company in CIS in terms of sales volumes and one of the largest manufacturers in the world. TMH employs 56,000 people and offers a wide range of products and services, including production and repairs of metro cars, electric and diesel trains, passenger cars, locomotives, freight cars, diesel power plants, marine and stationary diesel engines. In 2010, TMH and Alstom embarked on a global partnership in which Alstom had a 25% stake in TMH’s parent company. Alstom and TMH are designing railway solutions that are customised to market needs and aim to launch a new product per year. Since its creation, the partnership between Alstom and TMH has been very fruitful with the launch of the EP20 passenger locomotive launched in 2010 and recently with the 2ES5 and the KZ8A freight locomotives. New projects are under development. To date, Alstom and TMH have secured orders for a total of 700 locomotives in Russia and Kazakhstan, totalling €3.5 billion.
Alstom Transport, a strong corporate culture

ENGAGED AND SUPPORTED EMPLOYEES
An essential ingredient in the development and success of the Alstom Group is the strong corporate culture. It is built on the employees’ commitment to the company’s values, vision and ambition and a human resources policy that offers the best working conditions and professional fulfilment for everyone. Alstom lays great stress on equality of opportunity and opens its doors wide to diversity. Alstom is continuing its fight against discrimination on the basis of health or disability and respects local legislation to facilitate the integration and retention of employees with disabilities. This engagement is manifested through specific hirings and a set of initiatives, measures and agreements signed at European level. Alstom is strongly involved in such actions to make the well-being of its employees a priority. The Alstom culture is based on three unifying values: trust, team spirit and a sense of action. Trust relies on responsibility, delegation and the conviction that each employee contributes to the company’s development. Alstom’s activity depends on the smooth execution of the company’s projects through teamwork. Success requires discipline and collective effort, together with a networked organisation that makes it possible to take advantage of all available skills. To respect its commitments to its customers, Alstom gives priority to action. It relies on strategic thinking and the daily attention given to each customer in each project. This sense of action involves a speed of execution that sets Alstom apart from its competitors.

These three core values have taken on an added ethical dimension through the Group’s Integrity Programme, which is mandatory for all employees from each Sector. Headed by the Ethics & Compliance Department, the programme is based on the Group Code of Ethics which provides guidelines for Alstom’s relationships with business partners and suppliers, its engagements to socially responsible business practices, its corporate human resources policies and the protection of its assets. The Group recently adopted a new vision for human resources based on recruitment, knowledge, development and commitment. This programme, closely followed by each of the Group’s sectors, aims at further reinforcing the corporate culture, developing skills and careers, adapting staffing to the levels required by business and the markets and promoting equality of opportunity while ensuring the best working conditions, all by 2020. The involvement and motivation of Alstom’s employees are fundamental to its internal culture, reinforcing the feeling of belonging.
EXPERT EMPLOYEES
Alstom is a high-technology rail company that manages complex long-term projects and whose success depends on the quality of its teams, their expertise and their commitment. Alstom’s employees benefit from training schemes throughout their career with the company to develop and maintain their skills, together with personal development programmes to help them orientate their careers. A specific development programme has been prepared for Alstom technical experts. The “World Class Engineering” programme was created in 2000 to identify, recognise and develop in-house experts. This has allowed Alstom to build a community of experts across its many sites throughout the world, prepare a strategy to develop and retain experts and, in the long term, ensure that knowledge is passed on. Enriching the skills base is also essential and involves identifying new expertise outside the company. Alstom develops relationships with schools and universities to spread the word about the company, identify future employees, establish partnerships and contribute to education and training in the countries where Alstom has a presence.

SAFE EMPLOYEES
Alstom provides a safe and healthy workplace to both its employees and its external contractors. Alstom Transport has clear targets which are part of an extended action plan launched nearly two years ago by the Group, the Alstom Zero Deviation Plan. The plan is designed to concentrate on high-risk activities. It relies on three actions: the critical requirements for high-risk activities must be enforced everywhere, external contractors must ensure that Alstom’s safety directives are respected and severe accidents must systematically be analysed and followed up with corrective actions. The safety performance of Alstom operations is carefully and regularly reviewed. These actions in favour of safety are already bearing fruit. In the UK, for example, the maintenance teams at two of Alstom Transport’s depots (Golders Green and Morden) have achieved the threshold of two years with no accidents requiring time off work. These maintenance centres are setting the example for all of Alstom’s depots worldwide.

what our employees say

Cristina Anderiz
Civil Works Director
“I graduated in civil engineering from Imperial College (London). I spent 15 years in the oil and gas industry, managing large engineering, procurement and construction contracts. In late 2009, I joined Alstom Transport as director of the Civil Works function within Alstom Transport’s Global Solutions product line, responsible for the highly complex turnkey and infrastructure tenders and projects. As a member of the Management Committee, my mission is to support all activities related to civil works, both within my department, other product lines and commercial organisation. My missions range from defining the partnering strategy with construction contractors to managing the whole project execution and interfaces. These rich and extended responsibilities provide my team and myself with a truly global experience and offer the opportunity to collaborate with many experts in various countries.”

Victor Ionescu
Supply Chain Director
“After graduating in international business administration from the Academy of Economics of Bucharest, I joined a Romanian electrical equipment company as logistics manager before moving to the automotive sector of Honeywell in 2000. For ten years, I have held a variety of positions in supply chain management, based in Romania and Switzerland. In 2010, I joined Alstom Transport Services as supply chain manager in Bucharest before moving to the company’s headquarters in Paris in 2012 as supply chain director, in charge of the global performance and development of the supply chain for the worldwide maintenance, repairs and overhauls activities. With the fantastic support of my team, we have created a network of more than 500 professionals worldwide, motivated to boost the profitable growth of Services. It has been a challenge, but also a journey of motivation and inspiration.”
THROUGH A TIGHTLY WOVEN NETWORK OF MANUFACTURING AND SERVICE SITES, ALSTOM TRANSPORT OFFERS THE BEST TO ITS CUSTOMERS.
ACCESSIBILITY  [ak-se-si-’bi-li-ty] n.

♦ 1 - Quality of that which is accessible. ♦ 2 - Ability to be reached, entered. Ability to be easily approached and appreciated. ♦ 3 - Law, the right to have access to something.
Citadis tram in Casablanca (Morocco)
KNOW-HOW
ALSTOM’S SOLUTIONS IN THE
HEART OF THE CITIES

WHEN IT COMES TO IMPROVING THE CAPACITY, OPERATING FREQUENCY AND SAFETY OF THEIR FLEETS – BEARING IN MIND THEIR CONCERN FOR SUSTAINABLE DEVELOPMENT – OPERATORS CAN RELY ON ALSTOM’S INNOVATIVE AND ECONOMICALLY EFFICIENT URBAN SOLUTIONS.

METROS AND TRAMWAYS

PARTNERING WITH OVER 90 CITIES ALL OVER THE WORLD

DIMINISHING OPERATING COSTS

The proximity of Alstom’s manufacturing sites to its customers ensures that the company can monitor customer concerns closely and take quick action. With local maintenance teams and Alstom’s quality and reliability standards, operators can enjoy optimum availability and better returns on their investment. Alstom has in-depth expertise in carrying out maintenance and modernisation operations on every type of metro car and tramway. Alstom is notably in charge of maintaining a large proportion of the 1,500 Citadis in service. This is shared not only with Alstom R&D teams to continuously enhance the reliability and adaptability of Alstom’s urban solutions but also with customers who can benefit from the return of experience gained by Alstom teams on the operation of tramways.

4,000 Metropolis cars have been sold to 50 customers all over the world. Metropolis was conceived with a threefold objective: maximise passenger comfort and safety, reduce lifecycle and maintenance costs and simplify traffic management. Although developed from a core of standard and proven components, it offers genuine scope for customisation by operators in terms of its interior and exterior design, dimensions and materials. Metropolis can carry up to 100,000 passengers per hour and per direction, helping to improve the flow of traffic. Metropolis is designed to serve sustainable mobility through increased energy efficiency (lighter trains, motor control optimisation and innovative energy recovery device).

