

Engineering, Procurement and Construction for Solar Photovoltaic plant (EPC – Turn Key)



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ABOUT US – MACCAFERRI GROUP

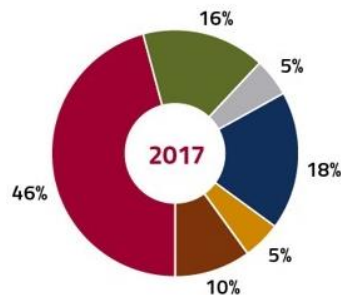
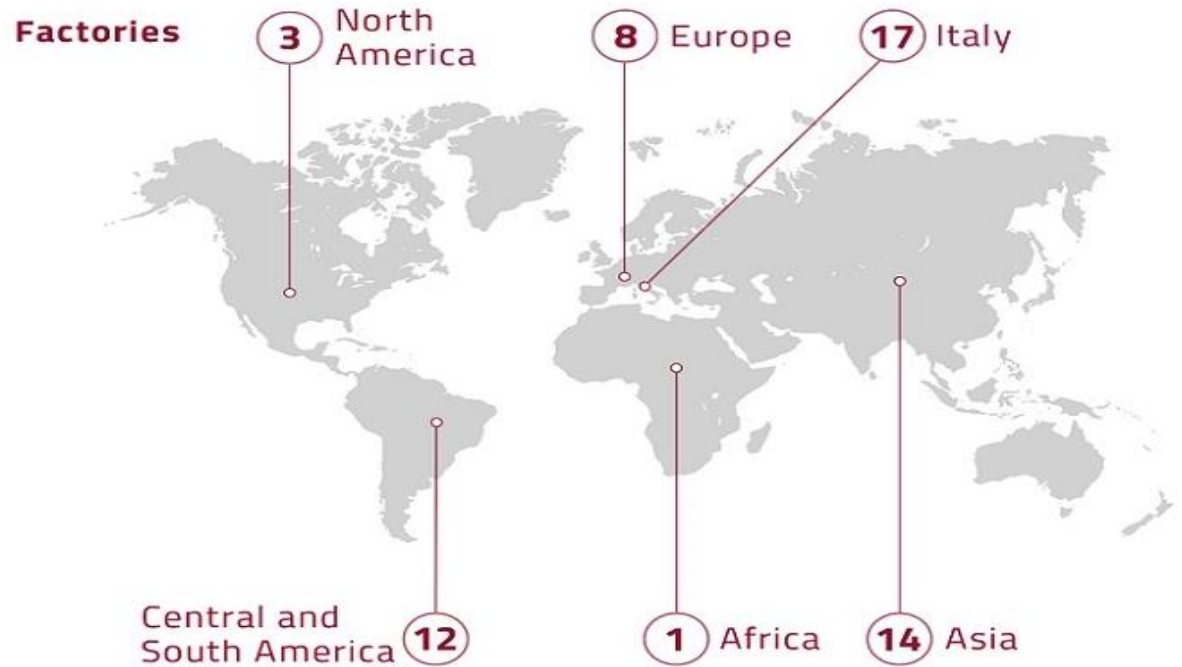


1.039 million Euro
Total turnover

55
Factories

4.944
Employees worldwide

Turnover per geographic area	
million Euro	
Italy	380
Europe	150
Other continents	509

