



Energy Transition

Clean Renewable Energy

GROUP
coba
Engineering and Environmental Consultants



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Presentation

COBA is a multinational and multidisciplinary group of Engineering and Environmental Consultants, founded in 1962.

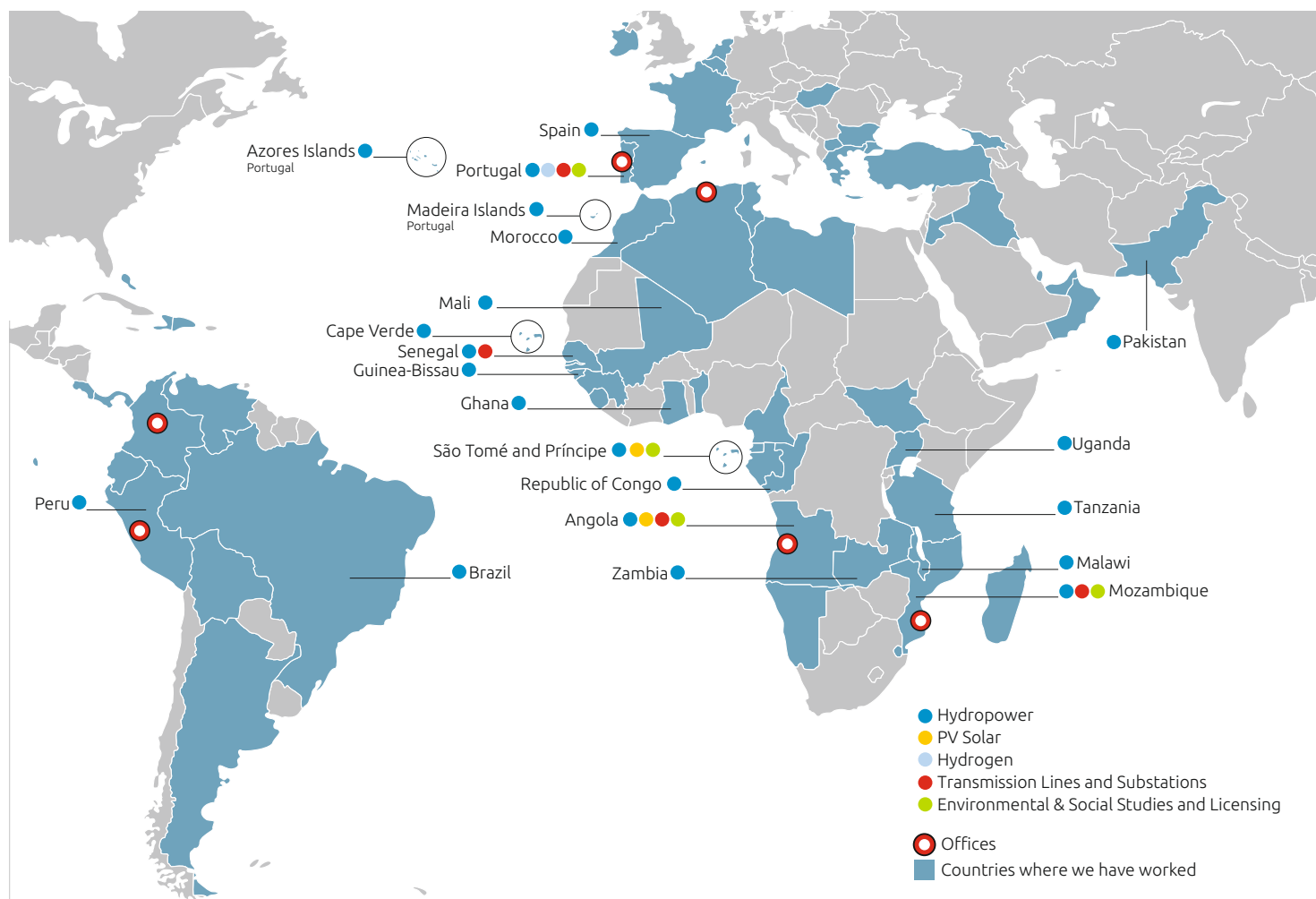
The Group provides engineering consultancy services ranging from basic and planning studies, technical, environmental and economic feasibility studies, design and construction design as well as project management and works supervision, to operation follow-up and behaviour monitoring. The Group has offices/subsidiaries in three continents and experience in more than fifty countries and encompasses several companies in accordance with functional specializations or geographical areas.

With over six decades of acquired expertise, complemented by state-of-the-art employee knowledge, a stable permanent staff, and extensive international experience, we are equipped to identify optimal solutions that fully satisfy the needs and expectations of both public and private clients.

Throughout its existence, the Group has collaborated with public authorities or private developers in the feasibility of multidimensional projects, some of them being structuring projects and with major impacts on the improvement of people's life conditions in the several countries where it worked.

