Alstom in Spain

Projects and References

Alstom’s Presence

KEY FACTS FOR SPAIN

- Employees: 3,500
- Sales 2012/2013: 750 Me
- National HQ Alstom Spain in Madrid
- Global HQ Alstom Wind in Barcelona
- Industrial and commercial presence of all activities of Alstom Group
- 27 working sites
- 4 manufacturing sites
- 9 technology centres and R&D sites.
Today`s breadth of product offering and impressive presence is the culmination of confidence in project completion and commitment to our Spanish partners. This rich heritage of trust and cooperation is demonstrated in the timeline of Alstom Spain`s landmarks below:

1989: Merger with General Electric Company (GEC) to form GEC ALSTHOM.
1989: Acquisition of MTM (1855) and ATEINSA (1973) by GEC ALSTHOM.
1989: MACOSA (1857) signs a contract with GEC ALSTHOM and MEINFESA is founded, obtaining the railway activities from MACOSA.
1993: GEC ALSTHOM NERPYC Española S.A. is formed after various name changes since 1942.
1993: GEC ALSTHOM takes over Motores Man and changes its name to GEC ALSTHOM Electromecánica S.A.
1994: GEC ALSTHOM S.A. is born and becomes the holding company for GEC ALSTHOM in Spain.
1998: GEC ALSTHOM changes the group name to Alstom. GEC ALSTHOM S.A. changes its name to Alstom España IB S.A.
1998: Railway activities are renamed as ALSTOM Transporte S.A..
1998: GEC ALSTHOM NERPYC Española S.A. changes to ALSTOM Hydro S.A.
1998: GEC ALSTHOM Electromecánica S.A. changes its name to ALSTOM Energía S.A.
1998: Alstom Transport acquires at global level Sasib Railway (previously Abengoa). The signalling business unit is established in Spain.
2000: Alstom acquires the Group ABB.
2000: ABB ALSTOM Power España S.A. (former ABB Generación) absorbs ALSTOM Hydro S.A. and ALSTOM Energía S.A.
2000: Power generation sector renamed ALSTOM Power S.A.
2001: Alstom España IB. S.A. changes its name to Alstom España IB S.L., and becomes the holding of all the Group`s companies in Spain.
2003: Alstom sells the T&D business to Group AREVA, being called AREVA T&D.
2006: ALSTOM Hydro España, S.L. is founded, and is assigned the hydro activities of ALSTOM Power S.A.
2007: Alstom acquires the Spanish company Ecotècnia Energías Renovables S.L., creating the new sector Wind.
2010: Ecotècnia Energías Renovables S.L. changes its name to ALSTOM Wind, S.L.
2010: Alstom acquires the transmissions business from Areva and creates a third sector: Alstom Grid.
2013: Merger of the companies ALSTOM Hydro, S.L. and ALSTOM Wind, S.L. into one sole company called ALSTOM Renovables España, S.L.

Milestones

1958: First hydroelectric PSP (pump and storage) technology installed by Alstom in the Valdecañas plant.
1974: Inauguration of the energy transmission facilities in San Fernando de Henares, nowadays integrated into Alstom Grid and which is the head office of Alstom Spain`s energy transmission activities.
1986: Alstom enters the energy transmission market, with the incorporation of a specific unit which offers products and services (via the company Sprecher Energie)
1989: Beginning of industrial activities of Alstom Spain following the acquisition of the centurion companies MTM, ATEINSA and MEINFESA, which had taken on the railway activities from MACOSA.
1992: The 1st high speed train at 300km/h, manufactured by Alstom, enters into service in Spain on the Madrid-Seville line.
1994: Inauguration of the industrial plant for rolling stock and railway equipment in Santa Perpètua de Mogoda, close to Barcelona.
1998: Creation of Alstom with its current image and logo, and consequently Alstom Spain.
2000

- The consortium led by Alstom is awarded a contract for the 1st tramway turnkey project in Spain in Barcelona (Trambaix).
- Alstom`s manufacturing site in San Fernando de Henares supplies the first mobile substation
Alstom in Spain

Projects and References

2004
- From 2000-2004, 127 Citadis tramway were contracted for the Spanish market in the cities of Barcelona, Tenerife and Madrid.
- First contract in Spain for automatic metros Metropolis (Series 9000) for Line 9 of Metro Barcelona.
- First substation 2x25 in Spain. HSL Madrid-Barcelona

2005:
- Alstom’s manufacturing site in San Fernando de Henares supplies the first mobile substation for exports in the energy transmission division, going to Saudi Arabia.

