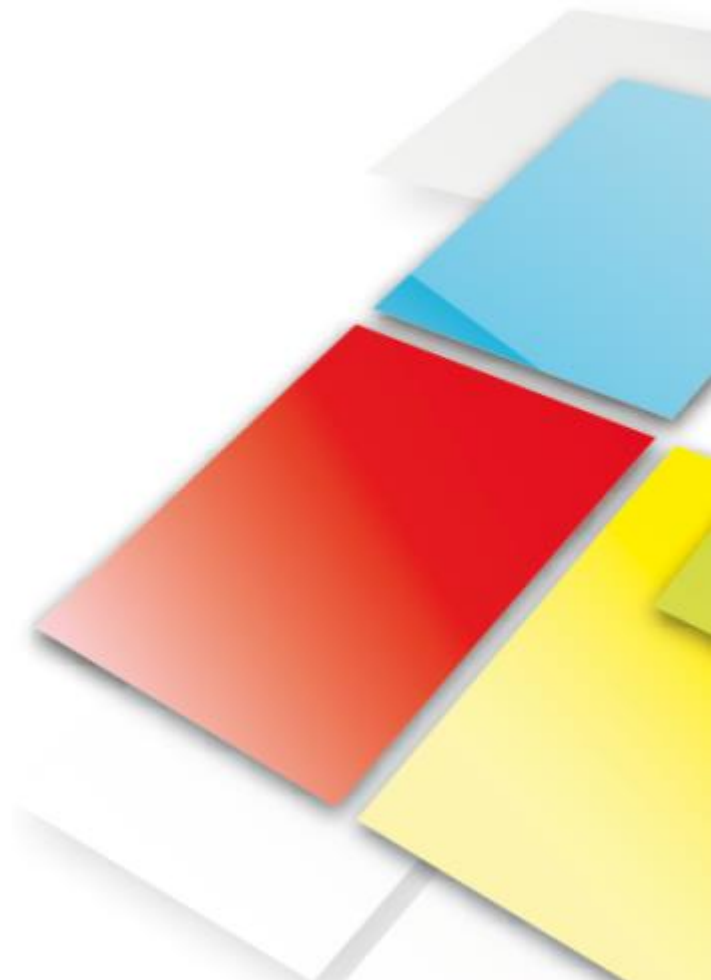

ENGINEERING AND CONSULTANCY SERVICES



MORE THAN
ONE GW
OF EXPERIENCE

GSE AT A GLANCE



GSE at a glance

MISSION



GSE is the state-owned company which promotes and supports **renewable energy sources** (RES) in Italy. In particular, GSE fosters **sustainable development** by providing support for renewable electricity (RES-E) generation and by taking actions to build awareness of environmentally-efficient energy uses.

The sole shareholder of GSE is the Italian Ministry of Economy and Finance, which exercises its rights in consultation with the Ministry of Economic Development. GSE is the **parent company** of three subsidiaries: “Acquirente Unico” (**AU**) “Gestore dei Mercati Energetici” (**GME**) and of “Ricerca sul Sistema Energetico (**RSE**), which is active in research in the electricity and energy sectors and in projects of strategic interest.

GSE manages **support schemes** for renewable energy sources (RES) at central level, with different solutions, which take into account the different technologies of the plants and the level of maturity of the related markets.

The granting of support by GSE requires a careful technical assessment of the plants in order to check their compliance with sector-specific legislation. In the past few years, GSE’s technical responsibilities for **qualification and verification of plants** have been extended to the assessment of the architectural integration of solar photovoltaic (PV) plants into buildings and to energy efficiency.



GSE at a glance

ACTIVITIES FOR ITALIAN MARKET



Support for renewable electricity
We support electricity generation in almost all of the plants fuelled by renewable sources in Italy, verifying their technical features, qualifying them and managing support schemes in accordance with the applicable legislation



Purchase of electricity from producers & resale in the market
We purchase electricity generated by renewable-energy plants and to be injected into the grid and resell it in the electricity market



Support to institutions and to the Public Administration
We assist institutions in implementing their energy policies, by providing studies, data and consulting services, as well the Public Administration, by supplying specialist services in the energy sector



Promotion of renewables and of the renewable-energy industry
We constantly carry out activities of training & awareness to the benefit of operators of the sector and citizens, in order to spread the culture of sustainable energy



Promotion of energy efficiency and thermal energy
We support interventions for increasing energy efficiency and for the production of thermal energy from renewable sources

GSE at a glance

INTERNATIONAL ACTIVITIES



The fast pace of evolution of renewables and the new challenges confronting the energy sector make it increasingly necessary to engage in dialogue on the global scale.

GSE carries out a dynamic activity of **international relations**, co-operating with the main entities, institutions and associations of the sector.

GSE has developed a dense network of bilateral and multilateral relations, by actively participating in the **working groups and task forces** created within the various associations.

INITIATIVES

In support of the Ministry of Economic Development, GSE actively participates in the following renewable energy and energy efficiency fora:

CEN/CENELEC - Joint Working Group on Guarantees of Origin for electricity

IPEEC - International Partnership for Energy Efficiency Cooperation: in particular, GSE takes part in its Worldwide Energy Efficiency Action (WEACT) Task Group

ECT - Energy Community Treaty

ORGANISATIONS

Thanks to its growing commitment to promoting renewables at national level, GSE has become a reference point also at international level, participating in the main fora for consultation and debate over renewable energy policies.

GSE is a member of associations, such as:

IEA (International Energy Agency)

RES4MED (Renewable Energy Solutions for the Mediterranean)

OME (Observatoire Méditerranéen de l'Énergie)

AIB (Association of Issuing Bodies)

PROJECTS

Thanks to its role of leading enabler of renewables and energy efficiency and to its long-standing experience, GSE participates in major energy projects funded by the European Commission's Intelligent Energy Europe (IEE) programme:

CA-RES - Concerted Action on the Implementation of the RES Directive

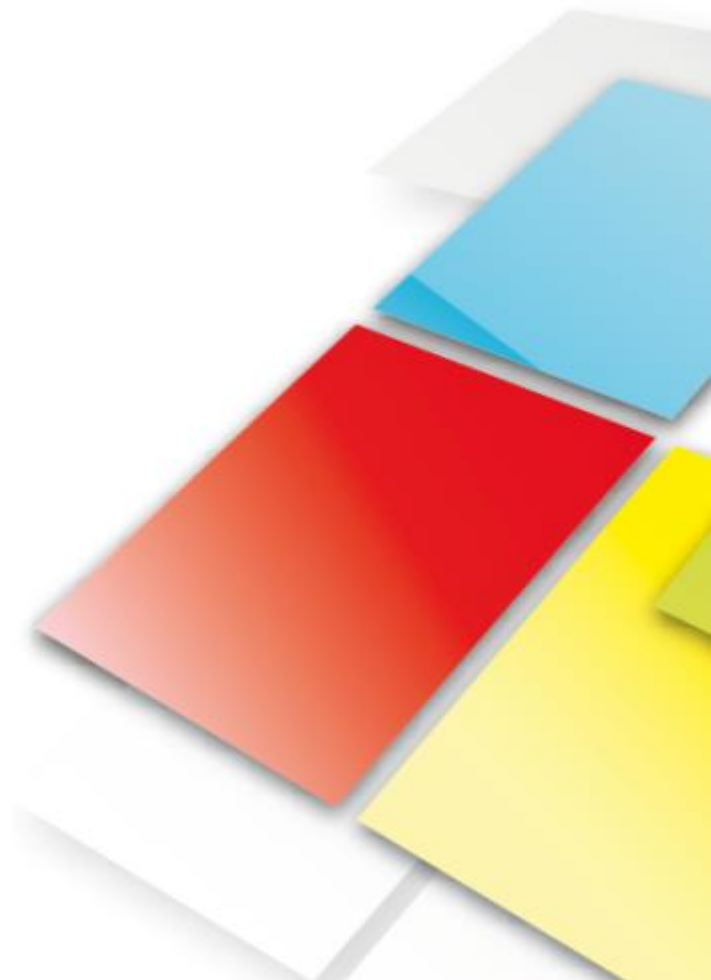
EPED/RE-DISS - European Platform for Electricity Disclosure/Reliable Disclosure Systems for Europe

PV PARITY





M&P AT A GLANCE



M&P at a glance

OUR DIVISIONS



Engineering

- Environmental impact assessment and authorisations
- Design, engineering, urban and structural planning
- Detail Engineering
- Works Management
- Health & Safety
- Energy Efficiency for Industrial & Real Estate applications
- Re-Engineering

Technical Advisory

- Preliminary evaluation and business plan
- Technical and Administrative Due Diligence
- Testing during and after construction
- Instrumental verifications
- Insurance appraisal
- Final & Provisional Acceptance Tests (FAC/PAC)

Asset Management

- Service supply management
- Validation of Maintenance activities
- Remote monitoring of key performance parameters
- Assistance for administrative and accounting requirements
- Assistance in Customs Duty and GSE relations
- Tax and Legal assistance
- O&M supervision



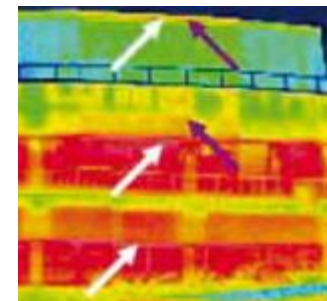
M&P at a glance

ENGINEERING



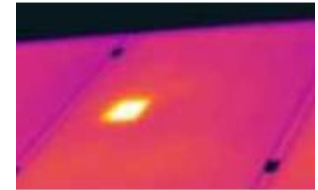
Development, design, construction supervision and Health & Safety operations for:

- **PV** and **CPV** plants
- Solar Thermodynamic (**CSP**) plants
- **Biomass** and **Biogas** plants
- **Wind** farms
- Hydroelectric plants
- Combined Heat and Power plants (**CHP**)
- **Grid connection** solutions for RES power plants
- **Storage** systems
- **Solar thermal** and **solar cooling** plants
- **Energy Efficiency** actions
- Innovative low energy consumption and passive buildings
- High efficiency HVAC and electric plants



PHOTOVOLTAICS AND CPV

- Technical, instrumental and administrative Due Diligence
- **Performance Ratio** Measurements
- **IR-Thermographic analysis** in compliance with UNI EN 473
- Laboratory tests in compliance with IEC 61215 e IEC 61646
- Provisional and Final Acceptance tests (PAC and FAC)
- Health and Safety Operations



SOLAR THERMODYNAMIC (CSP)

- Technical and administrative Due Diligence
- Plants and technology bankability Due Diligence
- **Direct Normal Irradiation Measurements**
- Advisory Services for suppliers selection
- **Tests on CSP tracking system**



WIND

- Technical Due Diligences
- **Wind Assessment (speed and continuation)**
- Annual Energy Production estimation (P50 P75 P90)
- Power Curve measurement
- N.D.T. on moving parts
- **Acoustics measurements**



BIOGAS / BIOMASS

- Technical Due Diligence
- Advisory Services for technologies bankability
- **Third-part start-up verification**
- Biological Laboratory test
- Production and procurement costs optimization
- **Atmospheric emission analysis**



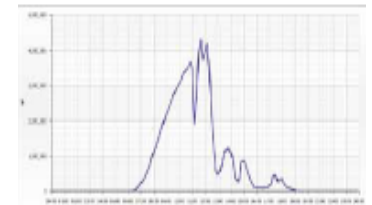
M&P at a glance

ASSET MANAGEMENT



M&P Asset Management services **help the investors for technical and administrative management** of PV plant, in order to **increase the investment value** and the revenues ensuring the **compliance with local laws**.

- **Suppliers selection** and O&M contract subscription
- On field **survey of O&M** activities
- **Remote monitoring** of PV plant performances
- PV plants **performance assessment**
- Support in the relationship with National Energy Management Operator, Custom Agency and Transmission System Operator
- Support to **administrative and accounting management** of the investment
- **Legal and fiscal management** support

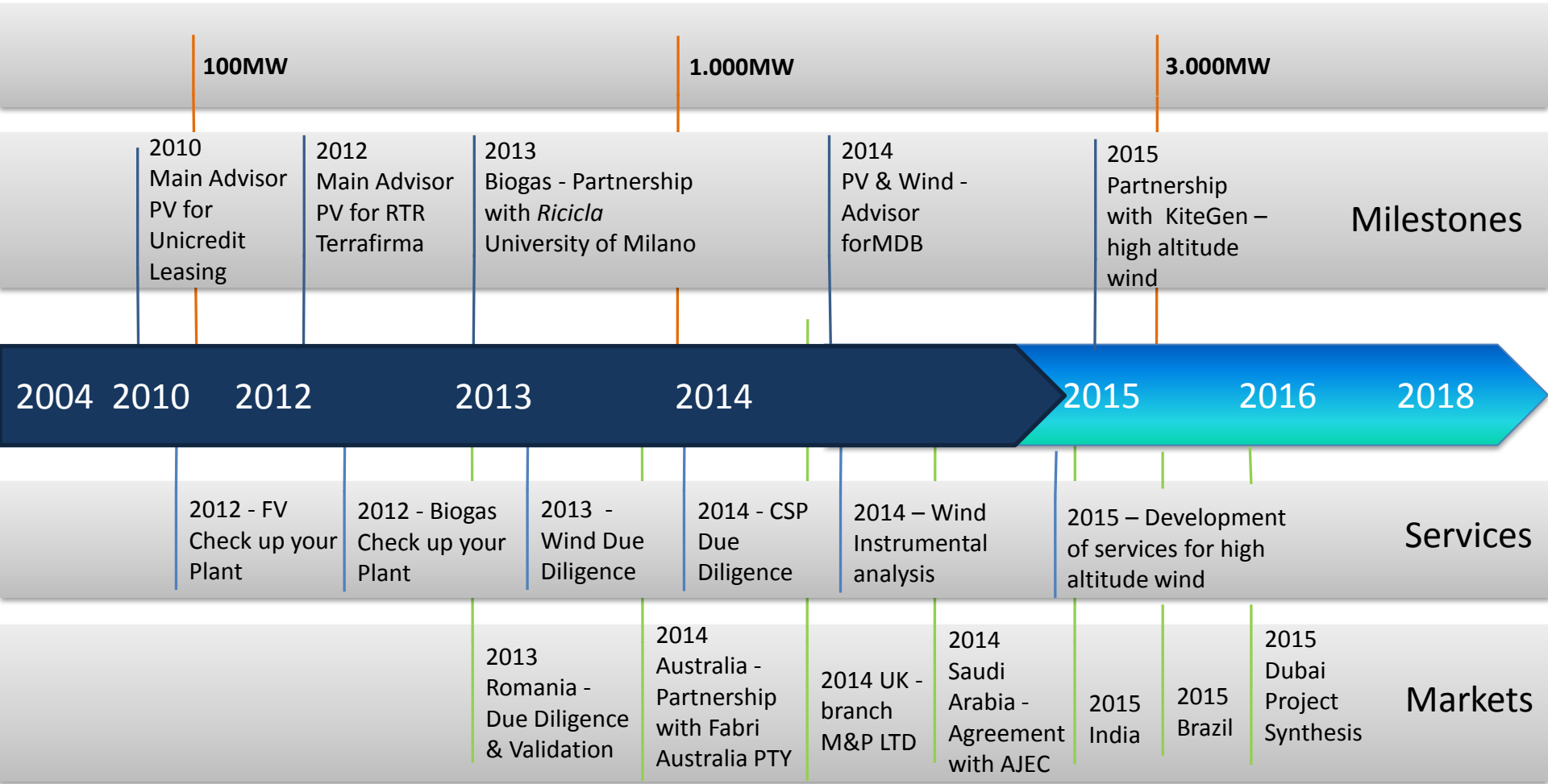


M&P at a glance

OUR HISTORY



MORE THAN
ONE GW
OF EXPERIENCE



M&P at a glance

OUR KEY MANAGEMENT



Mauro Moroni – CEO and Technical Director. PhD in Energetics, founder of M&P.

Head of PV Dept: Senior Engineer, graduated in Mechanical Engineer. 8 years of experience in PV operations.

Head of Wind Dept: Mechanical Engineer, more than 8 years of experience in the Operational Dept of a leading company in Wind Technology.

Head of Tech Advisory Dept: Senior Engineer, more than 6 years of experience in PV design.

Head of Administration: degree in Economics, 2 years of experience in M&P, former CFO of leading companies.

Head of Business Development: graduated in Engineering, experience in Financing for Renewable Energy Assets.

Head of Sales Department: graduated in Engineering. 6 years of experience in REN market in leading market companies.

TECHNICAL COMMITTEE:

Moroni & Partners takes part effectively on the issue of technical regulations. It is a member of the following technical committees (TC):

- TC 82 - Solar photovoltaic energy systems
- TC 88 - Wind turbines
- TC120 - Electrical Energy Storage (EES) Systems
- TC 313 - Smart grids
- TC 315 - Energy Efficiency

CERTIFIED OPERATORS:

The staff of Moroni & Partners is constantly trained and certified and it is composed by:

- Level 2 Thermographic Operators (UNI EN 473)
- «PEI» and «PES» Technicians for under voltage works (CEI EN 50110-1; CEI 11-27)
- Certified operators for overhead works (art 37 and 77 D.Lgs. 81/2008)



M&P at a glance

COMPANY CERTIFICATIONS



Moroni & Partners cares about services quality, environmental respect, energy rational use and workers' health and safety, obtaining these voluntary certifications:

ISO 9001:2008 - Quality Management System

ISO 14001:2004 - Environmental Management System

ISO 50001:2011 - Energy Management System

BS OHSAS 18001:2007 - Occupational Health and Safety Management System



Multi Development Banks are all the international financial banks whose goal is to provide financing opportunities to emerging markets.