At present, the Group has a wide number of competences and technical areas that allow the composition of multidisciplinary teams who share knowledge and experiences in the execution of projects.





Clean Renewable Energy

Origin, Evolution and Market Positioning

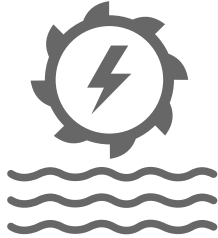
The activity of COBA related to Renewable Energies dates back to its foundation with the design of several large dams for energy generation which is currently COBA's main field of activity and one of the key reasons for which the company has been internationally renowned. COBA has studied, designed, provided technical assistance and supervised the works for many large hydropower projects in more than 18 countries in Europe, África and South America, totalling more than 10 000 MW.

More recently, there has been a significant increase in the design of Pumped-Storage hydropower projects, often associated with other renewable energy sources such as solar PV and wind, resulting in hybrid systems. These projects offer energy storage capabilities and grid regulation, facilitating the greater integration of intermittent energy sources. Currently, the design, environmental studies and construction supervision of solar and wind farms have become another major area of focus for the company.

Directly linked with renewable energy, COBA Group is actively targeting the clean energy-carrier Green Hydrogen and other Renewable Gases chain-value. This initiative involves collaborations with strategic partners for studies related to primary electric energy and water resources availability assessment, generation, storage, transportation, and distribution of liquid organic hydrogen carriers (LOHC), such as ammonia.

Services provided in this area include hydropower planning, base studies (hydrology, geology, seismology, sediments, ...), feasibility studies, all phases of design from preliminary to detailed and construction design, and owners engineering, including due diligences and construction supervision, and environmental and social studies.

The integration of both traditional and emerging fields of activity, coupled with the incorporation of specialized expertise from strategic partners, is significantly bolstering the continuous expansion and enhancement of COBA Group's portfolio in Renewable Energies.



Hydropower

Since its foundation, hydroelectric power generation is one of the major areas of expertise of COBA given its involvement in the study of dams and other hydraulic developments.

As a traditional and highly relevant clean and renewable energy, hydropower is also crucial for allowing the increase the ratio of intermittent renewables in the power grid, such as wind and solar PV, contributing decisively to fulfil the objectives of green energy transition, reducing the use of fossil fuels and achieving carbon neutrality, in alignment with the targets of COP meetings for lowering greenhouse gas emissions until 2050.

The activity of COBA in hydropower as increased markedly from the 2010's and some very relevant references of different scale hydropower projects, ranging from small to very large scale, in several countries, have been added to the company portfolio in this field.

COBA also has extensive experience in the design of micro and small hydropower plants in continental and island contexts, being interesting solutions for the electrification of rural and remote areas, including off-grid stand-alone systems and mini-grids.

Hydropower planning is also a very relevant activity of the company which can be exemplified by the National Program of Portugal for High Potential Dams, the Hydroelectricity Building Block of the National Water Plan of Angola and the National Dam Safety Plan of Brazil..