2006
- Alstom celebrates the 150th anniversary of the founding of centurion railway companies, La Maquinista Terrestre y Marítima, S.A. (MTM) and Material y Construcciones, S.A (Macosa), the origins of Alstom Spain’s industrial presence.
- Installation and commissioning of the largest interlocking system ever contracted by ADIF in Chamartin Station in Madrid, supplied by Alstom with the technology Smartlock 300.
- The combined cycle plant in Cartagena (3x425MW) is built and commissioned in the record time of 24 months and 12 days, 9 weeks ahead of schedule.

2007
- Creation of IRVIA MANTENIMIENTO FERROVIARIO S.A. between Alstom Transporte S.A. and Renfe. The objective of this joint venture is to carry out maintenance services of the trains and railway installations.
- Between 2003 and 2007, 115 modular trains Civia are contracted by Renfe.
- Alstom acquires the Spanish company Ecotècnia Energías Renovables S.L., creating the new sector for wind power.
- Implementation of “oil-free” technologies in the hydroelectric plant of Doiras (Groups I & II), the first reference in Spain for this type of technology.

2008
- Installation for the first time in Spain of the Hydrostatic water guide bearings in the hydro plant of Doiras and Contreras (2009)
- Installation of the Lead Unit for the MXL2 upgrade in the combined cycle power plant of Castejon I, Navarre
- Creation of the Services unit at the energy transmission division in San Fernando de Henares.
- Commissioning in record time of the new Gas Insulated Substation (GIS) 220kV substation for Maragall in Barcelona following its destruction during a fire in June 2007.

2009:
- Installation of the 1st commercial wind farm with ECO 100 in Le Vieux Moulin, France.
- Alstom creates an Innovation Chair for railway technology and clean energy with the Universidad Politécnica de Catalunya (UPC)

2010
- Alstom acquires the transmissions business from Areva and creates a new business unit for electricity transmission. Alstom Grid is born which integrates all types of products and services (electrical grids, smart grids, automation solutions, substations, etc).
- Signature of frame agreement with Red Eléctrica de España (REE), which converts Grid in REE’s main product supplier (Circuit breakers, switches).

2011: 2012
- Celebration of the 20th anniversary of high speed train in Spain on the Madrid-Seville line, where Alstom trains reach the best reliability and availability rates for high speed in Spain.
- Signalling contract for the high speed train line Albacete-Alicante within a public-private partnership scheme (PPP), a first for Spain.
- Since 1998, Alstom has supplied and put into service more than 150 interlocking systems.
- Inauguration in Saint Nazaire, France of the first wind turbine Haliade 150, the largest offshore turbine in the world with a blade diameter of 150m, developed by Alstom Wind’s R&D centre in Barcelona.
- Installation for the first time in Spain of the hydroelectric technology “Generator oblique elements” in the plant La Muela (currently under construction).
- Alstom Spain and UPM (Polytechnic University of Madrid) create a Chair for Innovation in railway infrastructure and smart grid management.
Alstom in Spain

Projects and References

2014

- New HQ Alstom in Spain and Alstom transport in Madrid
- New security and signalling laboratories for Alstom transport in Madrid
- Alstom Grid reinforces the centre of excellence for mobile substations located in Madrid. The Spanish facilities become a worldwide reference in the design, development and manufacturing of mobile substations.

Innovation

Alstom Spain, with 49 requests in 2013, is one of the top three patent applicant companies from Spain according to the 2013 ranking published by the European Patent Office (EPO). Together with the aerospace company, EADS, it’s the principal multinational company in Spain for R&D investment, leading the energy and railway sectors in our country through innovation and patents.

I+E Foundation:

Eight Spanish multinational companies, including Alstom, are responsible for the creation of the I+E Foundation. These companies are leaders in their respective industries and stand out for their activities and efforts in R&D, gaining significant achievements in innovation, continuous investment and R&D installations. Its main objective is to strengthen the role of multinational corporations in the growth of R&D and project execution in Spain.

