



Shire Oak International Vietnam Rooftop Solar



1. Solar Energy Potential - Assessment & Legal Background in Vietnam

- Vietnam's Energy Mix
- Rooftop Solar Opportunities in Vietnam
- Legal Framework
- General Framework
- Overview of Shire Oak International

2. Rooftop Solar Business Model

- Contract Options
- Cooperation Partners
- Detailed Process

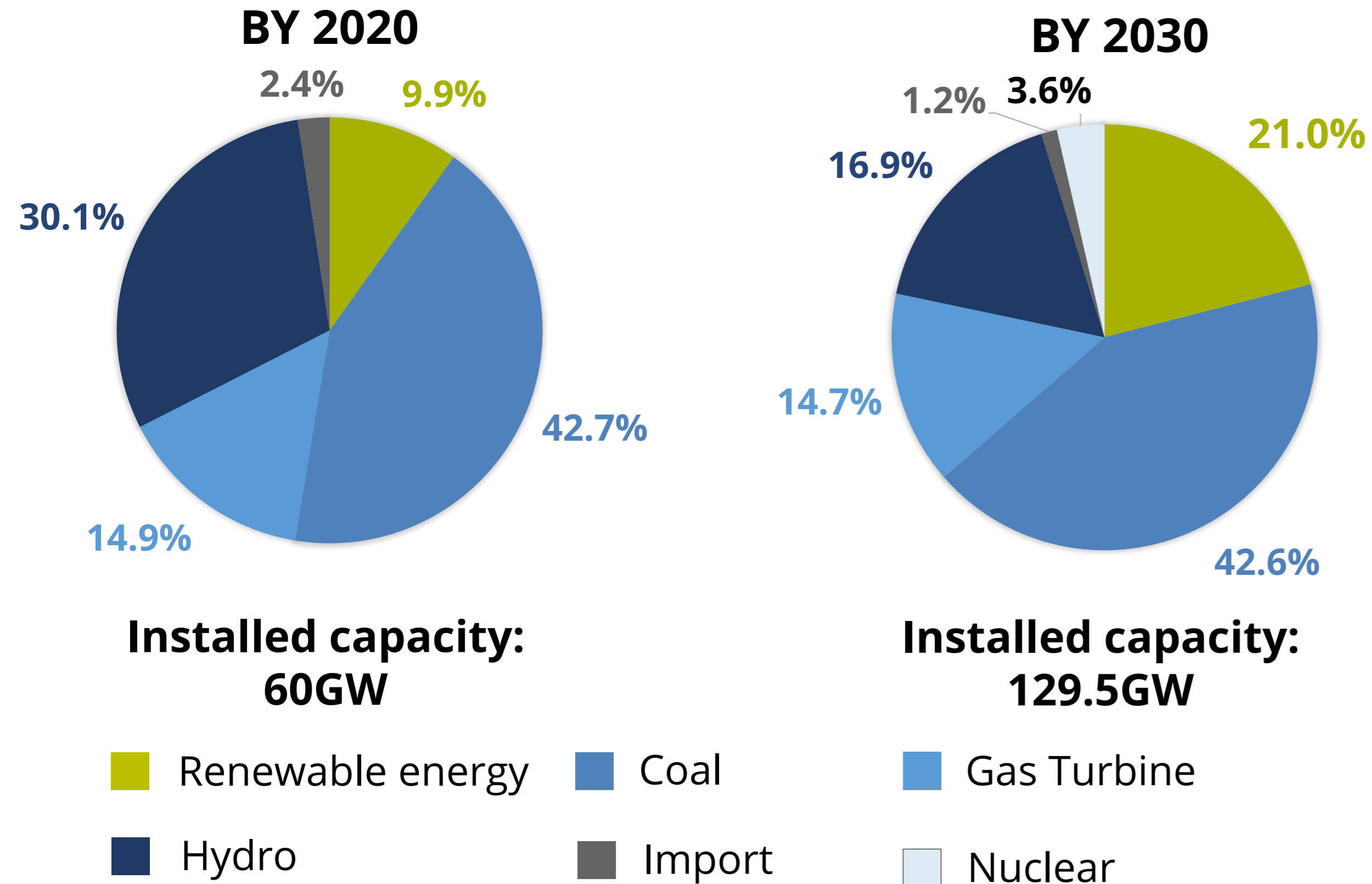
3. Technical Feasibility study

- Solar System Overview
- Our Management Plan
- Steel Structure Evaluation of Solar System
- Electrical Configuration
- References

Solar Energy Potential Assessment & Legal Background in Vietnam

Objectives of Resolution 55-NQ / TW (Orientation of the National Energy Development Strategy of Vietnam to 2030), vision to 2030:

- Renewable Energy accounts for **21%** of Vietnam's total primary energy supply.
- The **energy-saving** over the total final energy consumption against business-as-usual (BAU) scenario to reach 7%
- To **reduce greenhouse gases emissions** from energy activities against the BAU scenario by 15%



MARKET HIGHLIGHTS

The Government's strong supports for the development of Solar power.

10% / year Vietnam Power demand growth

850 MW Solar power installed in 2020

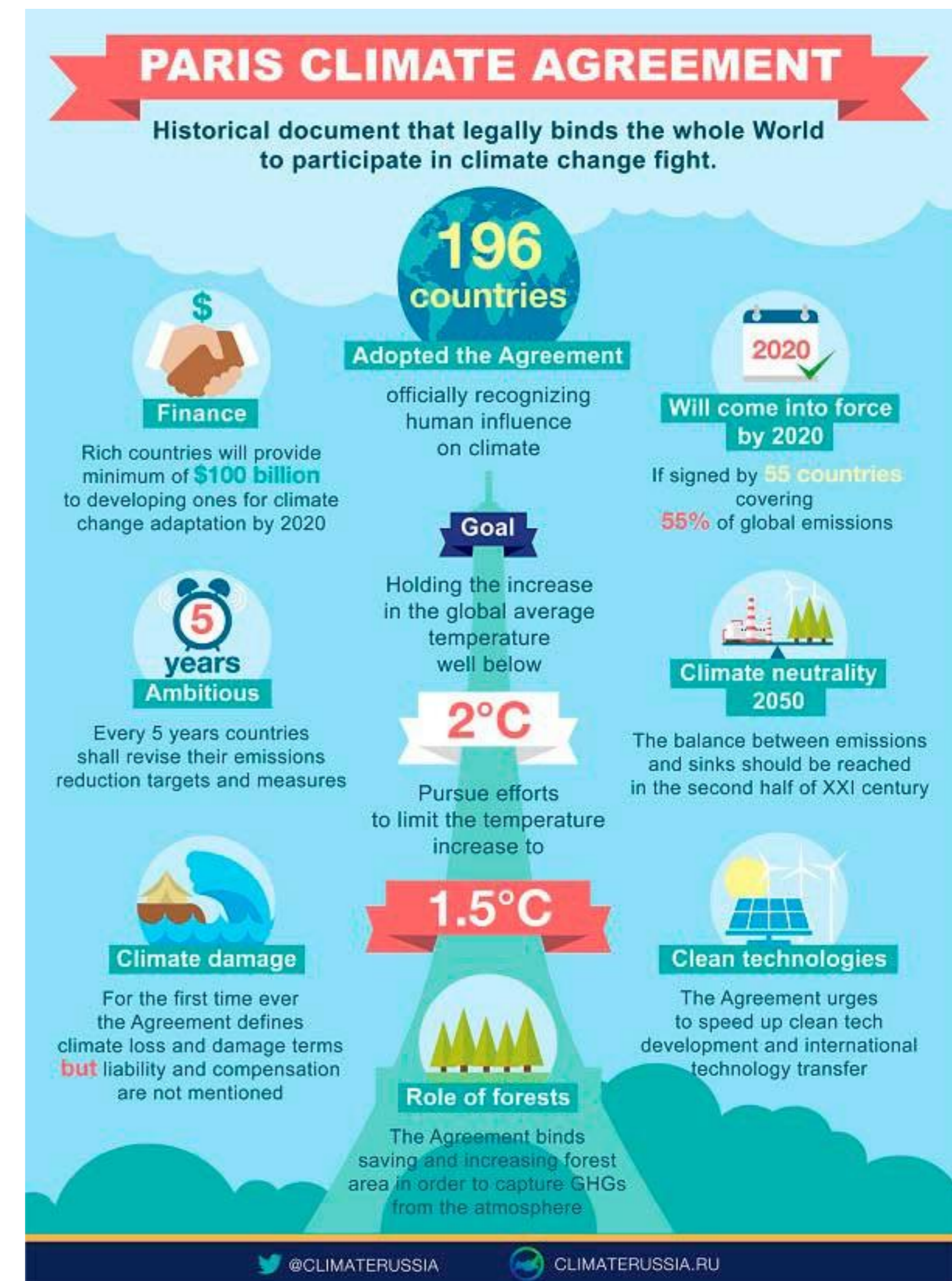
12,000 MW The government's target of solar power installed by 2030

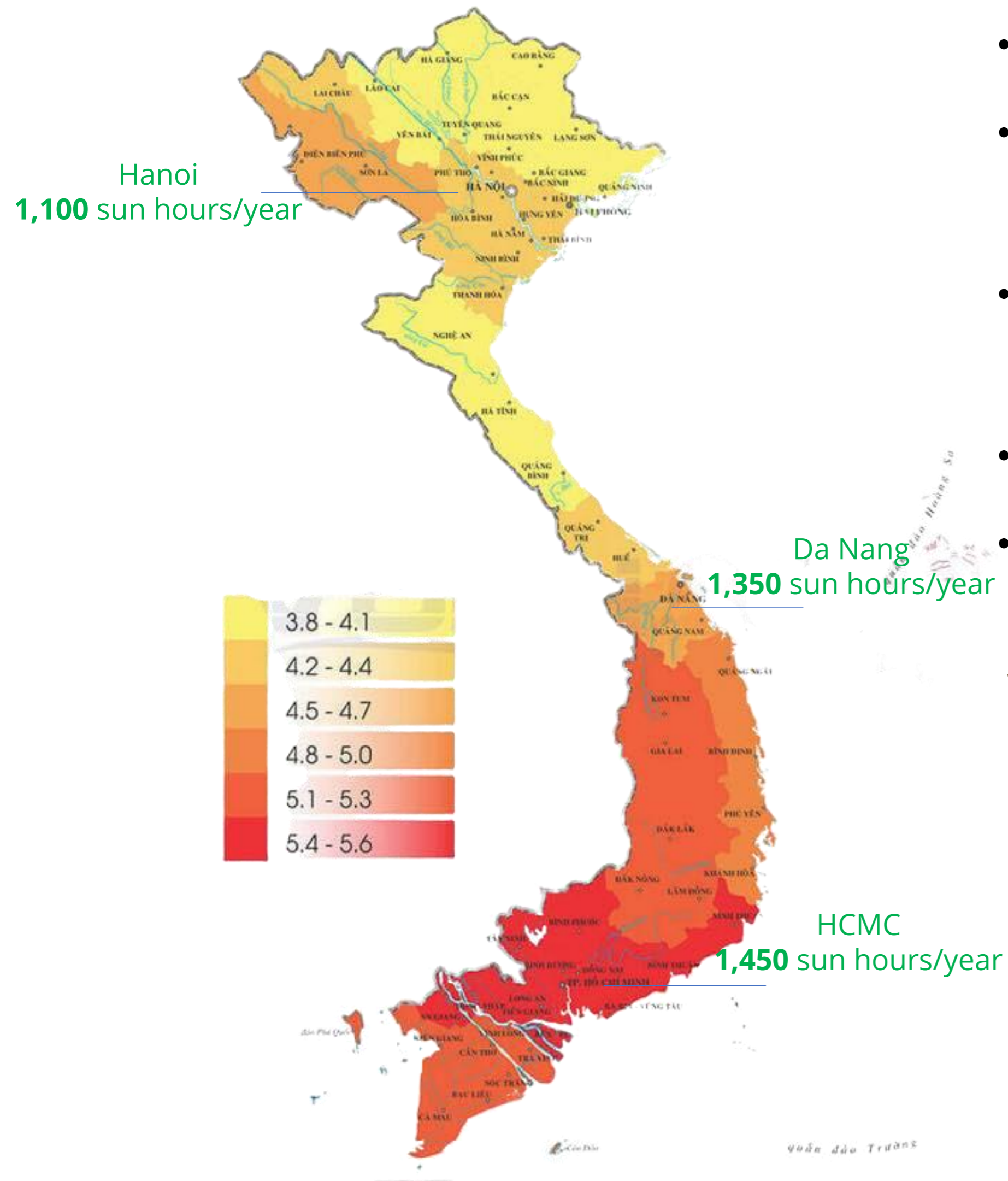
6% The percentage of solar power expected to cover the total electricity production in 2030

Source: Decision 2068/QĐ-TTg by the Vietnamese Government.