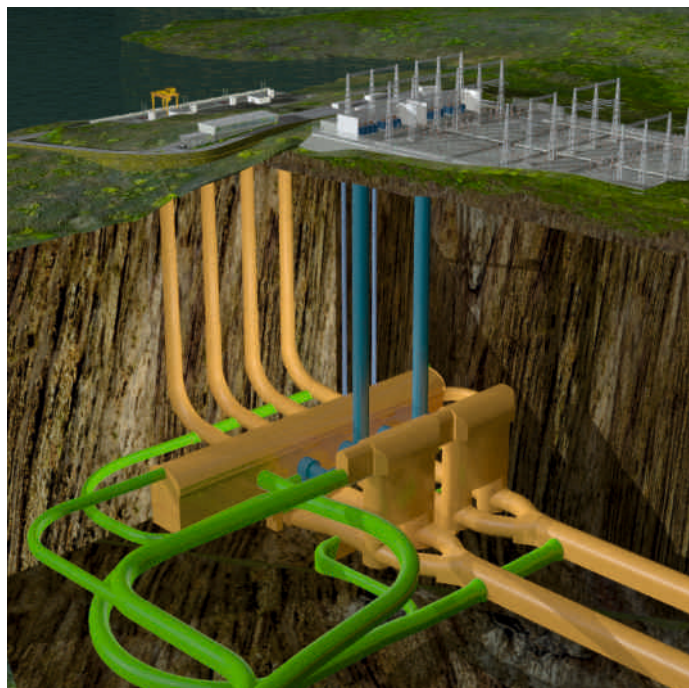


Caculo Cabaça | 2 172 MW | Angola

Client: GAMEK - Gabinete de Aproveitamento do Médio Kwanza

Detailed design and tender documents: 2013/2016

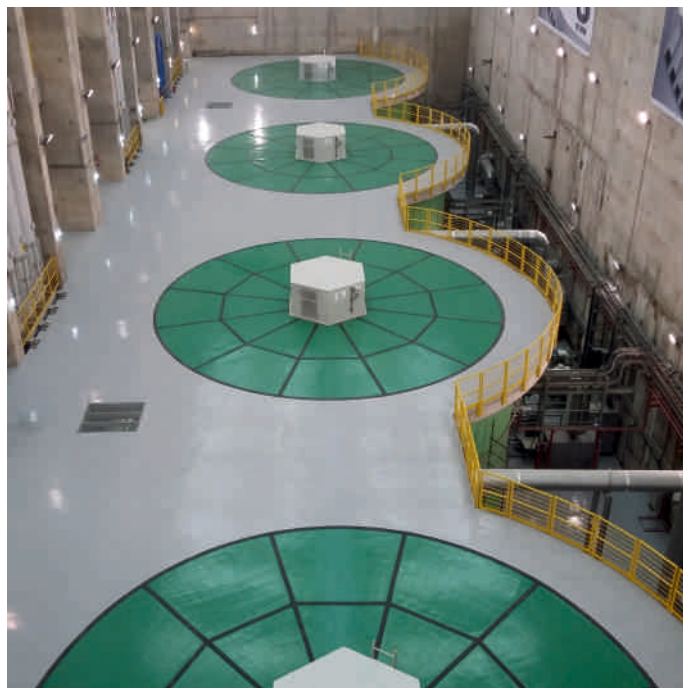
Owner's Engineer. Technical Assistance. Construction Design Review : 2017/ongoing



Cambambe II | 714 MW | Angola

Client: ENE - Empresa Nacional de Electricidade

Design Checking, Project Management and Construction Supervision: 2012/2017



Laúca | 2 070 MW | Angola

Client: MINEA - Ministério da Energia e Águas / GAMEK

Design Checking, Project Management and Construction Supervision: 2013/2021



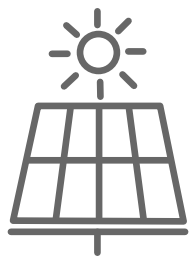
Kholombidzo | 219 MW | Malawi

Client: Ministry of Natural Resources, Energy and Mining

Feasibility Study and Environmental and Social Impact Assessment.

Preliminary Engineering Design and Cost Estimate: 2015/2017





Solar PV, Wind and Hybrid Energy Systems

Renewable energies, particularly solar photovoltaic (PV) and wind generation, are experiencing rapid global growth, with expectations of further acceleration in the coming years due to widespread technology diffusion and their increasing financial competitiveness and economic attractiveness. This trend is expected to contribute significantly to achieving the targets outlined in the Net Zero Emissions (NZE) by 2050 Scenario, aligning with government commitments for a sustainable pathway towards 2030.

The COBA Group is intensifying its efforts in renewable energy sectors beyond hydropower, expanding its portfolio to include significant projects developed for both public and private clients in Portugal, Angola and São Tomé and Príncipe. These initiatives aim to support and facilitate the transition from carbon-based energy sources to clean energy, addressing the substantial challenge of transforming the current energy matrix. COBA's involvement in renewables encompasses planning, design, construction supervision, owners' engineering, as well as environmental and social impact assessments for solar photovoltaic (PV), wind, and geothermal projects.





Solar Park at the Água Casada Area | 10 Mwac / 15 Mwp | São Tomé and Príncipe

Client: Project Fiduciary and Administrative Agency
Owner's Engineer to Conduct a Feasibility Study for the Solar Park and common Infrastructure, prepare the Technical Specifications and Bidding Documents for Procurement of Goods, Civil Works and Services for the Construction and Supervision: 2023/Ongoing



Quilemba Photovoltaic Solar Power Plant | 30 MWac | Angola

Client: Quilemba Solar Lda.
Geotechnical Survey, Hydrological Survey and Topographical Survey: 2023



Cabinda Power Reinforcement Project | 50 MW | Angola

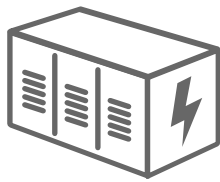
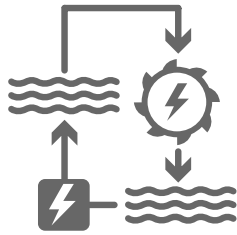
Client: Toyota Tsusho Corporation
Technical and Economic Feasibility Studies, as well as the Grid Impact Studies and Environmental and Social Studies: 2021



Hybrid Photovoltaic Generation Systems | 321 MWp / 723 MWh | Angola

Client: PRODEL
Work Supervision of the Engineering Design, Supply, Construction and Testing of Hybrid Photovoltaic Generation Systems, in the provinces of Malanje, Bié, Moxico, Lunda-Norte and Lunda-Sul: 2023/Ongoing