Academic Chairs and commitment to universities

Alstom Spain, the UPM (Polytechnic University of Madrid) and UPC (Polytechnic University of Barcelona) engineering schools have maintained collaboration agreements for many years through various academic chairs for the promotion and research in rail technology and renewable energy.

These chairs are held in the School of Industrial Engineering of the Polytechnic University of Madrid (UPM) - Alstom Chair for Smart Grids, Infrastructure and Railway Signalling- and at the School of Industrial Engineering of the Polytechnic University of Barcelona (UPC) - Alstom Chair for Innovation in Rail Technology and Clean Energy

The main aim of both chairs is the creation of a technological platform for conducting training, research and knowledge transfer in order to increase and strengthen the necessary collaboration between universities and industry.

With these academic chairs, Alstom also contributes to specialist training in matters related to the energy sector, from a professional and complementary point of view of the education received at the universities. The scholarship program developed by Alstom in both technical schools becomes, in turn, a doorway to the job market.

Besides these two research chairs, Alstom Spain, has agreements with the countries major universities, (UPC, UPM, Carlos III, Deusto, Jaen, Seville, etc...) and has several scholarship programs aimed at final year students, who have been able to put their knowledge into practice at Alstom facilities throughout Spain.

Awards and Certification

Alstom Spain

Projects and References

Power Generation

Finished Projects

Combined Cycle Power Plant (CCPP)
- Cartagena (Murcia): 1200 MW: 3 x 400 - Plant uses 3 gas turbines model GT26.
- Sant Adrià del Besòs (Barcelona): 800 MW: 2 x 400 - Plant uses 2 gas turbines model GT26
- San Roque (Cádiz): 800 MW: 2 x 400 MW - Plant uses 2 gas turbines model GT26
- Son Reus (Mallorca): 775 MW: 3 x 225 - Plant uses 3 gas turbines model GT8C
- Soto de Ribera IV (Asturias): 400 MW: 2 x 400 - Plant uses 2 gas turbine model GT26
- Málaga: 400 MW: 1 x 400 - Plant uses 1 gas turbine model GT26
- Soto de Ribera V (Asturias): 400 MW: 1 x 400 / Plant uses 2 gas turbine model GT26

Hydro References
- Doiras hydro power plant (Asturias): 2 generators x 24 MVA; refurbishment 2 FV turbines x 20.1 MW (application of water guide bearings)
- Contreras hydro power plant (Burgos): 1 generator x 15 MVA; refurbishment 1 FV turbine x 15 MW (application of water guide bearings)
- Frieira hydro power plant (Galicia): 1 x 18,3 MW turbina FV-generator
- La Muela II (Valencia) pumped storage plant: 4 motor-generators x 216 MW / 240 MVA - 840 m long and 5.45m diameter penstock

Wind references
- Coll de la Garganta (Tarragona): 13 units of ECO 74 (74 meter rotor and 1.67 MW output per unit) – 22 MW
- El Castre (Palencia): 16 units of ECO 80 (80 meter rotor and 1.67 MW output per unit) – 26.7 MW
- Veciana (Barcelona): 18 units of ECO 80 – 30.1 MW
- Cruz de Carretero (Palencia): 25 units of Eco 80 – 41.7 MW
- Fuente Salada (Burgos): 29 units of Eco 80 – 48.4 MW
- La Rabia (Cádiz): 13 units of Eco 80 – 22 MW
- Sierra Lácera (Murcia): 23 units of Eco 80 – 38.4 MW
- Loma Viso (Albacete): 1 unit of ECO 110 (the world’s most powerful onshore wind turbine: 110 meter rotor and 3 MW output per unit) – 3 MW

Desox plants
- Compostilla Grupo 3 (León): 350 MW – Client: Endesa
- Los Barrios (Cádiz): 550 MW – Client: Endesa
- Litoral de Almeria 1 – 550 MW – Client: Endesa