The Paris Climate Agreement CANNOT BE ACHIEVED if Vietnam cannot find alternatives to coal

(Vietnam adopted the agreement in 2015)





- Vietnam with a staggering **98.000 hectares** of industrial parks
- A **shortage of power** and a concentration of industrial parks in the South where the best sun hours are to be found
- The trend of increased FDI for production facilities is continuing: many factories move from China to Vietnam; EU-Vietnam Free Trade Agreement
- The country has a requirement for **6,000 MW** of new power a year
- The government is advocating the development of solar rooftop projects by offering a preferential tariff for solar power projects

VIETNAM SOLAR RADIATION

- The total solar radiation is about:
 - 5kW/h/m²/day in the South of Vietnam.
 - 4.5kW/h/m²/day in the Centre of Vietnam.
 - 4kW/h/m²/day in the North of Vietnam.

The Vietnamese Government target of **12 GW** solar PV by 2030 (Decision No. 13). In order to exploit the solar energy potential and further detail the solar power development policy, the Government issued:

Decision No. 13/2020/QD-TTg dated 6 April 2020 on mechanism for encouragement of development of solar power in Vietnam:

- Rooftop solar projects must have a capacity of **less than 1 MW**.
- Confirms that the new FITs will only be available for projects that achieve COD **prior to 31 December 2020**.
- The new FITs for rooftop solar energy projects: **8.38 US cents/ kWh**

Circular No. 18/2020/TT-BCT dated 17th July 2020 regarding project development and model PPA for solar projects:

- Provides all steps to follow from grid connection application until signing of PPA
- Provides the model PPA template
- The rooftop solar system is exempted from the operating license for power generation

General framework



The close-knit relationship between EVN and Renewable Energy Developers:

- The Developer funds solar rooftops completely.
- The Developer carries out, operates and maintains projects with the support of EPCs on technical matters.
- EVN approves the grid connection and is the buyer of electricity.

Tenants (Businesses) directly connect with EVN

Required documents: **EVN Grid Connection Approval**

If the business operates in an industrial park, they are required provide a permit from the Industrial park's manager in order to start a solar rooftop project.



Tenants buy electricity from Industrial Parks (Landlord)

Required documents: **Industrial Park Grid Connection Approval**

In this case, tenants sell overspill to the industrial park instead of EVN.

About Shire Oak International

18 Year Track Record

Leading UK Renewable Energy Developer:

Founded Wind Energy Ltd which became the leading independent developer of wind farms

Large Scale Renewable Energy projects:

- Wind – 967 MW
- Tidal – 320 MW
- Solar – 350 MW

Consented Renewable Projects Portfolio:

Total value **USD 2.49 bn**

Global presence as a developer



Vietnam

Our Green Vision:

- Reconcile legitimate business interests with sustainable development
- Accelerate the global transition to renewable energy
- Help companies achieve their sustainability targets
- Support the preservation of our natural world

-> ***Vietnam is poised to be a leader of the sustainable energy transition in South East Asia***

Ambitious Solar Energy Development Plan

- A pipeline of 720+ projects
- Capacity: 2.1 GW+

System Value: USD \$1.9 bn

Central Hub in SE Asia



SE Asia Expansion

Q3 – Q4 2020

Indonesia



Myanmar



Next 3 years

Laos



Thailand



Cambodia



Philippines



Our Business Model

In Vietnam, Shire Oak International offer **rooftop solar installations with a 15 - 20 years contracts.**

We build on large commercial rooftops at **no cost to the business** and then **sell the power generated** back to the company at a **discount to standard electricity prices** in Vietnam (EVN).

During the lease **we manage the operations and maintenance** of the system and at the end of the term we transfer ownership of the installed system to the business for a

Target Clients: All businesses (C&I as well as Agriculture) with a roof surface area of ~3,500m² and above are eligible for our service.

Your Savings

We pay to install rooftop solar systems to ensure efficiency and quality. Working closely with our **trusted EPC partners**, we source premium panels for our clients, manufactured in Europe, North America and Asia. **Over a 15 to 20-year lease period**, a Vietnamese business with a typical 1MW installed system has the potential to **save up to 10%** – or close to **USD \$900,000** – with a Shire Oak International system compared to EVN prices.



REDUCED CARBON EMISSIONS

A 1 MWp system can reduce up to 863 tons of CO2 emissions per year*



ACHIEVE GREEN CERTIFICATE

Leadership in Energy and Environmental Design (LEED)



GREEN RENEWABLE ENERGY



NO UPFRONT COSTS. LOW OPERATIONAL COSTS



LESS COOLING COSTS

Factories operate 5-7 °C cooler*



LOWER ELECTRICITY BILL

a minimum of 15% reduction per month

Benefits

OF SOLAR POWER SYSTEMS



LONG TERM HEDGING



CLEANER ENVIRONMENT

*Data collected from the BOHO Décor 998 kWp project invested by Shire Oak International.

- Currently 3 local strategic EPC partners & over 10 contracted EPC partner. With their experience of working in the Vietnamese market, we ensure smooth progression of projects in Vietnam.
- We favor partners who are highly experienced in the solar energy industry, illustrated by their extensive project portfolio, **quality assurance, health & safety procedure** and **technical expertise**.
- Our partners are helping us pave the way for a pipeline of 720 projects.



Our process will take from **10 to 15 weeks** after signing the offer letter and the Head of Terms

Non-Binding

Binding



1. Offer	2. Final Design & Contract	3. Investment Approval	4. Installation & Construction	5. Grid-Connection
<ul style="list-style-type: none"> Initial Information Material Selection Offer Letter + HoTs (NDA) 	<ul style="list-style-type: none"> Site Survey Final Design Contract Signing Technical & Transaction Checklist Documents 	<ul style="list-style-type: none"> Ready to Close/ System Book PPA with EVN Prepare materials and components EVN Connection 	<ul style="list-style-type: none"> Roof Reinforcement Solar Panels Installation Substation Construction QA/QC 	<ul style="list-style-type: none"> COD EVN Check & Approval 'Certificate'

Roof Lease Agreement

We will rent the roof of the factory. The amount of electricity generated by the solar power system will be put directly into the grid and sold to Vietnam Electricity (EVN).

Power Purchase Agreement

- Shire Oak will invest 100% of the cost of consultancy, design, materials and installation of the solar rooftop. During the term of the contract, we will be entirely responsible for the operation and maintenance (O&M) of the equipment.
- Businesses use electricity generated by the system at discounted prices compared to that of EVN.
- In case the business does not use all the electricity generated, the excess electricity will be sold to EVN and a part of the profits will be shared with the business depending on the location in Vietnam.
- When the contract expires, ownership of the solar rooftop will be transferred to the business.

INTERNATIONAL TRACK RECORD

We have 18 years of proven experience across the globe, founding pioneering projects in the UK, Europe and beyond.

EXPERIENCED LEADERSHIP TEAM

Our senior management team boasts 5 different nationalities with a combined business experience of over 100 years.

ESTABLISHED INVESTOR BASE

Our solid financial foundation is supported by global investor partnerships.

PREMIUM QUALITY

We only use Tier 1 solar panels sourced from manufacturers based in Europe, North America and Asia.

SERVICE EXCELLENCE

We offer full operations and maintenance support over the lifetime of the installed solar system.

PPA Contract Options for Manufacturing

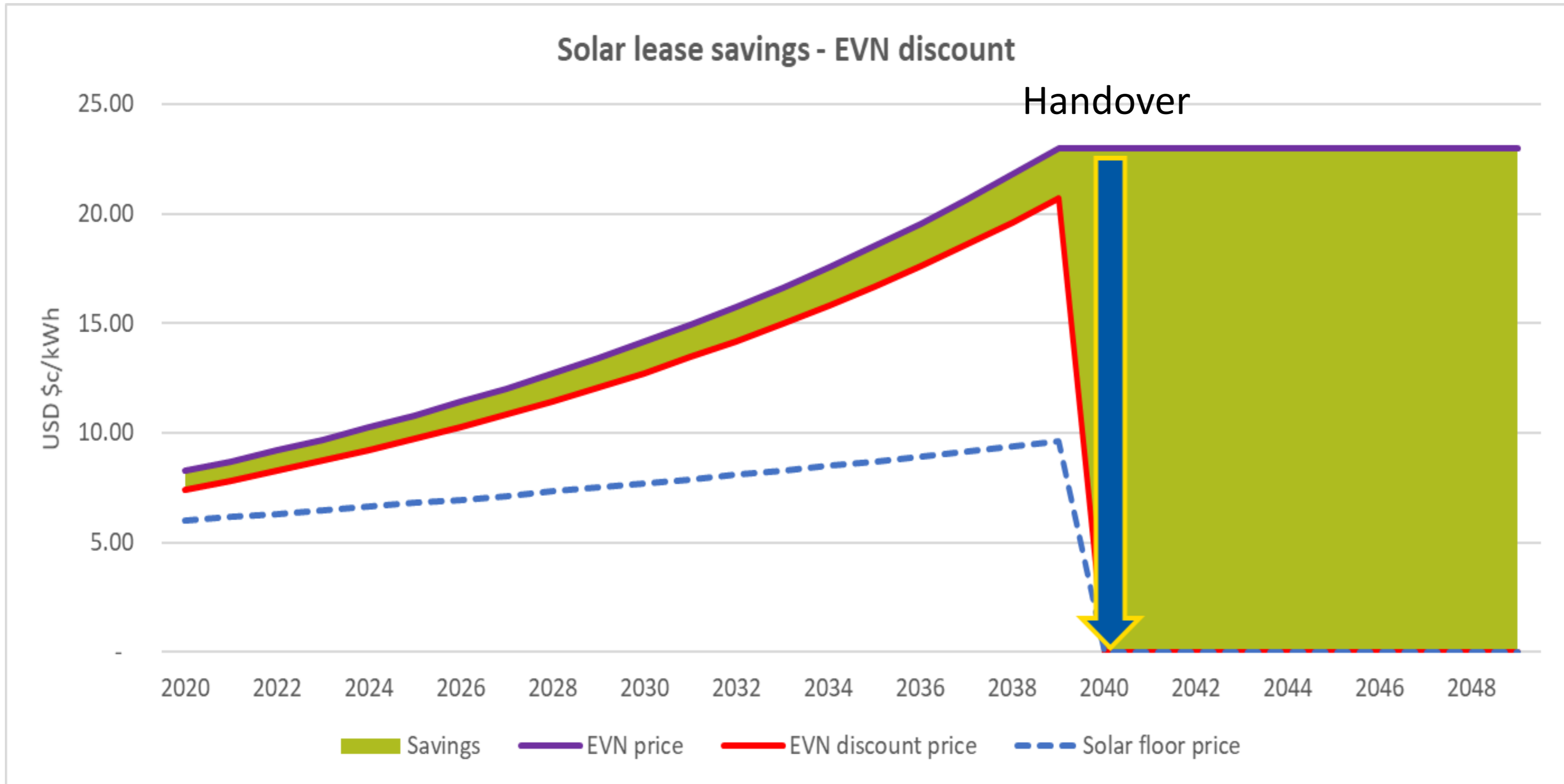
****We apply the same model for Servicing but with a different set of values.**