Multi Development Banks are:

- WB World Bank through its 5 agencies:
 - IFC International Financing Corporation
 - IBRD International Bank of Reconstruction and Development
 - IDA International Development Association
 - MIGA Multilateral Investment Guarantee Agency (MIGA)
 - ICISD International Centre for Settlement of Investment Disputes
- ADB Asian Development Bank
- IADB Inter America Development Bank
- EIDR European Bank for Reconstruction and Development
- ADB African Development Bank

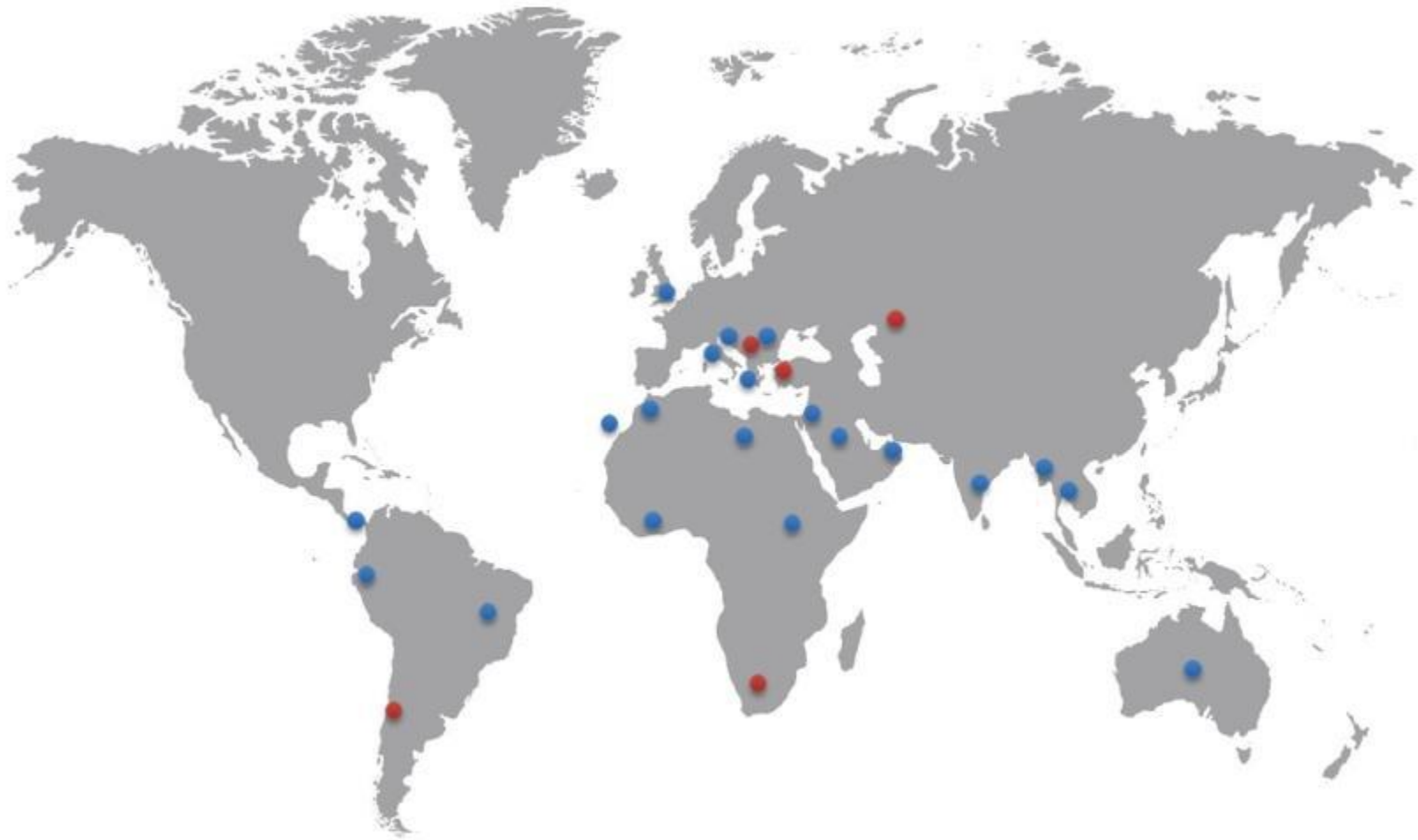
Since June 2014 M&P has been accredited by the **World Bank** and the other **Multilateral Development Banks (MDBs)** as advisor for engineering services and technical consultancy in the renewable energy market.

Since November 2013 M&P participates in international events:

- 10-14 November 2013 - Solar PV Trade Mission: Saudi Arabia (Solar Plaza), Riyadh, **Saudi Arabia**
- 4-7 November 2013 - Saudi Build, Riyadh, **Saudi Arabia**
- 5 March 2014 - Italian Cleantech Showcase, Riyadh, **Saudi Arabia**
- 26-29 May 2013 - Saudi Energy, Riyadh, **Saudi Arabia**
- 11-13 April 2014 - Solarex, Istanbul, **Turkey**
- 15 May 2014 - Solar UK Finance and Investment (Solar Plaza), London, **United Kingdom**
- 3 July 2014 - Solar Secondary Markets Europe, (Solar Plaza), London, **United Kingdom**
- 4-6 November 2014 – Photovoltaica International Exhibition, Casablanca, **Marocco**

M&P at a glance

M&P WORLDWIDE





Power	Technology	Location	Services
60 MWp	Photovoltaic	United Kingdom	Technical Advisory
54 MW	Wind	Romania	Technical Advisory
35 MWp	Photovoltaic	Italy	Engineering and Technical Advisory
29 MWp	Photovoltaic	Greece	Technical Advisory
26 MW	Wind	Italy	Technical Advisory
24 MWp	Photovoltaic	Italy	Engineering and Technical Advisory
12 MWp	Photovoltaic	Italy	Engineering
10 MWp	Photovoltaic	Italy	Technical Advisory
9 MWp	Photovoltaic	Italy	Technical Advisory

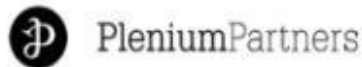
... and many others project from 3kW to 10 MW

