ARIES

INGENIERIA Y SISTEMAS, S.A.

ARIES POWER DIVISION PRESENTATION

ARIES
INGENIERIA Y SISTEMAS, S.A.

1. COMPANY PROFILE
2. POWER DIVISION
3. CONTACT

1.1 ABOUT ARIES

Founded in 1985, Aries is a world leader, independent, global and diversified engineering company. With headquarters in Madrid (Spain) and worldwide presence, Aries has a substantial background in the field of power engineering and particularly in renewable power plants.
Power projects all over the world have set Aries' reputation as the leading engineering company in the design and operation of efficient and reliable renewable power plants.

Founded: 1985

Global presence

Certificated Quality: ISO 9001

R+D (2014): 2.4 M€

Financial classification: A1
D&B Inter. num.: 46-237-5783

Offices:
Madrid. Spain

1.2 VISION, MISSION AND OBJECTIVE OF ARIES POWER DIVISION

Vision:

To be the company of reference in the electrical power sector, through technological leadership, efficiency, quality and excellence in the solutions we offer.

Mission:

To satisfy customer needs all around the world, with efficient solutions that provide exceptional added value, using the best qualified team and the most advanced technology, meeting or exceeding the agreed functionality, quality, cost and deadline and receiving a fair compensation for the delivered value.

Objective:

Aries' objective is profitable, strong and steady growth, by supplying electrical power for the world's growing population, by engineering, building and operating renewable power plants. Aries is also devoted to the principles of ethical business for future sustainability.

1.3 ARIES WORLD REFERENCES

2.1 SECTORS

- Renewable
  - Concentrated Solar Power (CSP)
  - Photovoltaic (PV)
  - Wind
  - Hydro
  - Biomass
  - Geothermal
- Hybrid
- Conventional
  - Cogeneration
  - CCGT

Astexol. (Badajoz, Spain)

Arsol-Toledo. (Toledo, Spain)

2.2 POWER DIVISION ACTIVITIES

Either as Developers, Engineers, turn-key or EPCM, Aries does the development, feasibility studies, basic and detailed engineering for renewable and conventional power plants. Aries also coordinates the finance, construction supervision and management of the plants once in operation.

2.3 POWER DIVISION SCOPE OF SERVICES

PHASE 1 — Feasibility study

- Site selection
- Technology analysis
- Technical feasibility
  - ✓ Front End Eng.
  - ✓ Performance Modeling
  - ✓ Technical Specs
- Economical feasibility

PHASE 2 — Development

- Licensing &Permitting
- Basic Engineering
- EPC Specification
- EPC Tendering
- Equipment purchase
- Finance arrangement
- Finance negotiation

PHASE 3 — Construction

- Detailed Engineering
- EPCM
- Preeliminary works
- Construction supervision
- Comissioning protocols definition
- Commissioning

PHASE 4 — O&M

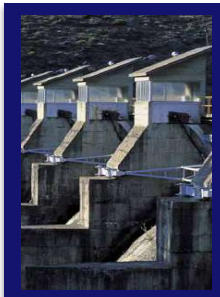
- O&M definition
- O&M cost evaluation
- O&M supervision
- Operation of PV Plants
- Operation of Solar Field in CSP Plants

2.4 REFERENCES OVERVIEW

CSP
500 MW Project Developments (150 MW under operation). More than 4098 MW providing engineering services.
Projects in Spain, India, Morocco, China, Chile, South Africa, UAE, Jordan, Egypt, Turkey, Libya, etc.

RESEARCH & DEVELOPMENT
Development of own proprietary technology.
Collaboration with CSIC, CEDEX.
R&D Project leaders funded by European Commission.

PHOTOVOLTAIC
40 MW Project Developments. First company to reach non-resource project finance for a solar PV in Spain. More than 4325 MW providing engineering services.
Projects in Spain, USA, India, Turkey, Chile, South Africa, UAE, Philippines, Bulgaria, etc.



MINI HYDRO
National Hydro Power Plants Development Program in Spain for IDAE (Ministry of Energy).
Deep expertise and know-how managing hydro projects of various sizes and site conditions.

WIND
More than 15 years track record. More than 4800 MW providing engineering services.
Projects in Spain, USA, Chile, Kazakhstan, Romania, Egypt, South Africa, Guatemala, Bulgaria, etc.