- Lease payments are **fixed at set discount to EVN three-stage price tariff**
- Floor price agreed to provide bankable projects
- Guaranteed savings over full EVN term
- Table shows potential savings available under two contract length options per MW

Zone	Discount to EVN price *	Lease term	Potential savings over lease term	Potential savings over asset life
#	%	Yrs	USD'000s	USD'000s
North	3 - 9 %	20	279	2,516
Centre	8 - 18 %	20	631	3,166
South	15 - 25 %	20	983	3,833

* Final discount % depends on sun hour & electricity consumption

Option 1: The EVN Price Discount Option



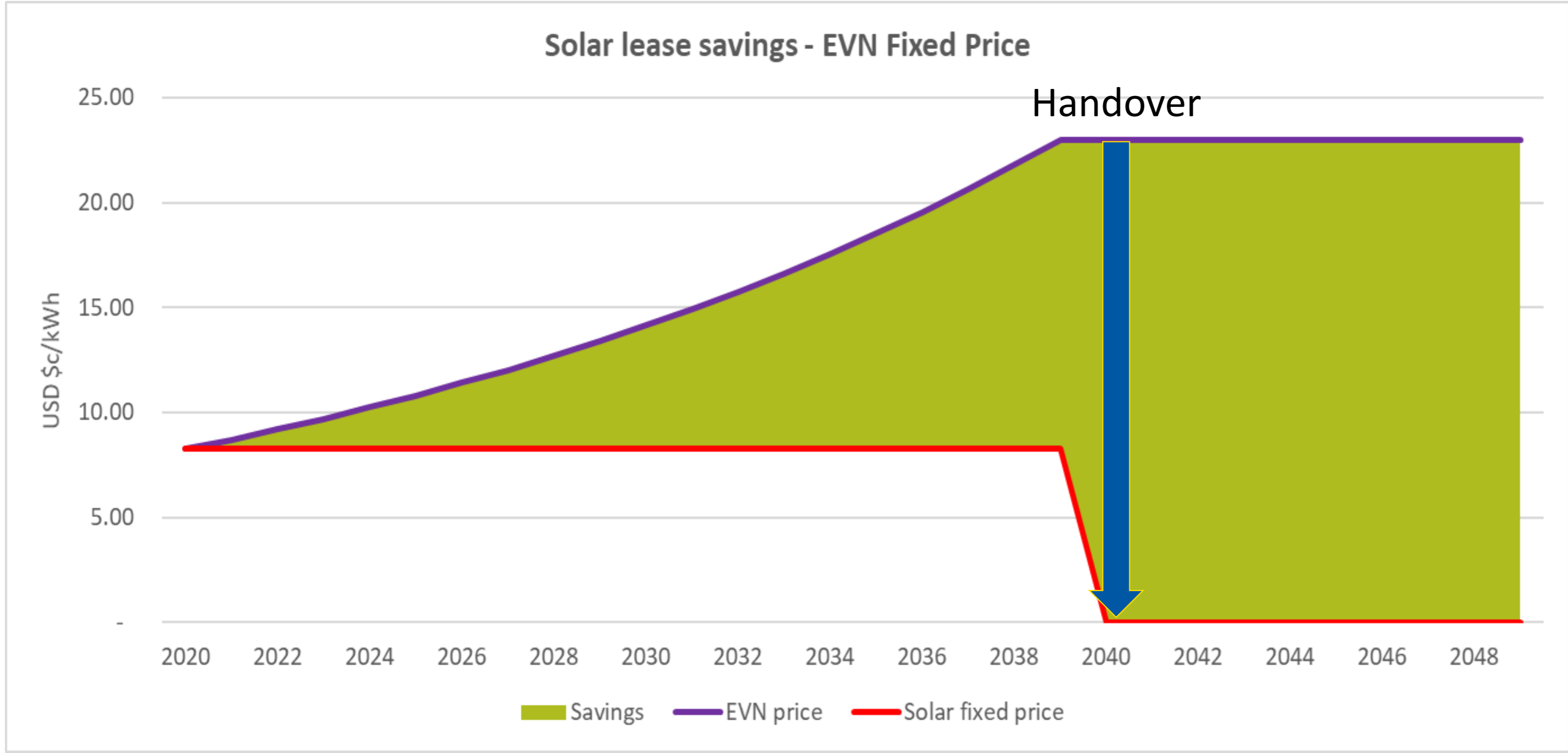
- 20 year example
- 25% discount to EVN price
- Factory inherits solar after year 20

Lifetime estimated savings: \$3.8m/MWp

- Lease payments are **fixed and do not increase over time**
- Starting prices may be slightly above current EVN pricing but are soon overtaken as EVN price increases
- Historical EVN price increases suggest there will continue to be electricity price rises
- Table shows the flat price and savings available under two contract length options per MW

Zone	Lease payment per kWh	Lease term	Potential savings over lease term	Potential savings over asset life
#	US \$c/kWh	Yrs	USD'000s	USD'000s
North	9.0	20	1,138	3,375
Centre	8.2	20	1,483	4,019
South	7.9	20	1,760	4,611

Option 2: Savings under Fixed Price Option

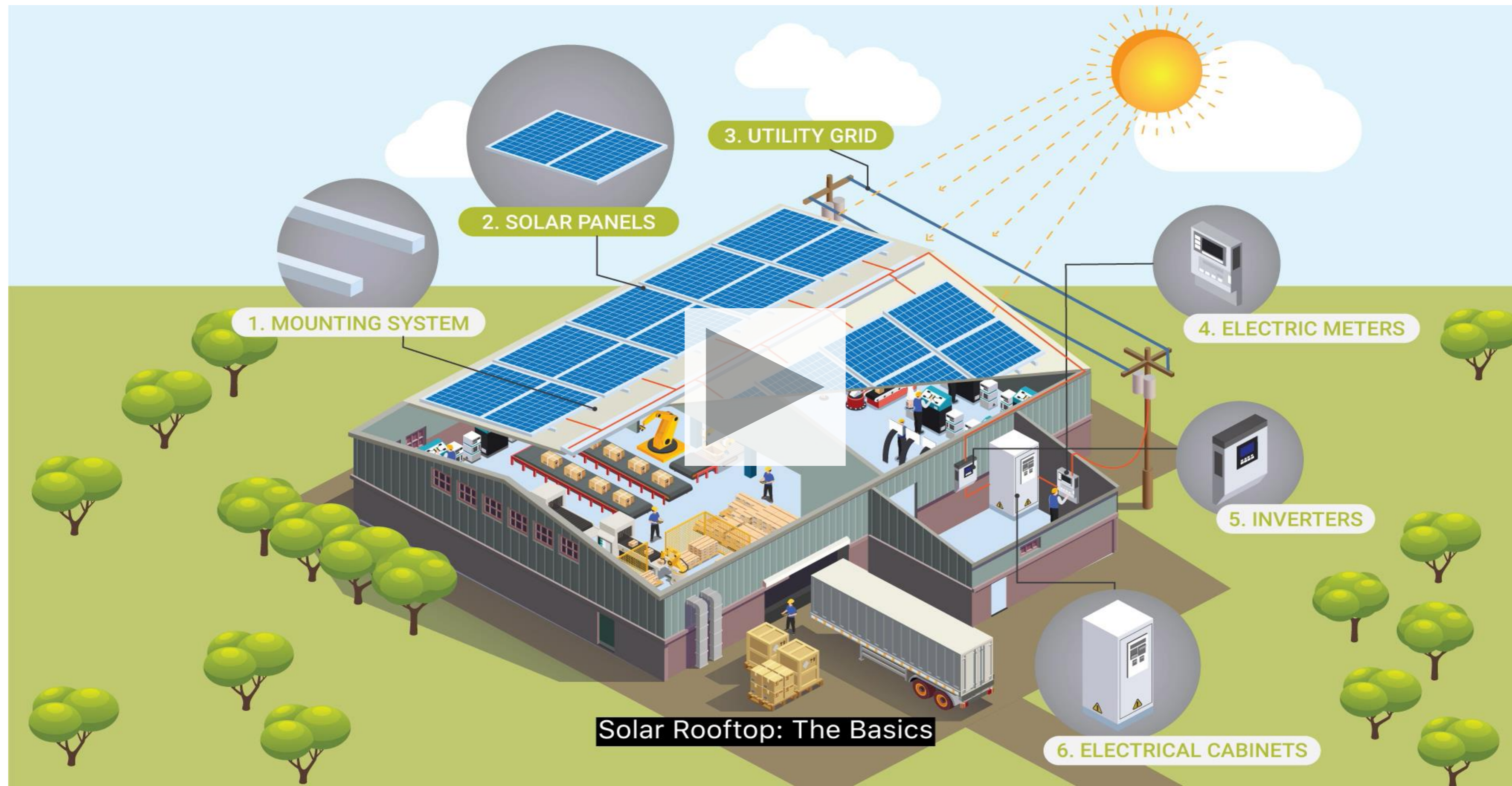


- 20 year contract
- US \$c7.90/kWh flat
- No escalation
- Factory inherits solar after year 20

Lifetime potential savings: \$4.6m/MWp

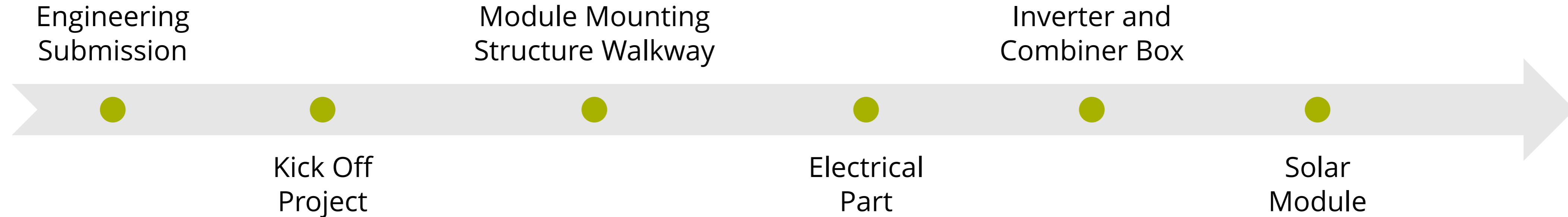
Technical Feasibility Study

- Solar panels convert sunlight to DC electricity
- An electronic inverter, converts the DC from the solar panels to AC
- Simple physical design with five major components (**Tier-1 Supplier**): Solar panel, Inverter, Bidirectional meter, Electrical cabinet, and Mounting system.

