FABRI S.A.
INGENIERIA, CONSTRUCCIONES Y MONTAJES INDUSTRIALES

Solar PV & Wind Farms

Operations & Maintenance


Improve Global
Environment
Foster
Local Development


Solar PV Farms Operation & Maintenance

Operation & Maintenance

Central Monitoring & Supervision
(24/7 availability)

Maintenance Management & Execution

MULTI-TECHNOLOGY SYSTEMS INTEGRATION

BEST IN CLASS SERVICE

TECHNICAL ASSET MANAGEMENT

PERFOMANCE **UPGRADING & REVAMPING**

O&M service

Operation Management Center

Preventative and corrective
Maintenance Reporting
Stock management and technical advising
Re-engineering and optimization

Energy Production Monitoring
Incidents Management
Operation Reporting

Increase Energy Production
Optimize O&M Costs
Ensure Quality of Performance & Staff Safety
Minimize Operational Risks

Engineering & Field Services

OPERATION OF PV SYSTEMS

- **Remote Supervision 24 / 7 / 365**
  - Automatic Alarming
  - Processed Alarming
  - Manual Supervision

Set of activities required to ensure continuous detection of disruptive operating conditions with relevant impact over production, maintenance or safety.

- 360º Incidents Management (occurrence-dispatching-closure)Impact management & losses awareness
- Performance & Operation Reporting (periodic)
- Local Reestablishment Capabilities
- Technical Detection & Diagnostic
- Reduction of false alarming
- Resources awareness ahead from intervention

Engineering & On-Site Services

MAINTENANCE OF PV SYSTEMS

Preventive Maintenance Management & Execution (SIGMA)

- Manufacturers recommendations implementation (Warranty)
- Certified Thermograph inspections (ITC)

- 3D Production holograms, Thermograph survey, Processed alarming
- Cost-benefit analysis for modules cleaning implementation

- **Corrective Maintenance**
- General electromechanical and civil works
- Highly skilled technical interventions – specialized repairing (equipment repair on manufacturers' behalf)
- **Condition Based Maintenance**

- **Cleaning**
- **Field Cleaning & Treatment (shadowing, drainage, security, fire)**
- Modules Cleaning (hotspots, production, warranty)

Maintenance delivery determines the lifecycle cost and performance. Good performance requires engineering delivery on field service.

Engineering & On-Site Services

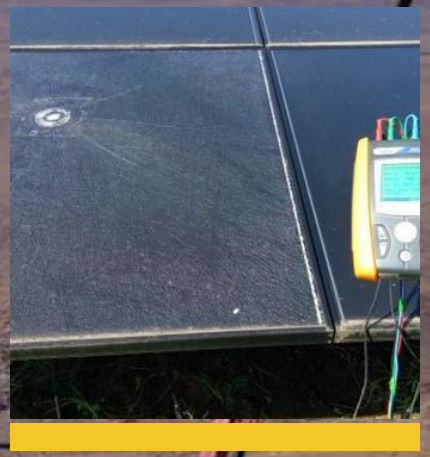
O&M ENGINEERING ON PV SYSTEMS

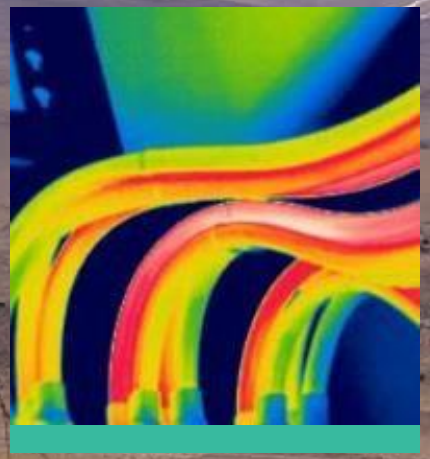
- **Warranty Management**
- MTBF Benchmarking
- ITC certified claiming
- Global warranty management & Purchase and Procurement
- **Stock Management** (global, portfolio level)

