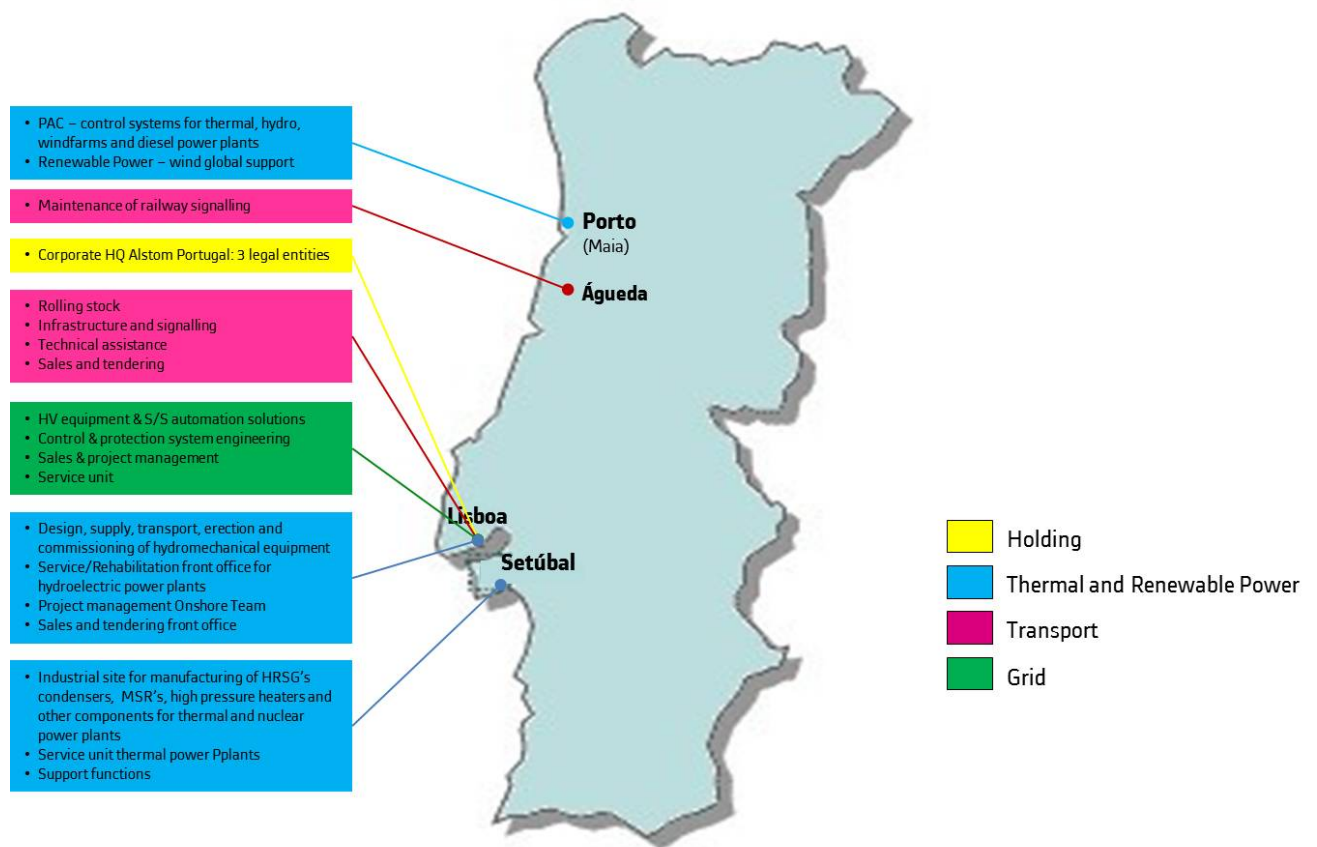


## Alstom in Portugal

Over 65 years contributing to economic and industrial development in Portugal



### Alstom's Presence



#### Key data for Alstom Portugal

- Employees: 265 - status 31<sup>st</sup> March 2013
- Sales: 2012/2013: 44 M€; Exports: 60,7%
- National HQ Alstom Portugal in Lisbon
- Industrial and commercial presence of all activities of Alstom Group
- 4 working sites
- 1 industrial site
- 1 maintenance workshop for railway signalling
- 3 legal entities: Alstom Portugal, S.A., Alstom Energias Renováveis Portugal, S.A. and Alstom Grid Portugal, S.A.