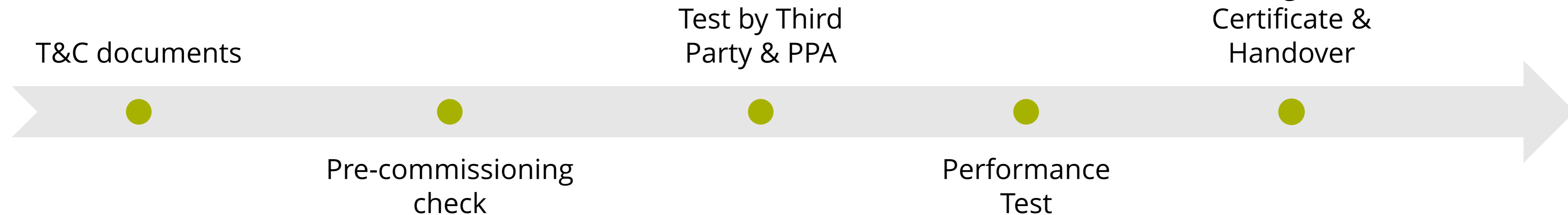


Environment, Health and Safety are an integral part of Shire Oak's operation and activities.

Construction

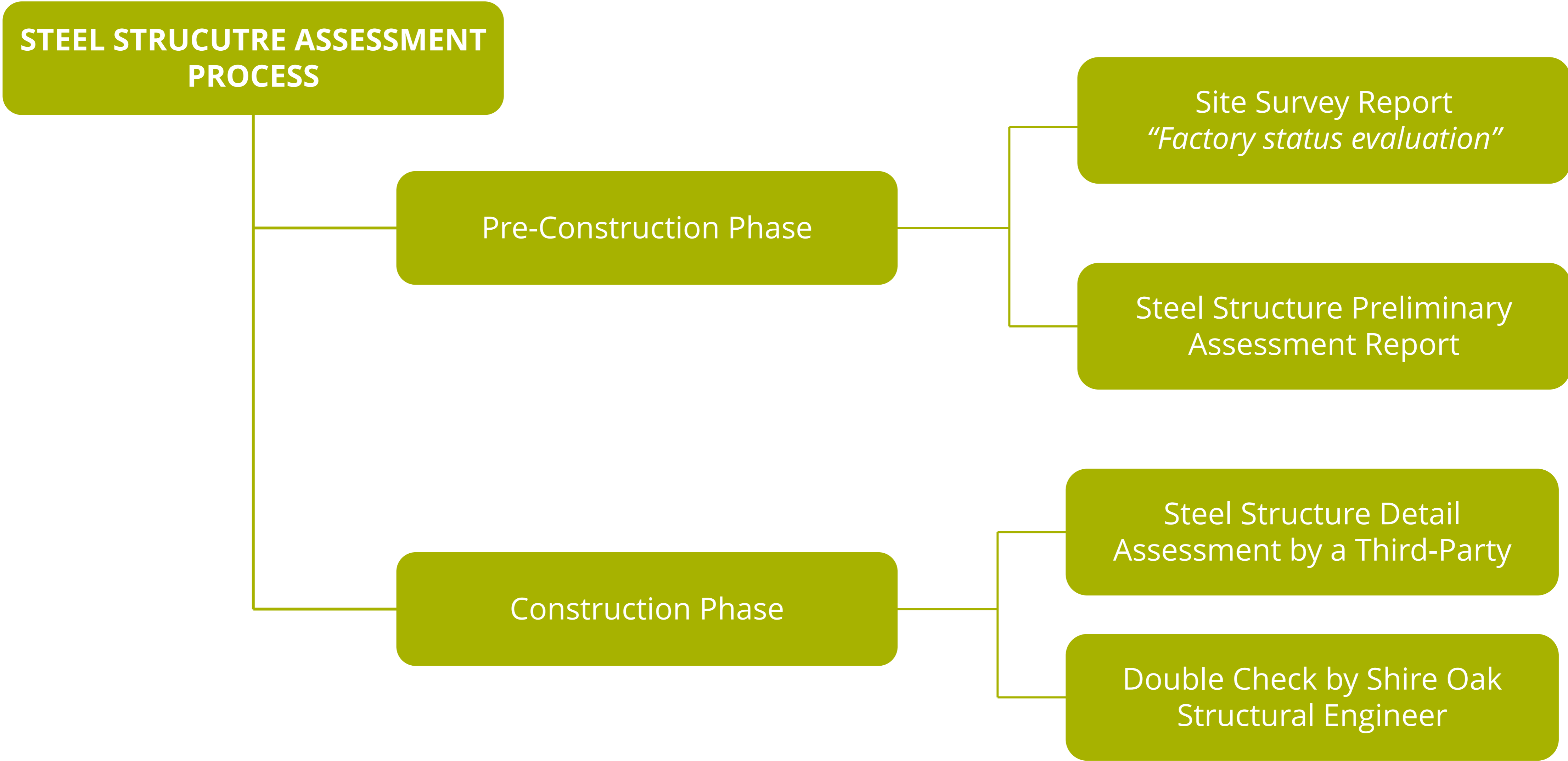


Testing & Commissioning and Handover



Operation & Maintenance

- 24/7 hotline for communication with the project owner
- 3-month period for site survey
- Provide monthly Operation report: remote monitoring



Factory requirements:

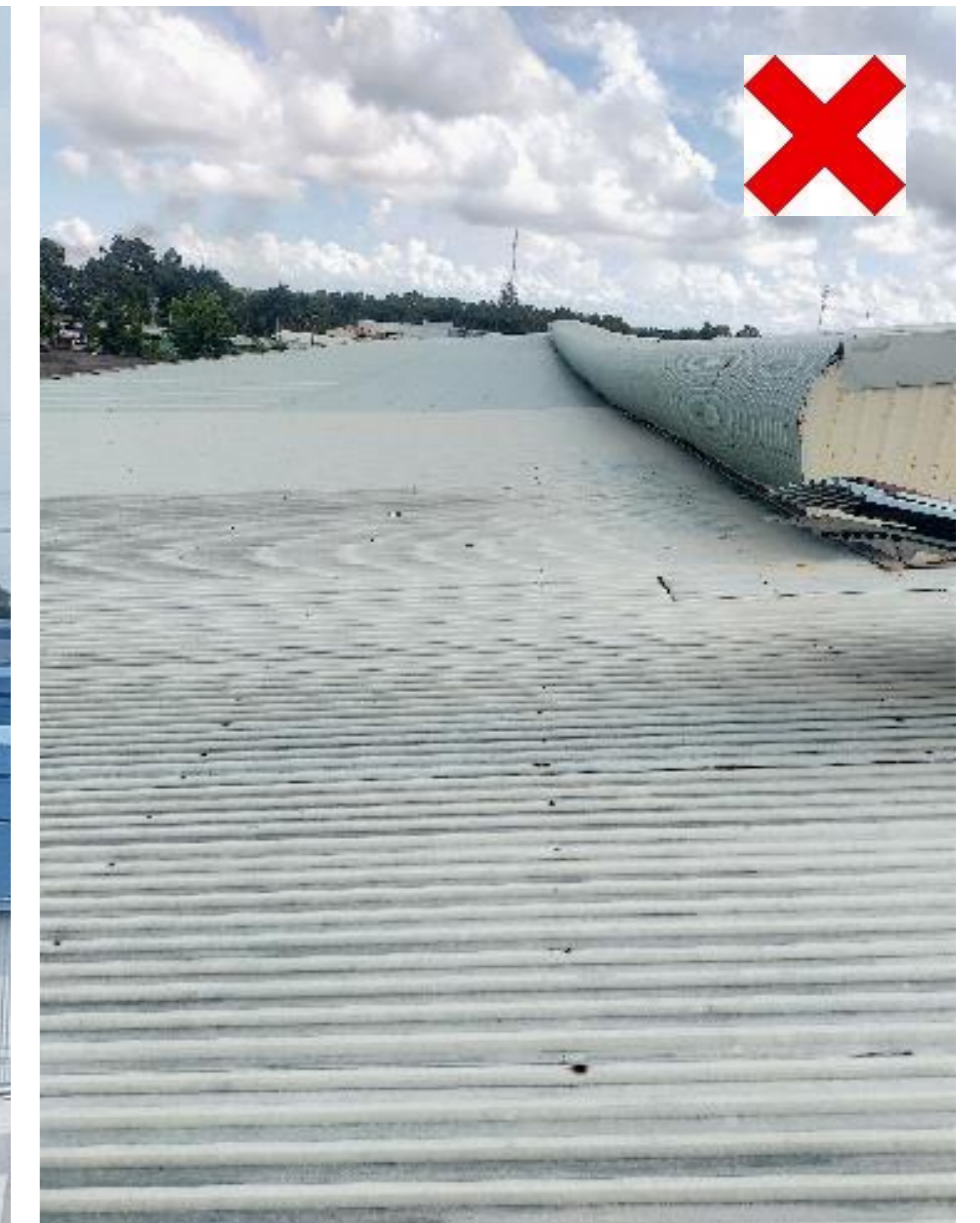
1. Roofing material has been used no more than 5 years



2. Little to no rust on the steel structure



3. No signs of subsidence



Commenting on his company's rooftop solar system, BOHO Décor's Business Development Director, Nguyen Minh Hoang, said:

*"Shire Oak International (SOI) provided us with an ideal solution. During the construction phase of our factory, we thought about how we could play a part in preserving Long An's environment. SOI helped us do just that. Their solar system reduces our energy cost while **causing no harm to the environment**. We are very happy to see **our electricity bills reduced by about 15%**. Also, the fact that our factory's temperature during operation is **lowered by 5 to 7 degrees Celcius**, while easily overlooked, pleased us greatly."*