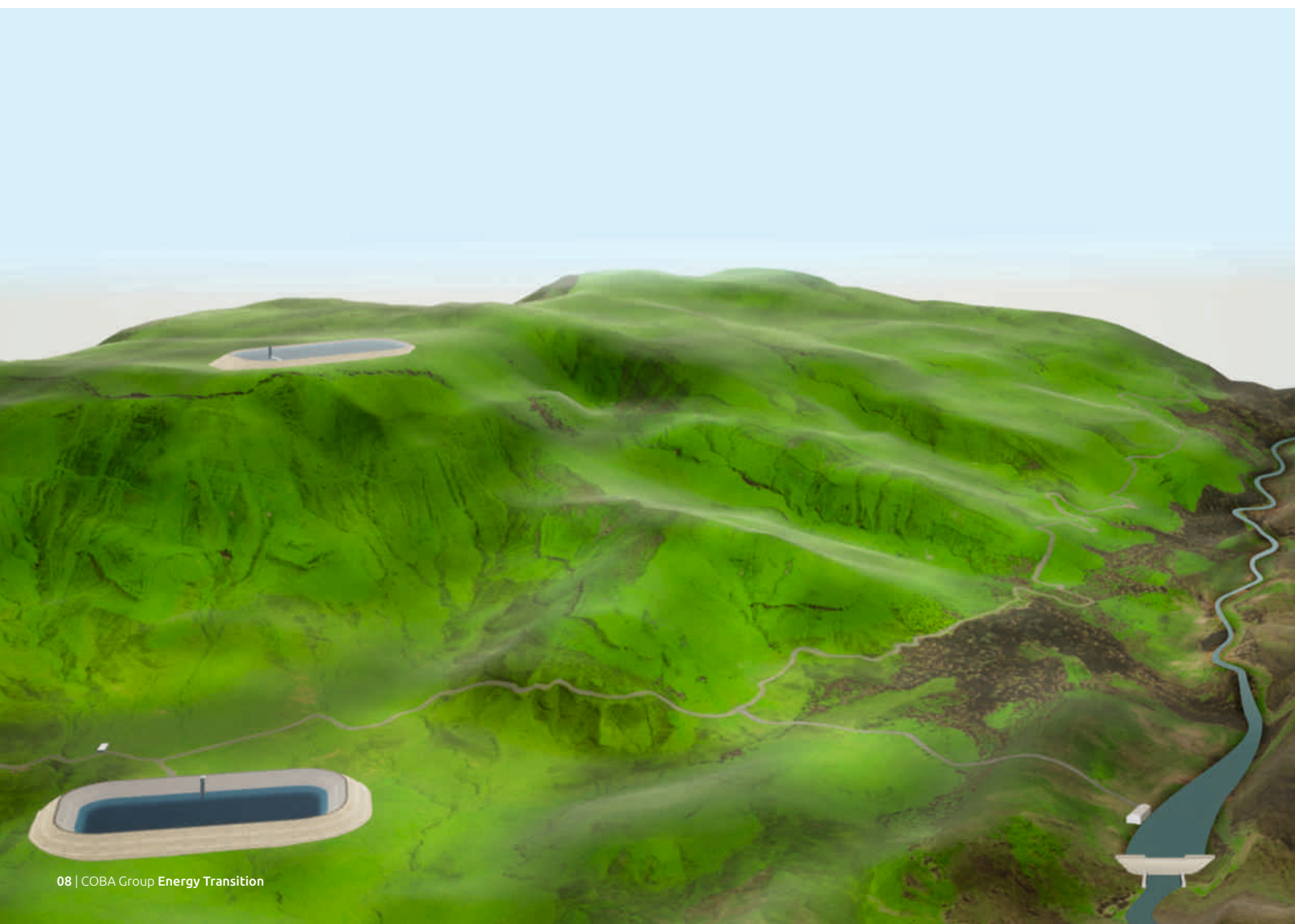
Energy Storage Systems

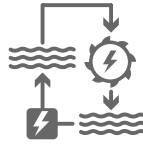
Energy storage plays a pivotal role in enabling the broader utilization and integration of intermittent renewables into the electric power grid. Consequently, Energy Storage Systems (ESS) are indispensable for facilitating Energy Transition.

Pumped-Storage hydro developments serve as water batteries, enabling the storage of a large amount of energy in the form of potential energy in the upper reservoir. They play a crucial role in integrating intermittent renewable source such as solar PV and wind by absorbing excess energy during periods of generation surplus. Moreover, they provide peak power during daily cycles, offer reserve capacity and ensure the stability of the electric grid.