Based on a 15-year track record of 1,700 tramways sold throughout the world, Citadis is the reference for tram solutions. The new generation of Citadis capitalises on this accumulated expertise, on the observation of changing demand, dialogue with elected officials and customers and analysis of passenger feedback. Its modularity offers thousands of configurations to enhance passenger experience and adapt to different customer networks. The double doors at the extremities of the train and a wider corridor (from 600 to 750 mm) increase fluidity. The exchange ratio is increased to 27%. Its length varies from 24 to 44 m and two widths are available: 2.40 m and 2.65 m. It can be equipped with different types of bogies. Operating costs are low with maintenance reduced to a strict minimum (up to 11% of cost reduction) and lower energy consumption. It comes with the new autonomy pack including the range of solutions developed by Alstom for catenaryless operation. Finally, its production scheme has been revisited in order to provide a time-to-market of just 16 months.
HEART OF THE CITIES

IMPROVING SAFETY AND FLUIDITY IN NETWORKS

Alstom’s expertise in advanced, high-performance train control for metros covers 25 years and 50 cities worldwide. Regularly upgraded, Alstom’s Urbalis signalling solution for urban rail lines improves output by ensuring optimal traffic flow rates and continual improvements to passenger safety. In 2013, Alstom launched Urbalis Fluence, the first urban signalling solution with direct train-to-train communication resulting in optimized technical response time, fewer interfaces and signalling equipment on tracks (see page 27).

INTEGRATED SOLUTIONS

PROVIDING UNIQUE EXPERTISE

Alstom’s turnkey systems integrate the company’s full range of expertise, including trains, signalling, infrastructure and maintenance. For 25 years, this global approach has guaranteed the respect of budget and delivery commitments together with optimal performance levels. Alstom is n°1 in turnkey tramway solutions. One recent key reference is the Nottingham tramway system. Alstom is providing the tramsets, infrastructure and the maintenance of the new fleet as well as maintenance of the old fleet — for which the company is achieving higher availability rates than its predecessor. To address the booming market for turnkey metro systems, Alstom launched Axonis in 2013. This non-proprietary light metro system for fast-growing and densely populated cities is quick to build, elegant, economical and easy to insert in a city.

PLACING INNOVATION AT THE HEART OF THE SYSTEM

Alstom is the world’s only manufacturer capable of offering a range of service-proven solutions for tram autonomy. Customers can choose the solutions best adapted to their needs. This could be the APS ground level power supply, the only service-proven system eliminating the need for an overhead wire over an unlimited distance; the onboard batteries; or the Supercaps which maximise energy autonomy over short distances. Hesop, a reversible power-supply substation adapted to metro and tramway systems, was created to improve energy efficiency and optimise infrastructure investment (by reducing the number of substations on the line). Hesop recovers over 99% of available braking energy, enabling it to be re-used through the station equipment or reinjected into the electricity network – representing major savings on energy consumption.

To limit disturbances to residents living near a metro or a tramway construction site, Alstom designed Appitrack, an innovative track-laying machinery that operates automatically at a rate four times faster than conventional procedures. This shorter project timeframe ensures greater cost-effectiveness.
Riyadh is the human, innovative and prosperous capital city of the Kingdom of Saudi Arabia. It is a contemporary oasis. With a population of 5.7 million and a prevision of 8.3 million for 2030, Riyadh requires an efficient and sustainable public transport system which respects and protects the urban environment and, in turn, solves the current traffic congestion by releasing the citizens from automobile dependence. In short, the capital city needs a mobility system which upholds the economic vitality of the city and favours the development of the quality of life of its inhabitants. The answer is a metro system. This fully automated driverless network is one of the largest turnkey metro projects ever launched in the world.

In order to turn this vision into a successful reality and to equip three of the six lines to be built by the city, FAST Alliance\(^\text{(13)}\) has mobilized the world’s most experienced teams in metro train manufacturing, control and telecommunications systems as well as tunnelling, civil, mechanical and electrical works.

Project execution time and disturbances in the city will be considerably reduced thanks to the innovative solutions proposed by the

FAST Consortium — which have already been implemented in other key urban areas — combined with the experience accrued throughout the years in installing driverless metro systems. For example, the bridge deck will be launched using precast full span and segmental methods for the execution of viaducts which have been already employed and proven in the United Arab Emirates, Taiwan and Korea. The tunnels will be constructed using Tunnel Boring Machines such as those used for metros of Madrid, Barcelona and Panama.

Alstom has been supplying integrated solutions for 25 years and has sold more than 4,000 metro cars throughout the world in cities such as New York, Paris, Barcelona, Istanbul, Shanghai, Buenos Aires, Amsterdam, Lausanne — the world’s steepest metro with a 12% gradient — and Singapore, the world’s longest automatic metro line. Based on this large return of experience, Alstom will provide the city of Riyadh with its fully integrated metro solution combining all its state-of-the-art metro sub-systems. The company will provide 69 Metropolis trains with three levels of comfort: First class, Family and Single.

To minimize headways between trains, the trainsets will be controlled by two operational control centres equipped with the Urbalis driverless system. In order to optimize energy consumption, the traction power system will use Hesop, Alstom’s advanced power solution (13) A consortium gathering worldwide leaders in their respective fields (FREYSINET SAUDI ARABIA - SAMSUNG - STRUKT0N - SETEC - TYP0A - ATKINS - ALSTOM)
offering both a reversible system and an optimized traction technology which allows to recover 99% of the available braking energy. Finally, Alstom’s fast tracklaying technology Appitrack — a technology successfully applied in Algiers, Toulouse, Orleans, Rheims and Nottingham that installs tracks four times faster than traditional methods — will also be included. Thanks to the combination and integration of all those state-of-the-art solutions, the lifecycle cost of the system will be highly competitive.

The Riyadh project is a recent illustration of how Alstom continues to develop strategic, long-term and powerful partnerships in the Middle East to accompany the region in the development of its urban mobility.

**FOCUS**

**Reflecting magnificent aesthetic**

FAST’s proposal provides the streets with a unique character through shaded sidewalks, indigenous plants, an intensely colourful atmosphere and urban furniture of great quality. This solution will create a friendly environment for pedestrians, inviting them to use the metro. FAST’s project attaches special significance to safety and comfort and takes advantage of stations, both underground and elevated, to provide pedestrian passages at several levels, improving the safety of both pedestrians and road traffic. Station entrances and lobbies have been designed using materials of the highest quality, displaying the most avant-garde designs. Most of all, the metro train itself will represent the expression of Riyadh identity, reflecting different characteristics associated with the local culture. FAST’s metro trains will be accessible to all passengers and will be adapted to extreme heats conditions. Inside, the metro trains will provide a peaceful haven: reliable and friendly, with an open spacious interior that includes ergonomic seating to provide each passenger with the best comfort conditions.
LILLE METROPOLE

TACKLING THE CAPACITY CHALLENGE

LILLE METROPOLE STAYS AHEAD OF THE TECHNOLOGICAL CURVE THANKS TO ALSTOM’S LATEST CBTC SOLUTION.
In 1983, Lille Metropole (LMCU) distinguished itself as a pioneer in automated metros by selecting a driverless metro train as its urban transport solution. Thirty years later, Lille’s ridership, about 50 million annual passengers, has outpaced capacity. In 2012, to meet this challenge, LMCU chose Alstom to modernise its existing metro trains, supply 27 new ones and install the latest-generation CBTC solution Urbalis Fluence.

Alstom has been the world leader in the rubber-tyred metro market for over 60 years. The new 52 m-long Metropolis rubber-tyred trains, comprising the latest-generation CBTC solution Urbalis Fluence, can carry up to 545 people. The Lille Metropolis design will offer passengers a more comfortable ride, particularly thanks to the absence of partitions between each car. The interior design will create a warm, bright environment with larger windows. Passenger information will be improved by electronic display units and multimedia screens. Spaces will be dedicated to people with reduced mobility. A system of video cameras transmitting images to the control centre in real time will strengthen passenger security onboard the metro and on the station platforms.

Urbalis Fluence represents the latest generation for automatic steering without traffic interruptions, including a new centralised command station, new on-board systems and modernised stations with new facilities. The revolutionary architecture of Urbalis Fluence, the first train-centric CBTC, means less equipment, extreme flexibility of train movements and higher operational availability.

As a result, overall passenger capacity on Lille Metro Line 1 will be doubled (up to 17,000 passengers per hour and per direction). The headway will be 60 seconds, thanks to faster response by direct train-to-train communication as well as the optimisation of the booking of track resources by the train in critical sections such as turnback tracks. The system’s energy consumption will be reduced by 20%. Reliability will be improved thanks to reduced equipment levels and simplified architecture easily made redundant. Moreover, extreme flexibility of train movements will mitigate most track and train incidents. As a result, operational availability will be best-in-class (99.99%). Reduced equipment levels also mean lower initial investments, less maintenance and hence better lifecycle costs. The new system will allow easier and economical extensions.