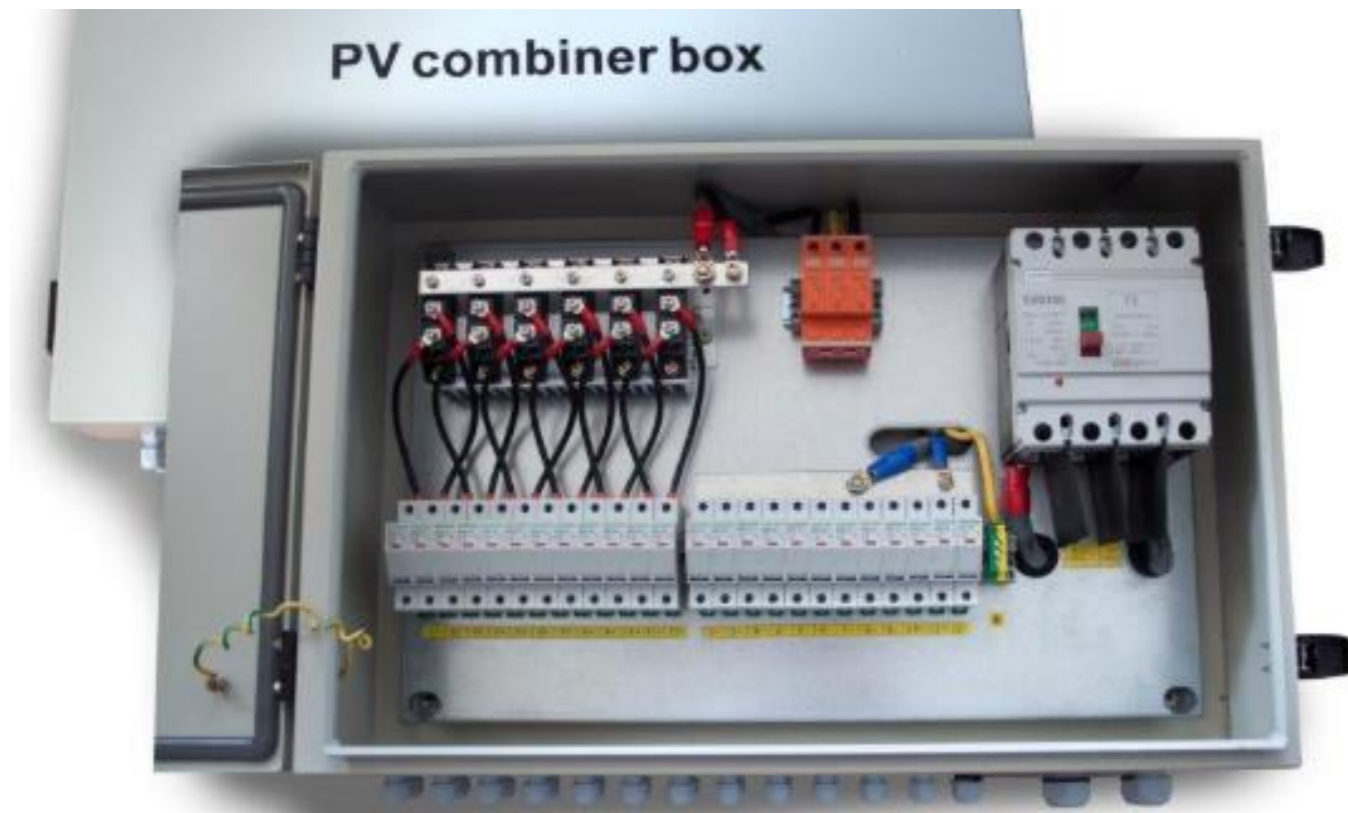
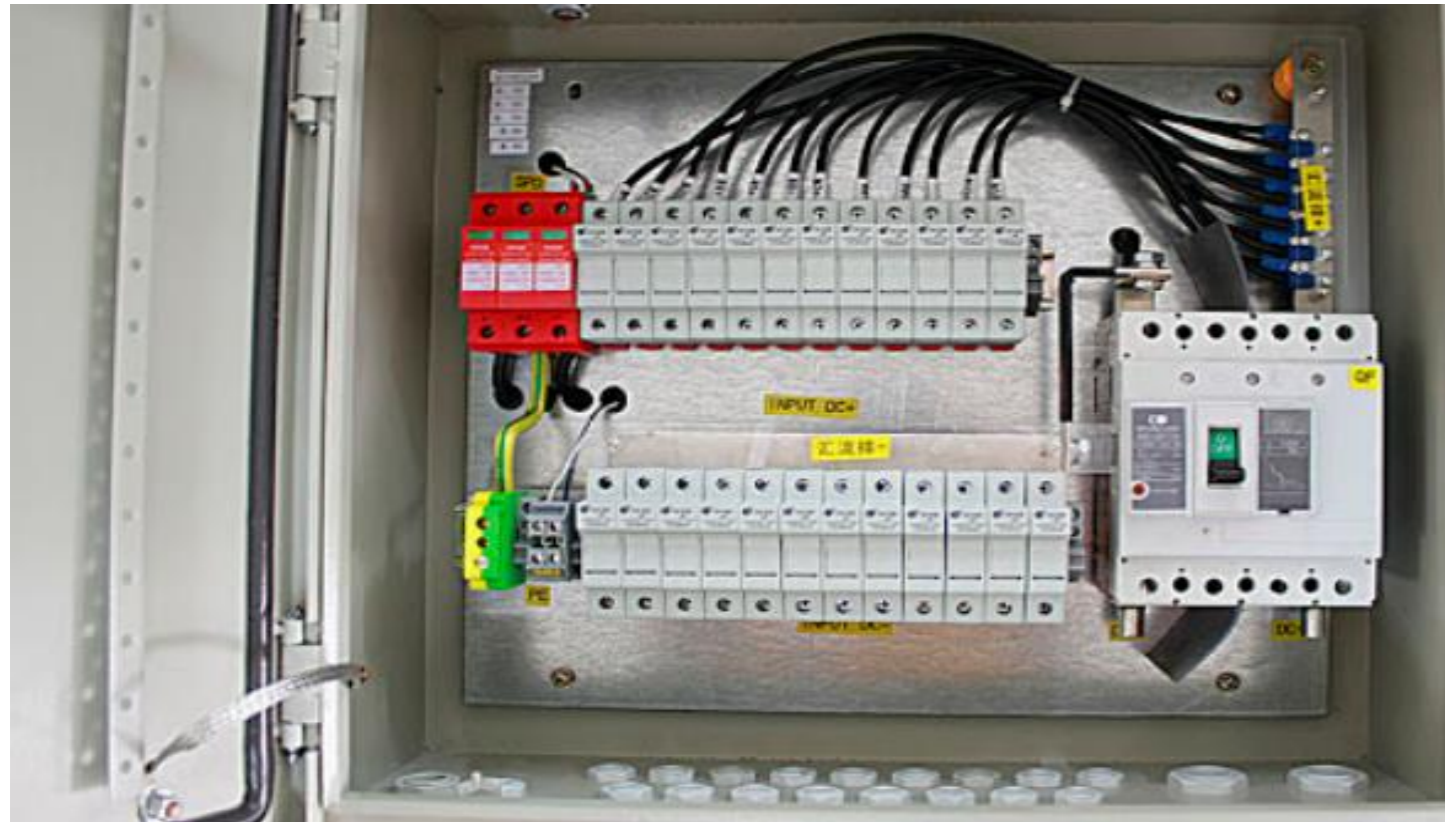


The factory's solar rooftop contributed 20 percent to BOHO's final LEED score.



Thank you!

References



Brand	Phoenix, Trinity, Schneider, SMA
Standard	IEC 61 439-1; IP 65(Outdoor); IP 54(Indoor)
Type / model of material	Steel or polycarbonat
Bus Bars	Copper Busbar
Input/Out put	MCCB, Fuse, Surge arrester



TBEA

ABB

TMEiC



Brands	Sungrow, SMA, ABB, HUAWEI, TBEA, TMEiC
AC/DC Ratio	≥ 0.8
Efficiency	$>98\%$
Total Harmonic Distortion	$<3\%$
Communication	RS485/ ethernet
Warranty for material and processing	≥ 5 years



Power Cables, Conduits:

- **DC Cable:** Installed in steel conduit
 - ✓ Insulation must be able to withstand high temperatures.
 - ✓ High levels of sunlight (UV).
- **LV Cable:** Cu/PVC/XLPE (*on cable tray, ladder*)



▪ Transformer:

- ✓ MV equipment & transformer : approved by EVN
- ✓ Power Transformers : *load is less than or equal 1000 KVA*
- ✓ Copper Conductor

▪ LV Switchboard / Distribution Boards:

- ✓ MSB solar: IP-65 (outdoor)
- ✓ **LV Power Consumption Meters:** Main meter is installed in DB-SOLAR.



