



COMPANY PROFILE


**KEEP
CALM
AND USE
RENEWABLE
ENERGY**



2017

History

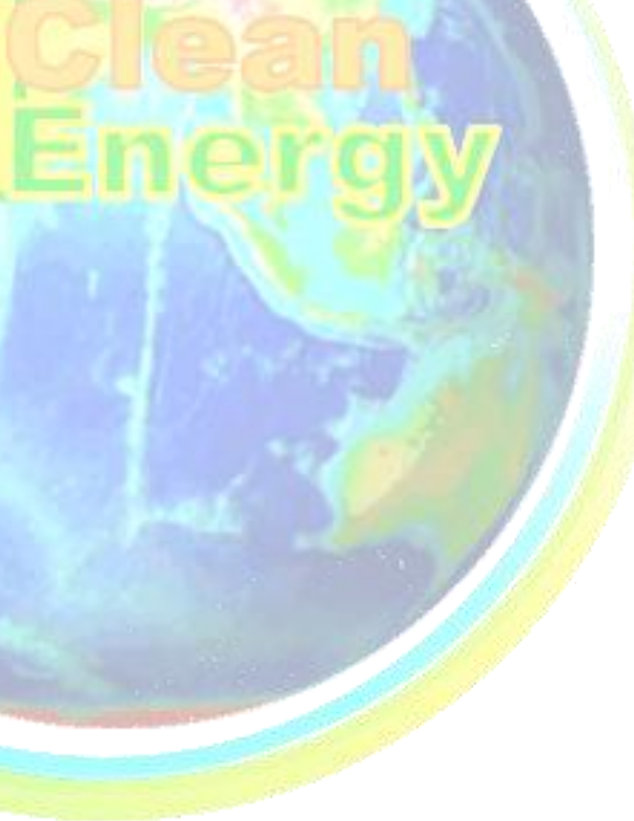
24 CLEAN ENERGY Co. LTD

was established in December 2014 with the aim to provide alternative power to Thailand which was at this time struck by flooding and with the aim to implement solutions which help to reduce the dependency on fossil fuels.

The founders had the idea that an alternative power supply independent from the power grids would ease emergency situations by giving people the possibility to communicate with beloved ones while charging of mobiles was impossible with the normal power grids due to the flooding. Solar panels have the huge benefit that they do not rely on fossil fuels which are also sparse in emergency situations.

Furthermore, antennas, emergency communication, hospital equipment and other emergency relive tools could be run with solar power as well.

After the situation returned to normal the second stage of our business concept started – the implementation of solar power plants.





VISION

24 Clean Energy will prevail only if it is not just an ideal. It has to be a solution which works under the pressure of economic competition and can rely on its advantages such as independency from outer fuel resources once installed.

MISSION

Becoming a leading Energy company in South East Asia

VALUES

- Honest and straight to the point
- Scientific methodology and constant learning
- Social responsibility
- Transparent and international working standards

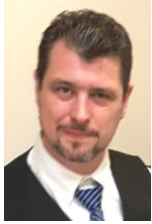
STRATEGY

The implementation of proven and approved technology, the consequent use of scientific data and attention to the details in each area of our business make our project almost fail-safe.





Board of Directors



Mr. Andreas Doegel - CEO

Founding member of 24 Clean Energy Co. LTD

Prior experiences include Head of R&D at QMI and technical director at Solarsunday Co. LTD
Andreas Doegel studied geology at ETH Zurich, Switzerland, and speaks 7 languages.

He is also the Chairman of AMIT Coffee Group Co. LTD, Red Dragon Investment LTD Hong Kong.



Ms. Phenphat Doegel - CFO

Founding member of 24 Clean Energy Co. LTD

Former experiences include the position as vice president of Solarsunday Co. LTD and a long track record in the Thai financial industry where she maintains a strong network.

She is also President of AMIT Coffee Group, Vice President of Red Dragon Investment LTD Hong Kong.



