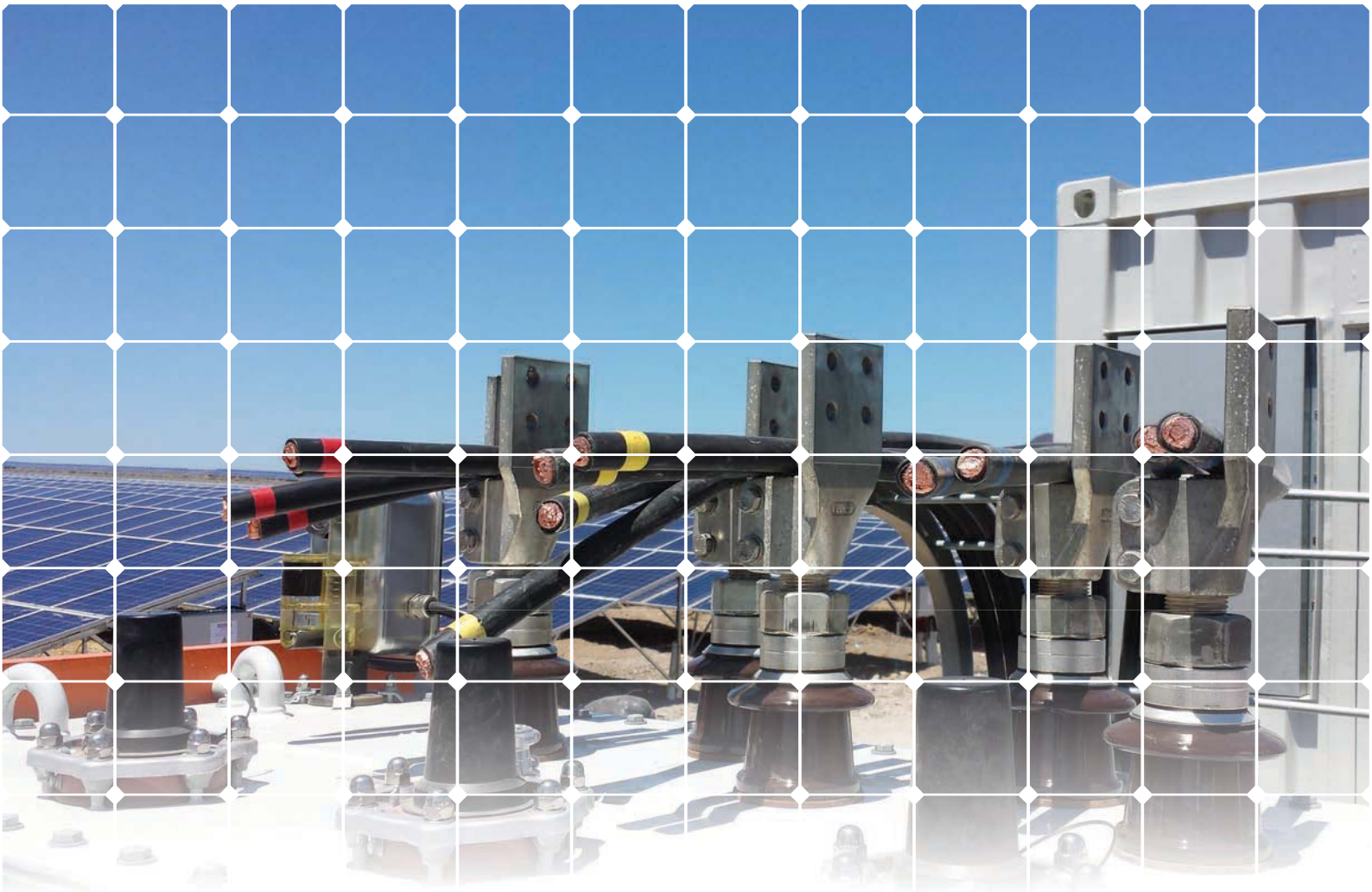




***Iberica Solar***  
*photovoltaic engineering*

# OFFERED SERVICES TO EPC CONTRACTORS





# PRIOR TO EPC CONTRACT AWARD

## Basic Engineering

- Preparation of documentation for bidding process, in alignment with Request For Proposals (RFP) or Minimum Technical Specifications (MTS), to be submitted to developers/owners
- Tendering Support. Preparation of documentation in alignment with tender's documentary structure

## PV Technology selection

These studies focus on the election of the best cost-effective PV arrangement stressing on minimizing the Levelized Cost of Energy (LCOE) or alternatively minimizing the Capital Expenditures (CAPEX)

- Horizontal Single Axis Trackers vs Fixed Tilt racking system
- DC voltage level
- Optimum DC/AC ratio
- Ground Coverage Ratio (GCR) optimization
- Support for tendering tariff estimation based on LCOE