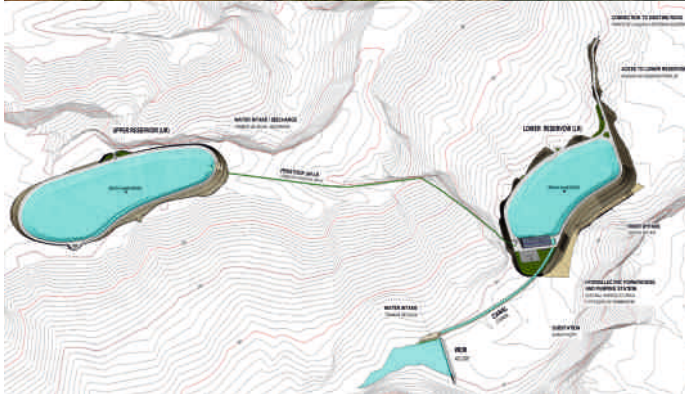
With the decreasing costs of solar PV and wind energy generation, Pumped Storage Hydropower has become increasingly significant in recent years, and it is anticipated that the expansion on this type of solution will continue to grow worldwide in the coming years.

COBA has been proactive in meeting the rising market demand for energy storage, recognizing it as a critical component of modern energy systems. Presently, the company boasts a significant portfolio of Pumped Storage Projects at both national and international levels, covering the entire spectrum from planning to detailed design.





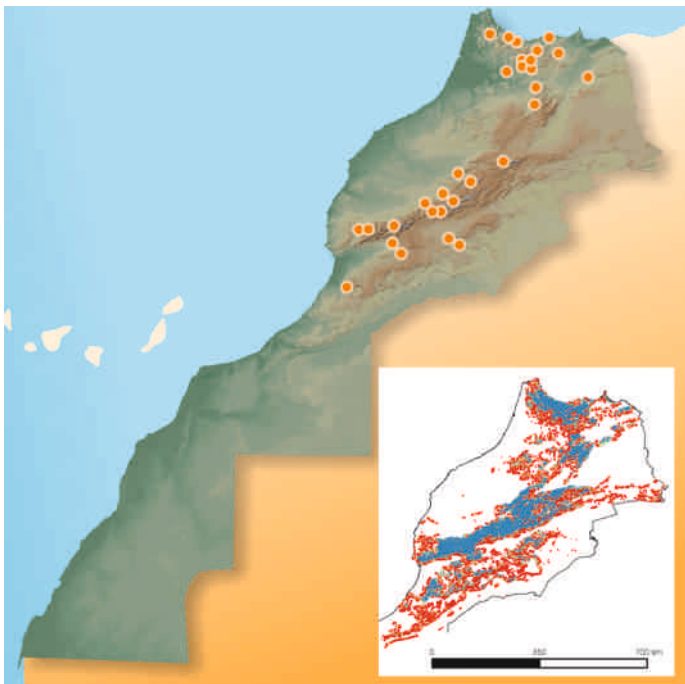
Pumped-Storage Powerplant in Santiago Island | 20 MW | Cape Verde
Client: Lux-Development, S.A
Technical Assistance to carry out the Feasibility Study: 2021



Salamonde II | 209 MW Reversible | Portugal
Client: EDP - Gestão da Produção de Energia, S.A.
Tender Design and Tender Documents: 2009/2010
Final Design and Technical Assistance: 2010/2016



Pumped Storage Powerplants | 400 MW to 600 MW each | Morocco
Client: ONEE
Master Plan for Pumped Storage Developments: 2019
Prefeasibility studies of 30 selected sites: ongoing



Alqueva II | 260 MW Reversible | Portugal
Client: EDP - Electricidade de Portugal
Preliminary Design, Detailed Design, Final Design Environmental Impact Assessment and Technical Assistance: 2007/2012





Hybrid Photovoltaic Generation Systems | 321 MWp / 723 Mwh | Angola

Client: PRODEL

BESS and Expansion of the Electrical grid with the construction of new transmission power lines in the provinces of Malanje, Bié, Moxico, Lunda-Norte and Lunda-Sul 2023/Ongoing



Cabinda Power Reinforcement Project | 50 MW | Angola

Client: Toyota Tsusho Corporation

Technical and Economic Feasibility Studies, as well as the Grid Impact Studies and Environmental and Social Studies: 2021



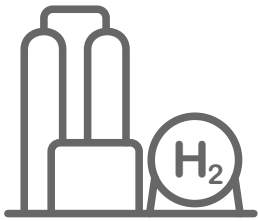
Green Hydrogen and Renewable Gases

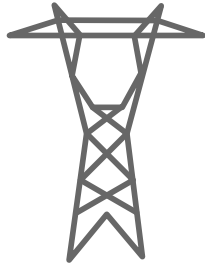
Green Hydrogen (GH₂) and Renewable Gases (biomethane, methanol and others), which serve as energy carriers, are taking on a central role in the decarbonization of economy and are anticipated to become significantly more important in the medium and long term.