Seven Alstom sites in France – Valenciennes, Saint-Ouen, Reichshoffen, Ornans, Le Creusot, Villeurbanne and Tarbes – are involved in this project, hence ensuring a high level of proximity and reactivity for LMCU.

The metros are scheduled to come into service progressively from 2015 and the work will be carried out without disturbing line operation.

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**R&D**

Moving intelligence on board the trains

To tackle the urban transport capacity challenge, Alstom has expanded its service-proven Urbalis range with a highly innovative CBTC solution, Urbalis Fluence. The solution comprises a number of innovations to simplify the complex route setting and interlocking functions and completely merges them into CBTC. Urbalis Fluence meets the highest safety standards endorsed by official authorities. Urbalis Fluence brings more onboard intelligence and direct train-to-train communication, resulting in 20% less equipment. Its key benefits are operational availability, greater transport capacity, optimal investments and energy savings of up to 30% thanks to a system which maximises the use of train coasting when regenerative braking is unavailable.
FLUIDITY IN
SUBURBAN MODE

ADAPTABILITY
[a-dap-ta-‘bi-li-ty] n.

♦ 1 - Ability to adapt to new environments and new situations. ♦ 2 - Psychology: faculty of adaptation. ♦ 3 - Suitability for use in a variety of environments and situations.
X’Trapolis
Melbourne
(Australia)
The contract to provide vehicles and 30 years of maintenance for Ottawa’s new light rail system marks the debut of Citadis Spirit and its entry into an important and growing segment of the North American transit market. Its 100% low-floor design offers easy accessibility from the street or the curb, as well as an interior layout without steps or ramps to provide a safer and more enjoyable experience for riders of all walks of life. Thanks to its modularity, Citadis Spirit provides a highly rider-friendly street-running service in city centres with the versatility to evolve into a light commuter solution on dedicated railways to connect passengers with the suburbs. Citadis Spirit operates like a streetcar running at grade in mixed traffic and like a light commuter on segregated rail infrastructure at speeds of up to 65 mph, providing very high capacity in its longest versions or in multiple units. Citadis Spirit also provides highly customizable exterior and interior styling options to best reflect each city’s unique identity. Thanks to its modular design, Citadis Spirit meets initial service requirements and can then be expanded to meet increased ridership by adding extra modules while optimizing fleet asset life. In its automatic version with high capacity vehicles, Citadis Spirit can fulfil transit needs similar to those of a metro system. The combination of Alstom’s Citadis Spirit and turnkey capabilities are an exciting new option for communities on the move. The first Citadis Spirit made in America will be delivered in 2015.
MOBILITY WITH ALSTOM

FOCUS

2 key services contracts

Merval, Valparaiso Metro, Chile
- Contract duration: 2005-2035
- Customer: Valparaiso Metro
- Trains: 27 (2 cars) X’Trapolis
- Scope: Full System Maintenance; Depot investment, trains maintenance (preventive, corrective, overhauls including parts), maintenance of infrastructure and of workshop equipment, technical cleaning, shunting inside of workshop
- Performance: 100% availability target at peak hours

Sydney, Australia
- Contract duration: 2002-2017
- Customer: Downer EDI
- Trains: 35x4 Double-deck
- Scope: corrective & preventive maintenance (level 2 & 3), technical support, training, inventory management, spare parts supply

DOUBLE-DECK SUBURBAN TRAINS

COMBINING CAPACITY WITH COMFORT

Alstom’s double-deck suburban train design gives priority to seating capacity, smooth traffic flows and passenger comfort. Each of the double-deck trainsets can transport up to 1,300 people. The cars are equipped with three large doors to optimise the exchange of passengers in stations. The maximum speed of 120 km/h assures improved speed and flow on the line. Specific lighting creates a calm visual mood for increased passenger comfort. Onboard screens display information on destinations, stations served and correspondences. Dedicated facilities are available for people with reduced mobility. Interior arrangement, which provides a full view of both decks when entering the train and onboard video-protection systems ensure enhanced passenger safety. Alstom double-deck suburban trains are equipped with state-of-the-art traction systems to reduce energy consumption and generate less brake dust thanks to increased use of electric braking. Furthermore, the trainsets feature a system to transmit train operating parameters to maintenance teams in real time, allowing them to anticipate maintenance operations.

Citadis Dualis tram-trains, traveling over both urban networks and regional rail lines, meet the demand for transport from the heart of the city to outlying areas, with no change in mode of transit. Designed to link city-centre tram networks with rail lines in the surrounding region, Citadis Dualis combines the benefits of a train with those of a light-rail system. It has the flexibility and lightweight construction of a Citadis. Once on the rail network, it converts seamlessly into a regional train, carrying passengers at speeds of 100 km/h. The recent comeback of light rail networks has also been instrumental in boosting the fortunes of tram-trains. It is a contemporary and eco-friendly form of suburban transport that encourages commuters to travel by rail rather than road.
With the adoption of the National Development Plan (NDP) for 2030, South Africa has designed a clear roadmap that guides its key choices and actions to achieve the dual goals of prosperity and equity for all South Africans. The Passenger Rail Agency of South Africa, Prasa, has decided to renew its mass transit transport system to reduce traffic congestion in the capital and other major cities and concurrently improve its regional competitiveness and the country’s economic development. Today, Prasa has a fleet of 4,600 cars, of which many trains are nearly 40 years old. Over the next ten years, Prasa will spend an estimated €11.5 billion on extensive capital programmes to modernise its railway infrastructure.

In 2013, Gibela, the Alstom-led consortium, was chosen to support Prasa’s fleet renewal programme. A production site will be established in Ekurhuleni. This will have a wide impact on local economy and local employment as 1,500 jobs will be created of which 80% will be held by South Africans. Moreover, the production activity created with this contract will create up to 33,000 indirect jobs over the first ten years. Gibela was chosen for its expertise to design, manufacture and supply 600 state-of-the-art X’Trapolis Mega commuter trains.

X’Trapolis Mega builds upon the 30-year technological expertise gained by Alstom in suburban rail transport. Featuring wide-ranging modularity and high capacity, X’Trapolis Mega addresses the suburban service required by the ever-growing number of commuters while mitigating traffic congestion. A metric gauge train, X’Trapolis Mega can travel at speeds of up to 120 km/h with the ability to upgrade to 160 km/h with crashworthiness standards. Each single-deck train is composed of six cars and can carry over 1,300 passengers.

X’Trapolis Mega was created for high-density lines while providing high levels of comfort thanks to its architecture: full length connecting gangways, spacious design with three wide doors per car and step-free entrances to improve passenger ease of boarding and exiting. In addition, air-conditioned coaches with ergonomic seat design, real-time information on board, Wi-Fi internet access and a combination of direct and indirect lighting based on LED technology increases the sensation of space. X’Trapolis Mega consumes 31% less energy than the existing fleet in service because of its IGBT regenerative braking system associated to a 66% motorization ratio and its lighter stainless steel body shell.

The selection of the most advanced regional transport system is slated to improve safety, comfort, reliability and punctuality for the 2.3 million daily rail commuters across South Africa.

The first 20 trains will be manufactured in Lapa, Brazil. Alstom’s French sites Orsans, Tarbes, Le Creusot, Villeurbanne, Saint-Ouen and Charleroi in Belgium will contribute to the project. Initial deliveries and commissioning are expected by late 2015.
**FOCUS**

Preserving a sustainable environment

— Eco-design, energy performance and material recovery at the different stages of the train lifetime have been anticipated from the design phase — over 90% of the components of Alstom trains are recyclable.

— Up to 30% of the energy generated by engines during braking is saved through regenerative brakes and then fed back into the electrical power network.

— The train is lightweight thanks to its stainless steel structure and consequently consumes significantly less energy than any other standard train.

**“These are modern trains that will be built in South Africa with the aim of revitalising our rail engineering industry, promoting local manufacturing (...) and developing a new generation of railway workers in the form of engineers and artisans.”**

Tshepo Lucky Montana, Prasa Group CEO

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**600**

X'Trapolis trains ordered by Prasa

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**31%**

less energy consumption

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**1,500**

direct jobs created locally

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**33,000**

indirect jobs created locally
FLUIDITY IN REGIONAL MODE

REGULARITY

◆ 1 - Quality of being regular. ◆ 2 - Geometry: proportion, harmony. Regularity of a figure, equality of all its sides and angles. ◆ 3 - Grammar: a formation that follows the usual rules.
The success of regional transport also relies on punctuality, smooth operations, higher commercial speeds, more frequent service and operating safety. Alstom has responded to this sizable challenge with Atlas, its proprietary network and signalling management system. With Atlas, a complete and proven system that can be used with Level 1 or 2 of the European Rail Traffic Management System (ERTMS), trains receive traffic management data (authorised speed, signals/shunts, safety distances between trains, etc.) from the track and as a result they can calculate the maximum authorised speed at all times.