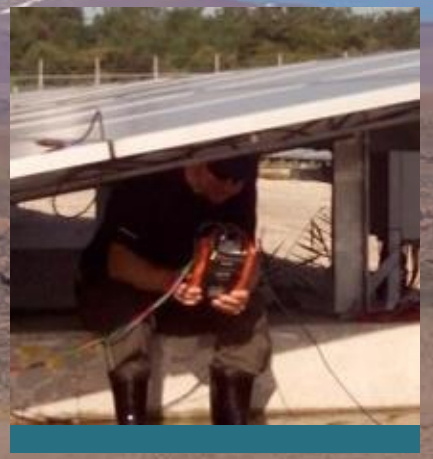
- **Cost-Benefit analysis for technical improvements**
- **Global Performance Benchmarking** (portfolio, regional, equip. level)
- **Retrofitting, overhauling, technological updating** (ageing effects)

Set of activities required to ensure equipment's lifetime and downtime minimizing at lowest cost, aiming its overall best performance and working conditions

Additional Services:







DUE DILIGENCE – TECHNICAL AND RISK ASSESSMENT

Evaluation of installed maintenance backlogs.

Hidden underperformance – bottlenecks & constraints

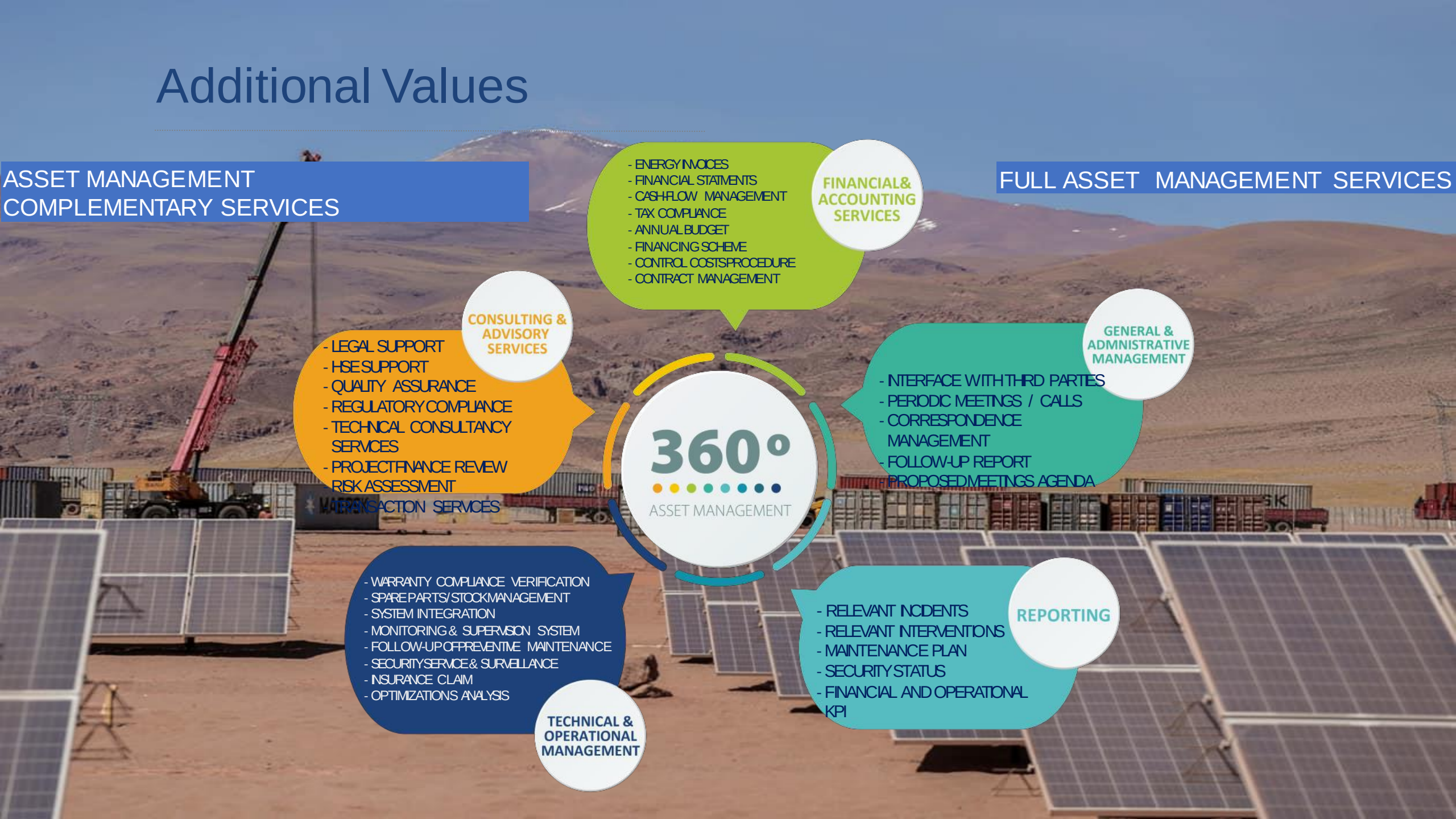
Warranty risk anticipation

Risk exposure to 3rd parties delivery incorporation

Additional Values

ASSET MANAGEMENT
COMPLEMENTARY SERVICES

FULL ASSET MANAGEMENT SERVICES



Differentiating Values

PEOPLE

ADDED VALUE

- **Profiles focus** (mainly electrical maintenance expertise, for the long term)
    - Experienced Maintenance Managers
    - Locals, native speakers
    - Electrical Engineering focus
- **OWN employees**

Differentiating Values

PROCESSES

ADDED VALUE

- **Resources management & allocation**
  - Engineering is directly placed in field areas
  - Own field technicians ensure TTR (Time to Respond)
- **Training for Expertise**
  - ITC certified engineering
  - Inverters Manufacturers certified training
  - Own field technicians
- Subcontract only for non-core activities for service delivery (cleaning)
- **MMC – Maintenance Methods Center** & Specialized Engineering (HQ)
  - Best Practices implementation
  - Standardization of Preventive Maintenance Plans and WI
  - Maintainability and Reliability assessment and benchmarking
  - Pool of Maintenance Experts (thermograph, SCADA, MV)

