Innovation for Cool Earth Forum (ICEF)

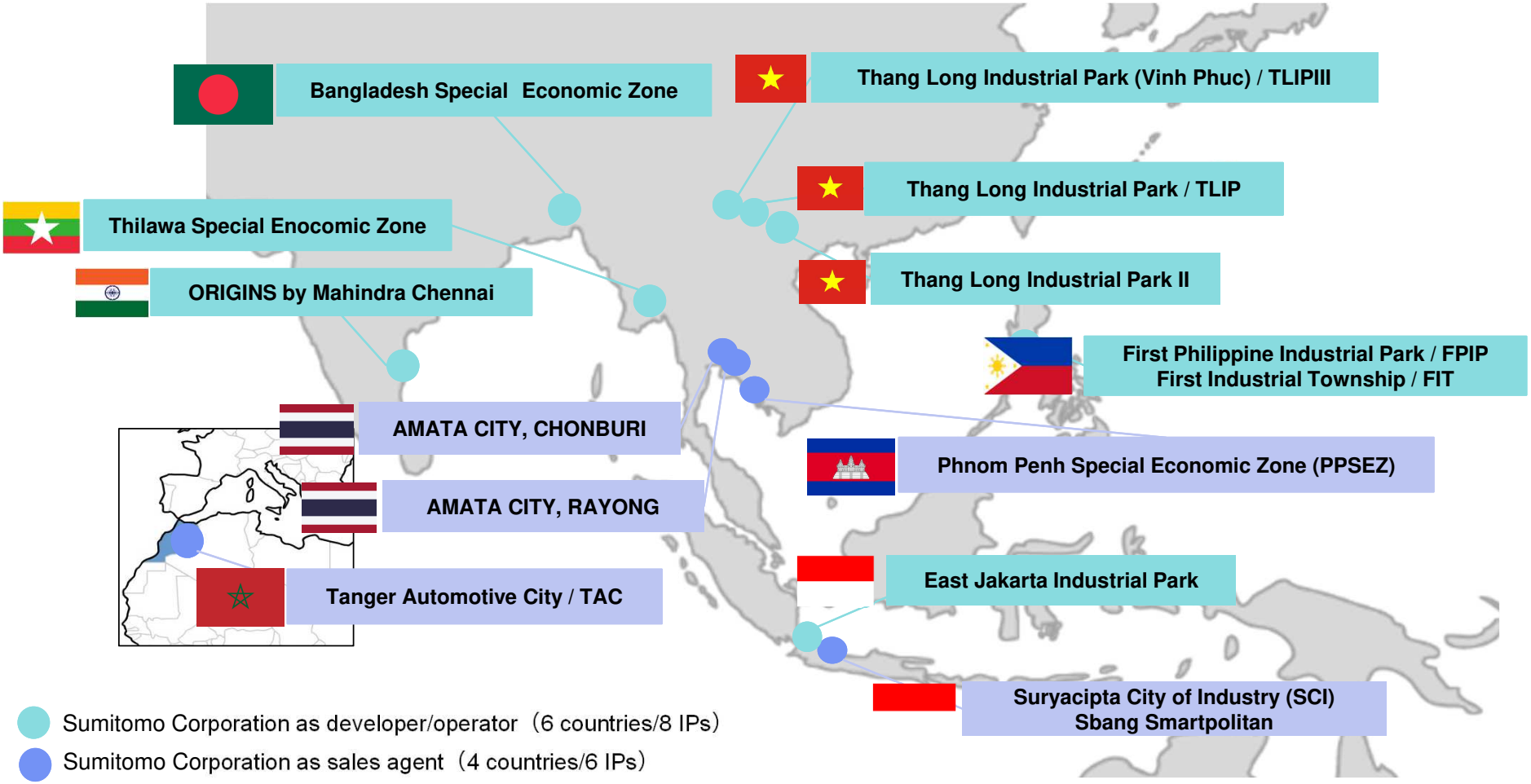
Potential of Perovskite in Industrial Park

Thang Long Industrial Park (Vinh Phuc) (TLIPIII)