OTHERS
Customized turn-key solutions, such as: Integrated Low Voltage Ride Through (LVRT) compensation retrofit solution for PV power plants in Spain; SCADAs, CMMSs, etc.
Hybrid Systems and Off Grid RE systems.

2.5 RELEVANT REFERENCES; CSP (I)

- REDSTONE (South Africa). 100 MW. CSP Solar tower project.
  - Technical Advisory.

- NOOR 2 & 3 (Morocco). 200 MW CSP plant and 100 MW tower plant
  - Technical Advisory.

- COPIAPÓ CSP (Chile). 2x125 MW CSP tower plant.
  - Complete conceptual engineering.

- HUMANRUS (South Africa). 100 MW CSP tower plant.
  - Due Diligence.

- TAQA (Egypt). 200 MW Central Receiver tower plant.
  - Technical Advisory.

- MA'AN SOLAR (Jordan). 46 MW.
  - Technical Advisory (review of technologies, technical DD of eSolar's technology, site assessment and analysis, project implementation planning).

2.5 RELEVANT REFERENCES; CSP (II)

- DELINGHA (China). 50 MW with 9 h of thermal storage.
  - Owner Engineering: technical studies, basic and detailed engineering revision and approval, critical components & EPC bidding process and procurement support, construction supervision, staff training, commissioning and start-up supervision.

- Hybrid thermo solar combined cycle power plant.17 MW ISCC hybrid power plant.
  - Basic engineering, detailed engineering, procurement engineering, construction site supervision, and commissioning site supervision.

- ASTEXOL 1,2 (Spain). 2X50 MW with 8.2 h of thermal storage.
  - Feasibility studies, site evaluation and selection. Basic engineering, main equipment definition, specification and procurement, owner engineering, licensing and front-end engineering construction supervision

- ASTE-1, 2 & 3 (Spain). 3x50 MW with 8.2 h of thermal storage.
  - Feasibility studies, site evaluation and selection. Basic engineering, main equipment definition, specification and procurement, owner engineering, main equipment procurement and construction supervision

2.5 RELEVANT REFERENCES; CSP (III)

- BOKPOORT CSP plant (South Africa). 50 MW with 3.5 h of thermal storage.
  - Technical studies, power plant dimensioning, performance model study, detailed engineering approval, construction supervision, start-up supervision, commissioning.

- OUAZARZATE (Morocco). 160 MW.
  - Technical advisory (technical and design optimization, EPC bidding process, contract management).

- SHAMS 1 (UAE). 100 MW.
  - Technical advisory (technology, engineering, cost estimate review and approval).

- SABHA SOLAR (Libya). 300 MW.
  - Feasibility studies (front end engineering, owner's engineering), EPC tendering, final arrangement and negotiation.

- HYPERION (Spain). 2x50 MW with 8.2 h of thermal storage.
  - Feasibility studies, site evaluation and selection, licensing and front-end engineering.

2.5 RELEVANT REFERENCES; CSP (IV)

- GUJARAT SOLAR (India). 50 MW.
  - Technical advisory (site selection, technical studies, front end engineering, equipment specification, performance modeling, financial modeling).

- RAJASTHAN SOLAR (India). 10 MW.
  - Owner's engineering (review of basic and detail design, support during construction, monitoring and technical support).

2.6 RELEVANT REFERENCES; PV (I)

- ARSOL-1, (Spain). 5 MW PV Plant.
  - Feasibility studies
  - Basic and detail engineering
  - Equity & debt arrangement
  - 42.2 M€ ($63.3 million)
  - Construction supervision
  - Plant operation management

- ARSOL-TOLEDO, (Spain).10 MW PV Plant.
  - Feasibility studies
  - Basic and detail engineering
  - Equity & debt arrangement
  - 92.0 M€ ($138.0 million)
  - Construction supervision
  - Plant operation management

- MIRASOL, (Spain). 5 MW PV Plant.
  - Feasibility studies
  - Front-end engineering

- Several Banks
  - Due diligence processes

2.6 RELEVANT REFERENCES; PV (II)

- ADANI POWER, (India). 40 MW PV Plant.
  - Basic and Detailed engineering
  - Purchase specifications
  - Project management services
  - Construction supervision