With 30 years of experience and more than 3,000 regional trains sold worldwide, Alstom is setting the standard in the market. Its primary asset is the vast scope of its product range in terms of engine (electric, diesel and bi-mode), architecture (single and double-decker), number of cars (from two to seven) and interior fittings on each car. Alstom’s regional product line has a technical configuration to suit every operator: from diesel-powered Coradia Lint to winterised Coradia Nordic able to withstand exceptionally low temperatures; from electric Coradia Continental and Coradia Meridian to double-decker Coradia Duplex and flexible Coradia Polyvalent.

This large portfolio allows operators to order a single fleet of highly modular trains whose cars can be tailored individually to their specific operational needs and reconfigured for different service needs, such as higher capacity at peak times, high density routes or seasonal fluctuations. This is an invaluable advantage for rail service providers, who can rest easy knowing their equipment is tailored to passenger demand.

The Coradia range stands out for its reliability and cost-effectiveness. Its acquisition, operating and maintenance costs have been streamlined, as has the cost of modernising Coradia to extend its lifespan. Coradia is both economical and environmentally friendly: over 90% of its components are recyclable and it consumes less energy than its competitors. As a result, Coradia trains are attracting operators throughout Europe and beyond.

An increasing number of travellers are abandoning their cars for more efficient modes of transport. Alstom is committed to meeting this demand by offering a range of solutions that, in terms of technical configurations, is unmatched in the market.

**Coradia Range: Responding to Diverse Needs**

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AINABLE MOBILITY

SERVICES

E-CAPABILITY ON CORADIA TRAINS

Coradia’s simple, rugged architecture, combined with a limited number of wear parts and equipment easily accessible from the roof, ensures minimal maintenance for maximum availability and reduced total lifecycle cost. The Traintracer e-maintenance module is a specially developed function connected to the main processor unit. It generates a continuous flow of data and information concerning the status and wear trend of the train’s main components. This data is then dispatched to the technicians either on demand via a PC when the train is at the depot or in real-time during operation via the Ethernet network. Technicians can then analyse the data to diagnose failures and better prepare maintenance interventions in case of failure. They can also anticipate possible problems and prevent failures to increase the fleet availability. Analyse stored information on fleet operations and keep the operator updated on events in real time using structured information. The health and usage data that accompanies any product nowadays is changing our perception of what a product is. A product is no longer just a piece of hardware that comes with a two-year warranty; it is defined by its purpose and characterized by its projected and actual behaviour. This is why Alstom serves its customers not just through superior products, but with lifelong support ensuring minimal operational cost at the highest availability. This represents a change in Alstom’s market, as train procurement is increasingly placed in the context of a “bundle” which couples the initial acquisition with the long-term support required to optimise the total cost of ownership.

POWER MOBILISED FOR REGIONAL TRANSPORT

For regional train operators who need push-pull train configurations, Alstom offers passenger locomotives and coaches. Notable examples are Russia and Kazakhstan for which the Alstom-TMH joint venture and its partners have developed the EP20 and KZ4AT passenger locomotives. Tailored to CIS infrastructure, both can reach speeds up to 200 km/h and operate in temperatures as low as -50°C.

INFRASTRUCTURE

NETWORKS AND WORKFORCE

Alstom proposes a complete range of sustainable solutions for track laying, electrification and the supply of electromechanical equipment for installation in stations and in depots. Lecco (Italy) is the Alstom Centre of Excellence for the design and production of components for catenaries. It is specialised in the design and manufacture of energy transmission equipment. Alstom also supplies workshops, the necessary equipment and a qualified workforce. Its engineers rely on their knowledge of all aspects of rail systems to optimise systems integration and their costs.
Heralding a new era in European rail networks

BANEDANMARK MANAGES ONE OF THE MOST AMBITIOUS SIGNALLING PROJECTS TO SECURE THE FUTURE OF THE RAILWAY IN DENMARK AND IMPROVE REGULARITY FOR PASSENGERS.

__ In January 2009, the Danish parliament decided to fund a €3.2 billion programme to renew and replace all Danish railway signalling by 2021. Can you explain the context of this programme?

JESPER HANSEN. For operators and passengers alike – in Denmark and the rest of the world – punctuality is one of the most significant indicators of service quality. It is also one of the keys to increase the output of rail lines. In the past, large numbers of trains in Denmark were subject to delays, mainly due to problems with the signalling system. In 2006, for example, signalling problems were the cause of 50% of the 39,000 train delays. In addition to being technical challenges, such incidents also reduced the efficiency of the network.

__ Can you describe the project in a few words?

J.H. Our particular advantage in Denmark is that all our systems were equally old. Around half of the signalling systems in use are more than 50 years old. Nearly 80% are based on relay technology from the 1950s-60s and some even on pre-World War 1 technology.
Therefore we had to consider its modernisation on a national scale. How do you upgrade a 2,100 kilometres network, with about 2,000 point machines? We took advantage of what other countries and other rail operators had done before. We truly benefited from this exchange of experiences. Our context was, however, a very different scenario from the other rail networks we benchmarked. Until then, national operators had always tackled projects like this section by section. We opted for another approach to meet several key objectives. First, we wanted to implement a highly consistent system with centralised data handling. Next, we wanted to reach the same level of safety nationwide, secure network-wide punctuality improvements and use economies of scale and the introduction of competition to reduce the overall cost of the project. Finally, with an eye on the future, we wanted to open the door to increased network capacity and future interoperability with Sweden and Germany. This is the context in which we decided to equip the entire national network with an ERTMS Level 2 system by 2021. This was a brave decision from our politicians because the benefits will only be visible in two or three mandates.

J.H. Our objective was to find a solution provider who could turn our economic goals – punctuality, minimised overall cost of ownership, capacity, network profitability and passenger satisfaction – into secure technical accomplishments. Our approach was quite innovative and we looked for suppliers which could match it with industry-proven manufacturing methods. Apart from the necessary technological excellence, the way the migration process would be handled was also crucial to the project’s success. The deployment had to be performed in a way that did not disrupt commercial traffic. To successfully complete a project of this scale, the solution provider had to be familiar with turnkey

“OUR APPROACH WAS QUITE INNOVATIVE AND WE LOOKED FOR SUPPLIERS WHICH COULD MATCH IT WITH INDUSTRY-PROVEN MANUFACTURING METHODS.”

What objectives were set for this project?

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projects and to have solid project management experience. Through a well-planned but swift roll out, a number of benefits can be obtained: minimising the disruption during implementation, obtaining a beneficial learning curve by repetitive similar installations and not least a quicker “pay-back” in terms of benefits.

___ Why was the ERTMS standard chosen?

J.H. Total renewal offered the possibility of a step-change in technology: implementation of the newest proven signalling technology, based on standard industrial hardware components, redundant system configurations offering uniform system interfaces and high reliability. Furthermore, it provided the opportunity to implement full interoperability on the Danish conventional network and to integrate automatic traffic management in a few centres for the whole country. To obtain these benefits, the natural choice for the conventional network has been ERTMS Level 2, which offers substantial economical and operational benefits associated with the removal of all line side signals. The reduction of volatile equipment in the hostile near-track environment reduces the vulnerability of the signalling system. The centralisation of interlocking logic and radio block centres enables the realisation of the high-performance vision. The configuration will, in addition to the above, include condition monitoring of components, integration with passenger information systems and a uniform and higher countrywide level of safety country wide. We later shared our project with countries that had either helped us at the beginning of our project or that were preparing their own renewal programme. We are quite proud today to be seen as a reference, as a benchmark, by the European Union.

___ You chose Alstom to equip the eastern region of Denmark as well as a large fleet of trains. What were your selection criteria?

J.H. By signing a contract with Alstom, we entered into close cooperation with a supplier, which is able to deliver both a technically modern and a mature solution. Alstom has proven this aspect in operation. Alstom is able to implement the new system in the whole of eastern Denmark and simultaneously we are...
able to ensure the careful use of our government funds by using the most economically advantageous tender. Overall, and thanks to the close cooperation between the suppliers’ and Banedanmark’s teams, we have saved nearly 700 million euros on the total amount allocated. Those funds will be used for new projects that will in return bring more benefits to our passengers. For example, we have recently launched a new programme for the expansion of the catenary system for electrical trains. The current plan provides for the installation of a catenary system on approximately 550 kilometres of railway on four separate sections of the Danish railway system.

