New technologies for design, construction and operation of Parabolic Trough CSP: Lessons learned to optimize the construction and commissioning

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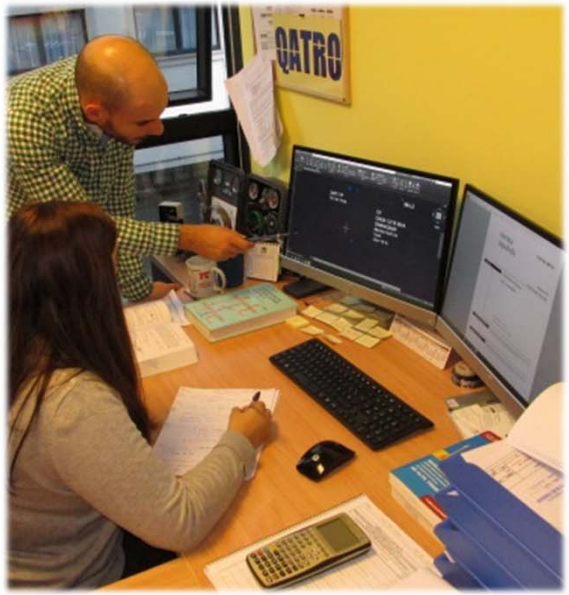
Electrical and I&C services

- Supervision & Commissioning
- Engineering, Training and Tests
- Operation & Maintenance



Where we were and where we are today

- Germany
- Angola
- Saudi Arabia
- Australia
- Bangladesh
- Brazil
- Chile (**QATRO Chile**)
- USA
- Egypt
- UAE
- Spain
- Finland
- Netherland
- Italy
- Ireland
- Israel (**QATRO Israel**)
- Mexico
- Portugal
- Domenican Republic (**QE Dominicana**)
- Southafrica (**QATRO SouthAfrica**)

Assuming always, the total responsibility of the contracted service, with own resources

Main clients:

QATRO

Some CSP references of QATRO (in Commissioning and Test):

→ CSP Orellana (50MW) **(Spain)** (ACCIONA Energía) 2012

→ CSP Khi Solar One (50 MW) **(Southafrica)** (ABENGOA) 2014

Some CSP references of QATRO (in Commissioning and Test):

→ CSP Ashalim Plot B (121 MW) (GE) + Ashalim Plot A (110 MW) **(Israel)** (SOLELABEN) 2017 - 2018

→ CSP Kaxu Solar One (100 MW) + Xina Solar One (100 MW) **(Southafrica)** (ABENGOA) 2014 - 2017

Which is the focus of every POWER PLANT Project?

AVOID DELAYS IN CONSTRUCTION AND COMMISSIONING OF THE PLANT

MAXIMIZE GENERATION PERFORMANCE

AVOID NON REGULAR MAINTENANCE STOPPAGES

IMPROVE THE EFFECTIVENESS AND EFFICIENCY OF THE LIFESPAN OF THE PLANT

The development of a project consists of three distinct phases, consecutive and intensely related to each other:

CONSTRUCTION

- From the layout in order to the earthmoving, until the completion of the previous tests