M&P at a glance

COMPANIES THAT HAVE CHOSEN US



Bluefield





OUR PROPOSED SERVICES FOR LEBANESE MARKET

Assistance on tender set up

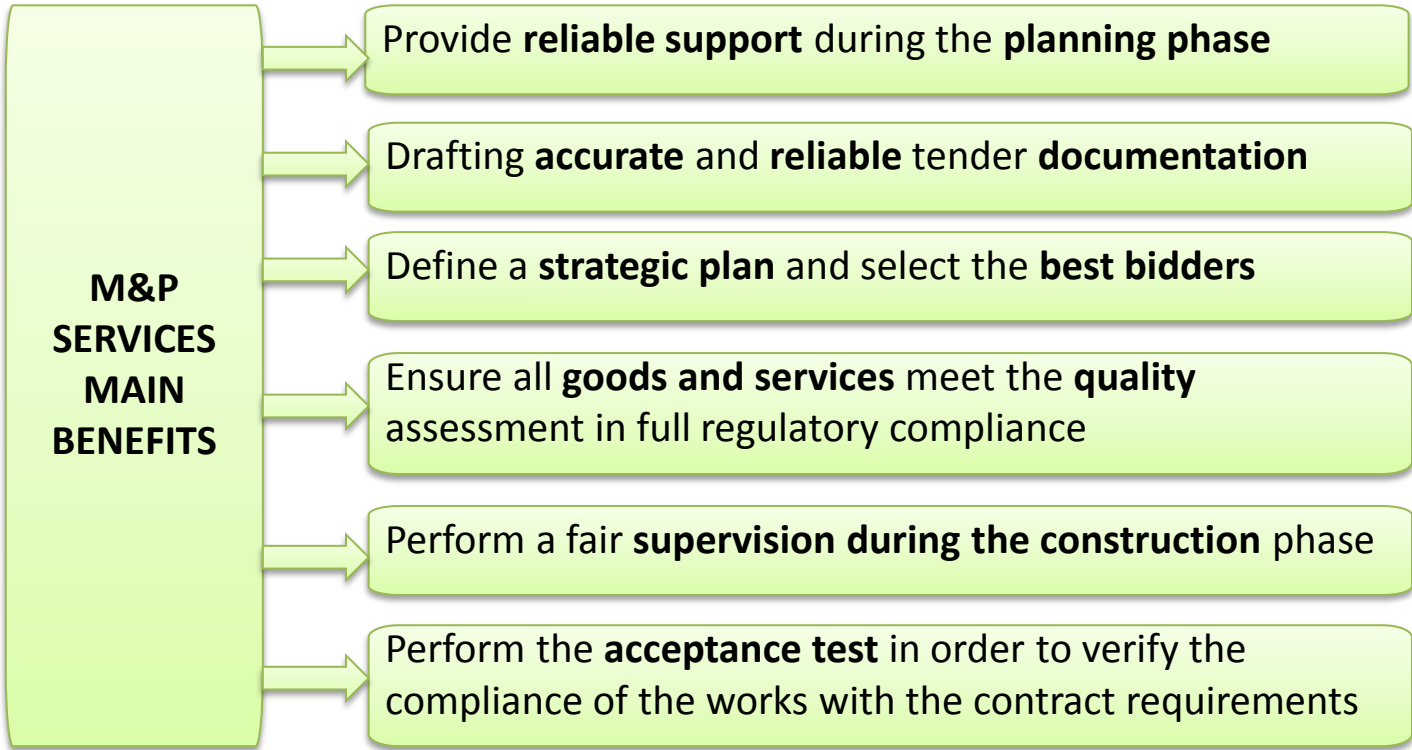


Our services

TENDER DRAWING ASSISTANCE

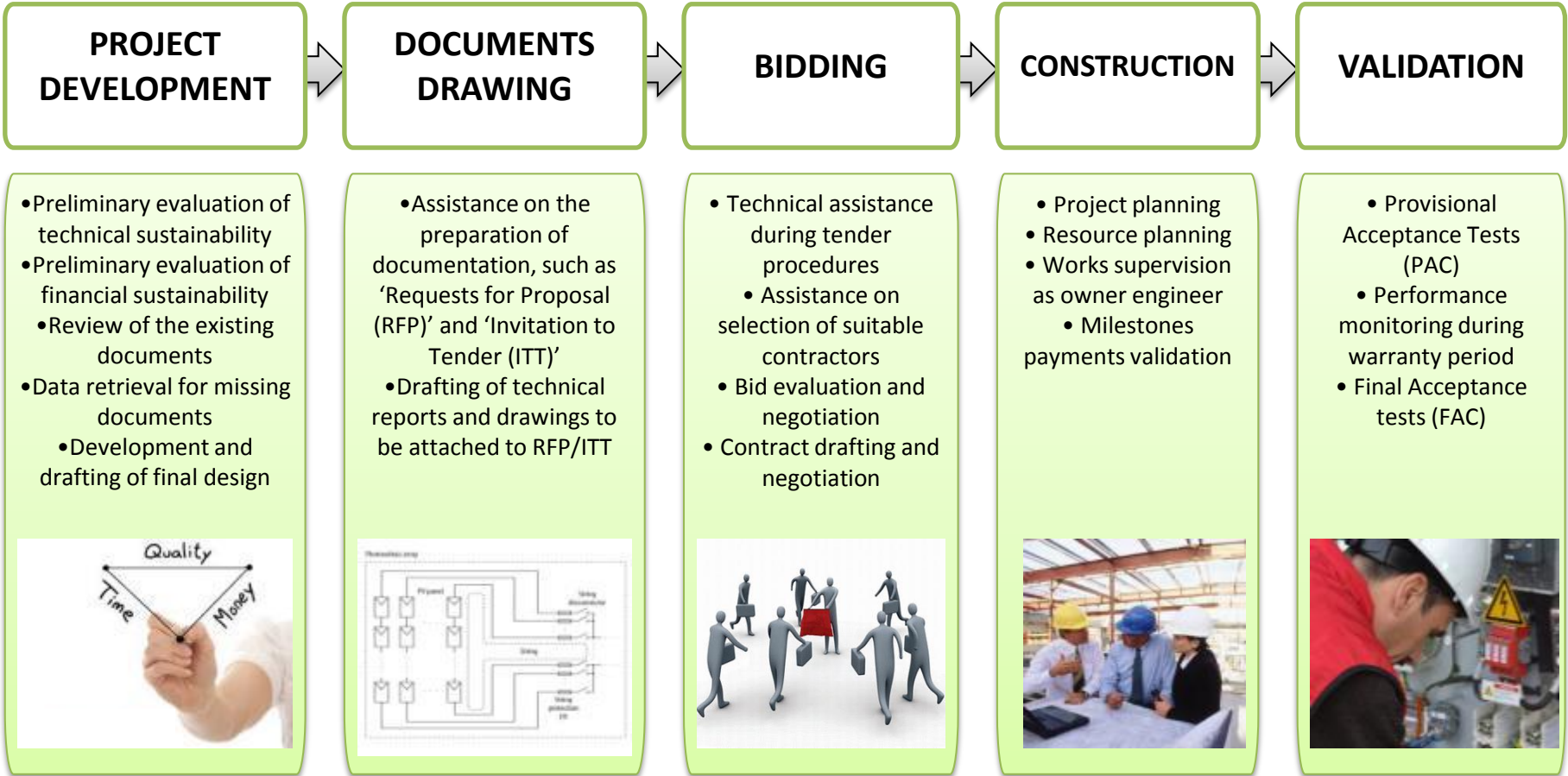


As leading consultancy company, with **more than 1,5 GW of experience in Renewable Energy Sources (RES)**, our firm offers you unsurpassed experience, expertise and reliability. As a result, we are one of best international provider for clients requiring effective **support for an accurate tender phase**



Our services

ASSISTANCE DURING ALL TENDER PHASES





MAIN PLANT REQUIREMENTS (Typical PV System)

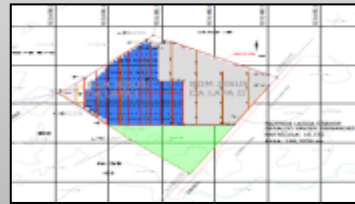
GENERAL REQUIREMENTS

- Energy sources data
- Minimum Peak Power
- Conversion technology and efficiency
 - Structures and foundations type
- Control and Monitoring
 - Grid specifications



DESIGN REQUIREMENTS

- Site Layout and soil investigation report
- Equipments location
 - Cable routing
- Electrical Diagrams
- Rules and regulations



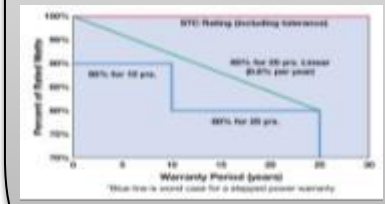
EQUIPMENT WARRANTIES

- PV Modules
 - Product and workmanship
 - Output power Degradation
 - Inverters
- MV transformers
- MV switchgears
- Structures



PERFORMANCE WARRANTIES

- Energy output
- Plant Availability
- Plant efficiency and performance

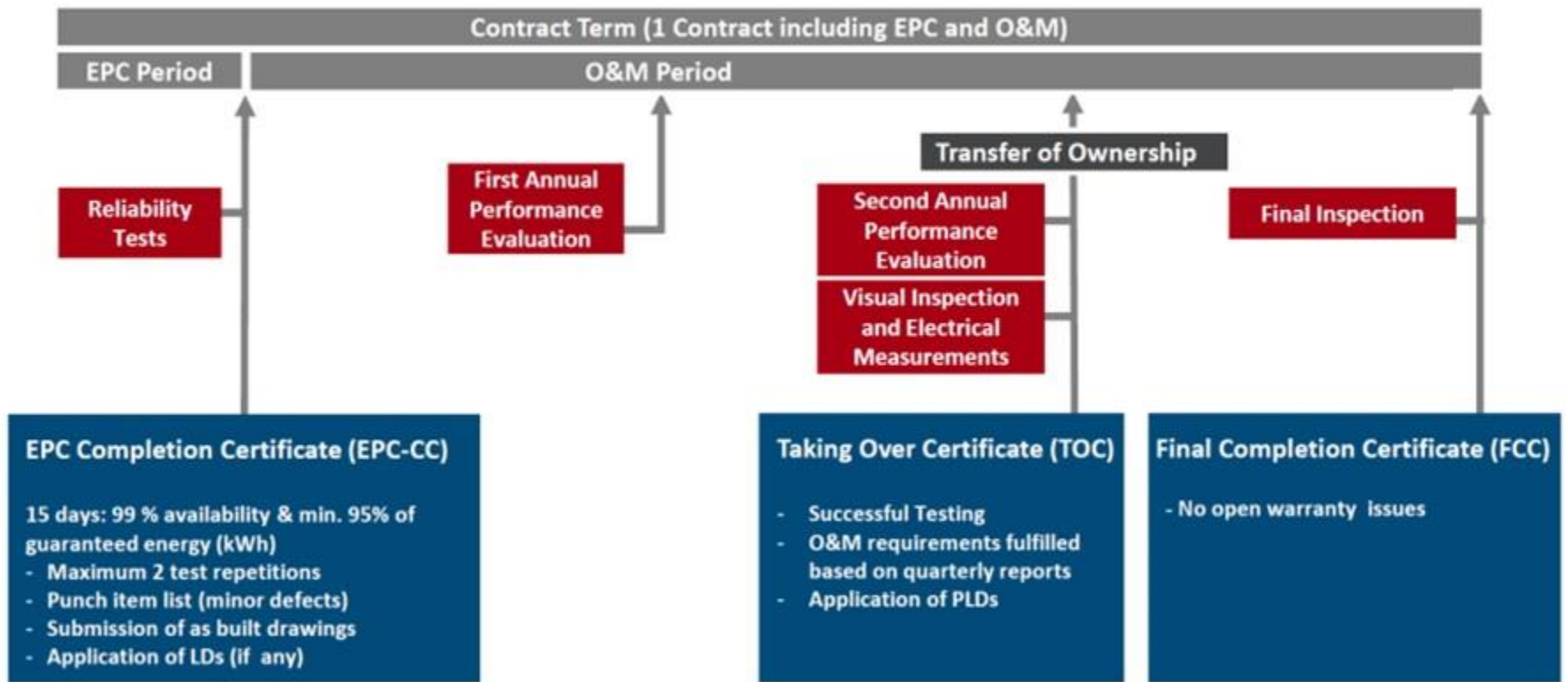


Our services

TESTS SCHEME AND CERTIFICATES ISSUANCE



The staff of Moroni & Partners is constantly trained and certified and by specific in-house instruments is able to perform the above mentioned tests.