___ What are the next challenges of Banedanmark?

J.H. Have the new signalling system up and running on time and on budget!

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SMARTLOCK SOLUTION

Overseeing network operations effectively

Smartlock contributes to the safety of rail traffic. This solution enables infrastructure managers to oversee their operations effectively, in complete safety and with maximum output. Since 1997, 17 computerised interlocking control units have been supplied to France’s national rail network (RFF), including the largest such unit in Europe to the city of Strasbourg in 2006. In 2009, one of Europe’s first “super-integrated” centres was delivered to Bologna, Italy. The centre manages infrastructure for eight lines, 29 train stations, over 600 signals, 300 point machines, 1,400 major routes and 1,700 shunting routes.

ICONIS INTEGRATED CONTROL CENTRE

Providing the control and surveillance functions operators need

Iconis centralized control systems give railway infrastructure managers and their agents complete control over their network operations. The unified Iconis platform can integrate ATS (Automatic Train Supervision), SCADA (Supervisory Control And Data Acquisition), Infotainment (Passenger Information) and Security as optional functions according to each customer’s needs. A single screen set displays constant, simultaneous supervisory information on all trains and stations, giving controllers the best basis to make crucial operating decisions, suggesting the best choice based on predefined action policy.

ATLAS ERTMS TRACKSIDE AND ONBOARD SOLUTION

Maximising output in total safety

Alstom has brought more than 20 ERTMS infrastructure projects and many train equipment projects into commercial operation, spanning nine European countries and has established itself as the leader in operational deployment. In Europe, Alstom is responsible for one-third of all ERTMS infrastructure projects and three-quarters of all ERTMS-equipped trains – which equates to over 2,100 locomotives or trainsets of over 60 different types. In addition, Alstom has contracts for over 1,200 further trains and 6,000 kilometres of line worldwide. Each month, trains equipped with Alstom Transport’s ERTMS solutions travel over 2 million kilometres.
FRENCH REGIONS & SNCF
PARTNERING FOR REGIONAL ECO-MOBILITY

(RELIABILITY, ADAPTABILITY, COMFORT, PASSENGER INFORMATION, COMPETITIVE LIFECYCLE COST, ENVIRONMENTALLY-FRIENDLY SERVICE: THESE ARE THE MAIN ASSETS BROUGHT BY CORADIA POLYVALENT TO THE FRENCH REGIONS.)

KEY DATES

October 2009: Contract signature
June 2011: Unveiling of the first trainset
July 2012: Beginning of the dynamic tests campaign in the Czech Republic and France
July 2013: Delivery of the first Coradia Polyvalent to the Aquitaine Region
September 2013: End of dynamic tests
2014: Start of commercial service
During the last decade, the amount of passengers using regional trains in France rose by 55%, a trend further confirmed in 2012 with an additional 5%. There are a million passengers daily taking the 7,000 regional trains in circulation on the national rail network.

To meet this demand, the French regions have invested €2.6 billion in next-generation regional trains. A large number of regions gathered in 2008 to prepare one common request for a train that could meet the diversity of their needs and constraints. In October 2009, Alstom signed a contract with SNCF for the supply of up to 1,000 Coradia Polyvalent regional trains. Coradia Polyvalent, named Regiolis by the French regions, is a train with a high degree of flexibility that offers several different types of technical configurations and passenger amenities. It can travel at speeds of 160 km/h in electric or bi-mode version and at two voltages (25 kV and 1,500 V). Coradia Polyvalent is also available in a cross-border version that can operate on the German and Swiss networks at a voltage of 15 kV. Its low, integrated floor means that passengers can enjoy maximum accessibility. The motor bogies positioned at the two ends of the train limit vibrations and sound levels.

This contract comes with an after-sales service package, handled by technicians experienced in mechanics, electronics and IT located in a centre in Metz, in the Lorraine region. One of its key assignments involves corrective maintenance of equipment once the trainsets have been commissioned throughout the warranty period in order to improve the reliability growth curve of the fleet. After-sales service is part of a new Alstom solution called PMCO — an integrated fleet support tool intended to optimise the maintenance and availability of the Coradia Polyvalent trains. In addition to the team of technicians at customer depots, the after-sales service is equipped with a dedicated parts warehouse and Alstom Traintracer software.

To date, the first Coradia Polyvalent trains have travelled over 250,000 kilometres. Up to the beginning of 2014, 182 trains have been ordered by 12 French regions. Thanks to the hard work of all players in France’s railway sector, close to 100 Coradia Polyvalent trainsets will be delivered by late 2014. The manufacturing of Coradia Polyvalent trains generates more than 4,000 jobs in France at Alstom sites — Reichshoffen, Ornans, Le Creusot, Tarbes, Villeurbanne and Saint-Ouen — and its suppliers.

“Coradia Polyvalent is a train with a high degree of flexibility.”

In 2013, SNCF ordered 34 Coradia Liner trainsets, Alstom’s latest generation of long-haul trains. The trains are expected to enter into service from December 2015. Coradia Liner is classed between a regional train and a high-speed train. Coradia Liner is fully accessible thanks to platform-level boarding. On-board passenger traffic is made much smoother thanks to spacious passenger areas perfectly suited to long-haul journeys. Comfort is provided by new seats featuring upholstered armrests, a coated floor to reduce ambient sound, large bay windows and indirect interior lighting. Large gangways and platforms optimise boarding times. In its current configuration, the train can carry up to 267 passengers. Coradia Liner is an economical train. Lighter than the previous generation of long-haul trains, it will use significantly less energy and its architecture has been designed to facilitate maintenance operations. It is bimodal (electric and diesel) and complies with all current European standards.
RAPIDITY

[ra-ˈpi-di-ty] n.

♦ 1 - Quality of travelling a long distance in a short time. ♦ 2 - Fig. Promptness with which something acts or is done. ♦ 3 - Literature: rapid movement of ideas or expressions. Rapidity of style.
KNOW-HOW
LEADING THE WAY

DESIGNED PRIMARILY TO SERVE MAJOR CITIES AND DENSELY POPULATED AREAS BY PROVIDING A FAST MODE OF TRAVEL OVER LONG DISTANCES, THE (VERY) HIGH-SPEED RAIL INFRASTRUCTURE HAS FUNDAMENTALLY RESHAPED THE TERRITORIES. WITH ABOUT 1,250 TRAINS SOLD WORLDWIDE, ALSTOM IS THE WORLD LEADER IN HIGH AND VERY HIGH-SPEED TRAINS IN TERMS OF INSTALLED BASE. ALSTOM EXPORTS ITS TECHNOLOGICAL EXPERTISE TO EVERY CONTINENT, OFFERING THE WIDEST RANGE OF PROVEN TECHNICAL SOLUTIONS ON THE MARKET, FROM ARTICULATED AND NON-ARTICULATED TRAINSETS TO TILTING TECHNOLOGY, SINGLE OR DOUBLE-DECKER ARCHITECTURES, CONCENTRATED OR DISTRIBUTED POWER.

HIGH-SPEED LINES: ALSTOM RAISES ITS PROFILE

Alstom offers a sophisticated array of solutions for laying, electrifying, powering and installing signalling for high-speed rail lines on which ERTMS signalling technology is key. With Atlas, Alstom’s upgradeable modular system designed for ERTMS, Alstom supplies rail operators with the full information solutions that allow them to operate their network in complete safety. Alstom is the world leader in ERTMS Level 2 and has already equipped six of the ten lines currently using this technology.
Thanks to its manufacturing experience, enriched by three decades of maintenance work in close collaboration with operators, Alstom delivers high-quality maintenance services for fleet availability, reliability and longevity. A greater emphasis on predictive and preventive maintenance has led to a substantial increase in the operating time and profitability of customers’ fleets. Train downtime is reduced to a minimum; their availability for commercial service is maximised. On the 650 trains connected, Alstom records a decrease of up to 30% in train immobilisation time and a decrease of up to 50% in repetitive faults. Thanks to the dedication of Alstom’s teams and Traintracer, Alstom’s powerful preventive maintenance solution, operators record excellent availability rates. Services can be added to trains supply contracts, hence providing a comprehensive offer. This has been the case for example for the 56 Pendolino trains delivered to Virgin on the West Coast Main Line (United Kingdom) whose maintenance is covered for 20 years, as well as for the 25 AGV trains delivered to Italian operator NTV and including a 30-year maintenance period.
Alstom has sold about 720 very high-speed trains; an unmatched wealth of accumulated experience. Alstom’s current range is based on two flagship products that represent the culmination of 35 years of expertise: Euroduplex and AGV. Euroduplex is the only double-decker very high-speed train on the market, able to carry up to 1,050 passengers in multiple units at speeds of 320 km/h. Designed for interoperability, it offers signalling equipment that is compatible with multiple networks. In addition, it is equipped with traction systems that are suited to several different electrical voltages. Accessible to everyone thanks to its platform-height doors, Euroduplex architecture offers operators the ability to create a range of travel environments: quiet rest areas in the lower cabin and lively spaces with panoramic views upstairs. Since its introduction in 1996, Euroduplex has travelled more than 700 million kilometres.