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### History

Alstom Portugal, as part of the International Alstom Group, has a long-lasting history in the Portuguese industry, being the heiress of big Portuguese companies in the field of energy and transport. After several merger and acquisition processes throughout the years, those companies now form part of Alstom Portugal. The origin and the chronology of key events, until the given day, are reflected on a journey dating back to 1948:

- 1943:** Establishment of SOREFAME (JV with % Alstom)
- 1948:** Establishment of Alstom in Portugal (Alstom Portugal Lda)
- 1952:** Establishment of MAGUE
- 1978:** Acquisition of 21% of Mague by BBC
- 1988:** Worldwide merger ASEA/BBC into ABB
- 1990:** SENETE Group is established (40% ABB; 40% MAGUE; 20% IPE)
- 1994:** ABB acquires 100% of the SENETE Group
- 1999:** ABB transfers Power Generation business onto ABB ALSTOM POWER
- 2000:** Alstom acquires ABB ALSTOM POWER
- 2001:** Integration of Alstom's activities in Portugal into Alstom Portugal
- 2002:** Merger of Alstom legal entities into Alstom Portugal, S.A.
- 2005:** Concentration of Alstom Portugal Operations in Setúbal
- 2006:** Alstom sells its T&D business to Areva
- 2006:** Transfer of Hydro business to Alstom-Bouygues JV with the creation of a new legal entity in Portugal: Alstom Hydro Portugal
- 2010:** Merger by incorporation of Alstom Hydro Portugal into Alstom Portugal, SA, creating the Hydro business Area
- 2010:** Merger by incorporation of EcotècniPort into Alstom Portugal, SA, creating the Wind business Area
- 2010:** Transmission business acquired to Areva becomes Alstom Grid Portugal
- 2013:** Establishment of a new legal entity, ALSTOM Energias Renováveis Portugal, SA, (demerge from Alstom Portugal, SA)

### Main events 2012/2013

- 2012:** 17<sup>th</sup> April: Announcement of the **Expansion project of Alstom industrial site in Setúbal**, with nuclear as the new manufacturing hub for Moisture Separator Reheaters (MSR), an essential component of the conventional island in nuclear power plants. The Ceremony was chaired by Minister of State and Foreign Affairs joined by AICEP's President and Alstom executives.
- 2013:** 23<sup>rd</sup> January: **Alqueva II Hydro Power Plant, officially inaugurated** by the Portuguese Minister of Environment, Agriculture, Sea, and Spatial Planning. The project set to double the existing plant's capacity to 520 MW was completed in December 2012.
- 2013:** Early February: **Alstom Portugal chosen to integrate "Choose Portugal"** the promotional video launched by AICEP (Portugal's Agency for Foreign Investment and Trade ruled by Ministry of Foreign Affairs) focused on the promotion of Portugal abroad, portrays Portugal as a welcoming, modern, sophisticated, innovative, full of talent and with good investment opportunities. The video is available in 5 languages: Portuguese, English, Spanish, French and Mandarin - [www.portugalglobal.pt](http://www.portugalglobal.pt)
- 2013:** Early April: **Alstom Portugal invited to join the Advisory Board of AICEP** (Portugal's Agency for Foreign Investment and Trade).
- 2013:** 9<sup>th</sup> July: **R&D project SIEF** (Integrated System of Reliability for Railway Equipment) – Alstom unveiled a brand new technology which aims to detect and prevent technical failures on trains, in order to increase safety, reduce maintenance costs and increase fleet availability. The public ceremony took place in Contumil – Porto, North Portugal.
- 2013:** 16<sup>th</sup> July: Filming session and interviews conducted by Alix Le Bourdon from **France 24TV Channel**, at the **Alqueva Power Plant** reporting on Portugal which uses renewable resources to produce 70% of the country's power capacity – <http://www.france24.com> L'Europe dans tous ses États.
- 2013:** June: the **Expansion project** of the industrial site in **Setúbal is successfully concluded**.
- 2013:** July: **EDF** (Electricité de France) **Audit qualified the industrial site in Setúbal** for the manufacturing of Heat Exchangers, Condensers, MSR's (Moisture Separators Reheaters) and High Pressure Heaters for Nuclear Power Plants.