OUR PROPOSED SERVICES FOR LEBANESE MARKET

RES plants grid connection



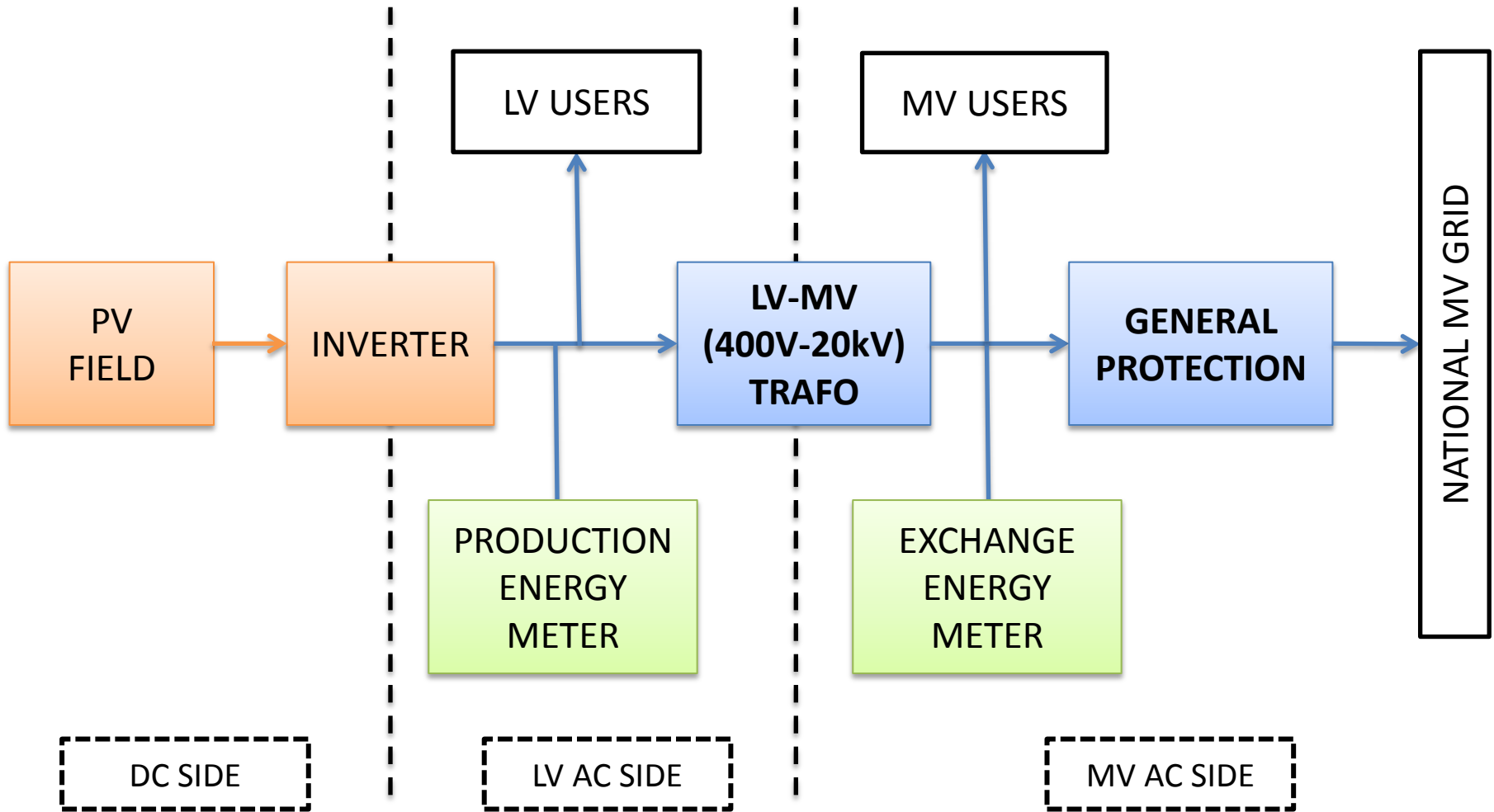
RES and GRID CONNECTION WORLDWIDE STANDARDS



Country	Standards	Official Releaser
Italy	CEI 0-16 (MV) CEI 0-21 (LV)	Italian Electrotechnical Committee (CEI)
Germany	VDE-AR-N 4105 (LV) BDEW (MV)	Ass. for Electrical, Electronic & Information Tech. German Ass.of Energy and Water Industries
United Kingdom	G83/2, G59/3 G83/1, G59/2	UK Energy Networks Association
USA	UL1741	Underwriters Laboratory (UL)
Brazil	ABNT NBR 16149:2013	Associação Brasileira de Normas Técnicas
Lebanon	To be defined	To be defined



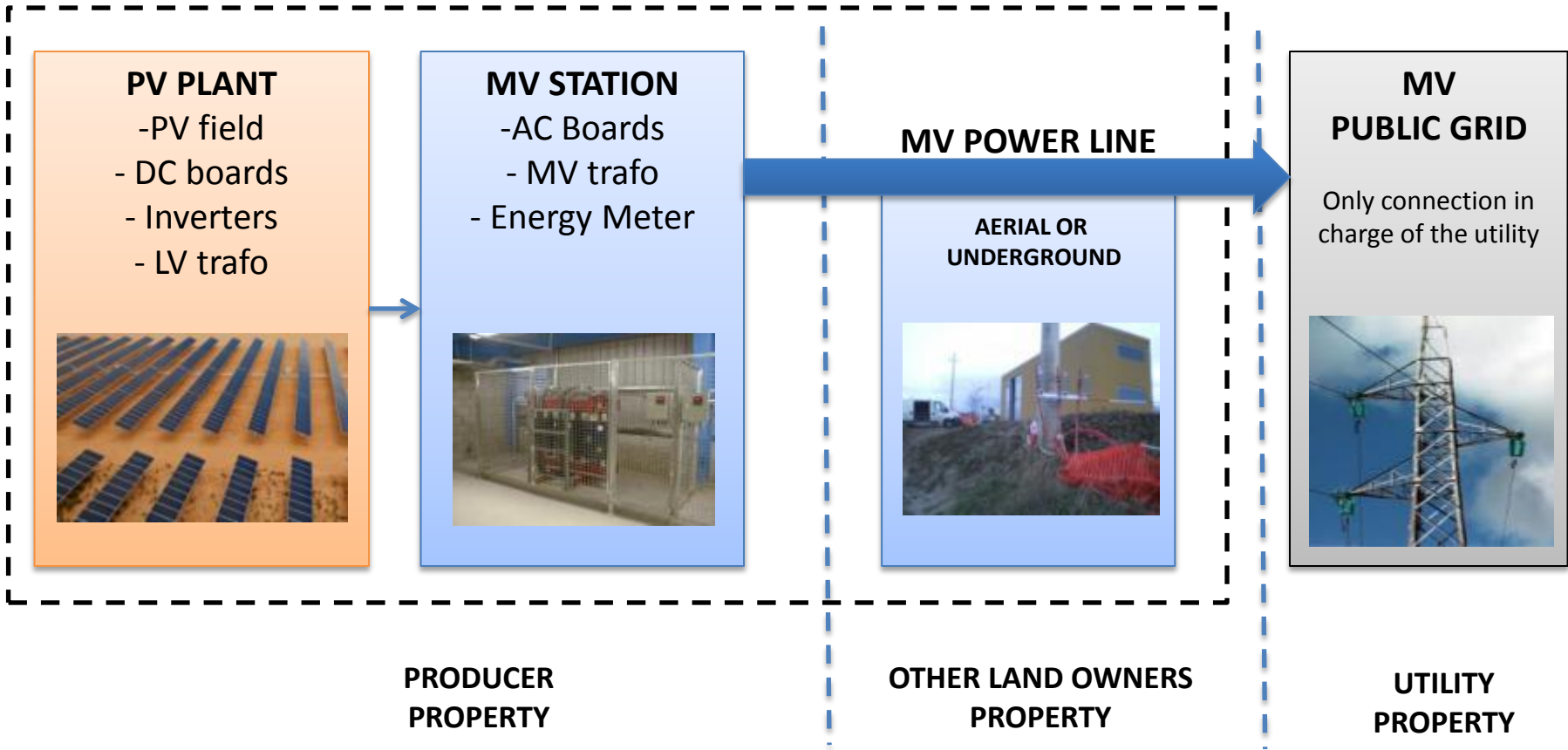
RES and GRID CONNECTION GENERAL CONNECTION DIAGRAM



RES and GRID CONNECTION WORKS EXECUTION FRAMEWORK (MV)



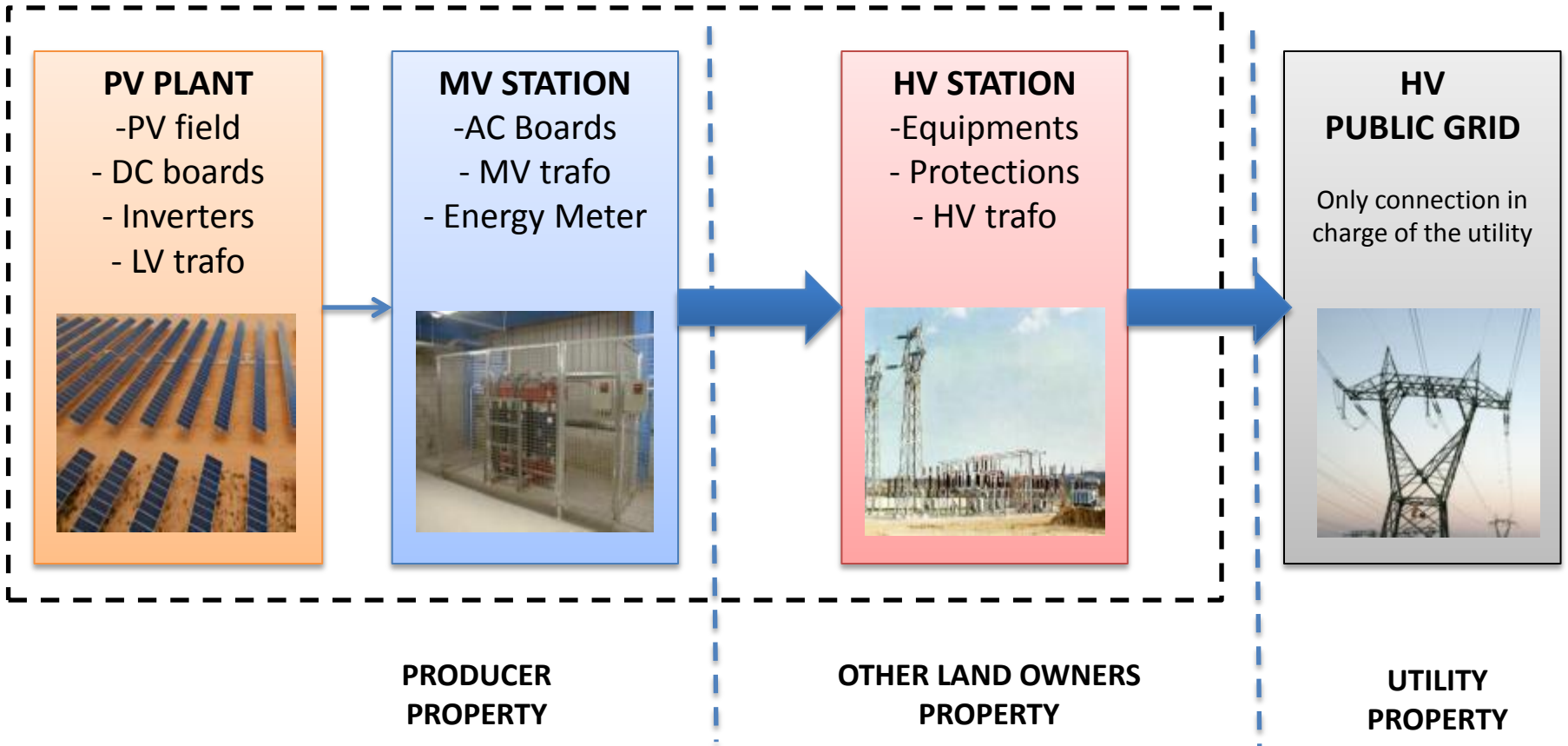
CONSTRUCTION IN CHARGE OF INDEPENDENT PRODUCER