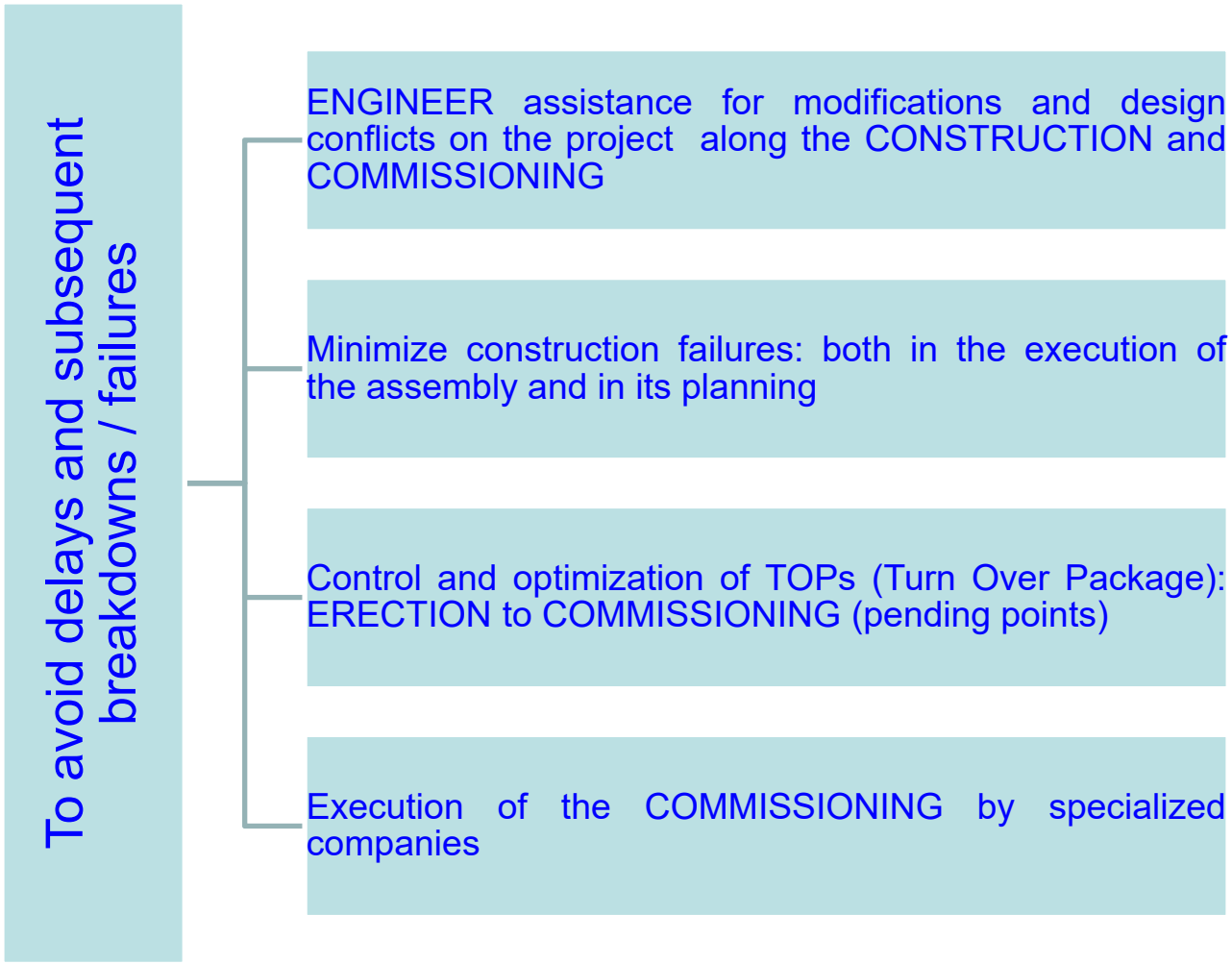
COMMISSIONING

- Of all the elements, equipment, systems and plant
- Involving basically the cold tests (including the repetition of the previous tests carried out by construction: now named as initial commissioning tests), the cold functional tests, the hot tests, the hot functional tests, the tests of systems and, finally, the integrated tests of the plant