## Alstom in Portugal

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### Partnerships with Universities

With the aim of promoting the transport and power industry within high education level establishments so as to facilitate the potential recruitment of the most talented graduated students, Alstom signed several cooperation agreements with the main Portuguese Universities:

- **Instituto Superior Técnico de Lisboa (IST)** aggregates excellence in the fields of Transport systems technologies, analysis and policies, Energy and Aeronautics; Seminars and Conferences held with Alstom's regular participation. Alstom Portugal is the main sponsor for local BEST (Board of European Students of Technology) initiatives.
- **Science and Technology faculties of Universidade Nova de Lisboa (FCT/UNL):** Centre of excellence in robotics, telecommunications, technology assessment, infra-structure construction, computer networks.
- **Universidade do Minho (UM):** Centre of excellence in the fields of Polymer Engineering and Science.
- **Instituto de Telecomunicações Universidade de Coimbra (IT/UC):** Centre of excellence in Power Electronics and Power Systems.
- **Engineering faculty of Universidade do Porto (FEUP):** Centre of excellence in Mechanical Engineering, Industrial Engineering and Management, Civil Engineering, Electrical and Computers Engineering, Informatics and Computing Engineering.
- **Universidade do Algarve:** Seminars and Conferences held with Alstom's regular participation.

### Partnerships with Business Associations

- **COGEN Portugal:** Portuguese Association for the promotion of energy efficiency and cogeneration – non-profit entity, whose objective is to promote the efficient use of energy through cogeneration or through decentralized energy production, whatever the source of energy used.
- **COTEC Portugal:** Business Association for Innovation – non-profit business association, headed by Portuguese President and having the support of Prime Minister and a group of companies established in Portugal, whose mission is: “promoting the competitiveness of companies established in Portugal, through the development and the diffusion of a culture and a practice of innovation as well as of knowledge, especially that generated in the country”. Currently, Alstom Portugal has a seat in the Advisory Council for Innovation.
- **CCILF:** Portuguese-French Chamber of Commerce and Industry – Alstom Portugal became a member of CCILF some years ago. Most recent initiatives focused on Wind and Smart Grid/Smart Cities.
- **ANEME:** National Association of Metallurgical and Electromechanical Companies – non-profit nationwide employers' association that aims to defend the legitimate rights and interests of their member companies, provide assistance and support to their associated companies and promote and encourage the training and development of human resources. Alstom Portugal appointed as Board Member of ANEME for the triennium 2013-2015.

### Corporate Social Responsibility

Under its policy of Corporate Social Responsibility Alstom Portugal has been participating in several initiatives:

- 2009: Interior design and rail sub-systems:** With the support of AICEP (Portugal's Agency for Foreign Investment and Trade), EMEF (maintenance of railway equipment company) and Efacec, some Portuguese companies were challenged to promote their technological and development capabilities, especially with regard to interior design and rail sub-systems, aiming the creation of a cluster of suppliers to the railway industry. In partnership with Porto University some students developed the interior design project for the Portuguese high speed train. The winners were given scholarships to work in Alstom's facilities in Barcelona and Paris.
- 2011: Food bank campaign:** food collected at our manufacturing unit in Setúbal for charities
- 2011: “Part of us”, volunteer initiative:** as a partner of EDP, Alstom employees joined 1<sup>st</sup> initiative in upgrading pediatric and maternity wards in 12 hospitals, painting, gardening and small repairs; simultaneously an awareness campaign for the need for blood and bone marrow donations took place.
- 2012: Social infrastructure project:** Launched by REN (Redes Energéticas Nacionais, SGPS, SA).
- 2012: “Prettier Setúbal”** Setúbal City Council campaign: re-qualification and painting intervention of public spaces
- 2012: Galp Energia - Alliance for Road Safety:** Alstom's employees driving behavior assessment (volunteer initiative).

## Alstom in Portugal

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**2012: "Part of us" volunteer initiative:** as partner of EDP, Alstom Portugal's employees participated in the removal of invasive non-native species and fast-growing trees in forests throughout the country.

**2013: "Part of us" volunteer initiative:** New EDP invitation to take care of Forests and Beaches; actions took place in June.