Mr. Thephatsadin Akkharabunyasit – Division manager

- 2006 to present: Executive Director Ubon Land & House for Sale

Investment consultants on all types of real estate investment and financial advisory Real Estate Mortgage Sale of land



Ms. Phiroonphon Poolsap

2005-2009 Telecommunication market and equipment

- 2009-present: International Marketing Manager Mutita Candle.

- 2012 to present: Executive Director Ubon Land & House for Sale, Investment consultants on all types of real estate investment



Mr. Thomas Hogan - Advisor

Experienced in construction, operation and funding of conventional power plants, former president of Yellowstone Power plants. American national, studied engineering and filed several patents in the field.



PRODUCTS AND SERVICES

Represented by the three arrows in our logo we are active in our three main departments – Projects, Consulting, Trading

Projects expertise in the following fields:

- Solar Farm (PV + Thermal)
- Solar Rooftop
- Wind Turbine
- Biomass, Biogas
- Construction

Trade in the following areas:

- Solar Hybrid Air conditioner
- Solar Pumps
- Solar Mobile Phone chargers
- Portable Solar solutions
- Solar street lighting systems
- LED lighting solutions

Consulting Services

For foreign investors

- Find suitable projects in Thailand and the ASEAN countries
- Manage and implement projects on their behalf

For domestic investors

- Find the suitable business partners and technology providers
- Planning and management of projects



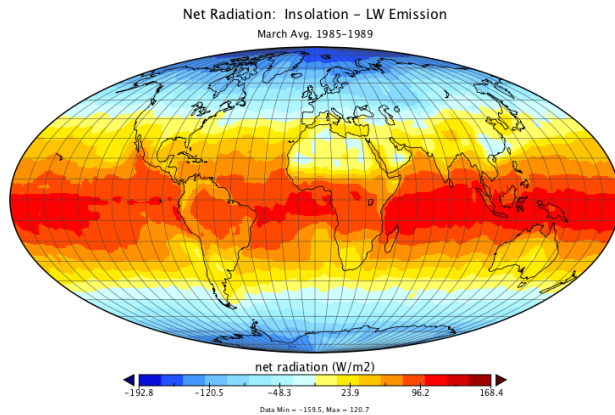
CORPORATE RESPONSIBILITY AND AFFILIATES:

Our company has evaluated and keeps observing the following aspects which affect directly and indirectly the implementation of our current and future projects:

- Political situation
- Technical feasibility
- Geological and meteorological survey
- Social and economical development
- Legal and financial regulations regarding land ownership
- Legal, social and financial aspects related to our project

Solar Technology – a short introduction

In just 40 minutes enough energy reaches our planet from the sun to cover the entire need for energy of all human kind for an entire year.



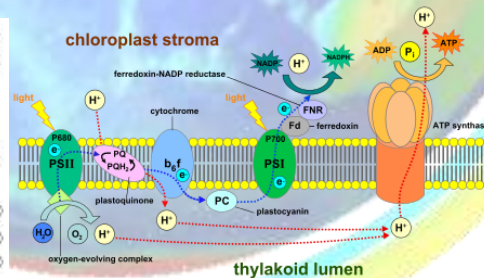
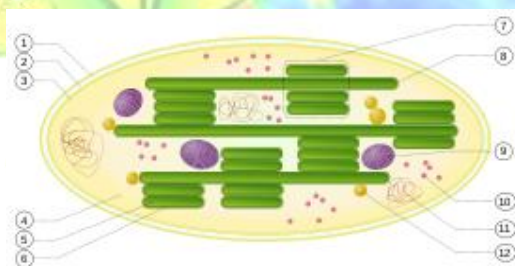
The problem which researchers worldwide are working on is:

How can we harvest and convert this energy into usable electrical energy?

This leads to several different approaches:

1) Indirect approach

Plants use solar light to transform $H_2O + CO_2$ to $CH_2O + O_2$, storing the energy from the photons in form of chemical energy in the CH_2O compound which is then used to produce starch and sugar. Interestingly the oxygen released in the process comes from the water (H_2O) and not from the carbon dioxide (CO_2), contrary to common belief.