- SHAPORJI PALLONJI, (India). 2 x 5 MW PV Plant.
  - Technical advisory

- 200 MW PV plant, Antofagasta (Chile).
  - Owner's engineer

- Several USA Developers, 5-15 MW PV Plants.
  - Technical advisory
  - Front-end engineering

- Several Spanish Developers, Rooftop PV.
  - Technical advisory

2.6 RELEVANT REFERENCES; PV. SCADA SYSTEM DEVELOPMENT AND INSTALLATION (III)

- JAVIERA (Chile). 73 MW.
  - Supply, delivery and commissioning of control monitoring system & SCADA, detailed design, hardware installation, software release and commissioning.

- HORUS (Guatemala). 50 MW.
  - Supply, delivery and commissioning of control monitoring system & SCADA, detailed design, hardware installation, software release and commissioning.

- CRUCERO (Chile). 72 MW.
  - Supply, delivery and commissioning of control monitoring system & SCADA, detailed design, hardware installation, software release and commissioning.

- CHOLUTECA I & II (Honduras). 50 MW.
  - Supply, delivery and commissioning of control monitoring system & SCADA, detailed design, hardware installation, software release and commissioning.

- Pacífico (Honduras). 23 MW.
  - Supply, delivery and commissioning of control monitoring system & SCADA, detailed design, hardware installation, software release and commissioning.

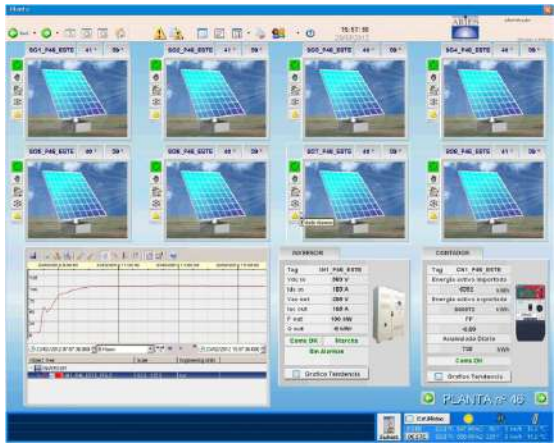
2.6 RELEVANT REFERENCES; PV. SCADA SYSTEM DEVELOPMENT AND INSTALLATION (IV)

- MARCOVIA (Honduras). 35 MW.
  - Supply, delivery and commissioning of control monitoring system & SCADA, detailed design, hardware installation, software release and commissioning.

- ARSOL TOLEDO (Spain). 10 MW.
  - Supply, delivery and commissioning of control monitoring system & SCADA, detailed design, hardware installation, software release and commissioning.

- ARSOL-1 (Spain). 5 MW.
  - Supply, delivery and commissioning of control monitoring system & SCADA, detailed design, hardware installation, software release and commissioning.

- Kathu (South Africa). 75 MW.
  - Supply, delivery and commissioning of control monitoring system & SCADA, detailed design, hardware installation, software release and commissioning.



2.6 RELEVANT REFERENCES; PV. SCADA SYSTEM DEVELOPMENT AND INSTALLATION (V)

- CAP, Llano de Llampos (Chile). 100 MW.
  - Supply, delivery and commissioning of SCADA System.

- SAN ANDRÉS (Chile). 50 MW.
  - Supply, delivery and commissioning of SCADA System.

Aries SCADA is absolutely flexible, based on standards, using non proprietary hardware & protocols and capable of adapting to allow our clients to fulfill their business goals minimizing costs and maximizing their assets efficiency.

2.6 RELEVANT REFERENCES; PV. CMMS SYSTEMS DEVELOPMENT AND INSTALLATION (VI)

- JASPER (South Africa). 95 MW.
  - Supply, delivery and commissioning of CMMS System (Computer Maintenance Management Software), detailed design, hardware installation, software release and commissioning, test validation, commissioning.

- HORUS (Guatemala). 50 MW.
  - Supply, delivery and commissioning of CMMS System (Computer Maintenance Management Software), detailed design, hardware installation, software release and commissioning, test validation, commissioning.