Service solutions references -Operation and maintenance contracts
- CCPP Málaga: 1 x 400 MW
- CCPP Cartagena (Murcia): 3 x 400 MW
- CCPP Sant Adrià del Besòs (Barcelona): 2 x 400 MW
- CCPP San Roque (Cádiz): 2 x 400 MW
- CCPP Castejón I & III (Navarra): 2 x 400 MW
- CCPP Soto de Ribera IV (Asturias): 1 x 400 MW
Projects and References

Railway Transport

Finished Projects

Rolling Stock
- Barcelona tramway, Trambaix & TramBesòs – Customer ATM
- Madrid tramways (Parla, MLO, ML) – Customer Ayuntamiento de Parla, Mintra
- Tenerife tramway – Customer Metropolitano de Tenerife
- Jaén tramway – Customer Junta de Andalucía
- Murcia tramway – Customer Municipality of Murcia
- Metro Barcelona Series 9000 – Customer TMB
- Commuter trains S213 – Customer FGC
- Commuter trains CIVIA II, III y IV – Customer RENFE
- High speed trains Lanzaderas S104 & S114 – Customer RENFE
- Traction system S121, S120 and S120.50 – Customer RENFE
- Very High Speed Trains S100 – Customer RENFE

Tramway infrastructures
- Barcelona Tramway - TramBaix y TramBesòs
  Customer ATM LRV Systems, 30km track and maintenance over 25 years
- Parla Tramway
  Customer: Ayuntamiento de Parla - LRV Systems, 8.3 km track
- Granada Tramway Installation
  Customer: Junta de Andalucía - Installation of electrification and catenary – LRV Systems, 15.9 km track
- Jaén Tramway
  Customer: Junta de Andalucía - Electrification, signalling and communication systems - LRV Systems, 4.7 km track

Track infrastructures
- High Speed Train tunnel Orense-Santiago
  Customer: Adif – Installation of civil protection and safety system

Substations
- High speed line Madrid-Zaragoza-Barcelona-French Border - Stretches Madrid-Lérida / Lérida Barcelona
  Customer ADIF - Supply, installation and maintenance of 8 electric substations with traction 2x25 kV and 38 associated autotransformer centres (supply of electrical equipment for 5 substations and 16 autotransformer centres)
- High speed line Cordoba – Malaga – Stretch Cordoba-Bobadilla and Bobadilla-Malaga Station
  Customer ADIF - Supply, installation and maintenance of 3 electric substations with traction 2x25 kV and 12 associated autotransformer centres.
- High speed line Madrid-Levante
- Line 5 from Metro Barcelona (TMB)
  Customer GISA - Renovation and energy output increase (de 1200 Vcc to 1500 Vcc) for 8 traction substations and the construction of 1 substation of 1500 Vcc.
- Electric substation in San Sadurní de Noya
  Customer ADIF - Restoration and energy output increase 3000 Vcc

Catenaries
- High speed line Madrid-Segovia and Valdestillas-Valladolid
  Customer: ADIF - Supply and installation of 2 x 100 km catenary 2x25 kV – 350 km/h
- Rigid catenary and urban commuter train tunnels in Barcelona
  Customer ADIF - Supply, installation, commissioning and guarantee for 50 km of catenary
Projects and References

- **Rigid catenary for reduced gauge on L9 Metro Barcelona**
  Customer TMB - Electrification of the tunnel for L9 between Bon Pastor and Cam Zam. Detailed engineering, supply, installation and commissioning of 10 km of catenary.

- **Mallorca commuter train line Palma-Inca-Sa Pobla-Manacor**
  Customer SFM - Installation of 70 km of hybrid catenary CR 160 – CR 220 on the stretch Son Rullan - Enllaç

- **Conventional Electrification of Montcada station**
  Customer SEITT – Renovation of 20km of catenary CR-160 at the Montcada Bifurcación station.