**2013:** Alstom welcomed some students for a **Technical Vocational Course in metals treatment following a partnership with the Ministry of Education**. The program was set to take 2 years and will see students split their time between the school and Alstom's factory. The opening ceremony held on September was chaired by the Minister of Education and Science.

## Awards and Certification

- **Quality Management System LRQA ISO 9001: 2008**
- **H&S Management System LRQA OHSAS 18001: 2007**
- **Environment Management System LRQA ISO 14001: 2004**
- **Statement of Compliance of the Port Facility ISPS Code N° IMO: PTSET0002**
- **Boilers & Power Piping ASME S STAMP**
- **Boilers & Pressure Vessels National Board of B & PV I – NB mark and authorization to register**
- **Pressure Vessels: ASME U Stamp**
- **Boilers & Pressure Vessels TÜV SUD, LRQA PED 97/23/EC, AD 2000-Merkblatt HPO; TRD 201; EN 13445 AND EN 13480, EN 12952**
- **Boilers RUSSIAN GOST-R, certificate of Conformity**
- **Steel Structures Welding GSI SLV Duisburg EN 1090**
- **Steel Structures Factory Production Control GSI SLV Duisburg EN 1090**
- **Mech. Lab., Accreditation IPAC ISO/IEC 17025:2005**

## R&D Projects

- **SITEM:** Integrated engineering system and maintenance management of facilities and industrial equipment – project set to develop and consolidate a set of methodologies and systems engineering, maintenance management and technical improvements in the most critical equipment creating competitive advantages to companies. Project led by Alstom in consortium with CELBI, EDP, FEUP, ISQ and Portucel.
- **SIEF:** Integrated System of Reliability for Railway Equipment – this unique system, worldwide, and fully developed in Portugal aims to detect and prevent technical failures in trains, increase safety, reduce maintenance costs and increase fleet availability. Project led by Alstom co-funded by Alstom partners, by European funds and QREN (NSRF) developed in partnership with ISQ, MIIT and with EMEF 's (Railway maintenance company) cooperation.
- **LighTRAIN:** The project seeks to develop innovative solutions in passenger trains with structural floor panels in aluminum aiming at weight reductions and increased fatigue performance as a means to reinforce their sustainability. Project led by Alstom being developed by a group of partners including R&D organizations (IST, ISQ, INEGI) and companies such as EMEF and Quantal.

### Projects and References – Thermal and Renewable Power

#### Finished Projects

##### **New Equipment for Thermal Power Plants**

- **EDP Setúbal** – 4x250 MW; **EDP Sines** – 4x300 MW; **Tejo Energia** – Pego 2x300 MW; **EDP Carregado** 4x125 MW
- **Soporgen** Co-generation Plant – 1xGT10B=24 MW; 1xGT10B + ST VAX - 24+30=54 MW; **Energim** Co-generation Plant – 1xGT100=44 MW

##### **Environmental Control Systems**

- **Conversion to low Nox combustion:** Portucel Cacia, Tejo Energia - Pego 1 and Pego 2; Borealis, Sines 1, 2, 3, 4; Galp-Leça (steam generators G and H); Hidrocantábrico – Soto de Ribera
- **Conversion to dual burning:** EDP, Carregado 5 and Carregado 6 Power Plants
- **Turnkey contract denitrification (SCR):** Sines Power Plant, Units 1, 2, 3 and 4
- **Emission Reduction of Air Pollution deSox, deNOx:** Pego Power Plant, Unit 1 and Unit 2

##### **Power Automation and Controls: Electrical installations for Wind Power Plants** (MV network, protections and auxiliary installations)

- **Cabeço da Rainha:** 20 MW – ENERNOVA/ENERCON; **Pena Suar:** 10 MW – ENERNOVA/ENERCON; **Vila Lobos:** 10 MW – ENERNOVA/ENERCON; **Chaminé:** 6,9 MW; **Portal da Freita:** 500 kW – FINERGE/ENERCON; **Caravelas:** 600 kW – FINERGE/ENERCON; **Bulgueira:** 2,2 MVA ATBERG/NORDEX

##### **Electrical & Control Systems + B.O.P.-E for Diesel Power Plants**

- **Belo Jardim** – 3x6 MW - EEG (Azores); **Vitória** – 9x4 MVA: EEM (Madeira); **Pico** – 2,5 MVA: EDA / MaK (Azores); **Cançal** – 3x15 MVA: A.I.E (Atlantic Islands Electricity (Madeira).