AGV is designed to travel at commercial speeds of up to 360 km/h. It is the only very high-speed train to combine an articulated architecture with distributed power. As a result, AGV offers excellent operating costs in terms of energy and maintenance. Acoustic comfort has been significantly improved thanks to modelling and research into the design of the head cars to improve their air penetration. By virtue of its ongoing investment in R&D, Alstom has also reduced AGV’s mass and energy consumption by 10-15%. As a result, it consumes just 0.4 litres in oil equivalent per 100 kilometres per passenger. That’s five times less than an airplane. Similarly, as a result of advances in traction technology, AGV can recover the energy lost during braking and return it to the power grid.
Alstom’s Pendolino provides great flexibility, smooth cross-border operations and enhanced passenger comfort. Pendolino is designed to run at up to 250 km/h on both high-speed and conventional lines. With more than 500 trains sold worldwide (with or without tilting technology), Pendolino is the world’s best-selling high-speed train. It is certified to operate in 13 countries and soon 14. Its success rests on its modularity and flexibility. Pendolino can be fully customised from interior layout to the number of cars (three to eleven), voltage power supply, gauge and suspension. It allows all passengers to travel comfortably, thanks to its catering facilities, wide corridors and gangways with optimal accessibility and passenger information systems. Large panoramic windows bring the benefit of natural light. Pendolino can be operated under extreme climate conditions (up to 45° and -45°C). It is also available with Tiltronix, Alstom’s anticipative tilting technology, which enables the train to tilt by up to eight degrees and still run at 250 km/h, allowing it to travel 30-35% faster than conventional trains. Neurologists and engineers have tested and demonstrated how Tiltronix can minimize the sources of motion sickness in tilting trains, rendering travel on these trains even more pleasant. Pendolino supports the Alstom’s policy of sustainable development: it is 95% recyclable and equipped with an electric braking system that cuts energy consumption by nearly 10%. Moreover, special care has been taken to reduce noise levels in compliance with the latest European regulations.

“ALSTOM’S CONTRIBUTION HAS HELPED BOOST PASSENGER SERVICE. THE CAPACITY OF THE LINE HAS INCREASED BY 30% OVER THE LAST FOUR YEARS, RESULTING IN A HIGH FREQUENCY SERVICE DESCRIBED AS THE MOST FREQUENT LONG-DISTANCE INTERCITY SERVICE IN EUROPE.”

Brendan Fox, Editor of Thomas Cook’s European Timetable, about operation on the WCML.
RENFE AND SNCF OPENED IN DECEMBER 2013 THE DIRECT HIGH-SPEED LINE LINKING PARIS (FRANCE) AND BARCELONA (SPAIN), WITH DOUBLE-DECKER EURODUPLEX AND SINGLE-DECKER AVE S100 VERY HIGH-SPEED TRAINS, ALL DESIGNED AND PRODUCED BY ALSTOM.

THIS IS THE 16TH BORDER CROSSED BY ALSTOM HIGH-SPEED FLEETS.

Beyond borders!
THE ESPERANTO OF THE RAILWAY WORLD
The European Union has decided to encourage the development of rail transport to carry passengers and freight across borders. The challenge is considerable and so are the difficulties to be met: unlike air transport, which has been developed within an international regulatory framework including standard technical specifications, rail has inherited a logic based on national territories. The result is a patchwork of regulations and a multitude of technical specifications which recall the Tower of Babel. The coexistence in Europe of more than twenty different speed control systems, four voltages and three mainline track gauges, represents a major obstacle to the development of international rail traffic.

The Thalys high-speed train, which links Paris, Brussels, Cologne and Amsterdam, offers the most revealing example of the complexity in Europe’s rail market. To ensure continuous service in the four countries, each Thalys train has to interface with no less than eight different signalling systems. This means, for instance, adding sensors, aerials and specific peripheral devices to the engines. Besides this clutter, the constraints of interoperability generate additional costs in terms of investment, development, acquisition, training drivers and maintenance.

A move to standardize train signalling and protection systems was launched in the early 1990s by the European Union with its ERTMS programme. It was aimed at establishing rail network interoperability and easing cross-border operation by replacing legacy systems with a safe, reliable, cost-effective, flexible and interoperable signalling system based on an open standard.

The rolling stock brings its own challenges. The total certification process can be long and expensive, especially when it concerns several countries. Operators must also face other concerns brought by differences in infrastructure tariff, border control and security issues.

ALSTOM, A PIONEER IN THE DEVELOPMENT OF HIGH SPEED ON INTERNATIONAL ROUTES
Contributing to making rail competitive compared with road is unquestionably a strategic
“Alstom guarantees on-time and on-cost delivery of its cross-border solutions.”

priority for Alstom which is aiming to supply solutions that offer a high degree of availability, safety, ergonomics, performance and competitiveness. Thanks to its unique know-how in the field of high speed, Alstom irons out all the obstacles of the complex cross-border context and guarantees on-time and on-cost delivery of its cross-border solutions.

The world’s first high-speed train ever to cross a border belonged to Alstom’s first generation of very high-speed trains range. It was operated by SNCF and travelled from France to Switzerland in 1984. Since then, and thanks to its growing know-how in interoperability and the breakthrough of ERTMS technology, Alstom has supplied most of Europe’s high-speed and very high-speed interoperable fleets, now crossing over 16 borders worldwide.

Pendolino is operable over a variety of networks, using four different voltages thanks to its integrated ETCS system meeting the latest ERTMS standards. European fleets cross seven borders. Trenitalia and SBB fleets cross the Swiss — Italian border, as well as the Swiss — German one. SZ Passenger Transport Pendolino trains travel from Slovenia to Italy. České Dráhy offers an international service across the Czech borders with Slovakia, Germany and Austria. Karelian Trains opened a service between Finland and Russia. Soon, Pendolino EIC Premium will cross the Polish borders with the Czech Republic and Germany.

Eurostar provides the very high-speed rail link between London, Paris and Brussels. Alstom supplied 38 trains, equipped with the six national signalling systems and a centralised traffic control system for international shuttles and trains.

German operator Deutsche Bahn chose Atlas trainborne ETCS Level 2 to upgrade the train control of 13 ICE3 high-speed trains. Since 2009, four trains are running on the Belgian high-speed line L3 — from Liège (Belgium) to the German border — equipped with Atlas trackside ETCS Level 2. The project was a technical-integration challenge given that the ICE3 trains were already fitted with six national signalling systems. Thanks to Atlas, travel time between Brussels and Frankfurt has been reduced by 25 minutes. Alstom was also responsible for certification of the signalling system in The Netherlands and update of its approval in Germany.

Alstom equips DB’s ICE3 cross-border fleet with Atlas

FOCUS

Thalys trains, designed and manufactured by Alstom, linking Paris, Brussels, Cologne and Amsterdam, are equipped with the eight national signalling systems in use in the countries they cross as well as matching voltage.

Euroduplex is the only double-decker very high-speed train to be fully interoperable within Europe. It complies with Technical Specification for Interoperability and meets the specific requirements of the countries it passes through. It already circulates in France, Germany, Switzerland, Luxembourg and Spain. Thanks to the certification of Euroduplex for the entire German network in 2012, Euroduplex entered into revenue service on the new international Frankfurt–Marseilles connection. This is the first direct high-speed commercial service between the South of France and Frankfurt.
A REVOLUTION IN POLISH RAILWAYS

THE POLISH PENDOLINO, DUBBED EIC PREMIUM, WILL BRING ABOUT A REVOLUTION IN RAILWAY TRANSPORTATION IN POLAND AND ENABLE PASSENGERS TO EXPERIENCE NEW LEVELS OF QUALITY AND COMFORT.