As part of one of the Company's Strategic Plan pillars, known as "Energy Transition", COBA is currently engaged in several aspects of the green hydrogen (GH₂) value chain. This involvement ranges from applied research conducted in collaboration with academia, focusing on wastewater valorisation with hydrogen (H₂) production, including conceptual definition and prototype development, to projects underway with private developers and investors, such as Green Hydrogen Valleys.

The acceleration of renewable energy generation in several countries presents an opportunity for green hydrogen (GH₂) production to capitalize on surplus electricity on the grid. This not only contributes to the balance and stability of the power grid but also enhances the profitability of the GH₂ generation.

COBA is swiftly expanding its portfolio of experience in the field of Green Hydrogen and Renewable Gases through early-stage feasibility studies for developers and investors. These studies encompass a blend of conventional expertise, including climate and water resources studies, water treatment, hydropower, electricity, transmission lines and electric substations, along with innovative approaches in industrial processes, piping and control & instrumentation.





Energy Transmission and Distribution

The transportation of energy from generation sites to urban and rural consumers, alongside the integration of renewable energy sources, is crucial for facilitating Energy Transition. Both on-grid and off-grid systems play a significant role in achieving the desired widespread electrification, particularly in developing countries in Africa and other continents. These systems aim to enhance energy independence and ensure power sustainability.

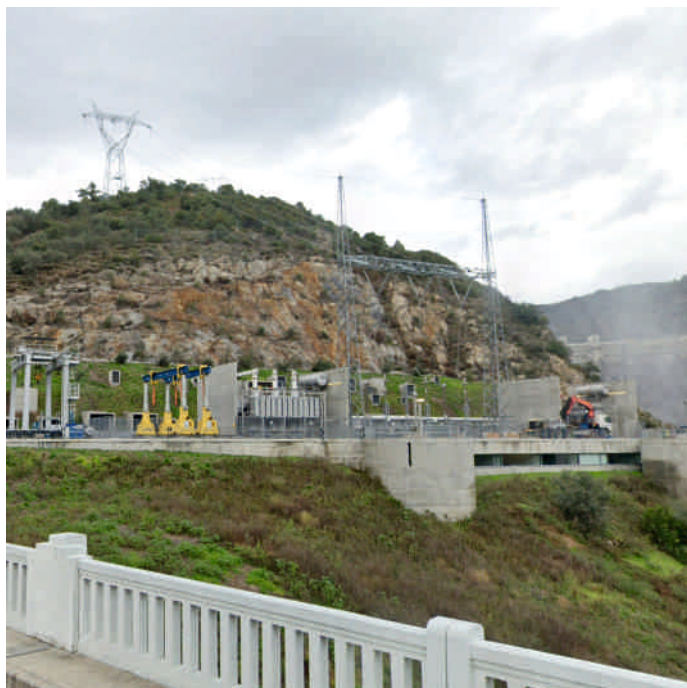
COBA has significant expertise in energy transmission, distribution lines and electric substations, primarily associated with hydropower projects, and is actively working to strengthen and diversify its existing portfolio by expanding into other renewable energy sectors.

COBA has built up expertise in Design, Project Management and Construction Supervision, as well as Environmental and Social studies of Low, Medium and High-Voltage Lines and Electric Substations.





Foz Tua Pumped Storage Powerplant | 400 kV GIS Substation | Portugal
Client: EDP – Electricidade de Portugal
Detailed Design, Licensing Project and Tender Design of the Powerplant and Water Conveyance System: 2009/2011



Energy Transmission Line Saltinho – Bambadinca | 110 kV | Guinea - Bissau
Client: UNPD
Tender Design: 1992/1994



Transmission Line of the Eastern Network (Dundo - Lucapa - Saurimo - Luena) and Associated Substations | 220 kV | Angola
Client: MINEA
Basic Design and Tender Documents; Environmental and Social Impact Assessment: 2012/2015



Aproveitamento Hidroeléctrico do Kunje 1 | 30 kV | Angola
Client: Grupo ProCme | CME Angola
Detailed Design: 2023





Environmental & Social Studies and Licensing

Environmental and social studies focus on interactions between ecosystems and human societies. Ecosystems represent organized natural systems that incorporate biotic organisms and their resource base, encompassing air, water, and minerals. With over 35 years of experience, COBA has been actively involved in environmental protection, pollution control, and assessing the environmental impacts of several projects.

These projects range from hydraulic infrastructures, notably dams of varying dimensions and complexities to large transportation systems such as motorways, railways and airports. Additionally, COBA has recently focused on renewable energy projects such as solar photovoltaic (PV) and wind energy, reflecting the company's commitment to energy transition.

Environment licensing of projects has been a crucial activity for COBA over the past 20 to 30 years, enabling the company to develop a robust and diverse expertise that is now being applied on new energy projects, including those involving green hydrogen and renewable gases.