**Infrastructure Maintenance**

- **High Speed Train Line Madrid-Valladolid**
  Customer ADIF - 4 years maintenance with an option for a further 2 years covering the electrification installed (LAC + SSEE), 169 km of double track

- **High Speed Train Line Olmeda–Medina**
  Customer ADIF - 4 years maintenance with an option for a further 2 years covering the electrification installed (LAC + SSEE), 24 km of single track

- **Workshop de RENFE INTEGRA**
  Customer RENFE – Maintenance of track and catenary of RENFE INTEGRA´s workshop (5 Lots)

**Interlocking**

- **Smartlock 200**

- **Smarlock 200**
  Customer FEVE – Interlocking for the stretch Muros-Cudilleno

- **Smartlock 300**
  Customer ADIF - Monforte de Lemos, Soto de Rey, Cartagena–Los Nietos, Chamartin station

- **Smartlock 300**
  Customer FEVE – Interlocking for the stretch Orgo-Carranza

**Urban signalling**

- **Barcelona Tramway**
  Customer ATM - Trambaix / Trambesòs, 1 Smartlock in Depot - Interlockings on line - Point motor – track circuit, Signals, SAE + radio, Integration PCC

- **Madrid Tramway**
  Customer Mintra and Metro de Madrid - 7 Smartlock, 3 lines (Colonia Jardín-Boadilla, Colonia Jardín-Pozuelo, Pinar de Chamartín-Sanchinarro-Las Tablas)

- **Malaga Metro**
  Customer Junta de Andalucía - URBALIS EVOLUTIONTM System in ATP / ATO with "distance to go" free propagation radio transmission, Smartlock interlocking 400 with object controller Smart I/O., Integrated Control Centre through the ICONIS TM with traffic regulation

- **Tren-Tram Chiclana-San Fernando**
  Customer Telvent - Signalling and fix communications

**ERTMS**

- **Train On-board equipment: S100, TAV S104, S114, AVRIL G3, CIVIAS, Mecca-Medina Talgo,TAV-S104**
  Customer Renfe - 239 on-board equipment sets in service

- **ERTMS Level 1 Zaragoza-Huesca**
  Customer MIFO - Number of LEUs: 30, Fixed/variables eurobalises : 274, Interlockings: 10

- **ERTMS Level 1 Girona–Figures**
  Customer ADIF - Interlocking (IXL), Installation of a 3rd rail to operate with Iberian and UIC gauge, ATLAS solution for ERTMS

- **ERTMS Level 1 Castellbisbal–Can Tunis**
  Customer ADIF - Interlocking (IXL), adjustment of the signalling for the section Castellbisbal-Can Tunis-Puerto de Barcelona to operate with two track gauges and ERTMS level 1.

---

Alstom Spain, December 2014 - Andres López Morancho – andres.lopez-morancho@crn.alstom.com
Alstom in Spain

Projects and References

- **ERTMS Level 1 Castellbisbal/Papiol-MolletSan Fost**
  Customer Adif – Adaptation of line to make it suitable for traffic running on international and Iberian gauge.

- **ERTMS Level 2 - Albacete-Alicante**
  Customer Adif - Contract awarded for high speed line by Adif in a PPP (Public Private Partnership) scheme.

- **High speed line Madrid-Levante (Alpera variation)**
  Adaptation of infrastructure (laying and connection of cables) for the installation of interlocking. Train protection system, telecommunications and central traffic control.

Main ongoing projects

**Rolling Stock Maintenance**

- **Suburban trains S450, S451, S447 & CIVIA**
  Customer RENFE - In collaboration with a consortium with RENFE – Sites: Barcelona, Madrid

- **Very high speed trains S100 “AVE”**
  Customer RENFE – 24 trains - Sites: La Sagra (Toledo) & Cerro Negro (Madrid)

- **High speed trains S104 and S114**
  Customer RENFE – 15 + 13 trains - Site: La Sagra (Toledo)

- **High speed locomotives S-252**
  Customer RENFE – 14 locomotives - Site: La Sagra (Toledo) and Cerro Negro (Madrid)

- **Barcelona tramway**
  Customer ATM - 18 units TRAMBESÒS in Sant Adrià del Besòs / 23 Units TRAMBAIX in Sant Joan Despí (Barcelona)

- **Adaptation of VHST Series 100 for Madrid-Paris corridor**
  Customer RENFE – S100 – Site: La Sagra (Toledo)

- **Citadis tramway in Madrid and Parla**
  Customer Metro, Ayuntamiento de Parla – Site: customer sites

- **Metro Barcelona series 9000**
  Customer TMB – 40 units – Site: customer site