2023/10/04　Power Leader / Nguyen Minh Tien

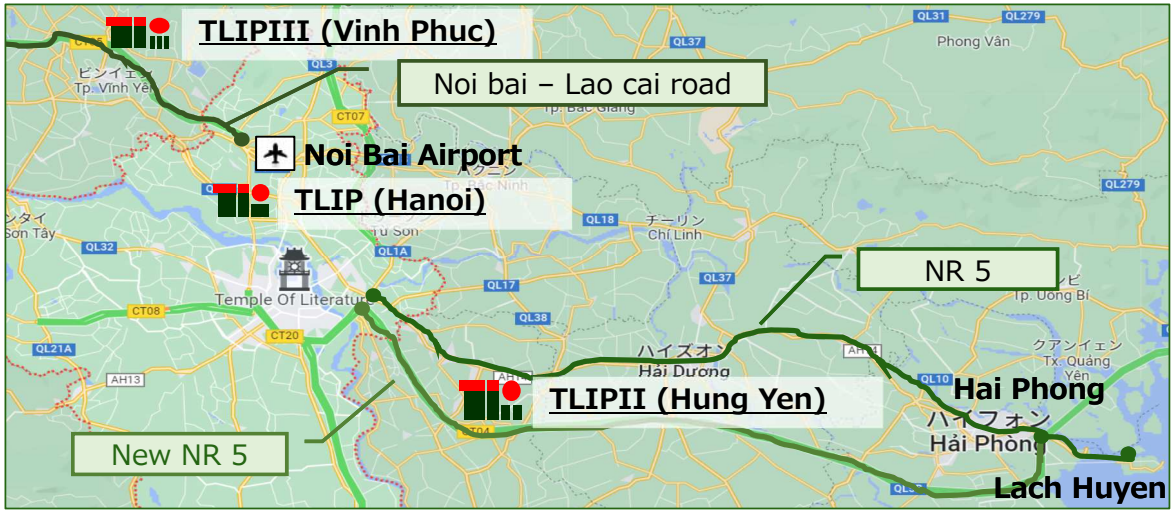
Overview for Our Industrial Parks

- Sumitomo Corporation has owned and operated **8 industrial parks in 6 countries**, mainly in South East Asia.



Overview for TLIPs in Vietnam

Basic Information



	TLIP	TLIPII	TLIPIII
Locatoin	Hanoi (30min from city)	Hung Yen (50min from Hanoi)	Vinh Phuc (50min from Hanoi)
Established	Feb./1997	Nov./2006	Nov./2015
Area	274ha	346ha ※Phase-3 (181ha) under construction	213ha
Share	Sumitomo 58%	Sumitomo 92%	Sumitomo 100%
Tenants	107 tenants	80 tenants	47 tenants
Employee	63,000	28,000	7,000

Countermeasure of 100-year probability calculation

In-house retention canal and pond, for rainwater
Dyke surrounding boarder
Drainage pump system to pump out to external canal

The best electric stability

In-house substation and distribution
Receiving electricity from 2 substation with high voltage
Periodic maintenance by in-house operator

Best quality of infrastructure and service

Security and safety

Surrounding fence prevent incursion
Combination of in-house and outsourced security for 24h, 365 days
Police station and fire fighting station inside park

Various support "Continuous Support after signing contract"

Providing valuable information in monthly meeting with tenants
Support recruit works by board, web site and job fair.
Many events such as Summer festival, Ekiden, Golf cup, Football tournament.

Recent investment trend in TLIPs

Investment trend

Various types of tenants

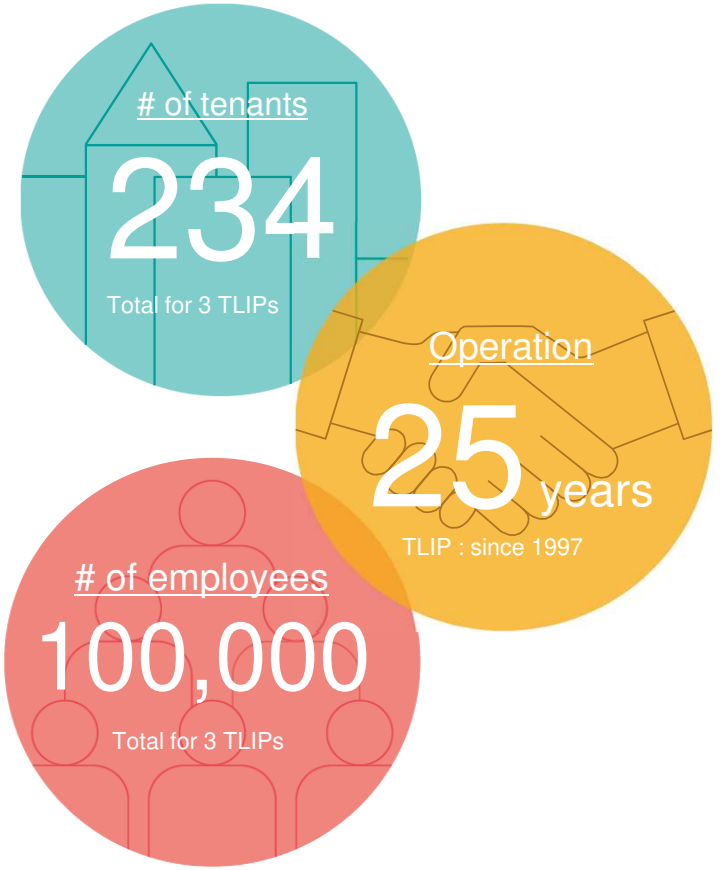
Various type（Export oriented ⇔ domestic market oriented）
Various area（Hi-Tech ⇔ Labor intensive ⇔ Food/Life style）
Various size （Large enterprise ⇔ Small/Medium-sized）