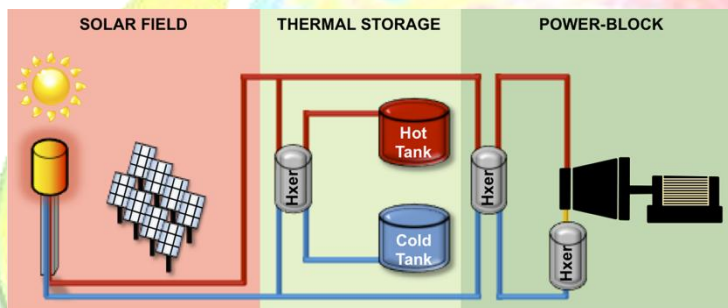
These energy-rich organic compounds can then be used as source of energy, for example by burning the organic compounds in Biomass-power plants. Since the CO_2 that is released in the process was earlier absorbed from the air, this solution has a neutral CO_2 -balance.



2) Direct approach

a) Solar Thermal power generation

In this installation, mirrors are used to collect the heat from the solar radiation through focussing. This heat is then used to power evaporate water and power a steam-turbine which generates electrical power.



First installations show that through the addition of a molten-salt storage tank, heat can be stored for times without solar irradiation, thus allowing the plant to produce solar energy around the clock.

b) Photovoltaic power generation

In this technology, an incoming photon dislocates an electron from a target-atom. This generates an electrical potential which the target atom needs to compensate, therefore inducing an electrical current. This is the most direct photon-to-electricity approach.

I) Generation 1 Photovoltaics

Known since the late 19th century, photovoltaic elements began to become increasingly popular during the space-race in the 1960's and first customer applications with solar power became available in the late 1970's but for a long time remained too expensive for utility scale application.



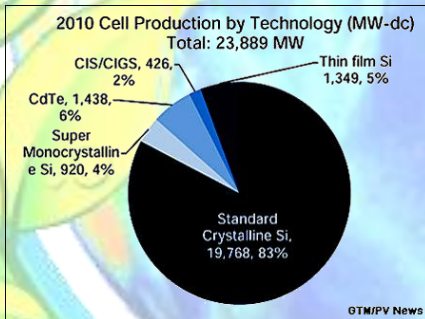
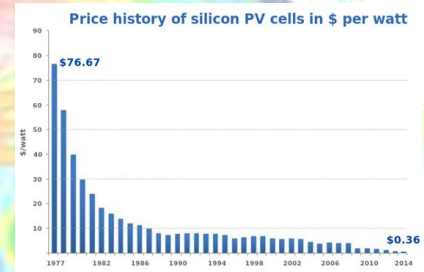
Vanguard1 Satellite, with solar power

One of the first solar powered calculators

Test of a 6% efficient solar panel, 1959

Further development and research together with an increasing demand however lead to the rapid decline of the prices per installed watt by about factor 200.

This effect was further increased by the government-subsidized, mass production of solar panels in China.



This first generation of solar cells include most of today's silicon wafer based solar panels, including polycrystalline, mono-crystalline and amorphous Silicon panels. Until today, this technology is the undisputed market leader with over 80% of all solar watts installed.

In the laboratory, the first Silicon-based solar cells have been researched to reach a current maximum efficiency of 26.3% - not far from the theoretical maximum efficiency of 32%. This will be the barrier for Silicon based solar panels since it is one of the material properties as it can be calculated with the Shockley-Queisser limits. This means no matter how much research is done, silicon based solar cells will probably never break the 32%-mark.