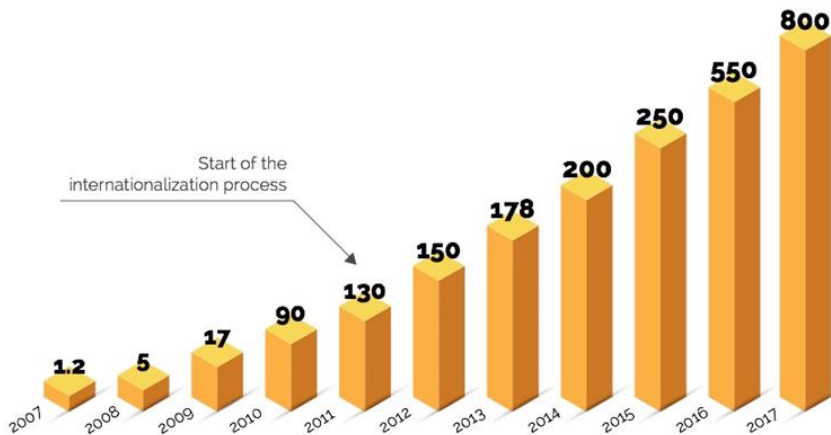


Turnover per division		2017
million Euro		1.039
Environmental Engineering	479	
Mechanical Engineering	163	
Real Estate and Construction	51	
Energy	188	
Food and Agro-industry	55	
Tobacco	103	

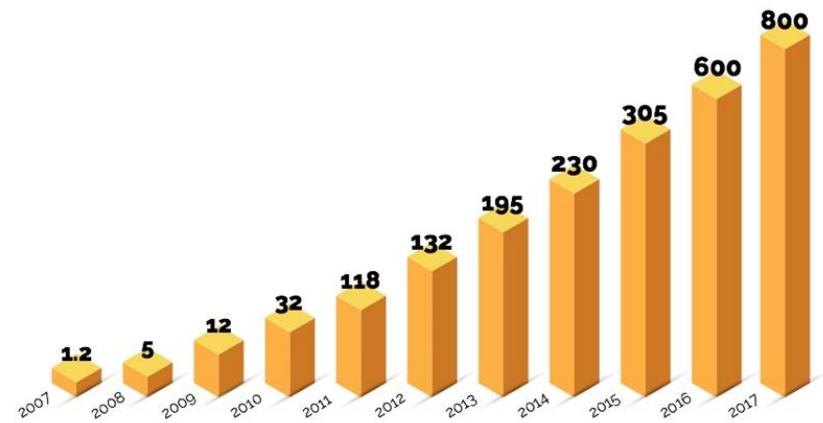
Enerray S.p.A., an Italian company founded in 2007 under Maccaferri Group, is a leader in the design, development and management of medium and large scale solar plants . We provide turnkey solution for industrial roofing, shelters, on-ground installations and greenhouses that can guarantee the best performance and function of the plants.



TOTAL INSTALLED CAPACITY (MWp)



ACCUMULATED MANAGED POWER (MWp)



ABOUT US – ENERRAY UAC (Thailand)



Why Enerray UAC (Thailand) | Strong Technical, Safety Focus, Competitive Price

- o 360 turnkey solution for Solar plants, On-grid and Off-grid system
- o Various business model offering both turnkey and BOT (PPA) (500 kWp)
- o Over 800 MWp of PV plants installed worldwide and over 800 MWp of PV plants under O&M service worldwide.
- o 25 years plant performance warranty
- o 10 years global experience
- o Best quality material, reliability and costs ratio
- o Being part of Maccaferri group which is a strong and reliable firm in Italy and presence all over the world
- o **Know local market – 16 MWp rooftop plant has been built in Thailand**



ABOUT US – ENERRAY UAC (Thailand)



More MWp projects under development with target of 50MWp for 3 years 2020 - 2022



2019

MAKRO 1,000 kW
CP ALL 500 kW

Mitrsteel 998 kW
TGG 561 kW
Perma-Flex 200 kW

2021
Johnson & Johnson
3.132 Mwp

Johnson & Johnson

2020

MEKKERE(2545) 306 kW
Mitrsteel –Phase 2 1,507 kW

Signed another 3 plants,
300kW in Bangkok
700kW in Ayutthaya
1000kW in Nakornpathom

EUT gets the O&M
75MWp of Bangchak
Solar farms – (96
people employed)

EUT is officialy
established as JV with
UAC Global

08- 2017
2017 - 2018

Signed the contract for one
of the biggest solar rooftop
projects in Thailand
TMT – 2.5MWp

06 - 2017

TAF 500kWp
First contract signed

12- 2016

Von Bundit + Saha Thai

04 - 2016

Reached **2MWp** of
Solar rooftops

2015

Enerray builds its first
plant
In Thailand - BKD

2014



OUR TOP CLIENTS



Top Clients



OUR TOP CLIENTS - Thailand



บริษัท มิตร สตีล จำกัด
MITR STEEL CO., LTD.