## PV Arrangement

P/Q Assessment. This study deals with the analysis of P/Q curves at the Point of Common Coupling for the complete voltage range of operation in order find best cost effective-combination of reactive power sources i.e. PV inverters, Fix Cap Banks, STATCOMs, SVC etc.. which fulfils with the reactive power requirements as set forth in the Grid Code of application

# AFTER EPC CONTRACT AWARD

## Detailed Engineering

- Electromechanical Engineering
- Civil Engineering
- Instrumentation and Control Engineering
- As-Built documentation

## Main Equipment election support

- Technical Specification drafting according to standards and regulations in force
- Technical comparison of received offers by means of Comment Resolution Sheets (CRS)
- Total Ownership Cost for all involved power transformers within the PV plant

## Some Specific calculations

### Related to the PV racking system:

- Calculation of the most suitable cost-effective foundation for the PV racking system
- Calculation and verification of the PV racking system supporting structure
- Calculation and verification of the PV racking system foundation
- Interpretation of the Local Regulation
- Design of verification procedures (Pull Out Test)
- Pull Out Test interpretation
- Corrosion studies

### Related to civil works:

- Roads design
- Earthworks estimations for both roads and platforms
- Drainage system design. Erosion control plant assessment
- Calculation of the most suitable cost-effective foundation for the inverter stations and control rooms
- Calculation of the perimeter fencing
- Underground conduits mechanical check

### Grid Interconnection electrical studies

- Interpretation of the Local Regulation
- Interconnection Requirements Study. These studies deal with the ability of the PV plant to meet with the grid requirements at the Point of Common Coupling

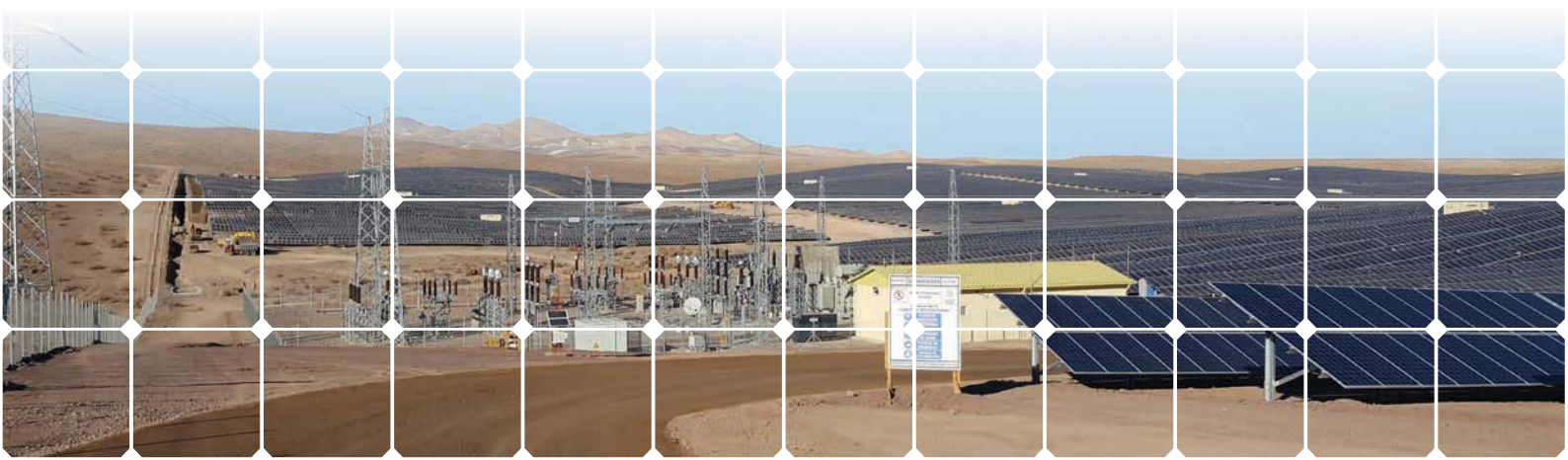
- Grid Impact Study. These studies deal with the impact that the PV plant induces on the electric network when the PV plant gets interconnected to the system
- Harmonic Investigation
- Flicker study
- P/Q Assessment and Power Flow against the system