Expansion in Vietnam

Second factory in Vietnam （South to North）
Good evaluation on investment environment in Vietnam

Growth of Vietnamese companies

4 local companies decided its investment in TLIPs (2020)
“NEW VIETNAM” generation enterprises.



Rooftop Solar Project in Thang Long Industrial Park

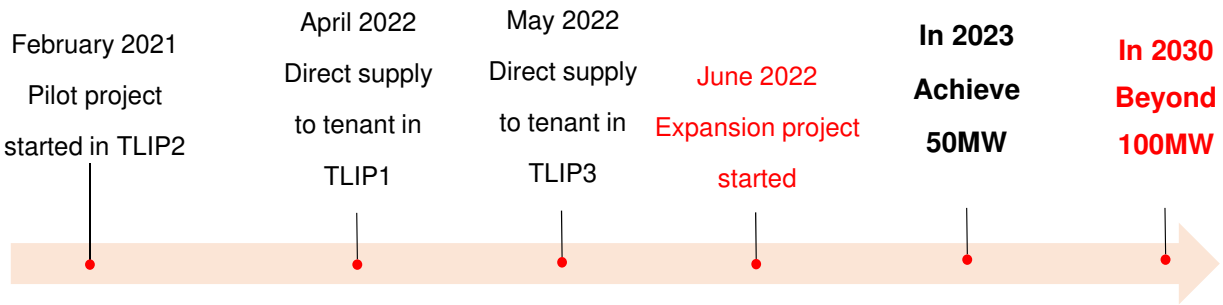
Rooftop Solar Project for TLIPs

- Since February, 2021, TLIP2 started pilot project for Rooftop Solar Project (RTS). Since April, 2022 in TLIP1, since May, 2022 in TLIP3, the RTS project has been started.
- Our RTS project directly supplies to the tenants by installing RTS on the roof of tenants.
- The number of tenants who are interested in our RTS projects is more than 30 companies with 70MWp potential.

Updated situation（As of Sep, 2023）

- TLIP1 : 14 tenants + Rental Factory - 16.8MWp
- TLIP2 : 3 tenants + Rental factory - 12.7MWp
- TLIP3 : 4 tenants - 7.2MWp

37MWp

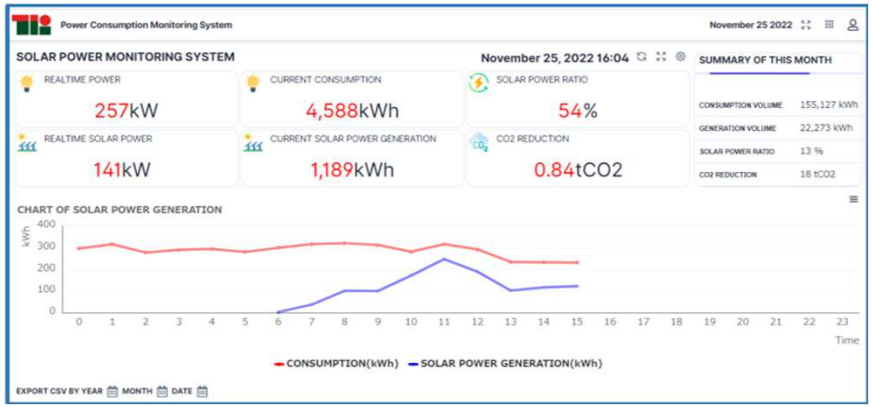


- TLIPs' annual consumption volume in total is approx. 1,000GWh. We aim at achieving 100MW of installed capacity (approx. 100GWh) by 2030, which results in contributing to green power demand not only of tenants but also of Vietnam.
- This business model of RTS will be spread out to our industrial parks in other countries such as Bangladesh (BSEZ).