- **Maintenance Management based on global system SIGMA / GMAO**
  - 360º management for work instructions (MTBF, MTTR)
  - Maintenance reporting and Benchmarking
- **Global Claiming Management**
  - Alert globally managers/customers for equipment endemic failures
  - Disseminate globally retrofitting per equipment
  - Enforce claims resolution at key account manager level
  - Global perspective on Reliability & Maintainability (RAMS, /MTR)

Differentiating factors

SYSTEMS

ADDED VALUE

OMC – OPERATION MANAGEMENT CENTER (HQ)
(Central Control room for the centralized supervision of PV systems)

- Remote supervision by **Electrical engineers**
- **Manual remote inspection** routines procedure
- **Alarmist routines** implemented: **Automatic, Processed & KPI's**
- **"Sunrise to sunset" working schedule, 365 days/year, 24h/day**

differentiating factors

SYSTEMS

ADDED VALUE

- **OMS – OPERATION MANAGEMENT SYSTEM**
  - **Top-Five Award** for **Excellence for European Software 2012** (March, Berlin)
  - **Automatic & Intelligent Processed Alarming**
  - **Incidents Management**
  - Centralized and Distributed **Stock Management**
  - **Maintenance Management and Reporting**
  - **Operations Management and Reporting**
  - **Modular and Portable** - web-based access
  - **Non-intrusive** System
  - **Multi**-technology **systems integration**
  - Single platform for **Assets portfolio integration**

- **EP – ENERGY PORTAL** (for Direct Customers Access)
  - Modular and Portable - web-based access
  - Single platform for Assets portfolio integration
  - Accessible from smartphones & tablets
  - Simple & user-friendly access
  - Data export function available