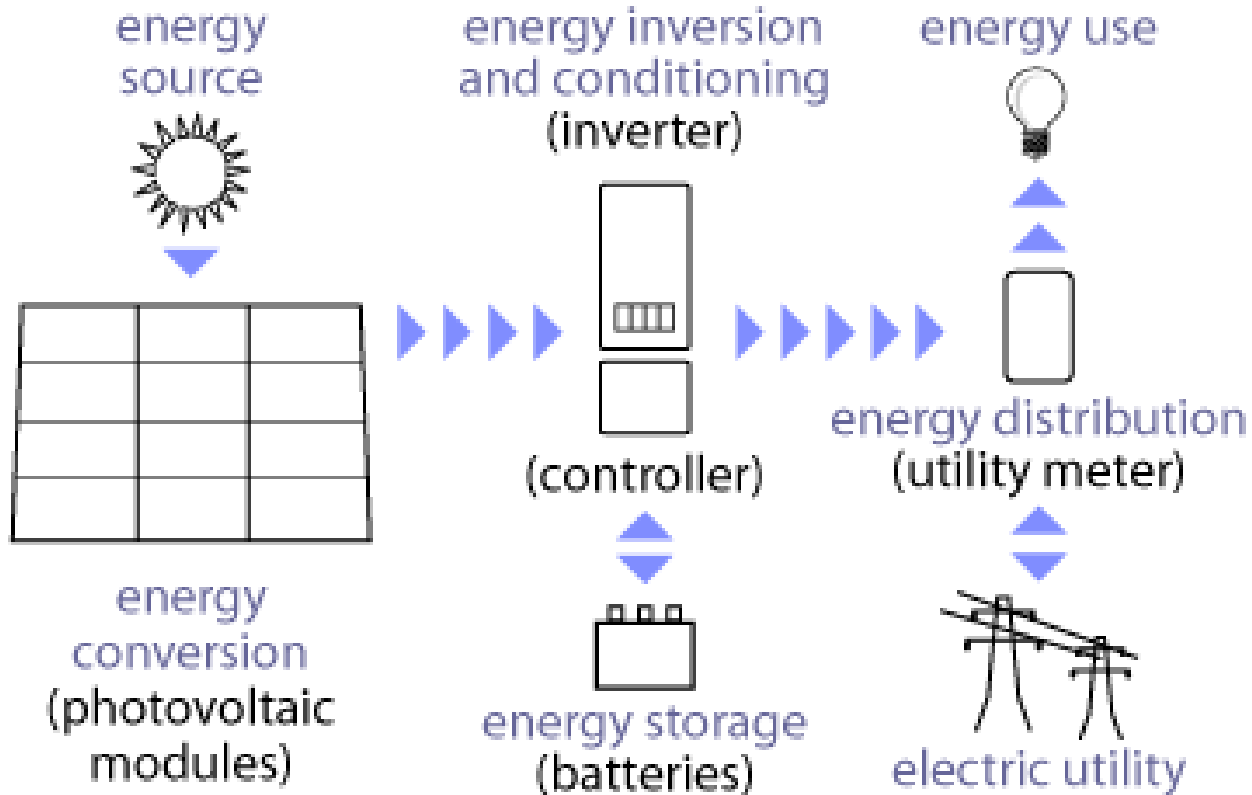
EPC and O&M SERVICE

**REDUCE
YOUR ENERGY
COSTS**

THANKS TO ENERRAY'S KNOW HOW



PHOTOVOLTAIC system



OUR SERVICES – EPC and O&M



Enerray's priority has always been to provide a **360 turnkey service**, putting its experience at the client service in order to maximize the investment profitability and minimize any technical risk related to the PV plant installation.