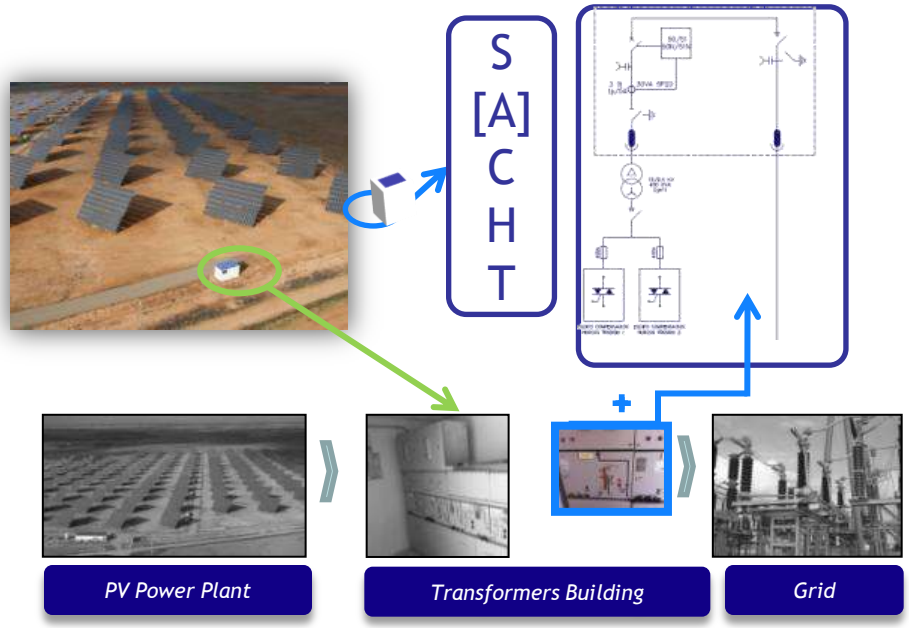
- ARSOL TOLEDO (Spain). 10 MW.
  - Supply, delivery and commissioning of CMMS System (Computer Maintenance Management Software), detailed design, hardware installation, software release and commissioning, test validation, commissioning.

- ARSOL-1 (Spain). 5 MW.
  - Supply, delivery and commissioning of CMMS System (Computer Maintenance Management Software), detailed design, hardware installation, software release and commissioning, test validation, commissioning.

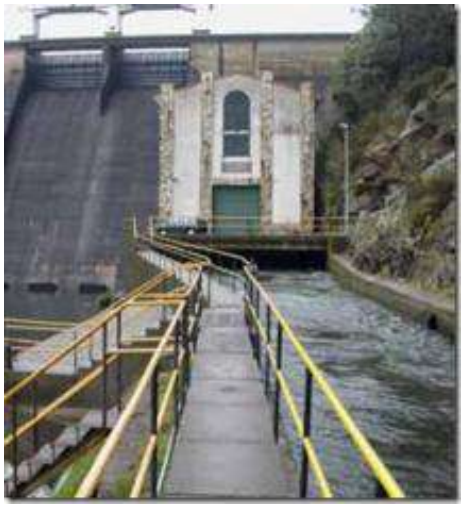
2.6 RELEVANT REFERENCES; PV. ARIES LOW VOLTAGE RIDE THROUGH (LVRT) SOLUTION

- Several (Spain). +650 MW. More than 80 certified plants in Spain. Adaptation of PV plants to Spanish regulation RD1565/2010, Normativa P.O. 12.3 related to Low Voltage Ride Trough.

  - EPC: basic engineering, equipment supply and installation, civil works, permitting, commissioning.



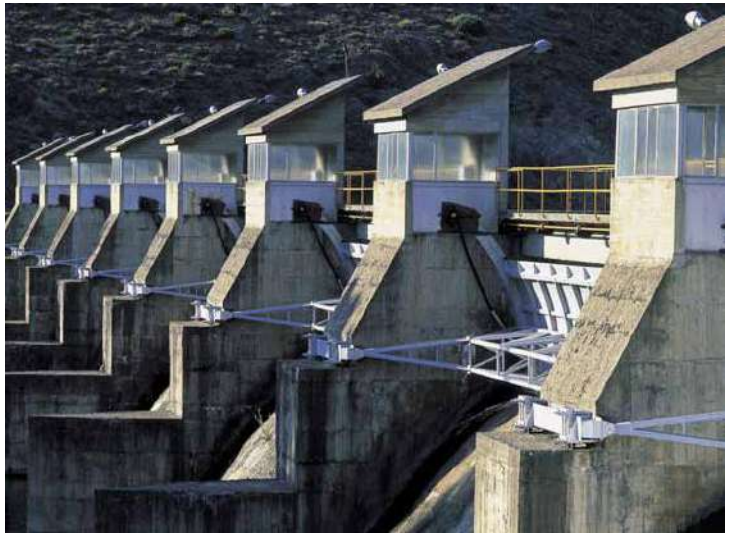
2.7 RELEVANT REFERENCES; HYDROELECTRIC POWER PLANTS (I)