O&M Service Footprint

references

Project: LOMA BLANCA I, II, III and VI WINDFARM Main contractor: POWERCHINA LTD
Client: Goldwind
Location: Ruta Nac No. 3 between Puerto Madryn and Trelew
Date: July 2018 - Ongoing

- Geotechnical studies for 80 foundations and 2 Transformers stations.
- Building 80 Rinforced concrete Foundations for WTG.
- Construction more than 100 km of internal roads.
- Exploration and Quarrying on site.
- Loma Blanca Transformer Station (SS) expansion II & IV.
- Civil works Loma Blanca Transformer Station I, III & VI.
- Civil and Electrical Engineering Loma Blanca I, II, III & VI.
- GROUT installation - Certification BASF

Project: PUERTO MADRYN I and II WINDFARM - Civil Works Client: GENNEIA SA
Location: NO Puerto Madryn - Chubut -
Prov Route No. 4, 15 km with crossing National Route No. 3.. -
Date: September 2017 up to March 2019

- Topographic surveys, geological and topographical assistance to work to foundations, internal roads and embankments, Transformer Station PEM, Buildings and complementary works
- Building 20 Rinforced concrete Foundations Wind Farm (PEM I)
- Building 42 Rinforced concrete Foundations Wind Farm (PEM II)
- Construction of 17.8 km of internal roads (PEM I)
- Construction of 37 km of internal roads (PEM II)
- GROUT Installation - Certification BASF

Project: ALUAR WINDFARM - Civil works
Client: Aluar SAIC
Location: Ruta Nac No. 3 - Puerto Madryn.
Date: August 2017 - January 2018
Work Packages 130 02-Aug-June 17-Jan-18
Contractual Tasks:
Building of 14 Rinforced Concrete Foundations Wind Farm, Platforms and Roadways.
Some Tasks performed in each of the 14 Foundations included: Anchor Cage Armed (in workshop contractor)
Blinding concrete
Cutting, bending, Transportation, Armed and Placement Reinforcemen. Puring Structural Concrete.

PROJECT: 500/330 KV Substation Upgrade
Puerto Madryn
Client: Isolux Corsan - Cartellone - UTE
Location: Puerto Madryn - Chubut
Date: May-September 2014
Transformer Station in Puerto Madryn 500/330 kV including:

- Transfer 500 kV line. (5CLPLY1) Field 01 to Field 03 including the completion of this, the transfer line reactors (R1L5PY) field 01 to 03, and incorporating in series a capacitor bank 500 kV.
- Transposition Field 01 on the existing foundations Reactor Series, a bank of reactors new bars (R1B5PY) 150 MVAr. with operating switch.
- Construction of:

. Rampart to all areas affected by the works within the Olympic siege and 3 meters finished off with a layer of gravel
. Perimeter fences
. Precincts Capacitors
. Transformers enclosures
. Piloted foundations for switchgear
. Foundations Support Equipment and Machines
. Foundations Reactors

- Earthworks to level the ground and plan runoff rainwater.
- Auxiliary Services AC 3x380 / 220 V and 110 V DC
- Electrical protection systems
- Remote Control and System TRANSENER. 500 kv outdoor switchyard equipment can be operated from: House Low Voltage Switchgear Local Control System

. Local team maneuver walk from the tripolar case switchgear (switchgears and switches).
. Transener regional office (remote).
. Local control from the workstation connected to a central unit UC (in building command)
. TRANSENER remote system was equipped with Central Unit, peripherals and other components GE - HARRIS.

Project: LOMA BLANCA IV WINDFARM
Client: Isolux Corsán ARGENTINA SA
Location: On National Route 3, km 1430
Date: May 2012 - March 2013

1. Construction of 17 Rinforced Concrete Foundations for wind turbines.
2. Building foundations for electrical transmission line (LAT) 132 kv from Loma Blanca to Transpa Puerto Madryn.
3. Construction of civil works of the Transformer SubStation Wind Farm Loma Blanca (building cells, Isolux building, building Transpa).
4. Transformer SubStation expansion Transpa Puerto Madryn
5. Laying of underground cables wind turbines ET