Our projects

TLIP2・RTS for our Rental factory

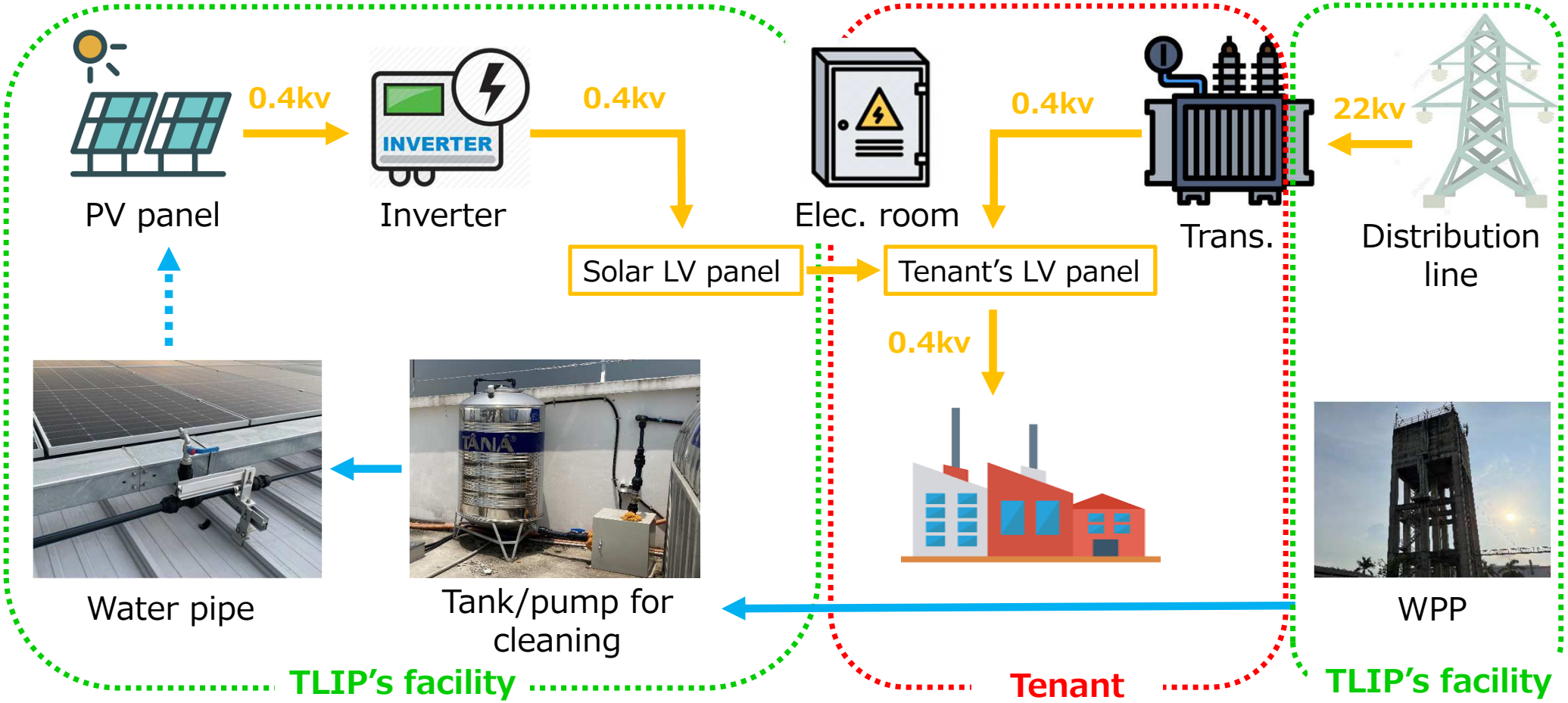
COD achievement



Monitoring system for tenants

Rooftop Solar Project for TLIPs

- Our RTS project directly supplies to the electrical room of the tenants. The surplus energy will be flown as reverse flow to TLIPs' grid, which do not have reverse flow to EVN's national grid.



Potential for Perovskite

- Power shortage issue in the North of Vietnam affects the production activities of Tenants, so we need to research and come up with solutions to ensure the power source for Tenant' production in our IP.