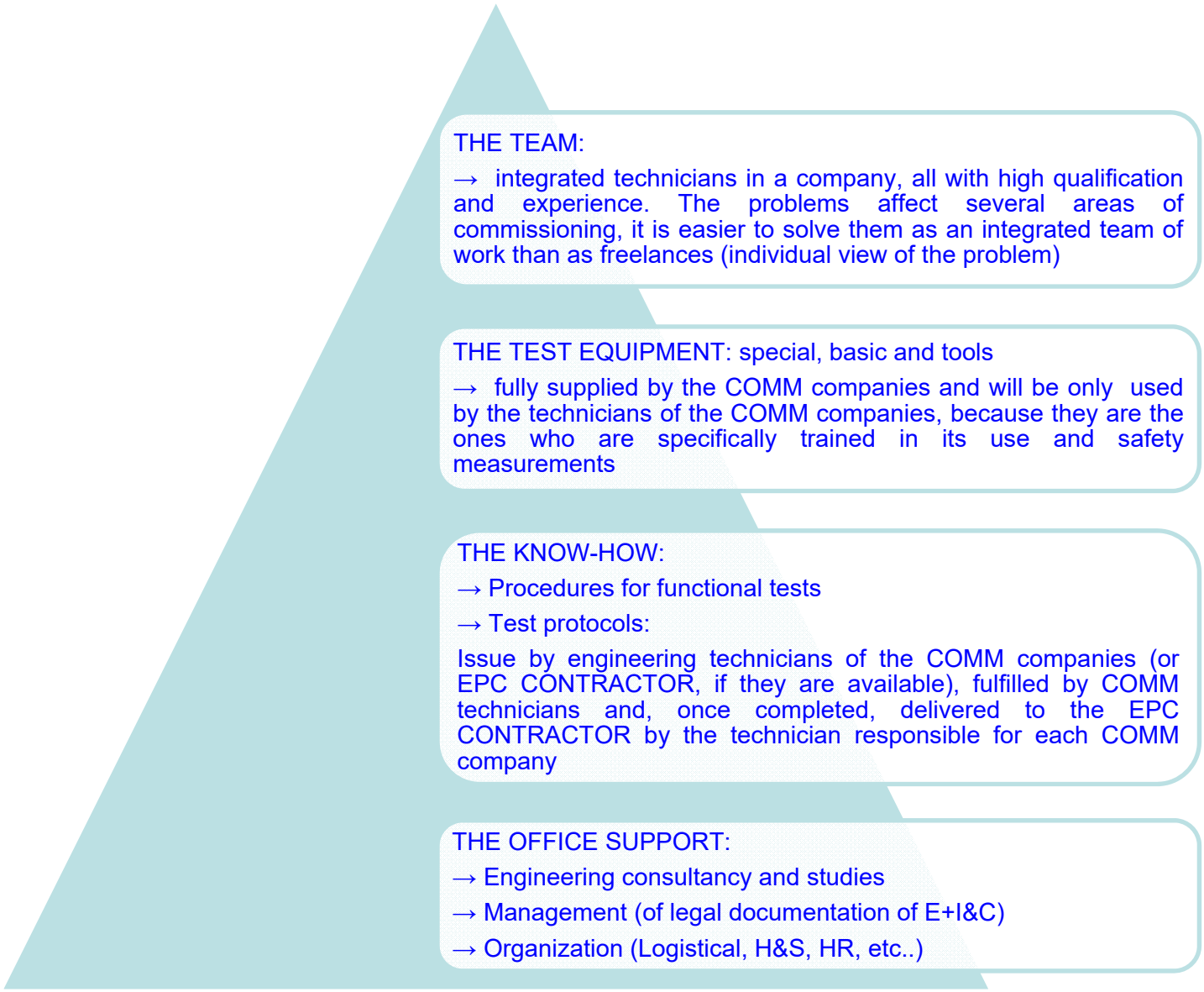
PRE-OPERATION

- Involving the resolution of all problems not solved in the two previous phases (construction and commissioning) for the optimization of the plant, as well as the performance tests, this stage ends with the signature of the definitive reception certificate, at the end of the guarantee period: delivery of the plant to its owner

Needs over Construction and Commissioning stages



Specialized companies: the tip of the iceberg of Commissioning service



THE TEAM:

→ integrated technicians in a company, all with high qualification and experience. The problems affect several areas of commissioning, it is easier to solve them as an integrated team of work than as freelances (individual view of the problem)

THE TEST EQUIPMENT: special, basic and tools

→ fully supplied by the COMM companies and will be only used by the technicians of the COMM companies, because they are the ones who are specifically trained in its use and safety measurements

THE KNOW-HOW:

→ Procedures for functional tests

→ Test protocols:

Issue by engineering technicians of the COMM companies (or EPC CONTRACTOR, if they are available), fulfilled by COMM technicians and, once completed, delivered to the EPC CONTRACTOR by the technician responsible for each COMM company

THE OFFICE SUPPORT:

→ Engineering consultancy and studies

→ Management (of legal documentation of E+I&C)

→ Organization (Logistical, H&S, HR, etc..)

Problems and construction gaps, solved in COMMISSIONING

QATRO

Solar Field

Despite being the most repetitive and simple assembly of all plant, an error in a temperature of a loop, multiplies transforming itself into losses of performance and time for its correction

It's a must:

Supervision of construction with one (1) COMM technician for each discipline that will later be integrated into the COMM team

And reinforce the commissioning of the solar field

Package plants suppliers

The suppliers of package plants or systems always provide its own commissioning, normally do it in the construction stage when the COMM team is not still in plant, which is the integrator of this equipment with the rest of the installation.