- **Traction system S112, S120 and S120.050**
  Customer CAF – 29 + 12 + 16 units – Site: Madrid + Barcelona

- **Citadis tramway in Jaén**
  Customer Junta de Andalucía – 5 units – Site: customer site

- **Adaptation of commuter train fleet to improve accessibility**
  Customer RENFE - Site: Valladolid

**Electrification and Turnkey Projects**

- **Conventional line in Barcelona**
  Customer Adif – Remote SCADA for LAC in Barcelona

- **Power system – Pajares Bypass HSL**
  Customer Adif - Construction and maintenance of the power system for the new 44.3 km high-speed line: catenary system, 2x25kV traction substation and autotransformer stations including associated traction power control system. This line includes Pajares Tunnel (25 km-long), the second longest tunnel in Spain

- **Tunnel safety and security systems- Pajares Bypass HSL**
  Customer Adif - Supply and maintenance of safety and security systems for 12 tunnels of the new Madrid-Asturias high speed line, including the 25 km-long Pajares bypass tunnel.

**Signalling**

- **ERTMS Level 2 - Madrid-Asturias high-speed line**
  Customer Adif – 310 km of new high speed
Alstom in Spain
Projects and References

Grid

Finished Projects

High Voltage Projects

Supply of high voltage circuit breakers for 24 kV to 420 kV (frame agreements with the main utility companies)
- 100% Frame Agreement with Iberdrola: Circuit Breakers 72,5 kV (2011 -2013)
- 50% Frame Agreement with Iberdrola: Circuit Breakers 24, 36 and 145 kV. (2011-2013)
- 50% Frame Agreement with Red Electrónica España (REE): Circuit Breakers 245/400 kV (2011 -2012)
- 50% Frame Agreement with Endesa: Supply, installation and commissioning of Automatic Circuit Breakers SF6 for the Spanish mainland, Balearic and Canary Islands.

Supply of high voltage disconnectors for 36 kV to 420 kV (frame agreements with the main utility companies)
- 35% Frame Agreement with REE: Disconnectors (2011 -2012)
- 70% Frame Agreement with Gas Natural Fenosa: Disconnectors (2012 – 2015)

Supply of hybrid compact switchgear (frame agreements with the main utility companies)
- Supply to REE of 5 hybrid compact switchgear 145kV for mobile substations on Balearic and Canary Islands.
- 60% Frame Agreement with Endesa: Hybrid Compact Switchgear in SG6 145 kV (2011 – 2013)
- 50% Frame Agreement with Endesa: Disconnectors 245 kV for REE substations

100% Frame agreement with Endesa to supply generator circuit breakers

Pilot project for Endesa for optical transformers on the mainland

Disconnector project for power plants all over the island for Endesa

Commissioning of transformer of 400/132/25 kV 315 MVA for boilers from Endesa

Network Systems Engineering

- Plana del Vent (Tarragona) 400 kV SF6 Gas Insulated Substation to evacuate power from the Combined-Cycle Station
  Protection and control systems, telecommunications and auxiliary services
- Maragall (Barcelona) Rebuilding of the SF6 Gas Insulated Substation after a fire
  Building remodelling, protection and control systems, telecommunications and auxiliary services with supplies and commissioning
- Escatrón (Zaragoza) Standard 400 kV Substation to evacuate power from the Combined Cycle Station
  Civil works, protection and control systems, a 400 kV evacuation line up to connection with the Power Grid substation and powering the auxiliary services by a 132 kV SF6 Gas Insulated Substation
- Zona Franca (Barcelona) 220 kV SF6 Gas Insulated Substation
  Including protection and control systems, telecommunications and auxiliary services
- Barcelona Port (Barcelona) 220 kV SF6 Gas Insulated Substation to evacuate power from the Combined-Cycle Power Plant
  Including protection and control systems, telecommunications and auxiliary services
- 10 Condenser batteries at 220 and 400 kV of 100 MVAR
  Civil works, protection and control systems, telecommunications, auxiliary services and connection to existing standard substations
- 4 66-132 kV Mobile Substations
  Protection and control systems and auxiliary services
- 5 45 kV Substations in containers
  Protection and control systems and auxiliary services
- 4 45/20 kV Mobile Substations with a 15 MVA transformer
  Protection and control systems and auxiliary services
- 2 55 kV Mobile Substations with a 15 MVA transformer
  Protection and control systems and auxiliary services
Alstom Spain