Our EPC service include all the following activities

- ✓ **Engineering** : Electrical and Mechanical engineering design with **PV Syst program**
- ✓ **Procurement** : All equipment and tools required for solar plant including safety system
- ✓ **Construction** : Site supervision, Project management, EAR insurance
- ✓ **Administration service** : Permit authorization process and BOI support
- ✓ **Feasibility analysis** : Business investment plan and profitability review

Our mission as O&M contractor with unrivalled set of skills and wide expertise is

- ✓ **Maximizing the availability of the plant**
- ✓ **Maximize the overall energy production**
- ✓ **Clients satisfaction is our key value**

Our O&M service include all the following activities

- ✓ Preventive Maintenance, *help prevent breakdowns and reduce energy yield losses*
- ✓ Corrective Maintenance, *repair damage or replace failed components*
- ✓ Condition-Based Maintenance, *schedule PM or to head off CM problems by anticipating failures or catching them early*

TECHNICAL – MAIN EQUIPMENT



Enerray is committed to provide reliable solutions by accurately selecting high quality products according to market standard and client needs.

PV Module

- Tier 1 Supplier in BNEF list
- High module efficiency > 16.3%
- Reliable brand with establishment more than 10 years
- Has reference project in Thailand
- 12 years product warranty and 25 years output warranty

JA SOLAR

JinkO Solar

LONGI Solar

Trina
solar

 **CanadianSolar**

TECHNICAL – MAIN EQUIPMENT

Enerray is committed to provide reliable solutions by accurately selecting high quality products according to market standard and client needs.

Inverter

- High efficiency > 98.1%
- Reliable brand with specialized in solar inverter
- Has service center in Thailand to support the client in short time



SOLAR TECHNOLOGY



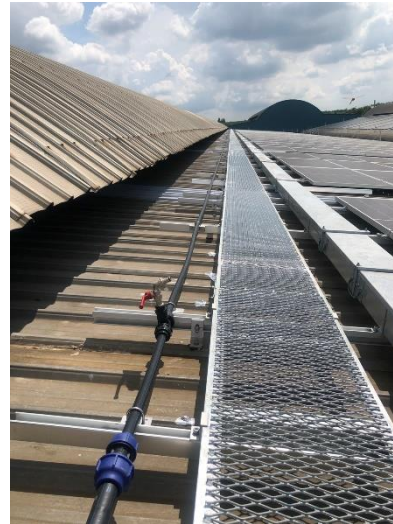
HUAWEI



Green and Effective

Enerray always focus on safety issue during construction and operation phase. Hence, we provide to our clients the safety equipment with international standard reference.

- *During construction phase*, always provide parapets and marking tape around skylights in order to prevent workers accidents. Also with EAR insurance.
- *During operation phase*, always provide safety lifeline and permanent safety ladder



COMMERCIAL – WARRANTY TERM



No.	Equipment	Warranty (Year)	By
1	PV Modules - Material	12	Manufacturer
2	PV Modules - Performance	25	Manufacturer
3	Inverters	10	Manufacturer
4	Mounting Structures	10	Manufacturer
5	Plant/Defect Warranty	2	Enerray UAC
***	Performance Warranty	25	Enerray UAC
	<i>Monetary compensation provided in case output less than the guaranteed value (under O&M service agreement)</i>		

TOP CLIENTS AND PROJECTS



REFERENCE PROJECT – **WORLDWIDE**



Ituverava Solar Park (Brazil)

 Power 254,000 kWp	 Yearly produced energy 550,000,000 kWh/year	 Avoided CO2 185,000 Kg/year	 Year of construction 2016/2017
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Tekno Kizören - Konya (Turkey)

 Power 22,500 kWp	 Yearly produced energy 30,792,000 kWh/year	 Avoided CO2 18,729,770 Kg/year	 Year of construction 2015
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REFERENCE PROJECT – WORLDWIDE