It's a must:

Planning the supply of plant / systems packages, as close to the arrival of the COMM Team or otherwise include in the contractual schedule, two separated assistances:

SUPPLY + COMM

Engineering modifications

On site it is necessary an engineering support for the resolution of conflicts along the CONS and COMM stages, the field service usually remains without this support that delays the progress of the project by modifications, errors in drawings, etc.

The EPC engineering in the final phase of the project is already working on new projects

It's a must:

An online support to the COMM, for example by solving consultancies in real time. Engineering support service for Commissioning

Are mostly assembly errors

(which delays the commissioning)

For example, usual mistakes:

► In the Thermal Energy Storage (TES) of molten salt: the assembling of valves; sometimes we find in the opposite direction (maybe because both sides are apparently the same)

► Wiring: Laying cables and connections: check that the cable communicates but NOT the suitable signal; sometimes for lack of knowledge of the plant process

► Connection of three-phase motors: the electrical feeders must be connected according to the direction of rotation requested by the pump (not the motor)

► In the solar field the interlocks between mini-substations are forgotten

► HTF System: joints sealed with Teflon instead of graphene

Our experience recomends:

► Supervision of construction with one (1) COMM technician for each discipline that later will be integrated into the COMMISSIONING TEAM

► Repeat previous tests: Tightening of connections and insulation resistance measurement

Lessons learned to optimize the construction and commissioning

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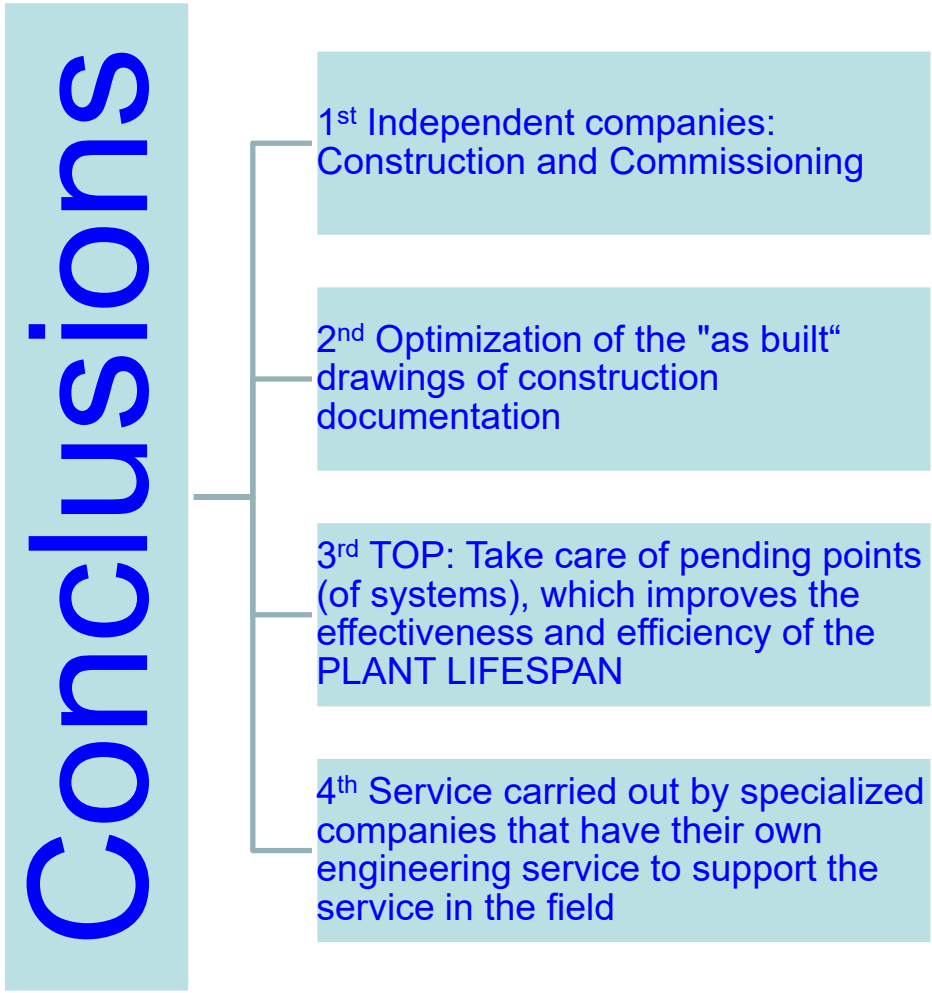

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Thanks for your attention

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