##### **Electrical & Control Systems + B.O.P.-E for Thermal Power Plants**

- **Solvay** (ENERGIN); **Borealis**; **Soto III** (HidroCantabrico - Spain)

##### **Control System and B.O.P. references in Hydro Power Plants**

- **Bouçã** 2x25 MW; **Salamonde II:** 1x244 MVA; **Cabril** 2x61 MW; **Agueira** 3x100 MW; **Belver U5** 1x20 MW; **Tabuaço** 2x25 MW; **Picote** 3x60 MW; **Miranda** 3x58 MW; **Bemposta** 3x70 MW; **Cançada** 2x36 MW; **Salamonde** 2x23,5 MW; **Alto Rabagão** 2x30 MW; **Vila Nova** 3x32+1x60 MVA; **Fratel** 3x50 MVA; **Carrapatelo** 3x67 MVA; **Castelo de Bode** 3x57 MVA; **Terragido** 1x1,8 MVA+2x5,2MVA; **Cabril** Aux. Unit AVR.

##### **Thermal Services: Operation and maintenance for Thermal Power Plants**

- **EDP, C.T.** Sines: O&M contract for ash systems

##### **Thermal Services: Maintenance for Thermal Power Plants**

- **DAI:** Modification for changing of boiler operation conditions
- **SOPORGEN:** Changing of HRSG operating conditions
- **REPSOL:** Supply and erection of parts under pressure in industrial boiler
- **PORTUCEL CACIA:** Fuel firing conversion in recovery boiler
- **PORTUCEL-SOPORCEL:** ESPs inspections of recovery Boiler
- **CT Sines:** Beneficiation of ESPs of the power plant
- **PORTUCEL-VIANA:** Inspection of ESP of recovery boiler
- **EDP, C.T.** Sines 314 MW: Partial overhaul of the Group
- **EDP, C.T.** Sines Tg 1-4: Forced cooling system
- **C.T. Pego,** 314 MW: Partial overhaul and diagnosis
- **GALP,** Sines 16 MW: Total overhaul with revamping

- **GALP**, Porto 23 MW: Total overhaul with remaining life assessment
- **GALP**, Porto Tg4003: Replacement of control system
- **EDP**: LTSA for maintenance of MV current transformers
- **EDP and Industry**: Distribution transformers maintenance
- **REN**: Erection and commissioning of HV circuit breakers and power transformers
- **EDP**: Overhaul and maintenance of hydro and cogeneration alternators
- **Alstom IB**: Maintenance contracts of alternators, excitation systems and transformers in combined cycle power plants
- **EDP and Industry**: Overhaul and rewinding of generators
- **EDP, Tejo Energia and Industry**: Overhaul and rewinding of MV motors in Thermal Power Plants (LTSA)
- **EDP and Industry**: Distribution transformers maintenance (LTSA)
- **Alstom Grid (Aveva)**: Erection and commissioning of HV circuit breakers
- **Alstom Spain**: Cooperation in maintenance contracts of generators and exciters, in Thermal and Hydro Power Plants, and also power transformers, in Combined Cycle Power Plants
- **C.T. Pego GTA2**: 314 MW – Partial overhaul and diagnosis
- **C.T. Pego GTA2**: 314 MW – MV electric motors maintenance
- **GALP, Porto Tg4001** – Generator Rotor machining
- **EDA, Faial** – 1 x Generator inspection

#### Thermal Power Operations: Combined Cycle Power Plants (CCPP)

- **Spain: Soto Ribera 5** – 1 HRSG
- **Greece: Volos** – 1 HRSG
- **Netherlands: Claus C** – 3 HRSG; **Eemshaven** – 1 Steam coil
- **United Kingdom: Grain** – 3 x HRSG; **Staythorpe** – 4 x HRSG; **Langage**: 2 x HRSG; **Pembroke** – 5 HRSG; **Carrington** – 2 HRSG – OCC Modules;
- **Germany: Emsland** 2 x HRSG
- **Russia: Chelyabinsk** – 3 HRSG
- **Tunisia: Ghannouch** – 1HRSG
- **Kuwait: Az Zour** – 5 HRSG
- **Dubai: Riyadh 12** – 4 HRSG (OCC Modules)
- **Israel: Tzafit** – 2 HRSG; 2 Units External Piping
- **Jordan: Samra III** – 2 HRSG