Falcon - Ma'an (Jordan)

 Power 23,100 kWp	 Yearly produced energy 46,893,000 kWh/year	 Avoided CO2 24,943,000 Kg/year	 Year of construction 2015/2016
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Shamsuna - Aqaba (Jordan)

 Power 10,000 kWp	 Yearly produced energy 19,978,000 kWh/year	 Avoided CO2 9,300 Kg/year	 Year of construction 2016
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REFERENCE PROJECT – WORLDWIDE



Ferrari - Maranello (Italy)

 Power 198.88 kWp	 Yearly produced energy 218,762 kWh/year	 Avoided CO2 116,160 Kg/year	 Year of construction 2008
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OMR (Italy)

 Power 1,617.00 kWp	 Yearly produced energy 1,778,700 kWh/year	 Avoided CO2 944,488 Kg/year	 Year of construction 2010
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OUR TOP PROJECT - ROOFTOP, THAILAND



OUR TOP PROJECT - ROOFTOP, THAILAND

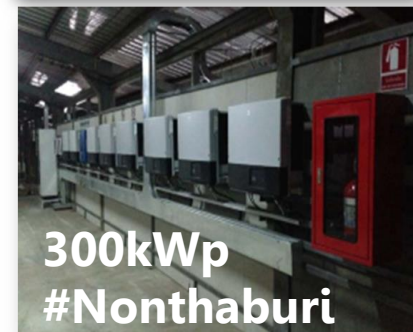
500kWp #Saraburi



750kWp #Suratthani



925kWp #Samutprakarn



PROJECT in Q1-Q2 of 2019- **ROOFTOP, THAILAND**



Makro 550 kWp #Ramindra



CP All Lumphun 306.24 kWp



Makro 583 kWp #Nakhon Phanom



CP All Buriram 201.96 kWp



Thai Wah 1,000 kWp #Nakhon Pathom



Mitr Steel 998 kWp #Rayong



Thai Gow Gai (TGG) 561 kWp #Pathumthani



Perma-Flex 200 kWp #Samutprakarn



Mitrsteel – Phase 2 1,507 kWp #Rayong



MEKKERE (2545) 300 kWp #Samutprakarn



PROJECT in 2021- ROOFTOP, THAILAND



ENERRAY
Don't worry, be sunny



Cleantech-Johnson & Johnson 3,132 kWp #Bangkok

(Under Construction)



SOLAR PV PROJECT



WHY SOLAR ?

*** * * With BOI promotion, the project payback will be only 3-4 years**

***Announcement of the Board of Investment No. 1/2557 (9/2560)
“Promote Improvement of Production Efficiency”***

- Exemption of import duty for machinery regardless of zone
- Three -year corporate income tax exemption on the revenue of an existing project, accounting for 50 percent of the investment under this measure, excluding cost of land and working capital
- Corporate income tax exemption period shall start from the date of revenue derivation after promotion certificate issuance
- Expire 31 December 2023



THAILAND
BOARD OF
INVESTMENT
www.boi.go.th

BUSINESS MODEL – TURNKEY or PPA



Model	EPC Turnkey	PPA
Invested by	Client	Supplier
Type	The Client invests by themselves to construct and own the solar plant in order to get used for all energy produced by the Plant	The Supplier shall invest, construct and operate the plant then sell the energy back to the client with a discount from PEA/MEA electricity price
Ownership of the Plant	Client	Supplier * The ownership will be transferred to the Client after year 15/20.
Price Estimation	EPC price at 21,500 Baht/kWp	Discount rate 30% for 15 years contract
Advantage	<ul style="list-style-type: none"> <input type="checkbox"/> Huge benefit from full electricity saving <input type="checkbox"/> Be the owner of the plant 	<ul style="list-style-type: none"> <input type="checkbox"/> No any investment <input type="checkbox"/> Not required any operate or maintenance by the client
Disadvantage	<ul style="list-style-type: none"> <input type="checkbox"/> Need investment <input type="checkbox"/> Require operate and maintenance 	<ul style="list-style-type: none"> <input type="checkbox"/> Less benefit <input type="checkbox"/> Bind with long term contract