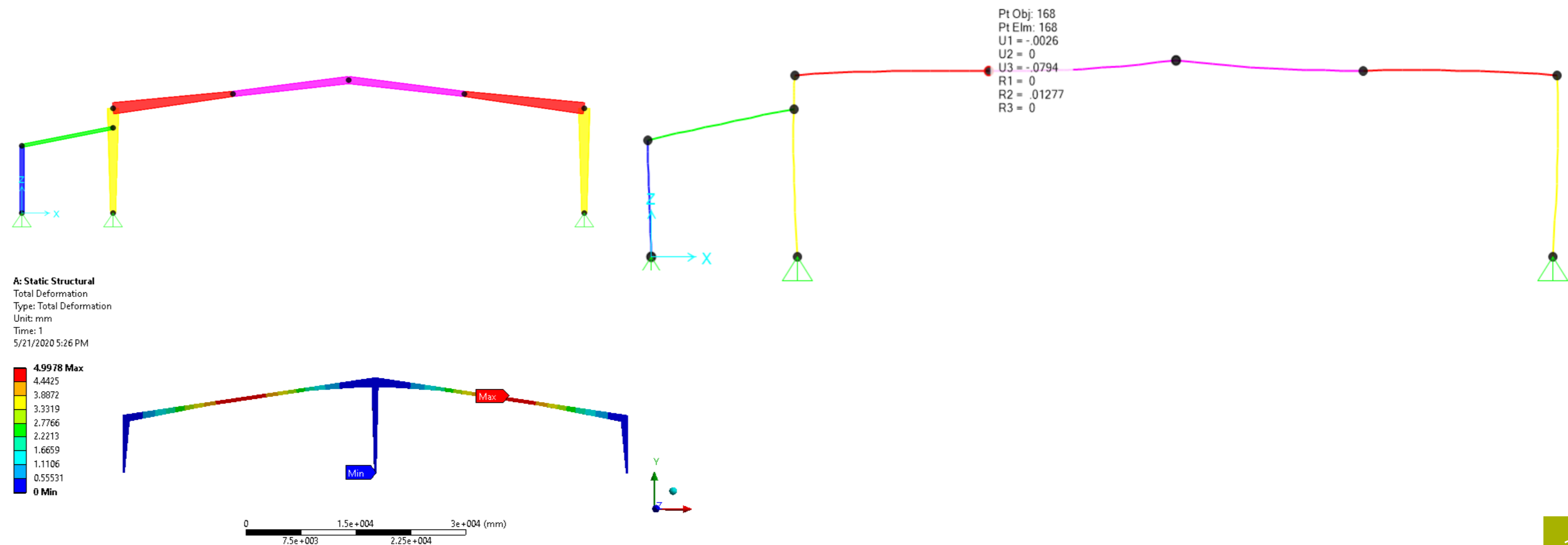


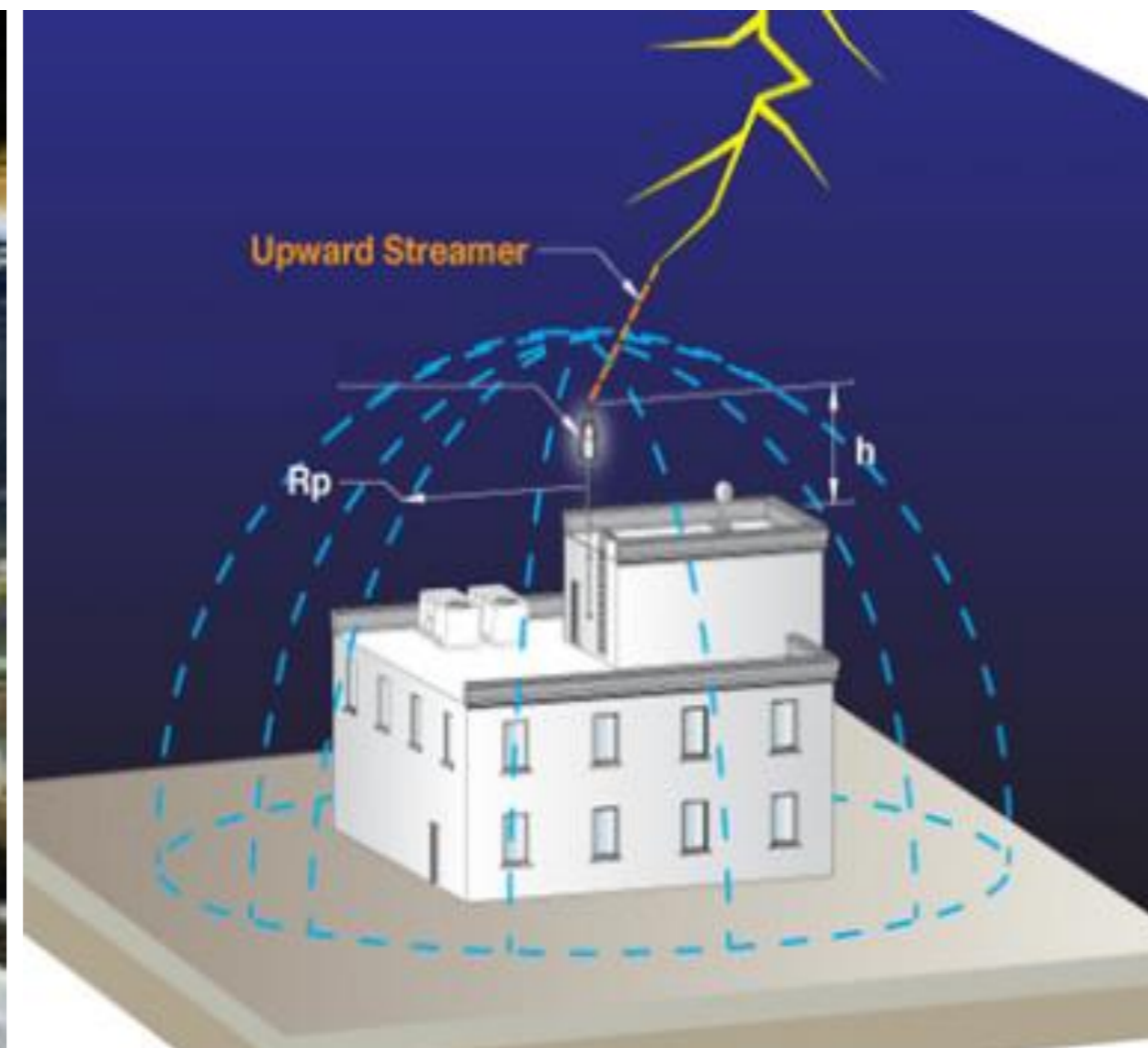
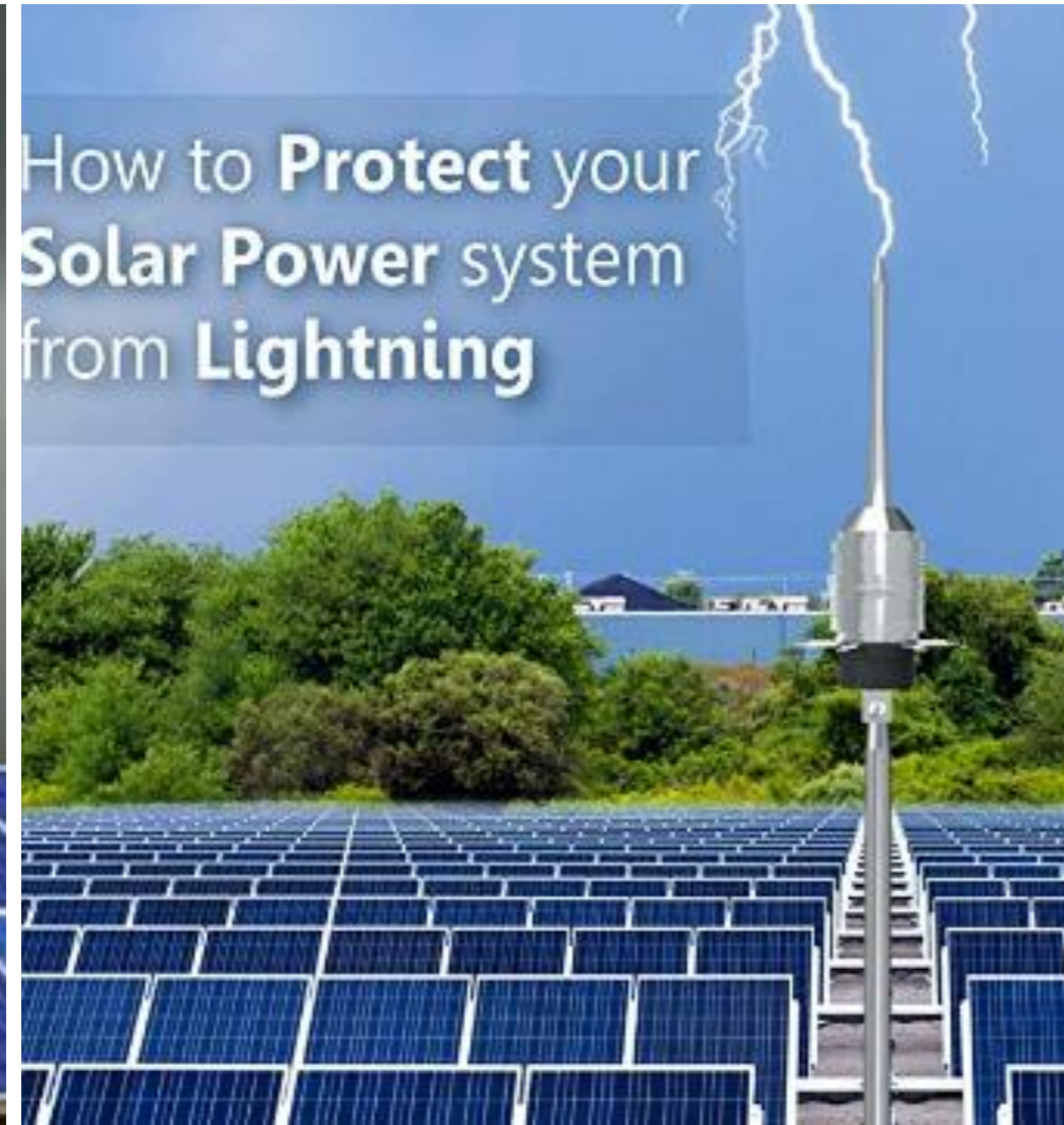
1. Standards applied

- **ASCE 7-05** “Minimum Design Loads for Buildings and Other Structures”
- **IBC – 2009** “International Buildings Code”
- **MBMA** “Metal Buildings Systems Manual 2010”
- **AISC – 9/13 Edition** “American Institute of Steel Structure – Allowable Stress Design”
- **AISI 2001** Cold Formed components have been designed in accordance with “American Iron and Steel Institute”
- **TCVN 2737: 1995** Wind speed & Live Load for Viet Nam Project have been applied in accordance with “Load and Effects – Design Standard”