- Engineering and Management Services for National Development Hydro Plants Program in Spain (IDAE). 30 Hydro:
  - Salto del Olvido, Segovia. 1.2 MW
  - Águeda, Salamanca. 5 MW
  - Bubones, Soria. 1.7 MW
  - San José, Valladolid. 3x0.8 MW+1.46 MW
  - Feixa II, Pontevedra. 5.0 MW
  - Selga de Ordás, León. 1.8 MW
  - Asturias I+II. 8.2 MW
  - Garganta de la Eliza. Lanzahita, Ávila. 2.0 MW
  - Almazán Canal, Soria.
  - Virgen de las Viñas, Burgos. 1.8 MW

2.7 RELEVANT REFERENCES; HYDROELECTRIC POWER PLANTS (II)

- Oquillegui. Guipúzcoa (Spain). 500 kW
- Derivación del Guavio, (Colombia). 32.0 MW
- Diteki River, (Philippines). 1.67 MW
- Talaytay River, (Philippines). 1.46 MW
- Davildavilan River, (Philippines). 1 MW



2.8 RELEVANT REFERENCES; WIND (I)

- Integrated Wind Programme, (Morocco). 850 MW. ACWA Power:
  - Technical advisory.
- San Vicente, (Guatemala). 10 MW. Filacol:
  - Wind resource evaluation, plant engineering.
- 2x200 MW Wind Farms, Colorado (USA). Investment fund:
  - Site selection, technical studies, land securing, administrative/official studies, licensing documents and management, front end engineering, pre-engineering.
- 2x200 MW Wind Farms, Illinois (USA). Investment fund:
  - Site selection, technical studies, land securing, administrative/official studies, licensing documents and management, front end engineering, pre-engineering.
- 2x200 MW Wind Farms. Wyoming (USA). Investment fund:
  - Site selection, technical studies, land securing, administrative/official studies, licensing documents and management.
- 64 MW Wind Farm, (Romania). Industrial Group:
  - Identification of utilities and traders, power purchase agreement negotiation and signature, green certificates contract negotiation and signature.
- 33 MW Wind Farm, (Kazakhstan). Development Fund:
  - Technical Advisory.
- 50 MW Wind Farm, (Romania). Development Fund:
  - Technical Advisory.

2.8 RELEVANT REFERENCES; WIND (II)

- 200 MW Wind Farm, Indiana (USA). Developer:
  - Technical Advisory.
- 120 MW Wind Farm, (Romania). Confidential:
  - Technical Advisory.
- 67 MW Wind Farms. Chimay, Froidchapelle and Cerfontaine (Belgium). NEO Energía:
  - Technical Advisory.
- 11.5 MW Wind Farm. El Hierro (Spain). Construcciones Especiales y Dragados, S.A.:
  - Technical Advisory.
- 11.7 MW Wind Farm. Sorihuela (Spain). Banco Sabadell:
  - Financial and technical advisory.
- Wind Farms Technical Advisory, (Spain). EHN (ACCIONA):
  - Technical Advisory.
- Wind Farms Monitoring Management, (Spain, Italy, Cyprus, Greece, UK, Poland, Romania, Hungary, Estonia, Mexico, Chile, China). Iberdrola:
  - Wind monitoring mast installation, wind resource and data management. Site selection.
- Several wind farms, (Spain). Gamesa:
  - Feasibility studies, components design, analysis of systems, wind turbine performance, power curve test.