Case Study 2021 – Solar Roof 1 MWp

Investment Capital

EPC price	21,500 Baht/kWp
Total price	21,500,000 Baht
O&M price	290,000 Baht/year *

* FREE 3 years

Project Assumption

Plant Operating day	330 days/year
Auto consumption	90%
Electricity rate	TOU 3.2.2
Avg. price	3.80 Baht/kWh
Specific Production	1,375 kWh/kWp
Annual Production	1,375 MWh
Inflation	2% /year
Degradation	0.6%/year

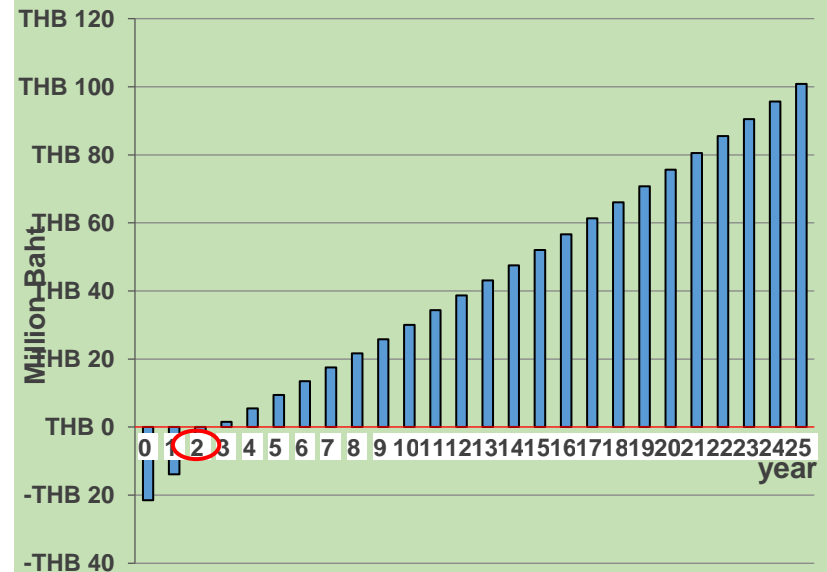
Return on Investment

With BOI promotion

Project Payback	2.80 years
Project IRR	27.7%

Without BOI promotion

Project Payback	5.33 years
Project IRR	19.0 %



Saving Comparison – Buy & PPA

Year	Energy (kWh)	Cumulated Cash Flow (Baht)	
		BUY	PPA
0		(21,500,000)	
1	1,237,500	(13,222,596)	1,408,221
2	1,230,075	(4,880,038)	2,835,989
3	1,222,695	3,226,862	4,283,573
4	1,215,358	7,811,369	5,751,251
5	1,208,066	12,457,626	7,239,299
6	1,200,818	17,166,451	8,748,002
7	1,193,613	21,938,676	10,277,645
8	1,186,451	26,775,140	11,828,520
9	1,179,333	31,676,696	13,400,921
10	1,172,257	36,644,206	14,995,147
11	1,165,223	41,678,544	16,611,501
12	1,158,232	46,780,595	18,250,290
13	1,151,282	51,951,256	19,911,826
14	1,144,375	57,191,434	21,596,423
15	1,137,508	62,502,051	23,304,402
16	1,130,683	67,884,037	25,036,089
17	1,123,899	73,338,336	26,791,811
18	1,117,156	78,865,905	28,571,903
19	1,110,453	84,467,711	30,376,702
20	1,103,790	90,144,735	32,206,552
21	1,097,167	95,897,971	38,390,712
22	1,090,584	101,728,424	44,660,709
23	1,084,041	107,637,114	51,017,733
24	1,077,537	113,625,073	57,462,993
25	1,071,071	119,693,347	63,997,713