2. Software applied

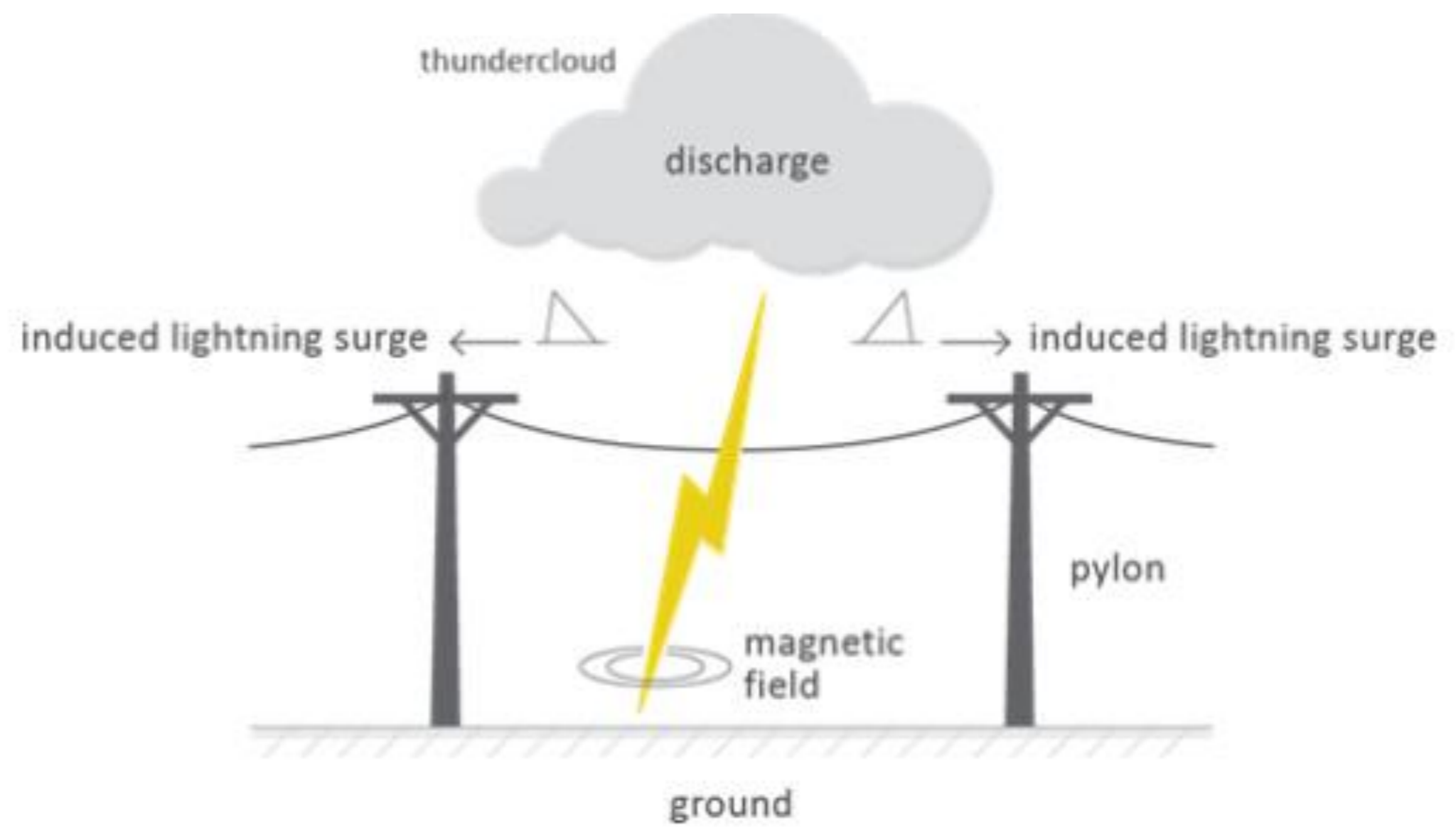
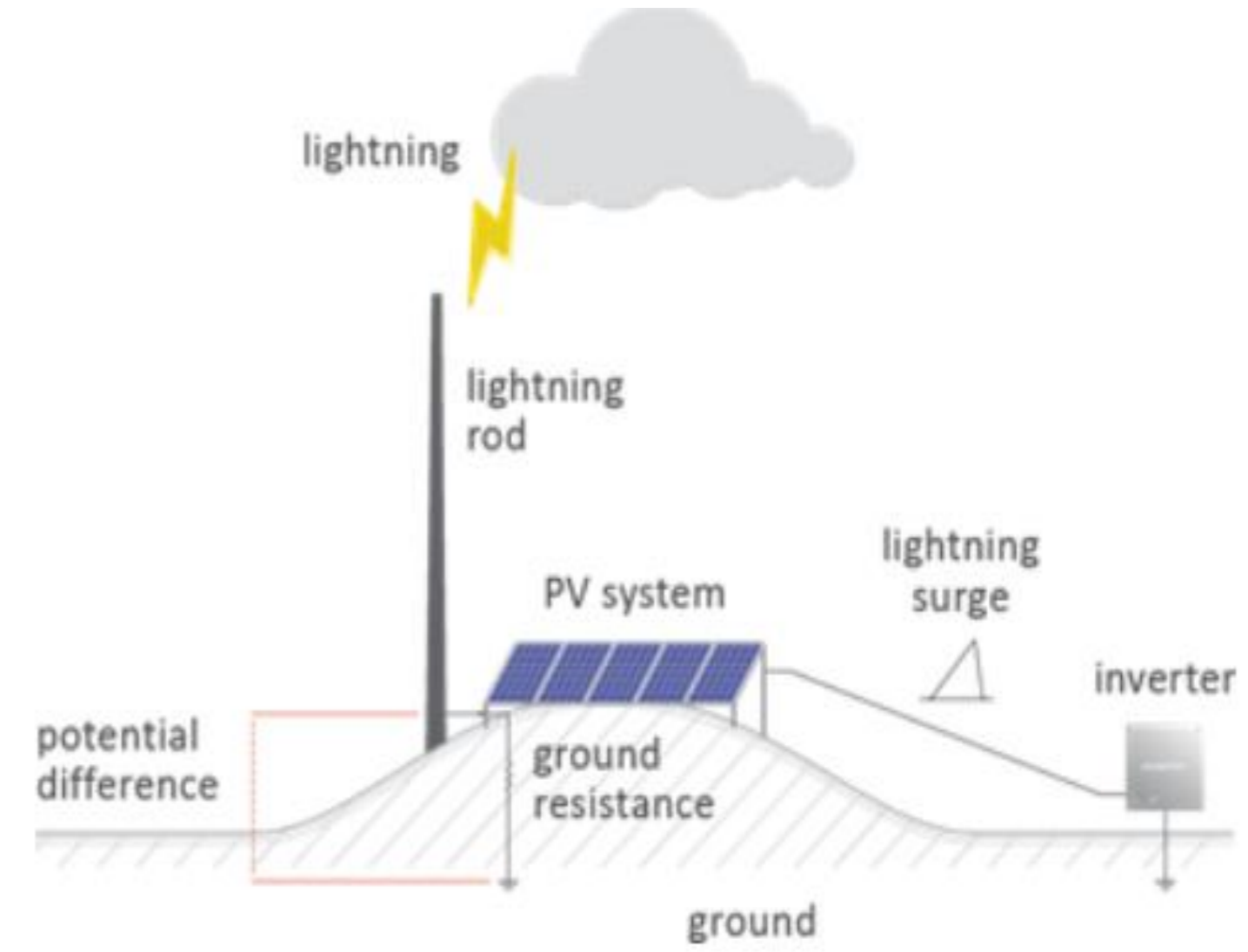
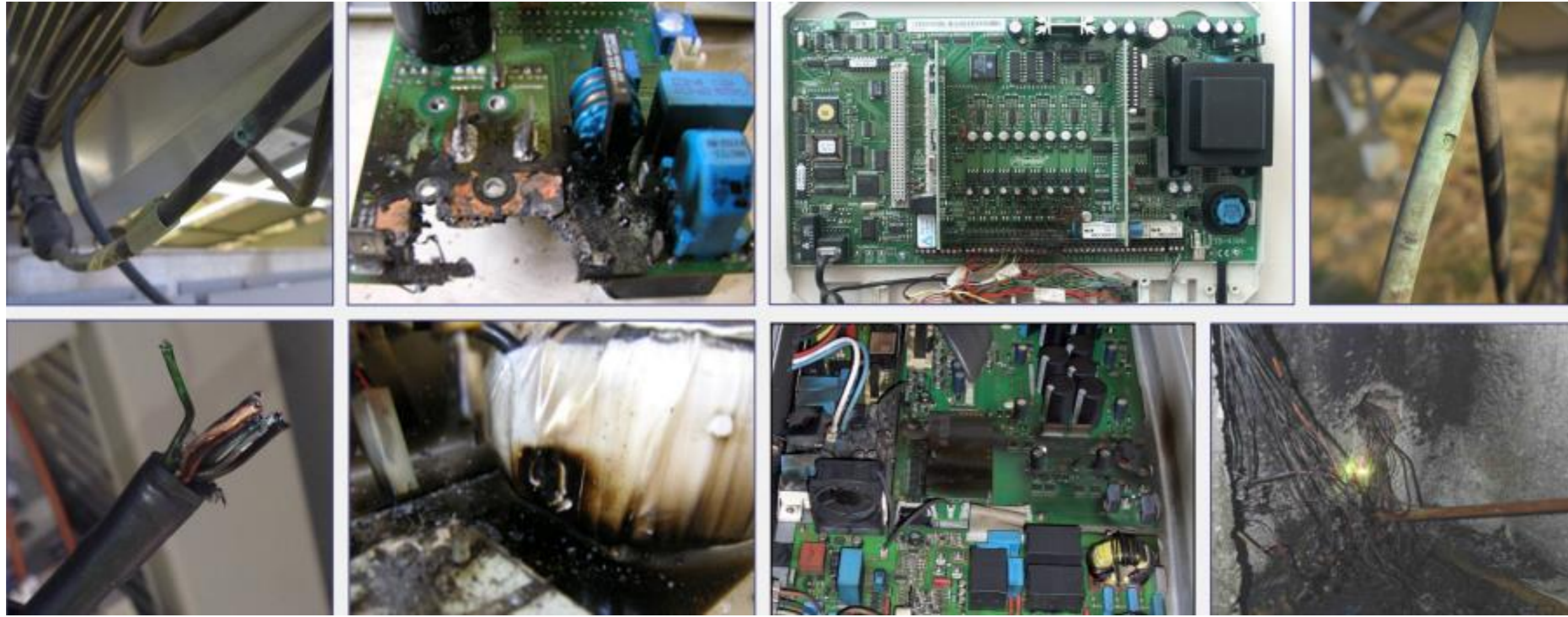
- SAP 2000
- ANSYS
- CFS





▪ Lightning protection system:

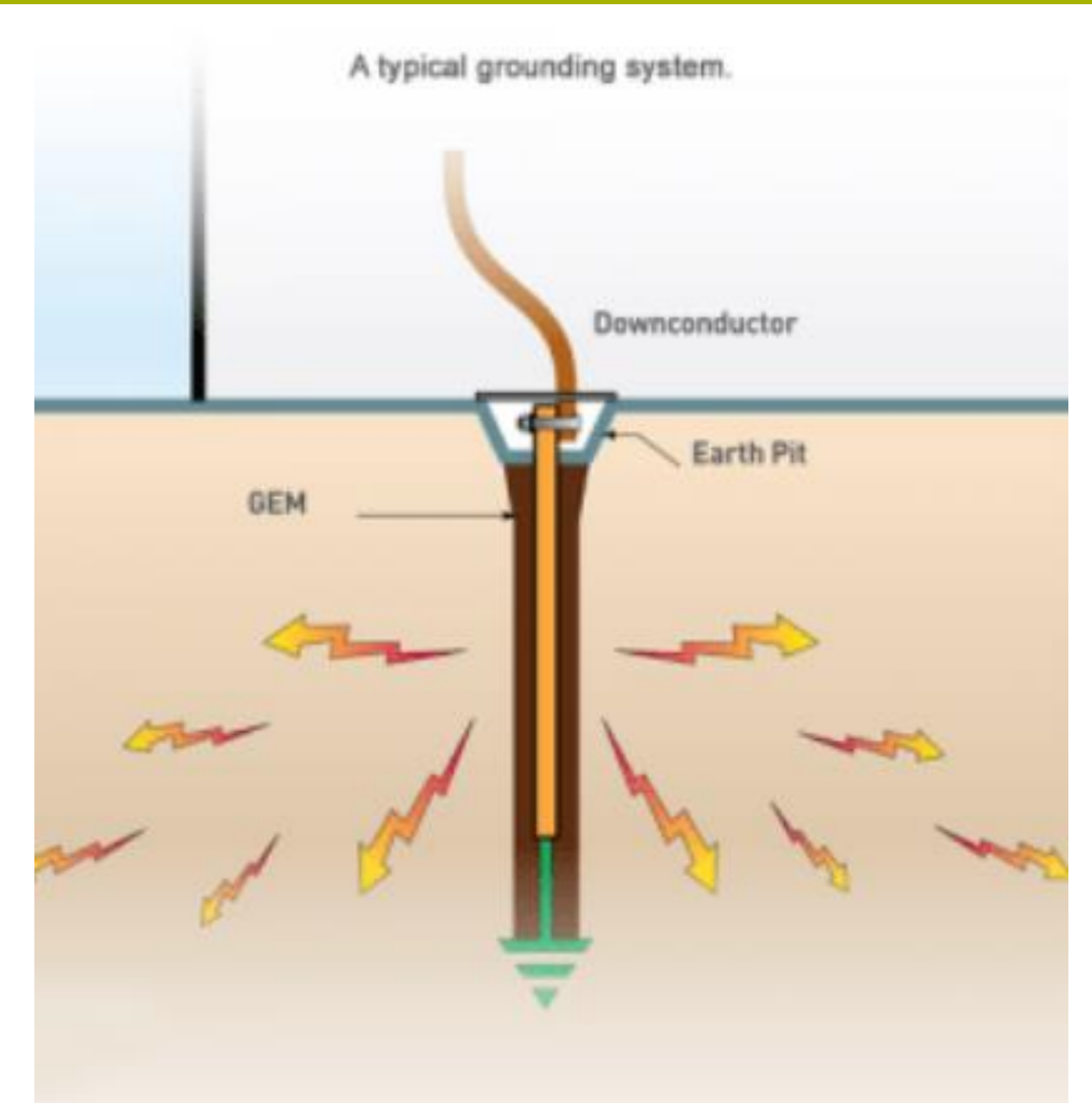
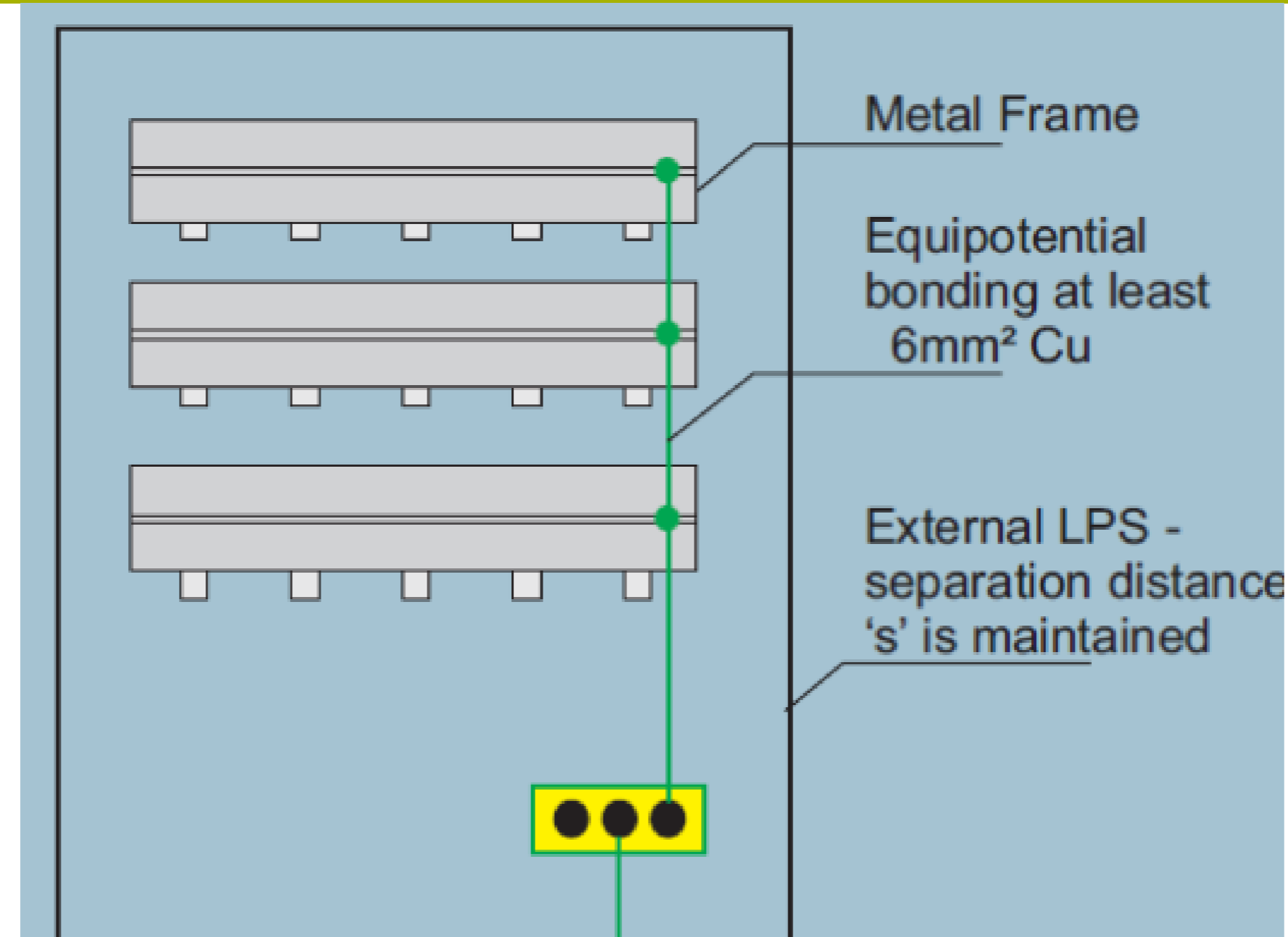
- Using existing lightning protection at factory.
- ESE air terminal mounted on roof is proposed for RTS system.
- Earthing resistance $< 10\Omega$.