#### Thermal Power Operations: Coal fired Power Plants

- **Germany: Mannheim 9** – 1 Condenser; **Mannheim 9** – 1 High Pressure Piping; **Mannheim 9** – 2 Steam Dump devices
- **Czech Republic: Ledvice** – 1 High Pressure Piping
- **Estonian: Narva** – 1 Condenser
- **Slovenia: Sostanj 6** – 1 Condenser; **Sostanj 6** – 1 High Pressure Piping
- **Malaysia: Tanjung Bin 4** – 4 Steam Dump Device; **Tanjung Bin 4** – 1 Turbine Startup Line

#### Hydroelectric Power Plants: - Hydromechanical Equipment

- **EDP – Cávado-Lima Production Center**: Lindoso, Alto Lindoso, Touvedo, Alto Rabagão, Paradela, Venda Nova, Salomonde, Vilarinho das Furnas, Caniçada, France
- **EDP – Ave**: Ermal, Senhora do Porto
- **EDP – Douro Production Center**: Miranda, Picote, Bemposta, Pocinho, Valeira, Régua, Carrapatelo, Crestuma-Lever, Vilar-Tabuaço, Chocalho-Varosa, Torrão
- **EDP – Tejo-Mondego Production Center**: Agueira, Raiva, Sabugueiro, Ponte de Jugais, Vila Cova, Fratel, Belver, Pracana, Santa Luzia, Cabril, Bouçã, Castelo do Bode
- **EDP – Alqueva Production Center**: Pedrógão, Alqueva I; Alqueva II

### Hydroelectric Power Plants: - Electromechanical Equipment - Turbine and/or Generator

- **EDP – Cávado-Lima Production Center:** **Alto Lindoso** – 2x315 MW, **Touvedo** – 1x22 MW, **Vilarinho das Furnas** – 2x62.5 MW, **Caniçada** – 2x30 MW, **France** – 1x7 MW
- **EDP – Douro Production Center:** **Miranda** – 3x60 + 1x189 MW, **Picote** – 3x65 MW; **Bemposta** – 3x80 MW; **Pocinho** – 3x62 MW; **Valeira** – 3x80 MW; **Tabuaço** – 2x32 MW; **Régua** – 3x60 MW; **Carrapatelo** – 3x67 MW; **Torrão** – 2x70 MW; **Crestuma-Lever** – 3x39 MW
- **EDP – Tejo-Mondego Production Center:** **Agueira** – 3x112 MW; **Raiva** – 2x12 MW; **Fratel**–3x44 MW; **Belver** (Group 6) – 1x25 MW; **Pracana** (Group 3) – 1x22 MW; **Sabugueiro II** – 1x11 MW
- **EDP – Alqueva Production Center:** **Pedrogão** (Mini-Hydro) – 2 x 5 MW; **Alqueva I** – 2 x 132 MW; **Alqueva II** – 2 x 132 MW
- **EDP – Mini-Hydro Power Plants:** **Freigil** – 1x4.5 MW; **Ribeira de Pena** – 2x5 MW
- **GENERG – Mini-Hydro Power Plants:** **Talhadas** – (6,25 MW); **Vale de Soeiro** – (3,7 MW); **Fráguas** – (4MW)
- **Hidrinveste – Mini-Hydro Power Plants:** **Pagade** – (1,8 MW); **Paus** – (5 MW)
- **Hidroeléctrica do Monte – Mini-Hydro Power Plant:** **Soutinho** – (3,9 MW)
- **Sociedade exploradora de recursos energéticos – Mini-Hydro Power Plant:** **Cercosa** (5MW)

### Hydroelectric Power Plants: - Service/Rehabilitation

- **EDP – Refurbishment of Generator:** **Caldeirão** – 1x32 MW; **Castelo do Bode** – 3 x 50 MW; **Cabril** – 2x50 MW; **Bouçã** – 2x25 MW; **Salamonde** – 2x21 MW; **Vila Nova** – 3x30 MW; **Pracana** – 2x8 MW; **Lindoso** – 2x8 MW