Projects and References

- **3 220 kV Mobile Substations**
  Protection and control systems, telecommunications and auxiliary services

- **2 132-66/25-20-15 kV Mobile Substations**
  Protection and control systems, telecommunications and auxiliary services

- **Desalination Plant Aguilas (Murcia):** Customer Acuamed: Turnkey substation including protection and control systems and connection to the electricity grid of this plant (Murcia)

- **Turnkey 66 kV SF6 Gas Insulated Electric Power Substation for the new data processing centre in Tres Cantos-Madrid**
  Customer BBVA, including protection and control systems, auxiliary services and 5 year maintenance contract.

- **2 Turnkey 55 kV SF6 Gas Insulated Electric Power Substations (2) for the new data processing centre**
  Two 20 MVA transformers in Santander for BSCH - Protection and control systems and auxiliary services

- **2 GIS F35-4 of 145 kV** - supply and installation for Abera and Bescano substations

- **80% Frame Agreement with Iberdrola for GIS – Gas Insulated Substation 72 kV (2011 – 2012)**

- **100% Frame Agreement with Gas Natural Fenosa for GIS F-35 Gas Insulated Substation 66 kV and 132 kV. (2012 a 2014)**

- **80% Frame Agreement with REE for GIS – Gas Insulated Substation 66 kV (2012 – 2015)**

- **40% Frame Agreement with REE for GIS - Gas Insulated Substation 220 kV (2012 – 2015)**

- **Nueva Escombreras for REE – Cartagena (Murcia): Extension of 400 kV gas insulated substation GIS 400 kV model T155.**

**Services**

- **Maintenance contract for high-voltage switches** - Repsol

- **Modernisation of the Gas Insulated Substation (GIS) substation** at thermal power plant of Teruel for Red Eléctrica de España and Endesa

- **Repair of Power Transformer** - Aluminium manufacturing plant – Avilés (Asturias)

- **Extension of the type 212 Gas Insulated Substation** - Urgell (Barcelona)

- **Retrofit modification of Measurement Transformers** - Gas Insulated Substation – Alcudia (Majorca)

- **Review and spare parts for Generator Switches** – Gas Generation Plant – Ciudad Real

- **Supply of strategic parts to REE** for GIS B105-1, B105-3 and T155 substations

- **Review and maintenance for 20 years for Endesa** of GIS 400 kV in Thermal Plant Compostilla

- **Review and maintenance for 20 years for Endesa** of GIS 400 kV in Hydroelectric Plant Sallente

- **Retrofit Generator Switches** for Hydro plant in Aguayo. Customer: EON

**Automation**

- **100% Frame Agreement with Endesa:** Protection relays Micom PS45 and circuit breakers protections Micom P143 - REE standards compliance (2011 – 2016)

- **Turnkey Substation Control System (DS Agile) and Protection System (MICOM).** Engineering, manufacturing and commissioning of High-Speed Railway from Albacete to Alicante

**Ongoing Projects**

- **Pola de Gordon**. Substation GIS 400kV model T-155 for REE

- **EON (Spain):** Mobile substation 132-55 kV with transformer 132-55 / 30-20-12 kV 20 MVA. Mobile substation 30-20-12 kV.

- **Alcudia** – Retrofit GIS S105 245kV, Client REE
Alstom in Spain

Projects and References

International References

Alstom Spain has contributed to the following international references:

Wind Farms

- **Akhfainir (Morocco)**: 61 units of ECO 74 (74 meter rotor and 1.67 MW output per unit) – 102 MW
- **Ashegoda (Ethiopia)**: 54 units of ECO 74 – 90 MW
- **Maesgwyn (United Kingdom)**: 13 units of ECO 80 2.0 (80 meter rotor and 2 MW output per unit) – 26 MW
- **Valée du Moulin (France)**: 10 units of ECO 100 (100 meter rotor and 3 MW output) – 30 MW
- **Senkoy (Turkey)**: 9 units of ECO 100 – 27 MW
- **Whitelee (United Kingdom)**: 69 units of ECO 100 and 6 units of ECO 74 – 217 MW
- **Muuko (Finland)**: 7 units of ECO 110 (110 meter rotor and 3 MW output) – 21 MW
- **Le Carne (France)**: 1 unit of Haliade (offshore wind turbine with an 150 meter rotor and 6 MW output per unit) – 6 MW
- **Ostende (Belgium)**: 1 unit of Haliade (offshore wind turbine with an 150 meter rotor and 6 MW output per unit) – 6 MW
- **Higashi izu II (Japan)**: 11 units Eco 74 -1.67MW
- **Kawazu (Japan)**: 10 units Eco 74 -1.67MW
- **Hamada (Japan)**: 29 units Eco 74 -1.67MW
- **Gimnyeong (Korea)**: 10 units ECO 110 3 MW
- **Lotnisko (Poland)**: 30 units ECO 110 3MW. SCADA2 remote control system.
- **Hartelkanaal (Holland)**: 8 units ECO 110 3 MW

Hydro Power Plants

- **Buyukduz (Turkey)**: 2 groups of 26 MW/MVA PV-turbine generator units
- **Beyhan (Turkey)**: 2 groups of 35 MW/MVA Francis Vertical (FV) turbine generator units
- **Cevizlik (Turkey)**: 2 groups of 56 MW/MVA FV-turbine generator units
- **Gavet (France)**: 2 groups of 50 MW/MVA FV-turbine generator units
- **Angostura (Chile)**: 1 group of 45 MW/MVA FV-turbine generator units
- **Chutes de l’Imperatrice (Gabon)**: 4 groups of 18 MW/MVA Kaplan Horizontal (KH) generator units
- **Chutes FE2 (Gabon)**: 3 groups of 18 MW/MVA Francis Horizontal generator units
- **IVELAND II (Norway)**: 1 turbine Francis vertical (50 MW),
- **Devoll (Albania)**.
- **Harjavalta (Finland)**. New generator 25 MVA/ 187.5 rpm e

Railway Transport

- **Rabat Tramway (Morocco)** - Citadis tramways
- **Oran and Constantine Tramways (Algeria)** - Citadis tramways
- **Shanghai Metro (China)**
- **Washington Metro (United States of America)**
- **London Underground (United Kingdom)**
- **Santo Domingo Metro (Dominican Republic)** - Lines 1 and 2
- **Panama Metro (Panama)**
- **Lima Metro (Peru)**
- **Nottingham Tram (UK)**
- **Santiago Chile Metro – Modernization (Chile)** - 35 metro trains, composed of seven cars each
High Voltage Products

- **Ethiopia:** Supply of high voltage equipment: circuit breakers, disconnectors and measurement transformers for 6 substations for customer EEPCO.

Power Transmission Systems

- **Venezuela:**
  - 4 mobile substations 110/13.8 kV Mobile substations with a 40 MVA Transformer, including protection and control systems and auxiliary services for Customer PDVSA (Petróleos de Venezuela)
  - 2 mobile substations 69/13,8 kV MVA mobile substations for PDVSA
  - 1 mobile substation 34.5 /0,48 kV 42 MVA with transformer for PDVSA

- **Sweden:** 170-50 kV Mobile Substation with a 35 MVA Transformer for Customer E-ON

- **Morocco:** Supply of 72,5 / 245 kV high voltage switches

- **Republic of Angola:**
  - Floating Power Plant: supply of a turnkey substation, including protection and control systems, installed in a container and placed over a non-propelled pontoon
  - 2 Substations GIS 220 kV and 66 kV – disconnectors for 245 and 72,5 kV. Client Elecnor.

- **USA:** Mobile substation GIS 145 Kv for Dominion Virginia Power.

- **Ireland:** Mobile substation GIS 220 Kv for ESB International

- **Colombia:** 4 mobile substations 110 kV, for Electricaribe (Gas Natural subsidiary in Colombia)

- **Ethiopia:** Contract to supply and manufacture equipment for the Ethiopian Utility (EEPCO, including equipment for 6 x 230 kV substations. Client CYMI (ACS Group).