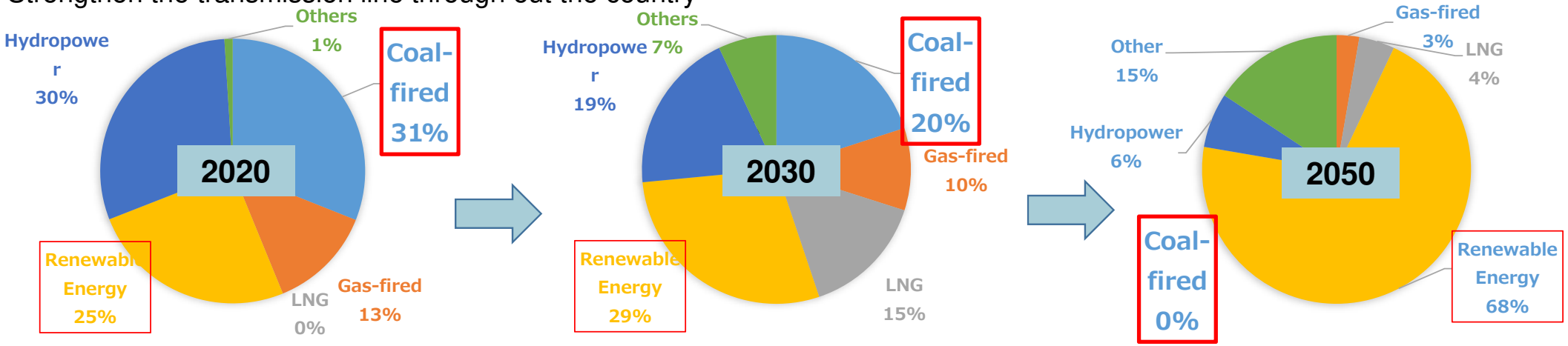
Current status

- In 2023, Vietnam suffered from power shortage due to El Niño, power plants trouble, and lack of water in some of hydropower plants.
- In 2024, the same power shortage may happen again in summer season due to lack of capacity around **1,600 ~ 4,900 MW**.

PDP8 policy

In the Power development plan until 2030 (PDP8) of Vietnam, Vietnamese government encourages renewable energy sources:

- Zero coal-fired power plant （→Ammonia/Biomass mixed).
- Promotion of Offshore wind power
- **Promotion of Self-consumption type of Rooftop Solar (expected to increase by 2,600 MW until 2030)**
- Strengthen the transmission line through out the country



Potential for Perovskite

- In some cases, we could not install the solar system on the factories with the lack of load capacity.
- Many factories were built without consideration of PV panel installation at that time.

Current PV panel

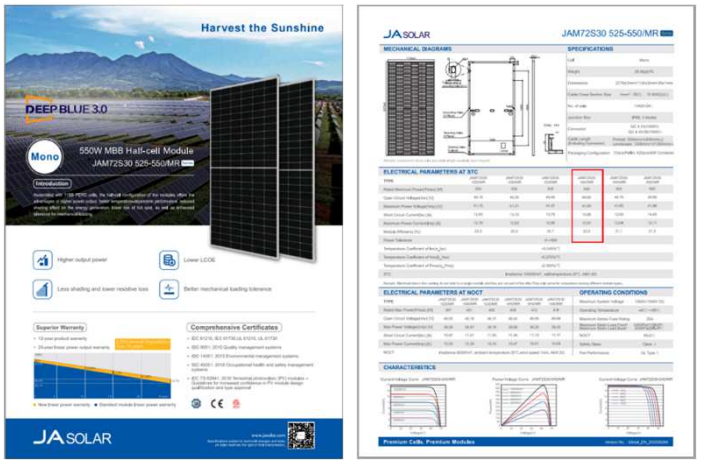
- Manufacture: JA Solar
- Rated maximum power (Pmax): 540 W
- Dimensions: 2279x1134x35
- Weight: **28.6kg ~ 11.07 kg/m2**

Total actual load of Rooftop solar power system (RTS) around **15kg/m2** (include PV panel, mounting structure, cleaning system, walk ways, DC&AC cable trays…)

Load capacity requirement

- Requirement from Vietnam regulations:
  + Factories shall have live load at lest **30kg/m2** for safety.
  + Dead load and hanging load based on factory design, which shall endure against additional **15kg/m2** for RTS system.