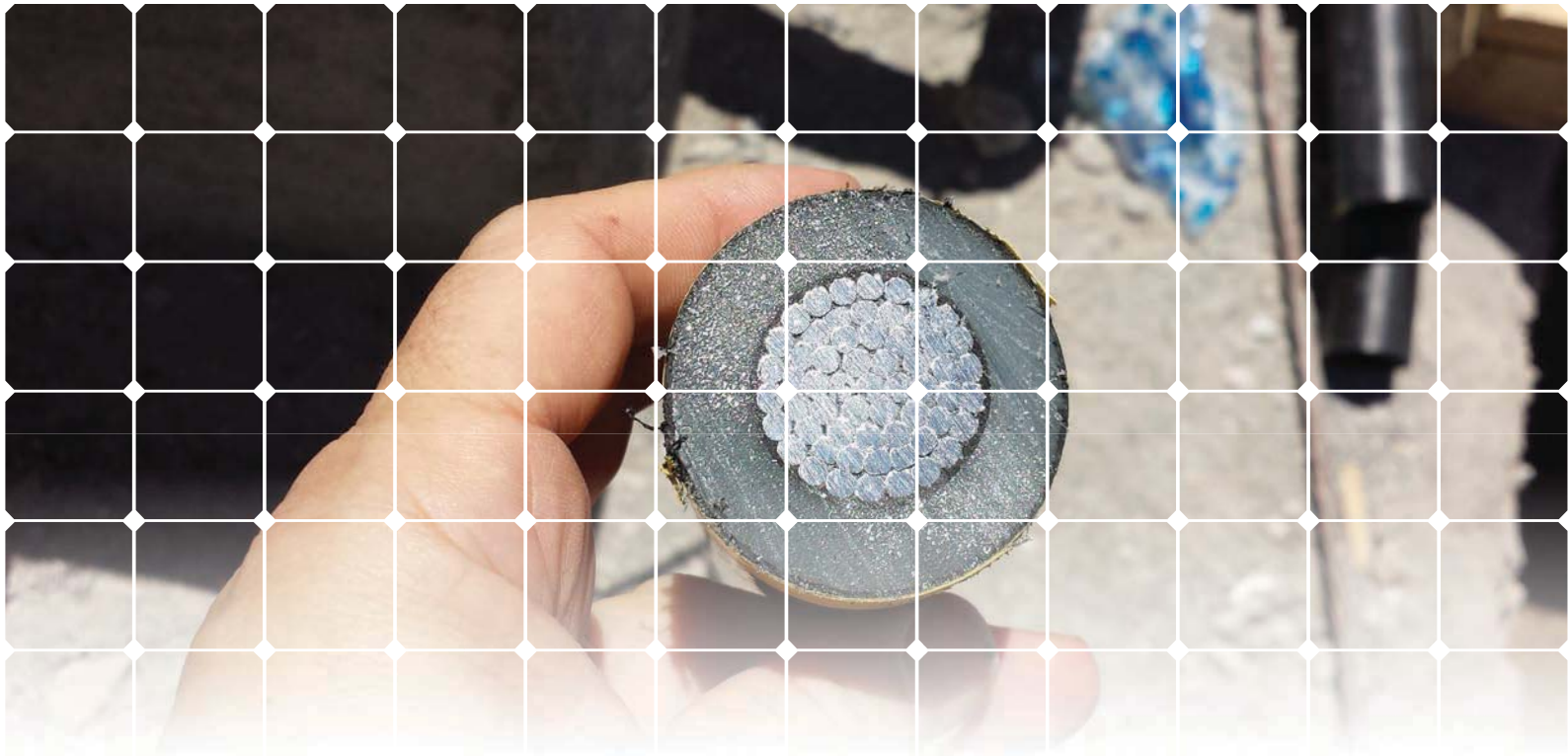
### PV Plant electrical studies

- P/Q Assessment and Power Flow
- Short circuit calculation
- Relay coordination Study
- T.O.V (Inrush Current)
- Grounding grid calculation studies
- Cabling calculation. MV, DC LV, AC LV
- Thermal calculation of trenches by means of finite elements.
- Lightning Risk Assessment Study
- Ferro resonance studies
- MPPT Window assessment for different reactive power Scenarios. Stings Length assessment
- Power Transformers calculation

### Some other studies:

- Ventilation and Air Conditioning studies for Inverter enclosures
- Auxiliary Systems calculation
- Internal and perimeter lighting calculation





# AFTER EPC CONTRACT AWARD

## **Power Plant Controller (PPC). Grid connected and Off-grid systems**

Power Plant Controller (PPC) development in compatible PLC programming language and replicas to attest a reliable and effective insertion of the PV plant meeting with the regulation in force

### **For Hybrid Power Plants**

- Battery Energy Storage System (BESS) optimum sizing.
- BESS performance assessment for either, Frequency Response Control, Ramp Rate Control and Energy Storage derived from energy surplus
- Diesel Gensets performance assessment for Ramp Rate Control in conjunction with BESS
- Weather forecasting integration
- Logic control development for either grid or off-grid systems

### **For Conventional PV Plants**

- Overfrequency and Ramp up management and impact on the PR. Unfulfillment requirements assessment
- Evaluation of potential performance improvement when incorporating BESS to regular PV plants. BESS optimum sizing