RES and GRID CONNECTION WORKS EXECUTION FRAMEWORK (HV)



CONSTRUCTION IN CHARGE OF INDEPENDENT PRODUCER





MORE THAN
ONE GW
OF EXPERIENCE

OUR EXPERIENCE

RES plants grid connection



RES and GRID CONNECTION OUR EXPERIENCE



- **CASE STUDY N°1: RES GRID IMPACT STUDY**
- **CASE STUDY N°2: HYBRIDIZATION OF AN EXISTING POWER STATION**
- **CASE STUDY N°3: RURAL ELECTRIFICATION BY 400 kW HYBRID PLANT**
- **CASE STUDY N°4: SMART GRID DESIGN FOR ITALIAN TOWNS**



RES and GRID CONNECTION

LARGE SCALE RES PLANT GRID IMPACT



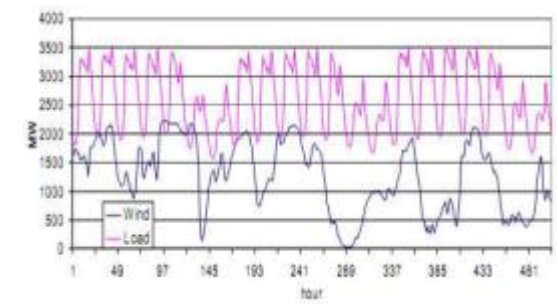
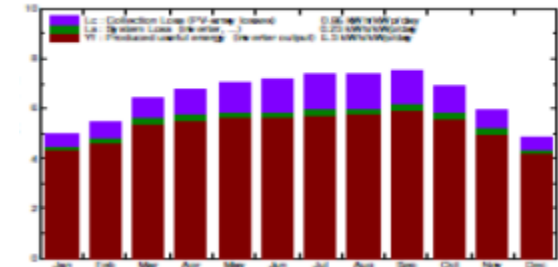
ANALYSIS OF ACTUAL GRID LAYOUT AND GRID TECHNICAL FEATURES

LOCATION AND TECHNICAL FEATURES OF EXISTING POWER STATIONS

UTILITY TECHNICAL REQUIREMENTS ANALYSIS

COMPARISON BETWEEN USERS AND RES LOAD

IMPACT EVALUATION (STATIC, DYNAMIC AND TRANSIENT STABILITY, SHORT CIRCUIT, VOLTAGE, THERMAL ETC.)



RES and GRID CONNECTION

LARGE SCALE PV PLANT GRID IMPACT



CASE STUDY: Design of a large scale PV plant (23 MWp) in Jordan
Impact study on existing electrical grid needed

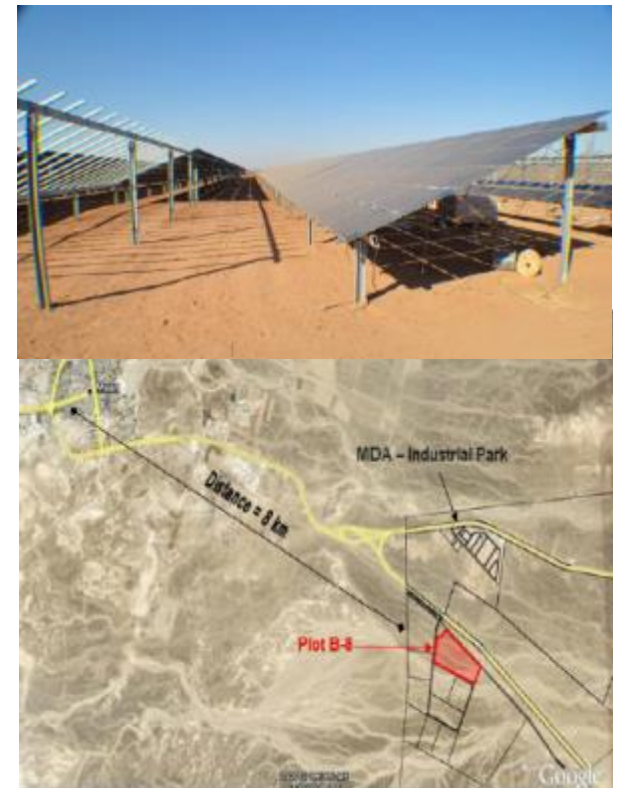
PV PLANT ELECTRICAL DESIGN (AC+DC)

PV PLANT PERFORMANCE ANALYSIS

STRUCTURAL / CIVIL WORKS DESIGN

DESIGN OF MONITORING SYSTEM

GRID CONNECTION

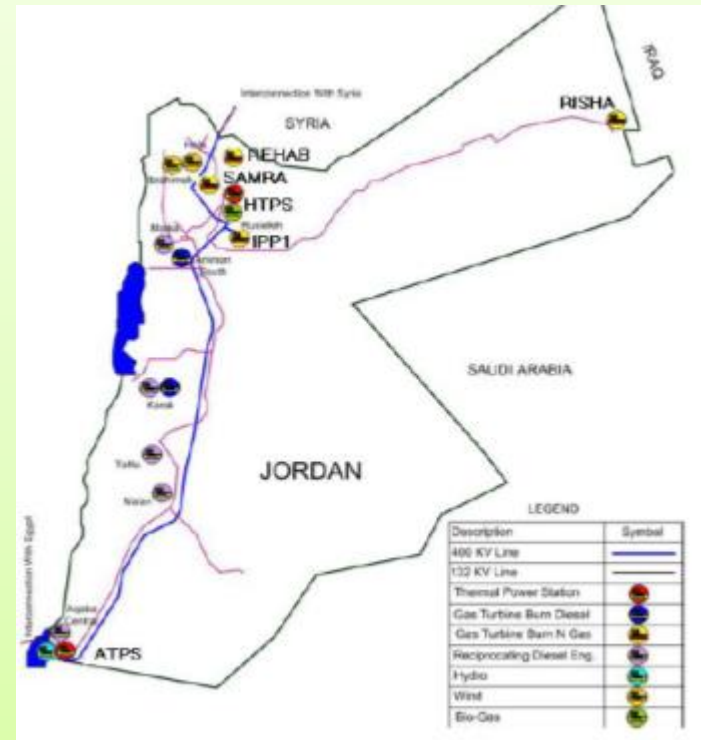
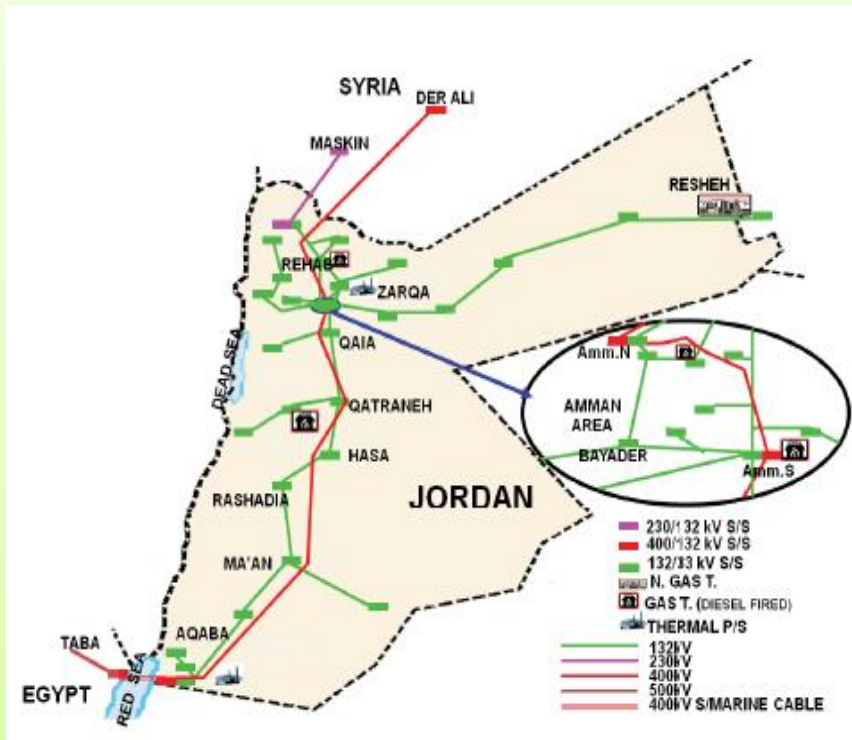