### Wind Farms Service

- **EDP Renováveis: Abogalheira:** 2 x ECO74 total of 3,3 MW
- **EDP Renováveis: Ortiga:** 7 x ECO74 total of 11,69 MW
- **EDP Renováveis: S. João I and II:** 13 x ECO74 total of 22,9 MW
- **EDP Renováveis: Safra/Coentral:** 25 x ECO74 total of 41,8 MW
- **EDP Renováveis: Serra d’el Rei:** 13 x ECO80 total of 21,7 MW
- **Tecneira: Alrota:** 3 x ECO74 total of 5,01 MW

### Ongoing projects

#### Thermal Services: Maintenance for Thermal Power Plants

- **C.T. Pego GTA 1:** 314 MW – General overhaul and diagnosis
- **C.T. Pego GTA1:** 314 MW – MV electric motors maintenance
- **GALP, Sines TG3:** Generator inspection
- **PORTUCEL-CACIA:** Inspection of ESP of Recovery Boiler
- **Alstom Spain:** cooperation in several generator winding Works; in GT welding repairs and Steam turbine mechanical inspections
- **Alstom Middle East:** cooperation in generator mechanical erection
- **Alstom Brazil:** cooperation in generator mechanical erection
- **Alstom Sweden:** cooperation in generator mechanical works
- **Alstom Switzerland:** cooperation in several generator mechanical erection
- **Alstom France:** cooperation in generator mechanical erection

#### Thermal Power Operations: Combined Cycle Power Plants (CCPP)

- **United Kingdom: Carrington** – 2 Units External Piping; **Carrington** – 2 Module Units Blow Down Tank
- **USA: Brunswick** – 1 HRSG
- **Germany: GuDNiehl 3** – 1 HRSG; **GuDNiehl 3** – 1 Feedwater Tank & Deaerator; **GuDNiehl 3** – 1 Condenser; **GuDNiehl 3** – 1 external piping; **GuDNiehl 3** – 1 ADV Module; **GuDNiehl 3** – 1 FWT Tower Module
- **Netherlands: Flevo** Piping – Repairing
- **Iraq: Al-Anbar** – 4 HRSG (Bundles)

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### Thermal Power Operations: Coal Fired Power Plants

- **Egypt: Suez** – 1 Condenser; **Suez** – 2 Steam Dump Device

### Control System and B.O.P. references in Hydro Power Plants

- **Medupi:** 6x900 MW (ESKOM – South Africa) - Engineering Work Packages
- **HPP Salamonde II:** 1x216 MW (EDP) – Control System
- **Kubanski HPP2:** 4x45 MW (Russ Hydro – Russia) DCS

### Hydroelectric Power Plants: Hydro and Electromechanical Equipment

- **EDP – Salamonde II:** New 207 MW Francis reversible unit;

## Projects and References – Grid

### Finished Projects

#### Air Insulated Switchgear

- **CBR** (150/220/400 kV): REN – various S/S
- **CBR Replacement:** EDP Produção - Bemposta Hydro Power Plant
- **CBR** (GL 309): EFACEC (final customer: SONELGAZ - Algeria)
- **CBR** EIP (final destination: Angola)
- **CBR** (GL 312/314/316): EFACEC (final destination: Mozambique)
- **CBR** (309/314/316): EFACEC (final customer: SONELGAZ - Algeria)
- **DSC** (400 kV): REN – various S/S
- **DSC** EIP (final destination: Angola)
- **DSC** EFACEC (final destination: Mozambique)
- **DSC** (400 kV + 220 kV + 150 kV): REN – various S/S
- **ITR Replacement:** EDP Produção Bemposta Hydro Power Plant
- **ITR** EIP (final destination: Angola)
- **DSC** (400/220/150kV): REN – various S/S
- **CBR** Salamonde – EDP
- **DSC** Efacec (final destination: Angola)
- **ITR** Efacec (final destination: Angola)
- **CBR** Efacec (final destination: Angola)

#### Power Transformers

- **PTR** 2x (220/60 kV, 80 MVA): CME – Penamacor
- **PTR** 2x (220/60 kV, 126 MVA): REN-Macedo, Valpaços
- **PTR** (10/6 kV, 5 MVA): EDA
- **PTR** (150/60 kV, 55 MVA): CME (Cogeneration ARTENIUS Sines)
- **PTR** (150 kV, 75 MVA): REN