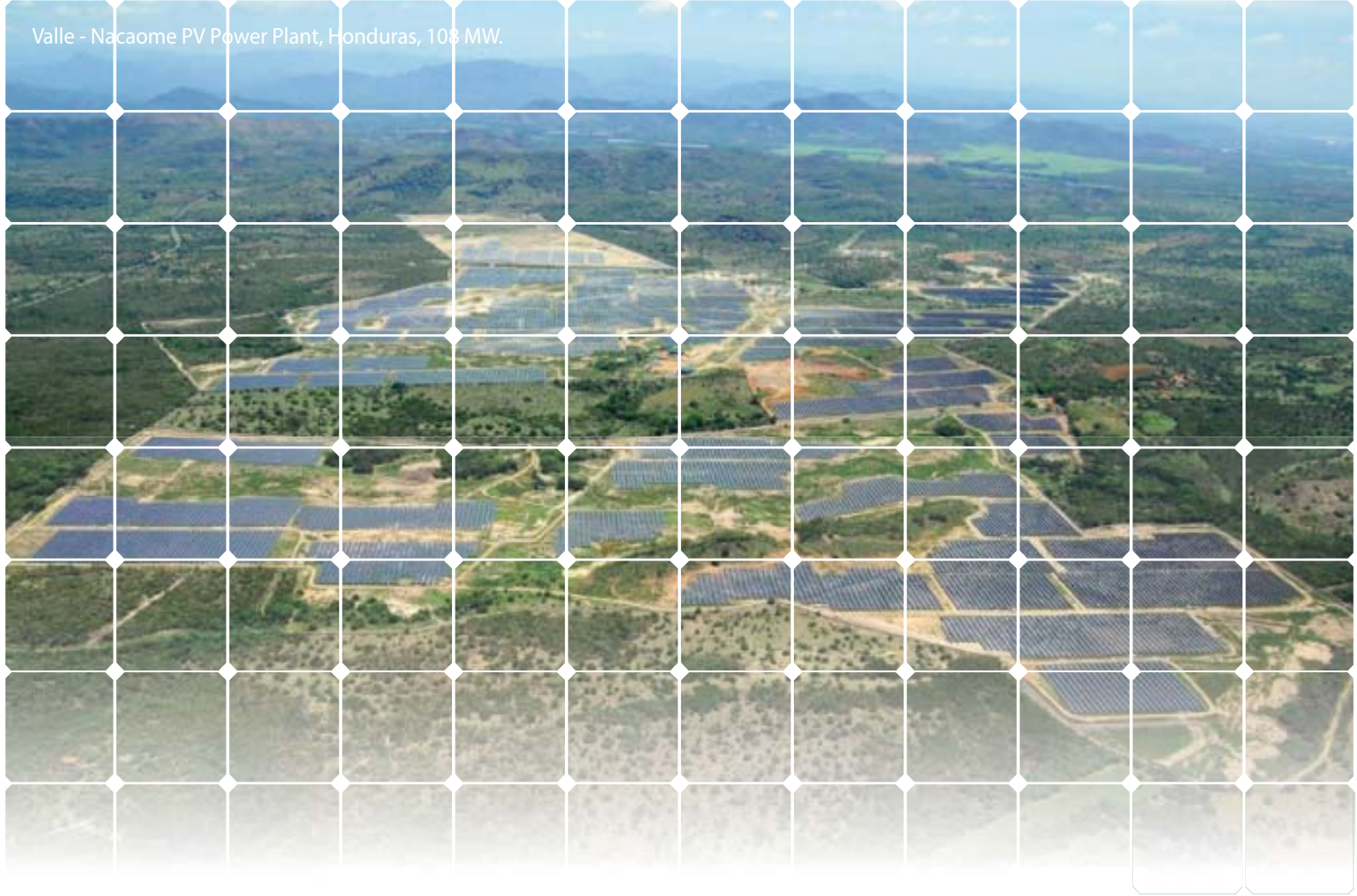
## **Impact of network requirements on Performance Ratio (PR) and Energy Yield**

- Frequency Response. Grid frequency profile along a complete year is needed to assess the actual impact
- Ramp Rate Control. The annual volatility of irradiance is needed to assess the actual impact
- Reactive power / Power Factor / Voltage Regulation System requirements. Reactive power management instructions from utility are necessary to assess the actual impact of such requirement

## **Performance Ratio (PR) actual assessment**

- Energy yield projections for a complete year obtained from the test period collected data
- Ambient temperature deviation factor for PR correction purposes
- Irradiance deviation factor for PR correction purposes
- Calculation of the Performance Ratio. Collating the committed EPC contract Performance Ratio with the actual PR
- Allocation of power losses among involved equipment
- Mean annual system yield P50, P75, P90 and P99 derived from real data
- Bankable Reports

Valle - Nacaome PV Power Plant, Honduras, 108 MW.



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