Current commercially available solar panels are still far from this point however with average efficiencies of about 15%-18%

THE DUOMAX MODULE

60 CELL MULTICRYSTALLINE MODULE

255-265W POWER OUTPUT RANGE

16.1% MAXIMUM EFFICIENCY

0~+5W POSITIVE POWER TOLERANCE

- Improved durability**
 - PID Resistant and free of metal ions
 - Improved module reliability to increase life expectancy
- Enhanced safety**
 - The case is certified by TÜV Rheinland according to the test IEC 61215-2:1997-03
 - The float for fire report (UL 1709)
- Increased value**
 - Higher power system voltage reduces BOS costs
 - 25-year warranty
 - 0.5% annual degradation
- Certified to withstand the most challenging environmental conditions**
 - Accurate loading according to snow, wind, and other
 - 2000 Pa wind load
 - 2400 Pa snow load
 - 30 mm hail impact of 81 km/h

Trina Solar's DUOMAX Ultra-Performance Warranty

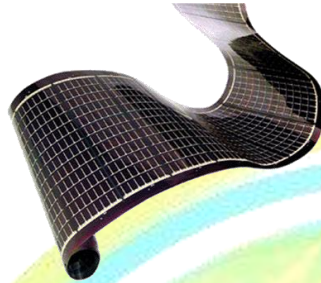
Additional value from their Solar 10 Year Warranty

Trina Solar Limited www.trinasolar.com

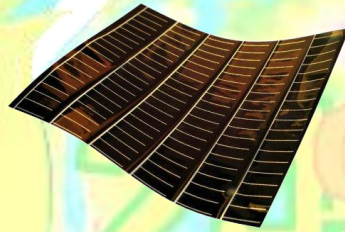
II) Generation 2 Photovoltaics

This category is made up mainly of so-called thin-film solar panels where as there are:

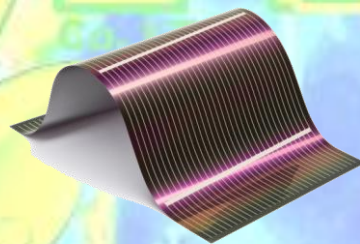
- a-Si (amorphous Silicon)



- CdTe (Cadmium Telluride)



- CIGS (Copper-Indium-Gallium-Selenide)



Historically, Thin Film Solar panels used to be less efficient than Si-based panels, but this gap is closing rapidly with modern thin film panels providing efficiencies of 17%. Together with the cheaper production methods – one of the main advantages of Thin Film technology, and with the reduced weight load, this technology is very promising and holds currently 20% of the market share.

Each of these types has however their own disadvantages which demand for solution:

- a- A-Si type: generally the amorphous Silicone type Thin Film panels are less efficient than its rivaling technologies.
- b- CdTe type Thin Film solar panels received some critics due to the high toxicity of the Cadmium used in the cells. Often the public opinion prefers non-toxic materials.
- c- The CIGS type Thin Film solar panels are still used only in a few special applications since the required Indium makes the panels extremely costly.

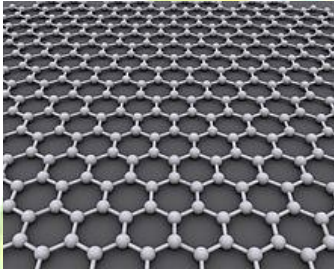
An outlook to the future – Generation 3 Solar panels

There are currently heavy efforts in research and development to bring a new, 3rd generation solar panels to the market. So far there are 2 very promising approaches which are been researched:

- 1) Perovskite based Solar cells – A Calcium-Titanium-Oxide mineral



- 2) Graphene based Solar cells – An allotrope or Carbon



Both elements are present in abundance and both are non-toxic which eliminates two critical barriers from the 2nd generation of Solar Cells.



Perovskite solar cell being researched at Oxford university

Under lab conditions, researchers are calculating efficiencies of 40% to 60% - far beyond the reach of Silicon based solar cells due to their Shockley-Queisser limits at 32% as discussed above.