Água Casada Solar Park Plant | São Tomé and Príncipe
Client: Project Fiduciary and Administrative Agency
Environmental and Social Impact Assessment (ESIA): 2023/ongoing



Very High Voltage Line between Alqueva II and Alqueva Substation | 400 kV
Portugal
Client: EDP – Electricidade de Portugal
Environmental Constraints Study and Environmental Impact Assessment: 2007/2008



Mphanda Nkuwa High Voltage Energy Transmission System | 1300 MW | Mozambique
Client: Hidroeléctrica Mphanda Nkuwa, S.A. (HMNK)
Environmental Impact Assessment (EIA), Resettlement Plan and
Environmental Management Plan: 2009/2011
Environmental and Social Impact Assessment: 2023/ongoing



Three Cavities for Natural Gas Storage at Carriço | Portugal
Client: TRANSGÁS Armazenagem, S.A. / REN Armazenagem S.A.
Environmental Impact Assessment and Risk Analysis: 2011/2012





Support Engineering

COBA relies on highly specialized multidisciplinary in-house teams, that are capable of giving support in several areas which are present in most Energy Transition projects such as:

GIS

BIM

Topographic surveys (Drones, Lidar, etc), cartography and cadastre

Climate studies

Water Resources

Hydraulics & Hydrology

Water treatment plants

Civil engineering

Mechanical engineering

Electrical engineering

Geotechnics

Roads

Main Clients

Throughout its history, COBA worked in 59 countries across Europe, Africa, Latin America and Asia / Middle East, in most cases in association with national and/or foreign companies. Furthermore, COBA works significantly for private entities and public authorities related to energy, ministries, national offices within the frame of projects funded by the IFIs such as the World Bank, JIICA, IBRD, IDA, EIB, EU, AfDB, KfW, UNDP, the Inter-American Development Bank and the AFD.



Major Recent Projects

Hydropower

PROJECT NAME	HYDROPOWER SCHEMES		COUNTRY	CLIENT	DATE
	POWER PLANT Rated Capacity	DAM / WATER CONVEYANCE SYSTEM			
Caculo Cabaça	2 172 MW	RCC dam (103 m H, 553 m crest L) 2 x 5.2 km long headrace tunnels	Angola	GAMEK - Gabinete de Aproveitamento do Médio Kwanza	2013/ongoing
Laúca	2 070 MW	RCC Dam (132 m H, 1 075 m crest L) 6 x 1.9 km long headrace tunnels	Angola	MINEA Ministério da Energia e Águas / GAMEK	2013/2023
Cambambe II	714 MW	Hydro Powerplant II 4 x 440 m long headrace tunnels	Angola	ENE Empresa Nacional de Electricidade	2012/2017
Kholombidzo	219 MW	Concrete gravity dam (16,8 m H, 265 m crest L) 2 x 2 800 m long headrace tunnels	Malawi	Ministry of Natural Resources, Energy and Mining	2015/ongoing
Oriang	435 MW	Concrete and rockfill dam (39 m H) Tunnels 8.6 km long	Uganda	Mota-Engil Africa	2016
Luachimo	34 MW	Rehabilitation and Repowering	Angola	MINEA Ministério da Energia e Águas / GAMEK	2013
Jamba-la-Mina	224 MW	Gravity concrete and earthfill dam (38.5 m H, 1 270 m L)	Angola	GABHIC - Gabinete para Administração da Bacia Hidrográfica do Rio Cunene	2010/2012
Jamba-la-Oma	79 MW	Gravity concrete and earthfill dam (47 m H, 2 803 m L)	Angola	GABHIC - Gabinete para Administração da Bacia Hidrográfica do Rio Cunene	2009/2011
Sambangalou and Kaleta	120 MW	RCC dam (94 m high), GG studies	Senegal	OMVG - Organisation de Mise en Valeur du Fleuve Gambie	2005/07
Warsak (Hydropower Plant Rehabilitation)	243 MW	Gravity concrete (76,2 m H, 140 m L)	Pakistan	WAPDA - Water and Power Development Authority	2017/under rehabilitation

Solar PV, BESS, Green H2

PROJECT NAME	SERVICES	POWER PLANT	COUNTRY	CLIENT	DATE
Água Casada Photovoltaic Solar Power Plant	Owner Engineering including Feasibility Studies and Works Supervision	15 MWp	São Tomé e Príncipe	World Bank	2023 - Ongoing
Angola 6 provinces Hybrid Photovoltaic Generation Systems	Design Review and Works Supervision	321 MWp BESS (723 MWh)	Angola	PRODEL	2023 - Ongoing
15 Mini-Grids PV Solar Projects in Huila - Lote 2	Design Review and Works Supervision	to be defined	Angola	PRODEL	2023 - Ongoing
13 Mini-Grids PV Solar Projects in Catete and Namibe - Lote 4	Design Review and Works Supervision	104 MW	Angola	PRODEL	2023 - Ongoing
Quilemba Photovoltaic Solar Power Plant	Feasibility Studies, Geotechnical Survey, Hydrological Studies and Topographical Survey	30 MWac	Angola	Quilemba Solar Lda	2023
Cabinda Power Reinforcement Project	Feasibility Studies	50 MW (solar PV)	Angola	Toyota Tsusho Corporation	2021
Green Hydrogen Valley	Geotechnical Survey and Cadaster	40 MW	Portugal	Confidential	2023 - Ongoing