2.9 RESEARCH AND DEVELOPMENT

Nanoscale mechanical metrology for industrial processes and products

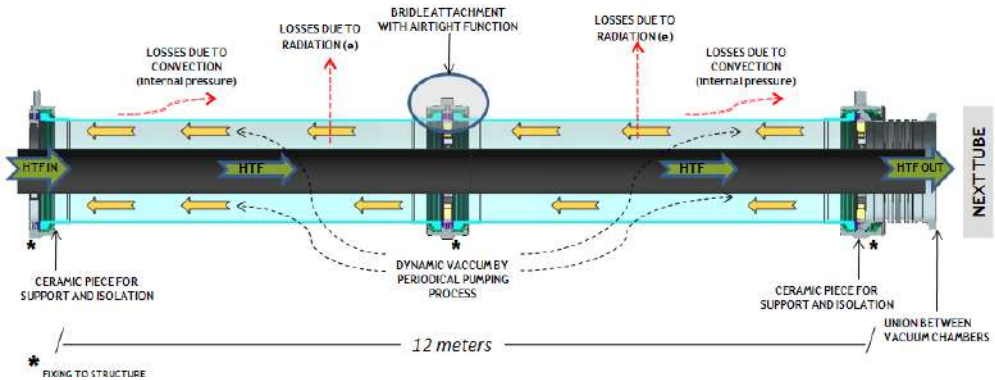
Project	NECSO "Nanoscale Enhanced Characterisation of Solar selective coatings
Date	2012 -2015
Customer	European Commission. R&D Collaborative project funded under the Seventh Framework Programme (FP7)
Aries role	Expert in CSP
Scope of Services	The target is providing tools to the end users (solar plants builders) to guaranty that solar selective coating will work properly during the whole life of the system (20-25 years). Additionally, the testing protocols should help coating developers comparing available layers and new designed films, with standard procedures.

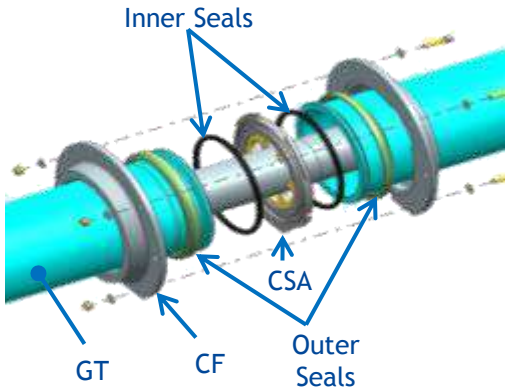
New solar collector concept for high temperature operation in CSP applications (HITECO)

Project	HITECO
Date	2010 -2013
Customer	European Commission. R&D Collaborative project funded under the Seventh Framework Programme (FP7)
Aries role	Project Coordinator
Scope of Services	Development and validation of a new concept of absorber tube and Solar Assembly Collector that allows the operating temperature of the transfer fluid (HTF) to reach near 600ºC increasing the performance and reducing the manufacturing costs.

2.9 RESEARCH AND DEVELOPMENT

Aries has developed a new absorber tube that integrates innovative approaches and exhibits technical and commercial advantages





- New geometrical-conceptual approach.
- Independence between the internal tube (steel) and external tube (glass).
- Dynamic vacuum produced on field in batch.
- Less severe working conditions and more flexible in operation.
- Continuous monitoring of the performance.
- Simply manufacturing and assembling.
- Usable with any conventional collector.
- A factory is not needed.

Patent granted in Europe, China and USA
Radiation heat Collector Device
PCT WO 2010/136471 A1