KEY DATES

May 2011: Contract signature
May 2013: Reveal of the train design and of its name EIC Premium (Express InterCity Premium)
June 2013: Unveiling of the first trainset in Savigliano
August 2013: Arrival of the first trainset in Poland
Fall 2013: Beginning of the dynamic test campaign in Poland
Spring 2014: Certification
December 2014: Start of commercial service
As part of a vast programme to upgrade Polish transport, Poland submitted a request for proposal to provide the country with a train fleet that will set a new standard in the Polish railway system for decades to come, thus restoring the competitiveness of rail transport in the country.

In 2011, Polish operator PKP Intercity, in charge of long distance passenger transport, awarded Alstom a contract to supply 20 high-speed Pendolino trains, their full maintenance up to 17 years and the construction of a new maintenance depot. Pendolino EIC Premium is a light blue and silver seven-car Pendolino. Running at 250 km/h, a trip from Warsaw to Krakow onboard Pendolino EIC Premium will take 2h15, shaving off an hour from the current journey time. It inherits the famous front end designed by renowned Italian car designer Giorgetto Giugiaro. The train graphics, colour range and interior were made by Marad Design in collaboration with Alstom. Pendolino EIC Premium will offer three classes and a total of 402 seats. The interior outfitting has been enhanced: wide corridors and gangways will improve accessibility and passenger comfort. Video monitors and a video-surveillance system will ensure maximum safety. Furthermore, Pendolino EIC Premium will offer facilities for blind and partially-sighted persons. The seats in each compartment will be marked with Braille and the “next station” information will be announced via a sound system. Noise reduction has been the subject of particular attention in order to meet new European standards. As well as meeting the latest European interoperability standards (ERTMS), the trainsets for PKP Intercity will be equipped with signalling systems required to operate not only in Poland but also in Austria, the Czech Republic and Germany.

In addition to delivering the trains, Alstom will supply full maintenance for a period of up to 17 years in a new depot of 12,000 m² which will be built in Warsaw. In only a few months, some 100 people have been hired and trained to occupy roles dedicated to commissioning, general warranty and full maintenance of the trains at the depot.

At precisely 2:09 pm, on 24 November 2013, the Pendolino EIC Premium reached speeds of 293 km/h on the conventional line between Gora Wlodowska and Psary, northwest of Krakow. Never before had the Alstom Pendolino high-speed train travelled so fast. This illustrates the quality of the train built by Alstom and the expertise of test teams, as well as the fruitful collaboration between Alstom, its customer PKP Intercity and the Polish authorities responsible for infrastructure, electrification and certification.

**FOCUS**

A new high speed record for Pendolino

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CONTINUITY
[kon-ti-’nu-i-ty] n.
♦ 1 - State of something that is a connected whole. ♦ 2 - Continuous duration. ♦ 3 - Permanent repetition, sequence.
KZ8A locomotive reveal (France)
RAIL FREIGHT: COMMITTING TO A SUSTAINABLE MODAL SHIFT

To ensure interoperability—a significant concern in the freight industry—Alstom has developed a new generation of Prima locomotives. Fully compatible with the ERTMS and ETCS systems, they can cross borders with ease and operate on every freight corridor in Europe, as well as being able to run on any of four power supply voltages (25 kV, 15 kV, 3,000 V and 1,500 V). They are equipped with an independent traction system on each axle: if an axle failure is detected, the locomotive can operate at 75% of its standard performance level for a BoBo¹⁶ version and 83% for a CoCo¹⁷ version, considerably reducing the risk of downtime.

Prima II offers ease of maintenance throughout its lifecycle thanks to several factors: the standardised nature of its structure and principal components, which substantially reduces the number of subassemblies; simpler access to key equipment; and Alstom’s Traintracer preventive maintenance module. As a result, Prima II guarantees a high residual value.

Prima II is designed to provide complete protection in the event of a collision at speeds approaching 65 km/h. Moreover, as it is essential to provide drivers with the best possible working conditions, Prima II offers the European Driver’s Desk (EUDD) and generous living space specially designed to accommodate two drivers. Its ergonomic control panel provides for easy access and use. The cab is fully insulated, particularly from the machine room, to ensure low levels of noise and is air-conditioned for optimal comfort. A wide range of equipment and accessories can be added, including toilets, beds, refrigerators and microwave ovens, to provide more comfortable conditions for drivers during extended journeys.

The Prima product range also includes diesel locomotives that have already attracted a long list of customers in numerous countries, including Iran, Syria, Sri Lanka, France, Great Britain and the United States.

يلة Patriot trackside equipment (The Netherlands)
SUSTAINABLE MODAL SHIFT

2ES5 AND KZ8A, OPENING NEW EASTERN FRONTIERS

Alstom and its Russian manufacturer partner TMH have jointly developed and produced a new freight locomotive called 2ES5. It is being designed by TRtrans, a jointly held engineering firm established in 2010. The design and manufacturing process is based at the TMH site in Novotcherkassk, southern Russia. 2ES5 is an asynchronous double BoBo freight locomotive that can run at speeds of up to 120 km/h. With an output power of 7,600 kW, it will have the capacity to pull freight convoys in excess of 6,000 tonnes over distances as great as 3,000 kilometres. It will also be able to withstand temperatures as low as -50°C, thanks to materials selected by TMH to be suited to intense cold.

In Kazakhstan, a new electric locomotive inspired by Prima, the KZ8A, is being produced by the national rail operator KTZ with a joint venture set with Alstom and TMH. It is a double BoBo freight locomotive able to haul up to 9,000 tonnes. They are being produced and assembled in the new Alstom plant in Astana. Employment, worker training and the transfer of production are key in the partnership. This long-term strategy, indicative of Alstom’s approach, reflects a spirit of ongoing dialogue on behalf of the customer and local development.

H3, PROVIDING AN INNOVATIVE SERVICE

H3 locomotives are mainly designed for the shunting and short distance service. Customers can choose between different modules for energy production/storage. The three-axle H3 hybrid locomotive consumes 50% less fuel than conventional shunting locomotives, leading to a 70% reduction in pollutant emissions. The H3 spends 80% of its operating time in battery mode, making emission-free rail transport possible. The H3 locomotive will be available with a full EBA (German Railway Authority) homologation in 2015 and afterwards in other country specifications.

MAINTAINING LOCOMOTIVES AND WAGONS

In its own depots or those of its customers, Alstom services all types of locomotives, built by Alstom or not. The company notably maintains GE and EMD fleets all over the world. The benefits for the customers are flexibility, reliability, expertise and cost control. On top of these services, Alstom teams also maintain wagons, for example in Germany at Alstom’s site in Braunschweig. Finally, Alstom Services teams can provide support for ECM (Entity in Charge of Maintenance).
KAZAKHSTAN
WITH ITS CAMPAIGN TO UPGRADE INFRASTRUCTURE, REORGANISE OPERATIONS TO BETTER MEET THE NEEDS OF PASSENGERS AND MARKET REQUIREMENTS AND CREATE AN INDUSTRY ABLE TO COMPETE ON THE INTERNATIONAL STAGE, KAZAKHSTAN HAS PUT THE FOCUS FIRMLY ON RAIL.

Stepping up the breakthrough in the east

The country aims at using its railways to gain greater economic independence, retain territorial integrity, cement social stability and, most importantly, tackle world trade head on. This clear will goes hand in hand with the rise of a modern state, now seen as a key player on both the regional and international scene. Given factors such as the sheer size of the country, its low-density population (fewer than 16 million people spread over 2,724,900 square kilometres) and the crucial importance of freight, rail transport is a cornerstone of the national economy and social welfare in Kazakhstan. In addition, the majority of railway lines that link Europe and Russia to Asia-Pacific, Central Asia and the Middle East travel through Kazakhstan. The development of each of these corridors is driven by globalisation.

Between 1997 and 2002, the public authorities of Kazakhstan began a thorough restructuring of the industry, setting up a benchmark public operator: Kazakhstan Temir Zholy (KTZ), now the nation’s biggest employer, with a workforce of nearly 140,000 people. In 2002, more ambitious reforms were implemented. The goal was to successfully upgrade infrastructure and rolling stock to establish Kazakhstan as a regional heavyweight in the rail industry. The country now has some 15,000 kilometres of broad-gauge (1,520 mm) railway lines, over 3,800 kilometres of which are electrified.