Therefore, **the Perovskite solar cell with lighter weight with high efficiency is one of the potential solutions for the factories with the lack of load capacity.**



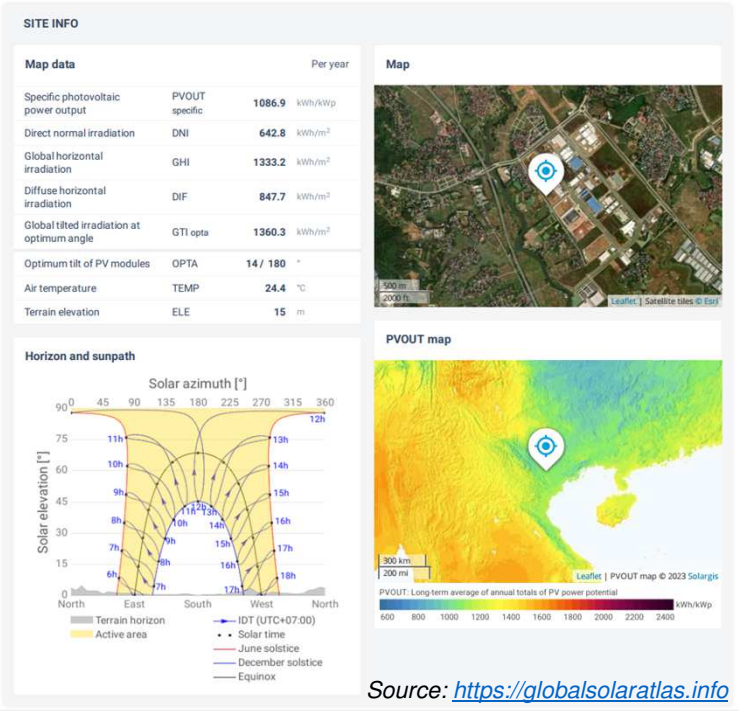
Specification of PV panel

Inspection load capacity of roof before install RTS

Potential for Perovskite

- Potential for solar power development with high efficiencies

Current solar radiation in our IP (TLIPIII)

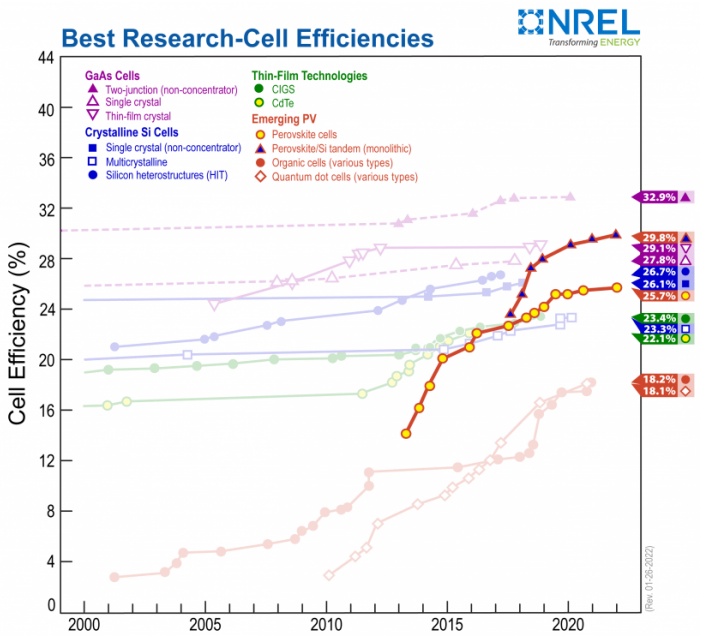


Source: https://globalsolaratlas.info

Perovskite solar cell efficiencies

Currently we are using the JA solar with module efficiency is **20.9%.**

As information on the website: *https://www.energy.gov* Perovskite solar cells have shown remarkable progress in recent years with rapid increases in efficiency, from reports of about 3% in 2009 to over **25%** today.



Efficiency records for perovskite PV cells compared to other PV technologies, with current records of 25.7% for single junction perovskite devices and 29.8% for tandem perovskite-silicon devices (as of January 26, 2022).
National Renewable Energy Laboratory

Source: https://www.energy.gov/eere/solar/perovskite-solar-cells

The solar radiation at our IP is only **664 kWh/m2 per year**, this index is lower, compared with South of Vietnam such as Ninh Thuan province, which have high radiation up to **1,800 kWh/m2 per year.**
Therefore, finding solar panels with higher efficiency is an issue we are very interested in

Thank you for listening