RES and GRID CONNECTION

LARGE SCALE PV PLANT GRID IMPACT



DETAILED ANALYSIS OF ACTUAL GRID LAYOUT AND LOCATION OF THE POWER STATIONS



RES and GRID CONNECTION

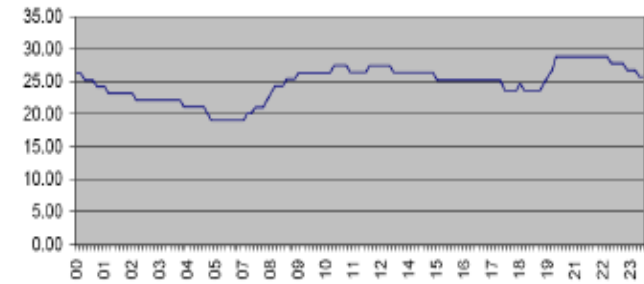
LARGE SCALE PV PLANT GRID IMPACT



USER LOAD DATA AND GROWTH FORECAST

Segment	Forecasted					
	2011	2012	2013	2014	2015	2016
Residential	82.55	88.80	95.52	102.75	110.52	118.88
Commercial	29.13	30.79	32.38	35.36	38.63	41.67
Industrial	13.00	13.88	14.80	15.78	16.85	17.85
Other	4.92	5.04	5.15	5.28	5.42	5.54
Water Pumping	63.39	65.82	68.49	71.57	74.75	78.19
Street Lighting	9.42	9.72	10.02	10.34	10.66	11.0
Total	202.41	214.05	226.36	241.08	256.83	273.13
Growth Rate	5.7%	5.8%	5.8%	6.5%	6.5%	6.3%

The typical daily loading curve is shown in Figure below. It is clear that there are two peaks, morning peak and evening; however, the latter is slightly higher than the former by about 2 MW.



- The typical load curve for the area illustrates **two peaks** – the **first from about 10:30–15:00**, and the second from about 19:30–22:30.
- The modeled output of the proposed PV plant in shows the plant producing at its highest level of output from **fully overlapping the first daily peak**.

RES and GRID CONNECTION HYBRID POWER PLANT DESIGN



Design of a **808 kWp power plant** for Dubai Facilities Area (Al Yassat Island)
Hybrid System: **PHOTOVOLTAIC + DIESEL**

PV PLANT ELECTRICAL DESIGN (AC+DC)

STRUCTURAL / CIVIL WORKS DESIGN

DESIGN OF MONITORING AND INTEGRATION STRATEGY WITH EXISTING DIESEL POWER STATION

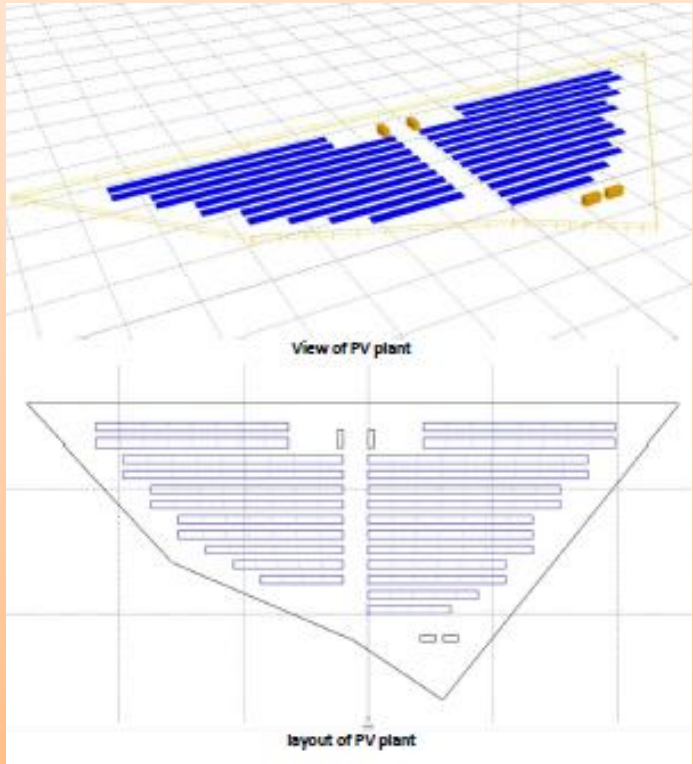
CONNECTION TO THE EXISTING 11kV MV LOCAL GRID



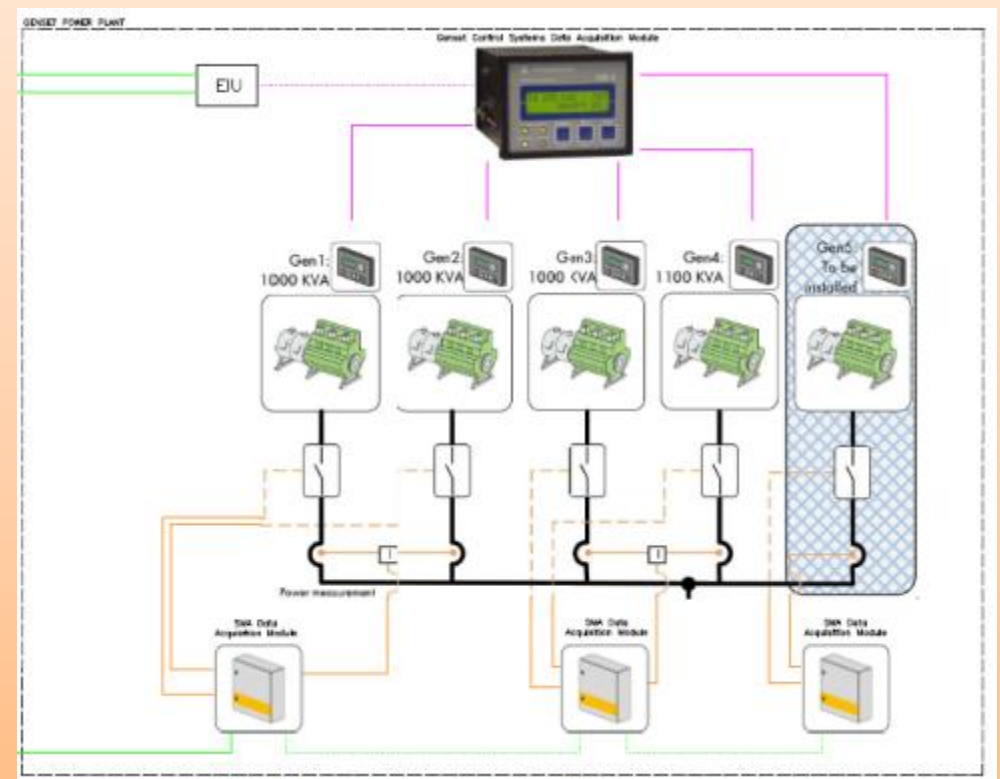
RES and GRID CONNECTION HYBRID POWER PLANT DESIGN



PV PLANT LAYOUT OPTIMISATION ACCORDING TO LOCAL ENVIRONMENT STATE



INTEGRATION STRATEGY WITH THE EXISTING GENSET (4 MVA TOTAL POWER)

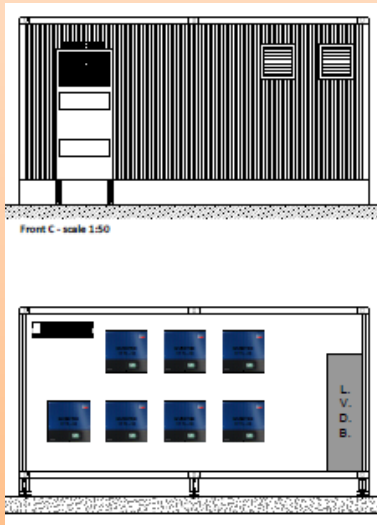


RES and GRID CONNECTION HYBRID POWER PLANT DESIGN



INVERTER ROOMS

Certified IPW65
(IEC 60529)
Air conditioned
Optimal equipment layout



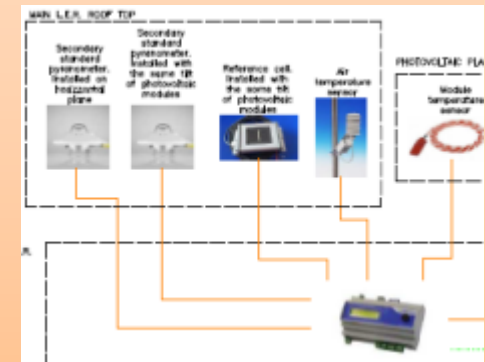
PV MODULES

Suitable for desertic
conditions
PiD Free
International
certifications available



MONITORING SYSTEM

Fuel Save Controller
Meteo Station
Archive server
LV / MV switches status
Genset Status



RES and GRID CONNECTION

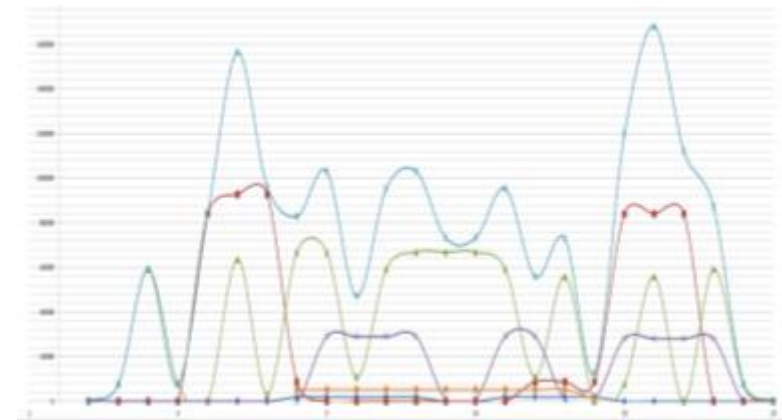
RURAL ELECTRIFICATION BY RES APPLICATION