In a country where annual temperatures can range from -50°C in winter to 40°C in summer, road maintenance is both difficult and costly. Freight, mainly used to drive the national economy and for exports, represents nearly 75% of KTZ business. Although affected by the world financial crisis, the amount of freight transported has strongly increased over the recent years. Kazakhstan is active on a number of fronts in its bid to maintain this momentum: it has signed orders with South Korea, Turkmenistan, Iran and countries in the Persian Gulf; it has invested in the Baku-Tbilisi-Kars line, with annual volumes estimated at ten million metric tonnes of freight; it has signed bilateral agreements with China and Russia; the list goes on.

A “Kazakhstan 2030” strategic plan is underway to better mesh the Kazakh rail system with the region’s key corridors and ensure compatibility with international standards on safety, speed and fares. The project involves public-private partnerships (PPPs) with leading western manufacturers. In 2010, the partners Alstom and TMH signed a memorandum of cooperation with KTZ to produce electric locomotives. This memorandum led 18 months later to the creation of a joint venture between Kazakh Railways and the Alstom-TMH partnership to build these locomotives on the Kazakh territory at Astana, the capital of Kazakhstan. This site was chosen to leverage synergies with the
“The ‘1,520’ rail market is one of the most important markets in the world with 227,000 km of track, 2 billion passengers and 2.5 billion tonnes of freight transported annually.”

diesel locomotive manufacturing site of AO Lokomotiv, a KTZ subsidiary and partner of General Electric that is already present in the city. The feasibility study carried out by Alstom and TMH showed that this choice would make it possible to achieve significant economies of scale (pooling of staff, use of the same network of suppliers, etc.) with a view to building a true rail sector in Kazakhstan (see page 59). The campaign also features plans to upgrade infrastructure in the medium-to-long term worth an estimated €5 billion. The authorities aim to develop 7,850 kilometres of mainline services in the coming years to speed up and smooth out traffic generally seen as too slow at present. There is also a raft of projects underway to modernise signalling. In 2010, Kazakhstan signed a memorandum of understanding with Alstom to form a joint venture dedicated to signalling. This agreement led in 2013 to the creation of the KazElectroPrivod joint venture based in Almaty, in the south of the country, at the Almaty wagon repair plant, owned by Kamkor and specialised in railway maintenance activities. KazElectroPrivod has been appointed for the supply of 10,000 point machines over a ten-year period starting in 2013. The first 680 point machines were installed by the end of 2013 and the KTZ teams were trained in record time by Alstom technicians.
How do you define fluidity?

Joël de Rosnay. I use the surfing metaphor to explain fluidity in society and in business because life is like a wave – it is a flow. When you surf, you have to look ahead, anticipate, adapt in real time and correct imbalances to maintain the right position, all of which allows you to enjoy the sport or win competitions.

The surfer’s goal is not just to stay upright on the board; it is to hold the line he has set himself, to surf the wave he has chosen. This means constantly detecting and correcting – deliberately – any imbalances and divergences from the line.

It’s the same thing in life and in business: you have to anticipate, look ahead, adapt and correct deviations from your strategy and your goals. Fluidity is this ability to adapt to the environment and individuals, to create and to share. It means contributing to a continuous exchange of information, knowledge, friendship, generosity, solidarity...

“A fluid company relies on the inevitable power relationships with its competitors but also on the flows it creates within its own ecosystem.”

So the fluidity of a company or an organisation is based on exchange?

J. de R. There are two types of relationships in life: those based on force and those based on flow. Both are necessary. A fluid company relies on the inevitable power relationships with its competitors but also on the flows it creates within its own ecosystem.

...
Joël de Rosnay, Doctor of Science, is advisor to the President of Universcience (Cité des sciences et de l’industrie de La Villette and Palais de la Découverte) and Executive President of Biotics International. Former research worker and teacher at the Massachusetts Institute of Technology (MIT) in the field of biology and computer science, he was successively Scientific advisor to the French Embassy in the United States, Scientific Director at the Société européenne pour le développement des entreprises and Director of Research Applications at the Institut Pasteur.


The flow relationship is based on the information we give and the information we receive, with each participant benefiting from additional knowledge.

We are gradually moving from a pyramidal, individualist society towards a more fluid, collaborative society in which individuals work together to define goals and the resources required to achieve them by listening to each other and sharing.

We are thus entering what I call the co-society, eco-society or co-economy, which is based on individuals’ ability to create the physical resources, equipment and information they need (via social networks, digital tools and the Internet) to act and give their lives meaning without needing to go through pyramidal structures and systems. This collective creation involves exchanging information, which itself involves the humanist values I cited above. These elements are the foundation for the new social relationships of the fluid society.

Does this vision of fluidity also apply to the world of transport?

J. de R. We are living in a digital civilisation, a digital ecosystem. Transport is part of this world and the resulting need for fluidity is being felt more and more strongly. Until now, transport has been a marriage between mechanical engineering and energy technology, summed up for the passenger as a time and a place: you wait for your bus, train or plane, scheduled at a certain time, at a predetermined station or airport. But now new technology is involved. Transport is the fruit of a marriage between energy technology and digital technology. Waiting and uncertainty have given way to useful, coordinated time controlled by passengers, who are kept up-to-date in real time on the different modes of transport they can use, their timetables, any interruptions there may be and who else is travelling the same way. Passengers become responsible for integrating, organising and processing all this information to manage their travel in a fluid manner.

“The flow relationship is based on the information we give and the one we receive, each participant benefiting from additional knowledge.”
Journeys personalised in this way are optimised and the time devoted to them becomes useful once again, something that is chosen rather than endured. Passengers are proactive, responsible for their own mobility within a collective system. Thanks to shared information, "transmobility" or "transmodality" is born. Soon we will go even further. Trains and metro will no longer just provide Wi-Fi access. They will be transformed into internal servers offering information and education services that will be an integral part of the transport service. For example, people using the metro every day will be able to take English lessons provided as an extra onboard infotainment service by the operator...

**How can fluidity serve today’s major issues such the environment, energy and the economy?**

**J. de R.** The democracy of information will lead to many other democracies and in particular, energy democracy. The energy transition is under way. It has not yet reached all countries and is not applied in the same way everywhere, but it is definitely already in progress. We can see it in France, for example, where we have a centralised, vertical energy model based on nuclear power. A one-way system from the power plant to your meter... I think this concept of centralised power stations and power sources competing with each other is giving way to the notion of smaller, interconnected power plants and a multimodal matrix. This decentralisation of energy requires the small plants to be connected together in intelligent networks for storing and distributing energy intelligently. This is the role of Smart Grids, a field in which Alstom is an advanced player. These are being established in many cities, which are thus becoming their own power plants. New technology allows individuals to become creative in the area of energy, becoming prosusers (PROducers + conSUMERS) and defining their own energy priorities for the future. All this evolution shows a trend towards greater citizen empowerment. This creates local responsibility, jobs and growth.

**And in transport?**

**J. de R.** What is true for Smart Cities is also true for transport. Means of transport – trains, buses and cars – will also become producers. One electric car stores 10 kWh. By 2020, there will be a million electric cars all storing 10 GWh, the capacity of a nuclear reactor. In the case of an AGV high-speed train, the power generated through braking can reach eight MW. All this energy produced by transport vehicles themselves could potentially be returned to the Smart Grid. Cars, buses and trains would then become mobile batteries for the use of society.

**So fluidity gives individuals the power to build their own future?**

**J. de R.** At the beginning of the twentieth century, mechanical engineering and energy technology gave birth to “auto-mobility”. Thanks to their cars, individuals gained access to independent mobility. By the end of the century, digital and information technology had developed “info-mobility”, the ability to create and receive information via networks. The twenty-first century will bring "eco-mobility". People will create and share their own energy – we will have the EnerNet, the Internet of energy. We are seeing a high level of personalisation of resources, tools and objects. There is an individualisation and ultra-localisation of production, the rise of microbusinesses, which – thanks to worldwide networks of information and sharing – are becoming one-person multinational.

This local production is having a global effect. For me, it represents Industry 2.0. I totally associate the construction of a shared future, co-construction, with fluidity. I fuse them together, a bit like Alstom, in fact – Shaping the future and Designing fluidity. To construct your future, you need a systemic vision, a vision of sharing and, of course, values: respecting diversity, respecting others, demonstrating empathy, altruism and solidarity.

“Passengers are proactive, responsible for their own mobility within a collective system. Thanks to shared information, ‘transmobility’ or ‘transmodality’ is born.”