Pumped Storage Hydropower

PROJECT NAME	HYDROPOWER SCHEMES		COUNTRY	CLIENT	DATE
	POWER PLANT Rated Capacity	DAM / WATER CONVEYANCE SYSTEM			
PSH El Menzel	350 MW (Reversible)	Head= 254 m Rated Discharge= 159 m³/s Stored volume= 3 000 000 m³ Stored energy= 1,75 GWh	Morocco	ONEE-BE	2022/ongoing
Santiago	20 MW (Reversible)	2 x 400 000 m³ reservoirs Penstock 1.2 km long, Ø 2.0 m	Cape Verde (Santiago Island)	LuxDev Luxembourg Development Agency	2021
Foz Tua	262 MW (Reversible)	Concrete arch dam (108 m high) Tunnels 1 470 m long, Ø 7.5 m	Portugal	EDP Gestão da Produção de Energia, S.A.	2010/11
Salamonde II	209 MW (Reversible)	Tunnels 2 297 m long, Ø 5.8/8.3/11.5 m	Portugal	EDP Gestão da Produção de Energia, S.A.	2009/16
Alqueva II	260 MW (Reversible)	Tunnels 750 m long, Ø 8.5 m	Portugal	EDP Electricidade de Portugal, S.A.	2007/12
Feiticeiro (Downstream Baixo Sabor)	30 MW (Reversible)	Tunnels 590 m / 640 m long, Ø 6.9 m	Portugal	EDP Gestão da Produção de Energia, S.A.	2009/12
Fridão	241 MW (Reversible)	Tunnel 380 m long, Ø 7.3/11.0 m	Portugal	EDP Gestão da Produção de Energia, S.A.	2009/10
Alvito	214 MW (Reversible)	RCC dam (88 m high)	Portugal	EDP Gestão da Produção de Energia, S.A.	2008/11

Energy Transmission and Distribution

PROJECT NAME	SERVICES	PV SOLAR SCHEME		COUNTRY	CLIENT	DATE
		TRANSM. LINE	SUBSTATIONS			
Rural and Local Electrification of three Municipalities in Cuanza-Norte (Banga, Bolongongo and Ngomguembo)	Design Review, Technical Assistance and Works Supervision	60kV (54km) 30kV (180km)	220/60 kV and 60/30 kV	Angola	PG of Cuanza North	2024
Malanje and Cangandala Eletrification Project	Works Supervision	30 kV (52 km)	to be defined	Angola	MINEA	2022 - Ongoing
Laúca Hydropower Development	Design Review and Works Supervision	400kV (370 km)	400 kV (main) and 220 kV (auxially)	Angola	MINEA	2021
Benguela Electrification and House Connections Project	Design Review, Technical Assistance and Works Supervision	400kV (370 km)	4 substations 50 MVA, 60/30kV	Angola	MINEA	2019
Cambambe Hydropower Development	Design Review and Works Supervision	400kV (340 km) 220 kV (480 km)	220/400/60 kV	Angola	MINEA	2017
Kholombidzo Hydro Electric Power Plant	Feasibility Study, ESIA and RAP and Tender Documents	132 kV (16km)	QS 66/132 kV	Malawi	Ministry of Natural Resources, Energy and Mining	2017
Medium and Low Voltage and Public Illumination of Towns of Fucauma, Cassinguidi, Luxito, Andrada, Maludi, Lucapa and Calonda	Tender Design	60 kV	220/60 kV and 60/15 kV	Angola	MINEA	2015
Ribeiradio-Ermida Hydropower Development	Tender Design, ESIA, Technical Assistance, Construction Design and Works Supervision	60 kV (28km)	220/60 kV	Portugal	EDP	2015
Marañon Hydropower Development	Detailed Design and Technical Assistance	220 kV (40 km)	13,8/220 kV	Peru	MOTA-ENGIL Peru	2014
Kalungwishi River Hydroelectric Project	Preliminary Studies, Feasibility Studies and Preliminary Design	330 kV and 66 kV (270 km)	330 kV, 66 kV, 66/33 kV	Zambia	MOTA-ENGIL Africa	2014
High Voltage Line between Alqueva II and Alqueva Substation	Tender Design, EIA, Construction Design and Technical Assistance.	400 kV	15/400 kV	Portugal	EDIA	2012



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