Lightning Surge

Arrestor System:

- Type 1: in MSB-solar
- Type 2: in combiner box

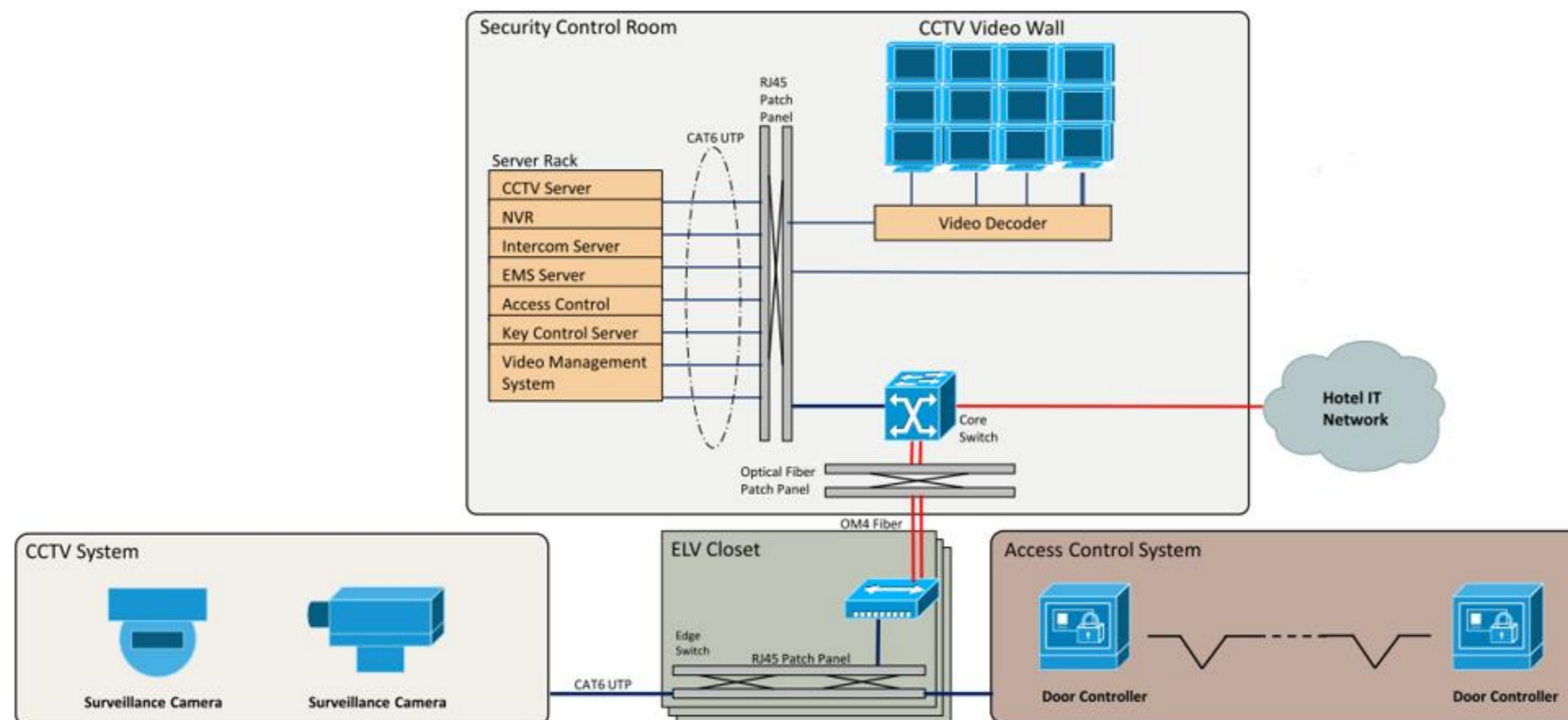


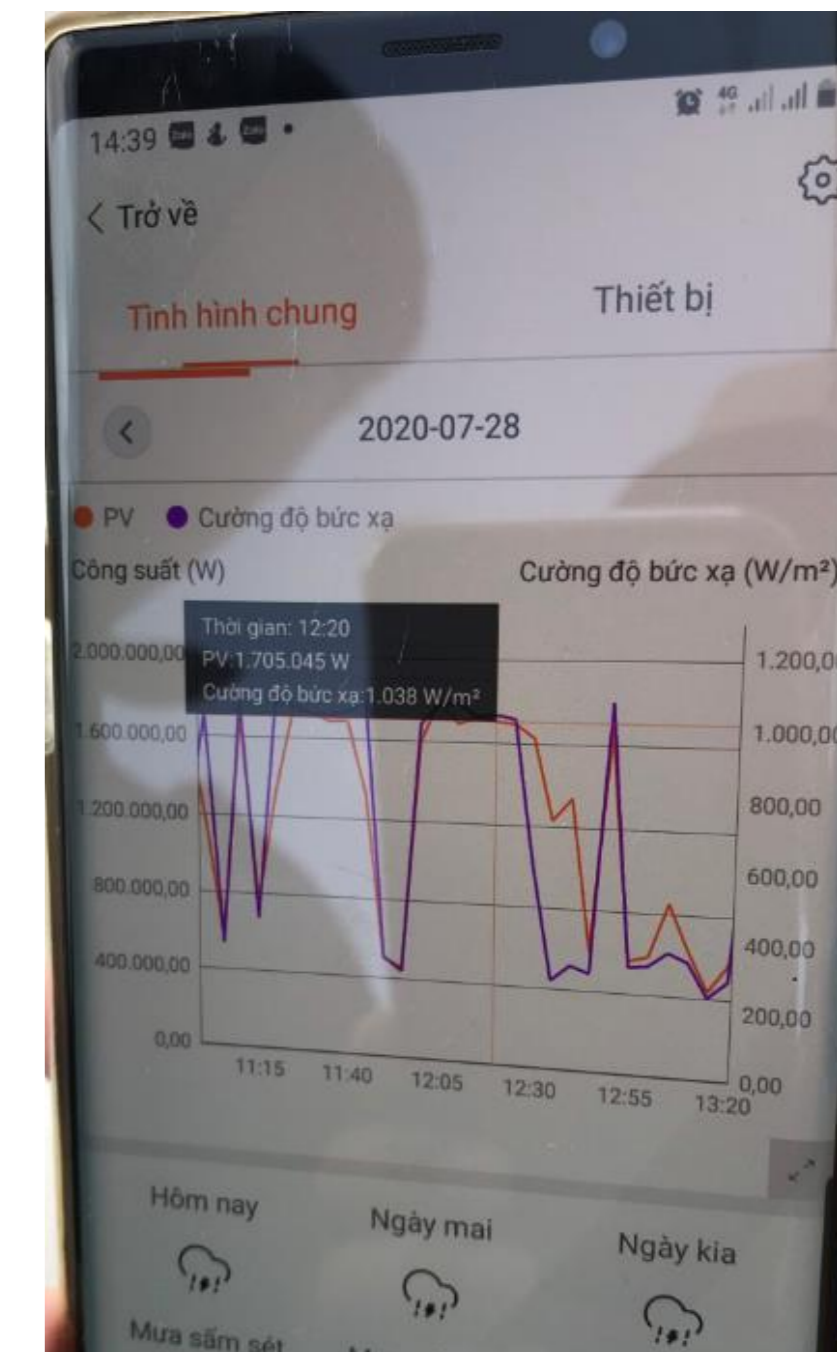
- **Use 2 new earthing systems:**
 - ✓ One for DC system
 - ✓ One for AC system
 - ✓ Earthing resistance < 4 Ω



CCTV Solution :

- Security solutions are required to reduce the risk of theft .
- Cameras should ideally have strong zooming capabilities .
- Cameras will be provided at:
 - Access roof location.
 - Internal road of factory





- Weather stations provide:
 - ✓ Data on **solar** radiation, **temperature**,...
- Solar monitoring systems operate through solar system's inverter.
 - ✓ Communication interface : RS485/Ethernet.



Q&A





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