#### Gas Insulated Switchgear

- **GIS** (150 kV) Turnkey project: REN – Sete Rios ; S/S
- **GIS** (150 kV) Turnkey Project: REN-Trafaria S/S
- **GIS** (400 kV): Andritz - Bemposta (HP)
- **GIS** (150 kV) Extension turnkey project: REN – Sete Rios
- **GIS** (60 kV) Maintenance: Prelada & Vitória – EDP



### Substation Automation Solutions

- **MiCOM** Protection Relays (Supply & Erection): EDP - various S/S
- **Current Differential Protection Relays:** REN various S/S
- **MiCOM** protection Relays - Cubicles Refurbishment: EDP-various S/S
- **Railway Protections** Turnkey Project (engineering, supply, erection and commissioning): REFER - various S/S
- **Refurbishment** of GEM 80 System/General Maintenance: GALP Sines
- **Refurbishment** of W3 S/S: GALP/FLUOR – Matosinhos
- **Line Differential and Bus-bar Protections:** EDP Produção – Vila Nova - Hydro Power Plant
- **Expertise Protection site Commissioning:** Albania
- **Expertise Protection site Commissioning:** Saudi Arabia
- **Expertise Protection site Commissioning:** Uganda
- **Expertise site Commissioning of Generator Protections:** Cambambe Hydro Power Plant-Final customer, ENE - Angola
- **Automation expert Training for Angola Technicians:** EDEL (Training in Portugal)
- **SAS** (DCS – Space; PSCN; Pacis): REN- Chafariz, Santarém, Sete Rios, Trafaria, V.P. Aguiar, Macedo, Trafaria, Tábua, Oleiros
- **SAS** (DCS-PSCN): CME – Lares (CCPP)
- **Integrated SCCP System:** AVE Albacete-Alicante, Alstom Transport Spain (final customer: ADIF-Spain)
- **Expertise Control System site Commissioning:** Italy

### Network Management Systems

- **e-Terra Wind:** Lógica

### Ongoing Projects

#### Air Insulated Switchgear

- **CBR:** Transfopor (final destination: Angola)
- **DSC:** Transfopor (final destination: Angola)
- **ITR:** Transfopor (final destination: Angola)
- **CBR:** EPME (final destination: Morocco)
- **DSC:** (400 kV + 220 kV + 150 kV): REN – various S/S
- **PTR:** PTR(150 kV,75 MVA): REN

#### Gas Insulated Switchgear

- **GIS** (150 kV) Extension turnkey project: REN – Sete Rios

### Substation Automation Solutions

- **SAS** MiCOM Protection Relays (Supply & Erection): EDP-various S/S
- **SAS** (DCS – PSCN): REN - Sete Rios
- **SAS** (DCS-DS Agile): REN – Rio Maior
- **SAS** (DCS-DS Agile): INOTEC – Musseque (Angola)
- **SAS** (DCS-DS Agile): INOTEC – Cazenga (Angola)



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### Projects and References – Transport

#### Finished projects

##### Rolling Stock

- **Azambuja Line**  
CP – Comboios de Portugal: Supply of 12 double-deck trains
- **North Line**  
CP – Comboios de Portugal: Supply of 10 tilting trains
- **Tagus River crossing**  
FERTAGUS: Supply of 18 double-deck trains

##### Maintenance and Renovation

- **Regional Service North Line**  
CP – Comboios de Portugal; 57 UTE – SI – Renovation

##### Infrastructure and Electrification

- **Cascais commuter Line**  
CP – Comboios de Portugal: 34 UTE/UQE – Supply of electric and electromechanical equipment

##### Catenaries

- **North and South Lines**  
REFER – Rede Ferroviária Nacional: Several catenary works

##### Interlocking

- **Vouga Line**  
REFER – Rede Ferroviária Nacional: Automation of 52 level crossings with half barriers - implementation phase concluded

#### Ongoing project

##### Maintenance and Renovation

- **Vouga Line**  
REFER – Rede Ferroviária Nacional: Automation of 52 level crossings with half barriers – maintenance phase up to May 2016