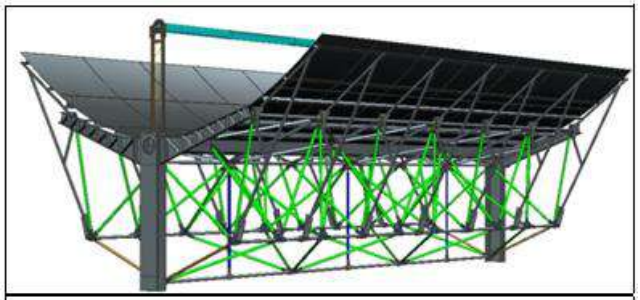
2.9 RESEARCH AND DEVELOPMENT

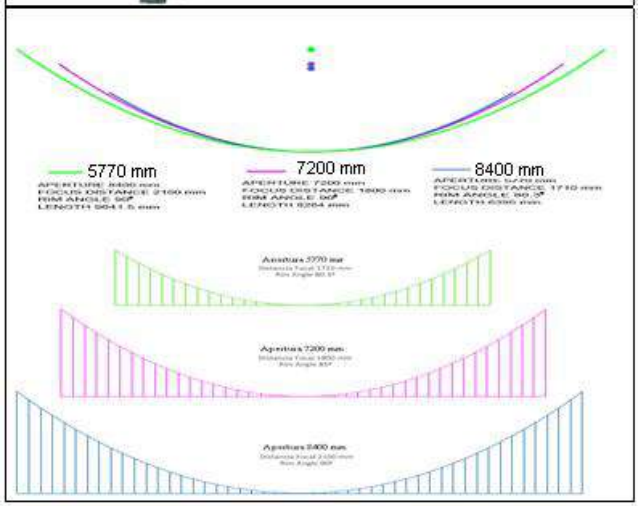
Tested in real conditions at medium 400ºC and high 550ºC temperatures.

ART tube has been introduced in fairs and publications around the world.

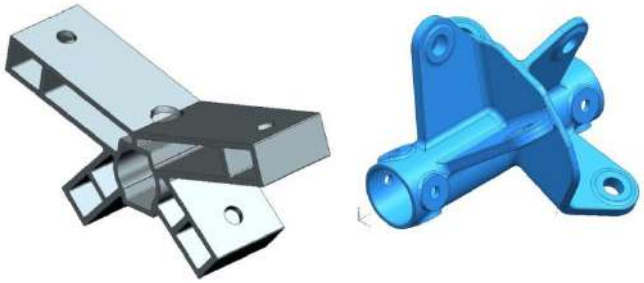
2.9 RESEARCH AND DEVELOPMENT

A new solar supporting structure has been developed by Aries. This conceptual design has been analyzed for several geometrical approaches…





- Adaptable to different apertures
- Configurations based on tetrahedroms
- 3D concept using steel bars



Unions of bars using aluminium nodes

2.10 RELEVANT REFERENCES; COMBINED CYCLE POWER PLANTS

- Endesa, Madrid, (Spain)
  - CCGT plant definition and environmental studies (6 plants, 5600 MW):
    - 2 x 400 MW CCGT plant. Gijón (Spain).
    - 2 x 400 MW CCGT plant. Escatrón, Zaragoza (Spain).
    - 2 x 400 MW CCGT plant. Escombreras, Cartagena (Spain).
    - 2 x 400 MW CCGT plant. Puertollano, Ciudad Real (Spain).
    - 3 x 400 MW CCGT plant. Estremera, Madrid (Spain).
    - 3 x 400 MW CCGT plant. Santa Cruz, Toledo (Spain).

- Papelera Española, Cicuñaga Plant, (Spain)
  - 7.2 MW CCGT Plant

2.11 RELEVANT REFERENCES; NUCLEAR POWER PLANTS

- Vandellós I, (Spain)
  - Pipe stress analysis
- CFE Laguna Verde I, (Mexico)
  - Startup piping final revision.
  - Main steam valve test set up and analysis.
- KNUPP, Karachi, (Pakistan)
  - Pipe stress analysis
  - Main steam valves test rig
- Nuclenor, Garoña Nuclear Power Plant, Burgos (Spain)
  - Main buildings pressure control system
- Valdecaballeros Nuclear Power Plant, Badajoz (Spain)
  - Pipe stress analysis.
  - Valve test systems review.
- Cofrentes Nuclear Power Plant, Valencia (Spain)
  - Pipe stress analysis.
  - Valve test systems review.
- Almaraz, Nuclear Power Plant, Cáceres (Spain)
  - Pipe stress analysis.
  - Valve test systems review

2.12 RELEVANT REFERENCES; BIOFUELS

- Biocarburantes Manchegos
  - Feasibility studies
  - Basic and detailed engineering
- Biobutanol process
  - Feasibility studies
  - Process development
- XTL (solid to liquid fuel)
  - Process development

2.13 OTHER REFERENCES

Since 1985 Aries has been involved in several other power projects:

- 100 kW Ceramic fuel cell development
- Nuclear power plants
  - Pipe stress analysis
  - P & ID review
- CO_2 capture process
- Natural gas reformer
- Other

3. Contact

For additional information, please contact us:

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