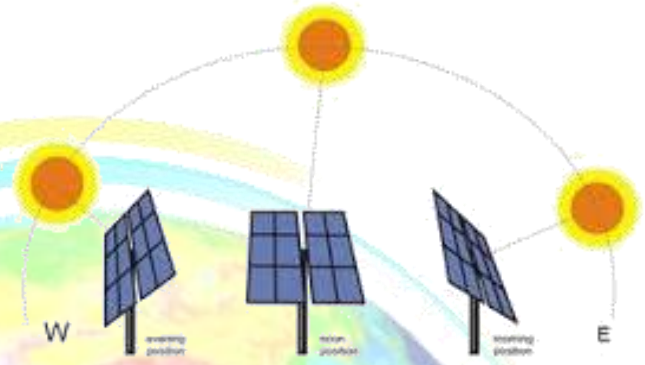
However – while Graphene is indeed a very interesting material – it is near transparent, highly conductive, stronger than steel – it has also its limits to readily absorb photon-energy. This is one of the tasks that researchers around the globe are working on.

While silicon absorbs the photons from a very narrow bandwidth of light, researchers are further investigating ways to absorb the photons from the full light spectrum. This is achieved by modifying the band gap of the material which is controlled by the Halide concentration in the material – or simply put, scientists are able to control the color of the light absorbed through the composition of the material.

While all these technologies have promising onsets, there are still a few problems to be solved and therefore 3rd generation solar panels will be commercially available only in a few years from now.

Tracking

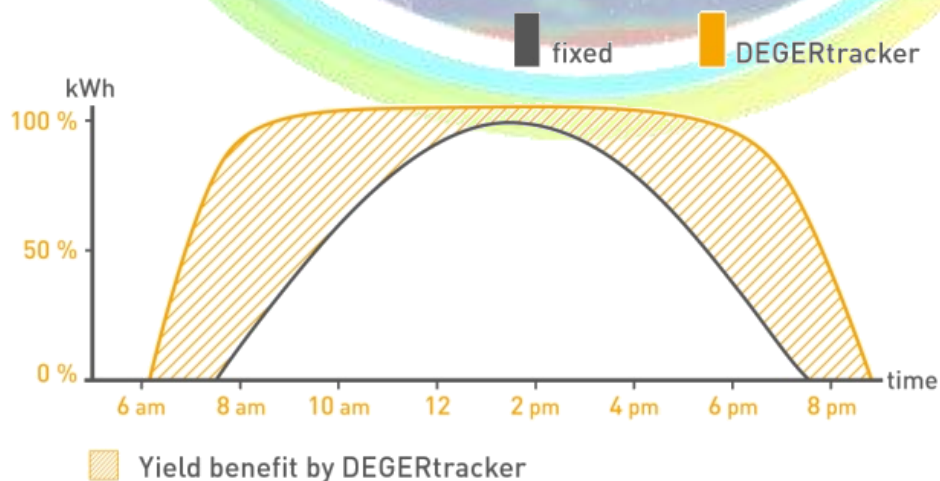
No matter which generation of solar panels is installed, any system receives an efficiency boost from a solar tracking system in which the solar panels are constantly aligned perpendicular to the sun, as opposed to fixed installed systems where the sun passes over it in the course of a day at various angles.



Depending in different variables such as location, technology, season etc, a tracking system will generate 10% to 40% more

Solar tracking systems that follow the sun over the course of the day are called intra-day tracking systems and can be single axis tracking systems

Rating chart using a sunny summer day as an example



Electrical and electronic components

In this field it was important for us to get the complete solution from one single supplier in order to ensure that all components work properly together. False alerts – or missed alerts in the control system due to a miscommunication between an Inverter and the server can lead to huge damages and losses. Moreover, the ABB inverter is currently the only inverter in the market which operates on partial redundancy; this means if a problem occurs, the inverter still works with reduced capacity until the problem is solved while other systems shut down completely.



Our evaluation showed that Siemens is about leaving the solar business which makes ABB our supplier of choice for the electrical components. The Swiss-Swedish enterprise is well established in this business and even has an office in Bangkok and their profound knowledge of the legal situation regarding each component made them our supplier of choice



Cleaning technology

Dust accumulating on the large surface of the solar panels is a major issue in this kind of projects and can easily lead to unnecessary losses. Therefore we plan to implement a state of the art cleaning robot with a cleaning capacity of several thousand m² per hour.