Design of a **small electrical grid** for African village needs (Uganda)
 Hybrid System: **PHOTOVOLTAIC + STORAGE + DIESEL**

		Q.ty	Power peak [kW]	Power consumption [kWh/year]
Families		1.400	168,000	531,440
Small Enterprises	Shops	245	4,900	10.731
	Kiosks	70	8,400	33.726
	Offices	4	2,310	7.716
Medium Enterprises	Health Centers	1	1,988	7.338
	Schools	3	2,464	8.012
	Fuel Stations	2	168	368
	Lodges / cottages	5	2,352	8.299
Large Enterprises	Semlik Lift Company	1	10,500	19.163
Total Number			201,082	626.793

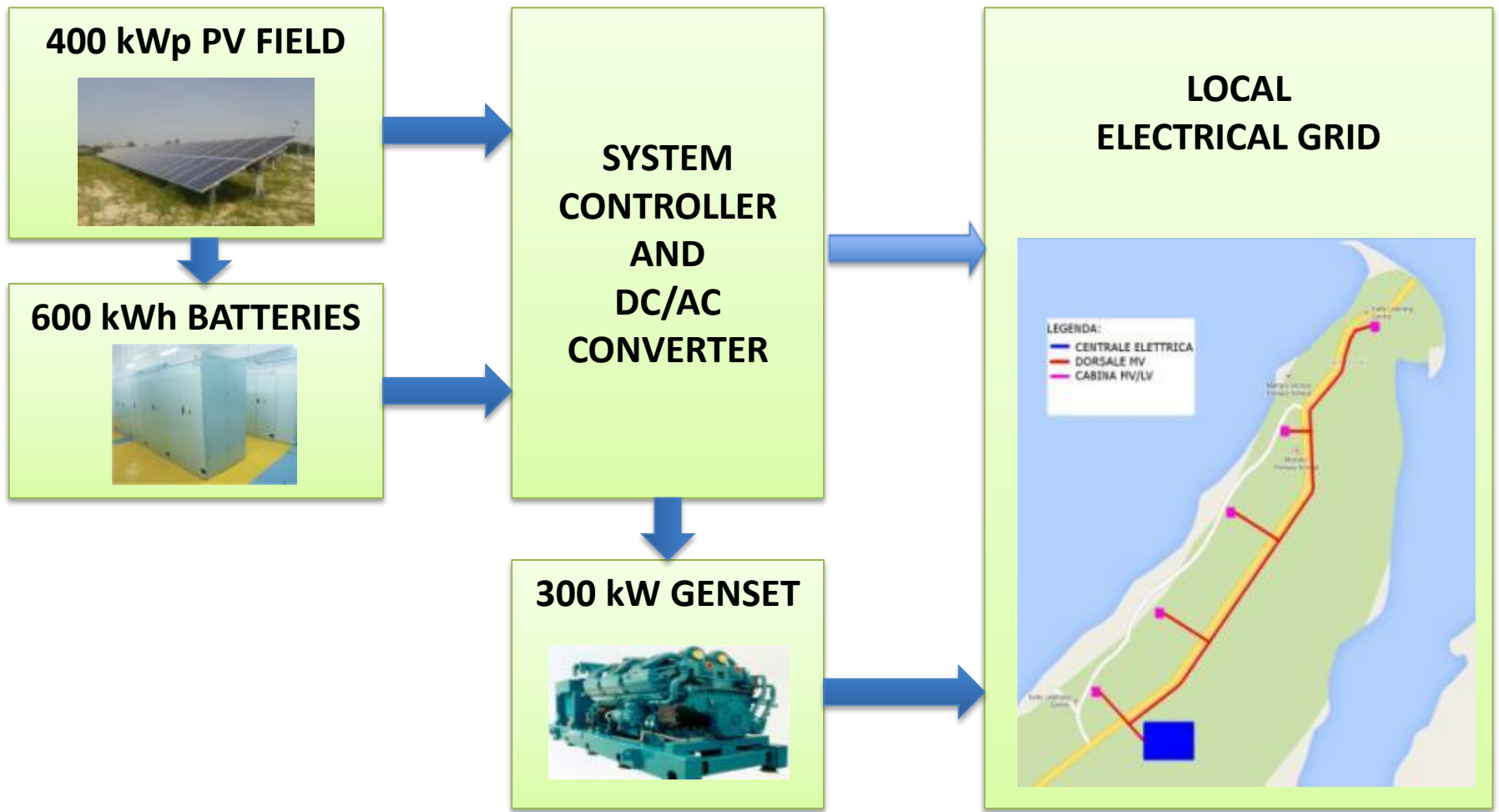
USERS POWER DEMAND ANALYSIS



USERS POWER DEMAND PROFILE

RES and GRID CONNECTION

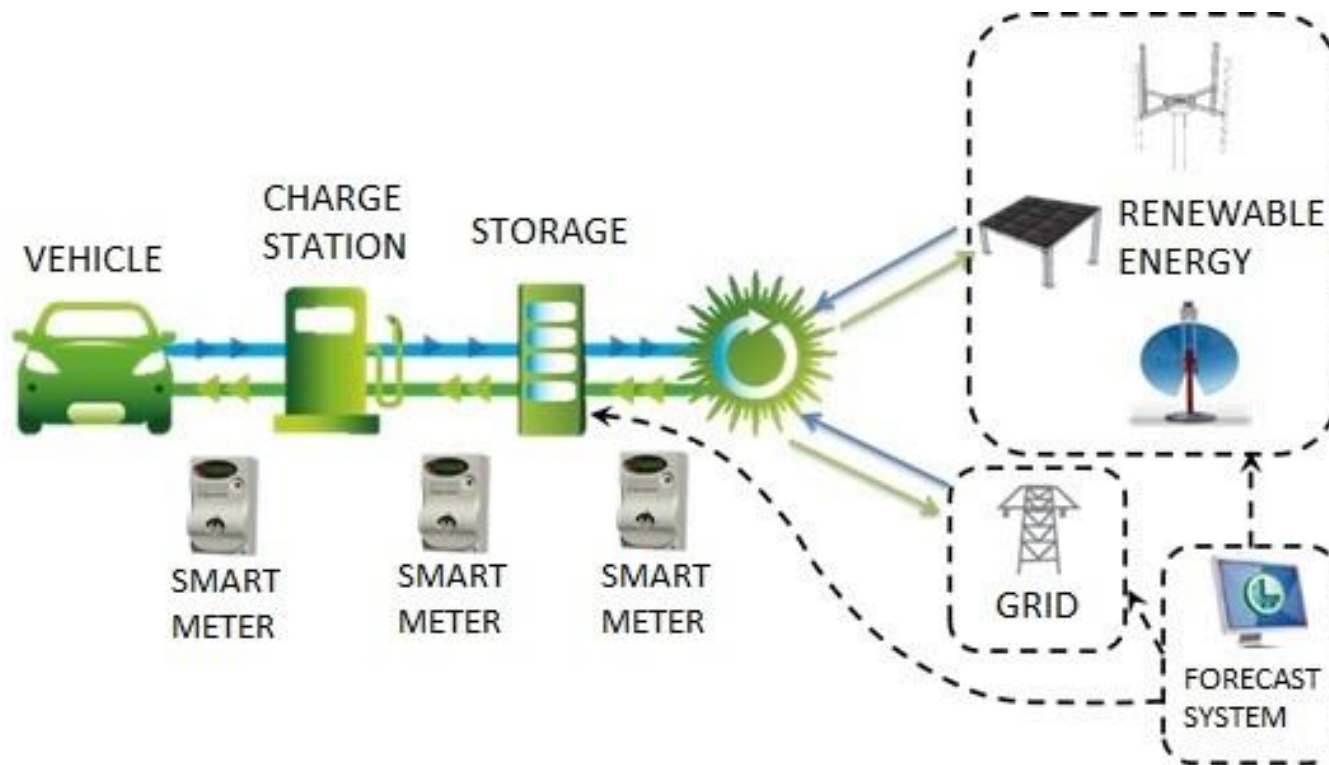
RURAL ELECTRIFICATION BY RES APPLICATION



RES and GRID CONNECTION SMART GRID DEVELOPMENT



Design of a prototypical system for the development and the large scale diffusion of the **electrical mobility** thanks to a diffusive grid of **smart charge stations**.
CUSTOMER: Public Authority (Piemonte Region)



RES and GRID CONNECTION SMART CHARGE STATIONS



Connected to **Smart Grid** and **powered by RES**

Mode V2G (Vehicle to Grid)
The storage of the parked vehicle could **support the grid**

All charge mode available
Including DC, AC, Fast and Superfast mode

Available for **Plug-in** electric vehicles (PEVs)

Available for **Plug-in HYBRID** Electric Vehicles (PHEVs)

RES and GRID CONNECTION SMART SOFTWARE DEVELOPMENT



MORE THAN
ONE GW
OF EXPERIENCE



Monitoring Forecasting **Remote updates** **Remote assistance**

STATION



Mobile access **Electronic payment** **Station mapper and planner**

USER

...FINALLY:

ANY THOUGHTS TO SHARE?

WHAT ABOUT THE NEXT STEPS?

OUR CONTACTS

MORONI & PARTNERS

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Tel. (+39) 071 89 50 23 | **Fax** (+39) 071 73 21 57

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Email: CeC@cenproenergy.me