Most of these systems are however designed for dry desert climates and will just wipe off some loose dust and sand. Due to the high percentage of humidity in Thailand and the high activity of biological life we need a different form of cleaning which leaves us with only a few alternatives that can effectively handle encrusted dust or animal feces.

Automated cleaning solutions like the one we implement deliver their return on Investment within 2-4 years due to lower fix costs for cleaning and more reliable results which leads again more sellable power being generated.



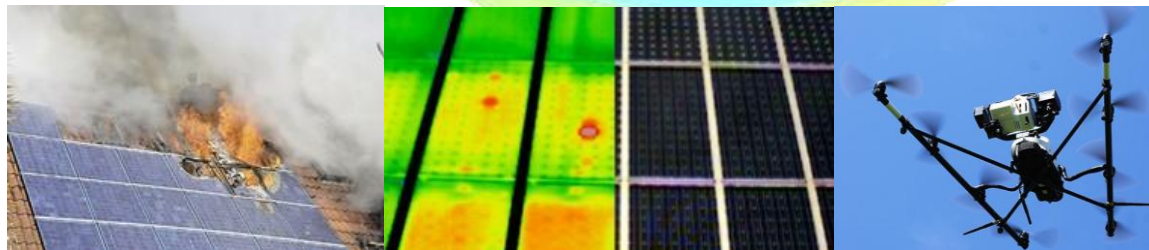
Clean Energy

Early recognition of errors

In order to eliminate unnecessary maintenance routines and fix costs we are implementing modern UAV technology for permanent surveillance of our solar PV field.

A drone equipped with the necessary sensors flies a programmed pattern over the solar field for early detection of any defects that could become a problem in the future.

The same technology is also used for initial inspection upon delivery and installation.



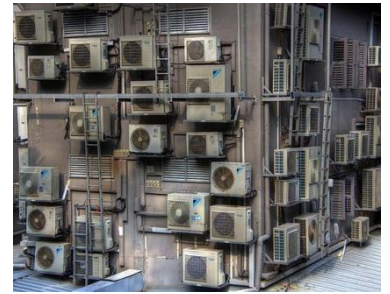
Undetected hotspot ignites solar panels.

Hotspots in Thermal vision vs. normal visual inspection

Service drone in action

SOLAR AIR CONDITIONER

Air Conditioning for cooling is one of the most power consuming home and office applications in use today – and we use it very extensively. Cooling and heating makes up for about 60% of domestic electricity consumption worldwide. This results in huge electrical bills – not to mention adverse effects for the environment. But there is a simple solution:



Solar Hybrid Air conditioner: By using the power of the sun to produce the energy required for the cooling process we make the problem a part of the solution. Depending on how and when the air conditioners are used we can achieve up to 90% energy savings compared to a traditional air conditioning unit. However – Solar Hybrid Conditioners still need to be connected to the power grid similar to traditional air conditioners for night time usage or when the solar panels don't produce enough power under overcast skies.



Our Solar AC used in Australia family




Our Solar AC used in Pakistan family


100% Solar Air Conditioner: Other than the Hybrid Air Conditioners, the 100% Solar Air Conditioners can operate completely independent from any power grid and can be used in areas where no power is available such as mountain resorts, islands, boats and similar, or in normal buildings who's owner want to be independent and contribute to environmental protection.





Refrigeration technical combine with pragmatic art perfecting

 air conditioner, combine with refrigeration technical and arts, consider air conditioners reliability and stability function, and also to consider harmony with room decoration (especially the type connecting to family: wall-mounted type, cabinet). And always use the latest surface handicraft; make you feel comfortable and suitable for air environment, the room space handicraft, make you feel comfortable and suitable for air environment, the room space showed more style, and more nature fresh.

 air conditioner use world famous compressor from japan, hydrophilic aluminum foil, super-quality internal threaded copper pipe and other key parts, add over 10 years technology and experience, the tip technical team, and consummate quality check, manufacturing hanging with high-performance effect.





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